No. 762,997. PATENTED JUNE 21, 1904.

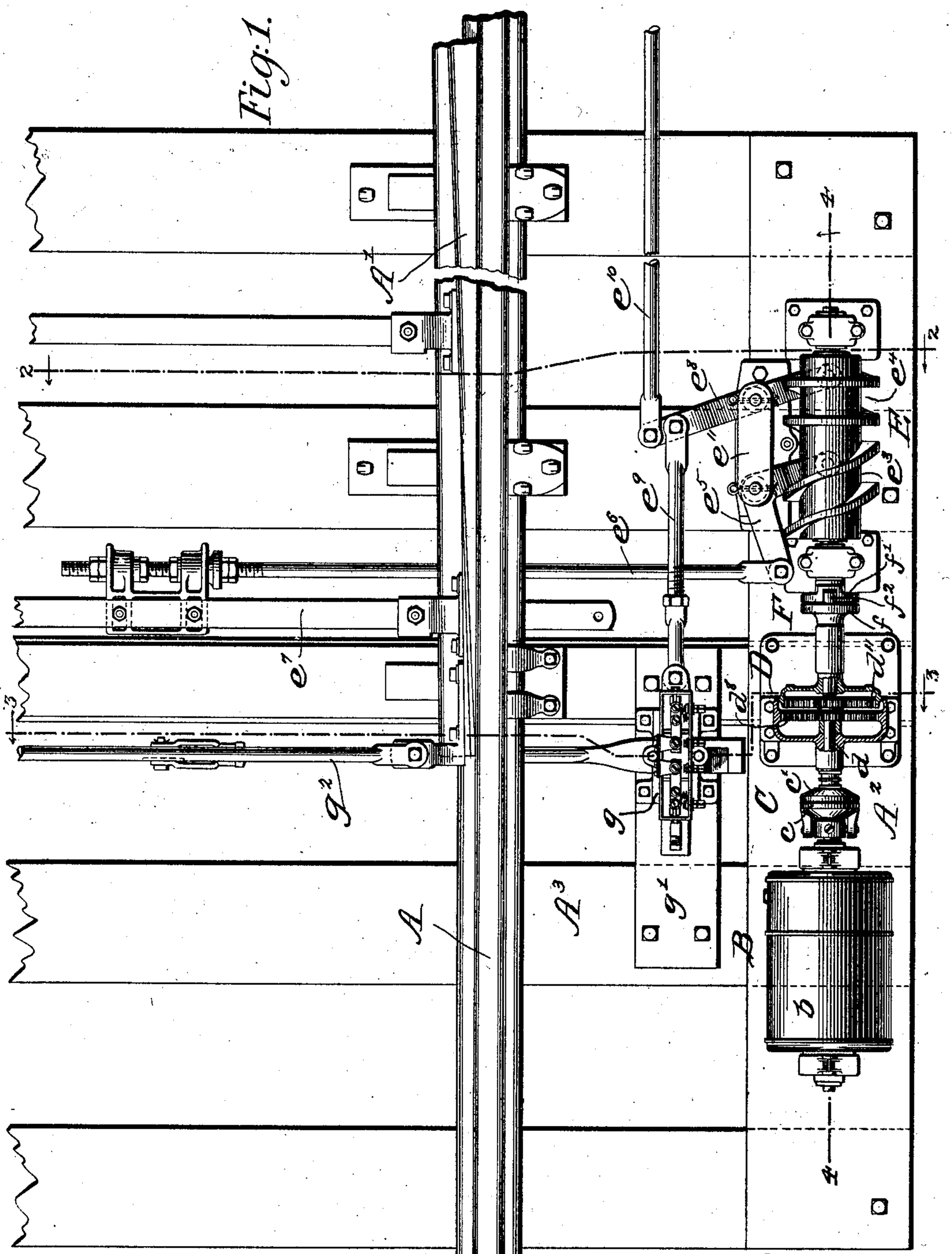
M. D. HANLON.

RAILWAY SWITCH OPERATING APPARATUS.

APPLICATION FILED OCT. 8, 1903.

NO MODEL. 6 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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NO MODEL. 6 SHEETS—SHEET 2.

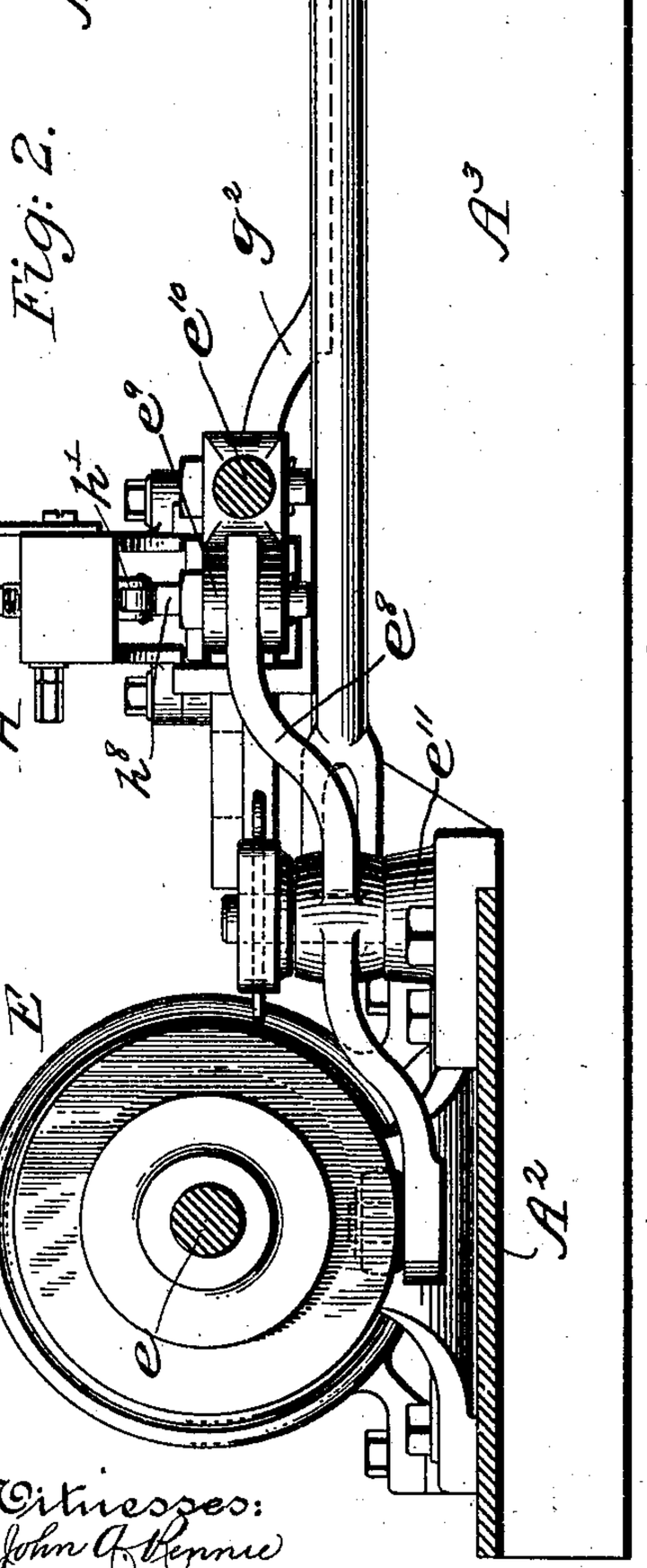

Fig. 2.

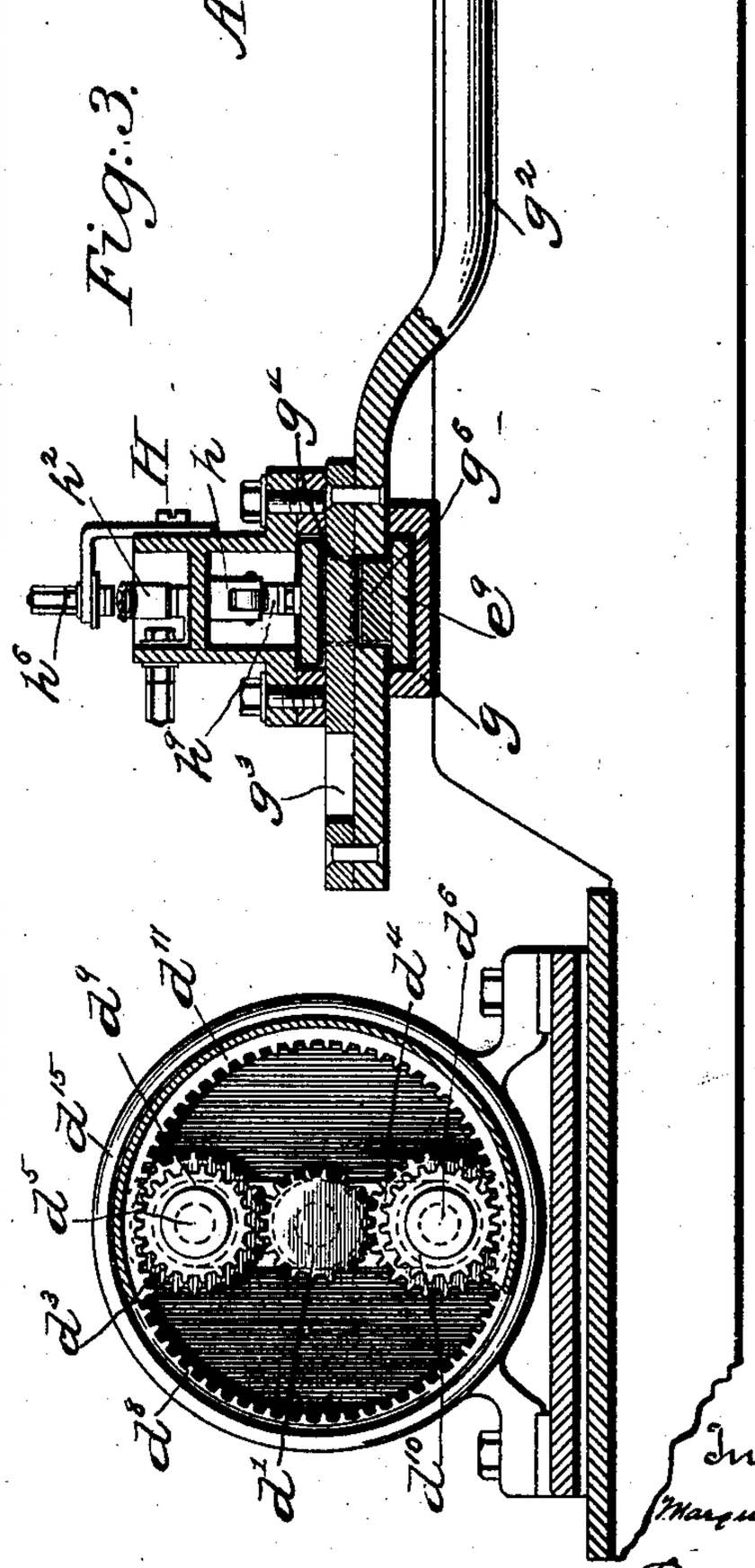

Fig. 3.

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NO MODEL. 6 SHEETS—SHEET 3.

Fig. 7.

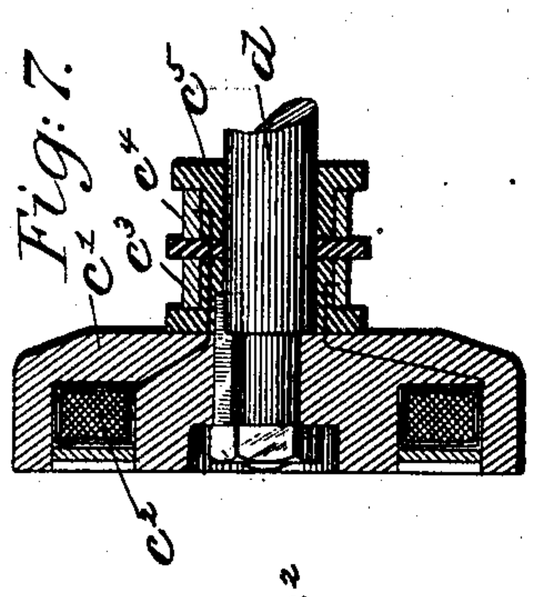


Fig. 6

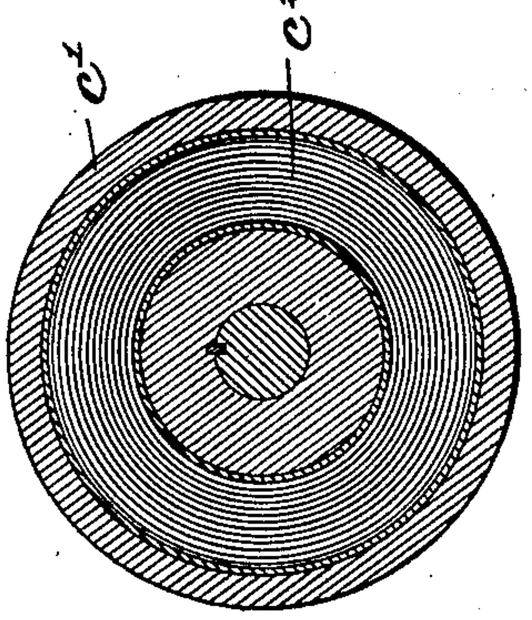


Fig. 5.

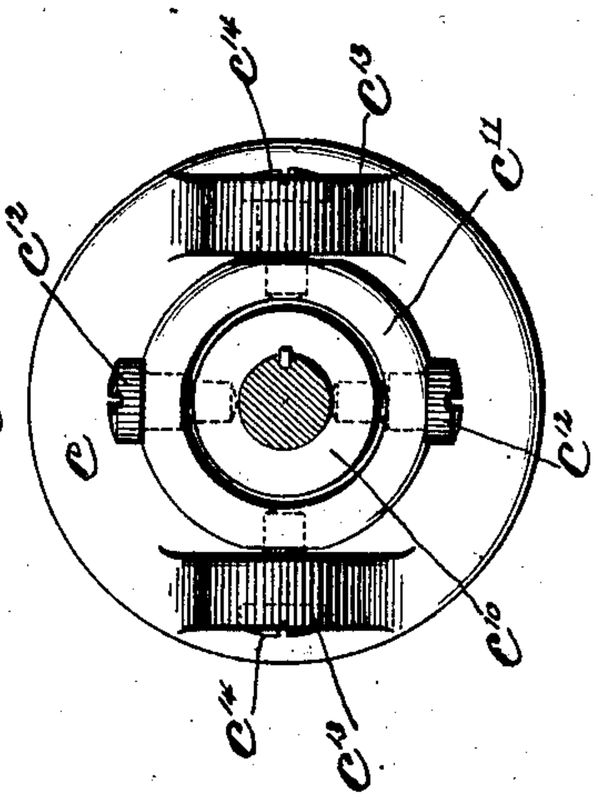
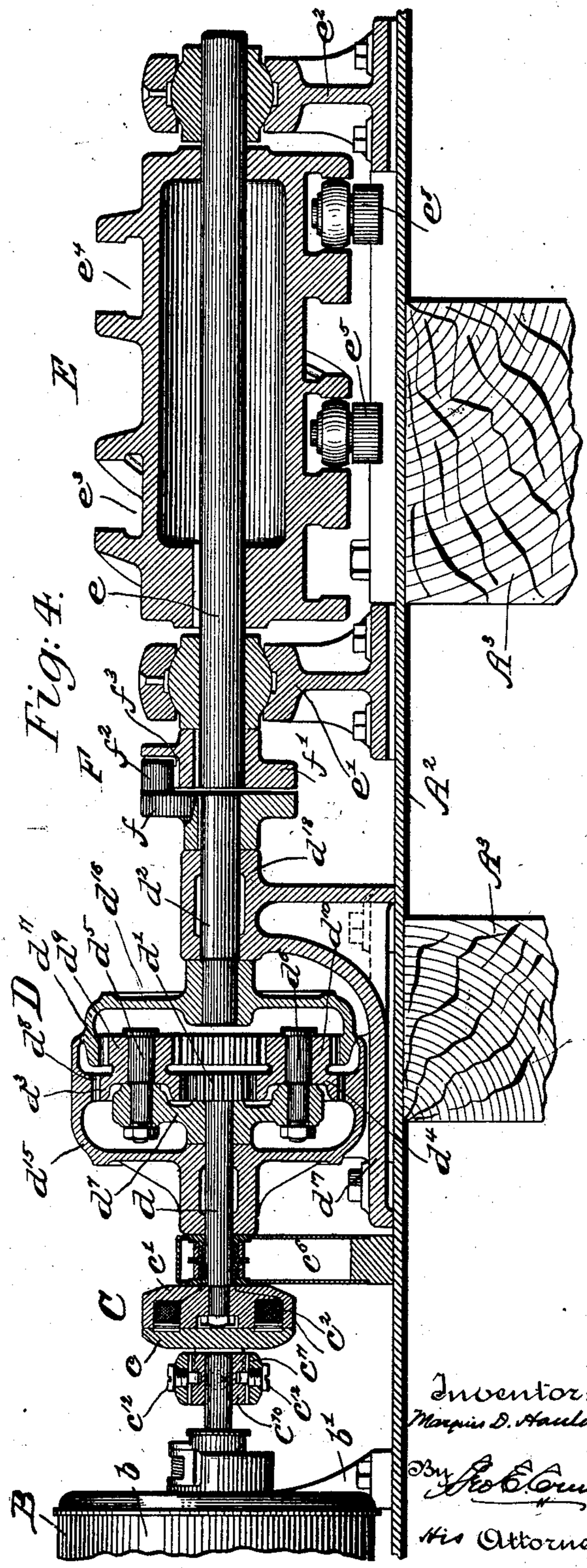


Fig. 4.



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NO MODEL. 6 SHEETS—SHEET 4.

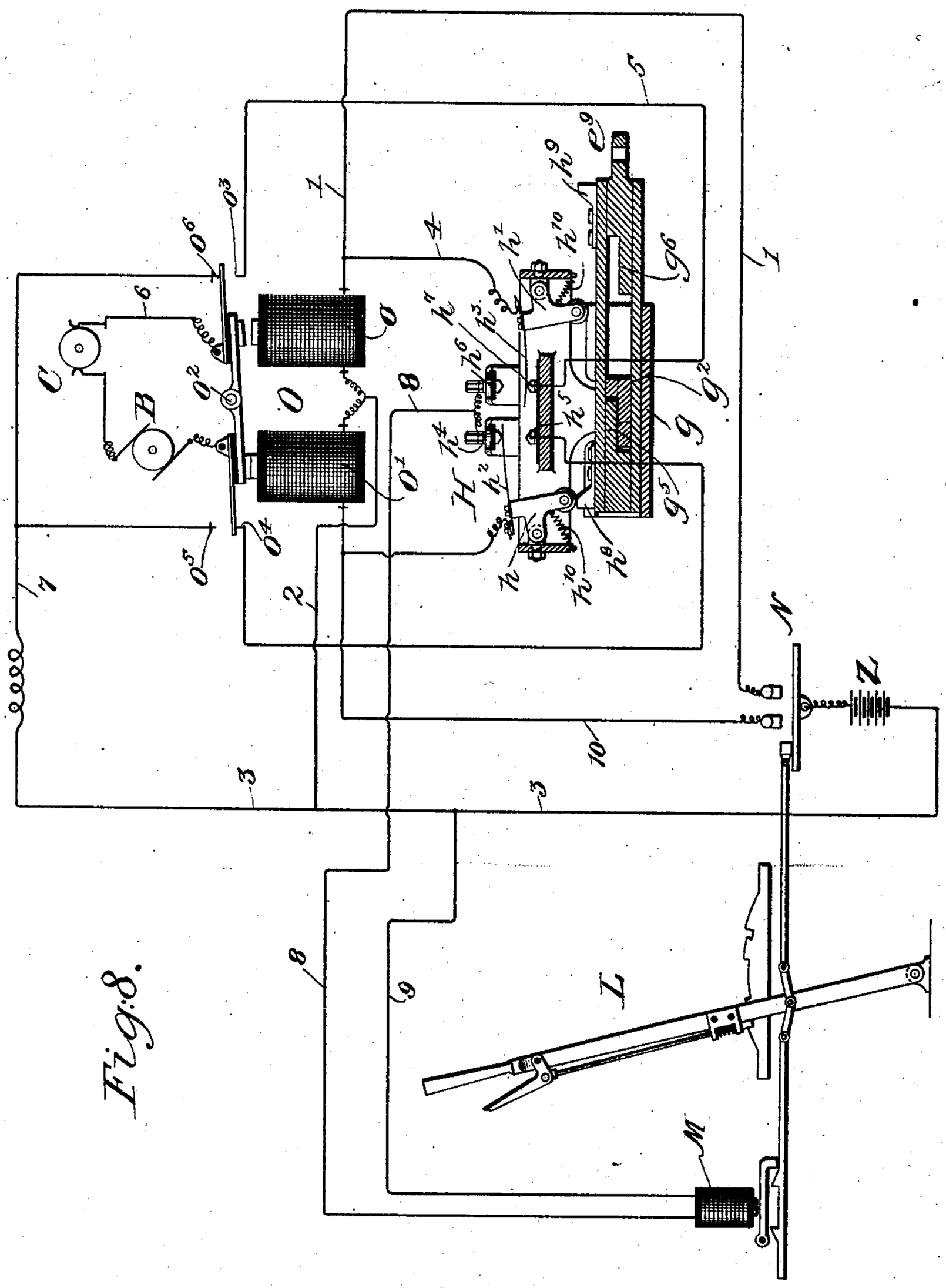

Fig. 8.

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NO MODEL. 6 SHEETS—SHEET 5.

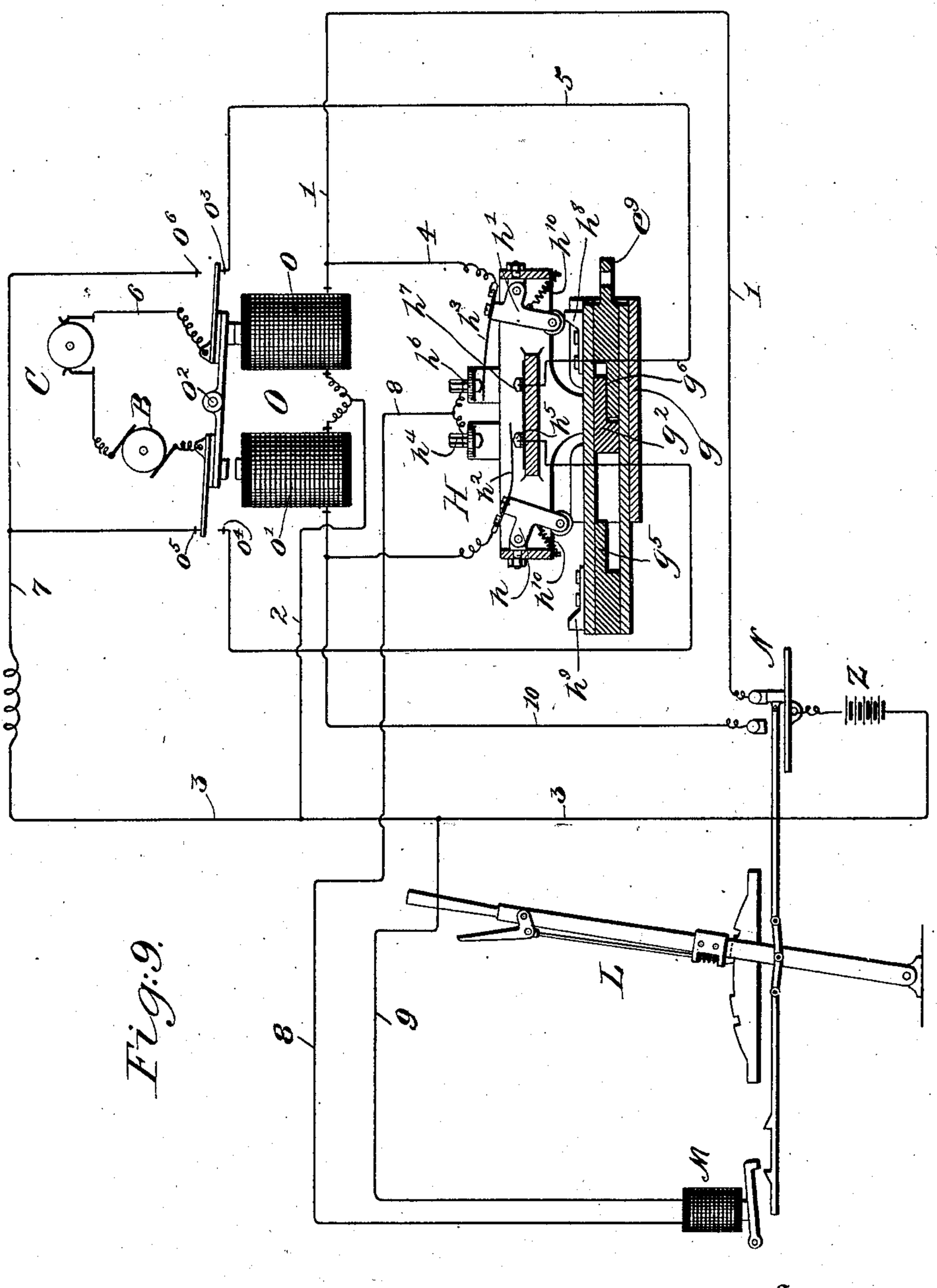

Fig. 9.

Witnesses:
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NO MODEL. 6 SHEETS—SHEET 6.

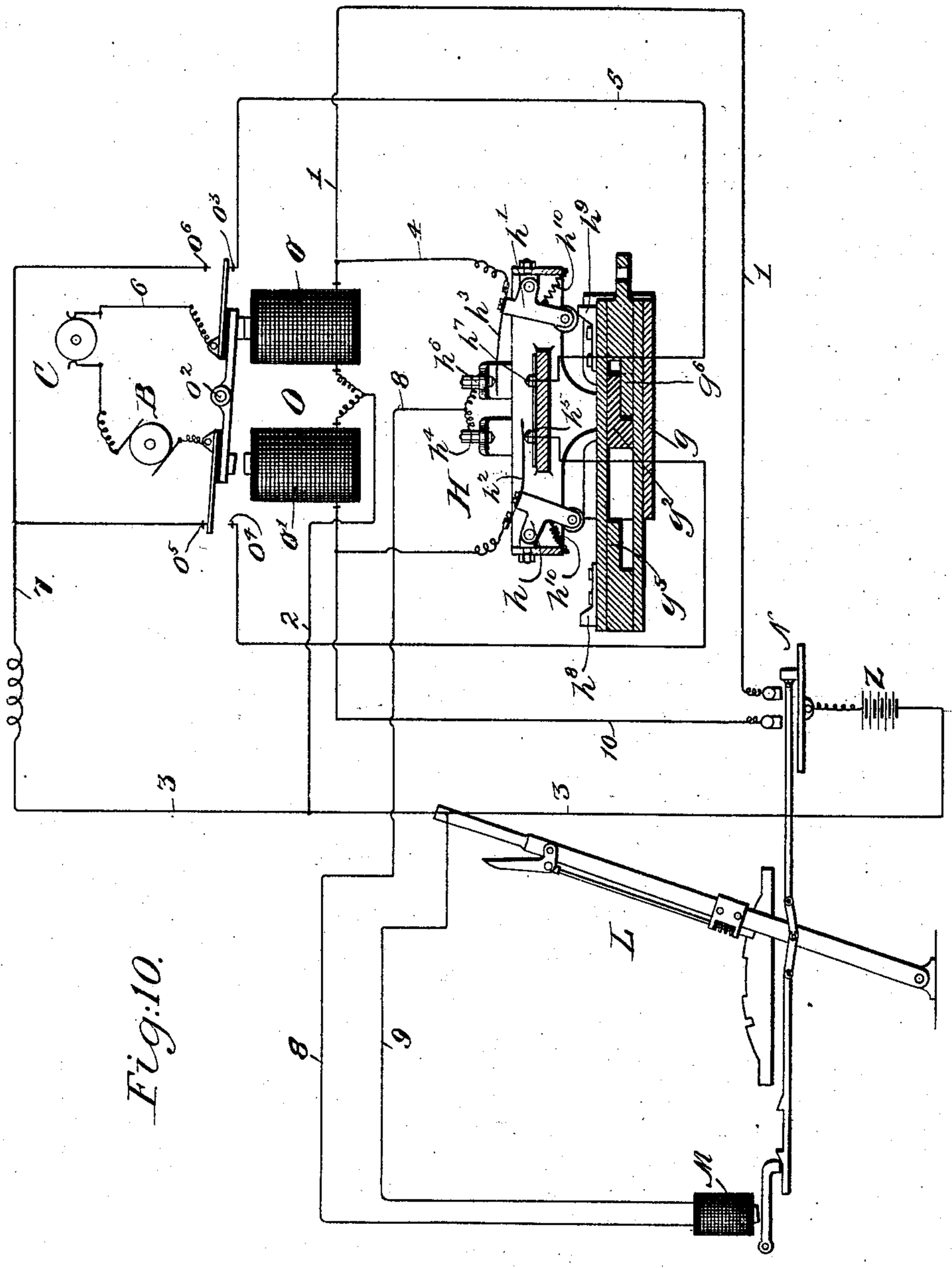

Fig. 10.

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B. A. Hinman

Inventor
Marquis D. Hanlon
By Fred. C. Goepel.
His Attorney.

No. 762,997. Patented June 21, 1904.

UNITED STATES PATENT OFFICE.

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RAILWAY-SWITCH-OPERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 762,997, dated June 21, 1904.

Application filed October 8, 1903. Serial No. 176,249. (No model.)

To all whom it may concern:

Be it known that I, MARQUIS D. HANLON, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Railway-Switch-Operating Apparatus, of which the following is a specification.

My invention relates to apparatus for moving, shifting, or operating railway-switches, and particularly to that class of apparatus which comprises an electric motor. I will describe a railway-switch-operating apparatus embodying my invention and then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is a top plan view, partly in horizontal section, of a railway-switch-operating apparatus embodying my invention and showing it connected with one of the usual two switch rails or points. Fig. 2 is a vertical transverse sectional view of the apparatus shown in Fig. 1, the section being taken on the line 2 2 of Fig. 1. Fig. 3 is a view similar to Fig. 1, the section, however, being taken on the line 3 3 of Fig. 1. Fig. 4 is a view partly in elevation and partly in vertical longitudinal section, the section being taken on the line 4 4 of Fig. 1. Figs. 5, 6, and 7 are each detail views of two parts of a clutch mechanism comprised in the apparatus. Figs. 8, 9, and 10 are each diagrammatical views of a system of control for the motor and clutch comprised in the apparatus and an indication means, certain parts of the apparatus being shown in vertical section.

Similar characters of reference designate corresponding parts in all of the figures of the drawings.

A designates one of the two lines of rails of a railroad, and A′ one of the two usual switch-rails which are provided at points for changing cars from and onto the rails A from an adjacent line of rails.

Adjacent the switch-rails is an operating apparatus by which their position is changed as desired. The apparatus, as shown in the drawings, comprises an electric motor B, a clutch mechanism C, a speed-reducing-gear arrangement D, and cam-cylinder E, by means of which the locking and unlocking of the switch-rails, the movement of the switch-rails, and the movement of the usual detector-bar are secured. The detector-bar is not shown, it being deemed not necessary, as it is well known in the art. These several parts are mounted on a base or bed plate A^2 in a manner to be hereinafter described, the bed or base plate being suitably secured to the ties A^3.

The electric motor B may be of any desired type and construction provided its armature be capable of rotation in reverse directions. The motor is inclosed in a suitable casing *b*, and the casing is held on supports *b′*, secured to and extending upwardly from the bed-plate A^2. The armature-shaft is suitably journaled in the end walls of the casing *b*, and it has connected with it a part *c* of a clutch mechanism C. This connection is such as to permit of a universal movement of the part *c*, and, as shown in the drawings, the connection comprises a collar c^{10}, securedly held to the armature-shaft, and a second collar c^{11}, which is connected to the collar c^{10} by pins c^{12} in such manner that the collar c^{11} may rock on the pins. The part *c* is provided with ears or lugs c^{13}, and the ears c^{13} are connected to the collar c^{11} by pins c^{14} in such manner that the part *c* can rock on the pins c^{14}. The pins c^{14} are located in a plane which extends at right angles to the plane on which the pins c^{12} are located. The clutch mechanism C is of the friction type and is preferably an electric clutch. The other or second part *c′* of the clutch is suitably fixed on what may be termed a "high-speed" shaft *d* of the speed-reducing-gear arrangement. It is provided with an annular recess, in which the energizing-coil c^2 is held. The terminals of the energizing-coil extend through the part *c′* and are joined to contact-rings c^3 c^4, which are held on and between flanges of a sleeve c^5, of insulating material. The ring of insulating material is suitably held on the high-speed shaft, and it is preferably inclosed in a casing c^6. The part *c* of the clutch serves as an armature for the coil c^2, and the clutch is of such strength as

to transmit the rotary motion of the armature to the high-speed shaft d for the ordinary operation of the switch-rails. When the switch-rails meet with any obstruction during their movement which would prevent them completing their movement and stop the further rotation of the shaft d or should a train be standing above the detector-bar when it is being raised by the apparatus, the part c of the clutch would slip on the part c^2, while continuing to rotate with the armature.

The speed-reducing-gear arrangement may be any desired. As shown in the drawings, it comprises the high-speed shaft d, provided with the gear d', and a slow-speed shaft d^2, which is suitably coupled with the cam-cylinder E. The gear d' meshes with gears d^3 d^4, carried on pins or shafts d^5 d^6, which are fixed at one of their ends to a disk or plate d^7, loosely mounted on the high-speed shaft d. The gears d^5 d^6 mesh with an internal gear-wheel d^8, fixed to a part d^{15} of a casing for the speed-reducing-gear arrangement, which, as shown in the drawings, may be integral with the parts d^{15} of the casing. On the same shafts with the gears d^3 d^4 are smaller gear-wheels d^9 d^{10}, and, as shown in the drawings, these gear-wheels are integral with the gear-wheels d^3 d^4. The gear-wheels d^9 d^{10} mesh with an internal gear-wheel d^{11}, which is carried by the other part d^{16} of the casing for the speed-reducing-gear arrangement. As shown, the gear d^{11} is integral with the part d^{16} of the casing, which is suitably fixed on the slow-speed shaft d^2. The arrangement of gears just described is such that upon the rotation of the gear d' in either direction the gears d^3 d^4 will travel around the gear-wheel d^8, and the gears d^9 d^{10}, traveling with the gears d^3 d^4, will cause the gear d^{11} to rotate, but at a slower speed than the shaft d, on which the gear-wheel d' is fixed.

The part d^{15} of the casing is carried by a base d^{17} and preferably is integral with the base d^{17}. The base d^{17} is also extended upward to form a bearing d^{18} for the slow-speed shaft d^2. The slow-speed shaft d^2 has fixed to it one part, f, of a coupling or clutch F, while the other part, f', of the coupling or clutch is secured to one end of a shaft e, provided for the cam-cylinder E. Instead of the shaft e the cam-cylinder may be provided with trunnions, in which case the part f' of the coupling or clutch would be fixed on one of the trunnions. As shown in the drawings, the parts f f' of the coupling or clutch are in the form of disks, and one of the parts—for example, the part f—is provided with a tooth or projection f^2, which fits in a recess or pocket f^3, provided for it in the other part—for example, the part f'.

The cam-cylinder E, as shown in the drawings, is mounted on a shaft e, which is suitably journaled in standards e' e^2, secured to the bed-plate A^2. The cam-cylinder is provided with two cam-grooves e^3 e^4, one of which operates a lever connected with the switch-rails, while the other cam-groove operates a lever connected with the locking means for the switch-rails and also with the detector-bar. These cam-grooves are arranged on the cylinder in such manner during one complete movement of the switch-rails preferably that while one cam-groove is operating its lever the other cam-groove will not operate its lever, and vice versa. In other words, the cam-groove e^3, which operates the lever connected with the switch-rails, will not operate the lever until after the cam-groove e^4 has operated its lever to unlock the switch-rails and raise the detector-bar above the rail. After the cam-groove e^4 has operated its lever to unlock the switch-rails and raise the detector-bar above the rails the cam-groove e^3 will then operate its lever to move the switch-rails, after which the cam-groove e^4 will again operate its lever to lock the switch-rails and to lower the detector-bar below the rail.

e^5 designates the lever in the form of a bell-crank, which is operated by the cam-groove e^3 and which is connected by a rod e^6 with the bridle-rod e^7, joined to the switch-rails.

e^8 designates the lever operated by the cam-groove e^4. The lever e^8 is connected by a rod e^9 with the locking means and by a rod e^{10} with the detector-bar.

e^{11} designates a casting for supporting the pivots for the levers e^5 and e^8, the casting being bolted to the bed-plate A^2.

The locking means for the switch-rails are here shown as being independent of the remainder of the apparatus and as being inclosed in a casing g, mounted on a plate g', which is secured to the ties A^3 adjacent the switch-rails.

g^2 designates a locking-rod, which is suitably secured to both switch-rails. The free end of the rod extends through the casing g, and it is provided with notches or recesses g^3 g^4, into which fit projections g^5 g^6, carried by the rod e^9. In one position of the switch-rails the projection g^5 fits in the recess g^3, and in the other position of the switch-rails the projection g^6 fits in the recess g^4. When either of the projections are in its recess, the switch-rails cannot be moved.

The operation of the locking means is so well understood in the art as not to require further detailed description. When the switch-rails are to be moved by the apparatus, the rod e^9 is first moved to disengage either of the projections g^5 g^6 from the rod g^2, so that the apparatus may move or shift the switch-rails. After the switch-rails have been moved or shifted the rod e^9 is again moved to have either of the projections g^5 g^6 engage the rod g^2.

H designates what may be termed in the art as an "indication-box." It is, in effect, a circuit-controller, being adapted when operated to break and establish in part circuits for the motor at predetermined times, and also to

establish in part circuits for the indication means, which indication means are provided, as is well known in the art, for indicating to the operator whether or not the switch-rails have been completely moved in response to his movement of the controlling-lever for the switch-operating apparatus. These indication means also have the function of preventing the controlling-lever being moved to its final position to release or lock, through mechanical interlocking, other controlling-levers. Generally the indication means are in the form of an electromagnet, which through its armature and suitable connections operates a mechanical lock engaging the controlling-lever in certain of its position to permit of the controlling-lever having at such times only a limited movement. These indication means may be any desired. The indication-box may be of any desired form. In short, any desired form of circuit-controller may be used, and it may be operated in any desired manner, provided it establishes and breaks in part the motor-circuit at determined times and also establishes and breaks wholly or in part at predetermined times the circuits for the indication means.

The indication-box, as shown in the drawings, is mounted on the casing g, and it comprises two pivoted levers h h', carrying contact springs or plates h^2 h^3. The contact-spring h^2 alternately upon the operation of its lever engages contact plates or points h^4 h^5, suitably arranged and insulated, and the contact-spring h^3 alternately upon the operation of its lever engages contact plates or points h^6 h^7, also suitably arranged and insulated. The levers h h' are moved in one direction by projections h^8 h^9, movable or carried by the rod e^9, and in the other direction by a spring h^{10}, though the levers may be positively moved in both directions through the rod e^9.

It will be seen, therefore, that my invention comprises an electric motor, a cam-cylinder, and means intermediate the electric motor by which the motion and speed of the armature of the motor is communicated to the cam-cylinder and at the same time reduced. If desired, the clutch and speed-reducing-gear arrangement may be included in the motor-casing without departing from the spirit of my invention. Various other changes or modifications of the parts or their relative arrangements may be made without departing from the spirit of my invention. The arrangement illustrated is preferable on account of its being easily inspected and the possibility of renewal of any part without dismantling the entire apparatus, this advantage being obtained through the use of the separable clutches or couplings and the supporting of each part of the apparatus on its own base. By having one part of the clutch C capable of a universal motion it is possible to operate the apparatus from the motor should any part of the apparatus get out of alinement by reason of a shifting of the ties. The same is true of the coupling F.

Any system of control may be employed for the apparatus. In Figs. 8, 9, and 10 I have diagrammatically illustrated a system of control for the electric motor and an electric clutch as well as a system of indication; but the systems may be modified or changed as desired. Fig. 8 illustrates the position of controlling-lever L and the position of the parts comprised in the indication-box after the switch-rails have been completely moved to one position and locked and the controlling-lever put in its complete position. Fig. 9 illustrates the position of the controlling-lever to close the circuit on the motor and the position of the parts of the indication-box after the apparatus has operated in response to the preliminary movement of the controlling-lever and the indication received that the switch-rails have been completely and fully moved to permit the controlling-lever being moved to its complete position. Fig. 10 is similar to Fig. 9, with the exception that the controlling-lever has been moved to its complete position to cut off current from the electric motor of the apparatus and the controlling and indication circuits.

The lever L is arbitrarily represented, as is the indication means M and the circuit-controller N or switch operated by the lever.

Z designates a source of electrical supply, which is generally in the form of a set of storage batteries. One pole of the battery is connected with the circuit-controller N, while the other pole is connected with a common return-wire. By moving the lever L to the position shown in Fig. 9 a circuit for the motor is closed for the rotation of its armature in one direction. This circuit, starting from the battery Z, is circuit-controller N, wire 1, magnet o of a circuit-changer device O, (see United States Patent No. 591,590, granted October 12, 1897, in the name of J. P. Coleman,) and wires 2 3 to battery, the latter wire being a common return. The magnet o being energized will attract the pivoted armature o^2 and have it close a circuit at o^3 and open a circuit at o^4. Current will then flow through from the battery Z through circuit-controller N, wires 1 and 4, contact-spring h^3, and contact-point h^7, (see Fig. 8,) wire 5, contact o^3, wire 6, through the coil of the clutch C, electric motor, contact o^5, (which is made when o^4 is broken,) wires 7 and 3 to battery. The motor will then operate the apparatus to shift the switch-rails, and when the switch-rails have been completely moved the parts in the indication-box will be moved to the positions shown in Fig. 9. By comparing Figs. 8 and 9 it will be seen that the circuit for the electric clutch and motor (they being in series) will be broken by the con-

tact-spring h^3 being moved away from the contact-point h^7, and as it is moved away from contact h^7 it is moved into engagement with the contact-point h^6. The indication-circuit will then be established, which, starting from battery Z, is circuit-controller N, wires 1 and 4, contacts h^3 h^6, wire 8, indication device M, and wires 9 and 3 to battery. The indication means will then unlock the controlling-lever L, (in a manner well known in the art,) and the controlling-lever can then be moved to its complete position, (see Fig. 9,) which will operate the circuit-controller N to cut off current from the battery Z. Of course if the switch-rails have not completely moved in response to the lever the engagement of the contact-spring h^3 with the point h^6 will not be made. When the apparatus is again to be operated, the controlling-lever will be moved to operate the circuit-controller to have current from the battery Z pass through wire 10 to energize the magnet o' and have it move the armature o^2 to establish the contacts o^4 o^6, (see Fig. 8,) so that current will pass through the motor in the opposite direction.

What I claim as my invention is—

1. In an apparatus for moving railway-switches, the combination of a motor, a cam-cylinder for moving the switch-rails, and an electric clutch intermediate the motor and cam-cylinder.

2. In an apparatus for moving railway-switches, the combination of an electric motor, a cam-cylinder for moving the switch-rails, and an electric clutch intermediate the electric motor and cam-cylinder.

3. In an apparatus for moving railway-switches, the combination of an electric motor, a speed-reducing-gear arrangement, a cam-cylinder operated from the speed-reducing gear, and an electric clutch intermediate the electric motor and speed-reducing-gear arrangement.

4. In an apparatus for moving railway-switches, the combination of an electric motor, a cam-cylinder operated from the electric motor and comprising two cam-grooves, one for operating a lever connected with the switch-rails, and the other for operating a lever connected with the locking means for the switch-rails.

5. In an apparatus for moving railway-switches, the combination of an electric motor, a cam-cylinder operated from the motor and comprising two cam-grooves, one for operating a lever connected with the switch-rails and the other for operating a lever connected with the locking means for the switch-rails, said cam-grooves being arranged so that they will alternately operate their levers.

6. In an apparatus for moving railway-switches, the combination of an electric motor, a cam-cylinder operated from the electric motor, and means operated by the cam-cylinder for moving the switch-rails and operating the locking means for the switch-rails.

7. The combination in an apparatus for moving railway-switches of an electric motor, a speed-reducing-gear arrangement, and a cam-cylinder, said parts being independently mounted and detachably and operably connected together.

8. The combination in an apparatus for moving railway-switches of an electric motor, a speed-reducing-gear arrangement, an electric clutch intermediate the motor and speed-reducing-gear arrangement, a cam-cylinder, and a clutch intermediate the speed-reducing-gear arrangement and the cam-cylinder.

9. The combination in an apparatus for moving railway-switches, of an electric motor, a cam-cylinder, and a clutch intermediate the cam-cylinder and the electric motor, said clutch comprising two parts one of which is arranged to have universal movement.

10. The combination in an apparatus for moving railway-switches, of an electric motor, a cam-cylinder, and an electric clutch intermediate the cam-cylinder and the electric motor, said clutch comprising two parts one of which is arranged to have universal movement.

11. The combination in an apparatus for moving railway-switches, of an electric motor, an electric clutch comprising two parts one of which has a universal connection with the armature-shaft of the electric motor, and a cam-cylinder operatively connected with other part of the electric clutch.

12. In an apparatus for moving railway-switches, the combination of an electric motor, a cylinder operated therefrom and provided with cam-grooves, one groove being adapted in its initial operation to unlock the switch-rails, while a second cam-groove is ineffective, and ineffective while the second groove is effective to move the switch-rails, and finally effective to lock the switch-rails.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MARQUIS D. HANLON.

Witnesses:
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James Chalmers, Jr.