No. 715,428. Patented Dec. 9, 1902.

J. L. SCHUREMAN, JR.

ELECTRICAL CONTROLLER.

(Application filed Dec. 4, 1899.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 2.

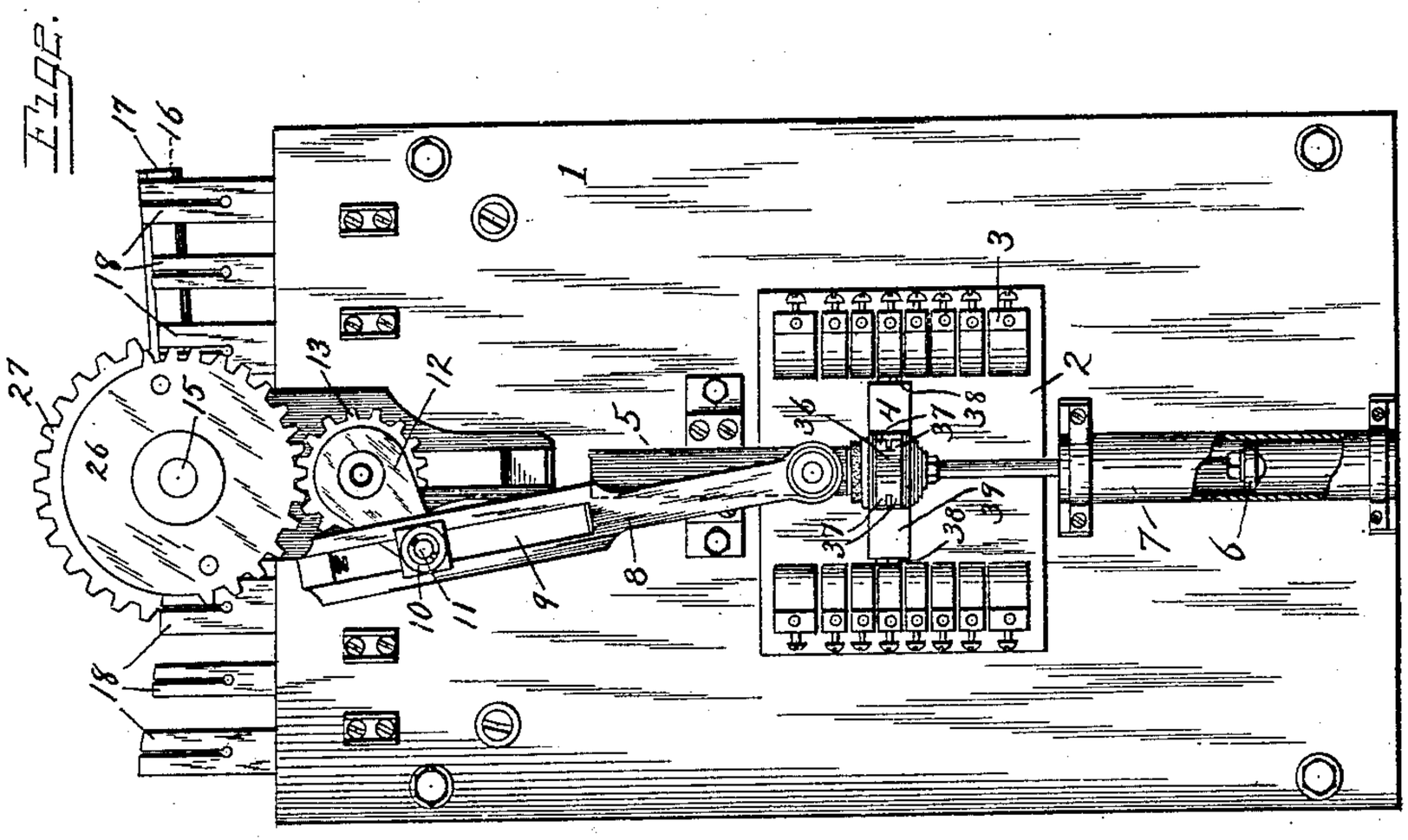


Fig. 4.

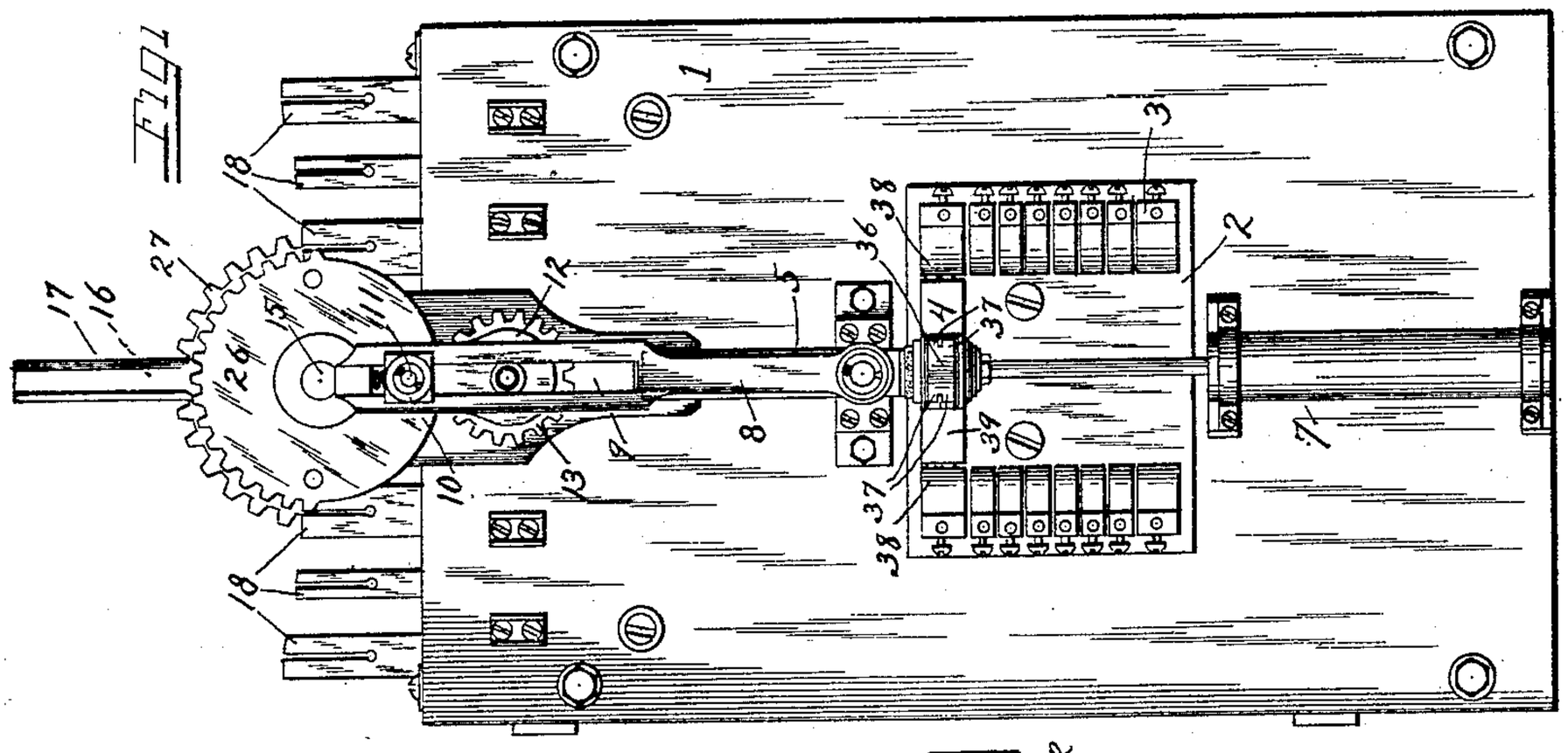


Fig. 5.

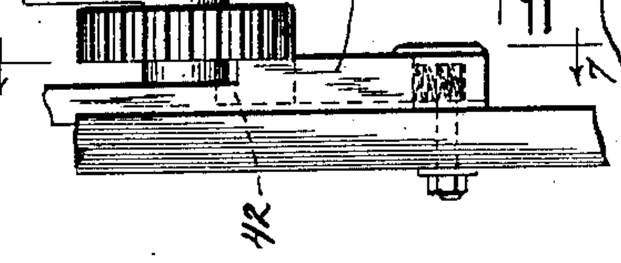
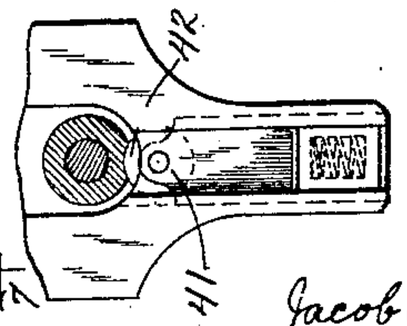


Fig. 7.



Witnesses
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(No Model.) 4 Sheets—Sheet 2.

FIG. 4.

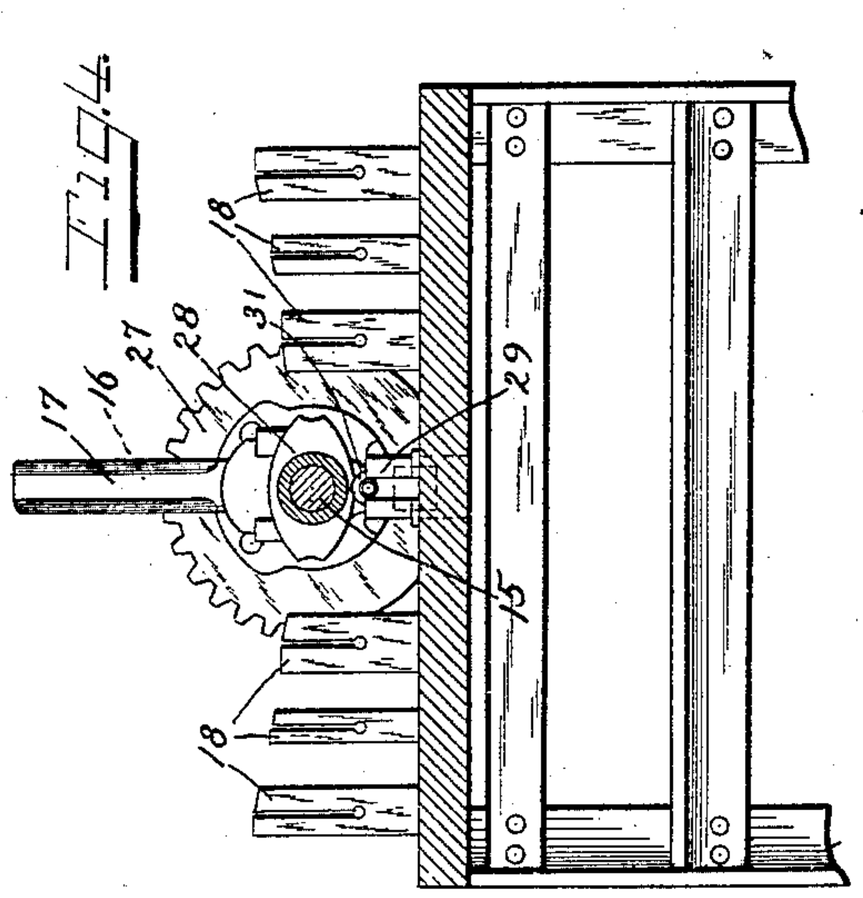


FIG. 5.

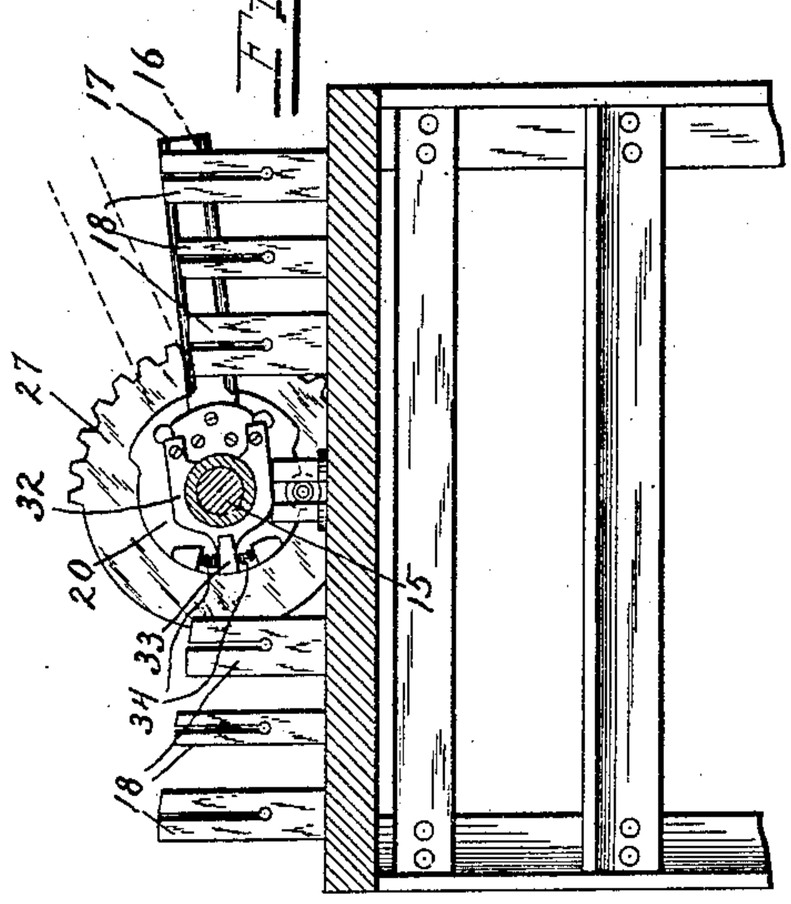


FIG. 3.

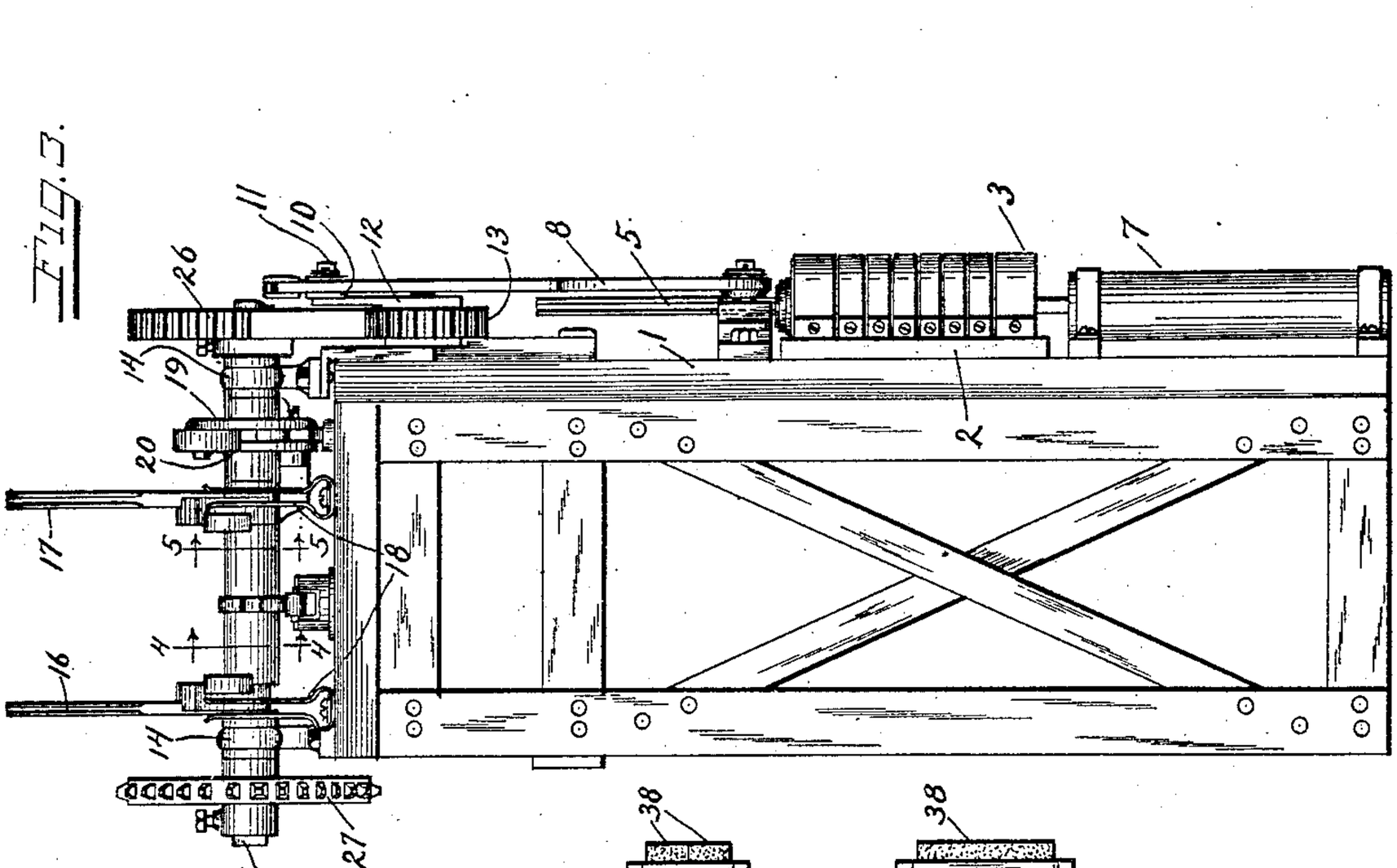


FIG. 8.

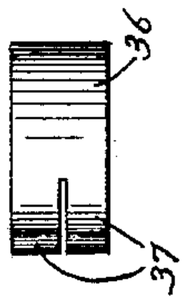


FIG. 9.

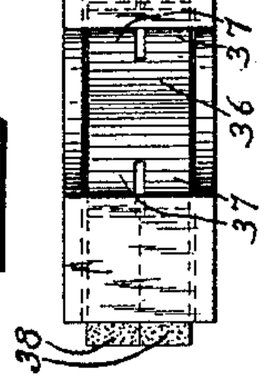
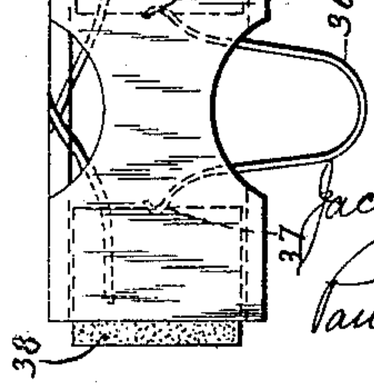


FIG. 10.



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(No Model.) 4 Sheets—Sheet 3.

Fig. 11.

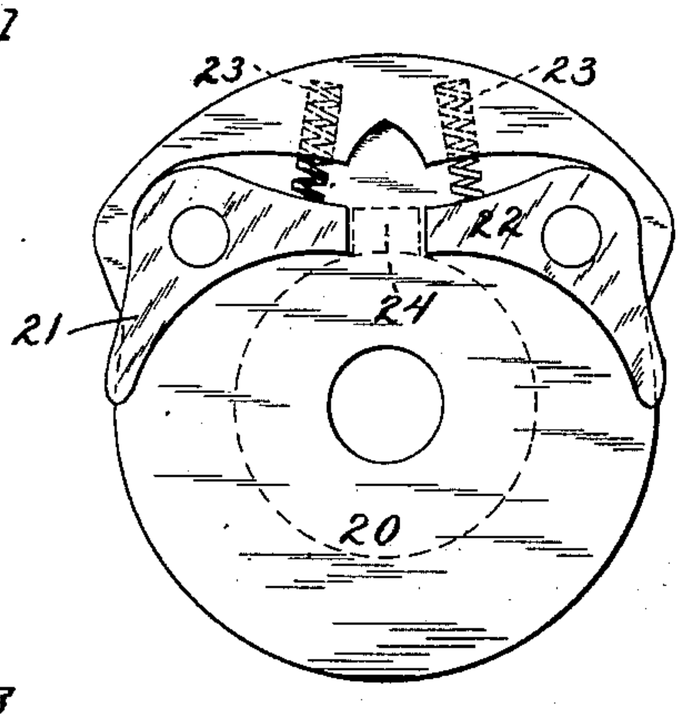


Fig. 12.

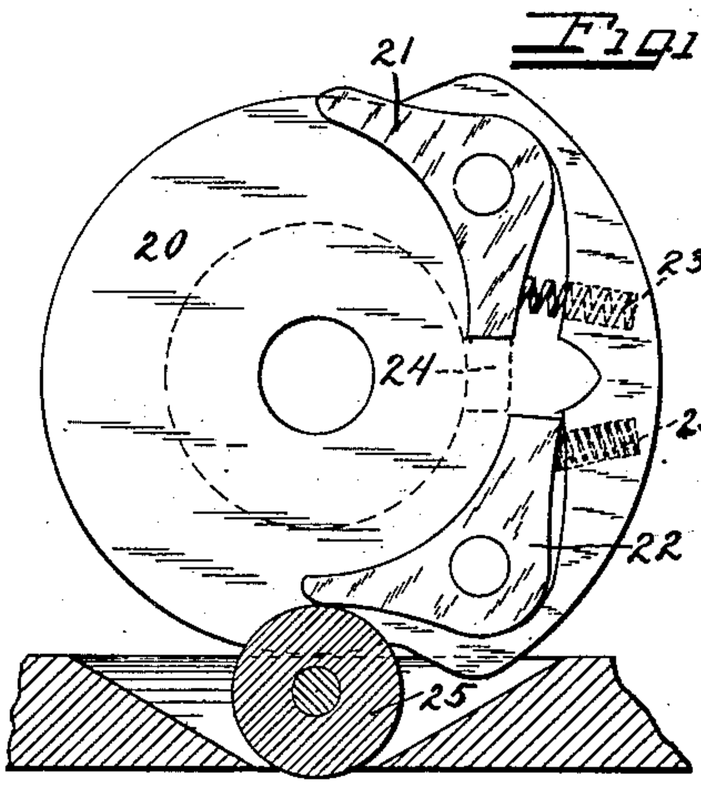


Fig. 13.

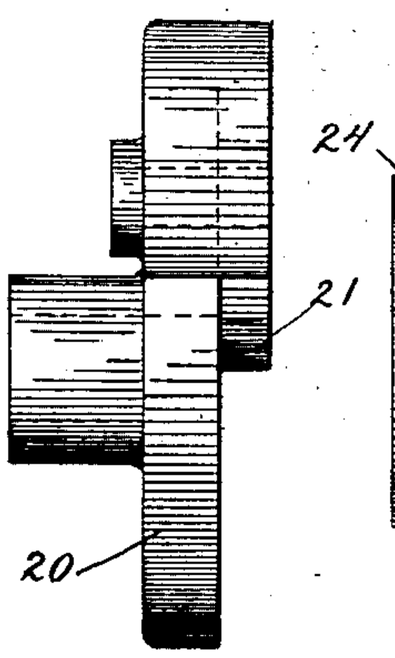


Fig. 14.

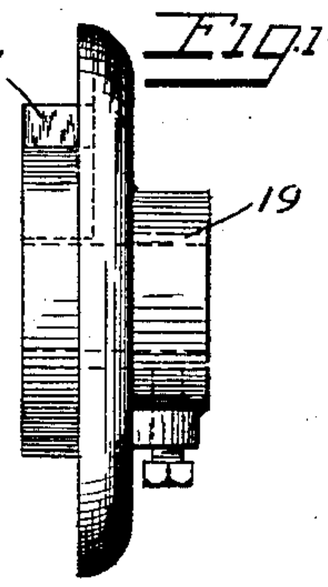


Fig. 15.

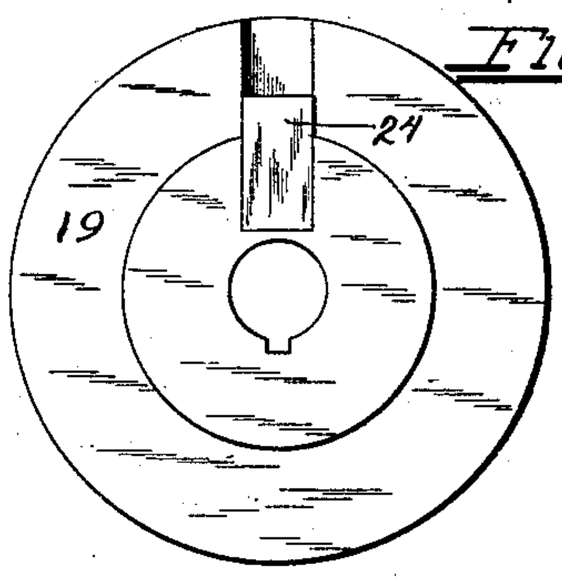


Fig. 16.

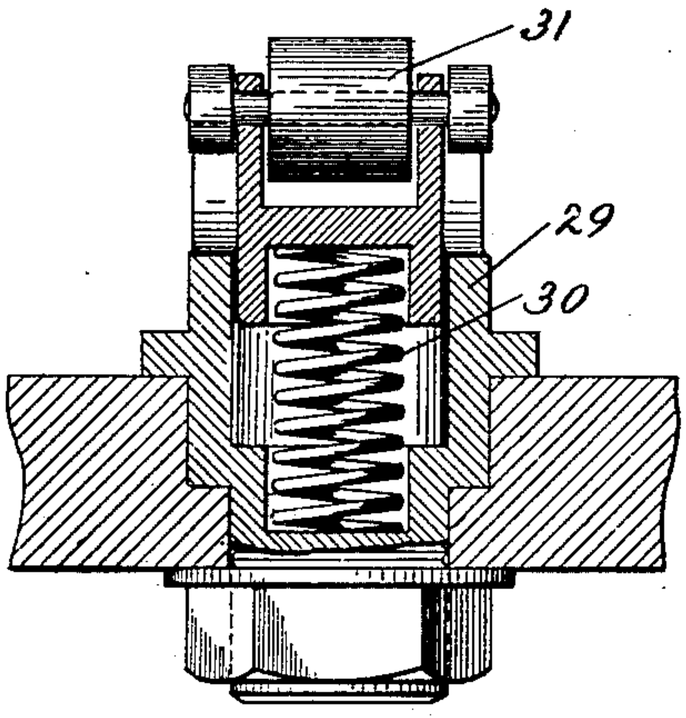
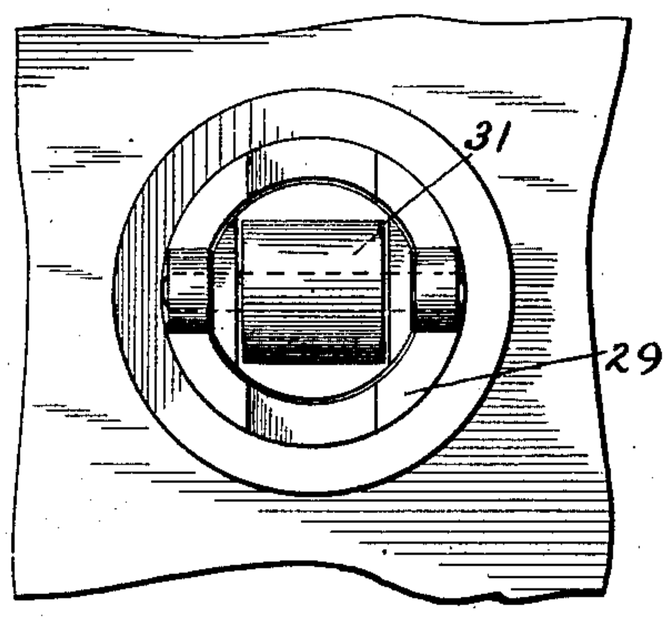


Fig. 17.



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(No Model.) 4 Sheets—Sheet 4.

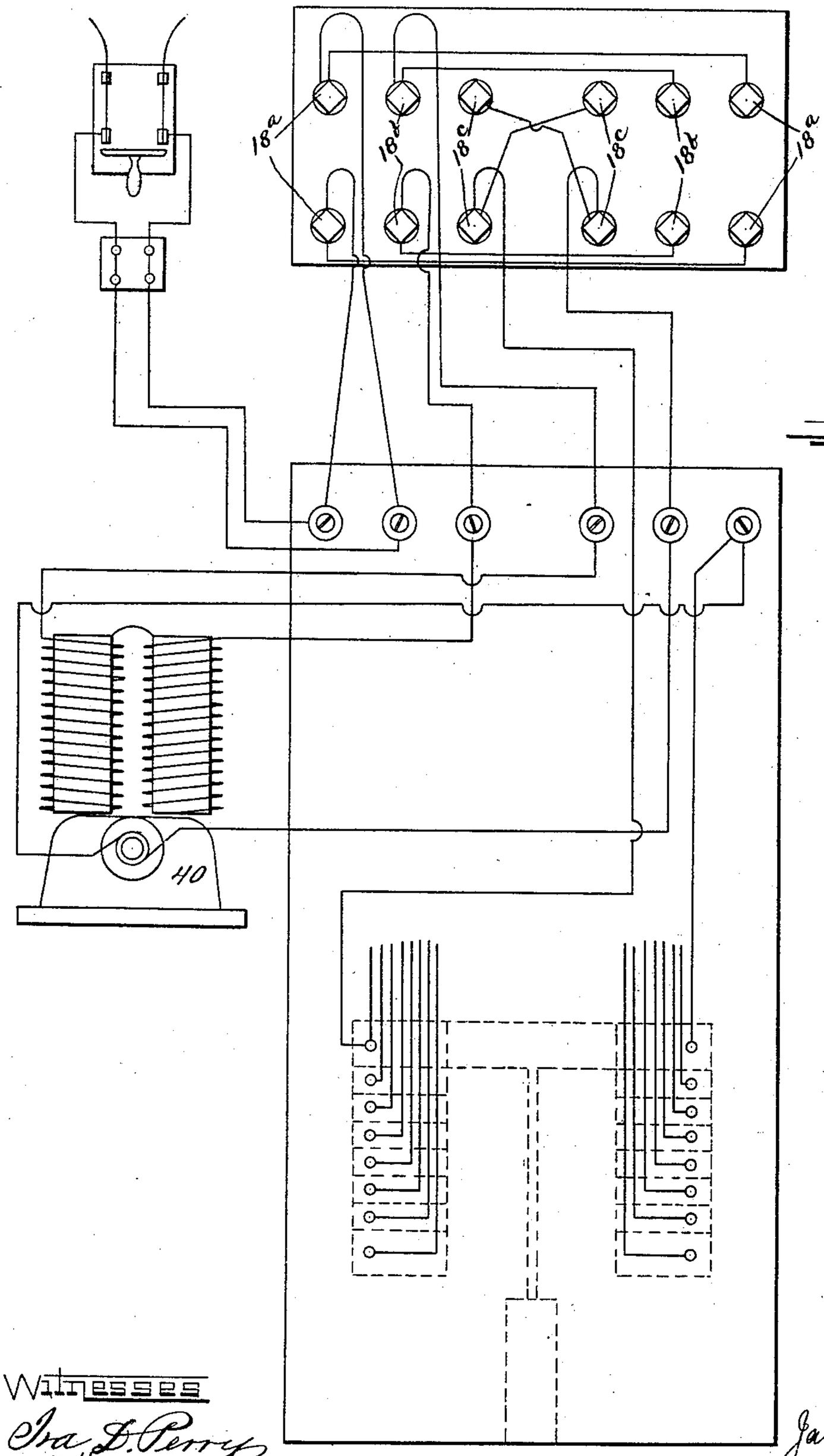

Fig. 18.

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UNITED STATES PATENT OFFICE.

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ELECTRICAL CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 715,428, dated December 9, 1902.

Application filed December 4, 1899. Serial No. 739,214. (No model.)

To all whom it may concern:

Be it known that I, JACOB L. SCHUREMAN, Jr., a citizen of the United States, residing in Chicago, Cook county, Illinois, have invented a certain new and Improved Electrical Controller, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to an improved construction of controller for regulating electrical circuits, comprising the combination of a circuit-breaking switch and a commutator or regulator, the latter being driven by means actuated by the means which operate the former, the several parts or mechanisms being so constructed as to produce movements of the circuit-breaking switch and the commutator in alternation.

The first of the objects of my invention may therefore be said to be the provision of an electrical controller having a commutator and a circuit-breaking switch combined with mechanism by which the said circuit-breaking switch can first be moved to close the circuit and the said commutator then actuated by the means which drive the said circuit-breaking switch, the circuit-breaking switch being released and stationary during the movements of the movable part of the commutator. By my invention also the commutator can be moved first without any movement of the circuit-breaking switch by the means which are primarily designed to operate the circuit-breaking switch, the circuit-breaking switch itself being moved afterward to open the circuit after the commutator or the movable part thereof has come to a position of rest.

All of the above-described movements are obtained by the turning or movement of a single operating part, lever, or handle, the alternate engagement or release of the two separate switch mechanisms being accomplished automatically.

Another object of my invention is the combination, with the commutator referred to, of means whereby a rapid movement of the same in one direction is secured while permitting at the same time a slow movement in the opposite direction. The slow movement is obtained by the action of gravity operating against a retarding device, such as a dashpot, the movable part of the commutator being adjusted to move a certain predetermined distance by novel means to be hereinafter more particularly described.

Another object of my invention is the construction of the circuit-breaking switch with a blade so mounted as to be capable of vibratory motion with reference to the socket or part which carries the blade, this provision being designed to minimize the amount of sparking produced on the breaking of a heavy current.

The above, as well as such other objects as may hereinafter appear, I attain by means of a construction which I have illustrated in preferred form in the accompanying drawings, in which—

Figure 1 is a front elevation of a switchboard or frame having my invention applied thereto. Fig. 2 is a front elevation showing the parts in different position, the circuit being closed and the movable contact of the commutator about midway of the two extremes of its movement. Fig. 3 is a side elevation showing my invention. Fig. 4 is a sectional detail. Fig. 5 is another sectional view showing some of the details relating particularly to the vibratory movement of the switch-blade. Fig. 6 is a detail designed to show the arrangement of the gear which carries the crank that imparts movement to the commutator and the latch employed for holding the said gear in normal or middle position. Fig. 7 is a detail of the latch referred to. Fig. 8 is a detail showing an improved form of spring used for holding the contact-brushes of the commutator. Fig. 9 shows the spring and brushes in place. Fig. 10 is another view showing the contact-brushes and springs in place. Fig. 11 is a detail showing, on a larger scale, the clutch mechanism employed for coupling or releasing the circuit-breaking switch. Fig. 12 shows the said clutch in a different position. Fig. 13 is a side view of one of the parts of said clutch. Fig. 14 is a side view of another part of said clutch. Fig. 15 is a face view of the last-mentioned part of the clutch. Fig. 16 is an enlarged view of a spring-jack used in connection with the circuit-breaking switch.

Fig. 17 is a plan view of the said spring-jack; and Fig. 18 is a diagrammatic illustration of the circuits in my invention when applied to a shunt-wound motor driven from some main-line circuit—as, for example, an elevator-motor.

Referring now more particularly to Figs. 1, 2, and 3, it will be seen that upon a frame or switchboard 1 I have mounted a commutator 2, having a plurality of stationary contacts 3 and a movable contact or brush 4, carried by a rod 5, at the lower end of which is a plunger 6, operating within a dash-pot 7, constructed to retard downward movement of the movable contact 4, but to permit a ready or free upward movement thereof. Connected to the rod 5 is a pitman 8, having a slot 9 at one end forming a link in which is slidably mounted a link-block 10, which engages a crank-pin 11 or a crank 12, projecting from a gear 13.

The movable contact 4 of the commutator is designed to travel downwardly by the action of its own gravity and that of the connected parts, the rapidity or slowness of movement being controlled by the dash-pot and plunger. The distance to which the movable contact can travel is regulated by the position taken by the link-block 10, carried by the crank 11. Thus, if the link-block be turned with the crank to the position shown in Fig. 2 the pitman will permit the movable contact to descend until the upper end of the slot or link comes in contact with the link-block, when further downward movement of the movable contact 4 will be prevented. The upward movement of the movable contact is secured by positive pull exerted through the crank 12 and pitman 8.

Across the top of the switchboard or frame mounted in suitable boxes 14 is a shaft 15, carrying the main or circuit-breaking switch, the latter comprising the blades 16 and 17, mounted upon the shaft in a manner to be hereinafter more particularly described, and the jaws 18. Upon the shaft 15 is rigidly secured a flange or collar 19, forming a portion of the clutch shown in Figs. 11 to 15, inclusive. Adjacent to the part 19 there is another clutch part 20, loosely mounted upon the shaft in position to impart motion to the switch-blades 16 and 17. The part 20 is provided with two pawls 21 and 22, arranged to be held by the springs 23, so that they will normally engage the key 24 on the clutch part 19, but upon movement of the switch until the blades engage the jaws will be thrown out of engagement with the key 24, as shown in Fig. 12, by coming in contact with a projection or roller 25, arranged in proper position for that purpose.

Upon the front end of the main switch-shaft I secure a segmental gear 26, (see Figs. 1, 2, and 3,) the said gear being so mounted that that portion which is not provided with teeth will be immediately above the gear 13 during movement in either direction of the main switch-blades until the latter engage the jaws upon either side, after which the clutch which actuates the main switch-blades being released the main shaft can continue to rotate, when the teeth upon the segmental gear will come into engagement with the teeth upon the gear 13, causing the latter to turn and shift the position of the link-block 10 to permit the operation of the movable contact of the commutator-switch in the manner already described. Upon the end of the main shaft 15 opposite the segmental gear 26 I have shown a sprocket 27, designed to be engaged by a driving-chain from any suitable driving mechanism, lever, or handle—as, for example, from the controlling-cable of an elevator-car.

Upon the main-switch shaft I have mounted a cam 28, arranged to engage a spring-jack 29, in the manner shown in Fig. 4, the notches in the cam being so located that the spring-jack will operate either to hold the blades of the spring in vertical position, as shown in Fig. 4, or in engagement with the jaws of the switch at the side, as shown in Fig. 2, and the spring 30 (see Figs. 16 and 17) of the spring-jack being made of considerble strength the roller 31 as it engages the notches in the cam 28 will aid in securing the prompt and proper movement of the blades of the main switch, both in closing the circuit and in opening the same. As an aid in securing the said prompt movement of the blades of the switch in opening and closing I provide the socket 32, (see Fig. 5,) which carries the blades, with a tail or projection 33, held between two springs 34, acting against the studs 35. Supposing the spring-jack to be in engagement with one of the notches on the cam 28 and the blade to be in engagement with the jaws in the position shown in Fig. 2, movement of the main shaft 15 will first act to compress one of the springs 34 and bring a heavy tension upon the blade until the blade finally moves and pulls away from the jaws, at which time, the resistance being suddenly taken away, there will be imparted to the blade a violent vibratory movement. This I have found to be of material value in reducing the amount of sparking. It appears that the arc formed by the separation between the blade and the jaws being first drawn out with rapidity and then as rapidly reduced in length, and this a number of times in rapid succession by the said vibratory movement, very much reduces the objectionable sparking produced in this type of switch and enables me to use it in controlling heavy currents without material damage from burning of the parts.

In Fig. 8 I have shown the spring which I employ for holding the contact-brushes of the commutator against the fixed contacts, the said spring 36 being provided with forked or divided ends 37, constructed to bear against the separate brushes 38, carried in the holder 39. (See Figs. 9 and 10.) The use of this double arrangement of brushes

with a spring having forked or split ends, each brush having in this manner the capacity of movement separate or independent from the other, enables me to secure a very satisfactory connection between the movable contact and the fixed contacts.

In Fig. 18 I have shown an illustrative diagram giving the wiring employed in the use of my improved controlling apparatus in connection with a motor 40—such as is used, for example, in running an elevator. The connecting-posts 18^a are for the main-line circuit, 18^b for the motor-fields, and 18^c the armature connections, the latter being cross-connected, as shown, to secure the reversal of the motor on movement of the main switch from one side to the other.

The operation of my invention is as follows: Suppose the controller be used in connection with the circuit (shown in Fig. 18) and operated by some controlling means connected with the sprocket-wheel 27, the parts first being in the position shown in Fig. 1. The main switch-blades being moved around by means of the clutch 19 20 until they are engaged by the jaws, as shown in Fig. 2, the pawls will release the key 24 and permit the segmental gear 26 to continue to turn, imparting a rotative motion then to the gear 13 and moving the crank 12 until the link-block 10 occupies the position shown in Fig. 2. The weight of the moving contact of the commutator will then cause the said contact to descend against the resistance of the dash-pot plunger 6 until the further movement thereof is arrested by the end of the slot in the pitman 8 striking the link-block 10. The closing of the circuit by means of the main switch will render the commutator operative, and the commutator itself will then in turn go through the necessary movements for controlling the operation of the motor, the movable part of the commutator being capable of actuation in either direction, up or down, and to any desired distance without disturbing the position of the main switch. If it is desired to reverse the motor, the shaft 15 will be rotated in the opposite direction, first bringing the movable contact of the commutator up to the position shown in Fig. 1 and then the segmental gear, ceasing for the time being to rotate the gear 13, will continue to turn, carrying with it the switch-blade into engagement with the switch-jaws upon the left, after which the switch will be released by automatic action of the clutch, as already described, and the movable contact or brush of the commutator will be permitted to move downward and can be moved up or down, as desired, to any point and any number of times, according to the requirements of the service.

The operation of the main or circuit-breaking switch and the commutator is thus alternate because the means for actuating the commutator and the means for operating the circuit-breaking switch are both driven from a common driving means or shaft and brought into operation automatically, so as to move in alternation, the automatic operation of the circuit-breaking or main switch being produced by the clutch device and the automatic or alternate action of the commutator by means of the arrangement of segmental gear and driven pinion.

In order to insure the driven pinion 13 resting in such position that the teeth upon the said segmental gear will engage the teeth upon the pinion 13 without difficulty, I provide the pinion 13 with a spring-latch 41, (shown in Figs. 6 and 7,) arranged to engage a notch or recess 42 in the hub of the pinion 13, the said recess being formed with sloping sides, so that the force of the spring-latch will hold the pinion in proper position with certainty.

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

1. An electrical controller comprising a circuit-breaking switch and a commutator, a driving-shaft, actuating means for operating both the switch and the commutator, including a clutch driven by said shaft to first move and then release the switch, and means independent of the switch-operating means for imparting motion to the commutator, the said switch-operating means and the said actuating means for the commutator being brought into play alternately.

2. A commutator comprising a movable contact, a retarding device attached to said contact, a driving-pinion carrying a crank, a link-box upon the crank, and a connection between said link-box and said moving contact whereby the position of said link-box will determine the extent of motion of said moving contact, substantially as described.

3. A circuit-breaking switch comprising a movable blade, springs acting upon said blade, and mechanism for compressing said springs and thereby, when the blade breaks contact, imparting a vibratory motion thereto, substantially as described.

4. A commutator having in combination with a movable reciprocating contact, a plurality of stationary contacts arranged upon opposite sides of said movable reciprocating contact, and means connected to the lower end of said movable contact device constructed to retard downward movement thereof, but to permit ready or free upward movement thereof, substantially as described.

5. A commutator comprising a plurality of stationary contacts arranged in a straight line, a reciprocating contact constructed to move over said stationary contacts, a dash-pot connected to said reciprocating contact to retard downward movement thereof, and to permit ready or free upward movement thereof, a pitman connected to said movable contact, a slot in said pitman forming a link, a link-block movable within said slot, and a crank-pin mounted upon a crank-shaft, and

engaging said link-block to move the same, substantially as described.

6. A commutator comprising a plurality of stationary contacts arranged in a straight line, a reciprocating contact constructed to move over said stationary contacts, a dash-pot connected to said reciprocating contact to retard downward movement thereof, and to permit ready or free upward movement thereof, a pitman connected to said movable contact, a slot in said pitman forming a link, a link-block movable within said slot, a crank-pin, a shaft, a main or circuit-breaking switch carried by said shaft, and clutch mechanism on said shaft for intermittently operating said main-circuit-breaking switch, substantially as described.

7. An electrical controller comprising a commutator and a circuit-breaking switch positively driven by a clutch mounted upon a shaft, means for releasing the clutch when the switch is closed, and means mounted upon the same shaft and independent of the switch-operating clutch, brought into play after and independently of the switch-operating clutch, to actuate the commutator positively in one direction and allow it to move by gravity in the opposite direction, substantially as described.

JACOB L. SCHUREMAN, JR.

In presence of—
CELIA A. MULVIHILL,
PAUL CARPENTER.