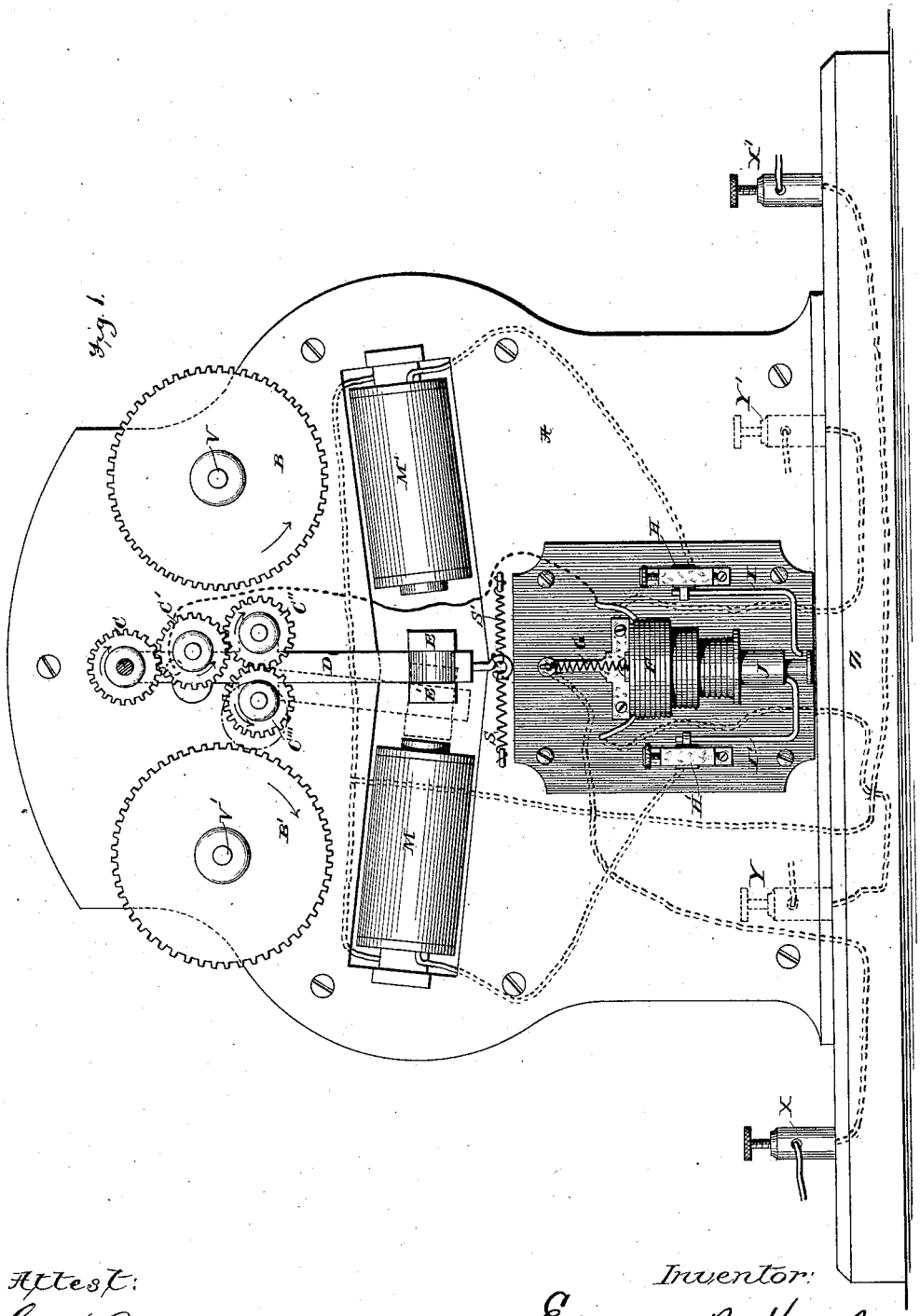
(No Model.) 3 Sheets—Sheet 1.

E. R. KNOWLES.

REGULATOR FOR ELECTRIC CURRENTS.

No. 381,254. Patented Apr. 17, 1888.



Attest:
Geo. H. Bott
Harry Y. Davis.

Inventor:
Edward R. Knowles.
By Ernest Webb
his Atty.

(No Model.) 3 Sheets—Sheet 2.

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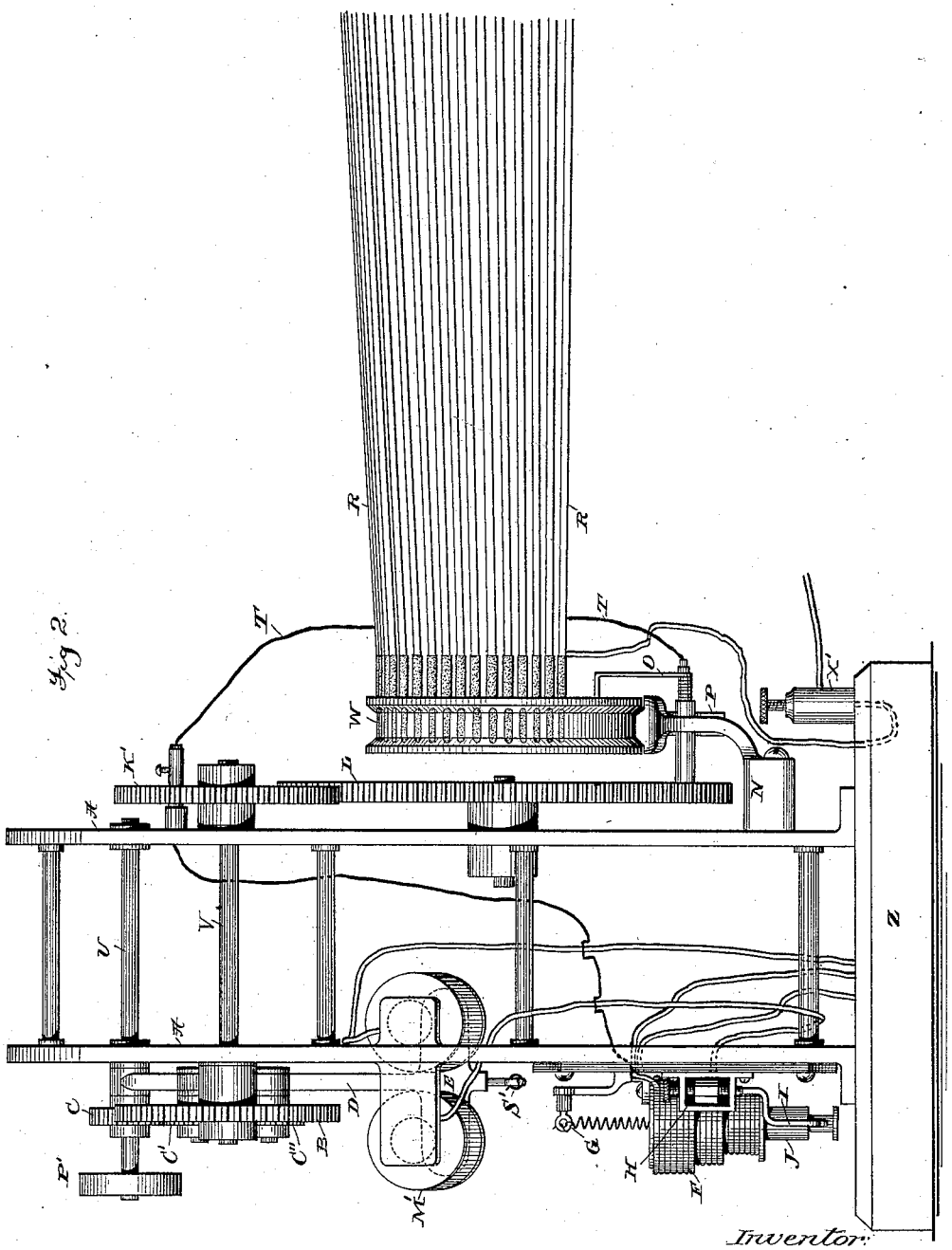
Fig 2.



Attest:

Geo. H. Bates.

Harry G. Davis.

Inventor:

Edward R. Knowles.

By Ernest C. Webb

his Atty.

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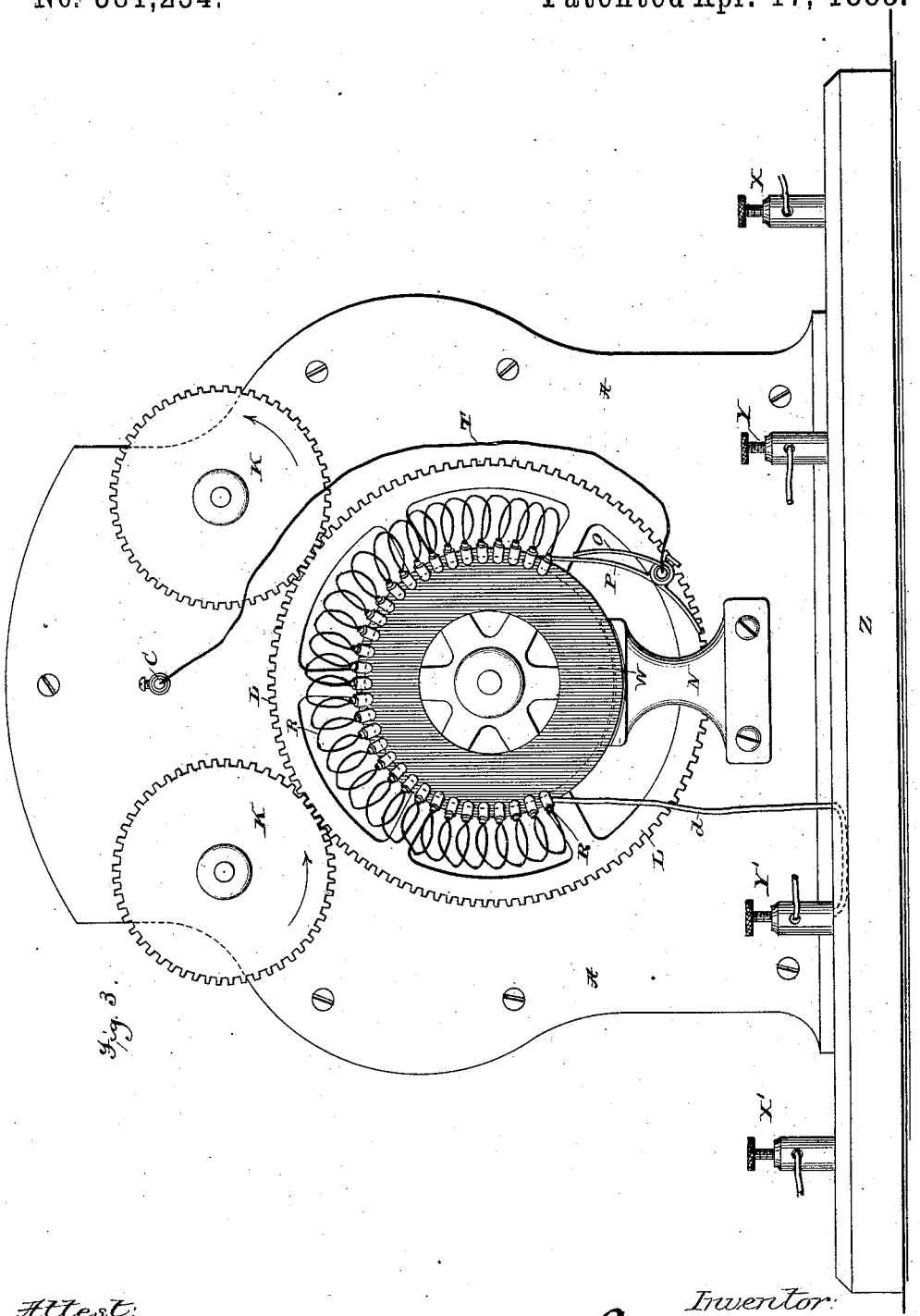

Fig. 3.

Attest:
Geo. H. Botts.
Harry V. Davis.

Inventor:
Edward R. Knowles.
By Ernest C. Webb
his Atty.

UNITED STATES PATENT OFFICE.

EDWARD R. KNOWLES, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE MUTUAL ELECTRIC MANUFACTURING COMPANY, OF NEW YORK.

REGULATOR FOR ELECTRIC CURRENTS.

SPECIFICATION forming part of Letters Patent No. 381,254, dated April 17, 1888.

Application filed April 22, 1886. Serial No. 199,756. (No model.)

To all whom it may concern:

Be it known that I, EDWARD R. KNOWLES, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in the Automatic Regulation of Electric Currents, of which the following is a full, clear, and exact description.

The object of this invention is to provide means for automatically regulating the strength of electric currents for lighting and other purposes.

My invention consists in means automatically operated by fluctuations in the main current to increase or diminish the resistance in the circuit over which the current is passing, and as one embodiment of my said invention I have shown in the drawings a commutator supplied with certain resistances, which are automatically operated with respect to the circuit by gearing connected with a pendulous armature interposed between magnets which set a right or left hand train of gearing in operation when energized by a local circuit rendered operative through fluctuations of the main circuit, as I will now proceed to set forth and claim.

In the accompanying drawings, in the several figures of which like parts are distinguished by similar letters of reference, Figure 1 is a front view of an apparatus embodying my invention. Fig. 2 is a side view. Fig. 3 is a rear view thereof.

A is the frame, composed of any suitable material and properly arranged to carry the various parts hereinafter described.

P′ is a driving-pulley hung on a suitable shaft journaled in the proper part of the frame, and carrying at one end a pinion, C, which is in mesh with a pinion, C′, arranged to turn the pinions C″ and C‴ in opposite directions. These pinions C″ and C‴ are arranged so as to respectively mesh with and turn the gears B B′, thereby rotating the gears K and K′, which are fast to the other ends of the axles V V′, carrying the gears B B′.

D is a pendulum suspended at *b* and free to swing. This pendulum carries the pinions C″ and C‴, and at its lower end it is provided with armatures E E′ for the magnets M M′. The adjustment and steadiness of the movement of the pendulum is facilitated by means of the springs *s s′*. A large gear-wheel, L, which carries the brush P for the commutator W, and a spring, *o*, to keep said brush in good contact with the commutator, is in mesh with the gears K K′, and adapted to be rotated in one direction or the other by movement of one or the other of said gears, as the case may be.

R R R designate resistance-coils connected in series with one another and to the segments of the commutator W.

F is a solenoid, and J its core suspended by means of the spring G, and having its ends formed into contacts, as shown, and I I′ are two adjustable contact-pieces.

The connections are as shown in the drawings, and may be briefly described as follows, viz: A local battery or shunt from the main circuit is connected to X and X′, and the circuit for its current is from battery to X, thence to spring G, core J, and either contact-piece I I′, magnets M or M′, thence to binding-post X′, and back to the battery or shunt. The main circuit is from the generator to Y, thence around the solenoid F, thence to *c*, thence to brush P through the flexible cable T, thence through coils of resistance R R R, thence by *d* to binding-post Y′, and then through the lighting or active circuit back to the generator.

The mechanism operates in the following manner, viz: By means of suitable power applied to the pulley P in the usual way the latter is first set revolving at a constant speed, and thus by the means of the pinion C and C′ keeps the pinions C″ and C‴ in motion in opposite directions. (See the arrows, Fig. 1.) The pendulum D, being free to move, would, if moved to the left, engage the pinion C‴ with the gear B′, thus rotating the latter in the direction of the arrow, Fig. 1, and if moved to the right engaging the pinion C″ with the gear B, thus rotating the latter in the direction of the arrow. Either of these gears when moved will, by means of its axle, rotate its corresponding gear, K or K′, at the other end of such axle, and will hence impart motion to the large gear L in one direction or the other. By this means a backward and forward motion can be given to the large gear L, and the brush P be made to move backward and for-

ward over the commutator W, and thereby cut in or out of the circuit the resistances R R R, according to the position of said brush. This will be very clear if it is borne in mind that when the brush is to the extreme left (see Fig. 3) all the resistance is cut out of the circuit, and when the brush is at the extreme right all the resistance is inserted in the circuit. Now when the core J of the solenoid F is in contact with the piece I′ the current from the local battery or shunt is thrown through the magnet M, attracting the armature E′ and engaging the pinion C‴ with the gear B′, and causing the large gear L and brush P to be moved to the right, and when the core J is in contact with the contact-piece I the current from the local battery or shunt is thrown through the magnet M′, and the armature E is attracted thereby, causing the pinion C″ to mesh with the gear B, and moving the large gear L and brush P to the left. Before the generator is started the core J is in contact with I, and the magnet M′ being energized the pendulum D is drawn over and the pinion C″ engaged with the gear B, turning the latter until the brush is moved to the extreme left (see Fig. 3) and all the resistance cut out of circuit. After the dynamo or other generator is started its current passing around the solenoid F energizes it, and when the proper strength of current is acting in the circuit the core J will be raised, so that neither of the contact-pieces I or I′ will be in contact with the core J and the pendulum D will hang between the magnets M and M′, as shown by full lines in Fig. 1. Now, if the current in the main circuit fluctuates in strength, either growing stronger or weaker, the core J of the solenoid will be moved up or down, making contact with I′ or I, and energizing the magnet M or M′, and thereby engaging the moving pinions C‴ and C″ with the gear B′ or B, to rotate the gears K or K′, to move the large gear L and brush P either in one direction or the other, thus introducing into the circuit or cutting out from the circuit the resistances R R R; hence it will be seen that by this means the resistance is automatically maintained in the circuit and the current is consequently kept constant.

The contact-pieces I and I′ are made adjustable, so that the sensitiveness of the mechanism can be varied.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A commutator, one or more resistances connected therewith, a suitable brush, and electrical connections, combined with two magnets, the pendulous armature arranged between them and provided with pinions set in motion by any suitable prime mover, and gearing interposed between said pinions and the commutator to be engaged by one or the other of the pinions on the armature to rotate the commutator in one direction or its opposite to put more or less resistance into the main circuit as one or the other of the magnets is energized through fluctuations of the main current to be regulated, substantially as set forth.

2. The electro-magnets M M′, a pendulous armature therefor, oppositely-rotating pinions carried by said armature, a main driving-pinion and an idler between them, and a local circuit in which the said magnets are arranged, combined with a reversible commutator, resistances thereon, and a main circuit for increasing or diminishing the resistance in the main circuit by fluctuations in the main current, substantially as set forth.

In testimony whereof I have hereunto set my hand this 13th day of April, A. D. 1886.

EDWARD R. KNOWLES.

Witnesses:

ARTHUR C. WEBB,

ERNEST C. WEBB.