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F. VIVÓ Y GRAELLS.

REGULATOR FOR DYNAMO ELECTRIC MACHINES.

No. 358,133. Patented Feb. 22, 1887.

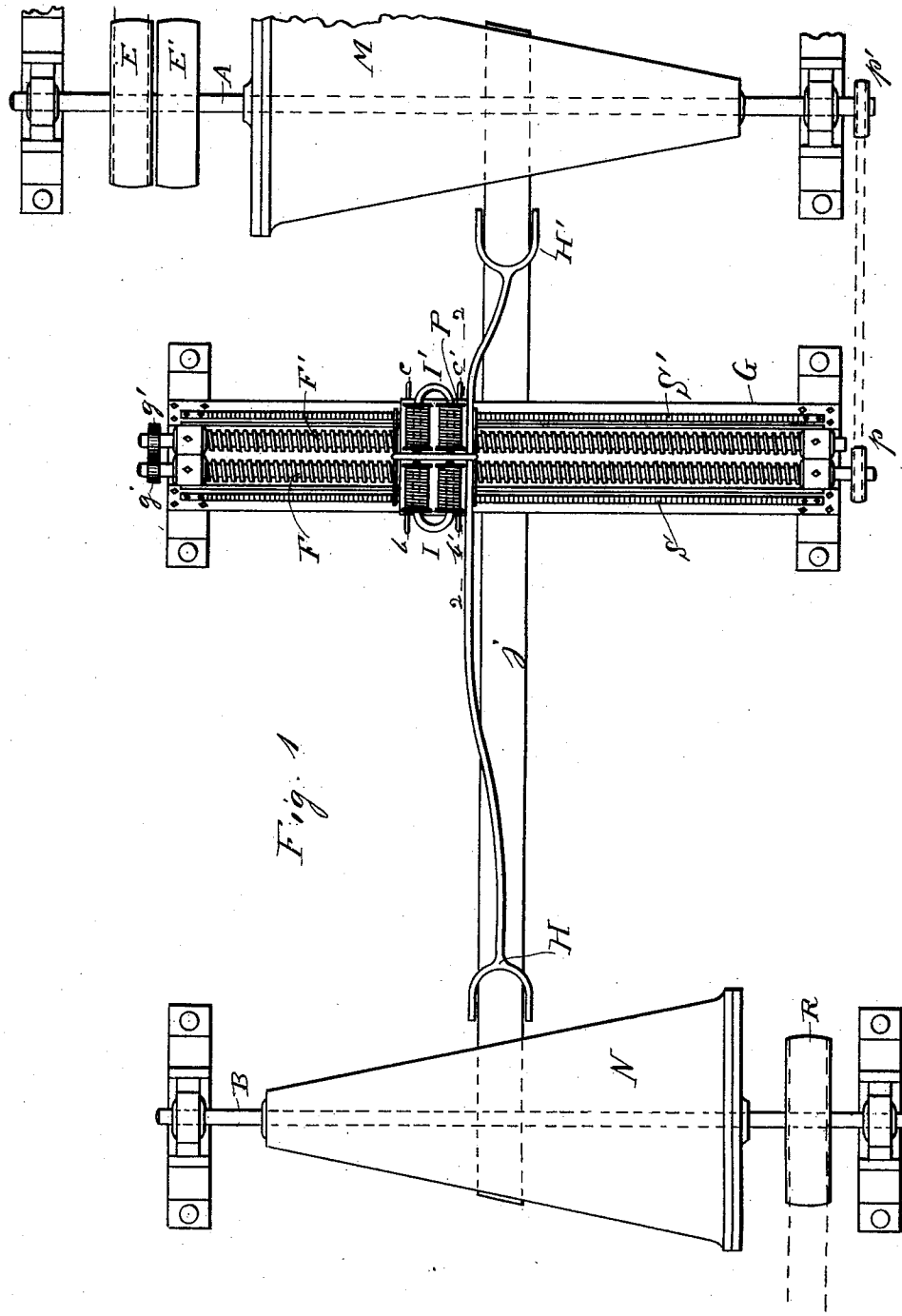


Fig. 1

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F. VIVÓ Y GRAELLS.

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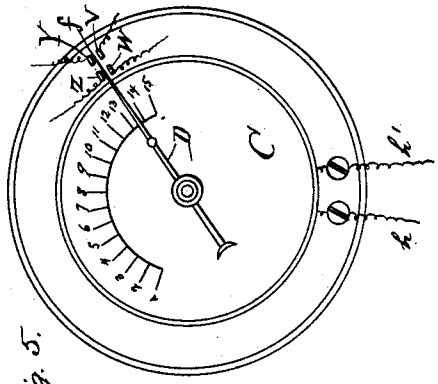


Fig. 5.

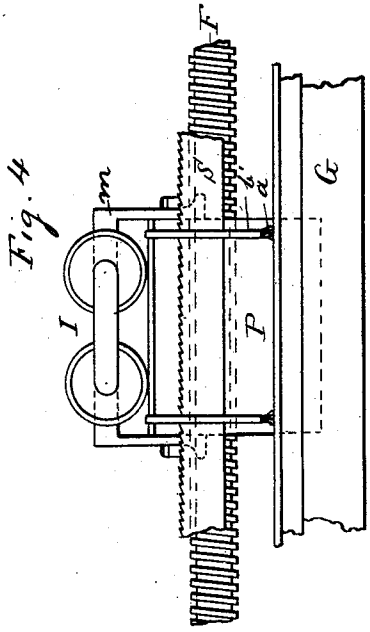


Fig. 4.

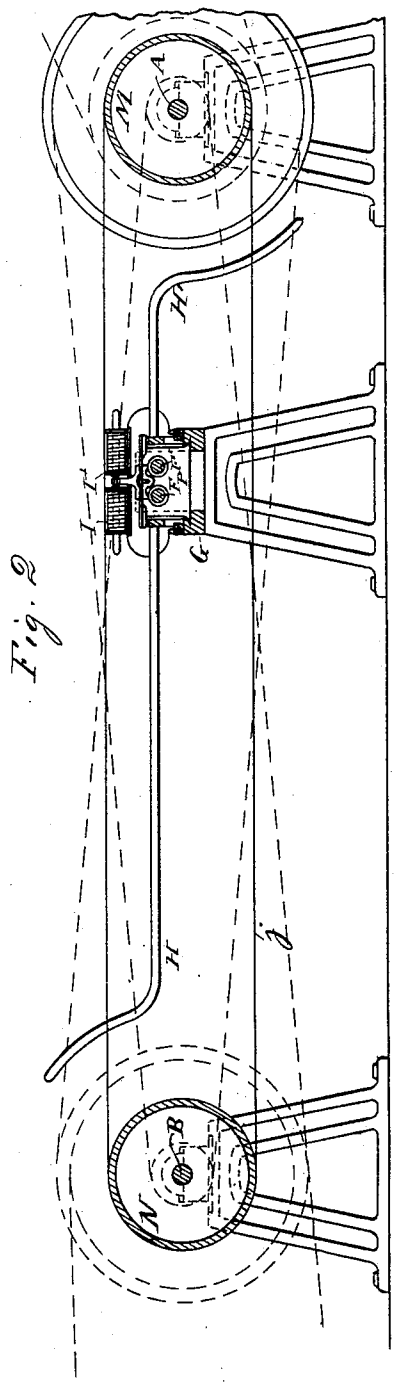


Fig. 2.

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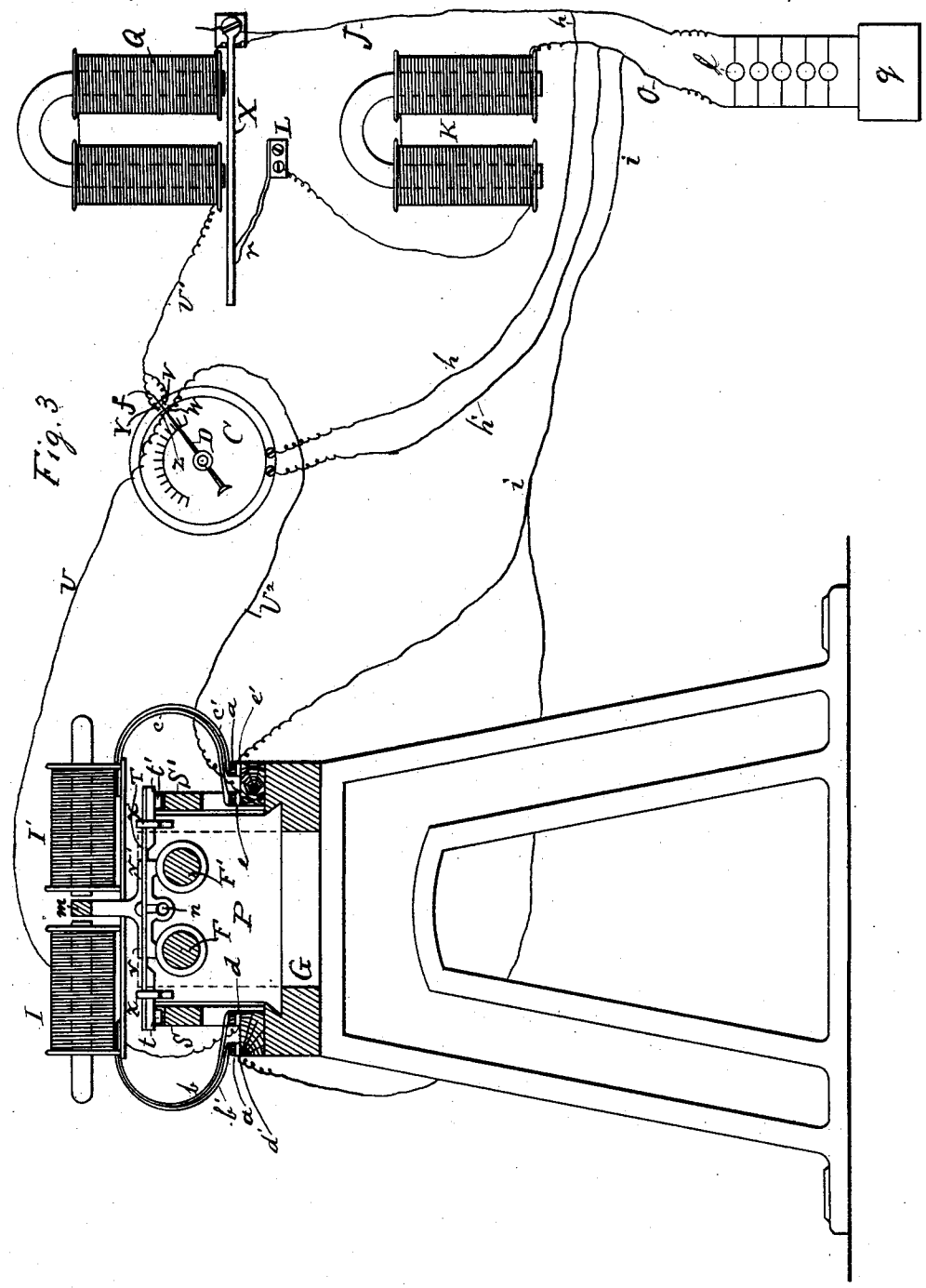
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UNITED STATES PATENT OFFICE.

FRANCISCO VIVÓ Y GRAELLS, OF BARCELONA, SPAIN.

REGULATOR FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 358,133, dated February 22, 1887.

Application filed January 8, 1887. Serial No. 223,808. (No model.) Patented in Spain September 18, 1885, No. 7,545, and April 14, 1886, No. 8,243.

To all whom it may concern:

Be it known that I, FRANCISCO VIVÓ Y GRAELLS, a citizen of Spain, residing at Barcelona, have invented certain new and useful Apparatus for Regulating Automatically the Intensity of the Currents in the Dynamo-Electric Machines, (for which I have obtained a patent in Spain, No. 7,545, bearing date September 18, 1885, and a patent upon improvements, No. 8,243, bearing date April 14, 1886,) of which the following is a specification.

My invention relates to an apparatus for regulating the intensity of the electric currents produced by the dynamo or magneto-electric engines by regulating their speed or number of revolutions to be in conformity with the resistance of the circuit as it increases or decreases.

The apparatus principally consists of two cone-pulleys placed parallel with each other, one of them being set in motion by the steam-engine or other motor, driving the other one by a belt, and the latter cone transmitting motion to the dynamo-engine. With two parallel cone-pulleys the speed is varied by the sliding or shifting of the belt along the surface of the cones, and the greater the circumference embraced of the first the less the circumference embraced of the second, and vice versa, whereby as the belt is shifted in one direction or the other the number of revolutions of the dynamo will be increased or decreased; of belt-guiding forks fixed to a carrier guided in a frame placed intermediate of and parallel with the axis of the two cone-pulleys, such carrier being moved in one direction or another by two screw-rods journaled in the guide-frame and turning in opposite directions, and by an anchor vibrating between two electro-magnets and a cross-beam forming part of such anchor, and having lugs intermittently engaging the screw-threads of one or the other screw-rod and of a spring-bar secured to or connected with the anchor, and provided with pawls to its ends engaging with ratchet-bars, the teeth of the opposite bars being oppositely inclined for holding the carrier from moving while the anchor is at its central or normal position; of an electric-current connection that actuates the electro-magnets of the carrier, and that may be either the same produced by the dynamo or that produced by an excitative engine in a manner that the current must pass through one or the other electro-magnet in proportion as the main current increases or decreases and, for that purpose, of the employment of an amperometer, the pointer of which, by its movement to the right or left, opens or closes the circuit to one or the other electro-magnet of the carrier, all as will be hereinafter more fully described and specifically claimed.

In the accompanying drawings, Figure 1 represents a plan view of the device; Fig. 2, a longitudinal vertical section of the same on line 2 2 in Fig. 1; Fig. 3, a sectional end elevation of the carrier, showing at the same time the manner of placing the wires for establishing communication with the amperometer, the dynamo, and the apparatus for resistances. Fig. 4 is a side view of the carrier, and Fig. 5 shows the amperometer on a larger scale.

Corresponding letters in the several figures of the drawings designate like parts.

Cones M and N are mounted upon shafts A and B, placed parallel with each other and suitable distance apart. Upon this shaft A are also mounted loose and tight pulleys E and E′ for the engine-driving belt, and upon shaft B is mounted a pulley, R, for driving the dynamo by a belt. A belt, *j*, is passed over cones M and N, transmitting motion from one to the other, and forks H H′, fixed upon carrier P, guide this belt *j*.

The carrier P is guided in a frame, G, placed intermediate of and parallel with the shafts A and B, and in this frame G, parallel with the dovetail guides thereof, are journaled two screw-rods, F and F′, one of which, F, has a pulley, *p*, mounted upon its overhanging end, and is driven by a belt, S, from a pulley, *p′*, that is mounted upon shaft A, and motion is transmitted from screw-rod F to screw-rod F′ by two gear-wheels, *g* and *g′*, in a manner that the two screw-rods are constantly rotated in opposite directions.

The carrier has secured upon a plate of insulating material two electro-magnets, I and I′, placed in opposition to each other, and an anchor, *m*, vibrating between the two electro-

magnets, on a spindle, *n*, has arms *v* and *v'*, so as to be T-shaped, and the ends of these arms *v* and *v'* are adapted to enter between and engage the screw-threads of the rods F and F' alternately, as the anchor may be attracted by one magnet or the other, but to be out of contact with the screw-rods as long as the anchor will remain on its central or intermediate position. As soon as the anchor *m* swings one of its arms, *v* or *v'*, into the screw-thread of one of the rods, F or F', the carrier is moved by such rod in one direction or the other. When the current does not act upon the electro-magnets of the carrier, the latter is held stationary by means of pawls *t* and *t'*, attached to the ends of a spring-plate, T, secured to spindle *n* and bearing upon studs *x* and *x'* of arms *v* and *v'* of the anchor *m*, and of ratchet-bars S S', forming part of the guide-frame G, the bar S having teeth oppositely inclined to the teeth of bar S'. When the end *v* of the lever rises, the stud *x* lifts the pawl *t*, disengaging it from rack S, while pawl *t'* is still held in engagement with rack S', the teeth of which, however, are inclined in the direction that they will not retard the motion imparted by rod F' to the carrier; but the pawl *t'* will slide or ride over the same, and vice versa, when the anchor is vibrated to lift arm *v'*.

Each of the electro-magnets is provided with two metal bow-plates, *b* and *b'*, *c* and *c'* connecting with the ends of its wire coils, and in the lower end of each bow-plate is secured a metallic brush, *a*, which brushes are held in contact with metal bars *d d'* and *e e'*, the current entering through one of these bars and returning through the other after acting upon the electro-magnet connected therewith.

The current from the dynamo *g* feeds the lights *l*. *h* and *h'* are branch wires connecting the amperometer with the main circuit-wires. This current circulates uninterruptedly. A second derived current passes through the wire J, and if the intensity of the current through *h* of the amperometer is constant, it runs through the anchor X and the contact-plates *r* L, and finally the electro-magnet K. This current goes again in the dynamo through wire O. We have a closed circuit so long as the intensity of the current through *h* is constant; but as soon as it increases or decreases the circuit is opened and the current is directed to the electro-magnets I or I', passing first through the electro-magnet Q and the amperometer C.

The amperometer C (shown in Fig. 5) is very much like those actually in use. It differs only by its pointer D being elongated with a small blade, *f*, preferably made of platinum. This blade *f* will bear against the limits V W or Y Z, and the pointer D may be caused to assume a position appropriate to the normal resistance of the circuit. The limits V W Y Z may be secured on the dial indicating the number of ampères to which the dynamo must work. In Figs. 3 and 5 the amperometer is shown with the limits attached, for the pointer D to oscillate between thirteen and fourteen ampères. The result of this arrangement is that as soon as the continuous current *h* increases or decreases even one-tenth part of an ampère the pointer D will be brought in contact with the limits V W or Y Z. In the first case, the blade *f* bearing against V W, a new circuit will be formed, whose current will be directed first to the electro-magnet Q, and by means of the wire U' U² to the metal bar *e*, thence through brush *a* and bow-plate *c* to the electro-magnet I', returning through the opposite plate, *c'*, bar *e'*, and wire *i*. In the second case, the blade *f* coming into contact with limits Y Z, the current passes through wire U, plate *d'*, electro-magnet I, plate *d*, and wire *i*. Again, when the electric current passes through the electro-magnet Q it attracts the anchor X, whereby the current that acted on electro-magnet K is cut at *r*. The sole object of the electro-magnet K is to act as an apparatus of resistance, and this resistance is equal to the sum of the resistances of one of the electro-magnets, I or I', and of the small electro-magnet Q. If not so arranged, it would happen that when the electro-magnet I or I' would be set to work there would be an increase of resistance in the main current, while that to the amperometer would be weakened.

If the electro-magnets I and I' were actuated by a current produced by an excitative machine, instead of by the main current or by a branch current, then the resistance of electro-magnet K could be dispensed with.

What I claim is—

1. In an apparatus for automatically regulating the intensity of the electric current produced by a dynamo by increasing or decreasing its speed, the combination, with two cone-pulleys and a belt uniting them, of two forks for guiding and shifting the belt upon the cone-pulleys, two revolving screw-rods, two electro-magnets placed in opposition to each other, a carrier to which the forks are attached and which bears the magnets, and an anchor or armature having arms acted upon by said magnets and engaging one or the other of said rods, as set forth.

2. In an apparatus for automatically regulating the intensity of a dynamo by increasing or decreasing its speed, the combination, with two cone-pulleys, a belt connecting them, a belt-shifter, two magnets to which said shifter is attached, and an electric circuit for energizing said magnets, an anchor or armature placed between said magnets and having arms, as described, and a pair of revolving screw-rods which are engaged separably by the arms of the anchor or armature.

3. In an apparatus for automatically regulating the intensity of the dynamo-currents, an amperometer acting as a circuit-closer, having its pointer bearing against two limits, placed on each side of the point corresponding to the normal intensity of the current, and directing the current to either one of two electro-magnets placed upon a belt-shifter, in

combination with said magnet and belt-shifter, means for coupling the anchor of such belt-shifter with a motion-transmitter, and with two cone-pulleys over which the belt is shifted laterally, substantially as set forth.

4. In an apparatus for automatically regulating the intensity of the dynamo-currents, the combination of two conical pulleys, of a carrier having secured two belt-shifting forks, two electro-magnets, a vibratable anchor engaging either one of two revolving screw-rods, and pawls engaging ratchet-bars, all substantially as described, to operate as specified.

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