(No Model.)

F. A. WESSEL.

AUTOMATIC STARTING SWITCH FOR ELECTRIC MOTORS.

No. 453,319. Patented June 2, 1891.

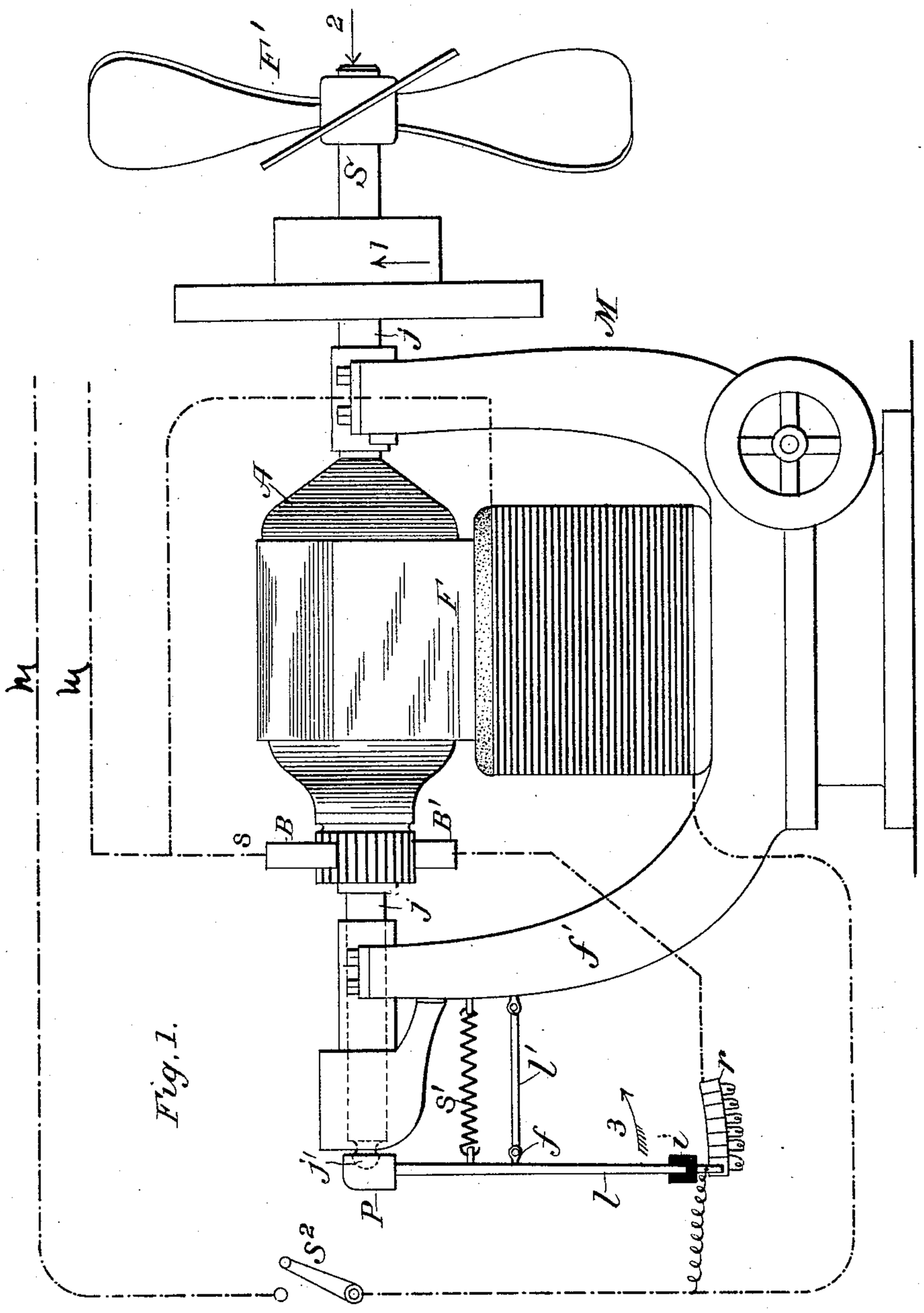

Fig. 1.

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AUTOMATIC STARTING-SWITCH FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 453,319, dated June 2, 1891.

Application filed January 9, 1891. Serial No. 377,270. (No model.)

To all whom it may concern:

Be it known that I, FERDINAND A. WESSEL, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Automatic Starting-Switch for Electric Motors, of which the following is a specification.

My invention relates to starting-switches for electric motors, and especially motors fed from constant-potential wires.

The object of my invention is to prevent damage to the motor by means of a sudden flow of an excessive current through the same.

When a motor-armature revolves at a slow rate of speed, its counter electro-motive force is small, and hence it offers very little resistance to the flow of current through it. As the speed rises the counter electro-motive force gradually rises also until, when the normal speed has been attained, there will be a normal flow of current through such armature. It is, moreover, well known that an increase of load will reduce the speed of the armature, and in reducing its counter electro-motive force will give rise to the flow of an abnormally-strong current therethrough. The effect of this abnormally-strong current passing through the armature when its speed is slow, either at starting or from overloading or any other cause, is the great liability to burn the armature before it attains the requisite speed. To prevent this destructive tendency it has been customary heretofore to provide an artificial resistance placed into the armature connection and gradually thrown or cut out as the speed rises by a switch-lever operated by hand.

My present invention is designed to provide a means whereby the operation of the device which throws said artificial resistance into and out of circuit shall be coincident with changes in the speed of the machine, the organization being such that as the speed rises the resistance will be thrown out of circuit until finally, when normal speed is reached, all or practically all of said resistance will be out, just as in the case of rheostatic switches operated by hand, while when the speed falls the resistance will automatically come into circuit to protect the armature, and will be all or practically all in circuit therewith when the motor is at rest or is running at a slow speed.

My present invention is confined to a special organization wherein the armature of the motor is permitted an end-play in its bearings, and the work is connected with such armature in such way as to give an end-thrust to the armature of increasing amount as the speed of the armature and the load rise. The armature-shaft operates upon the rheostatic switch, and a reverse movement of the shaft as the speed falls is produced by means of a retracting-spring or other suitable device.

My invention provides an effective safeguard against damage to the armature in case its speed should fall or the armature be brought to rest from any unusual cause, and also avoids the necessity of manipulating the usual rheostatic switch by hand after the circuit has been closed through the armature.

In the accompanying drawings I have shown what I consider the best means of carrying my invention into effect.

In the drawing the figure is a diagrammatic representation of an organization embodying the invention.

Referring to the drawing, it will be seen that the motor M is connected with the mains *m m*.

F is the usual field-magnet, and A the usual rotary armature, included in the shunt-wire *s*, which leads from one main through the brushes B B′ and the said armature and also through the artificial resistance *r* and switch lever or arm *l*, together constituting the starting or rheostatic switch, and thence to the other main *m*. As shown, the lever *l* is insulated at *i* for obvious reasons.

At s^2 is shown the usual main switch, which serves to throw the motor into or out of circuit.

The armature A is mounted in journals *j j*, adapted to slide in their bearings, and one of the journals bears, preferably by means of a rounded abutment, as indicated at J′, against one arm of the switch-lever *l*, so as to cause the said lever or arm to move or turn when the armature slides in its bearings, the said lever or arm being preferably fulcrumed at

f to a link l', supported by the motor-frame f'. In order to push the armature and its journal back to their extreme position when no current is passing through the field-magnets, I connect some part connected to the sliding journals, preferably the lever l, to the frame by a retracting-spring s'. In order to govern the amount of resistance cut out by the rheostatic switch by the speed of the armature, I provide a fan F′, mounted on and arranged near one end of the shaft S of the armature.

The operation of the apparatus thus described is as follows: The armature is preferably kept centered, when no current passes, by the spring s'. When the current is turned on and the motor started, the fan F′, turning with the armature in the direction of arrow 1, will tend to force the sliding armature-shaft S inward in the direction of the arrow 2 and cause the rheostatic switch-lever to move in the direction of arrow 3. It will be noted that this tendency of the vanes of the fan F′ to force the shaft inward, and consequently, through lever l to cut out more or less of the coils of the resistance r, is substantially proportional to the speed of the armature. The resistance interposed in the armature-circuit will hence be entirely governed by the amount of resistance required by the armature to counteract the destructive action of the current from the mains. No matter when a variation of speed occurs, due to a change of load or other causes, the rheostat will be adjusted automatically by the speed of the armature. A perfect governor or regulator is thus provided. This form of construction is well adapted to electric fans, where the wings or vanes of the fan can perform the double function of ventilation and a rheostatic governor.

While I have shown herein what I consider the preferred form of apparatus involving my invention, it is manifest that the same may be greatly modified in detail without departing from said invention, and I do not wish to be understood as confining myself to the precise details of construction hereinbefore described.

While I have described the armature-shaft itself as the shaft which is given an end-play through the increase in the resistance of the work to operation at increased speeds, it is obvious that any other shaft having proper end-play and carrying or connected with the work so as to rotate therewith and be given an end-thrust by the increased resistance of the work might be employed.

What I claim as my invention is—

1. The combination, with an electric motor having its armature in a connection between constant-potential mains, of a rheostatic switch the whole or a greater part of whose resistance is in circuit when the motor is at rest or running at slow speed, a rotary shaft connected to the work and having an end-play under the increased resistance of the work to rotation at high speeds, and a switch-lever or equivalent device engaged with or controlled by said shaft in its movements in the manner described, so as to throw out the resistance as the speed increases.

2. The combination, substantially as described, with an electric motor having its armature in a circuit between constant-potential mains, of an armature-shaft having an end-play, and a rheostatic switch engaged by said shaft and having the whole or the greater part of its resistance in circuit with the armature when the machine is at rest or running at slow speed, whereby on end-thrust of the shaft by increase of load or from other cause accompanying increase of speed the resistance may be thrown out of circuit as the speed rises.

3. The combination, with an electric motor, of an armature-shaft having end-play, a fan on said shaft, and a rheostatic switch controlled by the end-play of said shaft and having the whole or the greater part of its resistance in the armature-circuit when the motor is at rest or running at low speed.

4. The combination, substantially as described, of an electric motor run from a constant-potential main, a rheostatic switch in the armature-circuit, an armature-shaft having end-play and connected to said rheostatic switch, a fan upon said shaft, and a spring or equivalent retractor resisting the end-thrust of the shaft under the influence of the fan when in rotation.

Signed at New York, in the county of New York and State of New York, this 27th day of December, A. D. 1890.

FERDINAND A. WESSEL.

Witnesses:
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