(No Model.) 2 Sheets—Sheet 1.

C. E. SCRIBNER.

SPEED REGULATOR FOR DYNAMOS.

No. 563,317. Patented July 7, 1896.

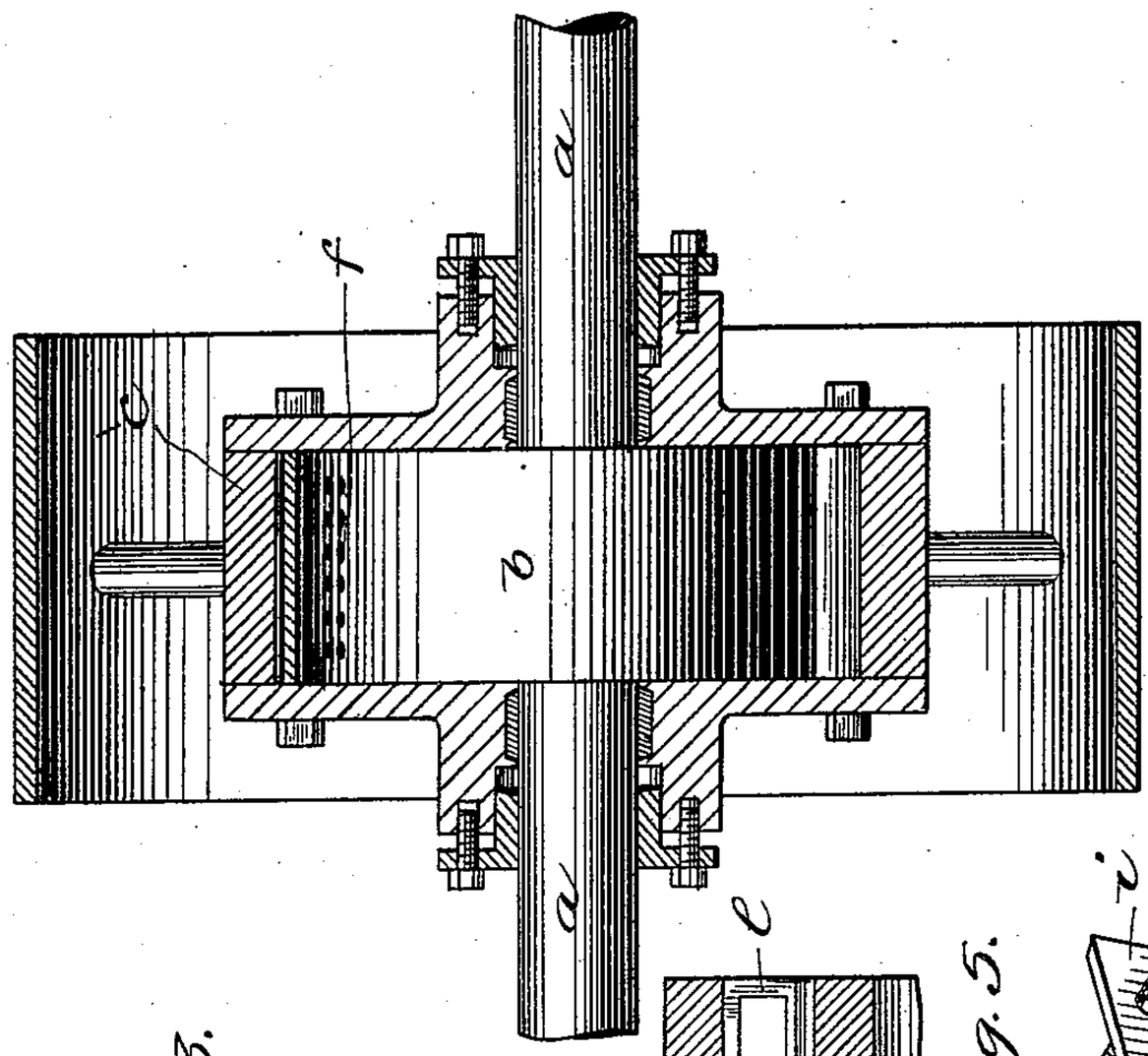

Fig. 2.

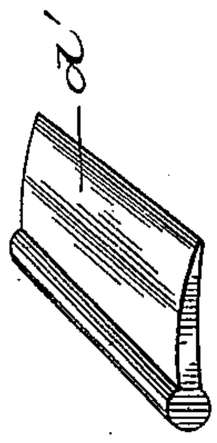

Fig. 3.

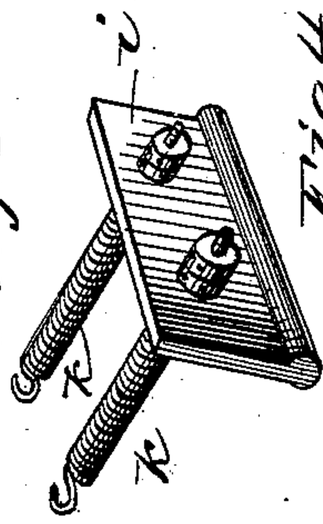

Fig. 5.

Fig. 4.

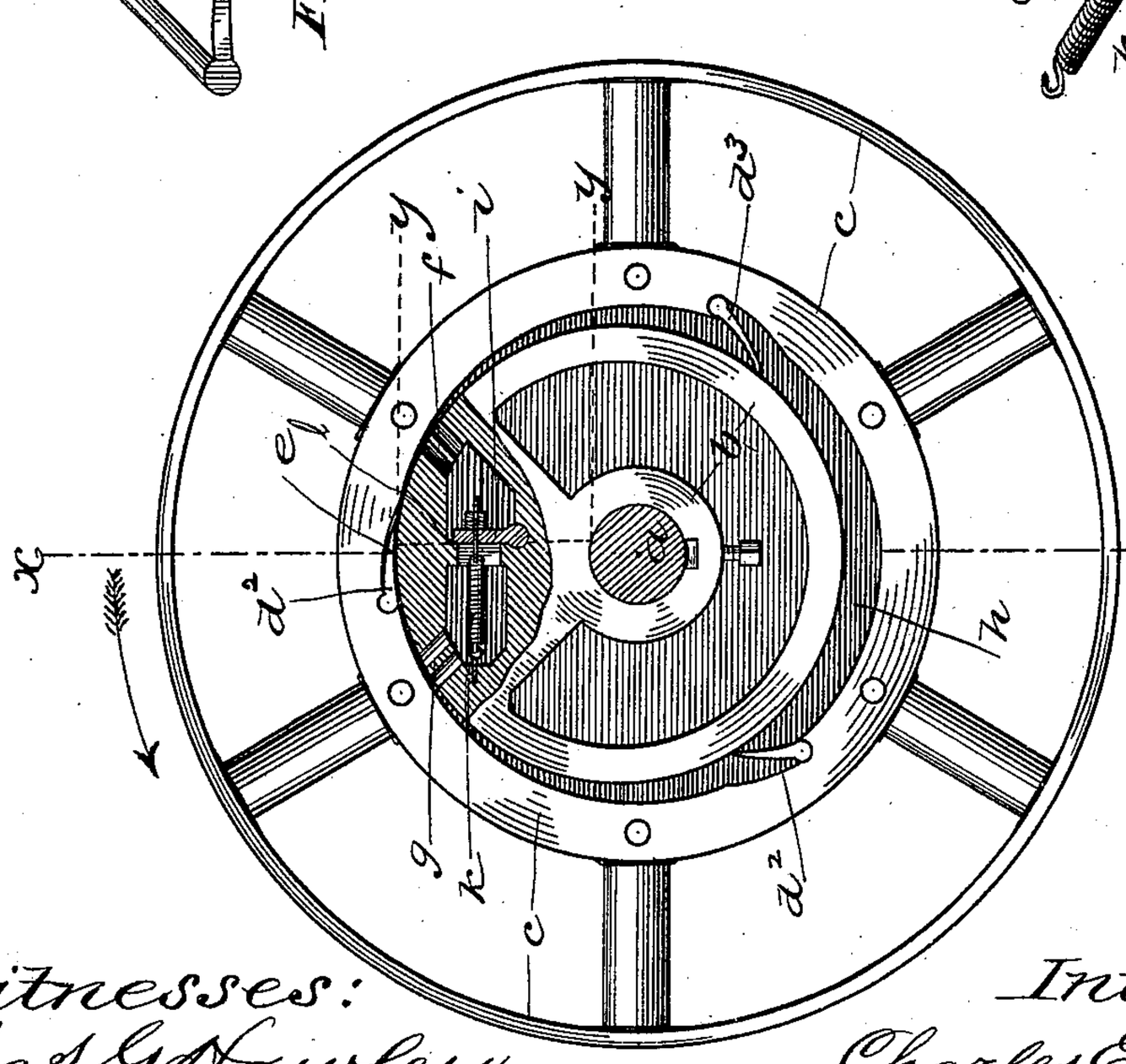

Fig. 1.

Witnesses:
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Ella Edler

Inventor:
Charles E. Scribner
By George P. Barton
Attorney.

(No Model.) 2 Sheets—Sheet 2.

C. E. SCRIBNER.

SPEED REGULATOR FOR DYNAMOS.

No. 563,317. Patented July 7, 1896.

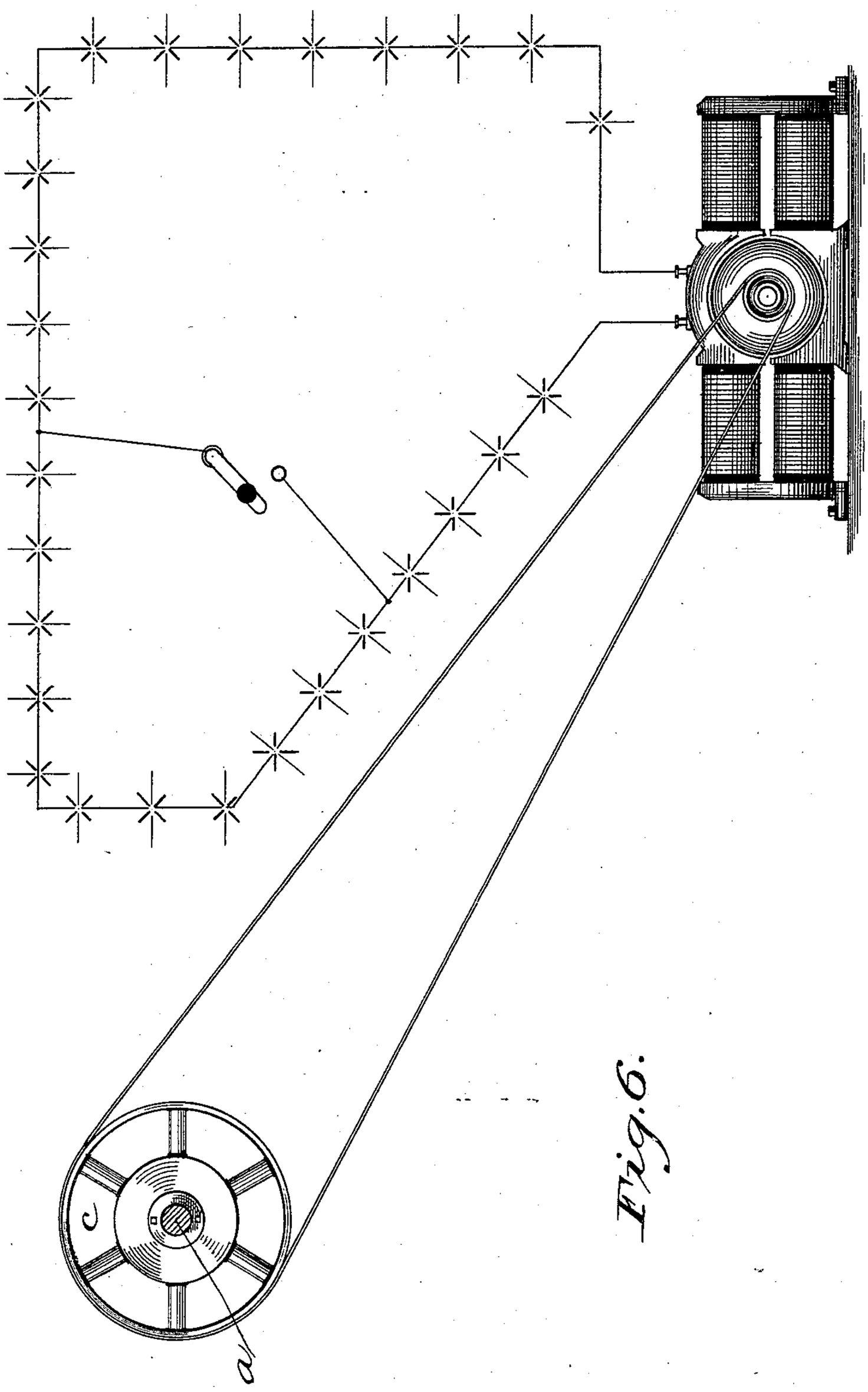

Fig. 6.

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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

SPEED-REGULATOR FOR DYNAMOS.

SPECIFICATION forming part of Letters Patent No. 563,317, dated July 7, 1896.

Application filed December 10, 1888. Serial No. 293,168. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Speed-Regulators for Dynamos, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to automatic speed-regulators for dynamo-electric machines, and its object is to control the speed of the armature responsively to changes in the load required.

My invention is especially adapted for use upon arc-light circuits.

The lamps being burned in series and the number of lamps varying at different hours, it is essential that the electromotive force shall be such as to do the work and maintain the desired current strength.

Heretofore the brushes have been moved automatically by the action of the current upon an electromagnetic device included in the main circuit to maintain the desired current strength. In an application, Serial No. 293,167, filed December 10, 1888, for Letters Patent executed contemporaneously herewith, I have shown a device connected with the main circuit termed therein a "responsive" controller, so connected with a liquid pulley-speed controller as to automatically control the speed of the armature to maintain the current strength under various loads within the capacity of the machine.

In my invention herein no responsive controller, that is, no automatic electromagnetic device, is included in or connected with the main circuit. The construction of the driving-pulley is such that a sudden increase of the load—that is, an increase in the number of lamps—operates to increase the speed of the pulley and consequently the speed of the armature. On the other hand, the removal from the circuit of one or more or all of the lamps operates to reduce the speed of the driving-pulley, or even to entirely stop the same, if all lamps are disconnected.

The cutting out of lamps from a circuit, as is well known, for the instant increases the current strength, and hence more power is required to rotate the armature. That is to say, the stronger the current the greater the power required to drive the armature.

Increase in the number of lamps for the time being at once reduces the current and makes the armature run easier. That is, suppose the normal current eighteen amperes, and suppose now enough lamps added to the circuit to cut the circuit down to ten amperes. Until the electromotive force is increased to bring the current up to its normal, less power will be required to drive the armature and consequently, as before stated, the armature will run easier. These changes in the resistance of the circuit instantaneously affect the current and consequently the power required to run the armature. I take advantage of these sudden initial changes in the load of the armature upon the pulley to change the speed of the pulley, as it were, inversely. That is to say, more lamps make the armature at first run easier, thus for the moment taking off a portion of the load upon the pulley. This reduction of the load suddenly changes the engagement between the pulley and its driving-shaft, so as to increase the speed of the pulley and thus increase the speed of the armature, and thereby the electromotive force to the extent required to maintain the current through the increased number of lamps.

A decrease in the resistance of the circuit, caused by cutting out lamps or otherwise, for the moment increases the pull or load of the armature, belted to the pulley upon said pulley. This increase of load on the pulley operates to change the engagement between the pulley and its driving-shaft to diminish the speed of the pulley and thus ultimately the speed of the armature, so that the electromotive force will only be sufficient to maintain the current strength at the normal with the less number of lamps in circuit.

My invention, briefly stated, consists in the pulley mounted on the driving-shaft and adapted to be driven thereby at different rates of speed, the speed being automatically controlled by the sudden changes in the pull or load of the armature, so as to maintain the current strength as the number of lamps or other translating devices included in the cir-

cuit of the machine are increased or diminished within its capacity.

The pulley, as herein described, is provided with a cylindrical opening, which is placed over an eccentric driving-wheel keyed to the driving-shaft. The space between the interior concave surface of the cylinder and the periphery of the eccentric driving-wheel would be in section crescent-shaped. This space is filled with oil, glycerin, or other suitable liquid, and gates are provided in connection with ports and valves, as hereinafter described. Thus we have devices acting after the manner of a pump, and, speaking generally, this feature of the pulley may be considered as the regulating-pump.

In the drawings which are illustrative of my invention, Figure 1 is a side view, partially in section, showing the pulley upon the eccentric driving-wheel, the oil in the space about the periphery of the wheel, together with the gates, the ports, and the valve for controlling the flow of oil through the ports. Fig. 2 is a sectional view upon line X X of Fig. 1. Fig. 3 is a perspective view of one of the gates. Fig. 4 is a perspective view of the valve for controlling the circulation of the oil. Fig. 5 is a view upon line Y Y of Fig. 1, showing the valve-seat. Fig. 6 is a view showing the shaft of the dynamo belted to the pulley.

Like parts are indicated by similar letters of reference throughout the different figures.

The shaft *a*, upon which the driving-wheel *b* is mounted, is driven by any suitable means. The pulley *c* is placed over the driving-wheel *b*, as shown. The problem which I have solved by this invention is to cause the pulley to be driven at different rates of speed by the automatic action of the dynamo in suddenly changing its drag or load upon the pulley as the resistance of the circuit of the machine is varied, the changes of speed being such as required to maintain the current strength.

The ends of the driving-wheel *b* should fit closely against the ends of the cylindrical space within the pulley. The greatest radius of the driving-wheel should be the same as the radius of the cylindrical opening, so that between the periphery of the driving-wheel and the interior concave surface of the opening space will be left for the oil or other liquid of the form shown, the periphery of the wheel at its portion of greatest eccentricity being adapted to prevent the circulaton of the oil between the same and the interior concave surface of the opening.

I provide the gates d' d^2 d^3, preferably three in number, which are hinged to the pulley, as shown, and adapted to ride upon the periphery of the wheel *b* whenever there is circulation of the oil, which permits the pulley to move at a less rate of speed than the driving-wheel.

We will consider the point *e* of the driving-wheel that of its greatest eccentricity. The driving-wheel thus on the line of its greatest eccentricity fits closely against the interior concave surface of the pulley. The gates d' d^2 d^3 also serve to prevent the circulation of the oil. I provide ports *f g* on opposite sides of the portion *e* of the periphery. Now as long as these ports are open it is evident that the driving-wheel might revolve within the pulley without turning the pulley, the resisting medium, that is, the oil *h*, flowing, we will say, into ports *g* and out of ports *f*. By controlling the circulation of the oil through the ports, I am enabled to control the speed of the pulley. For this purpose I preferably provide a valve *i*, which is normally held by retractile springs *k* against the seat *l*.

Any sudden change in the drag of the armature upon the pulley serves to change the position of this valve, and, once changed, the circulation of the oil tends to keep the valve in its changed position until another change takes place in the drag or load of the armature as exerted upon the pulley.

The sudden cutting out of a number of arc-lights upon a circuit would increase the power taken to turn the armature, which in turn would act, by reason of its increased drag upon the driving-pulley, to throw open the valve *i*, which would then permit of a freer flow of the oil, and an immediate decrease in the speed of the driving-pulley would result, although the shaft remained at a constant speed, and said decrease would remain so long as the valve *i* remained in the same position. On the other hand, the sudden introduction of a number of arc-lights into the circuit would diminish the power taken by the dynamo momentarily, which, in turn, would act on the driving-pulley to close the valve *i* and immediately increase the speed of the driving-pulley.

I have found that restricted ports without the valve would, to a certain extent, control the flow of the oil in the direction required. I do not limit myself, therefore, to the details of construction shown, but claim as within my invention the method of controlling the engagement between the pulley and its driving mechanism by the sudden changes in the drag of the armature caused by the increase or decrease in the resistance of the circuit of the machine.

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

1. The combination with a dynamo-electric machine, of a driving-shaft for rotating the armature thereof, a variable-speed connection between said driving-shaft and said armature, and means operated by the variation of the pull upon the armature for automatically changing the speed with which said variable-speed connection drives the armature; substantially as described.

2. The combination with a dynamo-electric machine, of a driving-shaft for rotating the armature thereof, a variable-speed connection between said driving-shaft and said armature

and comprising two relatively-moving parts one mounted to move with the driving-shaft and the other mounted to move with the armature, and means for controlling the flow of a liquid between said relatively-moving parts, said means being controlled by the pull upon the armature; substantially as described.

3. The combination with a dynamo-electrical machine, of a shaft *a*, a pulley having an interior casing, a driving-wheel *b* within said casing, gates d' d^2 d^3, ports *f g*, valve *i* and springs *k*, substantially as and for the purpose specified.

In witness whereof I hereunto subscribe my name this 1st day of December, A. D. 1888.

CHARLES E. SCRIBNER.

Witnesses:
GEORGE P. BARTON,
CHAS. G. HAWLEY.