

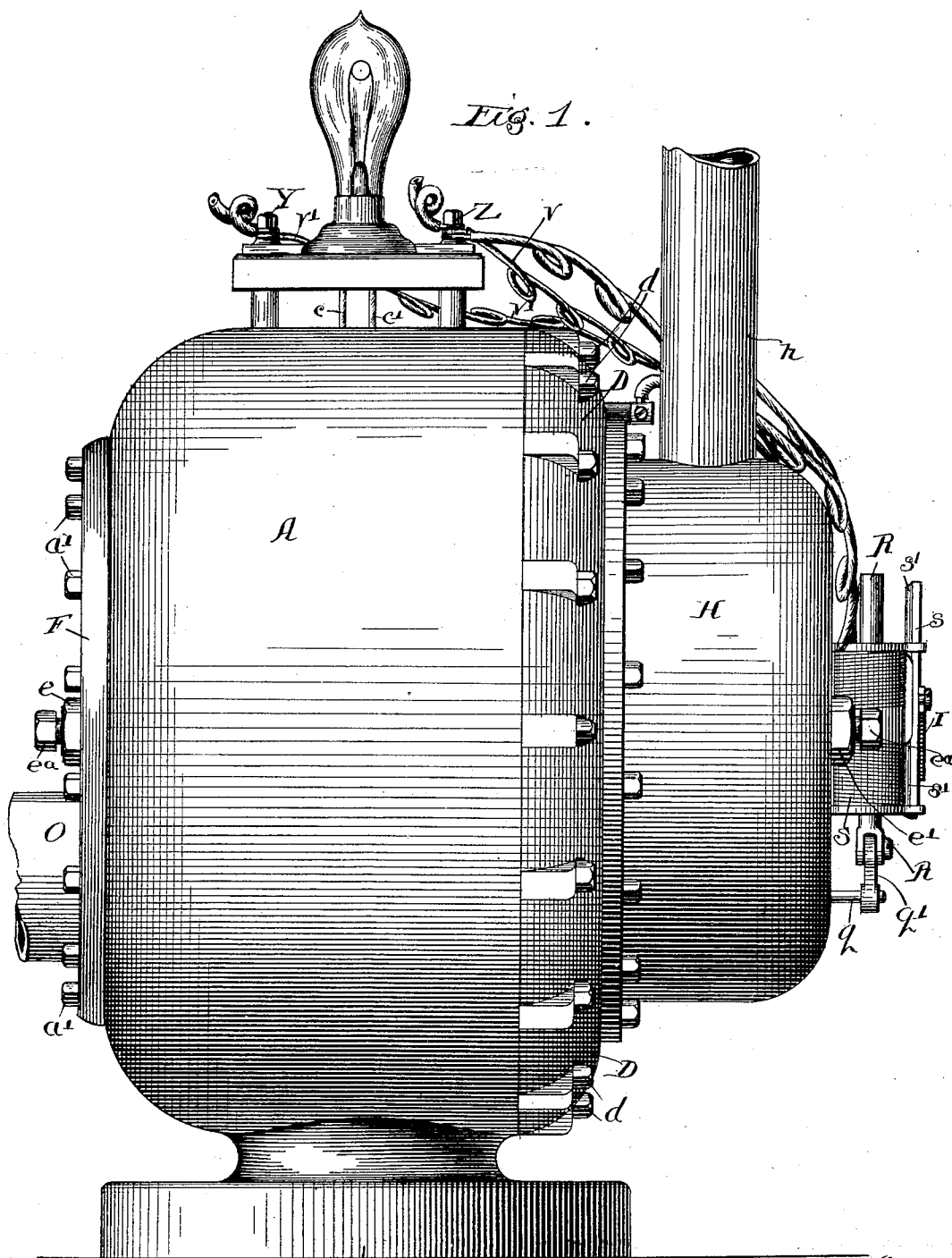
(No Model.)

6 Sheets—Sheet 1.

C. E. SARGENT.
TURBINE ELECTRIC GENERATOR.

No. 548,930.

Patented Oct. 29, 1895.



Witnesses:
Charles D. Shewey
A. H. Hansen

Inventor:
Charles E. Sargent
by Niles Inman & Co. Attys.

(No Model.)

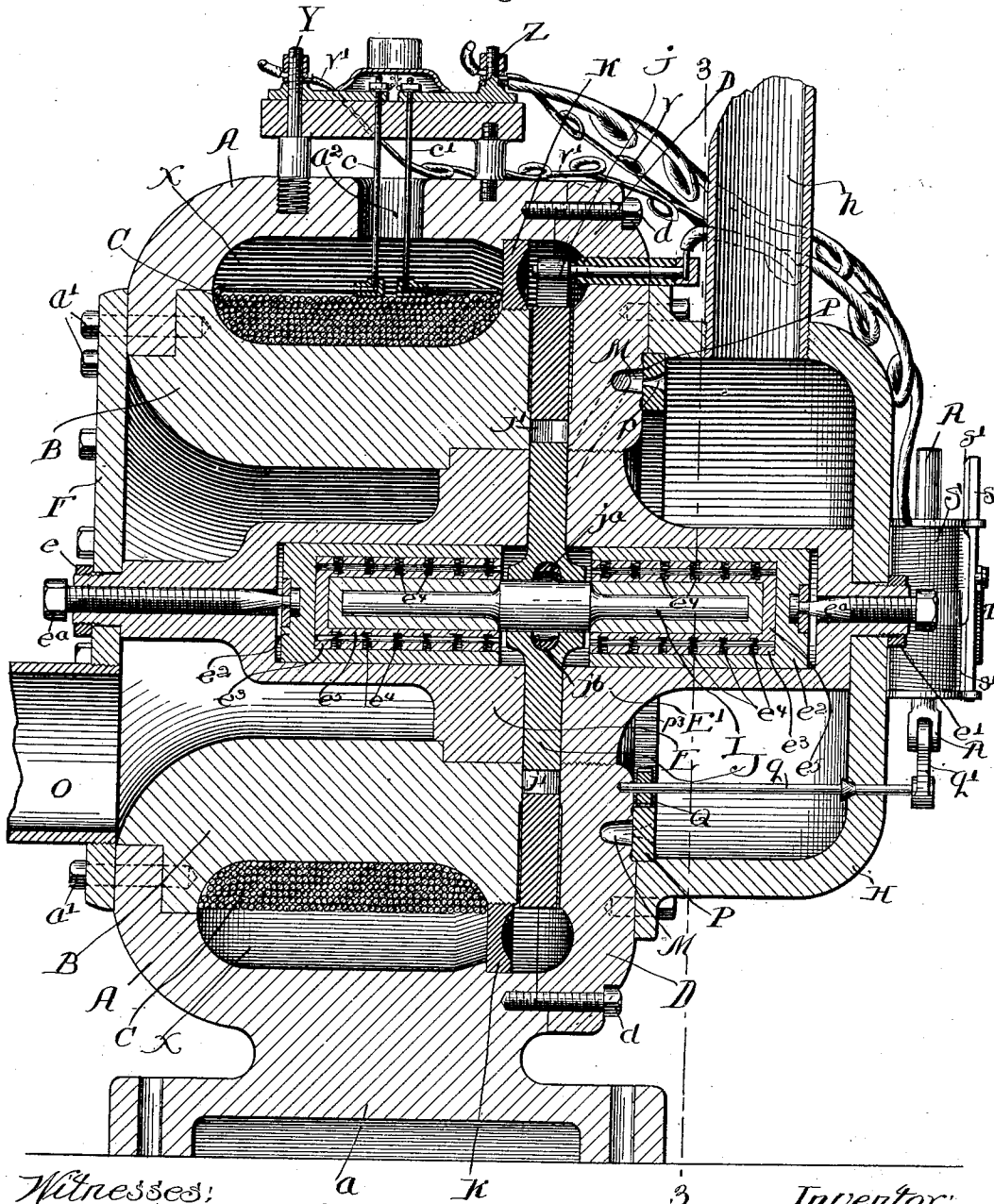
6 Sheets—Sheet 2.

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FIG. 2.



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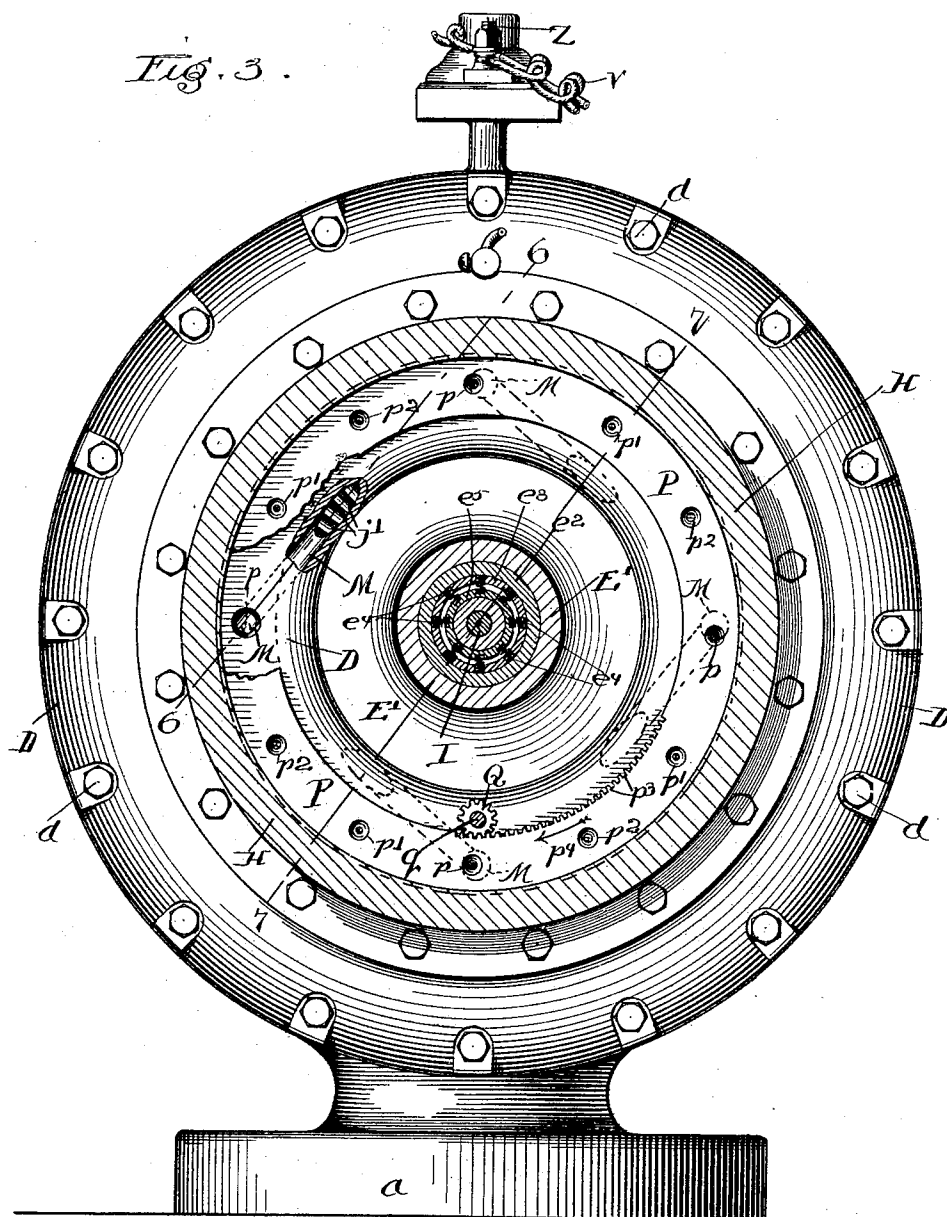
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(No Model.)

6 Sheets—Sheet 4.

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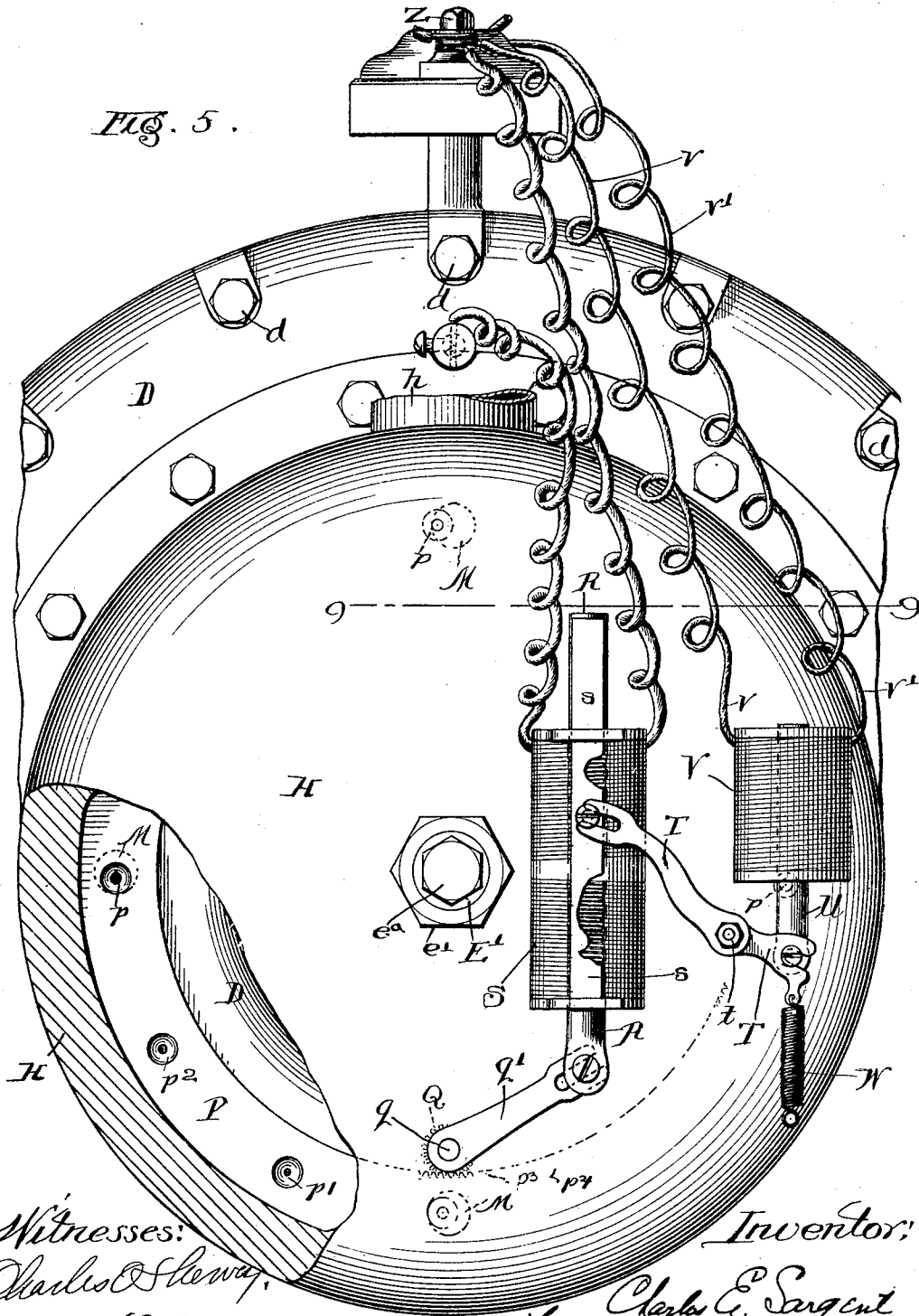
(No Model.)

6 Sheets—Sheet 5.

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No. 548,930.

Patented Oct. 29, 1895.



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UNITED STATES PATENT OFFICE.

CHARLES E. SARGENT, OF CHICAGO, ILLINOIS.

TURBINE ELECTRIC GENERATOR.

SPECIFICATION forming part of Letters Patent No. 548,930, dated October 29, 1895.

Application filed September 19, 1894. Serial No. 523,459. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SARGENT, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Turbine Electric Generators, of which the following is a specification.

My invention relates to certain improvements in electric generators, the main purpose of which is to apply a motive force or element—such as steam, air, or the like—directly to the armature of the generator, and thus to do away with the necessity for any shaft or other means of connection between the motor and the electric generator. Incidentally, I have aimed to make certain other improvements, both in the generator proper and also in the motor or power-receiving portion of the machine. All of these different improvements will be described in the following specification and their essential features pointed out in the appended claims.

In the drawings herewith presented I have shown nine figures illustrating my improvements upon six sheets of drawings.

Figure 1 is a side elevation complete of my improved generator in its preferred form. Fig. 2 is an axial section parallel to the plane of the paper in Fig. 1. Fig. 3 is a vertical section in line 3 3 of Fig. 2, showing portions broken away to reveal parts behind the same. Fig. 4 is a front elevation of the machine with all of the parts to the right of the armature in Fig. 2 removed and half of the said armature cut away. Fig. 5 is a front elevation enlarged of the complete machine, certain portions being also broken away in said view. Fig. 6 is a section in line 6 6 of Fig. 3. Fig. 7 is a section in line 7 7 of the same figure. Fig. 8 is an edge view in part section of the armature, and Fig. 9 is a detail section in line 9 9 of Fig. 5.

Referring first to Fig. 2, the generator proper is constructed as follows: An outer ring A is constructed of suitable paramagnetic material and provided with a base a , by means of which the entire machine may be fastened to its support. Within this outer ring and secured to it by means of bolts a' is an inner ring of similar material B, the meeting surfaces of the two being hollowed out to form

an annular chamber X, within which is a single field-coil C, wound upon the inner ring and having its ends $c c'$ extended through an opening a^2 in the outer ring. These series are here shown as connected with the binding-posts Y Z, which are the terminals of the generator, thus constituting a shunt-wound field. This is not material, however, to my improvements. Upon the right-hand end of the outer ring A is fastened a third ring D, by means of screws d , said ring being also of suitable paramagnetic material and forming with the right-hand end of the inner ring the poles of a cylindrical horseshoe-magnet. Within the inner ring B is fitted a diamagnetic journal-block E, extending through said ring and secured in a plate F fastened to the left-hand end of both rings by means of the screws a' . This fastening is accomplished by means of a nut e , threaded to the end of the journal-block. The right-hand end of the journal-block is hollowed out to receive a thimble e^2 , adjustable horizontally by means of a screw e^3 and containing within its interior a collar e^4 , which itself contains an inner thimble e^5 , suspended within the interior of the collar by means of a series of spiral springs e^6 , and within the inner thimble is a bearing of fiber graphite. Upon the opposite end of the machine and secured to the ring D is a hollow head H, and a second journal-block E', similar to the block E, is mounted in the ring D and in this head-piece and secured to the latter by means of a nut e' . The two journal-blocks are similar in construction, and within the two graphite bearings are mounted the opposite ends of a spindle I, upon which is the armature J, which consists of a metallic disk of steel or other suitable material, arranged to revolve between the poles of the horseshoe-magnet above referred to. A brush j , which may be a series of brushes, if you like, bears upon the outer periphery of the steel disk, and is connected by suitable conductors with the terminal Z of the machine. The other terminal Y is connected directly with the outer ring A, which is one of the poles of the generator. The chamber in which the brush j is located is separated from the one X in which the field-coil is placed by means of a diamagnetic ring K, for reasons which will appear hereinafter.

This completes the generator proper, and there remains only to provide means for rotating the disk J with sufficient rapidity to create the necessary voltage. Looking at the same figure, a pipe h is provided adapted to supply a sufficient quantity of steam or air under high pressure to the interior of the head H. This interior is connected with the disk chamber by means of a series of ports M, one of which will be clearly seen in Fig. 6. The metal of the disk is cut away in the portion which revolves in front of these ports to form a series of curved vanes j' , separated by a series of passages of similar curvature. Opposite to the ports M are a second series of ports N on the other side of the disk, which are clearly shown in Fig. 7, and which lead from the disk or armature chamber into the interior of ring B, from which leads a discharge-pipe O. The passage of steam through the ports M against the vanes j' and out of the ports N rotates the disk J with great rapidity.

To govern the passage of steam or air, I have placed a ring P, (see Figs. 2 and 3,) containing a series of ports p , adapted to register with the ports M, but of much smaller bore, so that the steam, in passing from the ports p into the ports M, will expand sufficiently to reach substantially the pressure existing in the discharge-chamber when the disk is reached. This discharge-pressure may, of course, be atmospheric or less, if desired. The ring P is shown as provided with two other series of holes p' p'' , of different size from the holes p , the purpose of the same being to adapt the size to different initial pressures, the intention being to use one series of holes for a given pressure, a series of smaller holes for greater pressure, and a series of larger holes for a lower pressure, so that, no difference what the pressure may be of the steam or other gas in the supply-reservoir, such pressure may be reduced to the desired point by the time it reaches the disk. This ring P is controlled both for the purpose of bringing any series of holes over the ports M and for the purpose of closing said ports altogether by means of a pinion Q, in mesh with a rack p^3 upon the ring and mounted upon a shaft q , extending through the head and bearing a crank q' . (See Fig. 5.) This crank-arm is pivoted to an armature R of a series-wound differential electromagnet S, controlled by a slide s , operated by a lever T, pivoted at t between its ends and pivoted at its opposite end to the armature U of a shunt-wound electric magnet V, connected with the binding-posts Y Z by means of wires v v' . A spring W resists the pull of the magnet V and assists the gravity of the armature U. The slide s is made of insulating material and bears conducting cheek-pieces s' s'' , sliding up and down upon the bare wires of the magnet S, so that by the vertical movement of said slide a portion or all of either end of said magnet may be short-circuited.

The drawings show the slide at the extreme upward limit of its movement, which short-circuits the entire lower half of the differential magnet S and throws into the circuit the entire upper half of said magnet, which upper half is wound to draw the armature R into its upper position, as seen in Fig. 5, and to throw the four holes p into register with the ports M, giving the full volume of steam to the disk that is possible by means of this series of holes. If too much voltage is thereby created, the pull of the shunt-magnet V will lower the slide s , changing the relative strength of the opposite ends of the differential magnet S and lower the armature R of the latter. This will rotate the pinion Q and move the ring P in the direction of the arrow p^4 in Fig. 3, and a sufficient movement in this direction will close the ports M. I do not arrange the holes in the ring P at spaces equal to the distances between the ports M, as will be seen in said Fig. 3 and also in Fig. 5; but I so space said holes that they will be cut off in turn by the motion of the ring, so that one or more may be open to its full capacity after the remainder are closed. The purpose of this is to utilize the full expansion of the steam, which can be better done by decreasing the number of ports when it is desired to check the machine than by decreasing the size of each port.

When it is necessary to bring a new series of holes in register with the ports M, the armature R is lifted from the crank q' , and the latter given a sufficient number of turns to move the ring P the necessary distance.

As both the nature of the motor and the generator proper require an unusually great rapidity of rotation, I have found it necessary to provide means for balancing the disks J, which is practically impossible in the ordinary way, and which, even if sufficiently well balanced, would be thrown out of balance by the slightest accumulation of dirt or rust. For this reason I have provided the springs e^4 , encircling the bearings of the disk, so that said disk can select its own center of rotation, even if such center is slightly out of the geometrical axis. To make this difference as slight as possible, I have formed in the disk, at a point where it is secured upon the spindle, an annular chamber j^a , which is partially filled with a heavy liquid, as mercury j^b , which when an increase of weight throws the axis of rotation to one side of the geometrical axis will seek the opposite side of said geometrical axis under the influence of centrifugal force and tend to restore the approximate coincidence of the two axes.

I claim as new and desire to secure by Letters Patent—

1. In an electric generator, an armature provided with a series of vanes and suitable ports and supply pipes for delivering a gas at great velocity against the vanes and for receiving the discharge therefrom; substantially as described.

2. In a turbine gas or vapor motor, the combination with a series of ports leading to the wheel, of a series of valves having suitable connections with an operating handle whereby
5 said ports are shut one after another in turn when the handle is operated; substantially as described.

10 3. In a turbine gas or vapor motor, the combination with a series of ports leading to the wheel, of a slide valve or valves provided with two or more series of holes of different sizes and adapted to different gas pressures; substantially as described.

4. The combination in an electric generator, of an armature provided with a series of
15 vanes, supply pipes or passages for delivering gas or vapor against these vanes, valves for varying the size of the supply passages and an electric governor controlled by the output of the machine and adapted to operate the
20 valves; substantially as described.

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