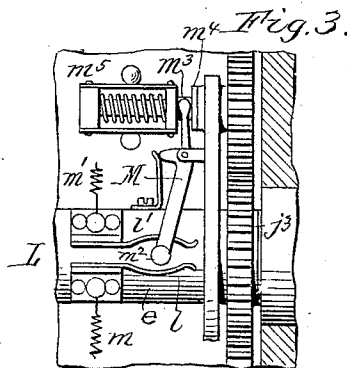
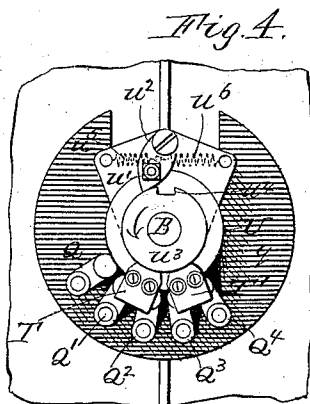
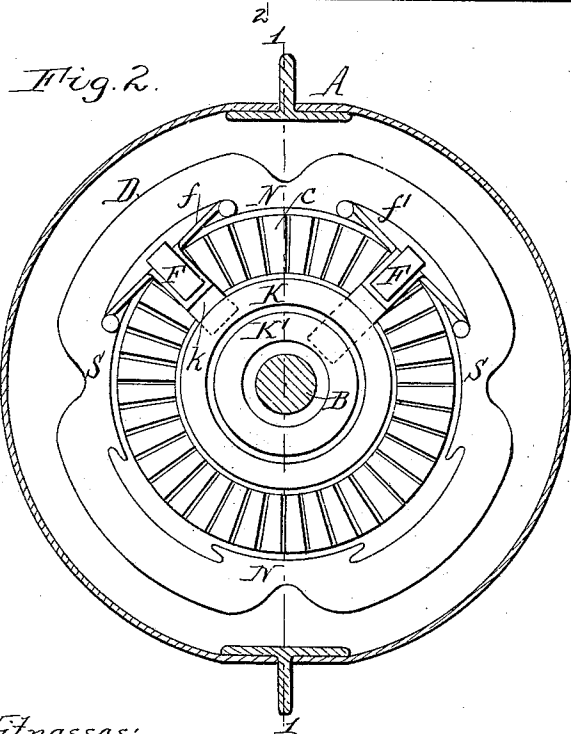
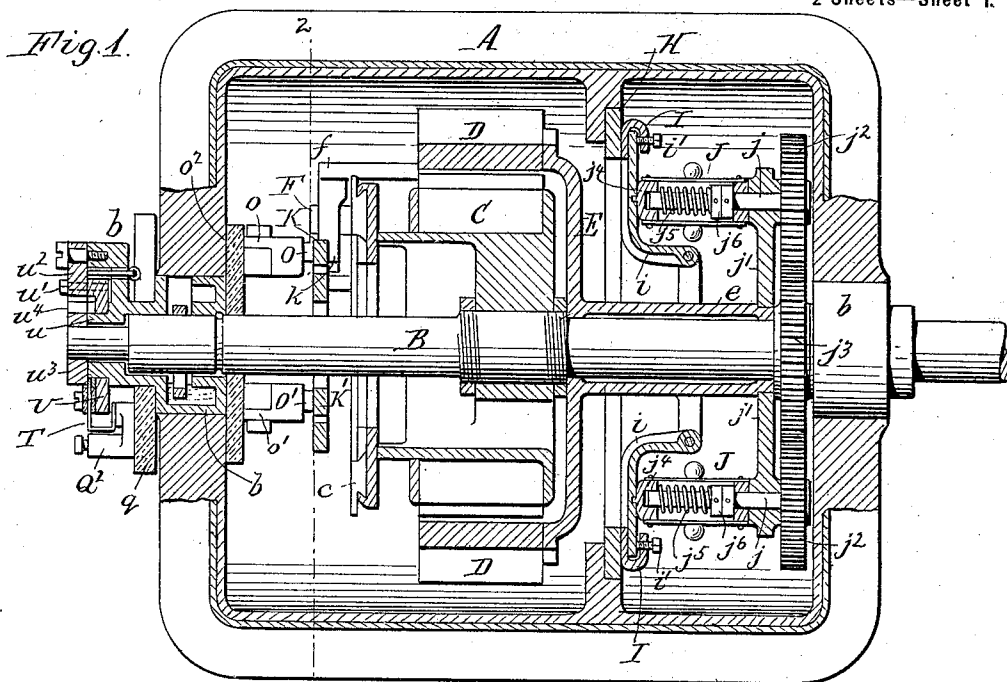


S. HUTCHINS.
DYNAMO.

(Application filed Dec. 19, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

E. A. Volk.

F. F. Schuniger

Inventor.

Samuel Hutchins.

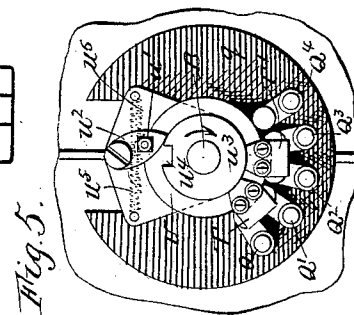
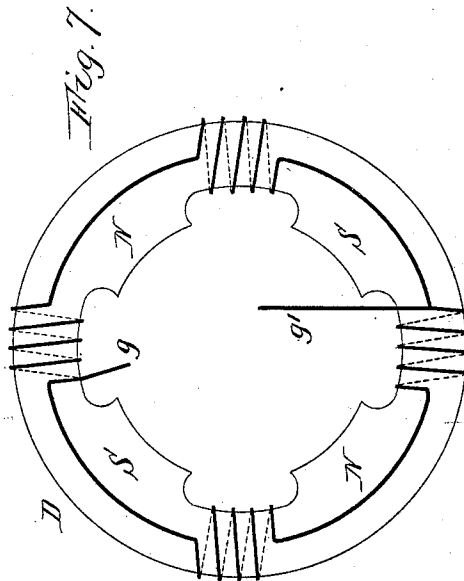
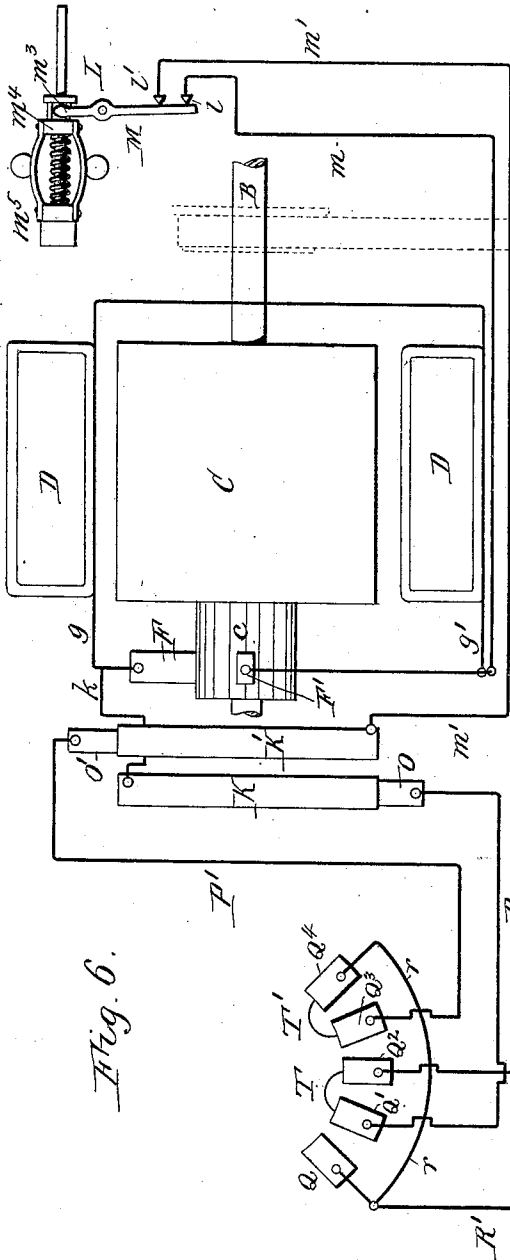
By Wilhelm Dornier, Attorneys,

S. HUTCHINS.
DYNAMO.

(Application filed Dec. 19, 1901.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:

E. A. Volk.

F. F. Schuyler.

Stainer Hutchins Inventor.

By Wilhelm H. Bennett.
Attorneys.

UNITED STATES PATENT OFFICE.

STAINER HUTCHINS, OF MANCHESTER, ENGLAND, ASSIGNOR OF ONE-HALF
TO CHARLES A. GOULD, OF NEW YORK, N. Y.

DYNAMO.

SPECIFICATION forming part of Letters Patent No. 699,388, dated May 6, 1902.

Application filed December 19, 1901, Serial No. 86,488. (No model.)

To all whom it may concern:

Be it known that I, STAINER HUTCHINS, a subject of the King of Great Britain, residing at Manchester, in the county of Lancaster, England, have invented new and useful Improvements in Dynamos, of which the following is a specification.

This invention relates to dynamos and electric motors in which the voltage or tension is automatically kept constant at varying speeds of the armature, or vice versa, the invention being especially applicable to dynamos employed for lighting railway-cars, where the voltage must be kept constant, while the armature, which may be driven from one of the axles or wheel-rims of the vehicle, is rotated at varying speeds, according to the speed at which the vehicle is moving.

The invention is based on the principle that if the field-magnets of the dynamo are mounted so that they can rotate and follow the armature, which they tend to do when current is taken out, and a constant difference of speed is maintained between the armature and the field-magnets then the voltage will also remain constant.

The object of the invention is to provide a simple and efficient dynamo or motor provided with field-magnets mounted so as to be capable of rotating and following the armature and automatic governing means which retards the field-magnets until the speed of the armature is sufficient for the desired voltage and releases the same so that they can follow the armature when the speed of the latter is greater than required, thus decreasing the speed of the armature relative to the field-magnets and maintaining a constant difference of speed between the armature and the field-magnets, and consequently a constant voltage.

In the accompanying drawings, consisting of two sheets, Figure 1 is a vertical sectional elevation of a dynamo embodying the invention, taken on the line 1 1, Fig. 2. Fig. 2 is a transverse sectional elevation thereof on the line 2 2, Fig. 1. Fig. 3 is a detail elevation of the cut-out switch and governor thereof. Fig. 4 is an end elevation of the reversing-switch mechanism. Fig. 5 is a similar view showing the parts in the position they occupy

when the armature-shaft is turning in an opposite direction to that in which it is represented as turning in Fig. 4. Fig. 6 is a diagrammatic view showing the circuits. Fig. 7 is a diagrammatic view showing the manner of winding the field-magnets.

Like letters of reference refer to like parts in the several figures.

A represents the frame of the dynamo, which may be of any suitable form; B, the armature-shaft, journaled at opposite ends in bearings *b* in the frame and driven by any suitable means, such as a belt connecting the same with a pulley on one of the car-wheel axles; C, the armature fixed to the armature-shaft intermediate of its ends; *c*, the commutator therefor, and D the field-magnets. The armature and field-magnets may be of any desired suitable type. Preferably the field-magnets are multipolar and shunt-wound, as shown in the diagrammatic views in Figs. 6 and 7, so as to give the four poles N S N S a polarity of north, south, north, south, the two north poles being diametrically opposite each other and the two south poles being diametrically opposite each other.

The field-magnets are carried by a frame E, provided with an elongated hub or sleeve *e*, journaled loosely on the armature-shaft at one side of the armature, so that the frame is capable of rotating to follow the armature.

f f' represent movable brush-holders secured to the field-magnets, so as to rotate therewith, and carrying brushes *F F'*, which are arranged at an angle of ninety degrees relative to each other and bear on the commutator *c*, the brushes being connected to the winding of the field-magnets by wires *g g'*, Figs. 6 and 7.

When current is taken out of the armature, the field-magnets, which are mounted on the rotatable frame, tend to follow the armature and would do so if not restrained. It is therefore necessary to provide means which will retard or hold the field-magnets until the speed of the armature approaches or is greater than that necessary to produce the required voltage. The means shown in the drawings for this purpose is as follows: H represents a brake-ring which is fixed to the stationary frame of the dynamo concentric with the armature-shaft, and I I represent frictional

brake-shoes bearing thereon. Each brake-shoe, of which there may be one or more, is carried at the outer free end of a radial brake-lever i and is preferably detachably secured thereto, as by a set screw or screws i' . Each brake-lever is pivoted at its inner end in any suitable manner to the hub of the field-magnet frame. $J J$ represent centrifugal governors, one for each brake-lever, for controlling the pressure of the brake-shoes against the brake-ring. The shafts j for the governors are journaled in radial bearing-arms or the like j' , carried by the magnet-frame hub, and one end of each shaft projects toward the adjacent brake-lever. The opposite ends of the governor-shafts, which project to the opposite side of the bearings, have gear-wheels j^2 fixed thereto, which mesh with a gear-wheel j^3 , fixed to the armature-shaft. The sliding sleeve j^4 of each governor is pressed against the adjacent brake-shoe by a spring j^5 , surrounding the governor-shaft between the sleeve and a collar j^6 , which is adjustable on the shaft to adjust the spring-pressure. The rotation of the armature-shaft through the described gearing causes the rotation of the governors. The governor-springs are adjusted to hold the brake-shoes against the brake-ring with sufficient pressure to hold the magnet-frame from rotation until the speed of the armature necessary for the required voltage is reached or nearly approached, when the centrifugal action of the governors overcomes the spring-pressure on the brakes and permits the magnets and magnet-frame to follow the armature. The rotation of the magnet-frame causes the gear-wheels j^2 to roll around on the gear-wheel j^3 , thus decreasing their speed proportionately to the increase of speed of the magnet-frame and applying greater pressure on the brake-shoes, and consequently a greater retardation of the magnet-frame. The difference of speed between the armature and field-magnets is thus kept constant and a constant voltage maintained. Any other suitable form of governor and brake mechanism may be employed which is adapted to release the field-magnets when the speed of the armature becomes too great.

$K K'$ represent two collector-rings secured to the movable brush-holders $f f'$. The former is electrically connected with the movable brush F , as by a connection or conductor k , and the latter is connected with the other movable brush F' preferably as follows: L , Figs. 3 and 6, represents a switch of suitable construction for automatically closing the external circuit when the correct difference of speed between the armature and the field-magnets, and consequently the correct voltage, is reached. The switch shown comprises two separated springs $l l'$, carried by the hub of the magnet-frame and insulated therefrom, and a switch-lever M . The switch-springs are respectively connected by conductors $m m'$ to the movable brush F' and the collector-ring K' . The switch-lever is pivoted to a

part carried by the magnet-frame and has a part m^2 at one end thereof adapted to enter between the switch-springs and electrically connect the same. The other end m^3 of the lever is bifurcated and engages in a groove in the sliding sleeve m^4 of a governor m^5 , carried by the magnet-frame and geared to the armature-shaft in a manner similar to the governors J . The switch-governor is adjusted to move the switch-lever into contact with and to close the circuit through the switch-springs when the correct voltage is reached. If preferred, the switch-lever can be connected to the sliding sleeve of one of the governors J .

$O O'$ represent fixed brushes contacting, respectively, with the collector-rings K and K' . The brushes are carried by brush-holders $o o'$, fixed to the dynamo-frame and insulated therefrom by suitable insulation o^2 .

$P P'$, Fig. 6, represent external circuit-wires connected, respectively, with the fixed brushes.

In order to maintain a constant direction of current in the external or lamp circuit irrespective of the direction of rotation of the armature, a reversing mechanism of any suitable construction is employed. That illustrated in the drawings is as follows: $Q Q' Q^2 Q^3 Q^4$ represent five separate contact-plates arranged in the arc of a circle concentric with the armature-shaft and secured to a block of insulating material fixed on the dynamo-frame. The circuit-wires $P P'$ are respectively connected to the contact-plates $Q' Q^3$, the central contact-plate Q^2 is connected to one wire R of the main or lamp circuit, while the return-wire R' of the main or lamp circuit is connected to one end plate Q and by a branch wire r with the other end plate Q^1 . $T T'$ represent two short-circuiting springs carried by and insulated from a ring U , mounted to oscillate so as to move the springs $T T'$ in one position of the ring to respectively connect the contact-plates $Q' Q^2$ and $Q^3 Q^4$, and in the other position of the ring to respectively connect the contact-plates $Q Q'$ and $Q^3 Q^5$. The ring U is preferably mounted on a hollow sleeve u , projecting from the bearing b for the armature-shaft concentric therewith and is connected, as by a screw-bolt u' , with the free end of a pawl u^2 , which is pivoted at its upper end to a fixed part of the bearing. The lower free end of the pawl projects toward a collar u^3 , fixed on the armature-shaft adjacent to the ring U and provided with a notch u^4 in the periphery thereof. $u^5 u^6$ represent oppositely-arranged springs, each connected at its inner end to the pawl and at its outer end to a fixed part of the bearing b . The springs tend to move said pawl to a central position. When the armature-shaft is turning from right to left, as indicated in Fig. 4, the pawl is held in the inclined position shown in said figure, with the end of the pawl riding on the periphery of the collar u^3 , which prevents the springs from moving the pawl to its central or radial position. When the rotation of the arma-

ture-shaft is changed and the shaft turns from left to right and the notch is brought opposite the end of the pawl, the latter is moved by its springs thereinto and the pawl shifted to the position shown in Fig. 5. The connection between the pawl and the oscillating ring causes the latter to shift with the pawl to the other position shown in Fig. 5, in which position the parts remain until the direction of rotation of the armature-shaft is again changed. The short-circuiting springs are thus shifted and connect the contacts, as above explained, each time the direction of rotation of the armature-shaft is changed.

When the armature-shaft is running in one direction and the cut-out switch L is closed, the current passes as follows, (see the diagrammatic view in Fig. 6:) from the commutator *c* to brush F, through conductor *k*, collector-ring K, fixed brush O, circuit-wire P, contact Q', short-circuiting spring T, contact Q², line R to lights or other translating devices, back through line R', branch *r*, contact Q⁴, spring T', contact Q³, circuit-wire P', fixed brush O', other collector-ring K', wire *m*', switch-spring *l*', switch-lever M, switch-spring *l*, wire *m* to movable brush F'. The current also passes from the conductor *k* through wire *g*, the shunt-winding of the field-magnets, and back through the wire *g*' to wire *m*. When the armature-shaft is turned in the opposite direction, the current passes from the brush F', through wire *m*, switch-spring *l*, lever M, spring *l*', wire *m*', collector-ring K', fixed brush O', circuit-wire P', contact Q³, short-circuit spring T', contact Q² out through the line R, translating devices, and back through line R' in the same direction as before, contact Q, spring T, contact Q', circuit-wire P, fixed brush O, collector-ring K, conductor *k*, movable brush F to commutator *c*. The current also passes through the field-magnet winding in the opposite direction to that before stated.

If desired, the cut-out switch L and connections may be omitted, in which case the movable brush F' would connect directly with the collector-ring K'; also, if the armature-shaft is always driven in the same direction the reversing-switch and connections are not necessary, but the current can pass directly through the line from the fixed brushes.

I claim as my invention—

1. The combination of an armature, a field magnet or magnets movably mounted and adapted to follow the armature and means for maintaining a substantially constant difference of speed between the armature and field magnet or magnets, substantially as set forth.

2. The combination of an armature, a field magnet or magnets movably mounted and adapted to follow the armature, a governor movable with the field magnet or magnets, gearing between said governor and the arma-

ture, and means actuated by said governor for controlling the movement of the field-magnets, substantially as set forth.

3. The combination of an armature, a field magnet or magnets movably mounted and adapted to follow the armature, a governor movable with the field magnet or magnets, gearing between said governor and the armature, a fixed brake-surface, and a brake held in contact with said brake-surface and controlled by said governor, substantially as set forth.

4. The combination of an armature, a field magnet or magnets movably mounted and adapted to follow the armature, a commutator, brushes carried by the field magnet or magnets and connecting with said commutator, collecting-rings carried by said magnet or magnets and electrically connected with said brushes, fixed brushes connecting with said collector-rings, and governing means for maintaining a substantially constant difference of speed between the armature and the field-magnets, substantially as set forth.

5. The combination of an armature-shaft, an armature fixed thereon, a frame journaled on the armature-shaft, a field magnet or magnets carried by said frame, a governor carried by said frame, gearing connecting said armature-shaft and governor, a fixed brake-ring, a brake-shoe carried by said frame and bearing against said brake-ring, and a connection between said governor and brake-shoe for controlling the same, substantially as set forth.

6. The combination with an armature and a field magnet or magnets movably mounted and adapted to follow the armature, a governor movable with the field magnet or magnets, a switch movable with said field magnet or magnets and controlled by said governor, and electrical connections between the armature and said switch, substantially as set forth.

7. The combination with an armature, a field magnet or magnets movably mounted and adapted to follow the armature, and means for maintaining a substantially constant difference of speed between the armature and the field magnet or magnets, of an external circuit, current-collecting means including brushes arranged to maintain a constant position relative to said field magnet or magnets, and a reversing-switch and connections for maintaining a constant direction of current in said external circuit, substantially as set forth.

8. The combination with an armature, and a field magnet or magnets movably mounted and adapted to follow the armature, of a commutator, brushes therefor carried by the field magnet or magnets, collector-rings each electrically connected with one of said brushes, fixed brushes for said collector-rings, an external circuit connecting with said fixed brushes, and a reversing-switch

and connections for maintaining a constant direction of current in said external circuit, substantially as set forth.

9. The combination with a dynamo, of a
5 device rotated by the dynamo-shaft, an oscillating device adjacent to said rotary device, a pawl pivoted to a fixed part and connected to said oscillating device, means tending to hold said pawl in a central position, said
10 rotary device adapted to engage said pawl and shift the same to opposite sides of said central position when said rotary device is oppositely rotated, and contacts controlled by said oscillating device, substantially as set
15 forth.

10. The combination with a dynamo, of a collar fixed to the dynamo-shaft, an oscillat-

ing ring adjacent to said collar, a pawl pivoted to a fixed part and connected to said oscillating ring, means tending to hold said
20 pawl in a central position, said collar adapted to engage said pawl and shift the same to opposite sides of said central position when the collar is oppositely rotated, and contacts carried by said oscillating ring and cooperating
25 with fixed contacts, substantially as set forth.

Witness my hand this 26th day of November, 1901.

STAINER HUTCHINS.

Witnesses:

H. O. S. LEAK,
THOMAS LANE.