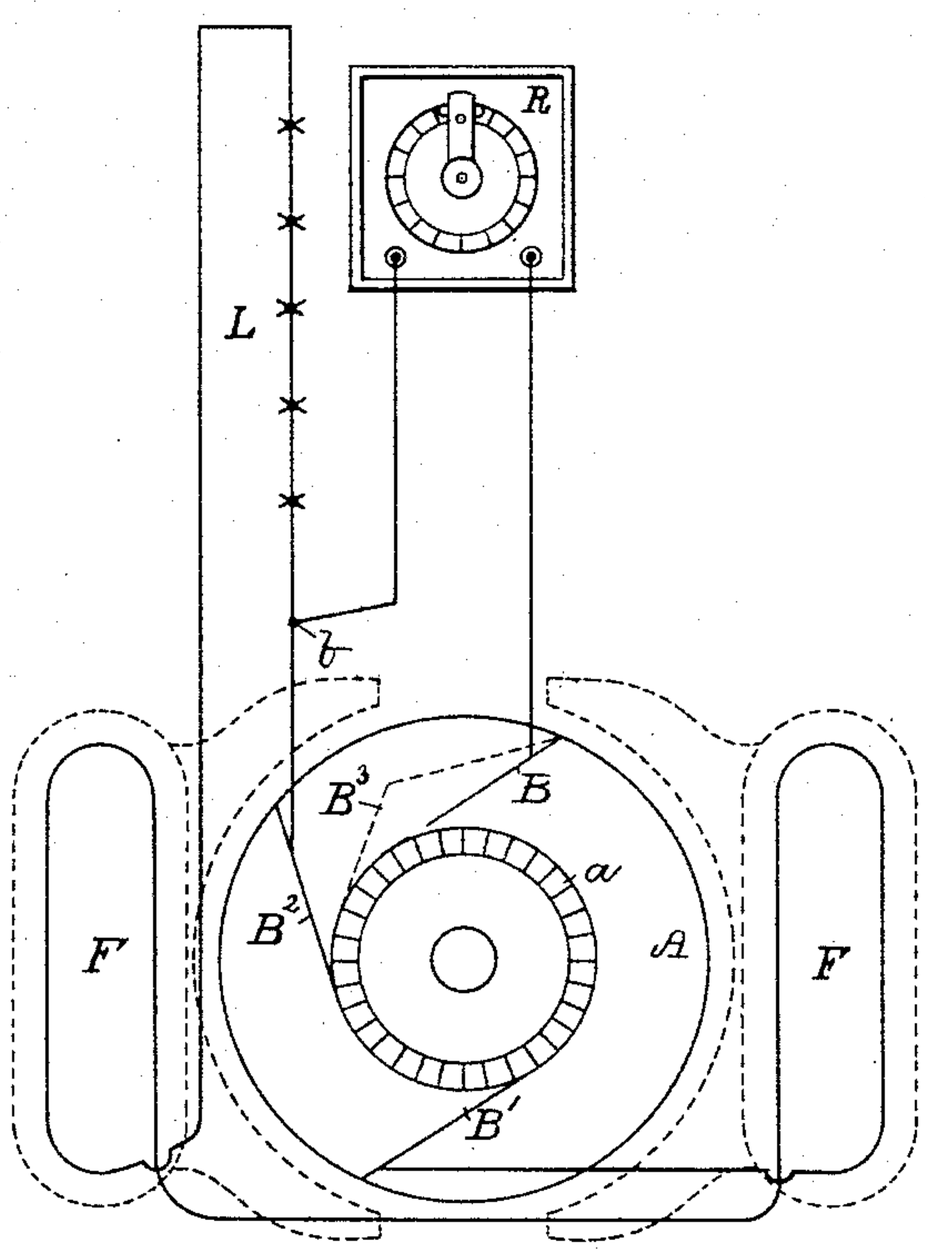
(No Model.)

W. H. ELKINS.

REGULATOR FOR DYNAMO ELECTRIC MACHINES.

No. 412,700. Patented Oct. 8, 1889.



Witnesses.
Edward S. Beach.
John R. Snow.

Inventor.
William H. Elkins
by his attorney
J. C. Maguadier.

UNITED STATES PATENT OFFICE.

WILLIAM H. ELKINS, OF CAMBRIDGE, MASSACHUSETTS, ASSIGNOR OF TWO-THIRDS, BY DIRECT AND MESNE ASSIGNMENTS, TO ARTHUR B. GRIGGS, OF BOSTON, MASSACHUSETTS, AND POLLY CRAIG, OF DE FUNIAK SPRINGS, FLORIDA.

REGULATOR FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 412,700, dated October 8, 1889.

Application filed January 18, 1889. Serial No. 296,753. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HENRY ELKINS, of Cambridge, in the county of Middlesex and State of Massachusetts, have invented a new and useful Regulator for Dynamos, of which the following is a specification, reference being had to the accompanying drawing, which is a diagram illustrating my invention, the pole-pieces and cores being shown in dotted lines, and the circuit which constitutes the main novelty being shown in full lines.

My invention relates to regulating the current in the work-circuit of a dynamo; and it consists in a novel compound dynamo-circuit differing materially from all other dynamo-circuits known to me, as will be now fully explained.

In the drawing, A represents the armature, and *a* the commutator, of an ordinary dynamo; B, the positive brush, and B′ the negative brush, and B^2 an additional brush. The work-circuit is from additional brush B^2, through lamps L and field F F, to main brush B′. The regulating-circuit is from brush B, through resistance R, to its junction *b* with the work-circuit.

In practical operation the resistance in the work-circuit B^2 L F F B′ is constant, excepting as it is varied by varying the load, as by introducing a different number of lamps L, and in the diagram I have shown five lamps or groups of lamps, so that the variable load may be divided into five portions. It will be found that the brush B^2 may be so adjusted in any given dynamo with a given speed that the desired current will be maintained over the work-circuit B^2 L F F B′ when only one lamp out of the five—that is, one-fifth of the variable load—is used, the regulating-circuit B R *b* being then open, or, what is practically the same thing, the resistance R being very large. Under these conditions, if a second lamp, or another fifth of the load, be introduced into the work-circuit B^2 L F F B′, the current in the work-circuit will be decreased, for the speed of the dynamo and electro-motive force remain the same; but the resistance or load L is doubled, and consequently the two lamps L, or two-fifths of the total number of lamps, will not be at full candle-power. To remedy this the electro-motive force of the work-circuit B^2 L F F B′ must be increased. An ammeter in the work-circuit B^2 L F F B′ will indicate when the current in the work-circuit is thus decreased by the introduction of another fifth of the load, and the regulating-circuit B R *b* will then be closed through resistance R, thus establishing a regulating-current through the circuit B R *b* L F F B′, this additional current bringing up the current in the work-circuit to the proper standard. When a third fifth of the load L is introduced, the current in the work-circuit again decreases, and is again brought to standard by aid of the regulating-circuit by still further decreasing the resistance R, and so on until the whole load is in the work-circuit, when the resistance R is eliminated, or practically so, the work-circuit being then from brush B to brush B′ practically as if the brush B^2 and the resistance R were not present.

In practice I have found that it is difficult after the introduction of, say, three-fifths of the total load to prevent a partial flow of the current from *b* to B^2 if B^2 remain in its proper position for the minimum load. My theory is that with, say, one-fifth of the load the difference of potential between B^2 and *b* is at the maximum, the regulating-circuit being then open, or practically so, and that as the resistance R in the regulating-circuit is decreased the difference in potential between B^2 and *b* diminishes, there being but slight difference in potential between B^2 and *b* with about four-fifths of the load in the work-circuit, while with full load in the work-circuit and the resistance R decreased to practically nothing there will be a current from *b* to B^2, instead of a current from B^2 to *b*, as is the case when three-fifths or less of the full load is in the work-circuit. In theory under the minimum load—say one-fifth of the full load—there should be no current in the regulating-circuit for the best results, and the additional brush B^2 should be set to give the desired current in the work-circuit when the load is

at the minimum, and then be drawn toward the brush B after, say, about one-half of the full load is introduced into the work-circuit, in order to prevent any possibility of a current from *b* to B^2; but, as will be clear, a second additional brush might be used between B^2 and B, where a closer degree of regulation—say from sixty lamps to only one or two—was required; or brush B may be moved toward B^2, as indicated by dotted line B^3.

In practice I have succeeded in maintaining a constant current in the work-circuit, although the load varied from one-fifth to four-fifths, the current from B^2 to *b* being with one-fifth load, and with the regulating-circuit open, the same, of course, as in the work-circuit; but with two-fifths load in the work-circuit the current from B^2 to *b* decreased and the current from B through R to *b* increased, and so on, until with four-fifths load there was no current from B^2 to *b*, and the current from B through R to *b* was the same as that in the work-circuit; but, as before observed, in this case under full load the current from B through R (R being then reduced to practically nothing) to *b* was greater than the current in the main circuit, and the excess flowed from *b* to B^2 and back through the coils of the armature to B. This backflow of a portion of the current is not desirable, and can readily be prevented by moving the brush B^2 nearer to the brush B, or by the use of brush B, as indicated by B^3.

It will be clear to all skilled in the art how the resistance R may be adjusted, and therefore no means are described or shown in the drawing.

What I claim as my invention is—

In combination with the armature A and its commutator *a*, the main brushes B B′, the additional brush B^2, and the adjustable resistance R, the brushes B and B^2 being connected to the work-circuit at *b*, with the resistance R between the brush B and the junction *b*, all arranged and operating as described to keep the current constant by variations in the current supplied by the brushes B^2 and B, substantially as described.

WILLIAM H. ELKINS.

Witnesses:

EDWARD S. BEACH,

JOHN R. SNOW.