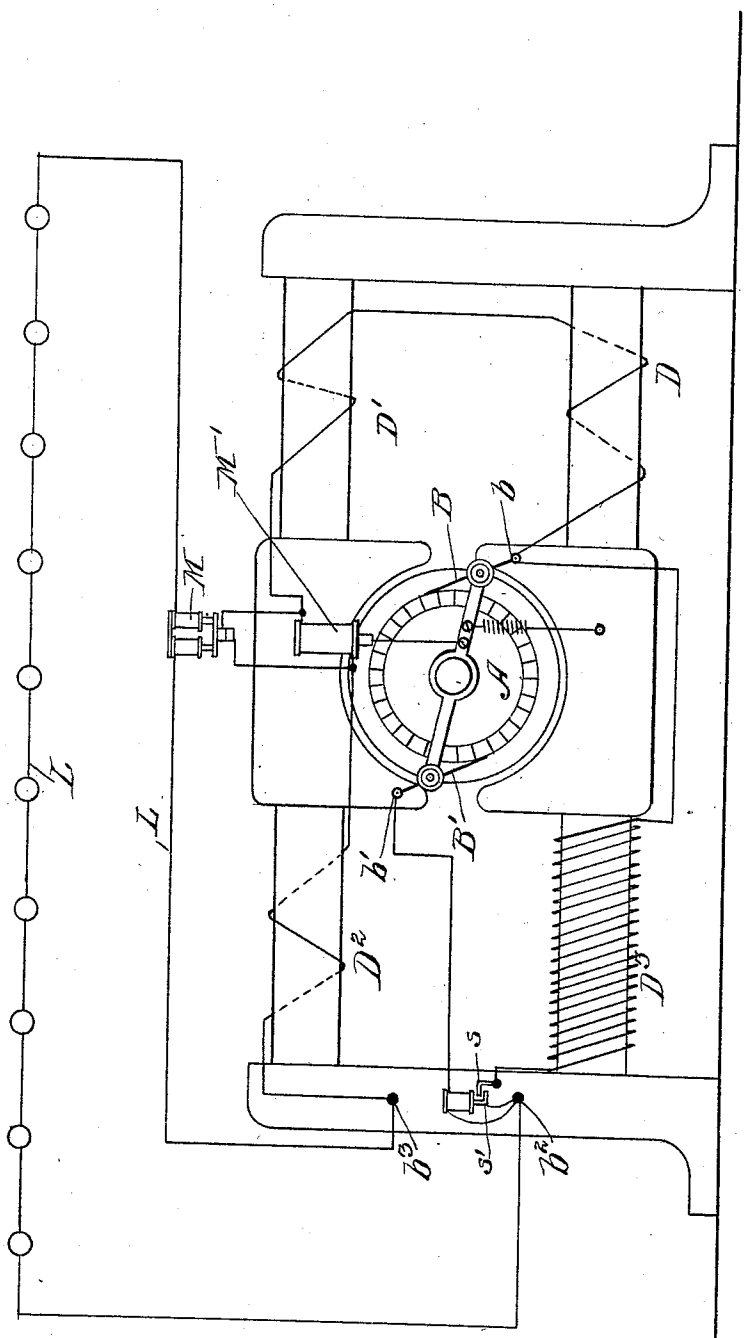
(No Model.)

W. H. ELKINS.

CONSTANT CURRENT DYNAMO.

No. 519,858. Patented May 15, 1894.



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CONSTANT-CURRENT DYNAMO.

SPECIFICATION forming part of Letters Patent No. 519,858, dated May 15, 1894.

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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 Constant-Current Dynamo, of which the following is a specification, reference being had to the accompanying drawing, which is a diagram illustrating my invention.

In arc light dynamos a constant current of about ten ampères with an electromotive force of about fifty volts per lamp, with the average line, is usual; and it is not uncommon for the electromotive force of such a dynamo to be about three thousand volts, that electric pressure being necessary for sixty lights in series. To produce dynamos for this work which can be regulated satisfactorily for the necessary variations of load is a problem which has been solved with more or less success by different inventors, and my present invention relates to the regulation of dynamos of this class; and consists in the combination of means for varying the adjustment of the brushes on the commutator with a compound winding of the field magnet, as will now be more fully explained, by reference to the drawing.

A represents the commutator; B B′ the brushes; D D′ D^2 D^3 the field coils; and L the work circuit.

At full load, shown as ten arc lights in the diagram, the difference of potential between the terminals b b' will be about five hundred volts, and for the best results the resistance of the shunt coils D^3 will be about one thousand ohms, making the current through the shunt circuit b D^3 b^2 about half an ampère, the current through the main circuit b D D′ D^2 b^3 L b^2 being always say ten ampères when the dynamo is properly adjusted; and the current from b^2 to b' being ten and a half ampères at full load. For this reason the number of turns of wire in the coils D^3 is twenty times the number in either of the other field coils, assuming that the field magnet is symmetrically wound as is usual. At half load the difference of potential must be only about two hundred and fifty volts, and the brushes B B′ will be moved about the commutator until they are so placed on the commutator as to give that difference of potential between them; but the amount of this movement in my dynamo is much less than in any other known to me, for the reason that the current in the shunt coils D^3 is only half as much as at full load, or one quarter of an ampère in the case supposed; and the field is therefore much weakened so that the necessary movement of the brushes is much decreased; and this is especially important for the reason that the regulation is effected much more quickly and the tendency to spark increased very rapidly as the brushes are moved more and more; for when properly adjusted for full load the brushes are so arranged that there will be no injurious sparking and they should not be moved from that adjustment unless the strength of the field be varied.

In my dynamo the current through the commutator varies with the load although it is constant in the work circuit; and this is the distinguishing characteristic of my invention, for in all other constant current dynamos the current through the commutator is kept as nearly constant as possible, while in mine with a constant current in the main circuit the current through the commutator must vary with the load, the strength of the field being decreased from full load to minimum load by decreasing the current through the coils D^3; and the current through the commutator is decreased both by decreasing the number of ampère turns in the field coils and by moving the brushes, as the load decreases; and this combination is my invention.

I have indicated the usual magnets M M′ for adjusting the brushes; as will be plain to all skilled in the art without description; but the brushes may of course be adjusted by hand.

The magnet M^2 is a safe guard in case of the accidental rupture of the work circuit L. Its armature when no current passes through the main circuit L is as shown in the drawings, being held in that position by its weight, or by a spring; but when a current of say over five ampères passes through its coils it makes the shunt circuit b' D^3 b^2, by bringing the electrodes s s' into contact; and holding them in contact so long as the current is flowing through the main circuit L. This is a feature of my invention of considerable practical importance for were it not for this contrivance the shunt circuit would be always closed, and

in case of accident to the main circuit the shunt circuit should be open, or current prevented from passing through it, for short circuiting it will have the same effect.

I have shown the shunt coils D^3 on one core only of the four cores of the field magnet, as this is the arrangement I prefer; but they may be one-fourth on each core, that is symmetrically wound.

While I have little doubt that one-fourth of the total ampère turns should be in the shunt coils D^3 and three-fourths in the main coils D D' D^2, yet that is a matter depending somewhat upon the style of field magnet, and I do not wish to limit my claim to any particular ratio of shunt to main coils.

In practice it is not advisable to greatly increase the number of ampère turns in the shunt coils D^3 above one-quarter of the ampère turns in the main coils D D' D^2, for although by so doing the amount of movement of the brushes B B' may be decreased, yet the evils of sparking will not be so well obviated, as the brushes require to be moved somewhat as the load decreases to prevent sparking. In short the brushes require to be moved mainly to decrease the difference of potential between them to suit the decreased resistance of the main circuit of the decreased load, but also to prevent undue sparking; and when about one-quarter of the ampère turns of the field coil are decreased in proportion to the decreased difference of potential the necessary movement of the brushes is best suited to accomplish both these purposes.

I am aware that it has been proposed to regulate a constant current dynamo by means of the compound winding of the field magnet; and I am also aware that compound winding is common in constant potential machines; and I do not, of course, claim compound winding; but my compound winding, that is with more than half the ampère turns in the main coils and less than half in the shunt coils, is new in itself, and also in combination with means for moving the brushes; the combination making an excellent dynamo in which the current in the main circuit is kept constant by varying the current in the commutator, simply by moving the brushes; and such a machine is new with me.

What I claim as my invention is—

The constant current dynamo above described comprising a compound wound field with the positive and negative terminals of both portions of the field coils connected to the main brushes, and means for moving the brushes about the commutator, to keep the total current generated always greater than the constant current in the work circuit, and to vary the total current generated as required in order to maintain the current constant in the work circuit; all the parts being arranged and operating substantially as described.

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