

W. H. ELKINS.
DYNAMO.

No. 470,784.

Patented Mar. 15, 1892.

Fig. 1.

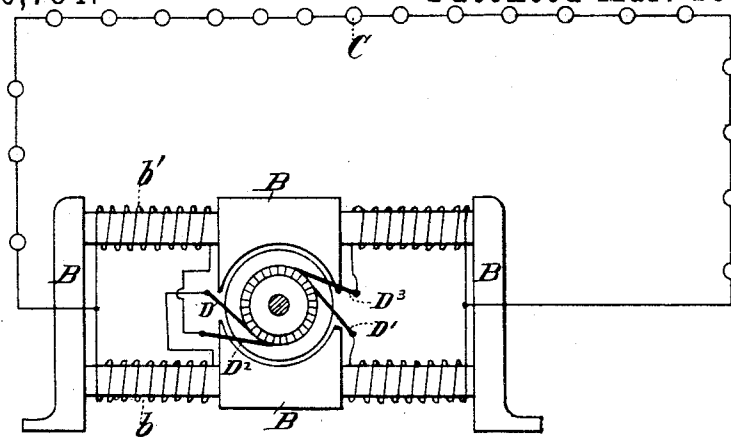


Fig. 2.

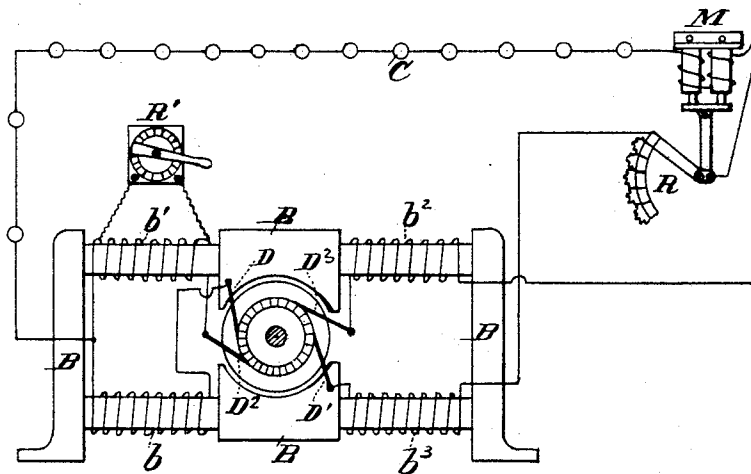
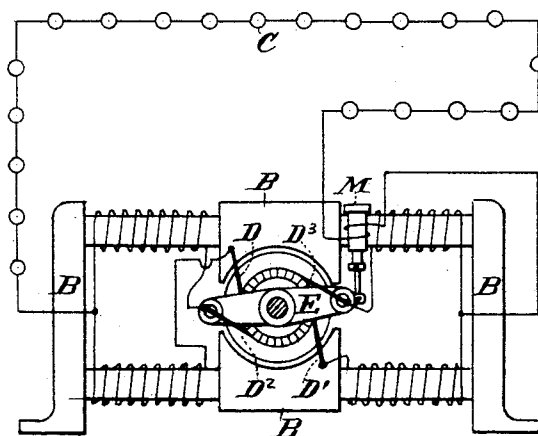


Fig. 3.



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(No Model.)

2 Sheets—Sheet 2.

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Fig. 4.

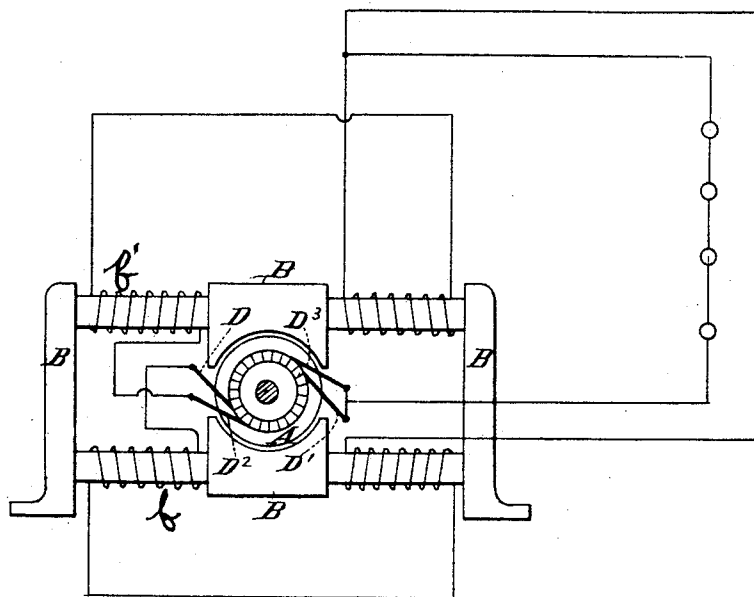
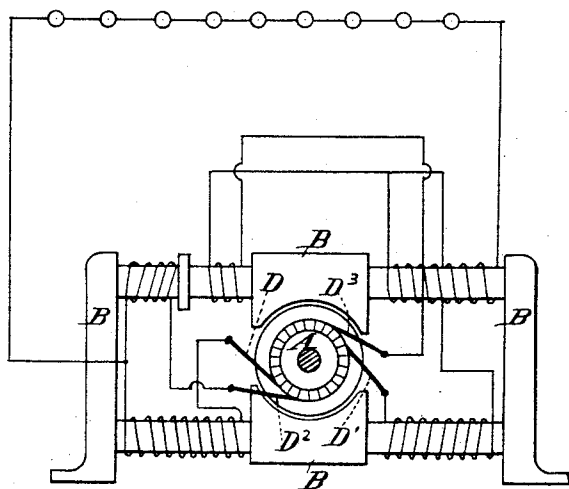


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM H. ELKINS, OF CAMBRIDGE, MASSACHUSETTS.

DYNAMO.

SPECIFICATION forming part of Letters Patent No. 470,784, dated March 15, 1892.

Application filed June 29, 1891. Serial No. 397,776. (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 an Improvement in Dynamos, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 illustrates the simplest form of my invention. Fig. 2 is like Fig. 1, but with additional attachments. Fig. 3 is also like Fig. 1, but with devices for automatically moving the brushes. Fig. 4 illustrates my invention applied to but one side of the armature, instead of to both sides, as in the other figures. Fig. 5 illustrates a form of my invention which, while not so simple as Fig. 1, is yet practically better.

My invention relates to the regulation of dynamos; and it consists in dividing the current from the armature and carrying one division of the current through a portion of the field-coils and the other division through another portion of the field-coils before the two divisions unite to form the current through the work-circuit.

In the drawings, A represents the armature, and B the field-magnet, of one familiar construction of dynamo. The brushes collect the current in two divisions, that part of the current through D passing through coil b and that part through D^2 through coil b' , and these two divisions unite to form the full current through the work-circuit C. The effect of this is that when the brushes are arranged so that an equal current flows from both brushes D D^2 and the field is of the proper strength for full load any decrease in the load will vary the diameter of commutation and cause a greater current in D^2 and a smaller current in D, and this weakens the effective field, although the total ampère-turns remain practically constant. This is probably because of the great leakage which takes place when the ampère-turns in coils b' b^2 exceed those in coils b b^2 , for, as a matter of fact, if all the current were through coils b' b^2 and none through coils b b^2 the effective field strength would be only a small fraction of what it would be if the same number of ampère-turns were symmetrically distributed. This weakening of the effective field keeps the current nearly constant, which

is the result desired, and does it instantaneously; but when the load is decreased largely the regulating effect is not quite sufficient, and in order to obviate this defect and also to keep the current more nearly constant I provide devices by which one division of the current can be still further regulated; but, as will be clear, regulating either division will affect the other, so that the total current will be kept constant.

In Fig. 4 I show the current divided on one side only of the armature; but in large machines—say above twenty-five arc lights—it is better to divide the current on both sides, as in the other figures.

In all the figures, except Fig. 5, the coils are arranged symmetrically—that is to say, with the same number of turns on each; but in Fig. 5 the coils on the two lower legs are equal in the number of turns, but the single coil on the upper right leg has one-half only that number of turns, and the two coils on the upper left leg each have half as many turns as the coil below it, making the same number of turns on three legs—the two lower legs and the upper left leg—but only half that number on the fourth leg—the upper right leg. For example, at full load the current in the upper right coil will be ten ampères and the current in the two lower coils five ampères, while the current in each of the two coils on the upper left leg will be five ampères, and the number of turns should be proportioned to make the ampère-turns symmetrical at full load.

In Fig. 2 that division of the current through brush D' and coil b^3 is regulated by the rheostat R, which is shown as controlled by the solenoid M, so that, while the regulation is mainly by the shifting of the diameter of commutation as the load varies, it is rendered more exact by the action of the solenoid M and rheostat R, for if the current in the main circuit tends to exceed the desired amount—say ten ampères—the core of the solenoid is pulled farther in its coil and resistance thereby introduced, diminishing the current through brush D' and coil b^3 , and this diminution of current weakens the field and causes the main current to remain constant. I also show a rheostat R' , by which the current through coil b' may be regulated, more or less of the cur-

rent being shunted past coil b' and through rheostat R' . These are well-known devices, which will be understood fully without further description. This more exact regulation
 5 may also be accomplished by varying the distance apart of the brushes D and D^2 or of the brushes D' and D^3 , and in Fig. 3 I illustrate a device for doing this by a yoke controlled by a solenoid M , as will be well understood
 10 without further description.

In all the figures, except Fig. 3, the upper pole of the field-magnet tends to grow stronger as the lower pole grows weaker; but in practice the most marked effect is the weakening
 15 of the lower pole. In Fig. 3 these conditions are reversed; but with large machines it is better to weaken the lower pole, as that tends somewhat to keep the bearings of the armature cool, for if the upper pole be weakened
 20 the weight of the armature and the attraction of the strong lower pole both tend to press the shaft of the armature upon its bearings, and in large machines this is objectionable.

Except in Fig. 5 I have shown the field-coil
 25 divided into two parts only, one part for one pole and the other part for the other pole; but obviously the field-coil may be divided into three parts and the full current carried through one of those parts, as illustrated in
 30 Fig. 5. This is desirable for the best effects; but so long as the current is split at the armature, whether on one or on both sides of the armature, one part of it being carried through a coil on one leg and the other part
 35 through a coil on the other leg of the field-magnet, the machine so constructed will embody my invention.

What I claim as my invention is—

1. The method of regulating dynamos, consisting in splitting the current at the armature into two continuous currents and uniting them to form one constant current after

each has passed through a portion of the field-coils, substantially as described.

2. The method of regulating dynamos, consisting in splitting the current at the armature, carrying one part to line through a portion of the field-coil, carrying the other part to line through another portion of the field-coil, and carrying the whole current through
 50 a third portion of the field-coil, substantially as described.

3. In a constant-current dynamo, a pair of brushes of like sign in contact with the same commutator, a forked circuit connected with
 55 each brush of that pair, and a portion of the field-coil in each of those forks, all substantially as described.

4. In a constant-current dynamo, two pairs of brushes in contact with the same commutator, one pair positive, the other pair negative, a circuit forked at each end, and portions of the field-coils in each of the four
 60 forks, all substantially as described.

5. In a constant-current dynamo, a pair of brushes of like sign in contact with the same commutator, a forked circuit connected with each brush of that pair, a portion of the field-coil in each of those forks, and means for varying the strength of either portion of the
 70 field-coil, substantially as described.

6. In a constant-current dynamo, a pair of brushes of like sign in contact with the same commutator, a circuit forked to connect with each brush of that pair, a portion of the field-coil in each fork, and a third portion of the field-coil in that part of the work-circuit where the current is constant, substantially
 75 as described.

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Witnesses:

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