

(No Model.)

J. & E. HOPKINSON.

COUPLING ALTERNATE CURRENT GENERATORS.

No. 412,185.

Patented Oct. 1, 1889.

Fig. 1,

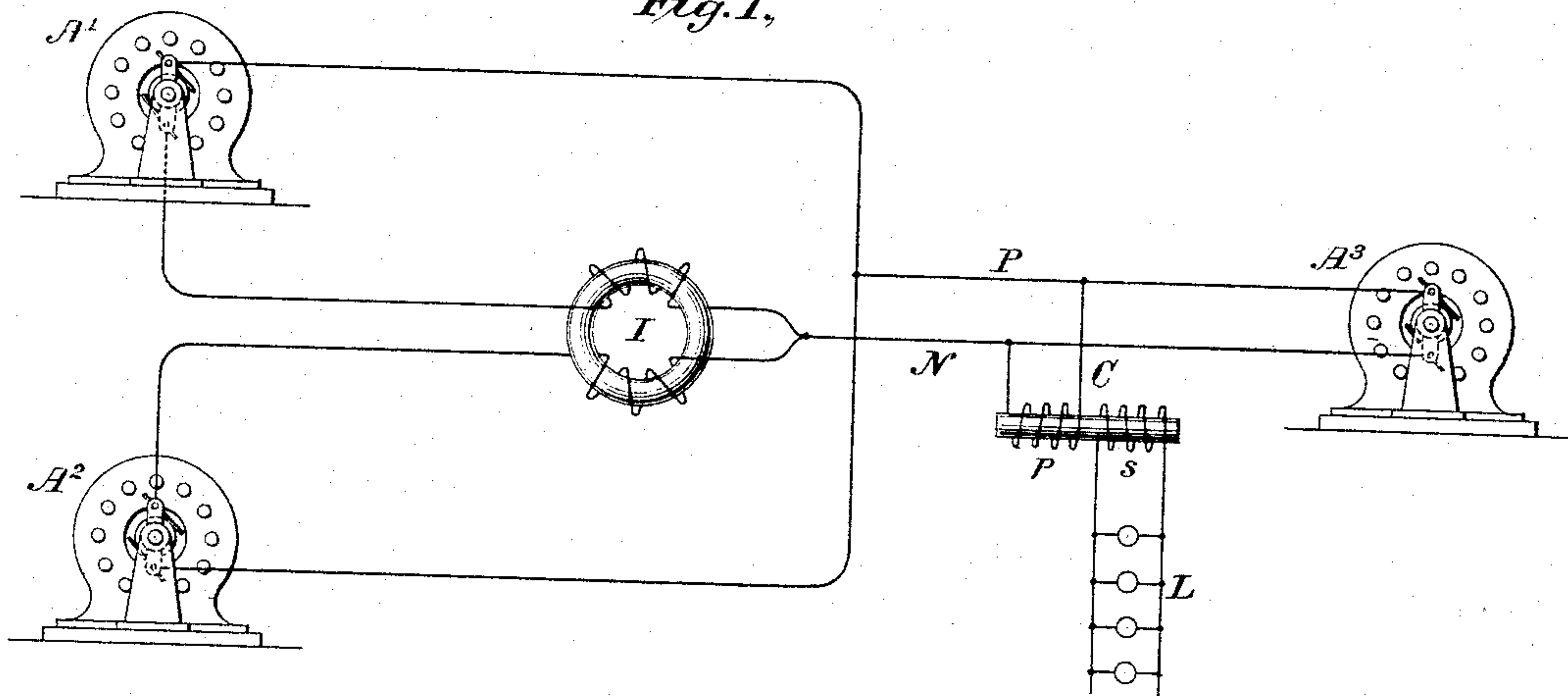
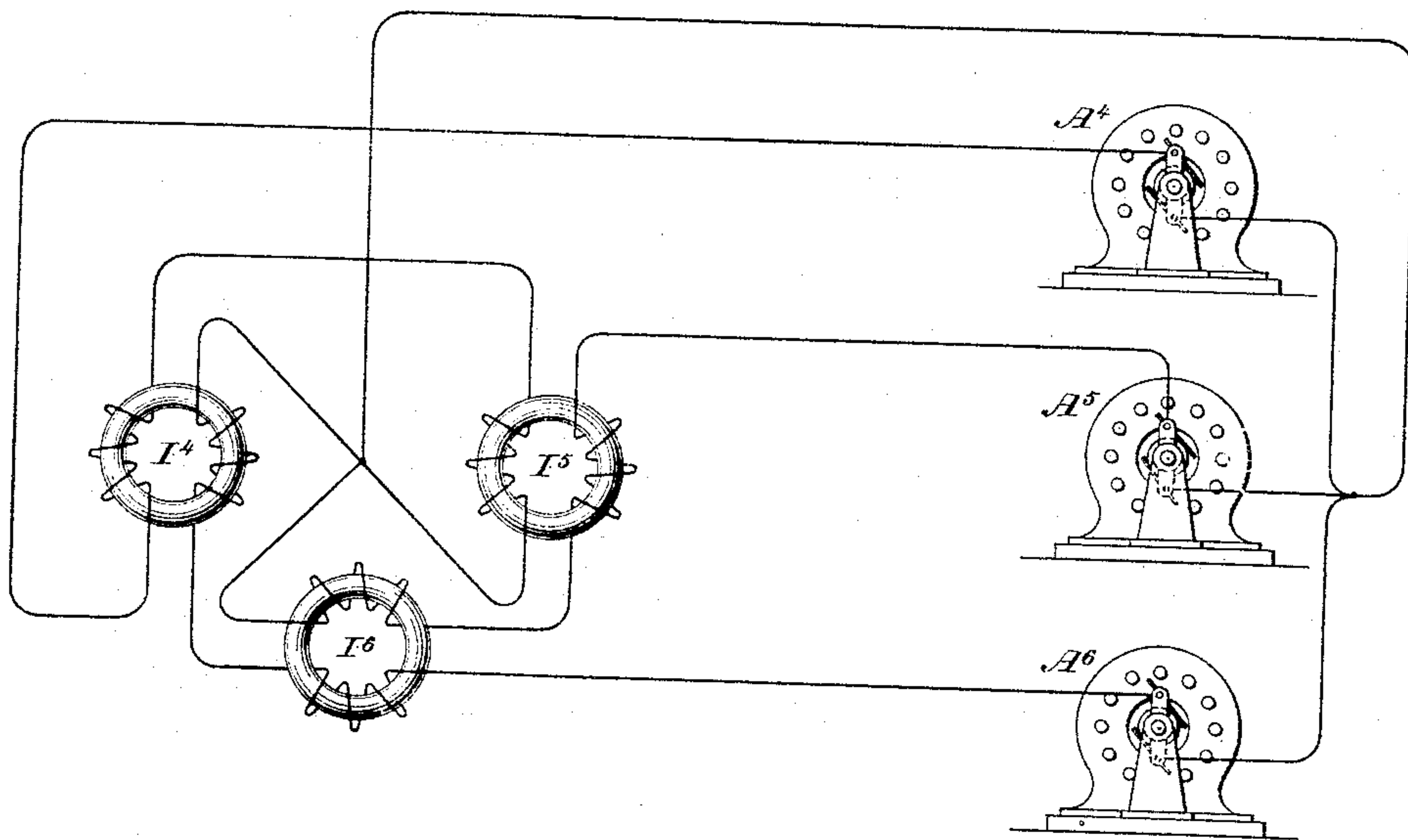


Fig. 2,



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN HOPKINSON, OF WESTMINSTER, COUNTY OF MIDDLESEX, AND EDWARD HOPKINSON, OF MANCHESTER, COUNTY OF LANCASTER, ENGLAND, ASSIGNORS TO GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

COUPLING ALTERNATE-CURRENT GENERATORS.

SPECIFICATION forming part of Letters Patent No. 412,185, dated October 1, 1889.

Application filed June 4, 1887. Renewed April 20, 1889. Serial No. 308,048. (No model.)

To all whom it may concern:

Be it known that we, JOHN HOPKINSON and EDWARD HOPKINSON, subjects of the Queen of Great Britain, residing, respectively, at
5 Westminster, in the county of Middlesex, and at Manchester, in the county of Lancaster, in the United Kingdom of Great Britain and Ireland, have invented certain new and useful Improvements in the Generation and Dis-
10 tribution of Currents from Alternate-Current Dynamo-Electric Machines, of which the following is a specification.

We have found that it is practicable to work two or more alternate-current dynamo-
15 electric machines when coupled parallel to each other (or, as it is sometimes termed, "in multiple arc") to a system of conductors common to both, and also that a similar alternate-current machine, coupled in like man-
20 ner and connected in parallel with the same system of conductors, may, under certain conditions, be employed as a motor. These results are dependent upon the self-induction or counter electro-motive force of the dynamo-
25 electric machines employed, and this in turn is dependent for its value upon the mass of iron in the armature which is subject to inductive action. In many classes of machines, especially those in which the armature is
30 formed wholly of coiled conductors, without iron cores, the coefficient of self-induction is too small to produce the desired result.

Our invention, which is designed to overcome this defect, consists in causing the current from such machines to traverse an independent self-induction coil or coils, which
35 coil or coils are preferably constructed in such a manner that the core forms a complete magnetic circuit, as by this means the
40 highest coefficient of induction is attained.

In the accompanying drawings, Figure 1 is a diagram illustrating the principle of our invention. Fig. 2 shows an arrangement applicable to a group of three dynamos.

45 A' and A² represent two alternate-current dynamo-electric machines, which are driven by power, usually independently, having their terminals united in parallel or multiple arc

to a pair of main conductors P N, common to both. 50

A³ is a third alternate-current dynamo-machine, which may be used as a motor, and this has its terminals likewise connected to the same conductors N P.

C is an induction coil or converter, which
55 has the terminals of its primary coil *p* attached, respectively, to the conductor N P, while the terminals of its secondary coil *s* are connected with a system of incandescent or other electric lamps, as shown at L. In
60 the circuit of one or more of the alternate dynamo-electric machines, as A' and A², a self-induction coil I is included, which may be of any suitable construction. We prefer
65 to construct the same in such a manner that the coiled-copper conductors are surrounded by a mass of iron subdivided by insulating-spaces in a direction parallel to the general
70 direction of the lines of the magnetic force, as set forth in the British Letters Patent No. 14,233, granted to us October 28, 1884, to which reference is had; but we do not desire to restrict ourselves to a self-induction coil
75 of any particular construction. It is sometimes desirable to vary the coefficient of self-induction of this coil, which may be effected in any convenient manner.

We have found that when one or more independent self-induction coils are included
80 in the circuits of two or more generators in which the mass of iron in the respective armatures is insufficient to maintain a continuous synchronism, the effect is substantially the same as if the mass of iron forming the cores
85 of the self-induction coils were a part of the armatures and subject to the inductive action of the armature-coils.

Fig. 2 shows a group of three alternate-current dynamos A⁴, A⁵, and A⁶ grouped with
90 three self-induction coils 14, 15, and 16 in such a manner that either machine may be used either as a generator or as a motor, or any two of the group may be used as generators and the other as a motor, or one may
95 be used as a generator and the other two as motors, as the conductors of each machine

are brought into inductive relation with the conductors of the other two.

We claim as our joint invention—

1. The combination, with the direct and re-
5 turn conductors of an electric circuit, of two or more alternate-current dynamo-electric machines connected thereto in parallel with each other, and one or more self-induction coils included in the circuits of said alternate
10 machines.

2. The combination, with one or more alternate-current dynamo-electric machines, of another alternate-current dynamo-electric machine serving as a motor, all of said ma-
15 chines being in parallel with the main con-

ductors, and a self-induction coil included within the circuits of said alternate machines.

In testimony whereof we have hereunto subscribed our names this 7th day of January, A. D. 1887.

JOHN HOPKINSON.

EDWARD HOPKINSON.

Witnesses to the signature of John Hopkinson:

FRANK L. POPE,

JNO. DEAN.

Witnesses to the signature of Edward Hopkinson:

FRANK L. POPE,

G. PAUTARWIG.