(No Model.)

E. M. BENTLEY.

SYSTEM OF ELECTRIC DISTRIBUTION.

No. 502,272. Patented Aug. 1, 1893.

FIG. 1.

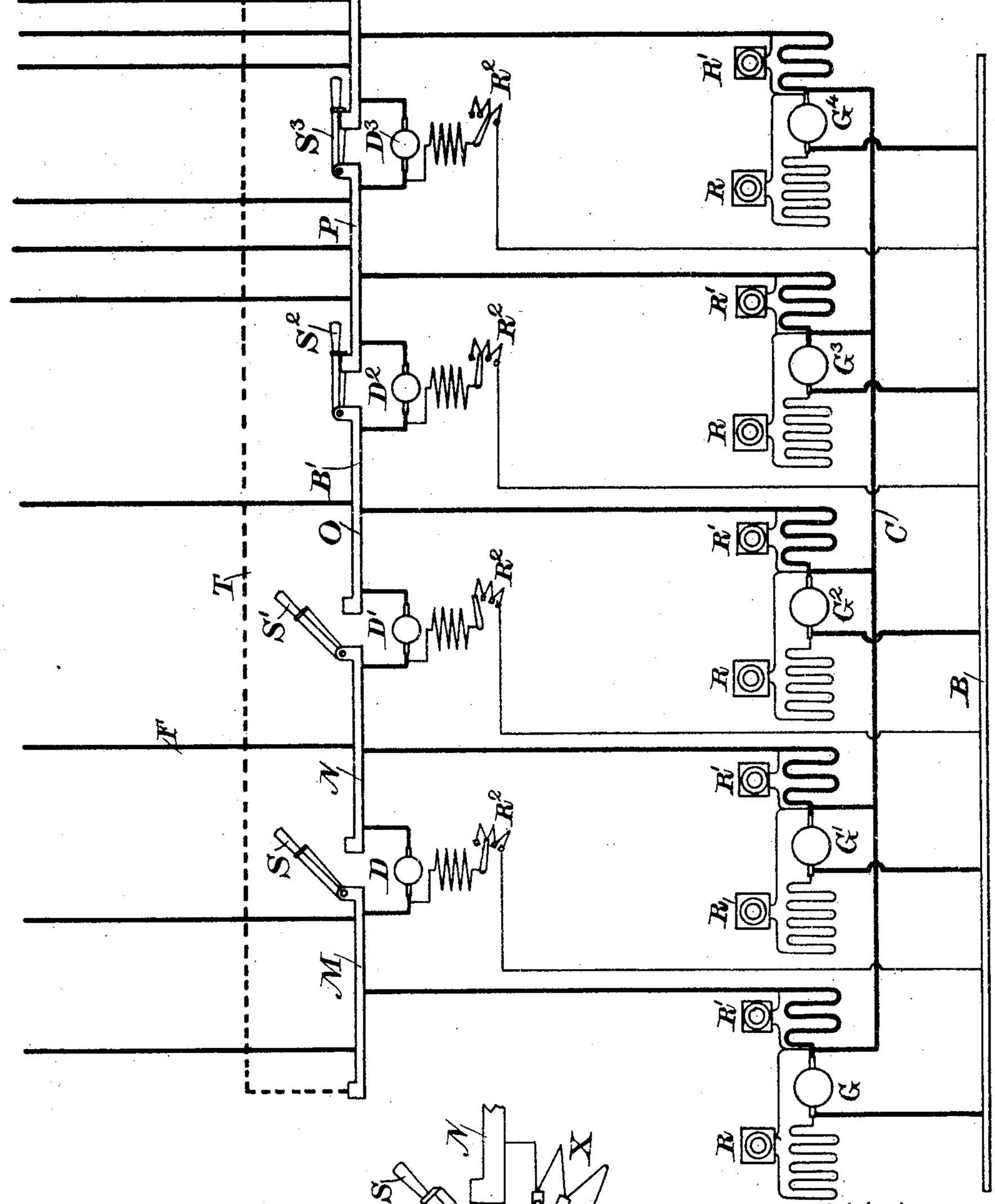
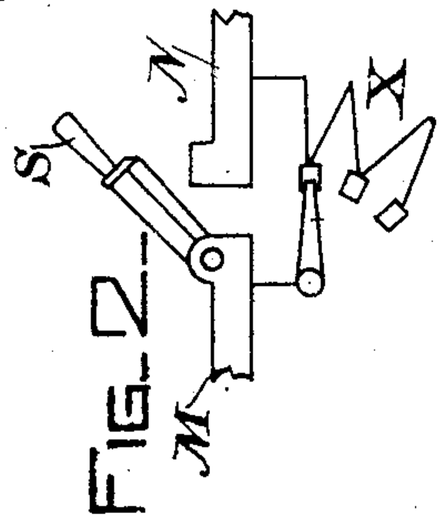


FIG. 2.



WITNESSES.

Alec F. Macdonald.

D. J. Johnston

INVENTOR.

Edward M. Bentley by Bentley and Blodgett, Attys

UNITED STATES PATENT OFFICE.

EDWARD M. BENTLEY, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, OF SAME PLACE.

SYSTEM OF ELECTRIC DISTRIBUTION.

SPECIFICATION forming part of Letters Patent No. 502,272, dated August 1, 1893.

Application filed May 8, 1893. Serial No. 473,398. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. BENTLEY, a citizen of the United States, residing at Boston, county of Suffolk, State of Massachusetts, have invented certain new and useful Improvements in Systems of Electric Distribution, of which the following is a specification.

My invention relates to systems of electric distribution employing currents of constant potential and has for its object to provide a method of and means for counteracting or compensating for the undue drop of potential upon certain parts of such a system.

It has been customary in central station work to connect a number of generators to omnibus wires, or as they are called in the art, "bus-bars," the generators being coupled in multiple and run at the same potential, all of them being connected by an equalizing conductor from points between the series coils and brush in each machine, in a well-known way. From one of the bus-bars feeders are taken off leading to different parts of the territory covered by the system. Such an arrangement is objectionable, because the feeders being of different lengths and sizes, and supplying varying demands, are necessarily of different resistances; and the drop of potential in the different ones may also vary greatly. It therefore becomes necessary either to run the whole system at a potential adapted to compensate for the loss in the feeder having the greatest drop, introducing resistances to adjust the other feeders to the same amount, or to increase the side of the feeders in which the greatest loss occurs; in the one case entailing an expense from loss of energy wasted in heating resistance, and in the other involving a largely increased expense for copper, while either alternative results in curtailing the territory which can be covered from a central station. It is to obviate these ojections that I have devised my present system.

In the accompanying drawings, hereby referred to and made part of this specification, Figure 1 is a diagram showing a method of applying my invention. Fig. 2 is a detail, showing a modified arrangement.

In the drawings G, G′, G^2, G^3, G^4 are generators connected in multiple to the bus-bars B B′ and provided with an equalizing conductor C. These generators are provided also in the usual manner with resistances R R′ for each of their coils, by which the output of each generator is adjusted as may be required, within certain limits. The bus-bar B′ is divided into sections M, N, O, P, Q, the sections being connected by switches S, S′, S^2, S^3 and the end sections M, Q, being connected by a conductor of ample capacity, indicated by the dotted line T. I prefer to make the sections equal in number to the generators, but may vary the number without departing from my invention. Between adjacent sections of the bus-bar B′ are motors D D′ D^2 D^3 having adjustable fields and so connected to the bus-bars that by raising the switch they will be started into action. Each motor is provided with a resistance R^2 adapted to throw more or less current through its field magnet coils, which are in shunt to the mains and constantly magnetized, and thus alter the counter-electro-motive-force of the motor. It is manifest that the motors may have fixed fields adapted to the required effect, if so desired.

The operation of the system is as follows: Suppose that the feeder F leading from the bus-bar section N becomes overloaded and the voltage falls below what is necessary to properly run the translating devices at its other end. In such case the switches S S′ will be raised, the generator G′ would be adjusted to give a greater electro-motive force and the fields of the motors D D′ would be adjusted by means of their rheostats R^2 to give such a counter-electro-motive force as would be necessary to raise the potential of the current delivered from the bus-bar section N to the amount required to overcome the undue drop of potential in the feeder F. For example, should the dynamos all be delivering current at a potential of one hundred and ten volts and should it be desired to raise the potential delivered to the feeder F to one hundred and twenty volts, the operation just described is carried out, and the fields of the motors D D′ are so adjusted as to cause them to generate a counter-electro-motive-force of ten volts. This practically isolates the bus-bar section N from the sections M O sufficiently to allow the feeder F

to take current at one hundred and twenty volts potential therefrom. At the same time the surplus current delivered from the generator G′ passes in each direction through the motors D D′ to the bus-bar sections M and O respectively, but is reduced to the one hundred and ten volts suitable for those sections by the counter-electro-motive-force of the motors.

The current delivered to the motors in the arrangement described may be used to run them for useful work, as well as for the purposes designated. For instance, they may be employed to pump water to the station, to drive an exhaust fan, or any similar work might be put upon them; or they may be left to run free if so desired.

In Fig. 2 I have shown a modified arrangement by which I employ an adjustable resistance X between the adjacent sections of the bus-bar in the same way as described and illustrated for the motors D, &c. The operation of this modified form of my invention is not so economical as the first form described, as the current is wasted in heating the resistance instead of doing useful work; but it is in other respects as efficacious.

Having thus described my invention, what I claim as new, and wish to protect by Letters Patent of the United States, is—

1. The method of raising the electro-motive-force of one or more feeders of a group in a system of electric distribution, which consists in supplying the feeder with an increased electro-motive force and interposing between such feeder and the others of the group means adapted to reduce the electro-motive force by the required amount.

2. The method of raising the electro-motive force of one or more feeders of a group in a system of electric distribution, which consists in supplying the feeder with an increased electro-motive force and interposing between such feeder and the others a counter-electro-motive force equal to the desired difference of potential.

3. In a system of distribution of electric energy, a plurality of generators supplying two or more feeders, means for adjusting the electro-motive force of one or more of said generators and potential reducers adapted to be included between one feeder and the adjacent feeders.

4. In a system of distribution of electric energy, a plurality of generators connected to bus-bars, one of which bus-bars is divided into sections provided with connecting switches, and motors arranged between the sections adapted to run when the sections are disconnected.

5. In a system of distribution of electric energy, a plurality of generators connected to bus-bars, one of which bus-bars is divided into sections equal in number to the generators and provided with connecting switches, and motors arranged between the sections adapted to run when the sections are disconnected.

6. In a system of distribution of electric energy, a plurality of generators connected to bus-bars, one of which bus-bars is divided into sections provided with connecting switches, and motors having adjustable fields and arranged between the sections; such motors adapted to run when the bus-bar sections are disconnected.

7. In a system of distribution of electric energy, a plurality of generators connected to bus-bars, one of which bus-bars is divided into sections corresponding in number to the generators and provided with connecting switches, and motors having adjustable fields arranged between the sections and adapted to run when the sections are disconnected.

8. In a system of distribution of electric energy, a plurality of generators connected to bus-bars, one of which bus-bars is divided into sections provided with connecting switches and resistances arranged between the sections and adapted to be brought into operation when the sections are disconnected.

9. In a system of distribution of electric energy, a plurality of generators connected to bus-bars, one of which bus-bars is divided into sections provided with connecting switches and adjustable resistances arranged between the sections and adapted to be brought into operation when the sections are disconnected.

In witness whereof I have hereunto set my hand this 4th day of May, 1893.

EDWARD M. BENTLEY.

Witnesses:
T. J. JOHNSTON,
A. O. OME.

Letters Patent No. 502,272.

Correction in

It is hereby certified that in Letters Patent No. 502,272, granted August 1, 18 upon the application of Edward M. Bentley, of Boston, Massachusetts, for an impro ment in "Systems of Electric Distribution," an error appears in the printed specifi tion requiring the following correction, viz.: In line 35, page 1, the word "side" sho read *size;* and that the said Letters Patent should be read with this correction ther that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 19th day of September, A. D. 1893.

[SEAL]

JNO. M. REYNOLDS,
Assistant Secretary of the Interio

Countersigned:

S. T. FISHER,
Acting Commissioner of Patents.