

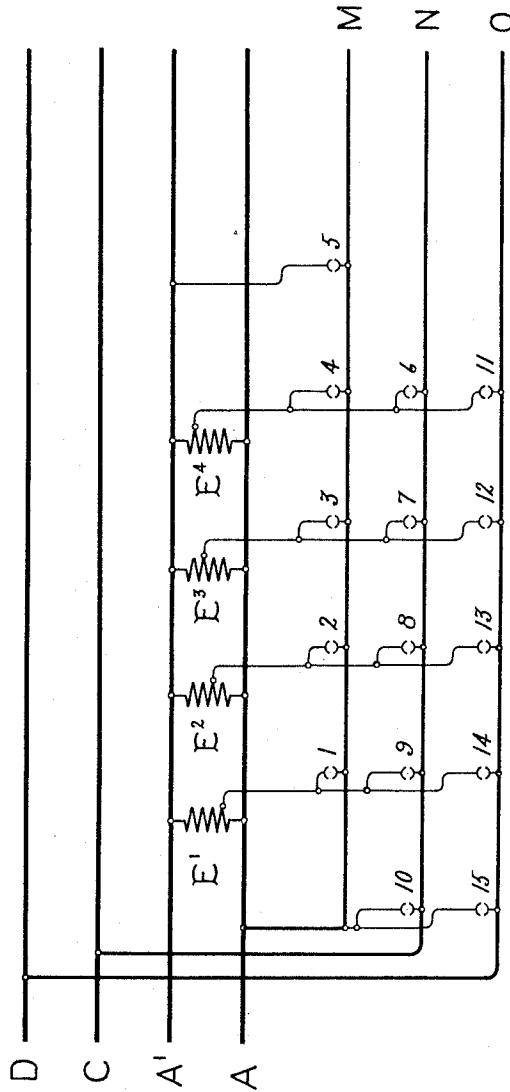
J. J. FRANK.
SYSTEM OF DISTRIBUTION.
APPLICATION FILED JAN. 26, 1911.

1,010,420.

Patented Dec. 5, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



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His Attorney.

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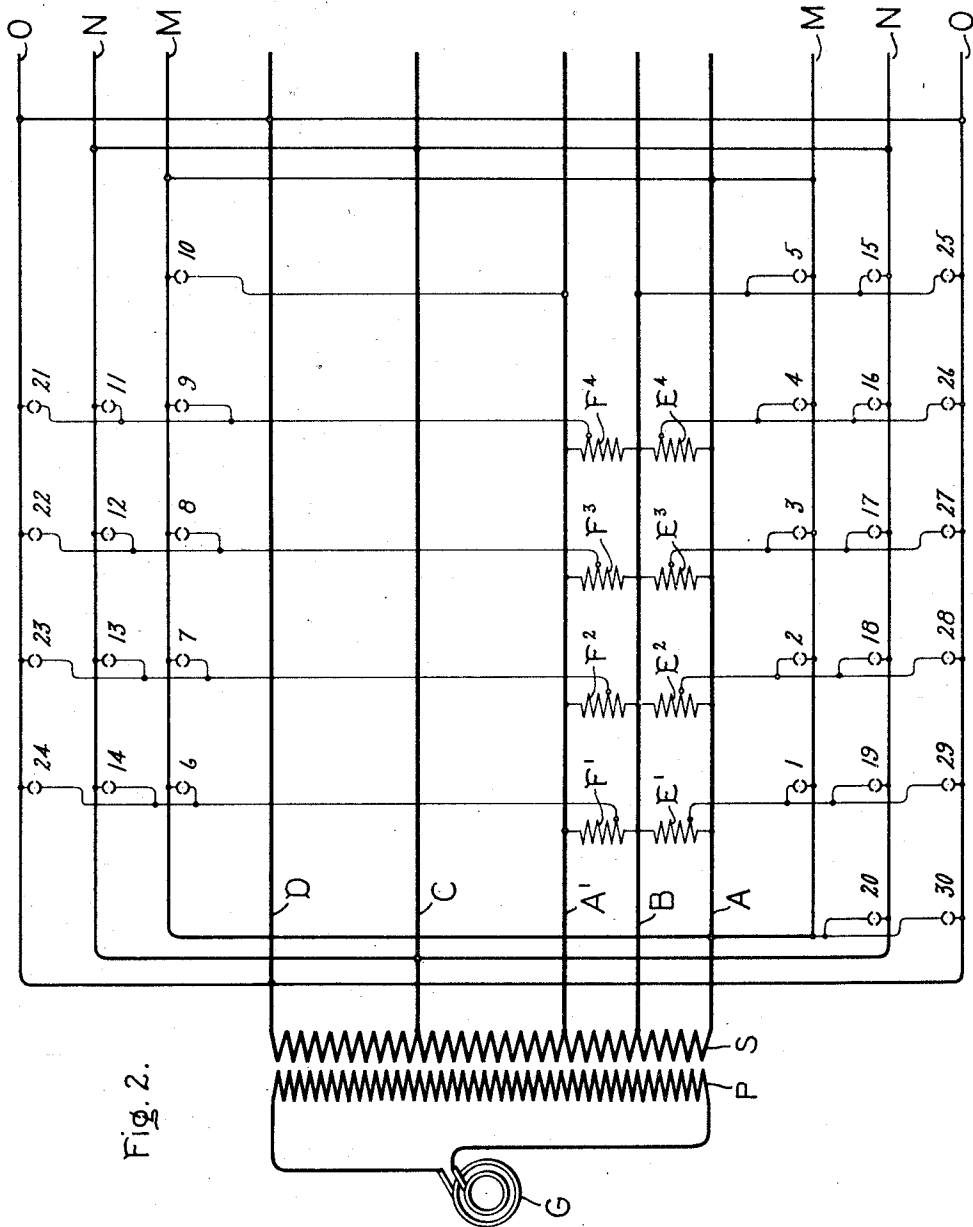


Fig. 2.

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UNITED STATES PATENT OFFICE.

JOHN J. FRANK, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SYSTEM OF DISTRIBUTION.

1,010,420.

Specification of Letters Patent.

Patented Dec. 5, 1911.

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To all whom it may concern:

Be it known that I, JOHN J. FRANK, a citizen of the United States, residing at Pittsfield, county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in Systems of Distribution, of which the following is a specification.

My invention relates to systems for the distribution of electric energy and is especially designed for life testing of incandescent lamps. However, my invention is not limited to this use only but the primary object is to so arrange a system as to obtain a great number of pairs of terminals or plug sockets which have different values for their respective differences of potential.

Another object of my invention is to so arrange a system as to obtain a great number of pairs of terminals or plug sockets which have different values for their respective differences of potential and where these various values will be very nearly constant. I accomplish the first object by the use of a series of bus bars separated by desired potential values. Between certain of these bars, I insert means to divide their difference; I then connect the plug sockets between these means and the busses in various ways to obtain the desired potentials. The use of "plug sockets" at the terminals is not, of course, absolutely necessary; any other desired means which will allow the ready attachment of electrical apparatus may, of course, be used as well, and by the use of the term "plug socket" hereinafter in the description and claims I intend to include other attaching devices also.

In the accompanying drawing which forms a part of this specification Figures 1 and 2 are diagrammatic views of a preferred form of a system embodying my invention and a modification thereof. In Fig. 1, A and A' are primary bus bars differing in potential by any desired value and supplied with current from any desired source. For example, however, it will be assumed that this difference is five volts. The secondary bus bar C differs from the bar A by 10 volts and the bar D from the bar A by 15 volts. These busses A, A', C and D may be supplied with energy from any desired source. Between the primary busses A, A' I have inserted four autotransformers E¹, E², E³, and E⁴; the secondary terminals of these

transformers give a difference of potential with respect to the bar A of 1, 2, 3 and 4 volts respectively.

For the convenience of connection and illustration, I have shown what I term the lamp busses M, N and O connected respectively to the busses A, C and D. The loose secondary terminal of each transformer is connected to one side of three plug sockets, the other side of these sockets being connected respectively to the lamp busses. Another plug socket is connected between the lamp bus M and the primary bus A'. Two other sockets are connected to the lamp bus M and the lamp busses N and O. These sockets I have numbered 1 to 15, and each numeral expresses the terminal voltage of the socket to which it refers. For example, since there is a difference in potential between the loose secondary terminal of transformer E³ and the primary bus A of 3 volts, there must be a difference of potential of 3 volts across the terminals of the plug socket 3 for this socket is connected to the loose terminal of transformer E³ and to the lamp bus M which is connected to and is of the same potential as the primary bus A. Since there is a difference of potential between the busses A and C of 10 volts, if the loose secondary terminal of the transformer E³ is connected to one terminal of a plug socket, the other of which is connected to the bus C, there must be a difference across these terminals of 7 volts, and hence the insertion of the socket 7 between the transformer E³ and the lamp bus N gives this difference. If then this same terminal of the transformer E³ is now connected to a socket between it and the bus D, this socket will obviously have a difference greater by 5 volts, the difference between busses C and D, than the difference in potential across the terminals of the socket 7 of 12 volts. It is clear that the addition of other busses with their accompanying lamp busses, and the connection of plug sockets between them and the terminals of the transformers will produce differences of potential across the terminals of these sockets greater in value than the potentials of the sockets shown by the difference between the bus D and the additional bus. The socket 5, of course, has a difference across its terminals of 5 volts, since it is connected directly between the busses A, and A', which have this difference.

Likewise the sockets 10 and 15 have the same difference of potential across their terminals as between the busses A and C and A and D respectively.

5 I have shown above a system employing 4 busses each separated from the adjoining bus by 5 volts or with a difference of 15
10 volts between the two extremes, and I have so constructed a system as to supply plug sockets giving all ranges of voltage between
1 and 15 in steps of one volt. It is apparent, however, that these differences are only
15 relative and that the steps may be either of greater or less than one volt as desired, depending upon the location of the secondary taps in the transformers and the number of transformers and bus bars used.

In another form of my system shown in Fig. 2, I have employed the primary and
20 secondary busses A, A', C and D, and also what I term an auxiliary primary bus bar B. Between busses A and B there is a difference of potential of 5 volts, between A
and A' 10 volts, between A and C 20 volts,
25 and between A and D 30 volts. A generator G supplies energy at a high potential to the primary P of a stepdown transformer, the secondary S of which has taps supplying the busses A, B, A', C and D. Between
30 the busses A and B and between the busses B and A' are inserted four autotransformers. The transformers E', E², E³ and E⁴ have loose secondary terminals with a difference of potential with respect to the bus
35 A of 1, 2, 3 and 4 volts respectively, and the transformers F', F², F³ and F⁴ have loose secondary terminals with a difference with respect to the bus B of 1, 2, 3 and 4 volts and with respect to the bus A of 6,
40 7, 8 and 9 volts respectively.

As in the preceding form lamp busses M, N and O are used connected respectively to the busses A, C and D. In this arrangement,
45 a plug socket is inserted between each loose secondary terminal and each lamp bus. A socket is inserted between the bus A' and the lamp bus M and other sockets are inserted between the bus B and each lamp bus M, N and O, while two other sockets are
50 inserted between the bus A and the lamp busses N and O. These plug sockets are numbered from 1 to 30, and these numerals indicate the voltage across the terminals of each socket respectively.

55 The differences of potential in the sockets 5, 10, 15, 20, 25 and 30 are obvious since these sockets are connected directly between the various busses. The loose terminal of the transformer E³ has a difference of 3
60 volts with respect to the bus A, and hence the socket 3 has a difference between its terminals of 3 volts. The bus C has a difference with respect to bus A of 20 volts; hence the socket inserted between the loose terminal
65 of the transformer E³ and the bus C, or its

lamp bus N, must have a difference across its terminals of 20 volts less the difference between the terminal of E³ and the bus A, 3 volts, or 17 volts for the plug socket. Continuing in this way a socket inserted be-
70 tween the loose terminal of the transformer E³ and the lamp bus O, which is connected to the bus D, has a difference of potential across its terminals of 30 volts less 3 volts or 27 volts, and the addition of other busses
75 and their accompanying lamp busses with greater differences of potential with respect to the bus A to allow the insertion of additional sockets with other differences across their terminals in the same order, may be
80 made. The potentials across the terminals of those plug sockets which are connected to the transformers F', F², F³ and F⁴ are similarly determined. For example, the loose secondary terminal of the transformer
85 F² has a difference of potential with regards to the bus B of 2 volts, but the bus B has a difference of potential with respect to bus A of 5 volts. Hence, it is clear that the socket 7 inserted between the terminal
90 of transformer F² and the lamp bus M has a potential of 7 volts. The socket inserted between the terminal of this transformer F² and the lamp bus N, which is connected to the bus C, must have a difference of potential
95 across its terminal of 13 volts because there is a difference between this terminal and the bus A' of 3 volts, and a difference between A' and C of 10 volts.

A system involving the invention may be
100 constructed on the same principles with any range of voltage, and subdivided into as many steps as may be desired. The principle involved in both of the systems specifically described is the same, viz: the use
105 of a plurality of busses differing in potential by desired values, the subdivision of the difference of potential between a certain two of these busses by any means whatever, and the insertion of sockets in the manner shown
110 between each of these dividing means and certain of the busses. It is, of course, to be understood in this second form of my system as in the first that the values given
115 are but relative, that the differences of potential may be of any desired value, and that there may be as many divisions of potential made between the busses A and A' as is desired to give the desired steps. The
120 use of the generator G and the stepdown transformer tends to maintain the voltage across the terminals of the various sockets constant. In practice a voltage regulator such as the Tirrill regulator may be used in
125 connection with the generator G.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In a system of distribution, primary bus bars differing in potential by a desired value, means to divide this difference, a sec- 130

ondary bus bar, and plug sockets between said means and one of the primary busses and the secondary bus.

2. In a system of distribution, primary bus bars of a desired difference of potential, a transformer between these busses, a secondary bus of a desired difference of potential with respect to one of the primary busses, and plug sockets between the transformer and one of the primary busses and the secondary bus.

3. In a system of distribution, primary bus bars of a desired difference of potential, an auxiliary primary bus differing in potential from one of the primary busses by a smaller value, a transformer between the auxiliary primary bus and each of the other primary busses, a secondary bus of a desired difference in potential from the first primary bus, and plug sockets between each transformer and the first primary bus and the secondary bus.

4. In a system of distribution, a source of supply, a stepdown transformer having taps at desired intervals, an auxiliary tap midway between two of these taps, an auxiliary primary bus connected to the auxiliary tap and primary busses connected to the taps immediately adjacent the auxiliary tap, a secondary bus connected to each of the remaining taps, autotransformers connected to the auxiliary primary bus and the primary busses to give desired steps in differences of potential with respect to the adjacent primary bus, and plug sockets between each transformer and one of the primary busses and the secondary bus.

In witness whereof, I have hereunto set my hand this 17th day of Jan. 1911.

JOHN J. FRANK.

Witnesses:

ANNIE R. NUGENT,
GEO. F. WRIGHT, Jr.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."