No. 745,594. PATENTED DEC. 1, 1903.

G. H. GIBSON.

MULTIVOLTAGE ELECTRIC GENERATOR.

APPLICATION FILED APR. 4, 1903.

NO MODEL.

Fig. 1.

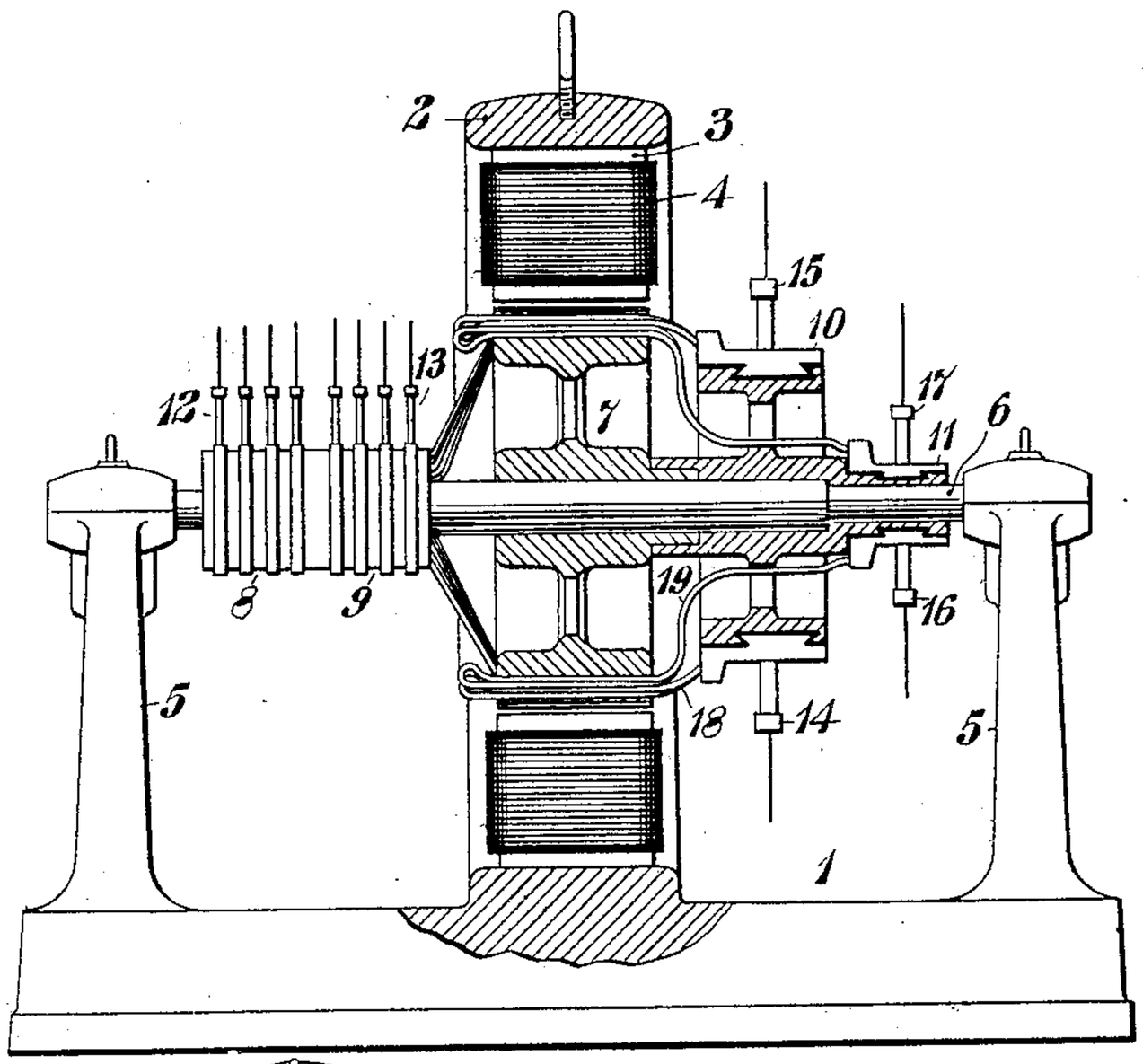
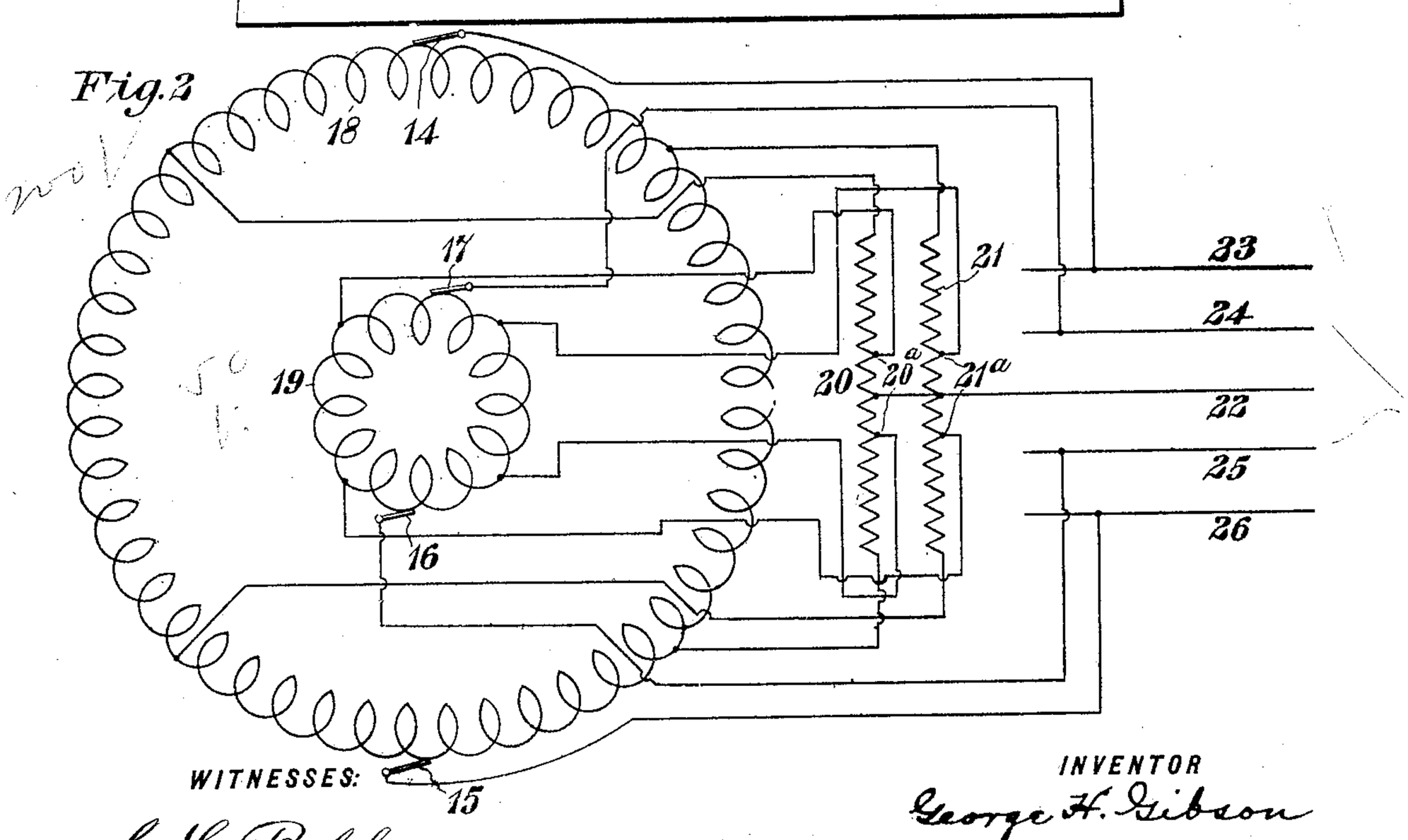


Fig. 2.



WITNESSES:

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No. 745,594. Patented December 1, 1903.

UNITED STATES PATENT OFFICE.

GEORGE H. GIBSON, OF HYDEPARK, MASSACHUSETTS, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

MULTIVOLTAGE ELECTRIC GENERATOR.

SPECIFICATION forming part of Letters Patent No. 745,594, dated December 1, 1903.

Application filed April 4, 1903. Serial No. 151,199. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. GIBSON, a citizen of the United States, and a resident of Hydepark, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Multivoltage Electric Generators, of which the following is a specification.

My invention relates to electric generators which provide a plurality of different voltages for the operation of translating devices; and it has for its object to provide a machine of comparatively simple and inexpensive construction from which may be derived a considerable number of voltages of wide range in such manner that the circuits corresponding to the different voltages may be utilized either independently at the same or at different times or conjointly in any order and manner that may be desired without disturbing the operation and regulation of the generator.

My invention is primarily based upon that covered by Patent No. 513,006, granted January 16, 1894, to Michael von Dolivo-Dobrowolsky, in which a balancing or neutral conductor, between which and the main conductors the voltage is one-half that across the main conductors, is connected to the middle point of a balancing-coil and the terminals of such coil are connected across the armature-winding of the generator.

In the simplest form of my invention, which I have illustrated in the accompanying drawings, the generator is shown partially in side elevation and partially in section in Figure 1, Fig. 2 being a diagrammatic representation of the circuits of the machine.

As here illustrated, the machine comprises a suitable frame 1, having a field-magnet yoke 2, provided with pole-pieces 3 and exciting-coils 4 and also with bearing-supports 5 for the shaft 6, all as is usual in this class of machines.

Mounted upon the shaft 6 and suitably keyed or otherwise fastened thereto are an armature-spider 7, two sets of collector-rings 8 and 9, and two commutator-cylinders 10 and 11, a set of brushes 12 being provided and suitably supported for making engagement with the respective rings of the set 8 and a similar set of brushes 13 being provided for making engagement with the collector-rings of the set 9. Commutator-brushes 14 and 15 are also provided for engagement with the bars of the commutator-cylinder 10, and similar brushes 16 and 17 are provided for engagement with the bars of the commutator-cylinder 11.

Two armature-windings 18 and 19, which may be located either in the same or in different slots in the armature-core, are connected, respectively, to the commutator 10 and the commutator 11 and also to the sets of collector-rings 8 and 9.

Two balancing-coils 20 and 21 are provided, to the middle points of both of which is connected the neutral conductor 22 of the distributing-circuit, the other conductors 23, 24, 25, and 26 of said circuit being respectively connected to the brushes 14, 17, 16, and 15 of the commutators 10 and 11.

The outer terminals of the balancing-coils 20 and 21 may be respectively connected to the brushes 12 of the collector-rings 8, and intermediate points 20^a and 21^a of the said balancing-coils may be connected to the brushes 13 of the rings 9, the last-named points of connection of the balancing-coils being so selected that the length of winding between each of these points and the middle point bears the same ratio to the length of winding between the outer terminal of the coil and the middle point that the length of the winding 19 bears to that of the winding 18.

The employment of collector-rings and brushes in substantially the manner above indicated is obviously necessary in cases where the balancing-coils are stationary; but if the coils are mounted upon the armature-spider or its shaft, so as to rotate therewith, direct connections with the armature-windings 18 and 19 may be made, as indicated in Fig. 2, and in view of the well-known character of the circuit connections first above mentioned the diagrammatic illustration in Fig. 2 may be regarded as indicative of each arrangement.

Two sets of balancing-coils might be em-

ployed in such manner that each armature-winding should have its own coils; but by employing the coils as indicated the apparatus is simplified and serves the same purpose.

It will be observed that each branch of each balancing-coil is connected to points in the high-voltage and low-voltage armature-windings that are always in phase. It will be also understood that instead of providing a single armature-core with the two sets of coils separate cores may be utilized.

As here illustrated, the two armature-windings have a ratio of one to four—that is, the low-voltage winding 19 has twelve coils and the high-voltage winding 18 has forty-eight coils, the former having six turns between brushes and the latter having twenty-four turns between brushes. The same ratio obtains between the number of turns in any balancing-coil from the neutral point to the point of connection of the low-voltage armature-winding and from the neutral point to the point of connection of the high-voltage armature-winding, these lengths being here indicated as two and eight turns, respectively.

By providing a proper ratio of voltages between the two coils a large variety of voltages may be secured from the external circuit. For example, if the voltage generated by the low-voltage armature-winding is fifty and and that by the high-voltage armature-winding is two hundred the voltage between conductors 22 and 24 will be twenty-five, that between conductors 24 and 25 will be fifty, that between conductors 23 and 24 will be seventy-five, that between conductors 22 and 23 will be one hundred, that between conductors 23 and 25 will be one hundred and twenty-five, and that between conductors 23 and 26 will be two hundred.

Other simple ratios may be employed which will give different ranges of voltages from four to six in number, according to the ratios of the voltages to armature-windings.

If the armature-windings were applied to separate cores or were not placed in slots, more complex ratios might be provided which would give different ranges of voltage in the external circuit, and a greater number of armature-windings and corresponding commutators would give a still greater range of voltages for the operation of translating devices. Any increase in the number of armature-windings and commutators would, however, materially increase the complication, and hence would not be so desirable as the number here indicated. It would also be possible to employ two sets of balancing-coils in connection with two three-wire generators of different voltages, and thus secure the same range of voltages that is here provided; but such a combination would be more expensive and for that reason less desirable than a single machine having two armature-windings.

I claim as my invention—

1. In a multivoltage-generator, the combination with a plurality of armature-windings of different lengths, of a plurality of balancing-coils having their middle points connected to the neutral or balancing conductor of the external circuit and having their outer terminals and certain intermediate points connected to the armature-windings.

2. In a multivoltage system, the combination with distributing-conductors, of a generator having a plurality of armature-windings of different lengths having a definite voltage ratio and a plurality of balancing-coils the middle points of which are connected to the neutral distributing-conductor, the outer terminals of which are connected to equidistant points in the high-voltage armature-winding and intermediate points of which are connected to equidistant points in the low-voltage armature-winding.

3. In a multivoltage system, the combination with distributing-conductors, of a generator having a plurality of armature-windings adapted for different voltages and a plurality of balancing-coils connected at their middle points to the neutral distributing-conductor, at their outer terminals to equidistant points in the high-voltage armature-winding and at intermediate points to the low-voltage armature-winding, the lengths between the intermediate points of connection and the middle points of the balancing-coils bearing the same ratio to one-half the entire lengths of the coils that the low-voltage armature-winding bears to the high-voltage armature-winding.

4. In a multivoltage system of distribution, the combination with distributing-conductors, of two armature-windings having a definite voltage ratio and two commutators to which all but one of the distributing-conductors are connected and two balancing-coils having their outer terminals connected to equidistant points in the high-voltage winding, their middle points connected to the neutral conductor of the distributing-circuit and having intermediate points connected to the low-voltage armature-winding, the ratio between one-half the length of each coil and the length between the low-voltage armature connection and the neutral-conductor connection being the same as that of the high-voltage to the low-voltage armature-winding.

5. In a multivoltage generating and distributing system, the combination with two armature-windings of different voltage and separate commutators for said windings, of two balancing-coils having their outer terminals connected to equidistant points in the high-voltage armature-winding and intermediate points connected to equidistant points in the low-voltage armature-winding and five distributing-conductors two of which are connected to one commutator and two to the other and one of which is connected to the middle points of the two balancing-coils.

6. In a multivoltage generating and distributing system, the combination with two

armature-windings of different voltage and independent commutators to which said windings are connected, of two balancing-coils having their outer terminals connected to the high-voltage winding and having intermediate points connected to points in the low-voltage winding which are in phase with the points of connection in the high-voltage winding and five distributing-conductors two of which are connected to one commutator and two to the other and the fifth of which is connected to the middle points of the balancing-coils.

7. In a multivoltage system of generation and distribution, a single generator comprising one field-magnet, two armature-windings, two commutators and two balancing-coils in combination with distributing-conductors so connected to said commutators and balancing-coils as to provide six voltages.

8. In a multivoltage generating and distributing system, the combination with two armature-windings having a definite voltage ratio and two balancing-conductors each provided with leads which divide it so as to provide lengths having a ratio corresponding to that of the armature-windings, connections between equidistant points in said armature-windings and the balancing-coil leads and five distributing-conductors two of which are connected to the high-voltage armature-winding and two to the low-voltage armature-winding and the fifth of which is connected to the middle points of both balancing-coils.

In testimony whereof I have hereunto subscribed my name this 30th day of March, 1903.

GEO. H. GIBSON.

Witnesses:
EARNEST T. CHILD,
R. R. SMART.