No. 726,831. PATENTED APR. 28, 1903.

W. S. MOODY.

METHOD OF CONNECTING MULTIPHASE WINDINGS.

APPLICATION FILED APR. 26, 1902.

NO MODEL.

Fig. 1.

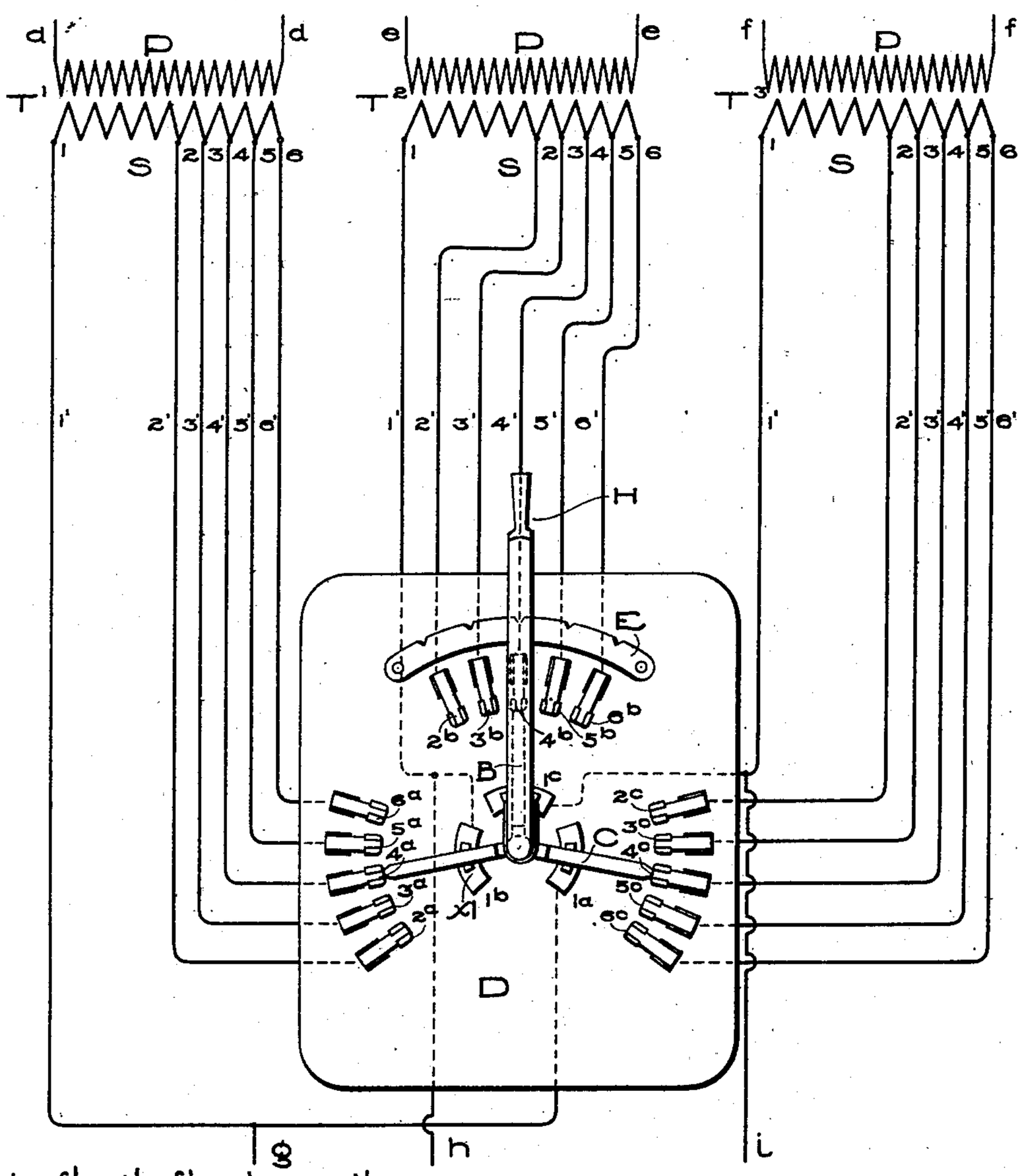


Fig. 2.

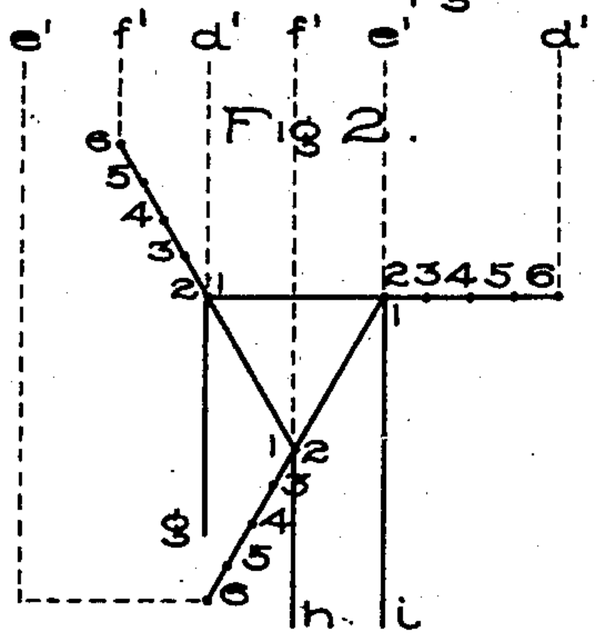


Fig. 3.

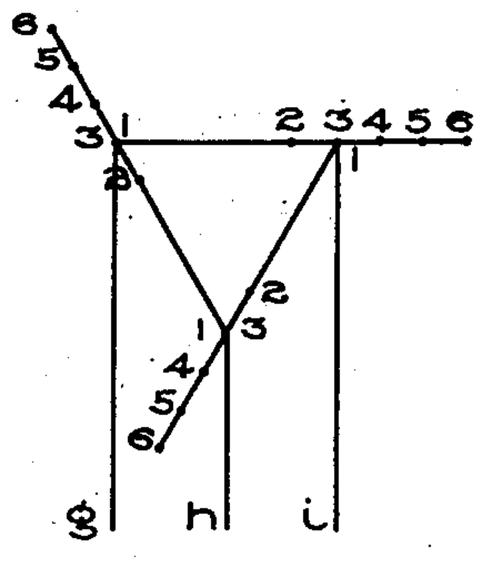
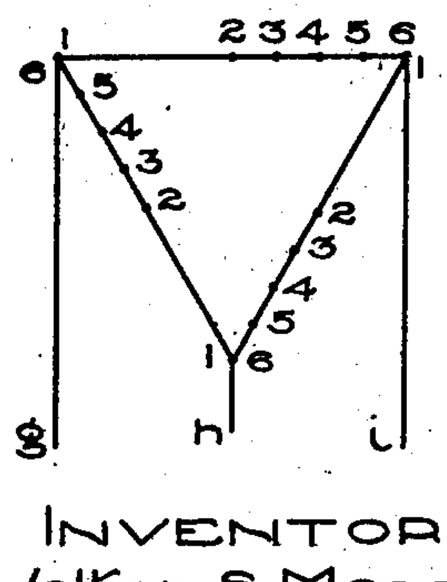


Fig. 4.



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UNITED STATES PATENT OFFICE.

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METHOD OF CONNECTING MULTIPHASE WINDINGS.

SPECIFICATION forming part of Letters Patent No. 726,831, dated April 28, 1903.

Original application filed February 3, 1902, Serial No. 92,332. Divided and this application filed April 26, 1902. Serial No. 104,892. (No model.)

To all whom it may concern:

Be it known that I, WALTER S. MOODY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Methods of Connecting Multiphase Windings, of which the following is a specification.

This application is a division of my prior application, Serial No. 92,332, filed February 3, 1902.

My invention has reference to the connection of multiphase windings in delta in such a manner that voltages different from the source of supply or different from the voltages across the terminals of the several windings may be readily obtained.

In a more specific aspect my invention contemplates the connection of multiphase windings in delta in such a manner that varying voltages may be obtained therefrom.

In the accompanying drawings, Figure 1 illustrates a plurality of multiphase windings, together with one arrangement of switch contacts and connections which may be used in practicing my invention. Figs. 2 to 4, inclusive, are diagrams illustrating the character of the connections made by the switch of Fig. 1.

Referring to Fig. 1 of the drawings, T′, T^2, and T^3 indicate a plurality of transformers. The primary windings P of these transformers are arranged to be connected to a source of three-phase current through the conductors *d*, *e*, and *f*. The secondary winding S of each of the transformers is provided with a plurality of taps 1 to 6, inclusive, the taps 1 and 6 being connected to terminal points in the windings and the taps 2 to 5 being connected to intermediate points therein. From these taps in each of the transformer secondaries conductors 1′ to 6′ lead to a set of contacts on a switch D, by means of which the windings may be connected in accordance with the principles of my present invention. The conductors leading from the taps of the secondary winding of the transformer T′ are connected to the set of switch-contacts 1^a to 6^a, inclusive, the conductors leading from the taps of the secondary winding of the transformer T^2 are connected to the set of contacts 1^b to 6^b, and the conductors leading from the taps of the secondary winding of the transformer T^3 are connected to the set of contacts 1^c to 6^c. In each of these sets the contacts 2 to 6, inclusive, are arranged in the arc of a circle, while the contacts 1^a, 1^b, and 1^c are displaced therefrom and arranged in the arc of a circle of a different radius in order that the movable members of the switches may engage therewith in such a manner as to make the desired connections. The movable member of the switch D comprises three arms A B C, insulated from one another and arranged to connect each one of the contacts 1^a, 1^b, and 1^c with any one of the contacts 2 to 6, inclusive, of one of the other sets. The switch-handle H may be provided with a pawl (not shown) arranged to engage one of the notches in the member E in each of the positions of the switch. A system of conductors *g*, *h*, and *i* leads from the contacts of the switch D to the translating devices (not shown) to which current is to be supplied.

In order that the operation of the switch may be understood, let it be supposed that the handle H is moved to bring the switch-contacts into their first operative position, with the movable contact A connecting the fixed contacts 1^b and 2^a, the movable contact B connecting fixed contacts 1^c and 2^b, and the movable contact C connecting the fixed contacts 1^a and 2^c. With the switch-contacts in this position the secondary windings of the three transformers will be connected in delta with the portion between the taps 1 and 2 of each winding included in the delta connection, the point 2 in the winding of the transformer T′ being connected to the point 1 in the transformer T^2, the point 2 in the transformer T^2 being connected to the point 1 in the transformer T^3, and point 2 in transformer T^3 being connected to point 1 in transformer T′. Also the several conductors *g*, *h*, and *i* will be connected to the apices of the delta connection. The character of the connections completed in this first position of the switch will be more clearly appreciated from an inspection of Fig. 2, which illustrates the connections above described. If now the

handle of the switch D is moved to bring the members A, B, and C into the second operative position, the connections illustrated in the diagram in Fig. 3 will be completed and in each of the succeeding positions of the switch the size of the delta, and therefore the voltages across the terminals thereof, will be successively increased step by step until in the last position of the switch, when the members A, B, and C are in a position to connect contact 1^b to 6^a, contact 1^c to 6^b, and contact 1^a to 6^c, the total length of each of the several windings will be included in the delta connection, as illustrated in Fig. 4. From an inspection of the diagrams, Fig. 2 to 4, inclusive, it will be noted that the system of conductors g, h, and i is always connected to the apices of the delta in whatever position the switch D may be placed.

In Fig. 1 the windings which are connected in delta are the secondary windings of a plurality of transformers; but evidently my invention is not limited to the particular application which is illustrated in this figure, and in the diagram of Fig. 2 I have shown in dotted lines that each of the separate windings, which are arranged to be connected in delta by the switch, may be supplied with current directly from a suitable source through the conductors d' e' f', corresponding to the conductors d, e, and f of Fig. 1. Moreover, I desire it to be understood that my invention is not limited to transformer-windings alone, but may be used in connection with multiphase windings of any character whatsoever. Further, in its application to the windings of a plurality of transformers my invention may evidently be applied with the connections the reverse of those above described—that is, with the conductors g, h, and i connected to a suitable source of three-phase current and with the conductors d, e, and f leading to the translating devices which are intended to be supplied with current therefrom. Also it is to be understood that my invention is not limited to the connection of three-phase windings, and in the claims hereto appended I have used the terms "delta" and "delta connection" to include any similar connection of any number of multiphase windings.

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

1. The method of obtaining voltages differing from the voltages across the terminals of a plurality of multiphase windings which consists in completing a delta connection including a portion only of each of said windings.

2. The method of obtaining voltages differing from the voltages across the terminals of a plurality of multiphase windings which consists in connecting said windings in delta with one terminal of each of said windings connected to an intermediate point in another winding.

3. The method of obtaining variable voltages from a plurality of multiphase windings which consists in connecting said windings in delta and varying the lengths of the windings included in the delta connection.

4. The method of obtaining variable voltages from a plurality of multiphase windings which consists in connecting said windings in delta with one terminal of each winding connected to an intermediate point in another winding and shifting the points of connection of the said windings.

5. The method of obtaining variable voltages from a plurality of multiphase windings which consists in connecting said windings in delta with one terminal of each winding connected to an intermediate point in another winding and varying the lengths of the windings included in the delta connection.

In witness whereof I have hereunto set my hand this 25th day of April, 1902.

WALTER S. MOODY.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.