No. 625,763. Patented May 30, 1899.

E. M. HEWLETT.

GROUND DETECTOR.

(Application filed Dec. 12, 1898.)

(No Model.)

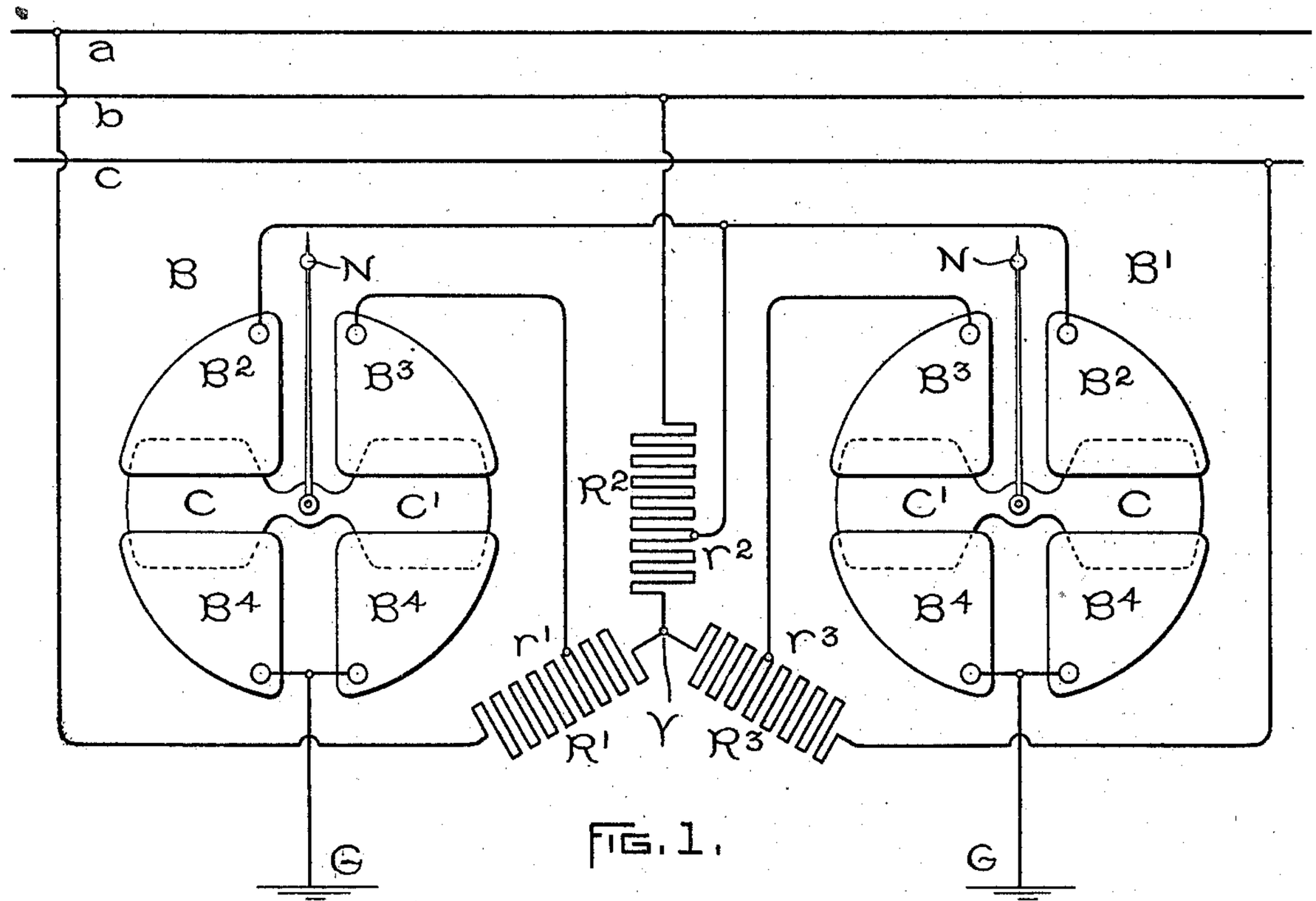

FIG. 1.

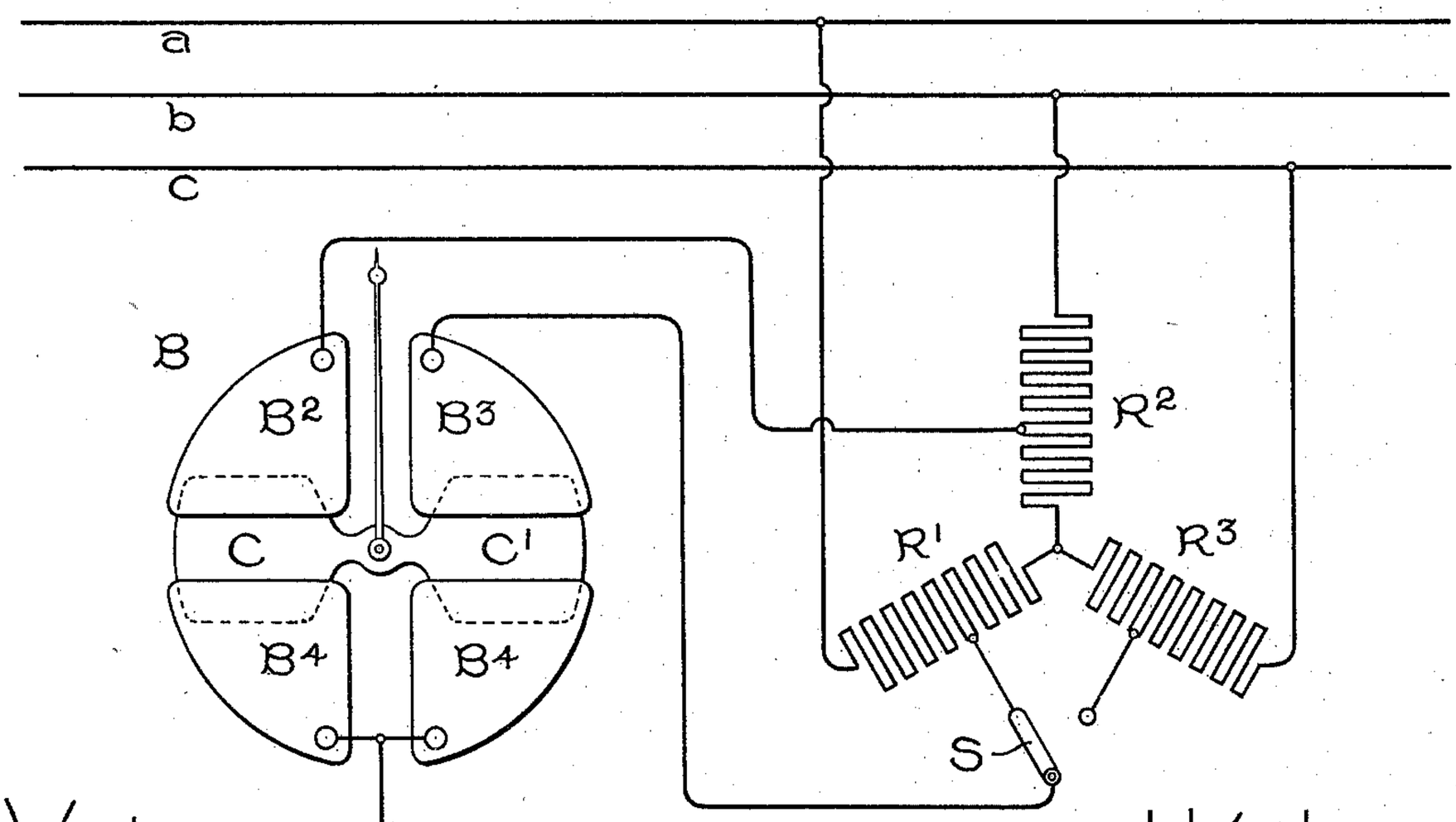

FIG. 2.

WITNESSES.

A. H. Abell.

A. F. Macdonald

INVENTOR.

Edward M. Hewlett,

by Albert G. Davis,

Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDWARD M. HEWLETT, OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

GROUND-DETECTOR.

SPECIFICATION forming part of Letters Patent No. 625,763, dated May 30, 1899.

Application filed December 12, 1898. Serial No. 698,957. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. HEWLETT, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Ground-Detectors, (Case No. 914,) of which the following is a specification.

My present invention relates to ground-detectors, and is an adaptation of a well-known form of electrostatic measuring instrument often used as a voltmeter or as a ground-detector on alternating-current lines to the detection of grounds in three-phase or polyphase systems. In such devices it has been necessary hitherto to employ a separate ground-detector for each of the lines, and this has been objectionable because of the possibility of making a short circuit in case of simultaneous grounds occurring at the instruments. The striking distance across such devices is usually very small and but little excess potential is necessary to bridge it. In order to avoid this difficulty, I have devised the present invention, which consists in connecting the electrostatic ground-detectors across the three-phase lines in combination with a polyphase resistance—that is, three equal resistances united at a common point. The stationary parts of the ground-detectors are connected to intermediate points of the resistances, so that parts of these are in series and part in shunt with the instruments. The resistance prevents any undue flow of current should the insulation of the instrument be impaired. I prefer for this purpose so high a resistance that practically no appreciable current will flow from one line to the other. In practice I find that but two instruments are necessary, inasmuch as their indications are different when grounds occur on the different lines. My invention, however, is not limited in this regard, as more or less than two might be employed.

The accompanying drawings show diagrammatic embodiments of the invention.

Figure 1 is an illustration of the preferred form, and Fig. 2 of an alternative or modified form of the device.

In Fig. 1, a b c are the three-phase lines. R' R^2 R^3 are the different branches of the three-phase resistance, united at the common junction Y. Leads pass from the points r' r^2 r^3 in the resistances to the plates of the static ground-detectors B B'. These are of the usual form of such mechanisms, having stationary plates or "quadrants," as they are often called, B^2 B^3, each of which is connected to one of the points r', &c. For instance, in the left-hand ground-detector the plate B^3 is connected to the point r' of the resistance R'. The plates B^4 are electrically connected and are also grounded at G. The needle N is mounted upon a horizontal shaft and is moved by the vanes C C'. The action need only be briefly described. As long as both of the plates B^2 B^3 are equally charged the vanes C C' are equally repelled and the needle stands in its central position. Should, however, the line connected with either plate be grounded, there will be a less potential at the plate, depending upon the extent of the ground, in the case of a short circuit there being no potential at all, so that the other plate will repel the vane adjacent to it and the needle take a position upon one side or the other of the center, in a measure showing by the amount of its displacement the extent of the trouble. In the arrangement shown assume, for instance, that the line a is grounded. In this case the plate B^3 will be of lower potential than B^2 and will not repel the vane C' so forcibly as B^2. In consequence the needle of the ground-detector B will be moved to the left. If a ground should occur upon the line b, a similar action will take place with the ground-detector B', in this case the needle also moving to the left, since the plate B^2 would be partially or wholly discharged; but since the plate B^2 of the ground-detector B is also connected to the line b its needle will also swing, so that the needles of the two instruments will converge, indicating the ground on the line b. If the line c be grounded, the plate B^3 of detector B' will be lowered in potential, and the needle of this detector will swing to the right, the other one remaining stationary. Should ground simultaneously occur upon lines a and b, the plate B^3 of the detector B and plates B^2 B^2 of both detectors will be lowered in potential and the needle of the indicator B' will swing to the

left. If the lines *b* and *c* be grounded, the plates B^2 B^2 of both detectors and plate B^3 of detector B′ will be lowered in potential and the indicator of the detector B will swing to the right. If the lines *a c* be both grounded, the plates B^3 B^3 of both detectors will be lowered and the two needles will diverge. Thus it will be seen that the two indicators give six different indications, each corresponding to a different condition of the lines. Of course if all of the lines be grounded through equal resistances there will be no indication on the ground-detectors; but the usual disturbances at the station or in the translating devices will indicate this condition, which very rarely occurs.

The device shown in Fig. 2, although capable of useful application, is not so general in its utility as that in Fig. 1. In Fig. 2 I have shown the same parts, except that only one indicator B is employed, and a switch S is provided by which the plate B^3 of this indicator may be shifted from line *a* to line *c*, as required, the plate B^2 remaining connected to the line *b*. This would be adapted to indicate ground on any one of the lines; but the indications for the grounding of any two lines are not the same for both positions of the switch, and it requires manipulation, not being automatic, for which reasons it is not the preferred form. Its operation would be similar to that of the apparatus shown in Fig. 1 and will require no further description.

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

1. A polyphase distribution system, a polyphase resistance connected across the lines, and one or more static measuring instruments connected between ground and points in the resistance.

2. A polyphase distribution system, a polyphase resistance having a number of branches connected across, the lines and a common junction, and one or more static measuring instruments connected between ground and intermediate points in the resistance branches.

3. A polyphase distribution system, a polyphase resistance having a number of branches, each with one end connected to a main and the other to a common junction, and one or more static instruments each with some of its plates connected to intermediate points in the resistance branches, with other parts of the instrument connected to ground.

4. A three-phase distribution system, a three-phase resistance composed of three resistances connected between the different mains of the system and a common junction, static measuring instruments having some of their plates connected to intermediate points in the different resistances, and other plates connected to ground, with a needle and vanes free to move under the repulsive influence of the plates.

5. A three-phase distribution system, a three-phase resistance composed of resistances connected between the lines and a common junction, and two static measuring instruments having plates connected to ground, plates in each instrument connected to similar parts in the other and to one of the mains, and other plates connected to the other mains, the connections to the mains being made through parts of the resistances.

6. The combination with polyphase mains, of a static measuring instrument connected to ground and also connected to the mains through resistance partly in series and partly in shunt with the instrument.

7. The combination with one or more static measuring instruments connected between the mains of a polyphase system and ground, of a polyphase resistance having a number of branches and a common junction and sufficient in amount to practically prevent current flow between the lines, the connections of the instrument being taken to intermediate points of the resistance.

In witness whereof I have hereunto set my hand this 9th day of December, 1898.

EDWARD M. HEWLETT.

Witnesses:

B. B. HULL,

J. L. D. LANGDON.