(No Model.)

P. NORDMANN.

EQUALIZER FOR ROTARY CURRENT SYSTEMS.

No. 501,094. Patented July 11, 1893.

Fig. 1.

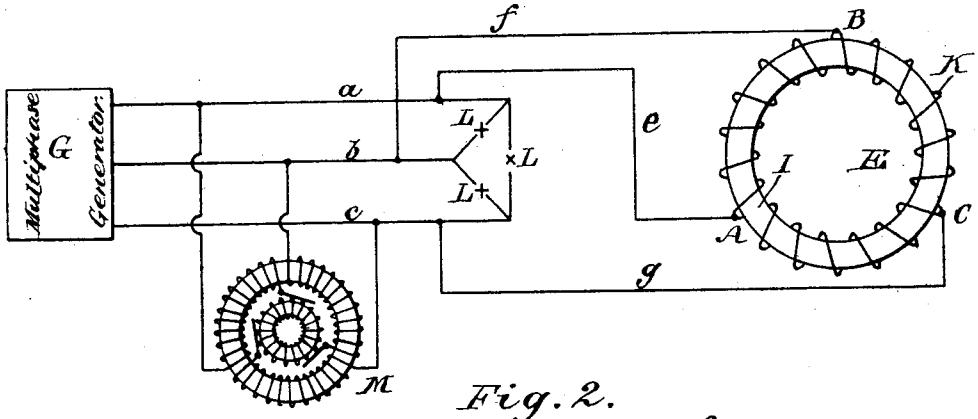


Fig. 2.

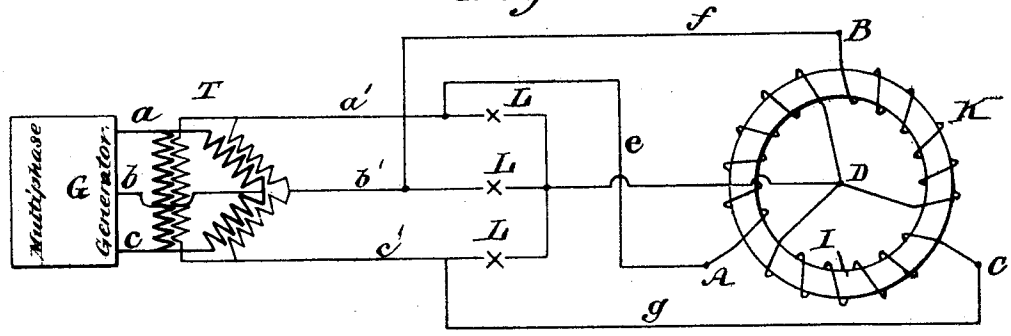


Fig. 3.

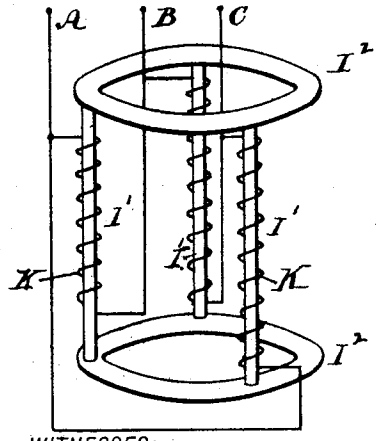
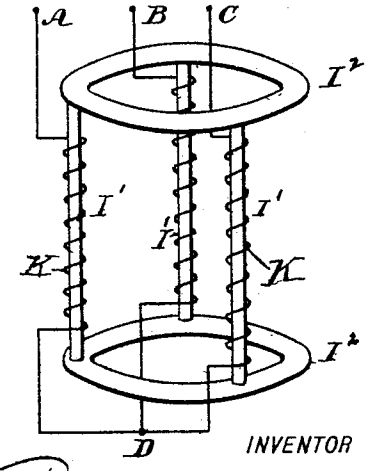


Fig. 4.



WITNESSES:

Timothy F. Dillon

William Baxton

INVENTOR

Paul. Nordmann

BY

Wm. H. Benjamin

ATTORNEY.

UNITED STATES PATENT OFFICE.

PAUL NORDMANN, OF BERLIN, GERMANY, ASSIGNOR TO SIEMENS & HALSKE, OF SAME PLACE.

EQUALIZER FOR ROTARY CURRENT SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 501,094, dated July 11, 1893.

Application filed February 23, 1892. Serial No. 422,581. (No model.)

To all whom it may concern:

Be it known that I, PAUL NORDMANN, a subject of the King of Prussia, residing at the city of Berlin, Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Equalizers for Rotary Current Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to apparatus designed to be employed in connection with a multiphase current system of electric distribution, and consists of a device which has for its object to maintain the potential of the currents in the several circuits of the system alike, irrespective of the work done in the individual circuits.

My invention further relates to the mechanical construction of the regulating or equalizing device itself.

In the accompanying diagrams, which serve to explain my invention, similar letters of reference indicate like parts.

Figure 1 is a diagram indicating a generator of multiphase currents, a multiphase distributing system, with lamps, an electro-motor, and my equalizing device connected in multiple of the several conductors. Fig. 2 indicates a generator, a multiphase distributing system, including a multiphase transformer, with lamps, and my equalizing device connected in series. Figs. 3 and 4 are elevations showing modifications of the equalizing device, Fig. 3 showing the coils arranged in series and Fig. 4, in multiple.

In the drawings, G represents a generator of multiphase currents of any well known type, and *a b c*, conductors leading from the generator, and corresponding in number with the number of phases of the current or separate currents transmitted from the generator.

In Fig. 2, the conductors *a b c* are shown as connected in a well known manner to a multiphase transformer T.

L are lamps, shown in Fig. 1, as in multiple of a pair of the conductors; and in Fig. 2, in series.

M is an electro-motor of the type adapted to be operated by multiphase currents, the coils of which are shown as in multiple of pairs of the conductors. They may be connected in series.

E indicates my improved equalizing device, of which two forms are shown in the drawings, *i. e.*, the ring form, shown in Figs. 1 and 2; and the columnar form, shown in Figs. 3 and 4. The ring form, shown in Figs. 1 and 2, consists of a highly laminated metallic core I, upon which is wound a closed coil K. The ring form of my equalizer is substantially similar in construction to a Gramme-ring.

In Fig. 1, the equalizer is shown as connected to the main conductors *a b c*, through the conductors *e f g*, which are respectively connected at equidistant points, A B C. In Fig. 2, the construction is similar to Fig. 1, with the exception that three separate coils are wound upon the ring and connected at one end to a common point D. In each of the figures, the coils or divisions of coils of the equalizer, are shown as corresponding to the number of current phases, or currents transmitted from the generator. It will, therefore, be understood that if more than three phases or currents are used, the number of coils or divisions of coils will correspond.

In Figs. 3 and 4, the equalizing device consists of a number of columnar laminated cores I′, united at their tops and bottoms by rings I^2, so as to form closed magnetic cores. Upon these cores are placed coils K. The points A B C, in Figs. 3 and 4, correspond to the points A B C, in Figs. 1 and 2.

The operation of my improved equalizer is as follows: If multiphase current motors requiring at least three phases of a multiphase current, or three separate currents, are to be used in the same system with lamps which are fed from a single current, it is necessary to provide some means for equalizing the current potential transmitted through the several conductors, to compensate for variations in load in the separate conductors. If, in a system of multiphase distribution, a group of lamps, fed by a single current, should be suddenly cut into or out of circuit, the potential of the current in the feeding main conductor to

the group will be changed from that flowing in the other conductors, and if this feeding current, as well as others, is used to energize a multiphase current motor at the same time, the potential of the currents fed to the motor will be unequal, and the motor will not do its work properly. Now, supposing that the potential of the currents traversing each conductor of the system is the same, and each of these conductors are connected in a suitable manner to my improved equalizing device, no magnetization of the core of the equalizing device will take place,—as in multiphase systems, the sum of all the currents at any moment is algebraically equal to naught. If, however, the potential of the current in one of the mains connected to the equalizer should be varied, in the manner previously set forth, or in any other manner, the coil upon the equalizer connected to that main would receive more or less current than the other coils, depending upon the change of potential of the main. If the potential of the current transmitted to such coil be less than that received by the other coils upon the equalizer, the equalizer would then assume the function of a transformer,—that is to say, the coil or coils receiving the highest potential will become primary coils, and the other coil or coils, secondary coils. The magnetization of the core by the primary coil or coils will inductively produce secondary currents in the secondary coil; and this action, occurring in the equalizer, will in effect restore the normal balance between the potential of the currents in the different conductors of the system, and also serve to regulate the periodicity of the phases of the transmitted currents, should the periods of said phases be altered by disturbing influences, in any one or more of the circuits of the system.

I have described my improved system as carried out with a multiphase system of three conductors. It will be clearly understood by those to whom the specification is addressed, that any number of conductors may be employed, corresponding to the number of phases of the current generator.

Having thus described my invention, I claim—

1. The combination with a multiphase system of distribution comprising three or more wires carrying three or more currents of different phase, of an equalizer consisting of an inductional apparatus, substantially as described, whereby energy may be transferred from such portion or portions of the system having a potential above the normal, to such portion or portions of the system having a potential below the normal.

2. An equalizer for multiphase current systems, comprising a laminated core, said core having a coil wound thereon, divided into as many sections as there are current phases, said sections connected in successive order to the main line conductors, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

PAUL NORDMANN.

Witnesses:
BROR HEMMING WESSLAU,
MAX WAGNER.