No. 713,720. Patented Nov. 18, 1902.

M. O. TROY.

SYSTEM OF ELECTRICAL DISTRIBUTION.

(Application filed Dec. 19, 1901.)

(No Model.)

Fig. 1.

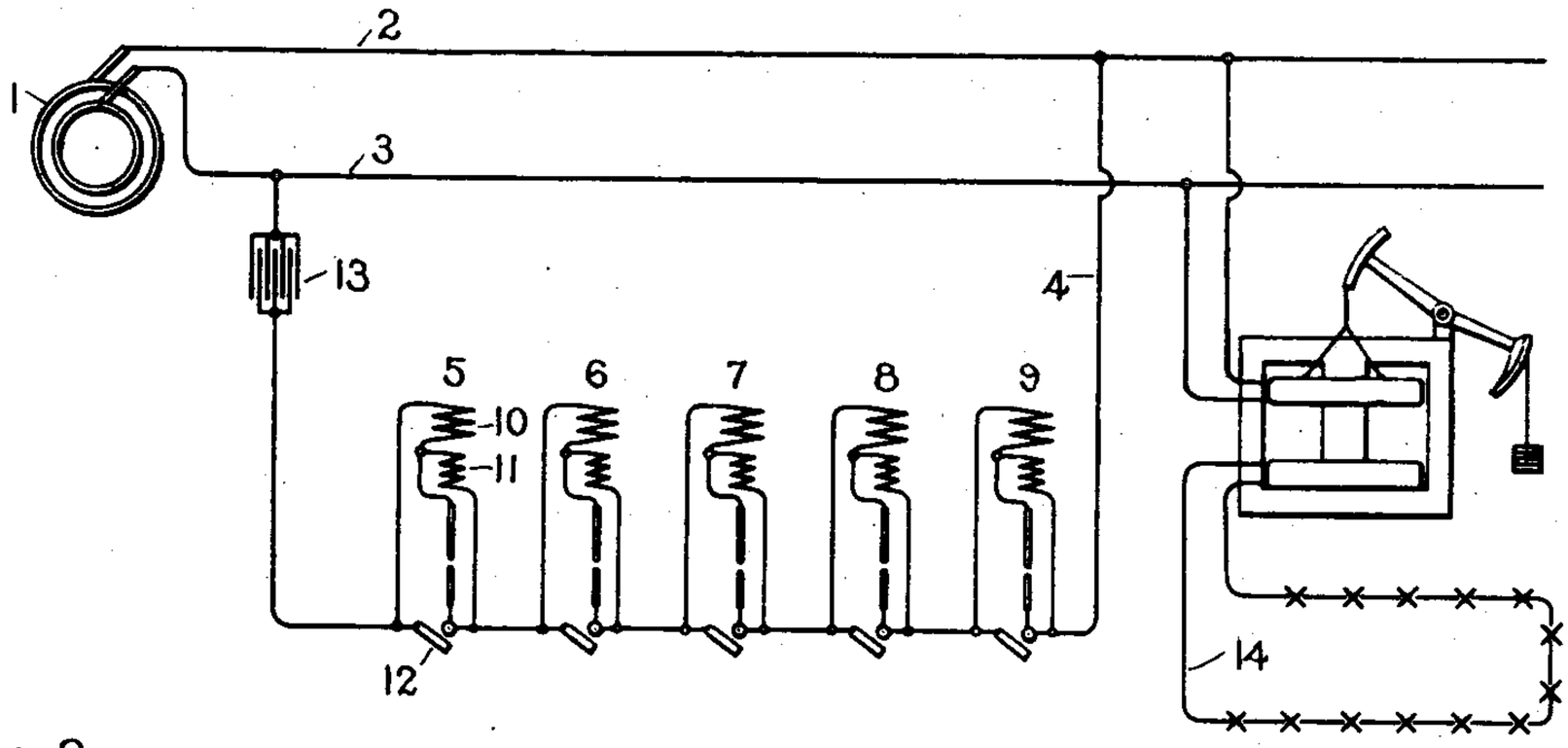


Fig. 2.

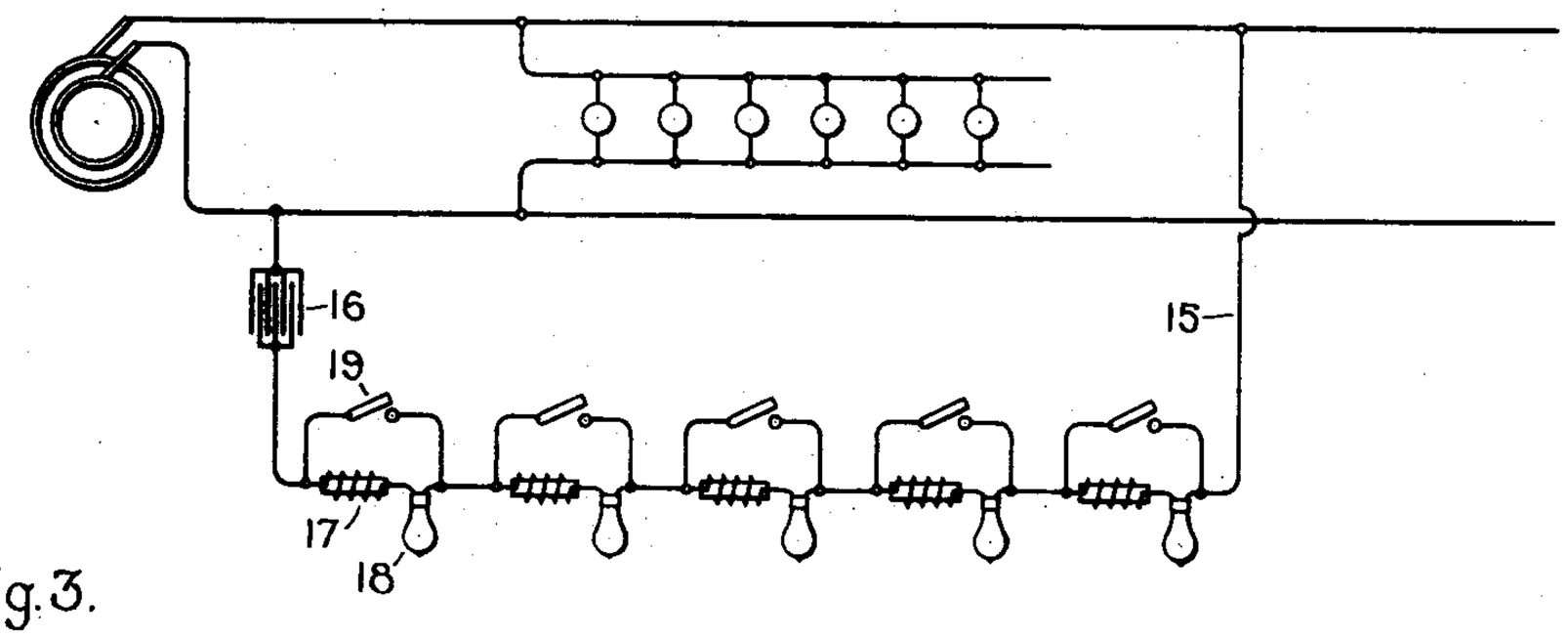
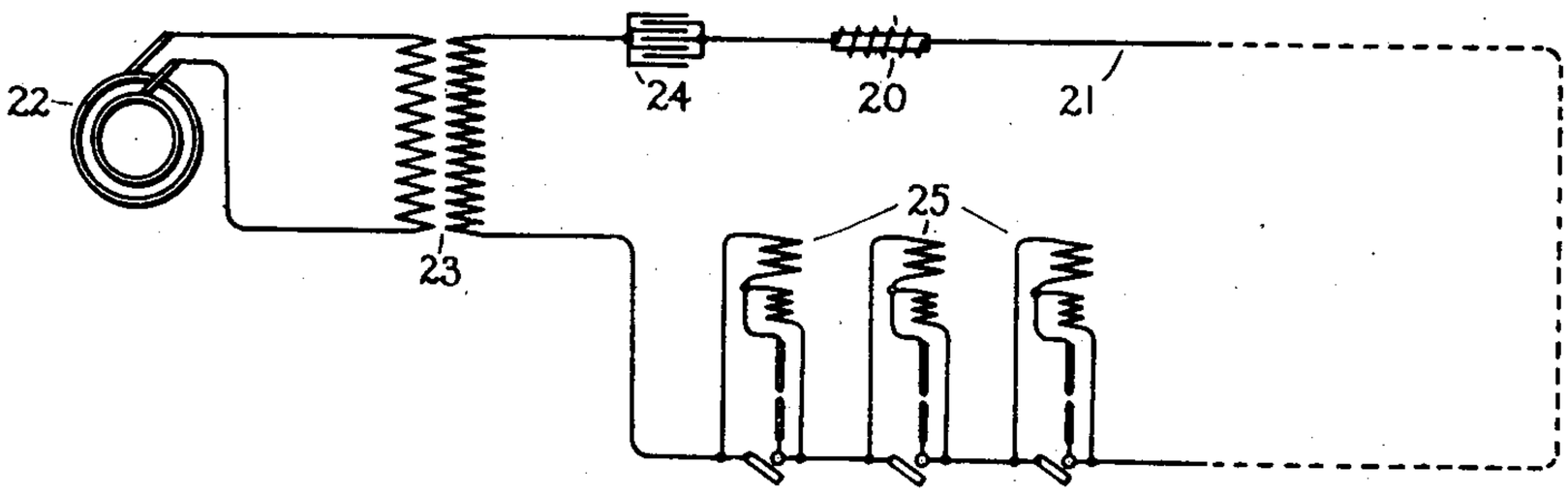


Fig. 3.



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UNITED STATES PATENT OFFICE.

MATTHEW O. TROY, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SYSTEM OF ELECTRICAL DISTRIBUTION.

SPECIFICATION forming part of Letters Patent No. 713,720, dated November 18, 1902.

Application filed December 19, 1901. Serial No. 86,473. (No model.)

To all whom it may concern:

Be it known that I, MATTHEW O. TROY, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Systems of Electrical Distribution, (Case No. 2,301,) of which the following is a specification.

My present invention relates more especially to an arrangement or arrangements whereby a circuit carrying a variable load may be supplied automatically with substantially-constant current derived from a constant-potential source.

The invention is intended more particularly for use in those cases where the translating devices supplied with constant current possess self-induction inherently or may be accompanied by adjunctive devices possessing inductance.

Generally speaking, my invention consists in connecting in circuit with the translating devices a reactance of different sign from the reactance present in the translating devices themselves. When, therefore, translating devices are cut into circuit, their resistance tends to increase the total impedance, while their reactance by counterbalancing a corresponding portion of the permanently-included reactance of opposite sign serves to maintain the resulting impedance of the circuit substantially constant. If translating devices are cut out of circuit, the reduction in impedance which would otherwise take place is similarly prevented by the fact that a portion of the permanently-connected impedance is no longer balanced in its effect by the reactance of the translating devices thus cut out. The circuit being of substantially-constant impedance regardless of load therefore carries a substantially-constant current.

The novel features which I believe characterize my invention I have set forth with particularity in the appended claims. For a description, however, of embodiments of my invention and of their modes of operation reference is to be had to the following specification, taken in connection with the accompanying drawings, in which—

Figures 1 and 2 are diagrams of modified forms of my invention, and Fig. 3 a diagram of a still different form.

In Fig. 1 a source of constant-potential alternating current is indicated at 1, and mains 2 3 extend therefrom, from which translating devices of any suitable character may receive current. Connected across these mains is a circuit 4, arranged, in accordance with my invention, to be supplied with substantially-constant current. This circuit is shown as supplying current to a series of arc-lamps 5 to 9, inclusive. These lamps are represented as of the differential type—that is, each one is provided with a series coil, such as 10, for striking the arc and a shunt-coil, such as 11, for opposing the action of the series coil, and thereby regulating the length of the arc. Short-circuiting switches, such as 12, serve to cut the lamps into or out of circuit, as desired.

In series with the constant-current circuit I permanently connect a condenser 13 or other device having the effect of capacity. Such devices are well known in the art and require no description here. The capacity of the condenser may be chosen so that when all the lamps or other translating devices are out of circuit current of the required value will flow. When, now, one of the lamps is cut into circuit by opening its short-circuiting switch, the inductance of the lamp balances a portion of the reactance of the condenser. The total impedance of the lamp and the condenser therefore remain approximately the same as the impedance of the condenser alone. Further increase in the number of lamps in circuit has a substantially similar effect. The result is the maintainance of a nearly-constant current in the circuit 4 regardless of the number of lamps or other translating devices in circuit. It is not claimed, however, that the current in the circuit 4 is absolutely constant, since such is not the fact. In general the current is higher for medium loads than for either small or large loads. As the current in the circuit 4 is to a greater or less extent a leading current, a beneficial effect upon the system as a whole may be obtained when this constant-current circuit is operated in conjunction with other circuits or translating

devices taking a lagging current. The power factor of the system as a whole is thereby improved. At 14 I have represented a constant-current circuit fed from the mains 2 3 by a constant-current transformer of well-known type. This transformer takes a variable lagging current from the mains, which lagging current is to a greater or less extent counterbalanced by the leading current taken from the mains by the circuit 4.

In case the translating devices to be supplied with constant current do not of themselves contain inductance, they may each be provided with an adjunctive device possessing inductance—such, for example, as an inductance-coil. Each translating device and its corresponding inductance-coil may therefore be cut into or out of circuit simultaneously and will produce the same regulating effect in the circuit as would be the case with arc-lamps, which are inherently inductive. The arrangement thus outlined is shown in Fig. 2 and will be seen to consist of a constant-current circuit 15, including the regulating-condenser 16 and a series of inductance-coils and incandescent lamps, one of the inductance-coils being indicated at 17 and the lamp corresponding thereto at 18. A short-circuiting switch for each lamp and its inductance-coil is employed for cutting the lamp and coil into or out of circuit. One of these switches is indicated at 19 in operative relation to the inductance-coil 17 and lamp 18. Cutting in or out a lamp and its corresponding inductance-coil has the same regulating action set forth in connection with the arc-lamps shown in Fig. 1.

It may be found in practice that the regulating-condenser has the effect of accentuating the higher harmonics in the current supplied, thereby seriously interfering with the regulating action of the system. In such cases the condenser may be considered as offering more or less oppos'tion to the passage of waves of the fundamental frequency and but little opposition to the passage of waves of higher frequency. To obviate this defect, I insert in series with a constant-current circuit an inductance-coil or other device possessing self-induction. This inductance-coil is represented at 20 in Fig. 3, which figure represents a system substantially the same as those shown in Figs. 1 and 2, but differing therefrom in the minor particular that the constant-current circuit 21 is supplied from the constant-potential source 22 through a transformer 23. In order that the inductance-coil 20, inserted in the constant-current circuit for the purpose of suppressing higher harmonics, may not have the effect of impairing the regulation of the system, I increase the amount of regulating-condenser 24 sufficiently to balance the lagging component of current due to the inductance-coil 20. The system as thus arranged is substantially free from magnified harmonics and regulates for approximately constant current in the manner already described. As in the case shown in Fig. 1, the constant-current circuit in Fig. 3 is represented as supplying translating devices in the form of arc-lamps 25.

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

1. The method of maintaining a substantially constant current in a circuit containing a variable number of translating devices possessing inductance which consists in producing in said circuit a comparatively large leading electromotive force and neutralizing more or less of said electromotive force as said translating devices are cut into or out of circuit.

2. The method of maintaining a substantially constant current in a circuit fed by a source of alternating current of substantially constant potential and in which circuit-translating devices giving rise to a reactive electromotive force of one sign are adapted to be included or excluded, which consists in producing in said circuit a substantially constant reactive electromotive force of opposite sign from that of the translating devices, and causing the resultant reactive electromotive force to vary reversely with the variation of resistance in said circuit whereby the impedance remains substantially constant thereby maintaining the current also substantially constant.

In witness whereof I have hereunto set my hand this 16th day of December, 1901.

MATTHEW O. TROY.

Witnesses:

DUGALD MCK. MCKILLOP,

JOHN A. MCMANUS.