No. 695,870. Patented Mar. 18, 1902.

E. THOMSON & E. J. HOUSTON.

ELECTRIC LIGHTING SYSTEM.

(Application filed Feb. 19, 1887.)

(No Model.)

Fig. 1.

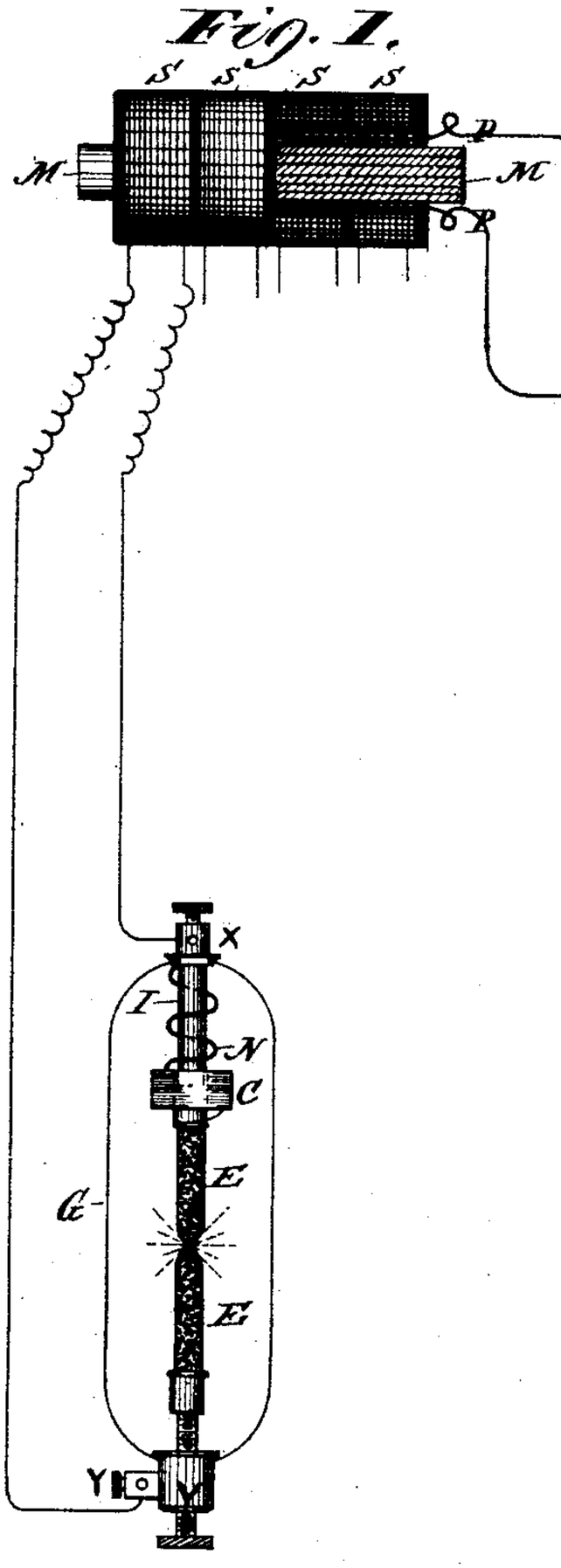


Fig. 2.

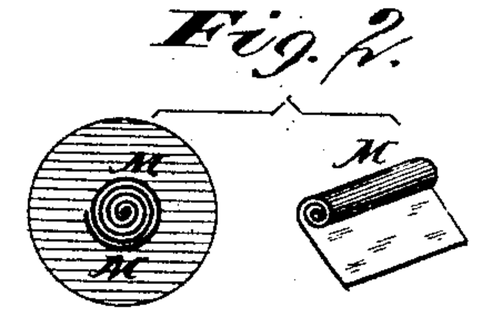


Fig. 3.

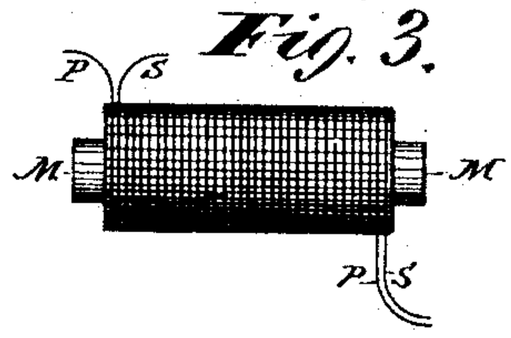
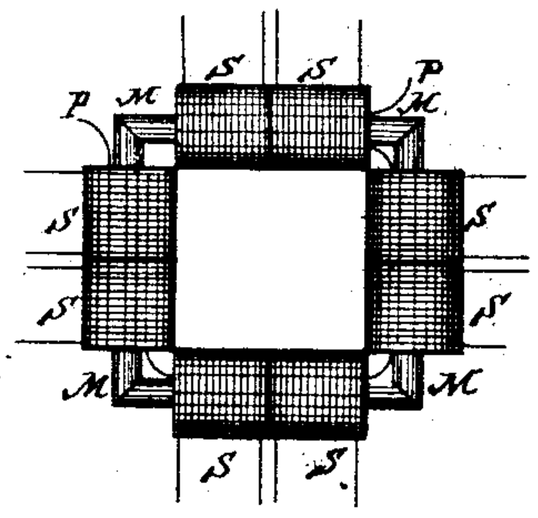


Fig. 4.



WITNESSES:

Gabriel J. W. Galster.

Wm. H. Capel

INVENTORS:

Elihu Thomson

Edwin J. Houston

BY

Townsend & MacArthur

ATTORNEYS

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS, AND EDWIN J. HOUSTON, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRIC-LIGHTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 695,870, dated March 18, 1902.

Application filed February 19, 1887. Serial No. 228,183. (No model.)

To all whom it may concern:

Be it known that we, ELIHU THOMSON, a resident of Lynn, in the county of Essex and State of Massachusetts, and EDWIN J. HOUSTON, a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, citizens of the United States, have invented a certain new and useful Electric-Lighting System, of which the following is a specification.

Our invention relates to an induction apparatus whereby electric currents—alternating, interrupted, or varied—upon one circuit may produce electric currents on a separate or independent circuit to be utilized in the production of electric light or for other purposes, such as motive power.

Our invention provides a means whereby electric energy generated at one point and supplied to an electric circuit may be utilized at another point in the shape of a current of low electromotive force for the production of electric light on a separate circuit.

Our invention also affords a means whereby a single alternating current generated at one point and flowing over an electric circuit may be utilized in the production of an indefinite number of lights at any other point, the character of the current operating the lights being adapted in quantity to the light apparatus and not being necessarily of the same character or of a higher electromotive force than the main or inducing alternating current, as would be the case if induction-coils of the ordinary construction were employed.

In the practice of our invention a single varied, intermittent, or reversed current is employed through the agency of coils of insulated wire to magnetize a soft-iron core, by means of which varied, interrupted, or reversed currents are set up in one or more peculiarly constructed and arranged coils surrounding said core. These latter are employed through the agency of any suitable device to produce the light or lights required or to perform other work.

In the accompanying drawings, Figure 1 is a diagram of a form of apparatus embodying our invention. Fig. 2 shows a detail of construction. Fig. 3 illustrates a modification in the disposition of the primary and secondary coils. Fig. 4 shows diagrammatically the preferred form of our invention.

In Fig. 1 is shown one form of our invention which we modify to suit peculiarities of conditions of working. The soft-iron core M M is constructed, as shown in Fig. 2, by rolling a sheet of thin iron whose width is equal to the length of the core desired into a close spiral around an iron rod which passes through its center. The sheet is coated before rolling with varnish or some other pliable non-conducting material. By means of this arrangement a thorough subdivision of the core is obtained, whereby the circulation of induction-currents is prevented without unnecessary loss of space. The core M M is surrounded by a coil or coils P P, whose terminals are connected with the circuit leading from a source of currents which are varying, interrupted, or reversed. The core M M is also surrounded by coils S S S S, having free terminals which are to be connected with the arrangement for producing the light, here typified as two carbon electrodes E E, contained in a closed transparent case. These latter coils differ from the secondary coils in the well-known Ruhmkorff apparatus in being constructed of coarse wire, whose electrical resistances are much less than the resistance of the carbon contacts connected to these terminals and used as the source of light. This latter relation of resistances is a vital feature in the application of our invention. The coils S S S S differ also from the secondary coils of the ordinary Ruhmkorff apparatus, in that they require no special insulation, since the electromotive force of the currents developed in them is comparatively low, and being produced in a circuit of very low resistance the heating power of said currents is high. The coils S S S S may, in fact, be constructed of the same size of wire as is used for the primary P P. In this case we prefer to wind the coils together—that is, winding a double length of wire in such a manner that the two wires shall be parallel and side by side throughout their entire length, as shown in Fig. 3. In this case one coil subserves the purpose of the coils P P, while the other coil serves the purpose of the coil S S. The obvious equivalent

of the latter method is to wind the two coils P P and S S in alternate single layers to subserve the same end. The two coils being of the same or substantially the same gage and the secondary being divided into sections, which may deliver currents independently of one another, as indicated in the other figures, the section of the secondary will be less than that of the primary and the sum of the currents evolved in said secondaries will exceed in quantity the quantity of the inducing-current.

The effect produced in the coils S S S S by the passage of a reversed current through the primary coils P P may be intensified by joining several cores M M, Fig. 4, with their accompanying coils, in such a position as to form a hollow polygon or endless magnetic core of suitable dimensions, and so that the magnetic polarization in the passage of the current through the coils P P will be in the same direction in the chain of cores so provided. The coils P P being connected in series, as shown, will take the alternating or other current through all the others. The coils S S, having independent or free terminals, may supply currents independently of one another to any circuit or circuits in obvious manner. This structure provides an endless core with primary and secondary coils embracing practically the whole peripheral length, the primary being in series and the secondaries in independent sections from which the currents of large heating effects may be drawn.

What we claim as our invention is—

1. In a system of electric lighting the combination substantially as described, of an alternating-current circuit, an induction-coil primary in said circuit, an induction-coil secondary acted upon by said primary and having an electrical resistance as low as that of the primary, and apparatus as described connected to said secondary.

2. The combination substantially as described in a system of electric lighting, of an alternating-current circuit, an induction-coil having its primary in said circuit, a local or separate circuit containing a translating device such as an electric light, and a secondary coil for the induction apparatus connected to said local or separate circuit and having an electric resistance less than that of the translating device.

3. In a system of electric distribution, a single alternating-current circuit fed from any suitable source, in combination with an induction-coil whose primary is included in said circuit, two or more local circuits each containing apparatus as described, and secondary coils for said induction-coil each connected to the circuit of an electric-light or motive-power apparatus.

4. The combination in an apparatus for electric distribution, of an alternating-current circuit supplied with current from any suitable source, an induction-coil whose primary is connected to said circuit, an electric-lighting apparatus in an independent circuit, and a secondary for said induction-coil whose conductor is of substantially the same size as the primary and is connected to the local circuit, as and for the purpose described.

5. The combination in a system of electric distribution, of a main electric circuit supplied with an alternating current from any suitable source, and at a local point an induction-coil whose primary is connected to the said circuit while its secondary consists of a number of coarse-wire conductors each connected to a separate circuit containing electric-lighting or motive-power apparatus as described.

6. An induction apparatus as described consisting of a magnetically continuous core with a primary wire or coil and a series of secondary coils having independent terminals.

7. In an induction apparatus, a series of cores joined end to end to form a magnetically continuous endless core, and having a series of primary coils connected into circuit with one another as described, in combination with secondary coils wound on the core-sections and having separate or independent terminals, as and for the purpose described.

8. In an induction apparatus, a series of iron cores connected end to end in a magnetically continuous or endless series, a primary coil on each core-section, an alternating-current circuit from which currents pass through to said primaries in series, and secondary coils on each core having independent terminals by which the current of each secondary may supply a circuit without passing through the other coils.

9. The combination with the endless core, of a set of primary coils embracing substantially the entire peripheral length and supplied with an alternating varying or intermittent current in series, in combination with secondary coils embracing also substantially the entire peripheral length of the core but having a multiplicity of free or independent terminals by which the several coil-sections may supply currents independently of one another.

10. The combination in a system of electric lighting of a circuit connected with a source of alternating currents, an induction-coil wound with two conductors of substantially the same gage, one of which is included in said circuit, and an electric light connected to the other conductor.

11. In a system of electric distribution, an alternating-current primary line wound around an iron core, with a set of secondary coils in inductive relation thereto, and of a section greater than the primary, as described, the sum total of the currents in the secondary coils combined exceeding the current in the single primary.

12. A system of electrical distribution comprising a main line having alternating currents, and induction-coils having their pri-

maries fed from the main line and their secondaries feeding translating devices, the electrical resistance of each secondary being lower than that of the translating devices fed from the same, substantially as described.

13. As a part of a system of distribution of alternating currents, an inductorium the primary of which is fed from the main line and the secondary of which is in the consumption-circuit and has a lower electrical resistance than the latter, substantially as described.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 7th day of February, A. D. 1887, by E. THOMSON, and signed at Philadelphia, in the county of Philadelphia, State of Pennsylvania, this 15th day of February, A. D. 1887, by EDWIN J. HOUSTON.

ELIHU THOMSON.
EDWIN J. HOUSTON.

Witnesses as to Thomson:
J. W. GIBBONEY,
E. WILBUR RICE, Jr.
Witnesses as to Houston:
W. V. MASSEY,
J. R. MASSEY.