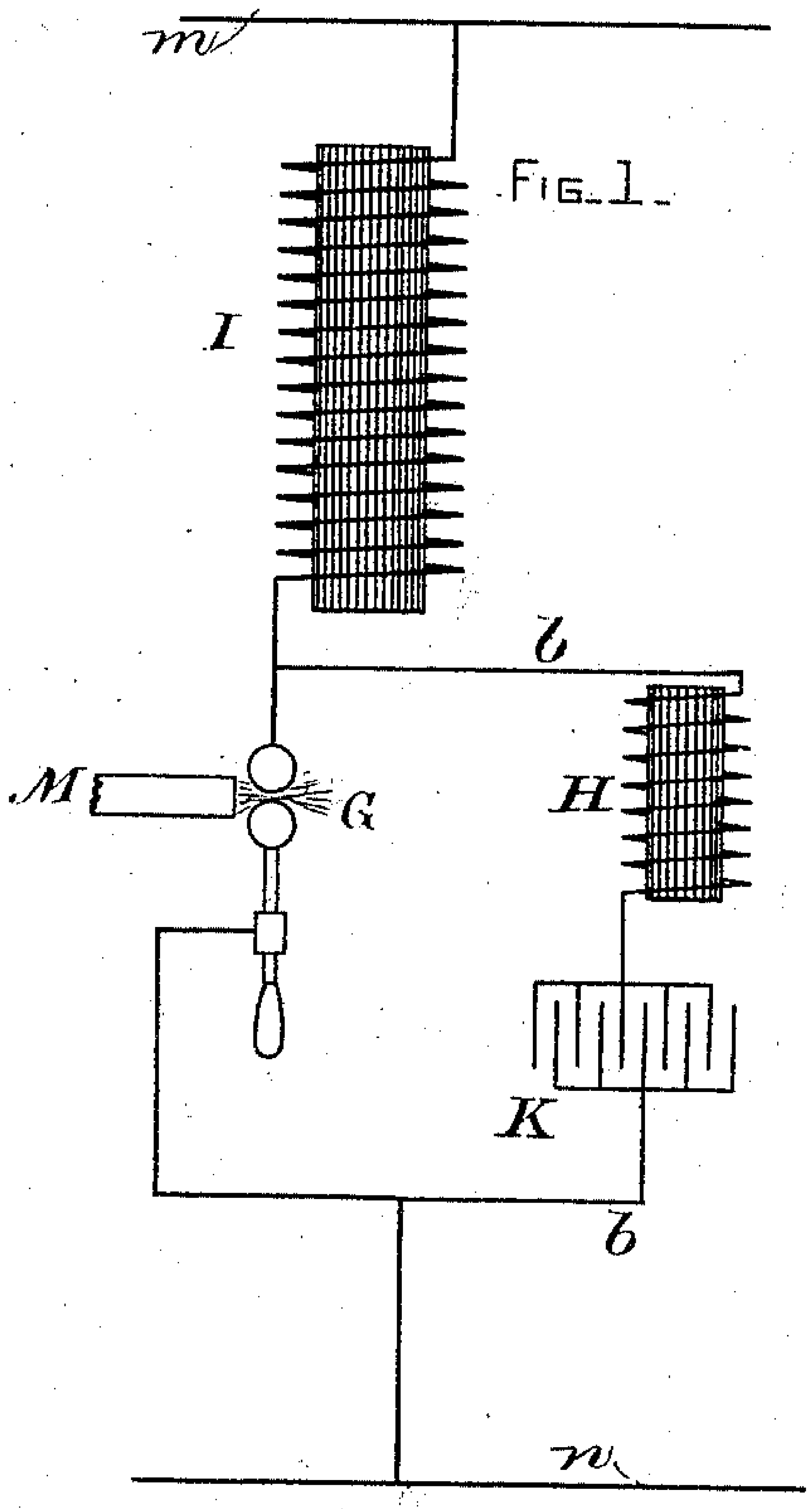
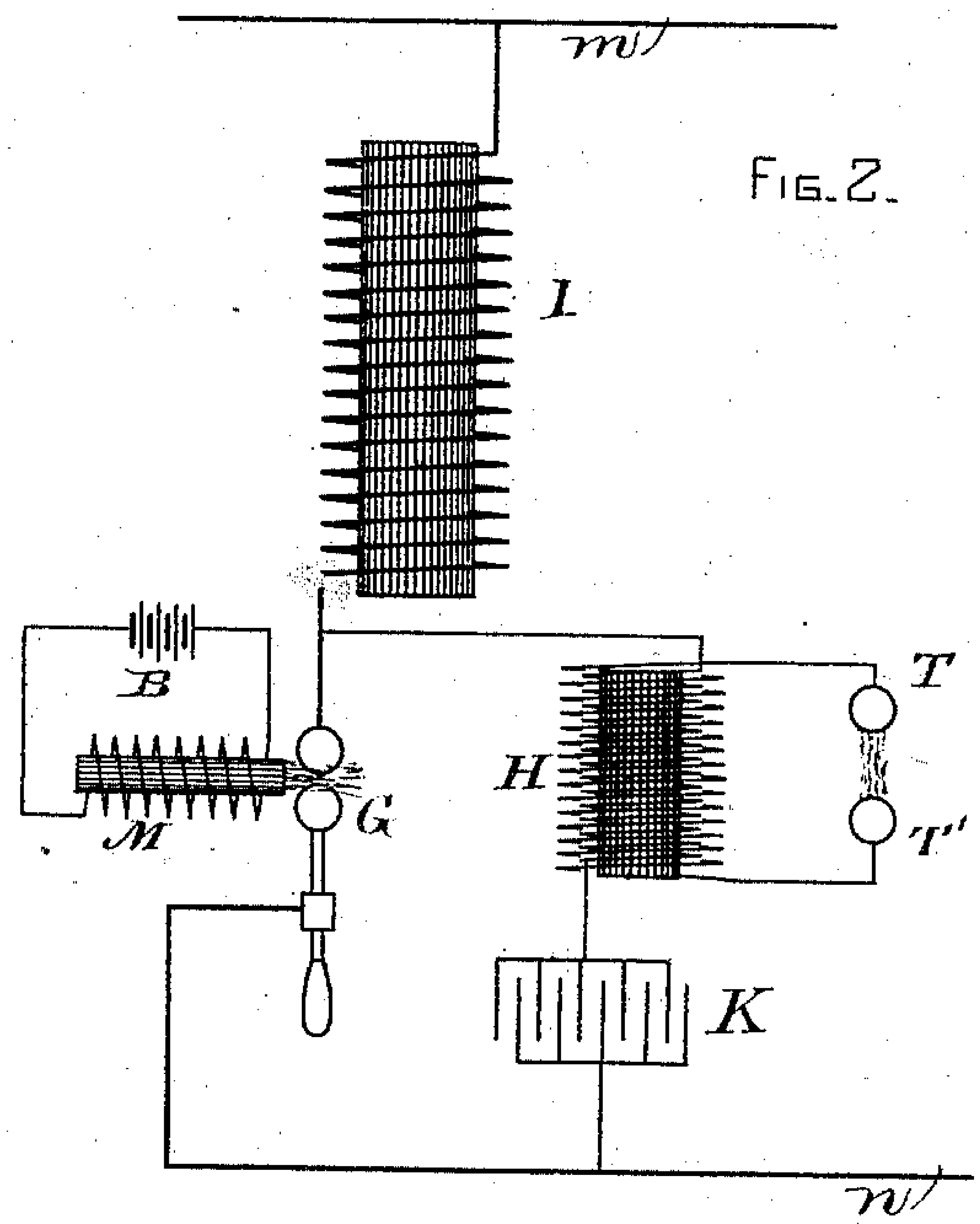
(No Model.)

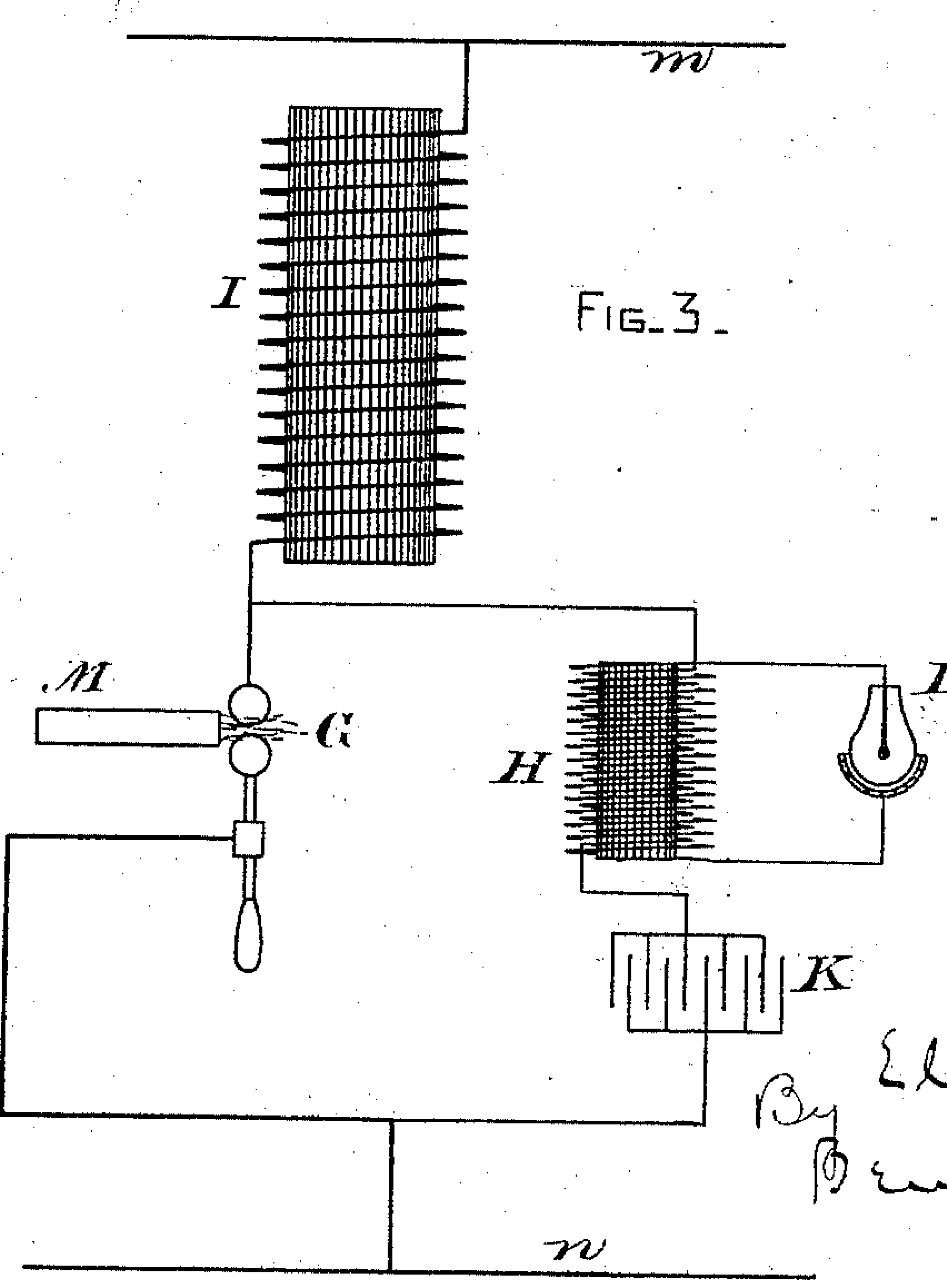
E. THOMSON.

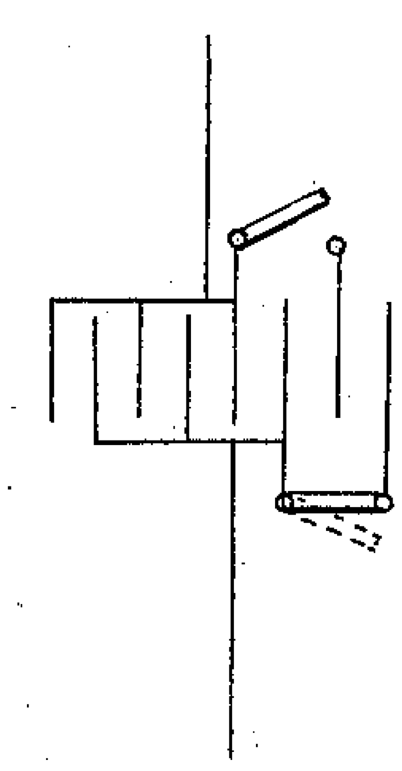
METHOD OF AND MEANS FOR PRODUCING ALTERNATING CURRENTS.

No. 500,630. Patented July 4, 1893.









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UNITED STATES PATENT OFFICE.

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METHOD OF AND MEANS FOR PRODUCING ALTERNATING CURRENTS.

SPECIFICATION forming part of Letters Patent No. 500,630, dated July 4, 1893.

Application filed July 18, 1892. Serial No. 440,698. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, in the county of Essex and State of Massachusetts, have invented a certain new and useful Improvement in Methods of and Means for Producing Alternating Electric Currents, of which the following is a specification.

The present invention relates to methods of and apparatus for obtaining alternating currents from a continuous current source or from a source in which the currents are intermittent or from a source in which the potential is sustained during a period more or less great.

My invention is applicable particularly to obtaining currents of and effects of high frequency alternations from continuous current lines or sources. The frequencies obtained can be adjusted or varied. Thus from a five hundred volt supply circuit I may obtain alternating current effects the frequency being, say, ten thousand, twenty thousand, thirty thousand, fifty thousand per second, or more. I may also obtain inductively from the alternating currents of a desired frequency, other alternating currents (by transformers or condensers in the ordinary way), and may employ such currents for any such purposes for which alternating impulses are applicable.

In Figure 1 is a diagram showing the features of my invention. Fig. 2 is another diagram showing some additional features. Fig. 3 shows a slight modification of Fig. 2. Fig. 4 is a diagrammatic representation of a variable condenser.

Briefly, in my invention I either make use of a line conveying continuous currents tending to constant value, or preferably, I employ a branch from a constant potential main and in that branch or in the continuous current circuit insert a discharger with small spark gap shunted by a condenser, and in the shunt, in branch around the discharge gap, I insert a coil or portion of the circuit having self-induction more or less great according to the conditions to be fulfilled. If the circuit is a constant current circuit, it is preferable that such circuit have a large self-induction, and if it is a branch from a constant potential main it should in like manner have a large self-induction obtained, for example, by inserting a coil of many turns surrounding a large iron core.

In Fig. 1, *m n* may represent mains or wires from a source at a difference of potential of, say, five hundred volts. The circuit connecting them includes at I a coil of many turns wound upon an iron core preferably of iron wire or laminated iron.

At G is a discharger consisting of two balls or terminals of brass or other such metal, the distance between which can be adjusted.

At K is a condenser the capacity of which may be made variable and the connection to which may be said to be shunt to the gap G.

At H, if desired, is included a coil of more or less turns or of more or less self-induction, in circuit with condenser K around the gap G.

At M is represented a powerful magnet which is not always, however, necessary, but the purpose of which is to break any arc between the balls at G. It may sometimes be replaced by an air jet.

To operate the apparatus, the balls at G are first made to touch or a switch around them might be arranged to complete the circuit. Then the balls are separated or the switch opened, and with an adjustment of the gap at G so as to obtain between the balls an apparently continuous discharge. A little care in the adjustment soon determines a condition of charge and discharge of the condenser K, as follows: The separation at G tends to stop current passing thereat and to divert it to the condenser K, and while this is charging the arc or spark is extinguished at G as the self-induction I has limited the current from increasing to an amount sufficient to keep up the discharge at G while still charging the condenser K. The charging of the condenser K takes place in a very short space of time and is attended with such an increase of potential from its two sides that, owing to the self-induction tendency or constancy of the feeding current, a spark or discharge again leaps at G, and the condenser at once discharges. The rupture of the spark or arc at

G follows immediately, the condenser again charges, accumulates a potential sufficient to to leap again, and so on.

It will be seen that that portion of the circuit represented by $b\ b$ will, during the action just described, be subjected to alternations of current as will also that portion H which represents a self-induction or coiled portion. Unless the capacity of condenser K be relatively very great or the self-induction of H be very great, these alternations or impulses will be of extreme rapidity, and I have obtained easily frequencies of thirty thousand or forty thousand so far as can be discovered by estimation. Self-induction at I should be as great as easily obtained, as its purpose is to practically make the branch $m\ n$ a branch of continuous constant current by resisting sudden changes in the value of the current flowing. It will be evident that the coil H might be wound parallel to another coil and both made to include a fine iron wire core or left without a core, and that the alternations in H would inductively produce corresponding alternations in the coil parallel to it. In Fig. 2 this modification is shown and the terminals T T′ are those of a secondary coil wound in inductive relation to H, and the relation of the turns may be as desired for increasing or decreasing the potential. They are assumed to increase the potential and give rise to a high frequency discharge at high potentials between the terminals T T′. The arc rupturing magnet M is shown as an electro magnet energized by a source of current, as at B.

In Fig. 3 the discharge terminals T T′ are dispensed with and are replaced by one or more lighting appliances L adapted to the use of high frequency discharges. The device may typify any working device through the agency of which the alternating currents are utilized. The periodicity or frequency of the alternating discharges will be governed by the capacity of the condenser K, the self-induction in circuit with it as H, and the spark length G, assuming that the self-induction at I is sufficient to practically maintain the constant current flowing in the feeding circuit, which feeding circuit, as stated before, might be a constant current circuit in which a current cannot be greatly diminished suddenly without an enormous rise of potential at that portion of the circuit, where opposing effects tending to cut down the current, are present.

What I claim as new, and desire to secure by Letters Patent, is—

1. The method of producing alternating currents or discharges, consisting in establishing a circuit of high self-induction, effecting a rupture of said circuit between suitable closely approximated terminals, and diverting said current into a shunt containing a condenser, whereby the current will be again established between the aforesaid terminals, substantially as set forth.

2. The method of producing alternating currents or discharges, consisting in establishing a circuit of constant current tendency, effecting a rupture of said circuit at a spark gap, and diverting the current through a shunt containing a condenser, substantially as described.

3. The method of producing alternating currents or discharges, consisting in establishing a circuit of high self-induction and constant current tendency, rupturing said circuit at a spark gap, and shunting said current through a condenser, whereby the spark gap is again bridged by the current, substantially as set forth.

4. The method of producing alternating currents or discharges, consisting in establishing a circuit of high self-induction, rupturing said circuit at a spark gap, and diverting said current through a shunt containing a condenser and a self-inducing coil, substantially as described.

5. The method of producing alternating currents or discharges, consisting in establishing a circuit of high self-induction, rupturing said circuit at a spark gap, and shunting said current through a circuit containing a condenser and the primary coil of an inductorium, substantially as set forth.

6. The method of producing alternating currents or discharges, consisting in establishing a circuit of high self-induction, rupturing said circuit at a spark gap, and shunting said current through a condenser, and through a transformer, having translating devices in its secondary circuit, substantially as described.

7. The method of obtaining high frequency currents from continuous currents, consisting in establishing a circuit in which rapid current changes cannot easily take place, and rupturing said circuit at suitable terminals bridged by a condenser, with inductive devices or self-induction coils of wire in said bridge, the capacity and self-induction in such bridging path together with the spark gap or rupture distance being adjusted or adjustable, substantially as set forth.

8. The method of obtaining high frequency currents from continuous currents, consisting in establishing a circuit in which rapid current changes cannot easily take place, and rupturing said circuit by a magnetic field at suitable terminals bridged by a condenser, with inductive devices in said bridge, substantially as described.

9. The method of obtaining from continuous currents or currents tending, through self-induction or otherwise, to remain unchanged, or to resist sudden change of value, high frequency alternating currents of desired periodicity consisting in bridging by determinate capacity of condenser and a determinate self-induction coil or circuit, a spark gap in said continuous current circuit, said spark gap being adjusted and arranged so as to respond to the desired frequency, substantially as set forth.

10. The method of working translating de-

vices demanding high frequency alternating currents of any desired potential, consisting in establishing a secondary circuit for said translating devices in inductive relation to a primary circuit or coil which is in series with the condenser as a bridge or shunt around an adjustable spark gap in a circuit tending to constancy of current flow, or possessing a high self-induction for checking sudden changes of current value, as described.

In witness whereof I have hereunto set my hand this 13th day of July, 1892.

ELIHU THOMSON.

Witnesses:
JOHN W. GIBBONEY,
ALEC F. MACDONALD.