No. 607,177. Patented July 12, 1898.

T. B. KINRAIDE.

ELECTRIC BREAK AND INDUCTION APPARATUS.

(Application filed July 26, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

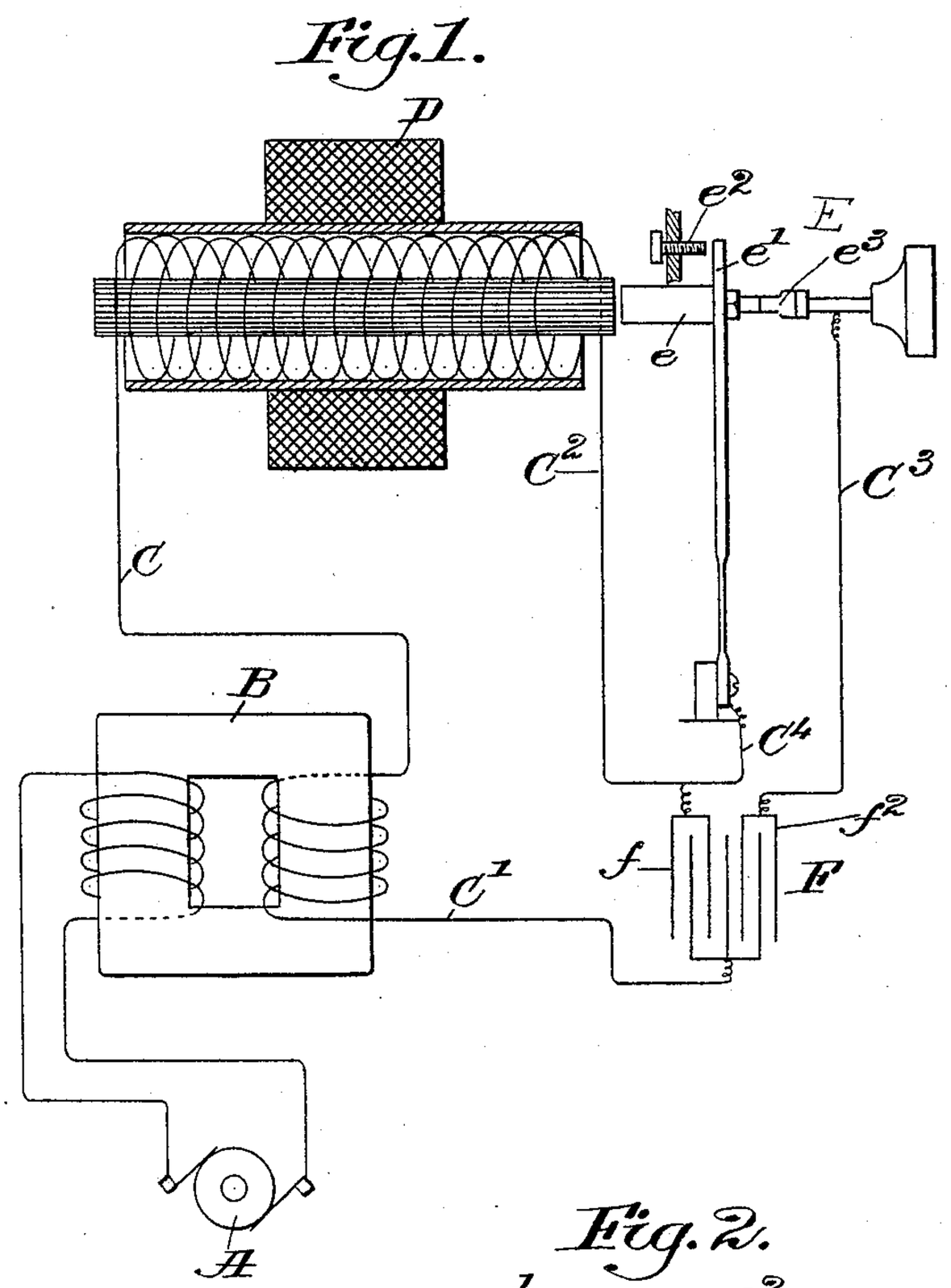


Fig. 2.ª

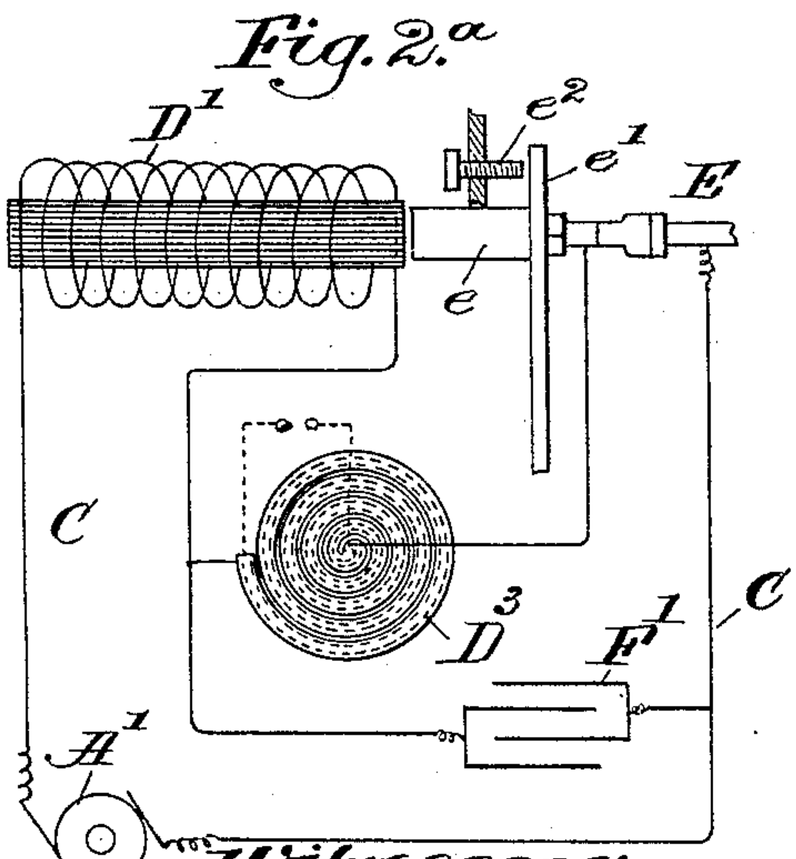
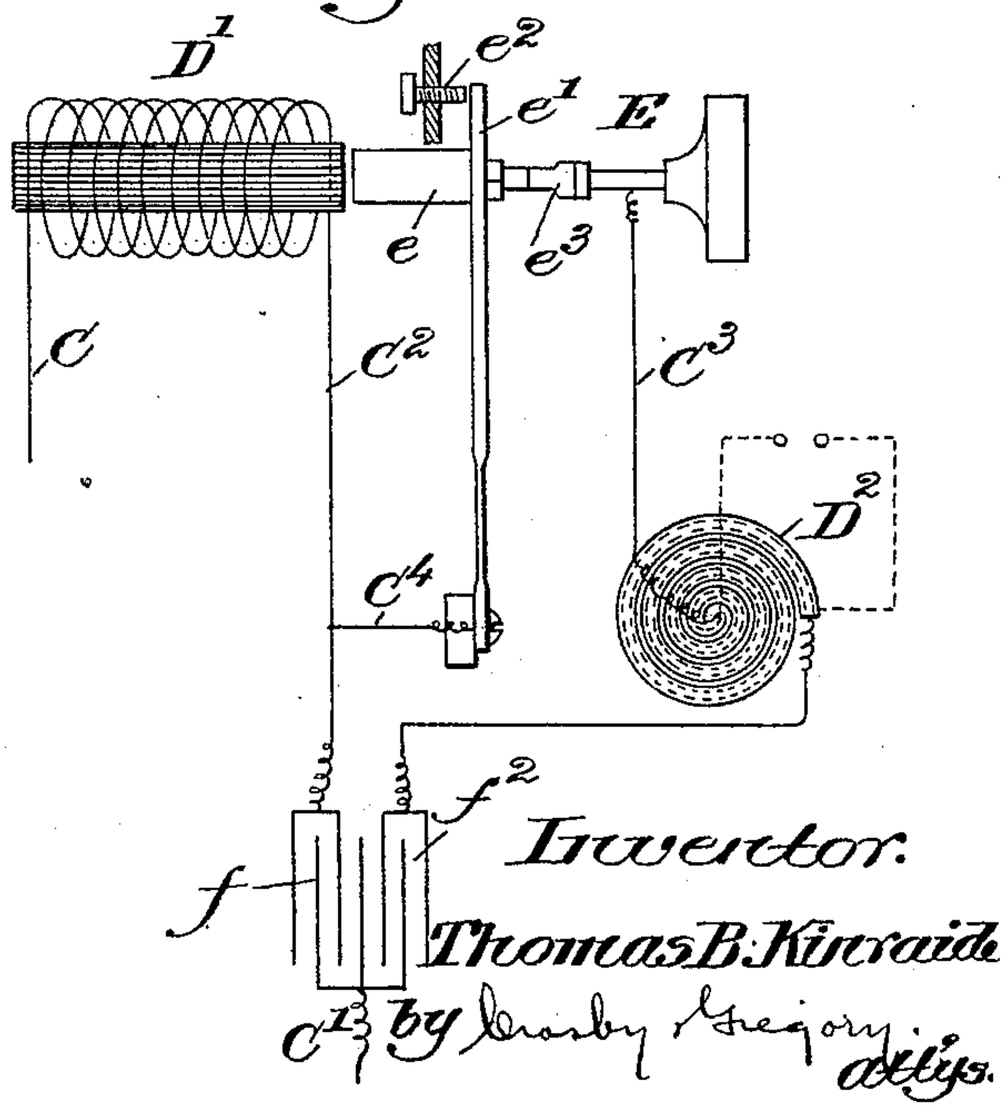


Fig. 2.



Witnesses:
A. C. Harmon
Thomas J. Drummond.

Inventor:
Thomas B. Kinraide
by Darby & Gregory
Attys.

No. 607,177. Patented July 12, 1898.

T. B. KINRAIDE.

ELECTRIC BREAK AND INDUCTION APPARATUS.

(Application filed July 26, 1897.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 6.

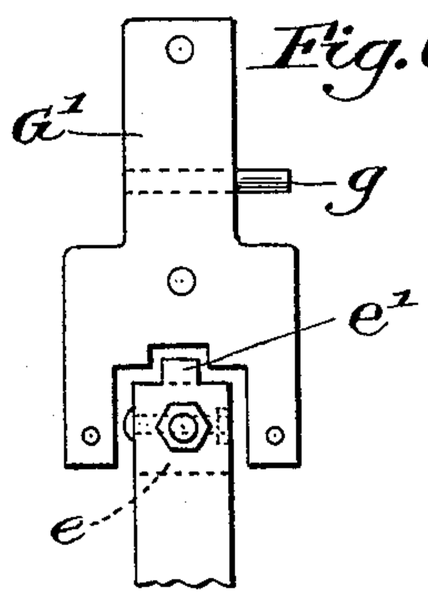


Fig. 4.

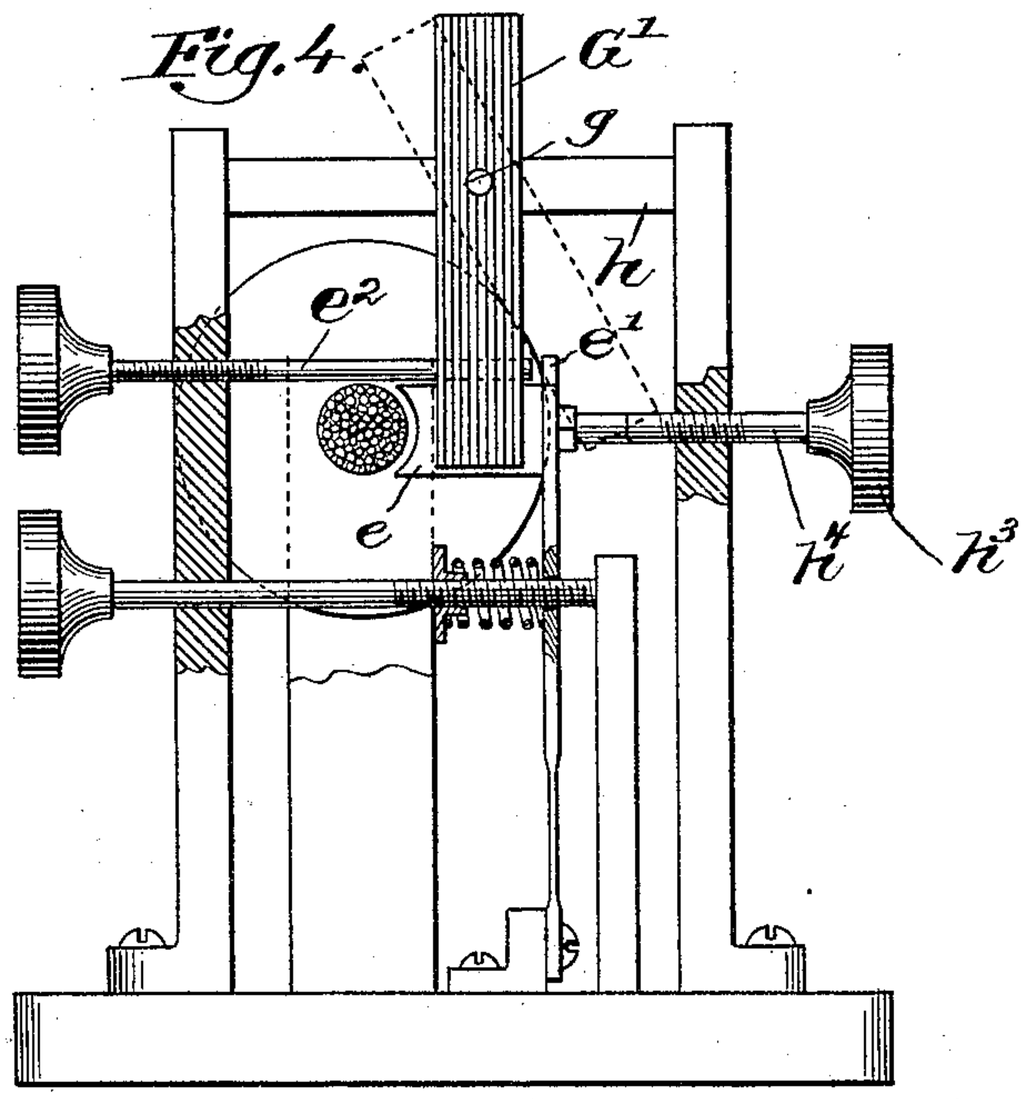


Fig. 8.

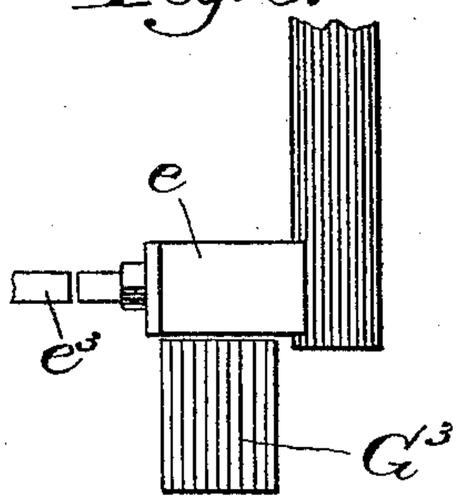


Fig. 3.

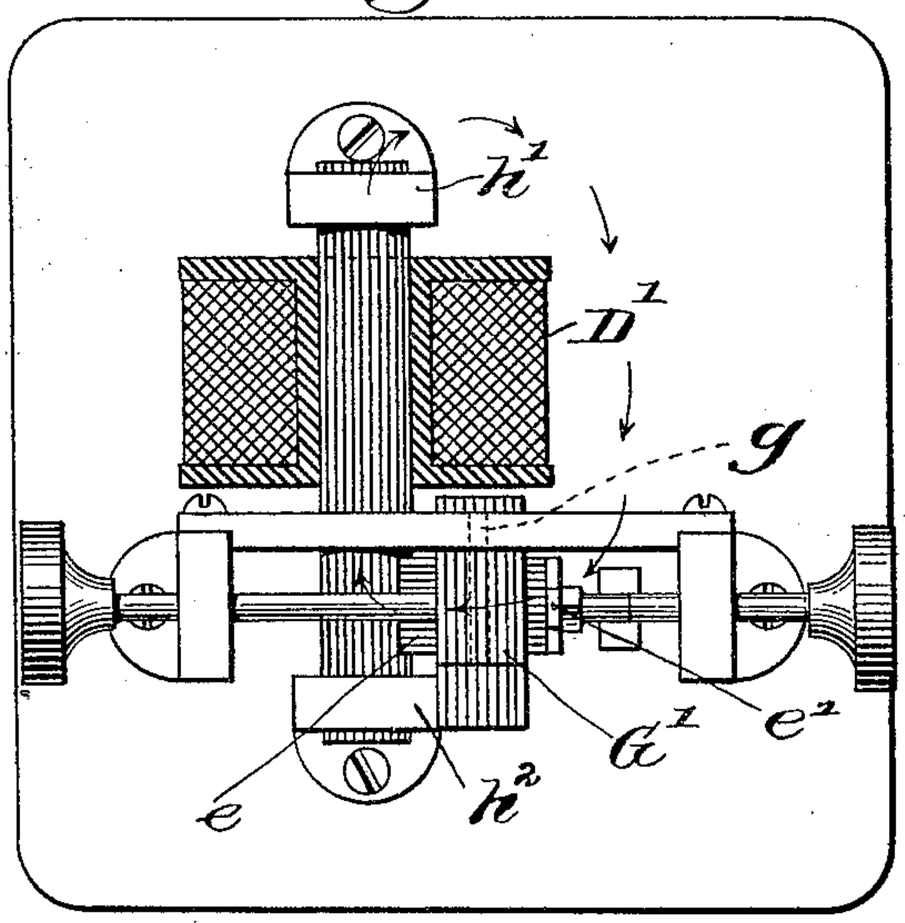


Fig. 7.

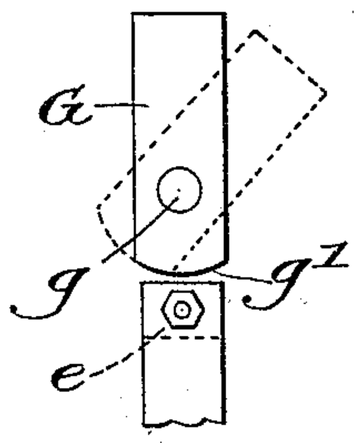
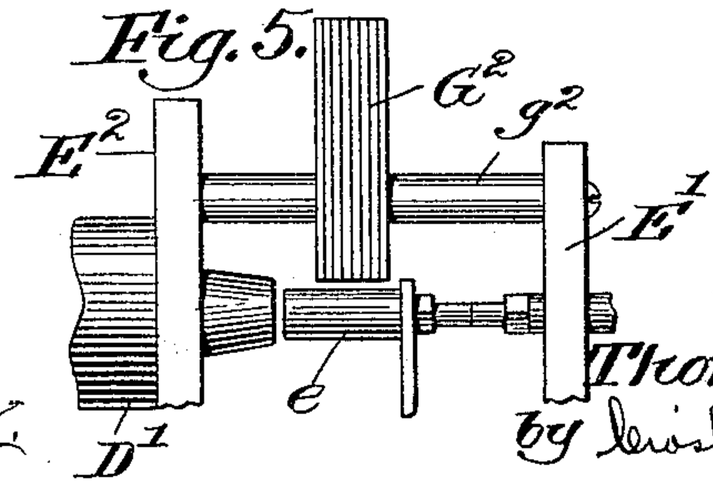


Fig. 5.



Witnesses:
A. C. Harmon.
Thomas J. Drummond.

Inventor:
Thomas B. Kinraide.
by Irwin & Gregory, attys.

UNITED STATES PATENT OFFICE.

THOMAS B. KINRAIDE, OF BOSTON, MASSACHUSETTS.

ELECTRIC BREAK AND INDUCTION APPARATUS.

SPECIFICATION forming part of Letters Patent No. 607,177, dated July 12, 1898.

Application filed July 26, 1897. Serial No. 645,880. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. KINRAIDE, of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in High-Speed Break and Induction Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention has for its object the provision of an improved break, particularly intended for use with induction-coils, and an improved means and method of operating the same.

In certain classes of electrical work it is of peculiar advantage to have the fluctuations of the inducing-current dropped with extreme suddenness from their maximum, so that instead of the usual sinusoidal curve the curve will present a series of gradual rises followed by abrupt drops in substantially vertical lines.

The details of my invention will be pointed out in the following description, reference being had to the accompanying drawings, and the invention will be more fully defined in the appended claims, also forming a part of this specification.

Figure 1 is a diagrammatic view of apparatus arranged in accordance with my invention. Figs. 2 and 2^a are similar views, respectively, of slightly-modified arrangements. Fig. 3 is a plan view of the preferred form of apparatus embodying my invention. Fig. 4 is a view in front elevation of the apparatus shown in Fig. 3, parts partly in section and partly broken away to expose the operating parts. Fig. 5 is a view of my "collector" applied to a well-known type of break. Figs. 6 and 7 are views of two forms of collector, that in Fig. 6 being of the preferred form shown in Figs. 3 and 4. Fig. 8 is a fragmentary detail in top plan, showing a rigid collector placed on the side of the hammer opposite the coil.

My invention is intended for use either with alternating or direct currents.

Referring to Fig. 1, it will be understood that A designates a usual alternating-electric-current dynamo. This is connected to a usual transformer B, and in the circuit C C′ thereof are included the induction-coil D, break E, and condenser F of my invention, which I will now explain. The induction-coil may be of any suitable kind desired. The primary of the latter instead of connecting directly to the main circuit at C′ is connected with one part f of a double condenser at C^2, the other part f^2 of said condenser having connection at C^3 with the break and through the latter with the part f thereof at C^4, the condenser F being connected at its opposite end to the main wire C′.

The principle of operation of my improved apparatus so far as explained may be briefly stated thus: When the break is closed, the full current passes through the induction-coil by reason of the fact that the condenser has both its parts f f^2 in closed circuit therewith, the part f being always in closed circuit, as described, and the part f^2 being in closed circuit through the connection C^3, the closed break, and the connection C^4. The core of the induction-coil is strongly magnetized upon the passage of this full current and immediately withdraws the hammer of the break from its anvil, so as to interrupt the current and thereby cut off that portion of it depending upon the part f^2 of the condenser. This causes at once a sudden drop in the inductive action of the coil.

It will be noted that the hammer e of the break is provided with means positively to limit its movement, said means being shown in the form of a projection e' coöperating with a stop e^2, preferably adjustable. (Indicated in Fig. 1 and shown more in detail in the preferred form of my apparatus shown in Figs. 3 and 4.) By reason of this stop the length of the spark-gap between the hammer e and its anvil e^3 is positively controlled, so that the time period of the interruptions may be regulated to the requirements for throwing the charged condenser f^2 into the circuit for discharging it at the proper moment to accelerate the inductive action of the primary.

In the figures last mentioned I show the preferred form of my break, in which it will be seen that the anvil is not at the end of the core, as is usual, but is at the side thereof, the core projecting from the coil sufficiently to enable this to be done. The reason for this is that I have found that by placing the hammer thus directly in the field of the great-

est number of lines of force the action of the apparatus is very materially improved, and in order to increase the frequency and to get rid of the heating thereof, so that the break can be extremely rapid, I have made the several parts thereof laminated, the core being preferably composed of a plurality of wires and the anvil of a number of plates secured together, although any other means of lamination is within my invention.

A further feature of my invention resides in providing a collector G for the lines of force to direct them upon the hammer, thereby enabling me to use a much smaller hammer than would otherwise be possible for the same effect.

When formed as illustrated in Figs. 3 and 4, the collector consists of a body of metal G', preferably soft steel or iron and preferably laminated, placed within the field of force of the coil and immediately adjacent the hammer, thereby presenting to the hammer a field of strong magnetic intensity, so that it is equivalent to making the hammer much larger, at the same time permitting a much smaller moving part than usual. Preferably this collector will be movable relatively to the hammer, so that its effect on the latter may be varied.

In Fig. 7 I have shown the collector G as pivoted at g and as having its lower end curved at g' adjacent the hammer e. By this provision it will be seen that the amount of current delivered through the break is readily controlled, inasmuch as the collector tends to gather in the lines of force and direct them to the hammer, so that if the collector is in the full-line position, Fig. 7, the greatest intensity will result, whereas if the collector is in its dotted-line position a less intensity will result, and this may be varied according to the position into which the collector is swung. The resultant effect upon the hammer is that it has an active or sluggish movement, according to the position of the collector.

When the collector is swung entirely away from the hammer, or in case it is omitted entirely, the tendency of the hammer is to lag or hang to the anvil as it is drawn away, whereas with the collector in its full-line position, as shown, the action of the break is short and quick.

In Fig. 5 I have shown one form of my collector as applied to a break having its hammer at the end of the core, the collector G^2 being therein shown as pivoted on a connecting or brace rod g^2 at the upper end of the posts E' E^2.

In Figs. 3, 4, and 6 I have shown the collector having a bifurcated end in order to encompass the hammer. In this case it will be understood that the regulator is composed of a plurality of pieces of metal stamped out and bound together to constitute its laminated body.

The configuration and position of the collector may be otherwise changed to include a greater or a fewer number of the lines of force or, indeed, the entire field, according to the effect it is desired to produce upon the hammer, one example being illustrated in Fig. 8, in which the collector G^3 is shown as mounted at the side of the hammer opposite the coil. With this construction whenever by the tearing off of small pieces of metal from the contact-points the break-gap is partially short-circuited when open the rapidly-increasing lines of force are so concentrated by the collector upon the hammer as to drag the latter sidewise toward the collector, thus overcoming the short circuit by shearing apart the fused particles and separating the points, the hammer then resuming its normal vibration.

In Fig. 2 I have shown another means of connecting the parts, D' indicating a solenoid for the purpose of drawing back the hammer of the break E, and an induction-coil being shown as interposed between the break and the part f^2 of the condenser, a flat coil, such as I have shown in my application Serial No. 636,293, being herein shown as preferred for this purpose, D^2 indicating the primary, and the secondary being shown by dotted lines. It will be understood that when the break is interrupted with a short spark-gap an extremely rapid oscillation takes place between the two parts f f^2 of the condenser F, and this effects an extremely rapid rise and fall of potential in the coil D^2, thereby producing a very efficient inductive action.

In Fig. 2^a I have shown an embodiment of my invention arranged for use with a direct current. In this construction the solenoid D' operates the automatic break E, the latter having a stop e^2, as before and for the same purpose. When the attraction of the solenoid opens the break, the condenser F' is rapidly charged and discharged with very high potential from the self-induction of the solenoid D' through the coil D^2, then in series circuit with the condenser. By this means I am enabled to use a direct current with a high-efficiency induction apparatus operated by or in connection with a vibrator-break.

My object in general is to increase the efficiency of induction apparatus or oscillators used in connection with breaks of the vibrator class.

The above-described improvements of the break or interrupter give it much sharper and improved action as well as increased speed, and the method and means of operating an induction apparatus therewith or therefrom increase the extent or range of the fluctuations, giving the sharp drop from the top of the wave before mentioned, together with increased rapidity. The two parts f f^2 of the condenser may be separated provided the part f is in the closed circuit and the part f^2 is in an interrupted circuit, as before explained. Moreover, my invention enables the operator readily to control the apparatus and the character of the inductive action.

The invention is not restricted in anywise to the embodiments herein presented, as various changes are within the scope thereof, and it is not otherwise limited than as defined in the following claims.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with an electric break having an electromagnet, an anvil, and a vibrating hammer, of a collector to concentrate the lines of magnetic influence on said hammer, substantially as described.

2. The combination with an electric break having an electromagnet, an anvil, and a vibrating hammer, of a collector to concentrate the lines of magnetic influence on said hammer, and means to vary the position of said collector relatively to said hammer, substantially as described.

3. The combination with an electric break, having an electromagnet, an anvil, and a vibrating hammer, of means to shear or drag sidewise the hammer from the anvil whenever the break-gap between the hammer and anvil is partially short-circuited by the fusing or clinging of the metal at the contact-points, substantially as described.

4. An electric break of the vibrator class, provided with a hammer composed of laminated material, substantially as described.

5. In an electric break, a core, hammer, and collector, to concentrate the lines of magnetic influence on the hammer, said collector being composed of laminated material, substantially as described.

6. The combination with an electric break, having an anvil and a vibrating hammer, of a positive stop to limit and positively stop the movement of the latter from the anvil, substantially as described.

7. The combination with an electric break, having an anvil and a vibrating hammer, of a positive stop to limit and positively stop the movement of the latter from the anvil, and means to adjust said stop, substantially as described.

8. The combination with a break, having an anvil, a vibrating hammer, and a positive stop for the latter, of a condenser interrupted by said break, and an induction-coil in series circuit therewith, substantially as described.

9. The combination with a break, having an anvil, and a vibrating hammer, of an electric circuit operating the same and interrupted thereby, an induction apparatus in said circuit, and a condenser having independent connections to said anvil and said hammer, substantially as described.

10. The combination with an electric circuit, including an induction apparatus, and an interrupter, of a double condenser also in said circuit, said induction apparatus having continuous connection with one part of said condenser and interrupted connection with the other part of the condenser, substantially as described.

11. The combination with an electric circuit, including an induction apparatus, and an interrupter including a hammer and anvil, of a double condenser also in said circuit, said induction apparatus having continuous connection with one part of said condenser and interrupted connection with the other part of the condenser, and means to regulate the movement of said hammer so as to bring the discharge of the said interrupted part of said condenser into synchronism with the period of said circuit, substantially as described.

12. The herein-described method of operating an induction apparatus in a system including said induction apparatus, an interrupter, condenser, and source of electric energy, said method consisting of energizing the induction apparatus from said source of energy in connection with said condenser, and when the wave is at its extreme fluctuation, cutting out the condenser, substantially as described.

13. The herein-described method of operating an induction apparatus in a system including said induction apparatus, an interrupter, condenser, and source of electric energy, said method consisting of energizing the induction apparatus from said source of energy in connection with said condenser, and when the wave is at its extreme fluctuation, cutting out the condenser the induction apparatus being then in direct circuit with the source of energy, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS B. KINRAIDE.

Witnesses:
GEO. H. MAXWELL,
JOHN C. EDWARDS.