No. 607,176. Patented July 12, 1898.

T. B. KINRAIDE.

ELECTRIC BREAK FOR INDUCTION COILS.

(Application filed Feb. 26, 1897.)

(No Model.)

Fig. 1.

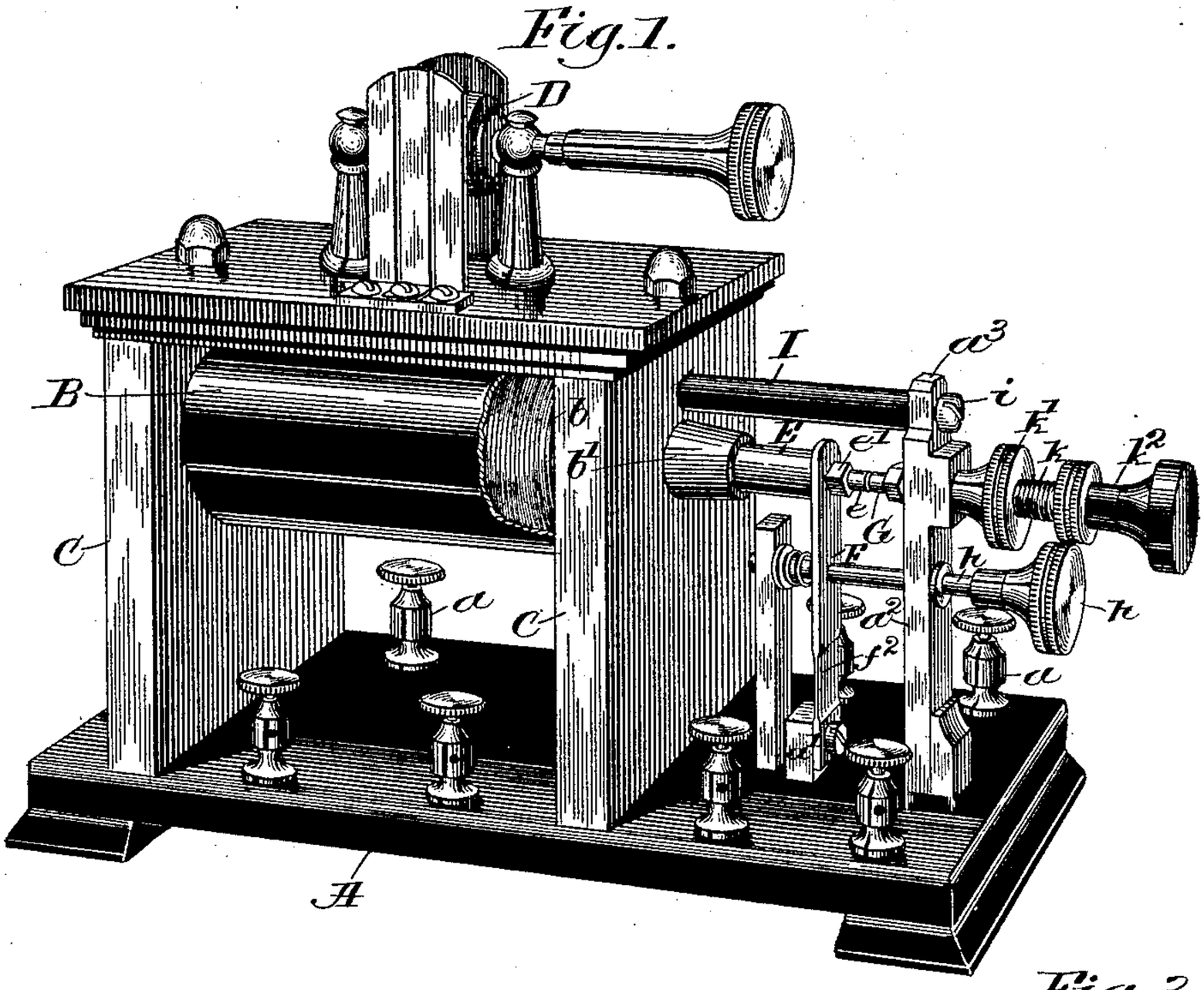


Fig. 2.

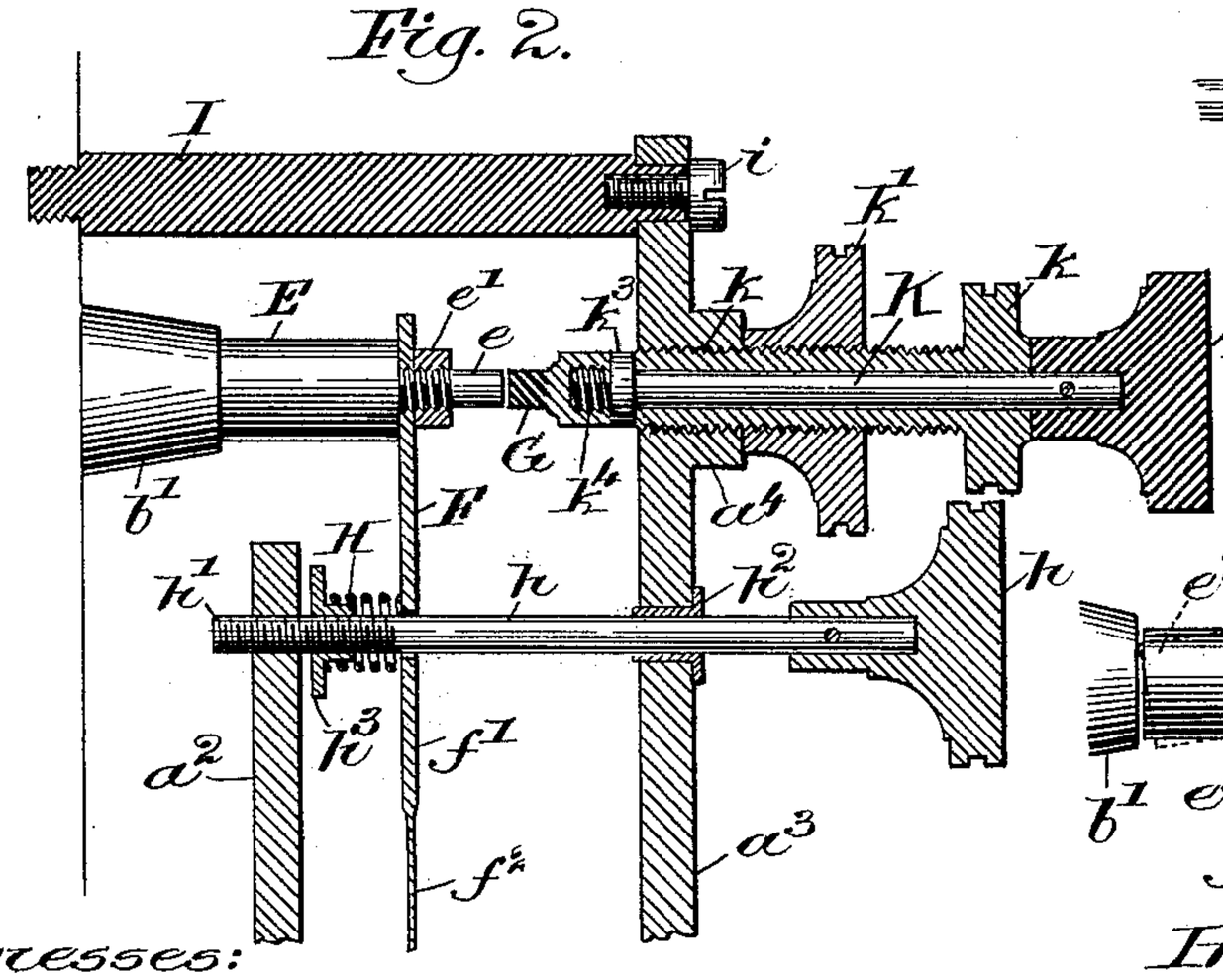


Fig. 3.

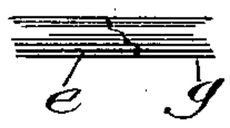
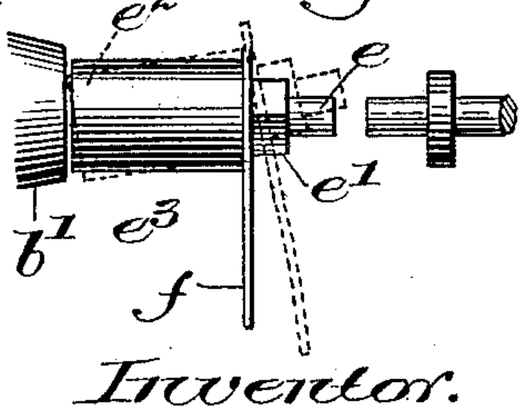


Fig. 4.



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ELECTRIC BREAK FOR INDUCTION-COILS.

SPECIFICATION forming part of Letters Patent No. 607,176, dated July 12, 1898.

Application filed February 26, 1897. Serial No. 625,173. (No model.)

To all whom it may concern:

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

It is the object of my invention to provide an improved automatic break or interrupter for electric currents, my invention being particularly adapted for use in interrupting the primary current of induction-coils in connection with X-ray and kindred apparatus.

My invention secures high speed and accuracy of break, the successive breaks being rendered similar and synchronous, provides uniformity of wear of the make-and-break contacts, cures the irregularity and unsteadiness of the current hitherto so objectionable, and gives uniform action of both current and apparatus under different resistances, besides simplifying and prolonging the life of the instrument. As heretofore constructed these instruments have had a break-hammer carried on the free end of an ordinary leaf-spring vibrating between the core end of an electromagnet and a small contact or anvil, the latter being mounted on the end of an adjusting-screw in the free end of a post or standard. One serious drawback to these instruments has been that the speed of interruption—*i. e.*, the speed of the vibrations of the hammer—has been quite limited and there has been an unevenness of break. I have found that these faults are due to a compound vibration of the instrument, which tends to hasten some of the breaks and to retard others, and I have further found that this "compound vibration," as I call it, may be obviated and that high speed may be attained and accurate breaks secured by providing an absolutely rigid and unyielding post or standard. As a result of this feature of my invention the objectionable inaccuracy and unevenness of the breaks or interruptions disappear and a nicety of adjustment and compensation is feasible, which would not otherwise be possible. A further objection to the present old style of instrument above mentioned is that as the tension of the spring-vibrator is increased to vary the electrical resistance of the break the sparking of the instrument is increased, the current being also otherwise rendered irregular and uncertain, and I have discovered that this is due to the fact that in the adjustment of the vibrator the hammer is thrown more or less out of alinement with the core end and anvil. It is therefore one chief feature of my invention to provide means to maintain the hammer in proper accurate alinement with its core and anvil. Again, irregularity and unsteadiness of current are due to the uneven wear of the contacting surfaces of the hammer and anvil, the intense heat of the constant arcing serving to fuse and batter down the said surfaces unevenly; and therefore I have mounted one of these surfaces on a rotatable spindle, so that the irregularities thereof may be automatically removed or obviated by rotating it as the hammer is vibrated.

Various other advantages and features of improvement of my invention, as well as the details of construction thereof, will appear in the course of the following description, reference being had to the accompanying drawings, illustrative of the preferred embodiment thereof.

In the drawings, Figure 1 is a perspective view of an automatic break or interrupter provided with improvements of my present invention. Fig. 2 is an enlarged central vertical section of the right-hand end of Fig. 1, showing the details of construction thereof more fully. Fig. 3 is a view showing how the contacting surfaces fuse into one another in instruments as heretofore constructed. Fig. 4 illustrates one of the objectionable features of the old-style instruments.

On a suitable base A, provided with the requisite complement of binding-posts *a*, is mounted in a jacket B a usual electromagnet *b* in a frame C, the latter also carrying a switch D, all of usual or preferred construction.

A hammer E, carried by a vibrator F, reciprocates between the core end *b'* and an anvil G, being shown as provided with a reduced end *e*, screw-threaded and held rigidly on the vibrator by a check-nut *e'*. Hereto-

fore this vibrator has been a leaf-spring *f*, as indicated in Fig. 4, this spring being deflected more or less to the right as it is desired to increase the electrical resistance offered by the hammer, the result being as shown in exaggerated form in Fig. 4, where it appears that the spring *f*, when deflected to its dotted position, inevitably upsets the hammer, so that the latter, when attracted to the core *b'*, strikes the latter with its upper edge e^2 only, thereby increasing the resistance entirely out of proportion to that intended and tending to burn or fuse down the small point of contact e^2, also leaving a spark-gap e^3, tending to ruin the hammer. The disastrous effects at the opposite end of the hammer are of the same sort, the difference being that, the contact-surfaces being smaller and composed of platinum, it is still more serious.

I make the vibrator F rigid and unyielding for most of its length, as shown at *f'*, a short resilient section f^2 being preferably provided at its lower end next to the stud *a'*, to which it is shown as fastened, and the necessary tension being secured by means of an auxiliary or tension spring II, carried on the shank of an adjusting-screw *h*, working at its threaded end *h'* in a post a^2 and journaled at h^2 in the standard a^3. An adjustable thumb-nut h^3 receives one end of the spring II, the opposite end bearing against the vibrator F, which rides loosely over the screw-rod *h*. This is merely a preferred form of mechanism for accomplishing my object. By turning the screw *h* to the right or left the spring II is correspondingly relaxed or tightened, thereby tending to move the vibrator F bodily forward to a greater or less extent to increase the number of amperes or quantity of current transmitted, and it will be noted that the hammer does not depend on the vibrator for its tension or resistance, but rather on the independent spring II, which bears centrally forward against the vibrator, the yielding section f^2 flexing readily enough to permit the required movement forward of the rigid portion *f'*.

The interruptions of the electric current are required to be so frequent for efficient work that the very slightest disturbance is exceedingly objectionable. The breaks should produce a note of two hundred and fifty vibrations per second at least, and these should be even or accurate and synchronous. Accordingly I have rendered the standard a^3 absolutely rigid and non-vibrant, finding as a result that the accuracy of break which is sought is thereby attained and that the speed or note of vibration is raised. I prefer to render the standard thus rigid by interposing a bar or brace I of insulating material between the frame C and standard a^3, this bar being shown as screwed into the frame and held rigid in the standard by a set-screw *i*. Various other means for the purpose may be employed, the requirement being to prevent the standard, and hence the anvil, from being responsive to the vibrations of the hammer, and thereby occasioning a compound or confused vibration or interruption of the current.

Referring now to the third feature of my invention, it will be understood that as the hammer end *e* is pulled away from the anvil G an arc is formed which fuses a slight portion of the opposing surfaces, and as the breaks are rapid these surfaces, although platinum, are quickly rendered uneven, so that in the old construction, in which the anvil was carried fixedly on the end of its adjusting-screw, the surfaces would fuse into each other disastrously, as shown in Fig. 3, where *e* designates the hammer and *g* the anvil. Accordingly I provide means to relatively rotate the meeting surfaces of the anvil and hammer independently of the rotations due to the adjustments of said parts, the said means being herein shown as preferably consisting of a freely-rotatable spindle K, centrally mounted in a hollow adjusting-screw *k*, having threaded engagement with an extended bearing a^4 in the standard a^3, being fixed in its adjustments by a check-nut *k'*. The spindle K is rotated by a thumb-wheel k^2, pinned on its outer end, and is held against longitudinal movement by a collar k^3, fixed near its inner end to abut against the inner end of the screw-carrier *k*. The spindle is threaded at k^4 to receive the anvil G, the latter being shown in the form of a threaded cap provided with the desired platinum contact, the platinum being soldered thereon, as indicated in heavy section-lines, Fig. 2. The collar k^3 and anvil are made of a size to permit them to be withdrawn, together with the adjusting-screw *k*, as the latter is screwed back out of the standard a^3.

In practice the operator will slightly rotate the anvil occasionally, so as to change its relative position to the hammer, thereby changing the fused and fusing places and maintaining the surfaces even and comparatively smooth. The result is that the points of contact wear uniformly and the irregularities and unsteadiness of current produced by the old construction are cured.

It is understood that as the platinum points wear and fuse away the anvil is nicely adjusted forward by its screw-carrier *k* to compensate therefor. Under the old construction, however, where the anvil *g* was fixed on the adjusting-screw, the surfaces would wear unevenly, as explained, and as shown in Fig. 3, and then when it became necessary to adjust the anvil forward it would be impossible, because it would be found that the surfaces had become more or less interlocked, thereby preventing any relative rotation thereof, the result being that the apparatus was rendered useless until the anvil had been removed and the contacting surfaces carefully filed down accurately, not only entailing loss of time but loss of the platinum.

According to my invention the adjusting

movement is entirely independent of any rotation of the anvil.

While I have endeavored above to describe the details of the mechanism in which I have embodied my invention, I wish it distinctly understood that these are not of the essence of my invention, being merely preferred embodiments thereof, and that many other means may be employed within the spirit and scope of my invention.

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

1. A high-speed break, comprising a coil and its core, an anvil in electric circuit with said coil, a standard supporting the anvil, and a vibrating hammer in and interrupting said circuit and vibrating between said core and anvil, combined with means substantially as described to prevent compound vibrations of said anvil and hammer, for the purpose set forth.

2. In a high-speed break, the combination with a vibrating hammer, and an anvil, of a standard supporting said anvil, and a brace rigidly secured between said standard and the frame of the break, substantially as described.

3. In a high-speed break, having a hammer vibrating between a core end and an anvil, means to vary the vibrating resistance of said hammer, and means to maintain said hammer in approximately unvarying end alinement with said core end and anvil, substantially as described.

4. In a high-speed break, a hammer, a vibrator supporting the same, and an adjustable tension device to vary the resistance of said hammer, said vibrator having an extended rigid portion extending from said hammer, substantially as described.

5. In a high-speed break, a hammer, a vibrator supporting the same, and an adjustable tension device to vary the resistance of said hammer, said vibrator having an extended rigid portion extending from said hammer and being provided at its opposite end with means to permit said rigid portion to be deflected slightly, substantially as described.

6. In a high-speed break, the combination with a hammer, of a rigid vibrator, means permitting the latter to move laterally, a tension-spring engaging said rigid vibrator, and means to adjust said spring, substantially as described.

7. In an electric break, having a hammer vibrating against an anvil, and means to adjust the latter, means to rotate said anvil independently of its said adjustment, substantially as described.

8. In an electric break, the combination with a hammer, its anvil, and a hollow adjusting-screw for the latter, of a spindle carrying said anvil and rotatably mounted therein, substantially as described.

9. The herein-described anvil, the same consisting of an interiorly-threaded cap, and a centrally-extended platinum contact integrally secured thereon, 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:
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