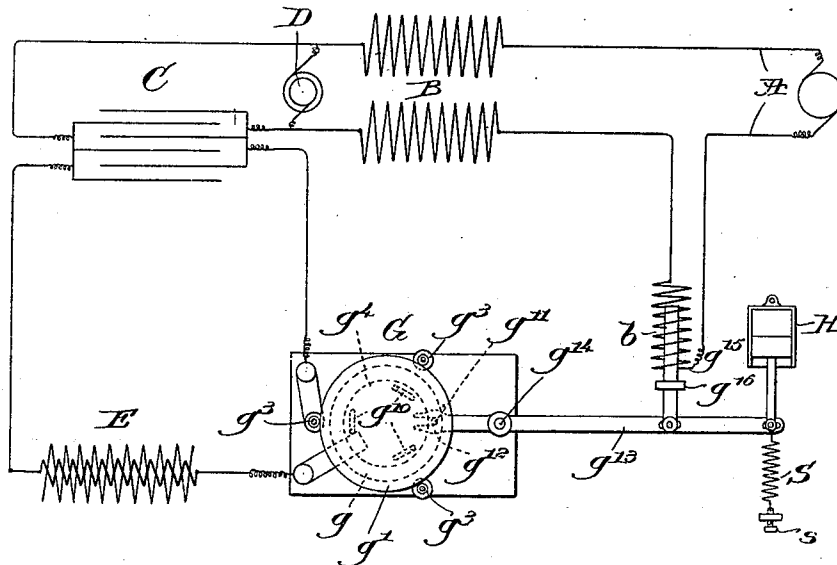


No. 684,828.

Patented Oct. 22, 1901.

T. B. KINRAIDE.
SPARK GAP REGULATOR.
(Application filed Mar. 5, 1901.)

(No Model.)



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UNITED STATES PATENT OFFICE.

THOMAS B. KINRAIDE, OF BOSTON, MASSACHUSETTS.

SPARK-GAP REGULATOR.

SPECIFICATION forming part of Letters Patent No. 684,828, dated October 22, 1901.

Application filed March 5, 1901. Serial No. 49,702. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. KINRAIDE, a citizen of the United States, residing at Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Spark-Gap Regulators, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention is an automatic regulator for a spark-gap, and is particularly intended for regulating such a spark-gap as is shown in my United States Patent No. 623,318, dated April 18, 1899. The spark-gap shown in the said patent comprises two plates or opposite parallel discharge-surfaces and means for moving one of said plates toward and from the other, said means being operated by a hand-lever horizontally pivoted at one side of the spark-gap, so that upon turning said lever in one direction the air gap or dielectric will be lessened and by turning said lever in the opposite direction it will be increased. This spark-gap has proved to be an exceedingly important piece of apparatus in the high-potential system set forth in my Patent No. 623,316, granted April 18, 1899; but on account of the continual oxidation of the adjacent surfaces of the plates in operation the amperage-discharge, which it is one purpose of this device to keep uniform, is liable to vary, due to the changing resistance caused by said oxidation. Accordingly it has been necessary for the operator to keep constant watch of the apparatus and maintain the plates at proper distances by continual shifting of the regulating-handle, which, however, is not only laborious, but cannot be performed manually with the exactness often necessary.

Accordingly it is the object of my present invention to provide an automatic means for maintaining the spark-gap regular in action according to the operation of the system, said regulator being automatically operated by the current of the general system, so that any change in the latter will instantly effect the requisite change in the spark-gap in order to maintain the discharge uniform.

The constructional details of my invention

will appear more fully in the course of the following detailed description, reference being had to the accompanying drawing, in which I have illustrated a preferred form of my invention, and the latter will be more particularly defined in the appended claims, also forming a part of this specification.

In the drawing I have shown my invention partly diagrammatically and largely in top plan view.

As already intimated, my invention relates particularly to the spark-gap, but also becomes an important part of the aforesaid system.

In the drawing the main circuit or conductor is indicated at A, containing in series an inductance-coil B, condenser C, interrupter D, induction-coil or other translating device E, and spark-gap G, the latter comprising, as is stated more fully in my first-mentioned patent, lower and upper plates g g' , the upper plate g' resting on adjustable supports g^8 , and the lower plate g resting on a support g^4 , carried by rocking struts g^{10} . The plate g has a depending pin g^{11} , engaged by the bifurcated end g^{12} of a regulating-arm g^{13} , pivoted at g^{14} , all as contained in said patent. The arm g^{13} is prolonged and is provided with a core g^{15} or armature g^{16} , or both, arranged to be attracted by a coil or solenoid b in series with the main line A. The auxiliary coil b is preferable, and I deem it essential with alternating currents, although the attractive influence of the main current may be obtained in various other ways. In connection with the attractive influence of the coil b I provide a dash-pot or other device H, and a regulating-spring S, controlled by any suitable means, as by a thumb-screw s , operating in opposition to the coil b .

It will be understood that many changes and substitutions within the well-known range of mechanical and electrical equivalents may be resorted to within the spirit of my invention.

The operation of my improved apparatus and system is as follows: When the current is passing normally through the line A, coil B, and discharging from the condenser C across the spark-gap at the amperage and voltage and with the regularity for which the spark-

gap and apparatus have been adjusted, the parts remain uninfluenced by the regulator, the spring S and action of the coil B serving to neutralize the effects of each other at such
 5 times and maintain an equilibrium. If, however, an increased current or discharge should for any reason occur, the solenoid *b* will instantly attract the lever *g*¹³, thereby opening the spark-gap, said movement, however, being
 10 retarded by the dash-pot, which serves thereby to prevent an undue opening of the spark-gap, which would otherwise occur. When the current falls and would, therefore, produce an opposite irregularity in the
 15 discharge action at the spark-gap, the attractive influence of the solenoid is lessened, thereby permitting the spring S to move the lever *g*¹³ so as to close or lessen the gap between the plates *g g'*. In this manner the ac-
 20 tion of the inductance-coil and condenser are maintained in normal coöperation, or, in other words, the condenser is caused invariably to discharge at the precise maximum charge for which the spring S, coöperating with the ar-
 25 mature of the solenoid, is set.

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

1. In a system of the kind described, includ-
 30 ing a main-line conductor, condenser, spark-gap, and translating device arranged in series, means actuated by the current of said main-line conductor for automatically maintaining said spark-gap set for a given discharge.
- 35 2. In a system of the kind described, a main-supply circuit, a condenser charged therefrom, and a spark-gap consisting of opposite parallel discharge surfaces or plates, movable toward and from each other, means

for governing the distance apart of said plates, 40
 and a solenoid in series with said supply-circuit for automatically controlling said governing means.

3. A spark-gap comprising opposite discharge-plates, movable toward and from each 45
 other, a lever for thus moving said plates, a circuit for supplying the current to be discharged by said plates, a coil in said circuit, means connected with said lever to be at-
 50 tracted by said coil, and regulating means tending to move said lever in opposition to the attraction of said coil.

4. A spark-gap comprising opposite discharge-plates, movable toward and from each 55
 other, a lever for thus moving said plates, a circuit for supplying the current to be discharged by said plates, a coil in said circuit, means connected with said lever to be at-
 60 tracted by said coil, regulating means tending to move said lever in opposition to the attraction of said coil, and an adjusting device for adjusting said regulating means.

5. A spark-gap comprising opposite discharge-plates, movable toward and from each 65
 other, a lever for thus moving said plates, a circuit for supplying the current to be discharged by said plates, a coil in said circuit, means connected with said lever to be at-
 70 tracted by said coil, and means for retarding the action of said lever.

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,
 GEO. W. GREGORY.