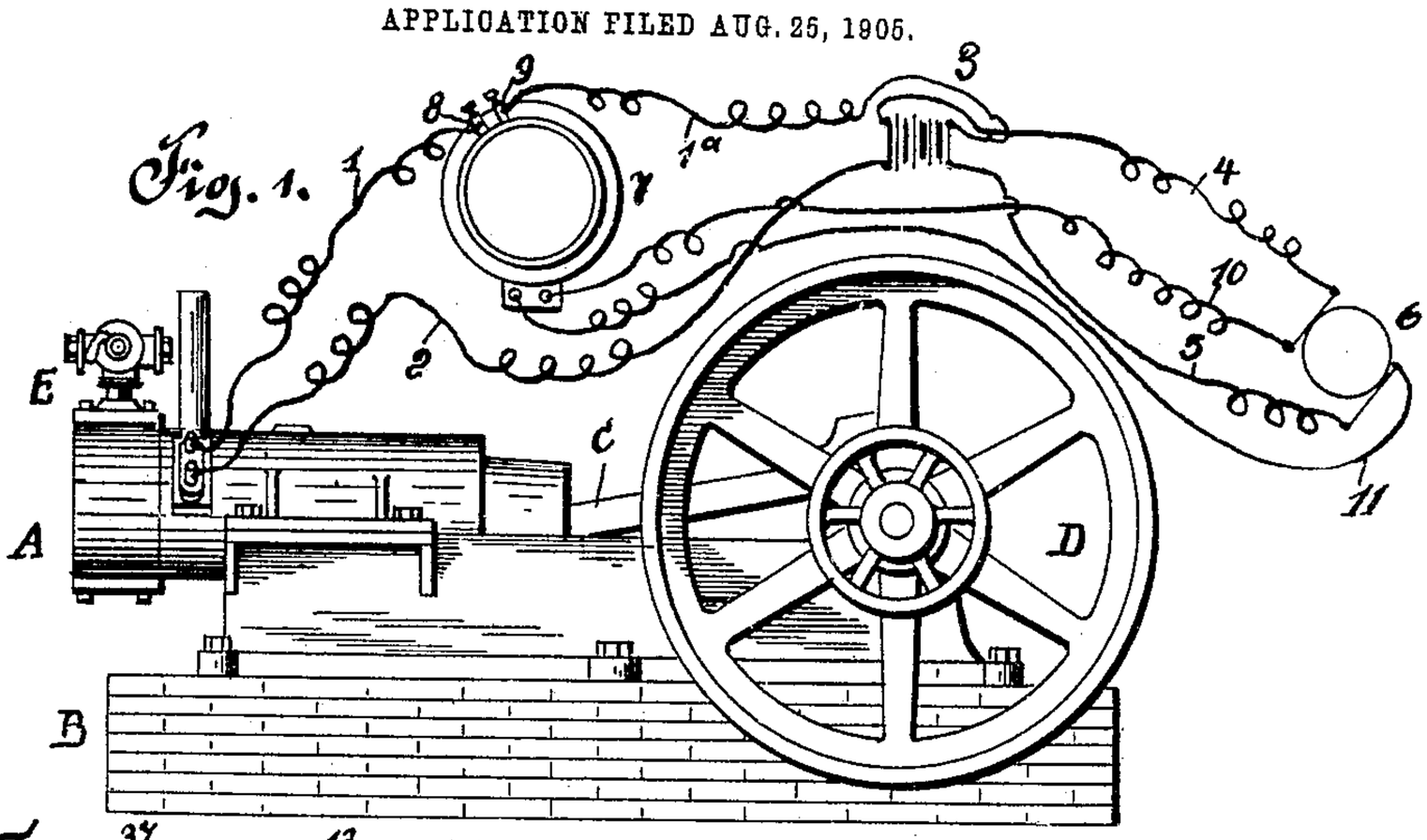
No. 824,439. PATENTED JUNE 26, 1906.

R. RICHARDSON.

AUTOMATIC SAFETY CUT-OUT.

APPLICATION FILED AUG. 25, 1905.

Fig. 1.



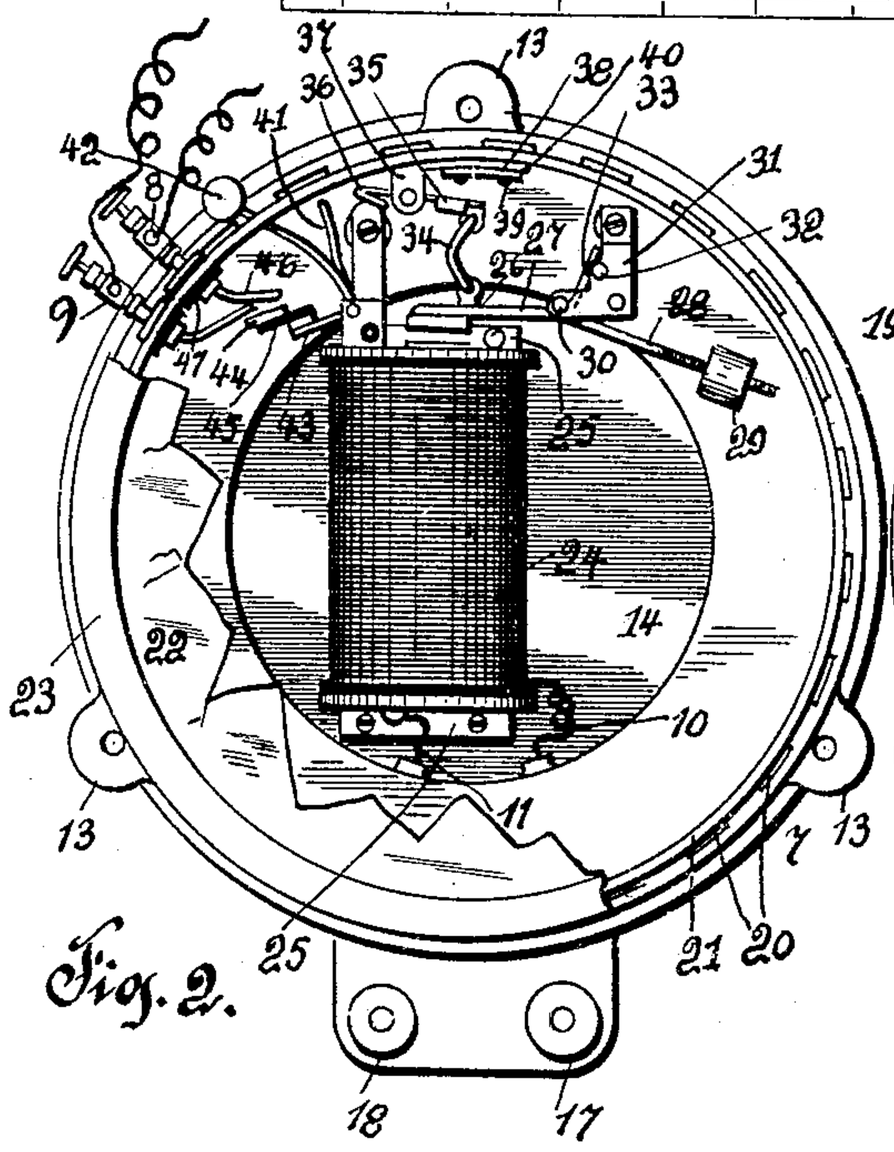


Fig. 2.

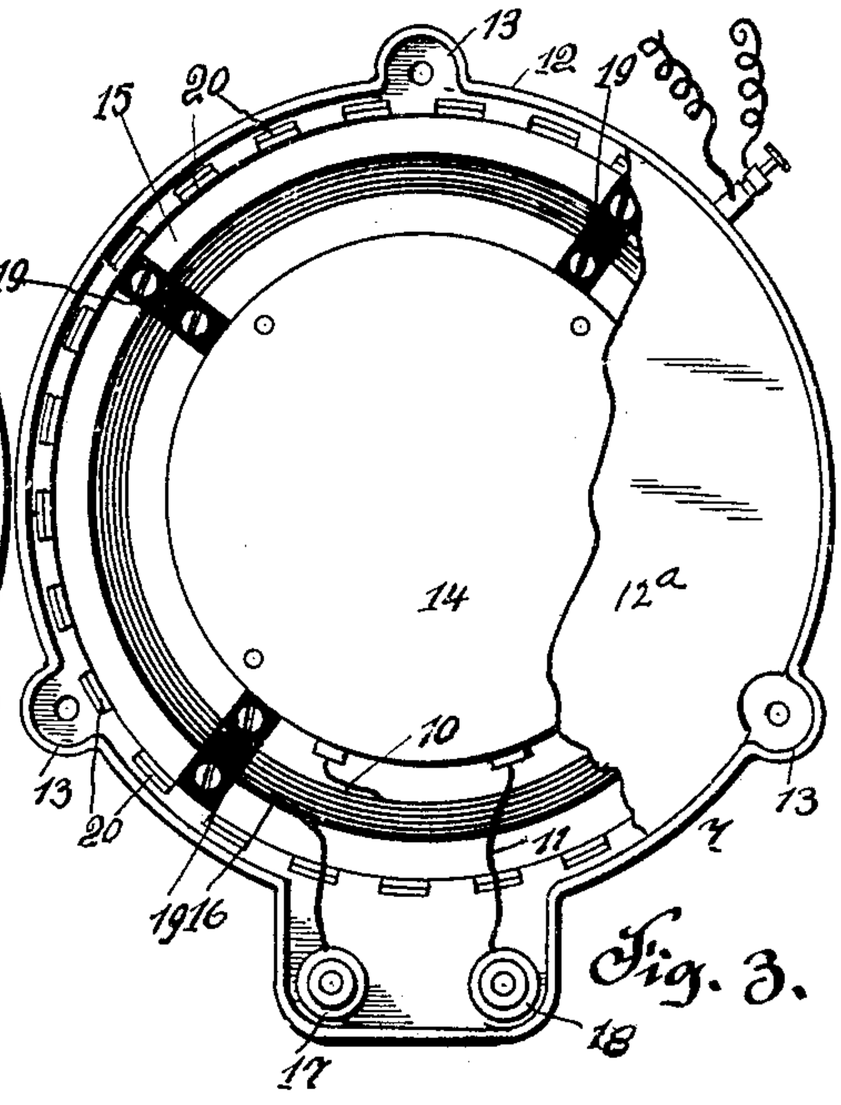


Fig. 3.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC SAFETY CUT-OUT.

No. 824,439. Specification of Letters Patent. Patented June 26, 1906.

Application filed August 25, 1905. Serial No. 275,724.

To all whom it may concern:

Be it known that I, ROBERT RICHARDSON, a citizen of the United States of America, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Safety Cut-Outs, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in automatic cut-outs for electric systems of engines.

The primary object especially contemplated is the provision of a safety device in the sparking circuit of an explosive-engine which, in the event of an increase of speed of the engine beyond the predetermined maximum rate will magnetically release the circuit-breaker, thereby causing the breaking of the sparking circuit and the stoppage of the engine.

The great difficulty with gas-engines of considerable horse-power is that when the speed of the engine is increased beyond the desired maximum rate and the speed of the motor is proportionately increased and the voltage is increased beyond its normal degree the engine "runs away," and unless some one is on hand to break the circuit by means of the usual switch a great amount of damage results therefrom, oftentimes involving considerable loss by the destruction of property and likewise danger to the persons near by.

The object above set forth has for its purpose the prevention of the engine running away when no one is around to oversee the action thereof. The cut-out device is not only automatic in its operation, but will act at the smallest increase of voltage beyond the required maximum degree, not perceptible in the speed of the engine to the engineer.

The particular construction embodies a magnetic cut-out device that is in direct circuit with the generator. One of the wires to the igniter system extends through the cut-out device and is in circuit with the usual storage battery, in turn fed from a generator by an independent circuit with relation to the cut-out circuit. The mechanism employed for effecting the circuit-breaking operation embodies a magnet energized directly from the generator, an armature adjustably tensioned and adapted to be moved by the said magnet when the voltage exceeds a predetermined degree. The armature is connected to a detent which normally retains the circuit-breaker in a closed position, so as to complete the circuit of the igniter system.

The particular construction will appear as the description proceeds, in which reference is had to the accompanying drawings, forming a part of this specification, like numerals designating like parts throughout the several views, in which—

Figure 1 is a side elevation illustrating diagrammatically the engine, the automatic cut-out, and the arrangement of the cut-out and igniter circuits. Fig. 2 is a front elevation of the cut-out, the glass face thereof being broken away to show in detail the circuit-breaking mechanisms; and Fig. 3 is a rear elevation of the cut-out with the rear face-plate removed to show the arrangement of the resistance-coil located therein.

In the accompanying drawings the gas-engine A is of conventional form, being mounted upon a heavy bed or foundation B and being connected by a pitman C with a fly-wheel D. The engine A is formed with the usual sparker E, which completes the circuit with the igniter. It may be here stated that my invention is particularly designed for use with the igniter of the "jump-spark" type, although it may be employed with other forms of igniters with equal advantage. The igniter-circuit embodies a positive wire 1 and a negative wire 2, leading from a storage battery 3, which is in circuit by the wires 4 and 5 with a generator 6. One of the wires of the igniter-circuit, arbitrarily the wire 1, extends through the cut-out 7, being secured to a binding-post 8, where it terminates. Arranged adjacent the binding-post 8 is a binding-post 9 of similar construction, from which the wire 1^a leads to the storage battery 3. The wires 1 and 1^a are in circuit, being connected by an automatic switch arranged within the cut-out, the circuit being broken only in the case of an abnormal increase of current due to excessive speed of the engine. The cut-out 7 is connected by an independent circuit, consisting of the wires 10 and 11, with the generator 6.

The cut-out 7 embodies a housing and mechanism mounted therein. The housing comprises a base 12, formed with laterally-extending peripheral apertured lugs 13, by which the cut-out is mounted upon a support provided therefor. The base 12 is formed with a central depressed portion 14, which

coacts with the periphery thereof to form a concentric compartment 15, arranged about said depressed portion 14. In this compartment 15 is located a resistance-coil 16, in direct circuit with the generator 6 by means of the wire 10, connected thereto at a terminal 17. The wire 10 is connected to a terminal 17 adjacent the terminal 18, and from thence it is led directly to an electromagnet, arranged in the front part of the housing cut-out, as will be more fully described. The resistance-coil 16 is supported in insulating-brackets 19 of conventional form. Arranged about the periphery of the base 12 is a series of ventilating-openings 20, disposed at regular intervals and for the purpose of preventing the resistance-coil from burning out. The base 12 is closed in the rear by a disk-shaped plate 12ª, secured by screws to the portion 14. The other elements of the housing constitute an annular wall 21, secured by screws or any other preferred form of fastening means to the base 12. The annular wall 21 is closed by a glass plate 22, secured thereon by a milled band 23, which may be fastened by screws or other desirable form of connection. The resistance-coil 16 is mounted, as above intimated, in the annular compartment 15, formed normally in the rear face of the base 12, and the cut-out-operating mechanisms are located in front of said base. A magnet 24 is mounted in the front side of the depressed portion or seat 14 and is supported thereon by the upper and lower brackets 25, from which it is insulated in the usual manner by a thin strip of fiber. (Not shown.) The magnet 24 is connected with the wire 10 from the terminal 18, passing through the base 12 and forming the terminal of the outermost layer of wire, and is connected by wire 11 with the terminal 17, being passed through the base 12 and forming the terminal of the innermost layer of the magnet. The armature 26 is of angular form, being formed with a horizontal arm 27 and an inclined depending arm 28, upon the finely-threaded end of which is adjustably mounted a weight 29. The armature 26 is mounted adjacent the junction of the arm 27 upon an arbor 30, having a transverse disposition in a supporting-bracket 31, secured upon the forward sides of the base 12 adjacent the seat 15. The bracket 31 also carries a transverse bar 32, which coacts with the upwardly-extending arm 33, carried by the armature 26 adjacent the junction of the horizontal and inclined arms 27 and 28, to form a stop or detent in limiting the movement of the armature away from the magnet when released thereby. Adjacent the end of this horizontal arm the armature is connected by a V-shaped link 34 with a dog 35, formed with a hooked end 36 and pivotally mounted in the bracket 37, depending from the annular wall 21, which is adjustably mounted thereon by virtue of a securing-plate 38 and a set-screw 39. The said screw 39 is threaded into an opening in the plate 38 after passing through a short-length longitudinal slot in the rearward extension 40 of the bracket 37. The aperture and slot herein referred to are not shown, as they constitute the adjusting device of well-known and conventional form. The switch embodies an L-shaped lever 41, provided with a weighted arm 42, extending through a slot (not shown) in the annular wall 21. The switch-lever 41 carries at the end of its horizontal arm 43 a contact-piece 44, separated therefrom by a strip of fibrous insulation 45. This contact-piece 44 is of sufficient width to be simultaneously in contact with positive contact-pieces 46, depending from the end of the respective binding-posts 8 and 9, to which the wires 1 and 1ª are connected. The contact-pieces 46 are insulated from the annular wall 21 of the housing by a fibrous strip 47.

The elements above described constitute the cut-out housing, the operating mechanism mounted therein, and the connections of the generator to the engine.

In operation electrical energy is transmitted to the igniter mounted within the engine A from storage battery 3 through positive wires 1 and 1ª, connected by contact-pieces 46 to the switch contact-piece 44, normally closing the circuit, and the negative wire 2. The storage battery 3 is fed by the wires 4 and 5 from the generator 6. The cut-out circuit leads from the generator 6 by the wires 10 and 11, through the terminals 18 and 17 and the resistance-coil 16 to the electromagnet 24, mounted within the housing. The degree of voltage for the igniter system is fixed at any predetermined limit, according to the predetermined maximum number of revolutions of the fly-wheel of the engine. The degree of voltage at which the electromagnet 24 is energized sufficiently to depress the armature 26 is regulated to correspond by means of adjusting the weight 29, mounted upon the depending arm 28 of said armature, whereby to vary the tension of the armature 26 in resisting the energy of the magnet 24. Should the current generated by the generator exceed the predetermined limit of voltage, the electromagnet will be sufficiently energized to move the armature 26 and by virtue of the link 34 raise the dog 35, which, with its hooked end 36, normally engages and supports the vertical arm 41 in maintaining a closed circuit between the contact-piece 44 and the contacts 46. When the dog 35 is moved by the armature 26, the hooked end 36 thereof will be raised to release the lever 41, at which time the weighted arm 42 by its gravitating influence will act to depress the lever 41 and break the contact between the pieces 44 and 46, thereby breaking the igniter-circuit in the wires 1 and 1ª

and stopping the sparking in the engine, so that the movement of the piston will gradually cease.

I do not wish to be understood as confining myself either to the exact arrangement of the circuits or to the exact arrangement and form of the various elements, as in practical use to suit the varying constructions of engines and sparkers I shall desire to make such minor alterations falling under the scope of the claims.

Having fully described my invention, I claim—

1. An automatic safety device for electrical systems for engines embodying in combination with the engine, the electric combustion-controlling devices mounted therein, and the generator, an automatic cut-out, said combustion devices being included in circuit with said generator, said cut-out being arranged in a circuit with said generator which is independent of said first-named circuit, one of the wires of said combustion-controlling device leading into said cut-out, and terminating in a contact member, said wire being broken in said cut-out to form a second wire extending from said cut-out to said generator, said second wire being formed with a contact member in said cut-out, a switch mounted in said cut-out and adapted to normally close the circuit between said wires of said combustion-controlling device, electrically-operated devices for maintaining said switch in its normal position, and electrical means for operating said devices to release said switch whereby to regulate the circuit of said combustion-controlling devices; to stop the operation of the same said means being in the independent circuit, with the generator and being designed to operate when the current of said generator shall have exceeded a predetermined degree of voltage, and means for adjusting the tension of said switch-holding devices with relation to the degree of voltage in the current passing through said electrical means for actuating said switch-holding devices.

2. An automatic safety device for gas-engine igniter systems embodying a cut-out arranged in the igniter-circuit, said igniter-circuit being broken in said cut-out and being fed from batteries in circuit with a generator, said cut-out being in a direct and independent circuit with said generator, a switch mounted in said cut-out and adapted to normally close said igniter-circuit leading thereinto, electrically-controlled devices for retaining said switch in closed position with relation to said igniter-circuit, and electrical means in the direct circuit of the generator above referred to and adapted to actuate said switch-holding devices whereby to release said switch and break said igniter-circuit, said electrical means being adapted to actuate said switch-holding devices when the current therein exceeds a predetermined degree of voltage.

3. An automatic safety cut-out for electric circuits of gas-engine igniter systems, fed from batteries in circuit with a generator, embodying a housing, one of the wires of said igniter-circuit passing into said housing and being broken therein, contact members arranged upon the ends of the broken portions of said wire within said housing, a switch arranged within said housing and adapted to normally close the igniter-circuit by contact with said contact members first mentioned, movable devices for maintaining said switch in its normal position for closing the said circuit, an electromagnet arranged in said housing and connected with said generator by a circuit independent of said igniter-circuit, said magnet being adapted to actuate said switch-holding devices when the voltage of the current passing therethrough exceeds a predetermined amount, and means for regulating the tension of said devices with relation to the degree of voltage of the current in said electromagnet.

4. An automatic safety device for gas-engine igniter systems, embodying a cut-out arranged in the igniter-circuit, said igniter-circuit being broken in said cut-out and being fed from batteries in circuit with a generator, said cut-out being in direct and independent circuit with said generator, a switch mounted in said cut-out and adapted to close said igniter-circuit leading thereinto, electrically-controlled devices for retaining said switch in closed position with relation to said igniter-circuit, and electrical means in the direct circuit with the generator above referred to and adapted to actuate said switch-holding devices whereby to release said switch and break said igniter-circuit, said electrical means being adapted to actuate said switch-holding devices when the current therein exceeds a predetermined degree of voltage, and means for regulating the tension of said switch-holding devices with relation to the degree of voltage in said electrical means for actuating said devices.

5. An automatic safety cut-out for circuits of gas-engine igniter systems, embodying a housing, said igniter-circuit passing into said housing and being broken therein, electric contact members carried upon the ends of the broken wires of said igniter-circuit and insulated from said housing, a movable switch mounted in said housing and adapted to normally close said igniter-circuit, devices for maintaining said switch in its closed position with relation to said igniter-circuit, an electromagnet in the independent circuit with said generator from said igniter-circuit, said electromagnet being designed to actuate said switch-holding devices to release said switch and break said circuit when the voltage of the current passing therethrough shall have ex-

ceeded a predetermined degree, means for moving said switch when released by said switch-holding devices to break contact with said contact members first mentioned, and means for adjusting the tension of said switch-holding devices with relation to the degree of voltage in the current passing through said electromagnet so that said magnet shall actuate said switch-holding devices when the voltage of the current therein shall be able to overcome the predetermined degree of tension thereof.

6. An automatic safety cut-out for circuits of gas-engine igniter systems, embodying a housing, one of the wires of said igniter-circuit passing into said housing and being broken therein, contact members arranged upon the ends of the broken portions of said wire, a switch adapted to normally close the circuit by contact with said first-named contact members, movable electromagnetically-operated devices for maintaining said switch in its closed position with relation to said igniter-circuit, an electromagnet in an independent circuit with said igniter-circuit, said magnet being adapted to actuate said switch-holding devices whereby to release the switch and break the igniter-circuit when the voltage in the current passing through the magnet shall have exceeded a predetermined degree, means for moving said switch when released by said switch-holding devices out of contact with said first-named contact members, and a resistance-coil arranged in direct circuit with said generator and said electromagnet, and means for regulating the tension of said switch-holding devices with relation to said magnet, to correspond to the degree of voltage at which said magnet is designed to operate said switch-holding devices to release said switch.

7. An automatic safety cut-out for electric igniter-circuits of gas-engine systems embodying a housing, one of the wires of said igniter-circuit passing into said housing and being broken therein, the ends of the broken portions of said wire being provided with stationary contact members, a movable contact member journaled in bearings in said housing, means for holding said contact member in position to close said igniter-circuit, and electrical means in circuit with the generator from which said igniter system is fed adapted to actuate said movable contact member when the degree of voltage of the current passing through said electrical actuating means shall have exceeded a predetermined amount, and means for adjusting said electrical actuating means to actuate said movable contact member at a predetermined degree of voltage.

8. An automatic safety cut-out for electric igniter-circuits of gas-engine systems embodying a housing, a pair of binding-posts arranged upon said housing, one of the wires of said igniter-circuit being broken and having the ends of the broken portions connected to said binding-posts, stationary contact members carried by said binding-posts within said housing, a movable contact member, normally in contact with said stationary members, means for retaining said movable contact member in position to close said igniter-circuit, an electromagnet in an independent circuit with the generator from which said igniter-circuit is fed, said electromagnet being designed to actuate said devices for holding said contact members whereby to release the latter and break the circuit, said magnet being adapted to actuate said movable-member holding devices when the voltage of the current therein shall exceed a predetermined degree, and means for adjusting the degree of tension of said devices for retaining said movable contact member to correspond to the strength of said electromagnet at a predetermined degree of voltage.

In testimony whereof I affix my signature in the presence of two witnesses.

ROBERT RICHARDSON.

Witnesses:
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O. N. JANKE.