

**No. 661,291.**

**Patented Nov. 6, 1900.**

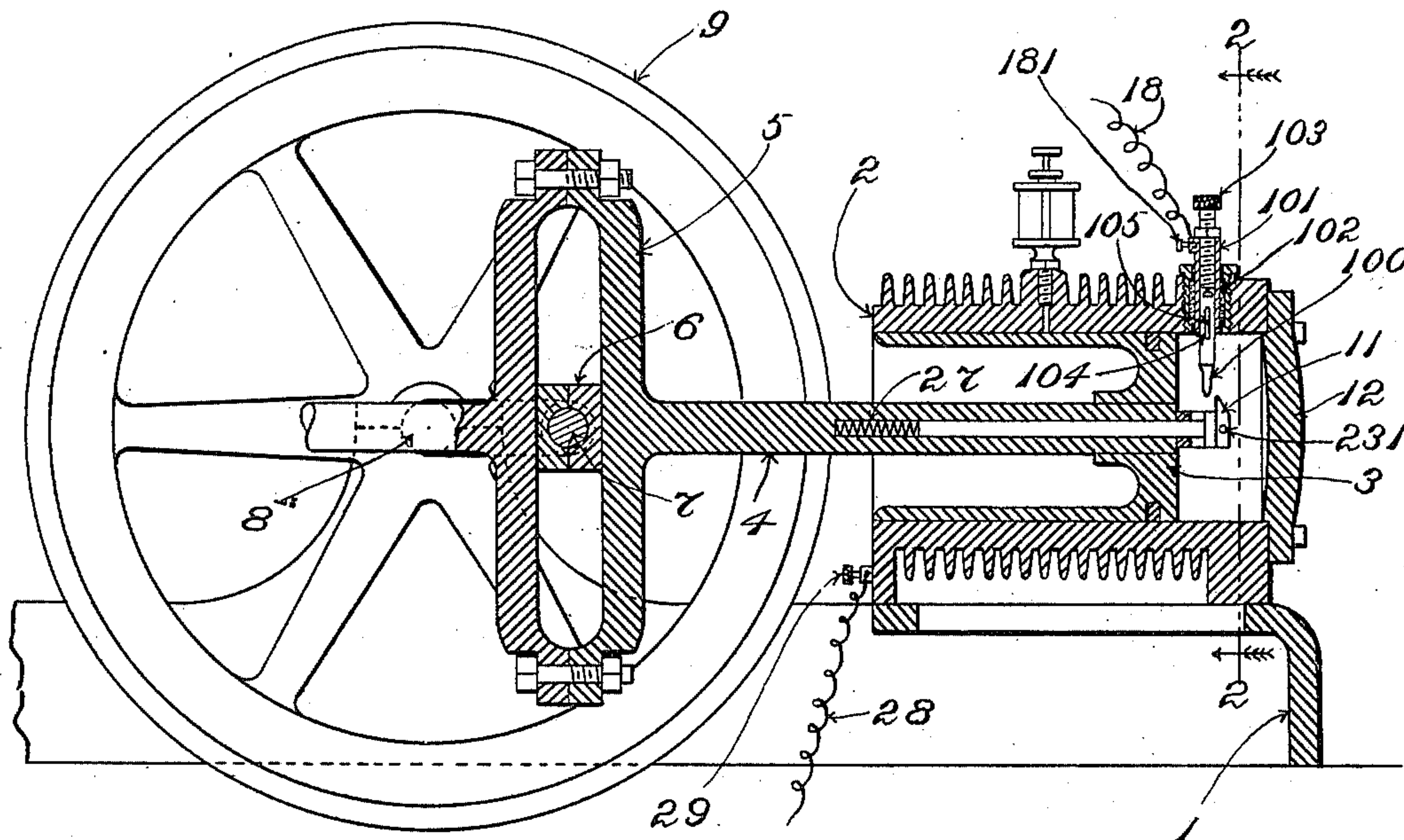
**A. JOHNSON.**

**SPARKING IGNITER FOR EXPLOSIVE ENGINES.**

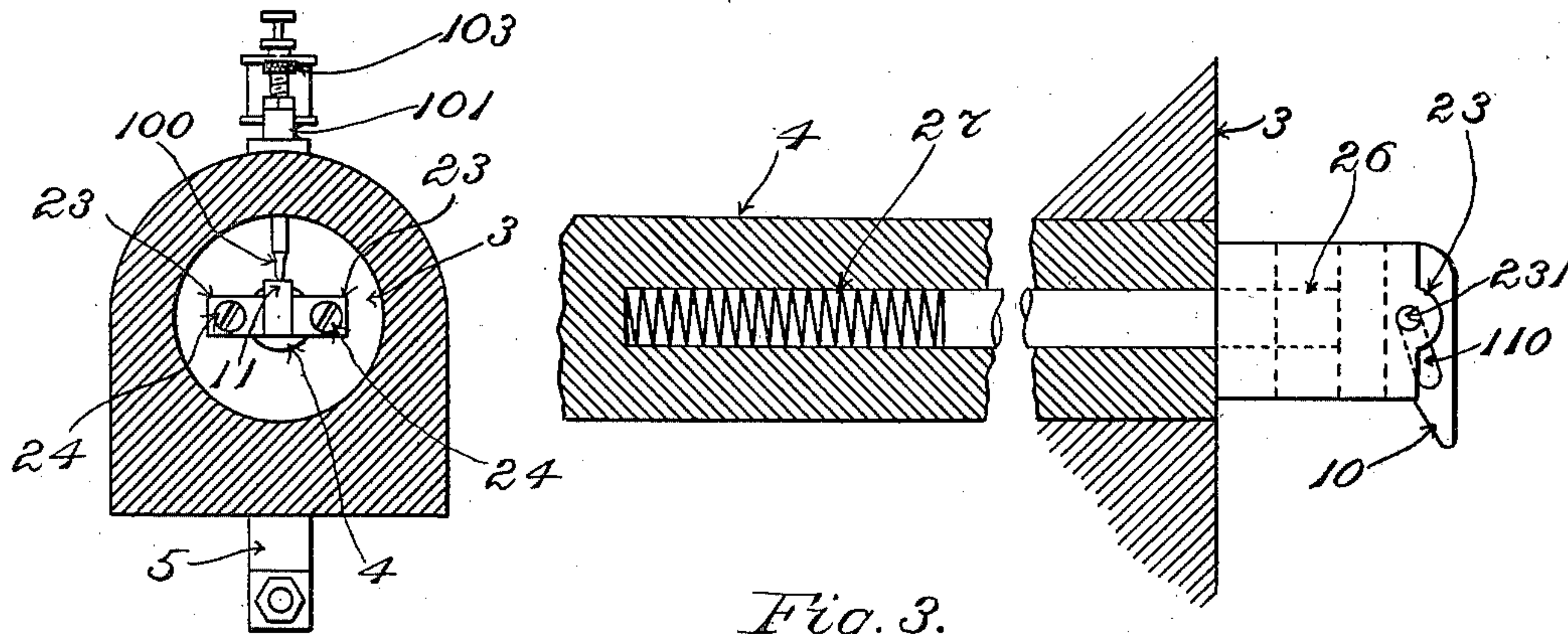
(Application filed Jan. 31, 1900.)

(No Model.)

**2 Sheets—Sheet 1.**



*Fig. 1.*



*Fig. 3.*

*Fig. 2.*

*Witnesses:*

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Edith J. Anderson.

*Inventor:*

Apel Johnson  
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2 Sheets—Sheet 2.

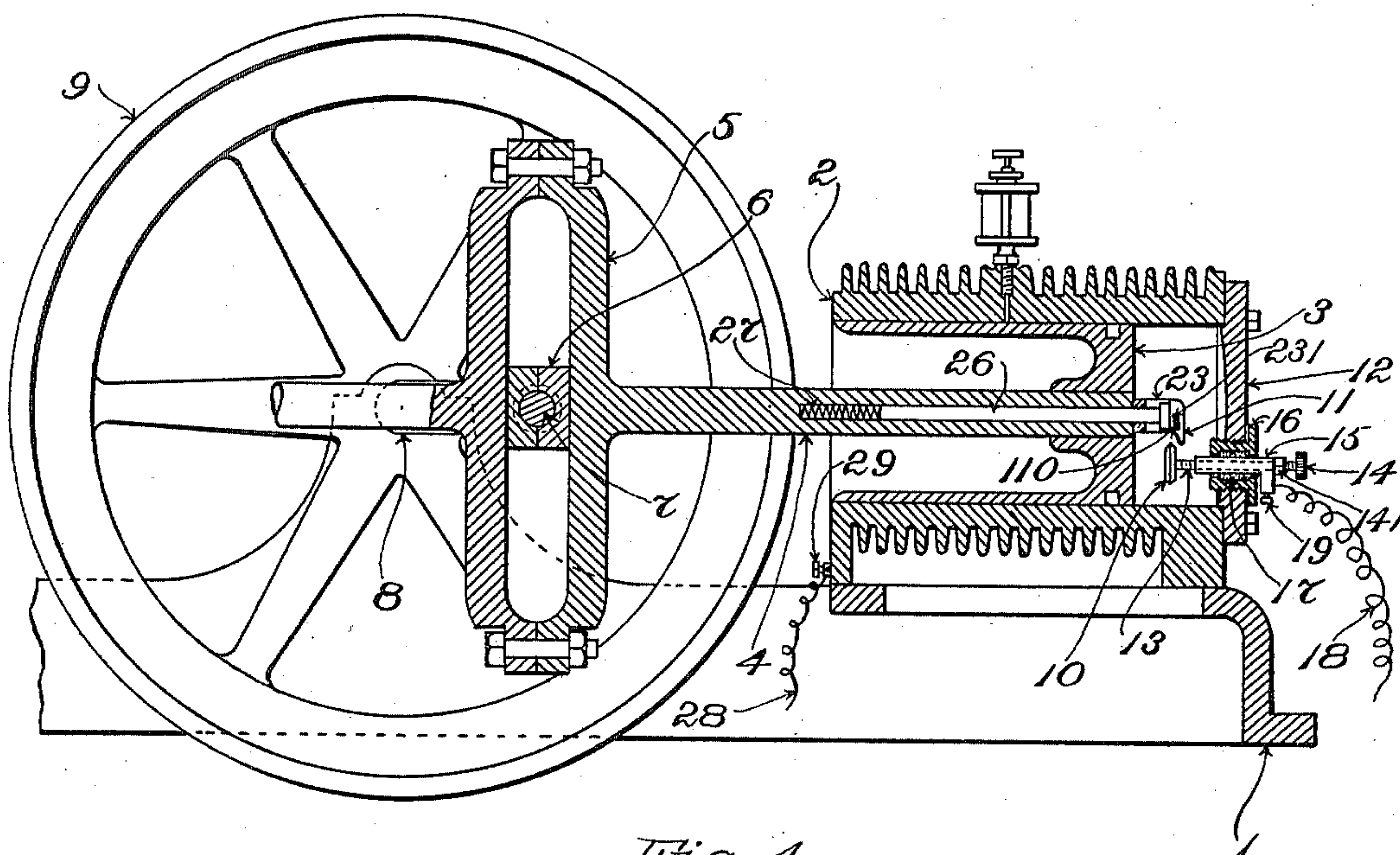


Fig. 4.

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# UNITED STATES PATENT OFFICE

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## SPARKING IGNITER FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 661,291, dated November 6, 1900.

Application filed January 31, 1900. Serial No. 3,427. (No model.)

*To all whom it may concern:*

Be it known that I, AXEL JOHNSON, a citizen of the United States, residing at Winchester, in the county of Middlesex, State of Massachusetts, have invented a certain new and useful Improvement in Sparking or Firing Devices for Explosive-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to sparking or firing devices for use in explosive-engines for igniting the charges of gas or vapor to thereby occasion the actuation of the pistons of such engines. One class of such devices comprises relatively movable electrical contact pieces or terminals which are arranged and operated to make and break an electrical circuit at proper times in unison with the movements of the piston. An example of such devices which is fairly representative of the class is that in which one of the said contact pieces or terminals is mounted upon the piston itself, while the coacting contact piece or terminal is so applied to some other portion of the engine as that in the reciprocation of the piston the first contact piece or terminal shall encounter the other at predetermined times in the movements of the piston.

The invention consists in improved devices of the said class, comprising a tripping or yielding contact piece or finger of novel construction, &c., as hereinafter will be made more fully to appear, and as will be particularly pointed out and distinctly defined in the claims at the close of this specification.

The invention will now be described with reference to the accompanying drawings, in which latter are illustrated the best embodiments of the invention which I have thus far contrived.

In the drawings, Figure 1 shows in vertical longitudinal section portion of an explosive-engine having one embodiment of the invention applied thereto, only so much of the engine being represented as is necessary to be shown in order to make clear the relations, &c., of the invention. Fig. 2 is a vertical transverse section on the plane indicated by the dotted line 2 2 in Fig. 1 looking in the direction indicated by the arrows at the ends of such line. Fig. 3 is a detail view, on an enlarged scale, showing the construction of

the pivoted trip more clearly. Fig. 4 is a vertical longitudinal section of portion of an engine having applied thereto a second embodiment of the invention.

Having reference to the drawings, 1 designates part of the bed of an engine.

2 is the cylinder. 3 is a piston working within the said cylinder.

4 is a piston-rod.

5 is a slotted or open yoke with which the piston-rod 4 is provided. 6 is a block or cross-head fitting the slot of the said yoke. 7 is a crank having the pin thereof in engagement with the said block or cross-head 6.

8 is the crank-shaft.

9 is a fly-wheel on the crank-shaft.

The foregoing parts are or may be as usual.

I will now describe the two contact-pieces which I utilize in an engine in carrying my invention into effect.

The construction and form of one of the contact-pieces—namely, that which in the present instance is shown as fixed relatively to its support—may vary somewhat in practice, as may be deemed advisable, although preferably I constitute the same of a beveled piece, which is conveniently arranged and mounted in the engine. In some cases the said contact-piece is formed as a disk 10, as in Fig. 4. Such form is convenient and practical, since it dispenses with necessity for extreme care in setting the contact-piece 10 in line with the other contact-piece 11. There is no danger of the said contact-piece 10 becoming misplaced out of line with contact-piece 11 during the working of the engine. As wear takes place at the point at which contact-piece 11 touches the contact-piece 10, the latter may be shifted rotarily to bring fresh portions into position for use. The disk form also enables the contact-piece 10 conveniently to be adjusted lengthwise of the cylinder simply by rotating the screw-threaded stem or shank of the said contact-piece in its threaded bearing without disturbing the operating relations between the two contact-pieces. The said adjustment is that which causes the contact to occur sooner or later in the stroke of the piston. The rotary shift and longitudinal adjustment of contact-piece 10 are provided for by affixing the contact-piece 10 to the inner end of a



screw-threaded rod or stem 13, the outer end of which last is furnished with a milled head 14, by means of which to turn the said rod or stem within the internally-threaded sleeve

5 15. A slight turn will effect the rotary shift of the said contact-piece 10 without materially altering the position thereof relatively to the length of the cylinder. A more extended turn will secure any required longitudinal  
10 shift when it is necessary to adjust the position of the contact-piece 10, so as to occasion engagement of moving contact-piece 11 therewith at a particular point in the movement of piston 3. Lock-nut 141, applied to rod or  
15 stem 13, prevents loss of adjustment. Sleeve 15 is fitted within a cylindrical shell 16, the latter being threaded externally and screwed into a correspondingly-threaded hole in the head 12 of the cylinder. Sleeve 15 and shell  
20 16 are electrically insulated from each other by means of a suitable cement or composition 17 surrounding the sleeve within the shell.

18 is a conducting-wire of one polarity forming part of an electric circuit, the said wire  
25 being connected with sleeve 15 by a suitable binding-screw 19.

I have shown at 100, Fig. 1, a form of contact-piece which, in accordance with part of the present invention, I employ by preference instead of the contact-piece 10, which  
30 has just been described. This contact-piece consists of a pin that is set in a sleeve-like socket 101, its inner portion being reduced in thickness and beveled at its extremity for engagement with the contact-piece 11. The  
35 said socket 101 is set in a hole that is formed through the shell of the cylinder 2, it being insulated from the said shell by suitable cement or composition 102. For the purpose of  
40 enabling the contact-piece 100 to be adjusted transversely with relation to the path of movement of contact-piece 11 the outer end of the same is coupled with an adjusting-screw 103, working in the threaded outer portion of  
45 socket 101. To prevent contact-piece 100 from turning out of proper working position, especially when adjustment is being effected by moving screw 103, a longitudinal slot or groove 104 is formed in the pin, the said  
50 slot or groove receiving a pin 105, projecting inwardly from the socket 101. Wire 18 is shown connected with socket 101 by binder-screw 181.

The contact-piece 11 is made as a pivotally-mounted trip. The pivot thereof is shown at  
55 231 in Figs. 1 and 3. The said contact-piece 11 is carried by the piston in proper position to coact with the contact-piece 10 or 100, applied to the cylinder. It is pivoted between  
60 lugs 23 23, forming parts of a block that is secured to the piston 3 by screws 24 24.

The tripping contact-piece 11 is formed with a flat back, against which last takes bearing the broadened head of a T-shaped  
65 plunger-rod 26. The stem of the said plunger-rod is in Fig. 1 shown received within a closed chamber, with which the piston is provided.

The said chamber may in practice be formed in any suitable or convenient portion of the piston. Herein it is represented as formed, for  
70 convenience, in the inner end of the piston-rod, which fits within the hole that is formed for its reception centrally in the piston. This is the same in effect as forming the chamber in the piston itself. Within the chamber is con-  
75 tained also a spring 27, which is arranged to act against the plunger-rod, in the present case expansively, with the effect of pressing the head of the plunger-rod against the inner face of the tripping contact-piece 11. There-  
80 by the latter is held in its normal position. (Represented in Fig. 1.)

It will be perceived that when the two contact-pieces 10 or 100 and 11 are pressed together in consequence of the movement of the  
85 piston in either embodiment of the invention the tripping contact-piece 11 will be permitted to turn upon its pivot 231 by the yielding of the plunger-rod 26 and spring 27, while these last will act to return the said tripping  
90 contact-piece to its normal position as soon as the pressure of one contact-piece against the other is relieved. It is contemplated that in practice the contact-pieces shall be so ad-  
95 justed in position as that in the inward stroke of the piston 3 the contact-piece which moves therewith shall be carried past the other contact-piece, and the contact being also repeated in the first part of the outward stroke. The herein-described construction and ar-  
100 rangement in connection with the tripping contact-piece 11 enable the same to yield in either direction, and also serve to restore the same to its normal position in either case.

In the case of the arrangements of parts  
105 which are represented in Figs. 1 and 3 the wire 28 of opposite polarity to wire 18 is connected by a binding-screw 29 with any suitable metallic portion of the engine.

As will be apparent, the two contact-pieces  
110 constitute terminals of opposite polarity of a normally broken or open electric circuit, the said circuit being completed or closed when such contact-pieces touch each other.

A special advantage of the construction  
115 and arrangement of parts which have been shown and described in connection with the tripping contact-piece 11 is the fact that the spring which furnishes the power that is required to act upon such contact-piece is  
120 shielded effectually from the intense heat and gases that are generated within the chamber wherein the explosions take place.

Under some conditions—as, for instance, after the occurrence of wear of the interen-  
125 gaging portions of the contact-pieces or in the case of improper adjustment of the contact-piece 100 relatively to the path of movement of the tripping contact-piece 11—the engagement of the two contact-pieces might fail  
130 to turn the said contact-piece 11 on its pivot. In this event breakage or injury would be likely to occur as a result of forcing the un-tilted contact-piece 11 past the contact-piece



10 or 100. To obviate this, I form the contact-piece 11 with a diagonal slot 110 for the reception of the pivot-pin 231. The pressure of the head of the plunger against the back of the contact-piece 11 holds the inner end of slot 110 normally in contact with the pivot-pin, so that the contact-piece will turn on the latter as desired in its regular working. In case, however, the contact-piece 11 is not tilted by its contact with the contact-piece 10 or 100, it will in being forced past the latter be crowded in the direction of the length of slot 110, thereby yielding sufficiently to permit the contact-piece 11 to pass the contact-piece 10 or 100 without breakage or other injury, after which the action of the spring-pressed plunger will cause the slotted contact-piece to slide upon the pivot-pin 231 until it resumes its normal position again.

I claim as my invention—

1. In an explosive-engine, in combination, the cylinder and piston, and firing or sparking devices comprising contact-pieces forming the terminals of opposite polarity of a normally broken electric circuit, one of the said contact-pieces being mounted pivotally on the piston, the plunger-rod acting by its head against the said pivoted contact-piece, and a spring to force the said plunger-rod lengthwise to cause it to act against the pivoted contact-piece to hold the latter in normal position on its pivot, the said piston having a chamber or bore within which the said plunger-rod and spring are received and in which the spring is shielded from the heat and gases, substantially as described.

2. In an explosive-engine, in combination, the cylinder and piston, and firing or sparking devices comprising contact-pieces forming the terminals of opposite polarity of a normally broken electric circuit, one of the said contact-pieces being mounted pivotally on the piston, a plunger-rod acting by its head against the said pivoted contact-piece, and a spring to force the said plunger-rod lengthwise to cause it to act against the pivoted contact-piece to hold the latter in normal position on its pivot, the said piston having a chamber or bore receiving the said plunger-rod and spring and in which the spring is shielded from the heat and gases, the other contact-piece being mounted on the cylinder and provided with means to adjust the same with relation to the path of that carried by the piston, substantially as described.

3. In an explosive-engine, in combination, the cylinder and piston, and firing or sparking devices comprising contact-pieces forming the terminals of opposite polarity of a normally broken electric circuit, one of the said contact-pieces being mounted pivotally on the piston, a plunger-rod acting by its head against the said pivoted contact-piece, and a spring to force the said plunger-rod lengthwise to cause it to act against the pivoted contact-piece to hold the latter in normal position on its pivot, the said piston having a chamber or bore

receiving the said plunger-rod and spring and in which the spring is shielded from the heat and gases, the other contact piece being mounted on the cylinder and provided with means to adjust the same transversely with relation to the path of that carried by the piston, substantially as described.

4. In an explosive-engine, in combination, the cylinder and piston, and firing or sparking devices comprising contact-pieces forming the terminals of opposite polarity of a normally broken electric circuit, one of the said contact-pieces being mounted pivotally on the piston, a plunger-rod acting by its head against the said pivoted contact-piece, and a spring to force the said plunger-rod lengthwise to cause it to act against the pivoted contact-piece to hold the latter in normal position on its pivot, the said piston having a chamber or bore receiving the said plunger-rod and spring and in which the spring is shielded from the heat and gases, a socket mounted in the cylinder-shell and containing the other contact-piece, and a screw to adjust the latter contact-piece transversely with relation to the path of the contact-piece that is carried by the piston, substantially as described.

5. In an explosive-engine, in combination, the cylinder and piston, and firing or sparking devices comprising relatively movable contact-pieces forming the terminals of opposite polarity of a normally broken electric circuit, a carrier or mounting with which one of the said contact-pieces is connected pivotally to enable it to be tilted by engagement with the other contact-piece, and the yielding presser whereby said contact-piece is held in normal position on its pivot, the pivotal connection having provisions for permitting transverse movement of the pivoted contact-piece on its carrier or mounting when such contact-piece engages improperly with the other one, substantially as described.

6. In an explosive-engine, in combination, the cylinder and piston, and firing or sparking devices comprising contact-pieces forming the terminals of opposite polarity of a normally broken electric circuit, one of said contact-pieces being mounted on the piston and one on the cylinder, and one thereof having therein a diagonal slot, a pivot-pin passing through said slot and on which the said contact-piece is adapted to be turned by engagement of the other contact-piece therewith in the normal working of the parts, the said slot allowing the contact-piece to slide transversely upon the pivot-pin in case the pivoted contact-piece fails to be turned properly, and a spring-actuated presser bearing against the back of the said contact-piece to keep it in normal position, substantially as described.

7. In an explosive-engine, in combination, the cylinder and piston, and firing or sparking devices comprising contact-pieces forming the terminals of opposite polarity of a normally broken electric circuit, one of such con-



tact-pieces being mounted on the cylinder and the other on the piston, and one of such contact-pieces having a slot therein, a pivot-pin passing through the said slot and on which  
5 the said contact-piece is adapted to turn and also to slide, a spring-actuated plunger acting against the said contact-piece to hold it in normal position, and a chamber containing the said plunger and spring and shielding the  
10 latter from the heat and gases, substantially as described.

8. In an explosive-engine, in combination, the cylinder and piston, and firing or sparking devices comprising a contact-piece moving  
15 ing with the piston and slotted as described,

a pivot-pin on which said contact-piece is adapted to both turn and slide, a second contact-piece, a socket applied to the cylinder and in which the said second contact-piece is fitted, and a screw to adjust the second contact-piece transversely with relation to the  
20 path of movement of the first contact-piece, substantially as described.

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

AXEL JOHNSON.

Witnesses:

CHAS. F. RANDALL,  
WILLIAM A. COPELAND.