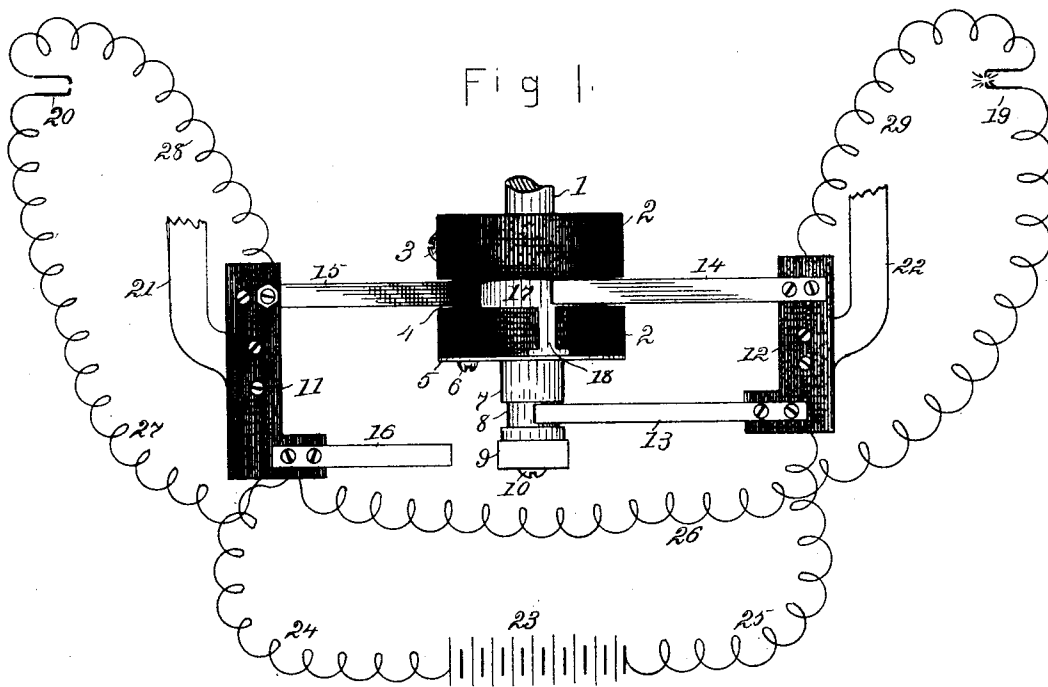
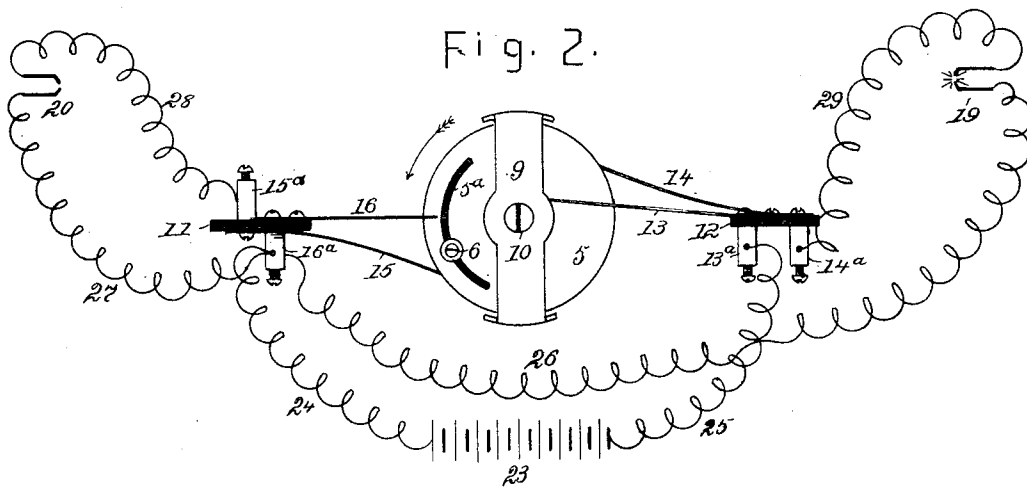


P. MUELLER.
IGNITER FOR EXPLOSIVE ENGINES.

No. 587,747.

Patented Aug. 10, 1897.



Attest.

Sna Graham.

Hora Graham.

INVENTOR
PHILIP MUELLER
by *S. P. Graham*
his attorney

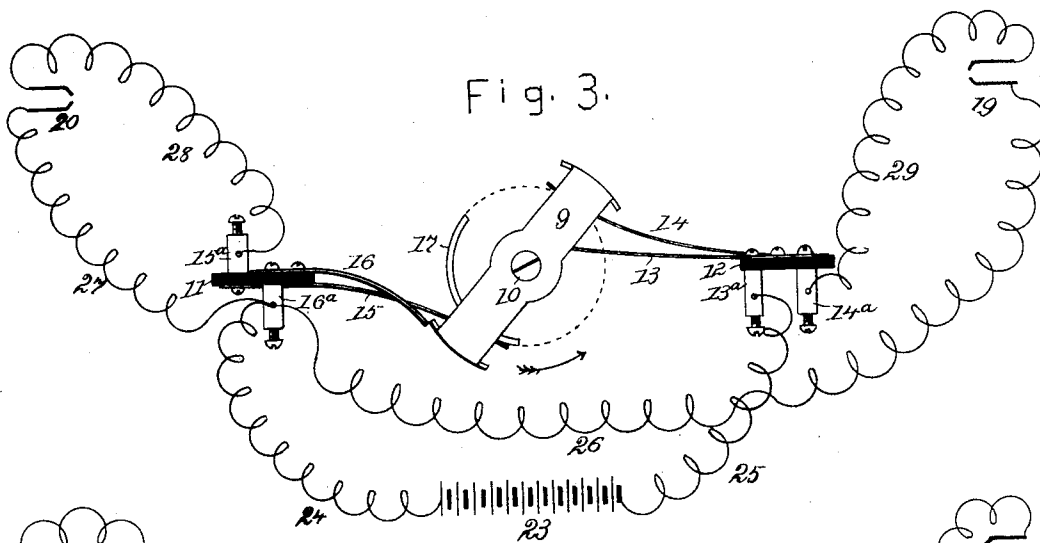
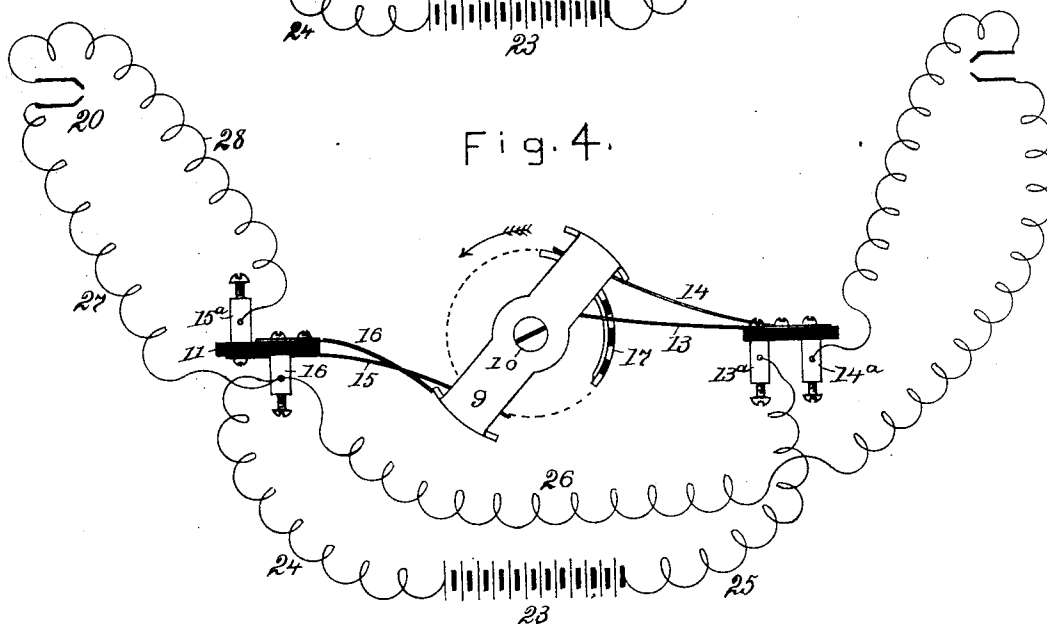
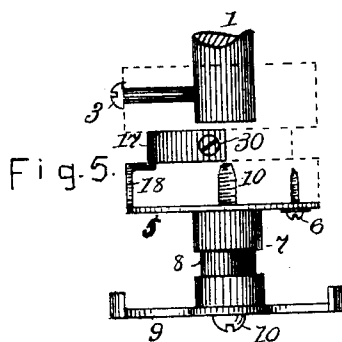
(No Model.)

2 Sheets—Sheet 2.

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his attorney

UNITED STATES PATENT OFFICE.

PHILIP MUELLER, OF DECATUR, ILLINOIS.

IGNITER FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 587,747, dated August 10, 1897.

Application filed December 18, 1896. Serial No. 616,133. (No model.)

To all whom it may concern:

Be it known that I, PHILIP MUELLER, of Decatur, in the county of Macon and State of Illinois, have invented certain new and useful
5 Improvements in Igniters for Explosive-Engines, of which the following is a specification.

This invention relates to electric igniters for explosive-engines, in which the pole-pieces of the sparkers or igniters maintain a constant correlation and in which the electric
10 current is short-circuited between explosions.

The invention is particularly applicable to engines having a plurality of cylinders; and its principal object is to enable times of explosion with relation to movements of the engine to be accurately controlled. It is exemplified in the structure hereinafter described, and it is defined in the appended
15 claims.

In the drawings forming part of this specification, Figure 1 is a plan of igniting apparatus constructed in accordance with my invention. Fig. 2 is a side elevation of the apparatus shown in Fig. 1. Fig. 3 is a diagram
20 illustrating in side elevation the correlation of certain active parts of the apparatus immediately preceding the creation of a spark between one pair of pole-pieces. Fig. 4 is a similar diagram showing the condition of the parts
25 immediately prior to the development of a spark between the other pair of pole-pieces. Fig. 5 is a plan showing details in the construction of the mechanical features of the apparatus.

In describing my invention specifically I will assume that it is to be used in connection with a two-cylinder engine, that probably being its most useful application.

A shaft 1 is journaled in some suitable manner, preferably in the frame of the engine, though it is a matter of no consequence to the action of the igniter where it is placed or how it is supported. Such shaft is driven by the engine at a speed dependent on the character of the engine, making one rotation to two rotations of the crank-shaft in connection with engines in which an explosion is made in each cylinder every second rotation of the crank-shaft and rotating at the same
30 speed as the crank-shaft in engines that have an explosion in each cylinder at each rotation of the crank-shaft. A cylinder 2, of rub-

ber or other non-conductor of electricity, is fixed onto the end of shaft 1 by means of a pin or screw, as 3, for instance. It extends
55 some distance beyond the end of shaft 1, and it has a circumferential groove, as 4. A metal disk 5 fits against the end of cylinder 2, and from said disk extends a shaft 7, that has a circumferential groove 8 and that is
60 provided on its extended end with a diametrical cross-bar 9, that forms radial contact-arms. A screw 10 extends axially through shaft 7 and into cylinder 2, and screw 6 passes through an arc-formed slot 5^a in disk 5 and
65 into the non-conductor cylinder. A metal strip 17 forms a segment of a circle conforming to the surface of groove 4, to which it is fastened by means of a screw—as 30, for instance—and it has a lateral extension 18, that
70 touches disk 5. Plates 11 and 12, of some non-conducting material, are held on opposite sides of the cylinder 2 by means of arms, as 21 and 22, that may be made to connect with the engine-frame, or by any other suitable
75 means. A metallic brush 13 is secured to plate 12 at one end, and its other end rests in the groove 8 of shaft 7. Metallic brush 14 is fastened at one end to plate 12, and its other end rests in groove 4 of cylinder 2. Metallic
80 brush 15 is fastened at one end to plate 11, and its opposite end rests in groove 4 and touches the cylinder at a point diametrically opposite the point of contact of brush 14. A metallic brush 16 is secured at one end to plate 11, and
85 its other end is extended into the path of the contact ends of the arms formed by cross-bar 9. A developer of electrical energy of a character adapted to igniters is indicated generally and conventionally at 23. A wire
90 24 connects the source of electrical energy with the binding-post 16^a of brush 16, and another wire 25 connects the binding-post 13^a of brush 13 with the electrical source. Wire 27 connects binding-post 16^a with a pole-piece
95 of sparker 20. Wire 28 connects the opposite pole-piece of sparker 20 with the binding-post 15^a of brush 15. Wire 29 connects the binding-post 14^a of brush 14 with one of the pole-pieces of sparker 19, and wire 26 connects the other pole-piece of sparker 19 with
100 binding-post 16^a.

The sparkers, which are represented conventionally by separated points at 19 and 20,

may be of any desired construction and may communicate with the interior of the cylinders of an engine in any desirable manner.

The brushes, shaft, and contact parts that have been specified as metallic are preferably made of metal, but it is only necessary that they should be conductors of electricity.

It makes no difference in the operation of the apparatus in what direction the current of electricity travels—that is, whether wire 24 is positive and wire 25 negative or the reverse—but to illustrate the operation it will be assumed that the positive impulse is given by way of wire 25 and through brush 13 to shaft 7. When in the rotation of shaft 1 the segment contact-surface 17 comes in contact with brush 14, a condition that is shown as existing in Figs. 1 and 2, the current is made to pass through sparker 19 by way of brush 14 and wire 29 and back to the source of electrical energy by way of wires 26 and 24. When the contact-surface 17 touches brush 15, at which time it must from its extent and the correlation of the brushes be out of contact with brush 14, the current is sent through sparker 20 and back to the source of electrical energy through wires 28, 27, and 24 in the order named.

This apparatus provides for alternately igniting the different sparkers with fair accuracy and without the inconvenience and loss of energy attendant on passing the current through the engine, but it is not impossible that with nothing but the provision described in the paragraph last preceding the intensity of the current or the susceptibility of the conductors may induce the current to jump from one contact-surface to another in advance of actual contact and with varying distances in length of jumps. This would cause an undesirable variation in times of explosions, and to provide against such conditions brush 16 and cross-bar 9 are introduced. The effect of the brush 16 and cross-bar 9 is to short-circuit the current away from contact-surface 17 until such surface is in actual contact with a brush 14 or 15, so that the times of ignition are determined by the times of separation of the ends of cross-bar 9 from brush 16, and the jumping of sparks is effectually precluded.

In Fig. 3 correlation of parts immediately preceding ignition of sparker 20 is represented, while in Fig. 4 the conditions immediately preceding ignition of sparker 19 are shown. In both instances it is seen that the surface 17 is in contact with a brush before the short circuit is broken.

The disk 5 may be adjusted rotatively with relation to the cylinder 2 by loosening screw 6, turning the disk on screw 10, and retightening screw 6. This is done to move the cross-bar 9, thereby hastening or retarding the explosions to suit the particular engine with which the apparatus may be connected.

In case the igniter is to be used in connection with more than two sparkers the segment 17 is shortened, and brushes to the number re-

quired are placed at regular intervals around the path of the segment. In addition to this arms equal to the brushes around the segment are substituted for the cross-bar 9, and connections are made in an obvious manner.

In case the igniter is applied to a one-cylinder engine one of the brushes contiguous to the segment may be dispensed with, and one of the arms of cross-bar 9 may be omitted.

As shown and described, the arms of cross-bar 9 have intervals of what may be termed "air-insulation," but the result would be substantially the same if the circle of which the ends of the arms form segments were completed by rubber or other insulating substance.

The description heretofore given relates to the initial spark, the time of such spark being determined by the breaking of the short circuit when the ends of arms of cross-bar 9 move out of contact with brush 16 in the preferred use of the device. In case it is necessary or desirable to provide for additional sparks a vibrator may be employed in an obvious manner, or the segment 17 may be divided into sections separated by non-conductors, as shown in Fig. 4 of the drawings, and the number of such sections will determine the number of additional sparks. In the latter case an ordinary sparking-coil may be substituted for a vibrator.

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

1. In an igniter for explosive-engines, the combination of a rotatable shaft insulated from the engine and communicating with a source of electrical energy, a segment of contact-surface rotatable with the shaft and electrically connected therewith, a plurality of brushes contiguous to the path of the segment and connected each with a pole-piece of a sparker, connections between the source of electrical energy and the opposite pole-pieces of the sparkers, radial arms on the shaft corresponding in number with the brushes contiguous to the segment, a brush in the path of the arms and in communication with the source of electrical energy, substantially as set forth.

2. In an igniter for explosive-engines, the combination of the non-conductor cylinder 2, the shaft 7 having the disk-flange 5 connected with the cylinder in a manner permitting rotary adjustment, the contact-surface 17 fastened to the cylinder and having a lateral extension touching the disk-flange, brushes 14 and 15 on opposite sides of the path of the contact-surface 17 and communicating each with a pole-piece of a sparker, conductors between the opposite pole-pieces of the sparkers and the source of electrical energy, brush 13 bearing against shaft 7 and communicating with the source of electrical energy, cross-bar 9 on shaft 7, brush 16 in the path of the arms of the cross-bar, and an electrical connection between the source of elec-

trical energy and the brush 16, substantially as set forth.

3. An igniter for explosive-engines having the following essential peculiarities, namely,
5 a plurality of brushes communicating each with sparkers, a movable electrode adapted to contact with the brushes successively, a short circuit for the current passing from the electrode to the brushes, or the reverse, and
10 means for maintaining the short circuit while the electrode is out of contact with a brush and for breaking it when contact is made, substantially as and for the purpose set forth.

4. In an igniter for explosive-engines, the
15 combination of a rotatable shaft insulated from the engine and communicating with a source of electrical energy, a segment of circular contact-surface made up of alternate

sections of conductor and non-conductor, such segment being rotatable with the shaft 20 and in electric communication therewith, a plurality of stationary contact-surfaces at regular intervals around and contiguous to the path of the segment, a wire leading from each stationary contact-surface to a pole-piece 25 of a sparker, and other wires leading from the opposite pole-pieces of the sparker back to the source of electrical energy, substantially as set forth.

In testimony whereof I sign my name in the 30 presence of two subscribing witnesses.

PHILIP MUELLER.

Attest:

WILL DILL,
A. H. BARBER.