

No. 776,700.

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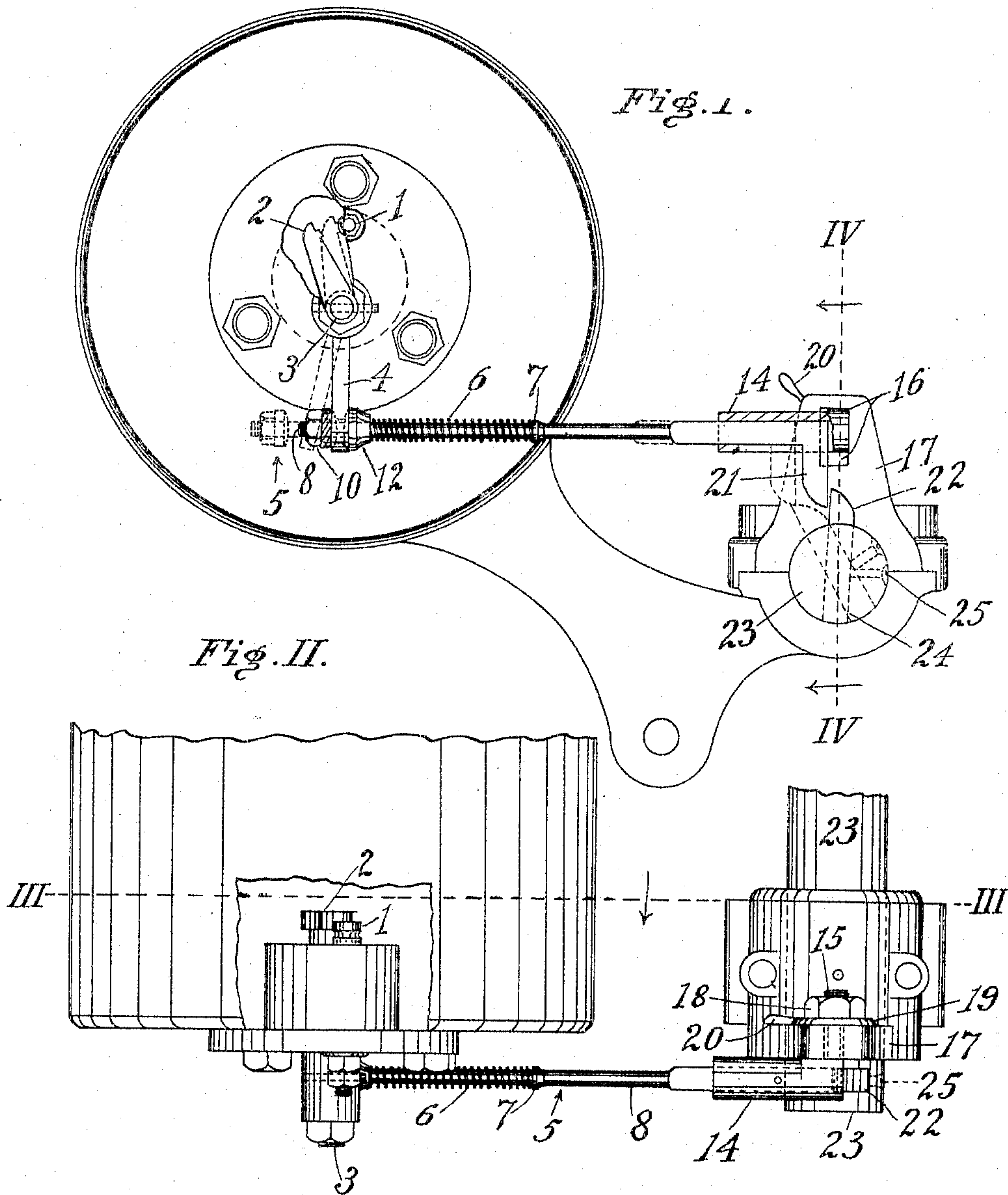
C. E. STERNE.

SPARKING DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED MAY 2, 1901.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES

J. Townsend,  
C. C. Healy

Charles E. Sterne INVENTOR  
BY  
Townsend Bros ATTORNEYS

C. E. STERNE.

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2 SHEETS—SHEET 2.

Fig. III.

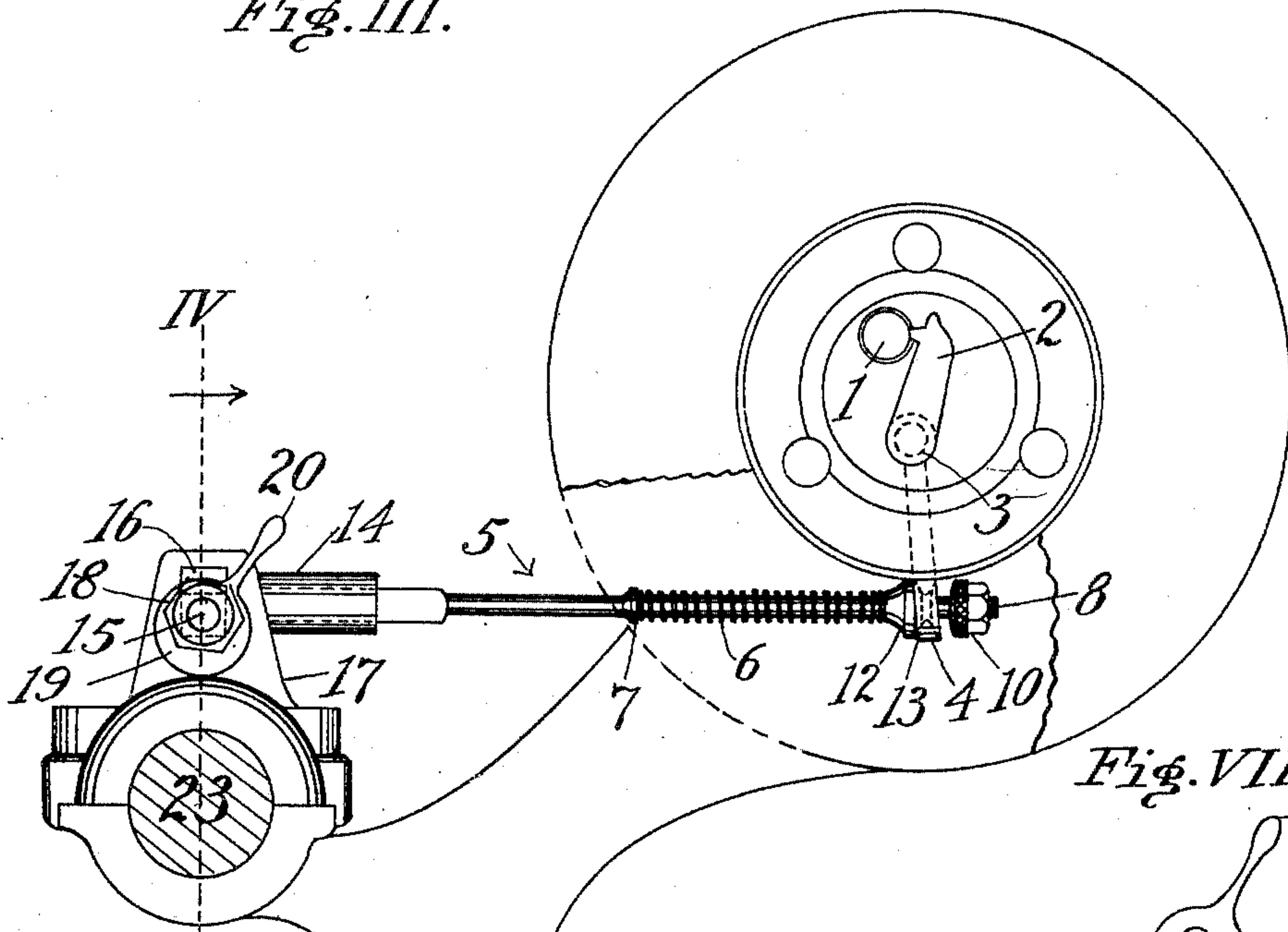


Fig. VII.

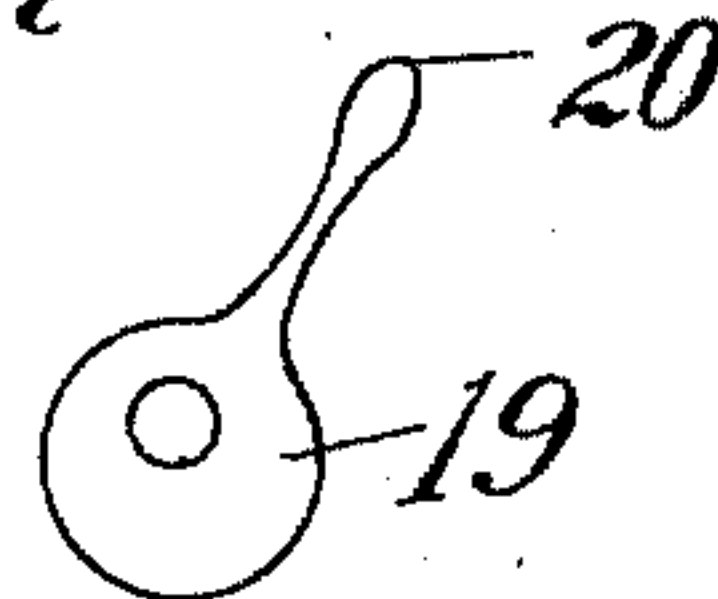


Fig. IV.

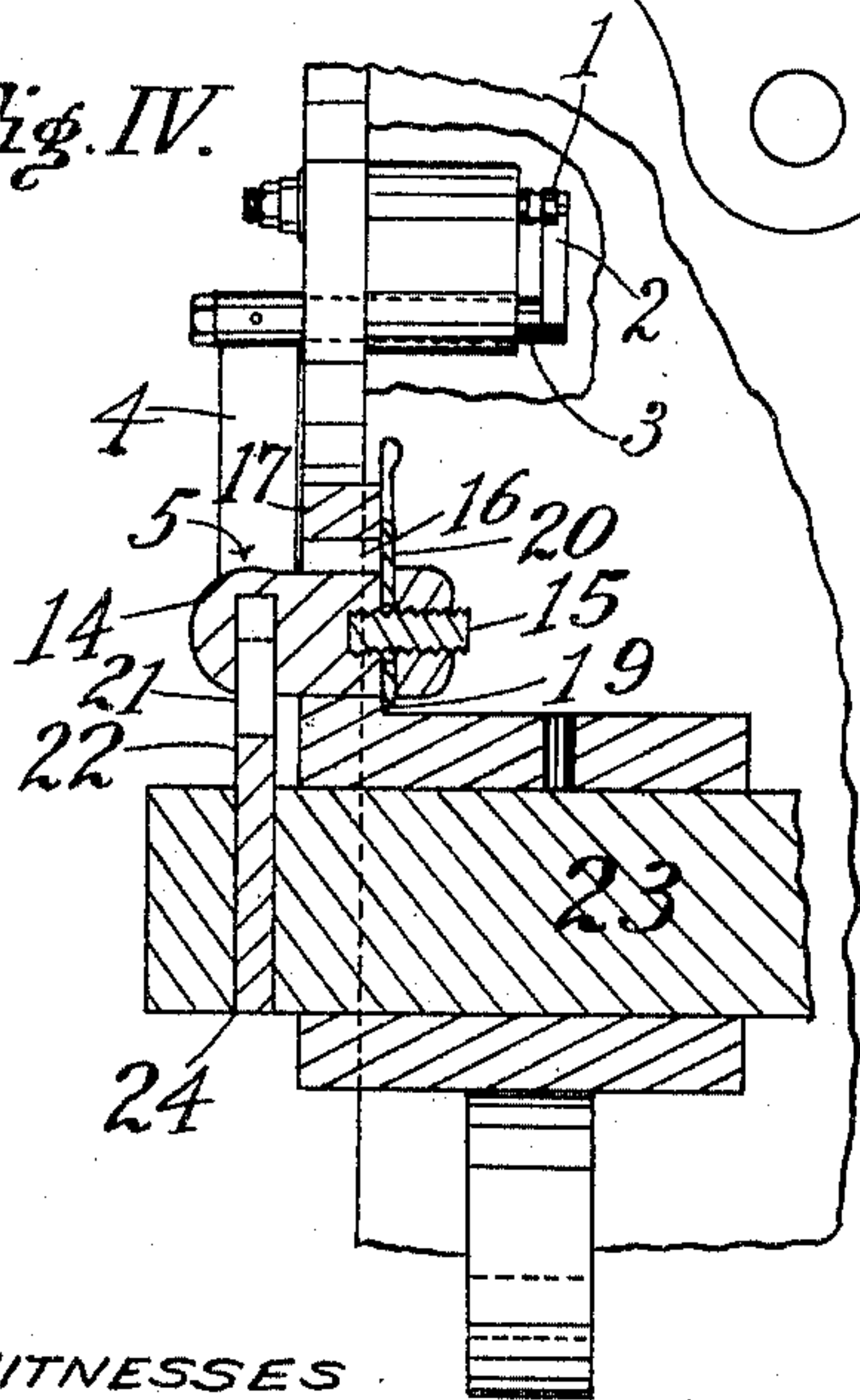


Fig. V.

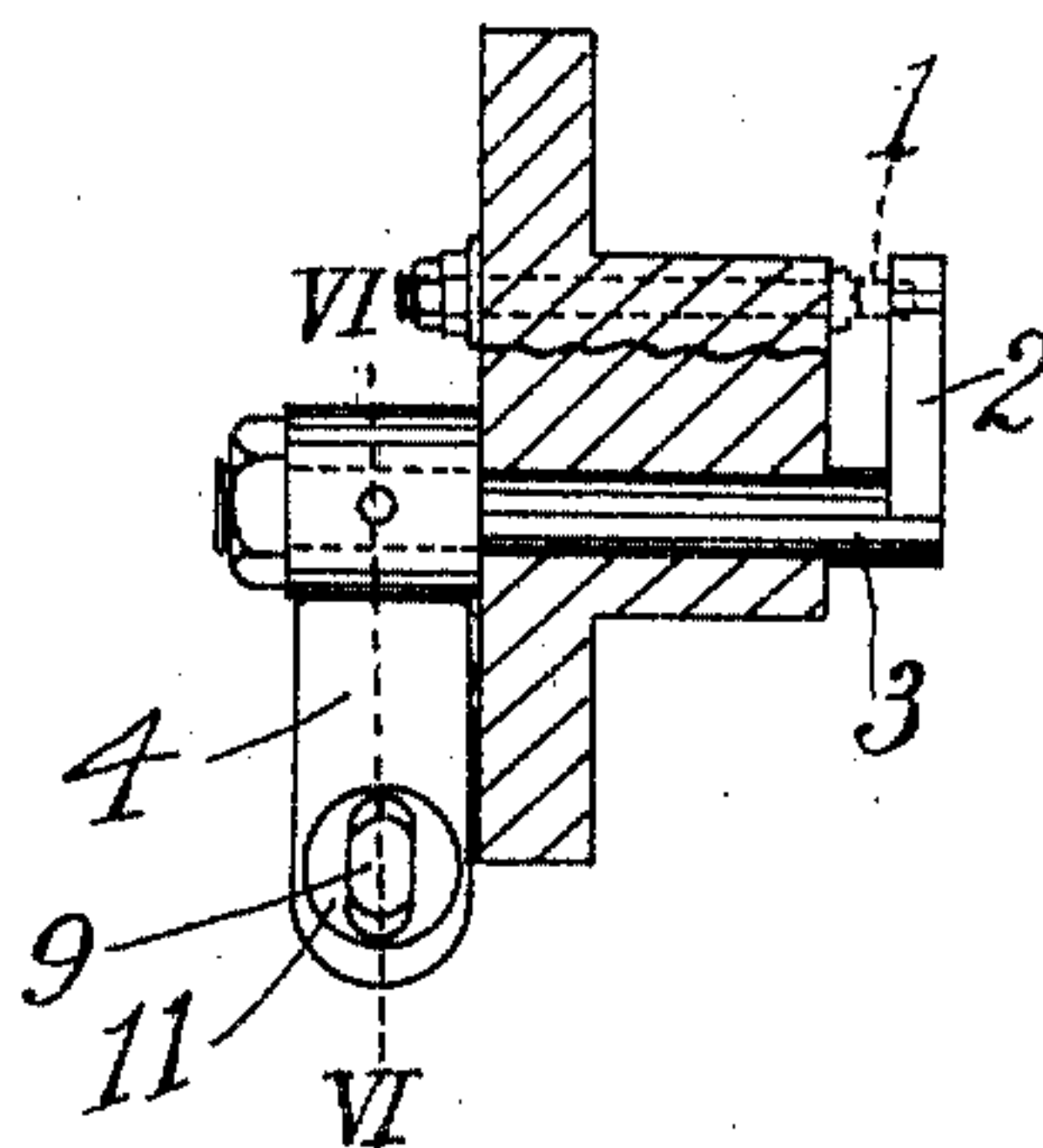
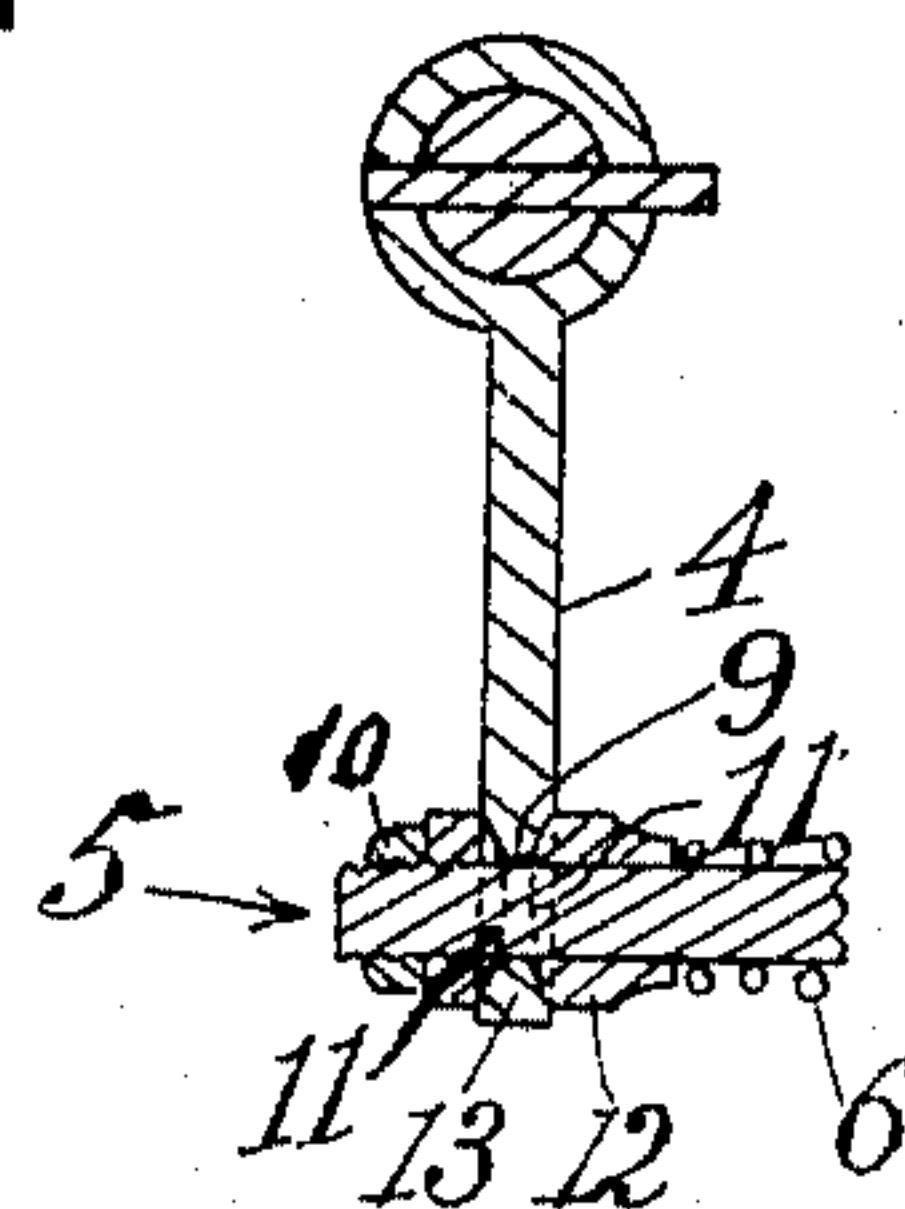


Fig. VI.



WITNESSES

J. Townsend.  
L. L. Heolby

Charles E. Sterne  
BY  
Townsend Bros  
ATTORNEYS



# UNITED STATES PATENT OFFICE.

CHARLES E. STERNE, OF SAN DIEGO, CALIFORNIA, ASSIGNOR TO STERNE BROS. CO., OF SAN DIEGO, CALIFORNIA, A CORPORATION OF CALIFORNIA.

## SPARKING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

SPECIFICATION forming part of Letters Patent No. 776,700, dated December 6, 1904.

Application filed May 2, 1901. Serial No. 58,530. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES E. STERNE, a citizen of the United States, residing at San Diego, in the county of San Diego and State of California, have invented new and useful Improvements in Sparking Devices for Internal-Combustion Engines, of which the following is a specification.

An object of this invention is to provide means for invariably producing an effective electric spark at the instant desired.

Another object is to produce this result by very simple, economical, and easily-constructed means which are not liable to get out of order and which can be readily assembled and taken apart.

This invention includes the combination of a stationary electrode, a movable electrode to make and break contact therewith, a hammer to strike a blow for operating the movable electrode to break the contact, a spring operating between the electrode and the hammer to hold the movable electrode in contact with the stationary electrode when the hammer is operated to compress the spring ready to strike the contact-breaking blow and to impel the hammer when the hammer is released to allow the blow to be struck. By this arrangement the contact is only made at the instant the hammer is being moved into position to strike the blow, and the contact is broken instantly by the stroke of the hammer, and a spark of considerable length and intensity is thus produced.

Another feature of this invention is the adjustment for regulating the stroke of the hammer. This regulation is provided for in two ways, as will hereinafter more fully appear.

Another object is to avoid any injury to the parts of the sparking device in case of reversal of the engine by premature explosion or otherwise.

The accompanying drawings illustrate my invention.

Figure I is an elevation of the sparking device in place on an engine, a portion of which is shown. Solid lines show the hammer at

rest and the cam-finger ready to engage the hammer-finger to retract the hammer. Dotted lines indicate the position of parts when the hammer is just released to strike the blow. A portion of the plug which inserts into the cylinder and carries the sparking device is broken away to expose the electrodes. Fig. II is a plan of the sparking device on the engine, a fragment of which is shown. Fig. III is a sectional elevation looking at the opposite side of Fig. I from line III, Fig. II. Fig. IV is an elevation in section on line IV IV looking left and right, respectively, in Figs. I and II. Fig. V is a view of the rocker-arm and shaft and the movable electrode. The plug is shown in section. Dotted lines indicate the stationary electrode. Fig. VI is a section of the rocker-arm on its shaft. Line VI VI, Fig. V, indicates the line of section. Fig. VII is a view of the cam-washer for raising and lowering the hammer-cam for regulating the time of the contact-breaking blow.

1 indicates the stationary electrode; 2, a movable electrode; 3, a rock-shaft furnished with a rocker-arm 4. The movable electrode 2 is mounted on the rock-shaft 3 to make and break contact with the stationary electrode 1 as the rock-shaft is operated for that purpose.

In a general way 5 indicates a hammer to strike the rocker-arm 4 to break the contact.

6 indicates a rocker-arm-operating and hammer-impelling spring which is operated by the hammer to hold the electrode out of contact when the hammer is retracted, said spring being arranged, by reason of its contact with one side of the rocker-arm and its engagement with a shoulder 7 on the hammer, to impel the hammer to strike the contact-breaking blow.

The hammer comprises a shouldered rod 8, which passes through a slot 9 in the rocker-arm and is furnished with a head 10, which is screwed on the end of the rod on the side of the rocker-arm opposite the shoulder of the hammer-rod.

The rocker-arm 4 is preferably provided with seats 11, which may be concaved, and the head 10 of the hammer is convex to rest



in the seat on the side of said arm opposite the shoulder of the rod. 12 indicates a washer sliding on the rod 8, and it is furnished with a convex portion or face 13 to seat in the other concave seat of the arm 4. The spring 6 holds the washer away from the shoulder 7 and in one of the concave seats 11. Means are provided for holding the hammer in position to keep the electrodes normally out of contact. For this purpose the spring is strong enough to normally hold the arm 4 in the same position relatively to the rod 8 at all times by clamping it between the stops or washers 11 and 12 and to return it to that position after it has been forced into a different position in either direction by the action of the operating mechanism on the engine. The outer end of the hammer-rod 8 is mounted in a guide 14, in which the rod slides freely and which has a stud 15, which extends through a slot 16 in a bracket 17. The stud is secured by a nut 18, which binds the guide 14 to the bracket 17. By pivotally connecting the guide to the bracket by means of the stud the guide can automatically adjust itself to the change of angle caused by raising or lowering the end of hammer or rod relatively to the axis of the cam-shaft. For convenience in raising the guide 14 when the engine is in motion a cam-washer 19 is provided between the nut 18 and the bracket 17. The range of the cam is such that when the lever 20 of said cam-washer is thrown in one direction the guide 14 will be allowed to come to its lowest position, and upon reversing the lever 20 the cam will raise the bolt 15 and its guide 14 to its uppermost position. The concave seats 11 and the convex faces of the head and washer, together with the slot 9, allow freedom of adjustment for the free or outer end of the hammer-rod. When the outer end of the hammer-rod is raised, the center of gravity will be changed, so that the moving electrode will be held normally farther out of contact with the fixed electrode than when the outer end of the hammer-rod is lowered.

21 indicates a finger on the hammer to be caught by a cam 22, which is adjustably mounted in the rotating cam-shaft 23 to operate the hammer against the force of the spring 6 and to suddenly release it to allow the blow to be struck. Said shaft is provided with a hole 24 to receive the cam-finger 22.

25 indicates a set-screw for adjustably fixing the cam-finger 22 in its seat 24.

The rotary shaft 23 is driven by the operative parts of the engine by the usual connections. (Not shown.)

The guide is preferably open at both ends and slotted longitudinally, preferably on its under side, for the reception of the finger or shoulder, which projects rigidly from the end of the rod. This construction permits of the insertion of the rod through the guide until the finger enters the slot, and the location of

the finger in the slot will prevent the rotation of the rod, thereby providing a very simple, cheap, and efficient construction. The slot preferably terminates near one end of the guide, and thereby forms a stop against which the finger will engage and prevent excessive movement of the rod toward the sparking mechanism if too quick or too heavy blows should be given to the finger by the cam 22.

In practice the attendant will adjust the cam-finger 22 to an appropriate height while the engine is stationary, so that when the engine is run the cam-finger 22 will engage and lift the hammer-finger 21 at approximately the appropriate time; but in order to give the nice adjustment while the engine is in operation he will loosen the nut 18 slightly and will then turn the washer 20 as required to raise or lower the guide 14, and consequently the hammer cam-finger 21, in order to shorten or lengthen the stroke of the hammer, as may be desired. If the spark occurs too soon, the guide 14 will be lowered, thus to release the hammer a little later, and if the spark is not soon enough the guide will be raised, so as to release the hammer a little sooner. By this contrivance the attendant can accurately regulate the time of the spark while the engine is in operation. An adjustment within an inappreciable moment of time will result in a large economy of fuel and increase of power. The attendant in making this adjustment will therefore depend upon the apparent work of the engine in determining when the adjustment is right. It is generally understood that the most effective results are attained by producing the spark somewhat before the compressing stroke of the piston has been completed.

The rocker-arm is longitudinally slotted, as shown in Fig. 5, in order that the hammer-rod 8 may play freely in making its strokes. If desired, the end of the rod can be slightly flattened at the sides where it passes through the slot to engage with the sides of the slot; but its diameter is so much less than the length of the slot that the rod will not engage with the ends of the slot even at the greatest angle in which the arm and the rod may be placed relatively to each other.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a sparking device, the combination with electrodes which are normally out of contact, of a rocker-arm for causing a contact, the free end of which is perforated and provided with a concave seat on each side, a shouldered rod projecting through said perforation, convex clamping means, one on each side of said arm, one of them being rigid and the one between the shoulder and arm being movable, a spring between said shoulder and the movable clamping means, said spring being strong enough to return said parts to their normal position by pressure upon said clamp-



ing means, a guide for supporting the free end of the rod, and means for moving the rod longitudinally.

2. In a sparking device, the combination of  
5 an electrode-operating rock-shaft; a spring-impelled hammer for operating the rock-shaft to make and break the contact; a rotary shaft; a cam-finger carried by said rotary shaft; means for adjusting the cam-finger toward and  
10 from the axis of the rotary shaft; a finger on said hammer to be caught by said cam to retract the hammer; and a guide for slidably holding the hammer in position to allow the cam to operate the finger.

3. In a sparking device, the combination of  
15 an electrode-operating rock-shaft; a spring-impelled hammer for operating the rock-shaft to make and break the contact; a rotary shaft; a cam-finger carried by said rotary shaft; means for adjusting the cam-finger toward and  
20 from the axis of the rotary shaft; a finger on said hammer to be caught by said cam to retract the hammer; a guide for slidably holding the hammer in position to allow the cam to operate the finger; and means for adjusting  
25 the guide to move the finger toward and from the axis of the rotary shaft.

4. In a sparking device, the combination of  
30 an electrode-operating rock-shaft; a spring-impelled hammer for operating the rock-shaft to make and break the contact; a rotary shaft; a cam-finger carried by said rotary shaft; a finger on said hammer to be caught by said cam to retract the hammer; a guide for slidably holding the hammer in position to allow  
35 the cam to operate the finger; a slotted support; a stud in the slot of said support to carry the guide; a cam-washer on said stud and resting on said support to adjust the stud as to  
40 height; and a clamp-nut to fix the stud on the support.

5. In a sparking device, the combination with electrodes which are normally out of contact, of a rocker-arm for causing a contact,  
45 longitudinally-movable rod movably connected with said arm, means for yieldingly holding said arm and rod in a fixed relation to each other, a support for the free end of the rod, means for moving said rod longitudinally, and  
50 means for moving the free end of the rod vertically without varying the fixed relation between the arm and the rod.

6. In a sparking device, the combination with electrodes which are normally out of contact, of a rocker-arm for causing a contact,  
55 longitudinally-movable rod movably connected with said arm, the free end of said rod being shouldered, means for yieldingly holding said arm and rod in fixed relation to each  
60 other, a support for said free end of the rod to permit of its free movement in either direction, and an adjustable pin for engaging with said shoulder and moving the rod.

7. In a sparking device, the combination of  
65 an electrode-operating means holding the elec-

trodes normally out of contact, a spring-impelled hammer for operating said means by spring action to make the contact and by impact to break the contact, a rigid finger on said  
hammer, a rotary shaft, a cam-finger carried  
70 by said rotary shaft and moved thereby tangentially to the movement of the hammer-finger and adapted to catch the hammer-finger and move the same tangentially to the movement of the cam-finger, to operate the ham-  
75 mer, a guide arranged tangentially to the movement of the cam-finger and supporting the hammer-finger against radial movement while allowing its tangential movement, and means for adjusting said guide, said means  
80 comprising a slotted bracket supporting the guide, cam means connected with the guide and a fixed part engaged by said cam means.

8. In a sparking device, the combination with electrodes which are normally out of con-  
85 tact, of a rocker-arm for causing a contact, a longitudinally-movable rod yieldingly connected at one end with said arm, a support for the other end of the rod, said rod having  
90 absolutely free movement in either direction in its support, and means for moving the rod longitudinally.

9. In a sparking device, the combination with electrodes which are normally out of contact, of a rocker-arm for causing a contact,  
95 the free end of which arm is slotted longitudinally, a longitudinally-movable rod projecting through said slot at one end, the diameter of which is less than the length of the slot, means for yieldingly holding the rod and the  
100 arm in fixed relation to each other, means for supporting the other end of the arm and permitting its movement in the plane of the arm, and means for moving the rod longitudinally.

10. In a sparking device, the combination with electrodes which are normally out of contact, of a rocker-arm for causing a contact, a  
longitudinally-movable rod yieldingly connected at one end with said arm, the other end  
110 of the rod being provided with a finger, a slotted guide for supporting said end of the rod, the guide at one end of the slot forming a stop, and means for moving the rod longitudinally.

11. In a sparking device, a shaft provided with a cam, a slotted bracket, two electrodes, a longitudinally-movable rod for moving one  
of the electrodes, the free end of the rod being provided with a laterally-projecting finger,  
120 a slotted guide for said end provided with a stud which projects through the slot in the bracket, and a nut on the stud for adjustably securing the guide to the bracket.

12. In a sparking device, a shaft provided  
125 with a cam, a slotted bracket, two electrodes, a longitudinally-movable rod provided with a laterally-projecting finger, a slotted guide for said end provided with a stud which projects through the slot of the bracket, a nut on the  
130



stud, and a cam-washer on the stud adjacent to the bracket for adjusting the guide relatively to the axis of the shaft.

13. In a sparking device, a shaft provided  
5 with a cam, a guide adjustable radially relatively to the axis of the shaft, a longitudinally-movable non-rotatable rod mounted in the guide and movable therein tangentially to the shaft and provided with a rigid finger  
10 which projects toward the shaft, and two electrodes, one of which is movable and operatively connected with said rod.

14. In a sparking device, a shaft, a longitudinally-adjustable radially-projecting cam-  
15 finger secured to the shaft, a longitudinally-

movable rod arranged tangentially to the shaft and provided with a rigid finger which projects toward the axis of the shaft, means for adjusting the finger relatively to the axis of the shaft, and electrodes, one of which is movable 20 and operatively connected with said rod.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, at Los Angeles, California, this 26th day of April, 1901.

CHARLES E. STERNE.

Witnesses:

JAMES R. TOWNSEND,  
JULIA TOWNSEND.