No. 890,815. PATENTED JUNE 16, 1908.

C. M. STROUD.

REVERSING DEVICE FOR EXPLOSIVE ENGINES.

APPLICATION FILED MAY 9, 1907.

Fig 1

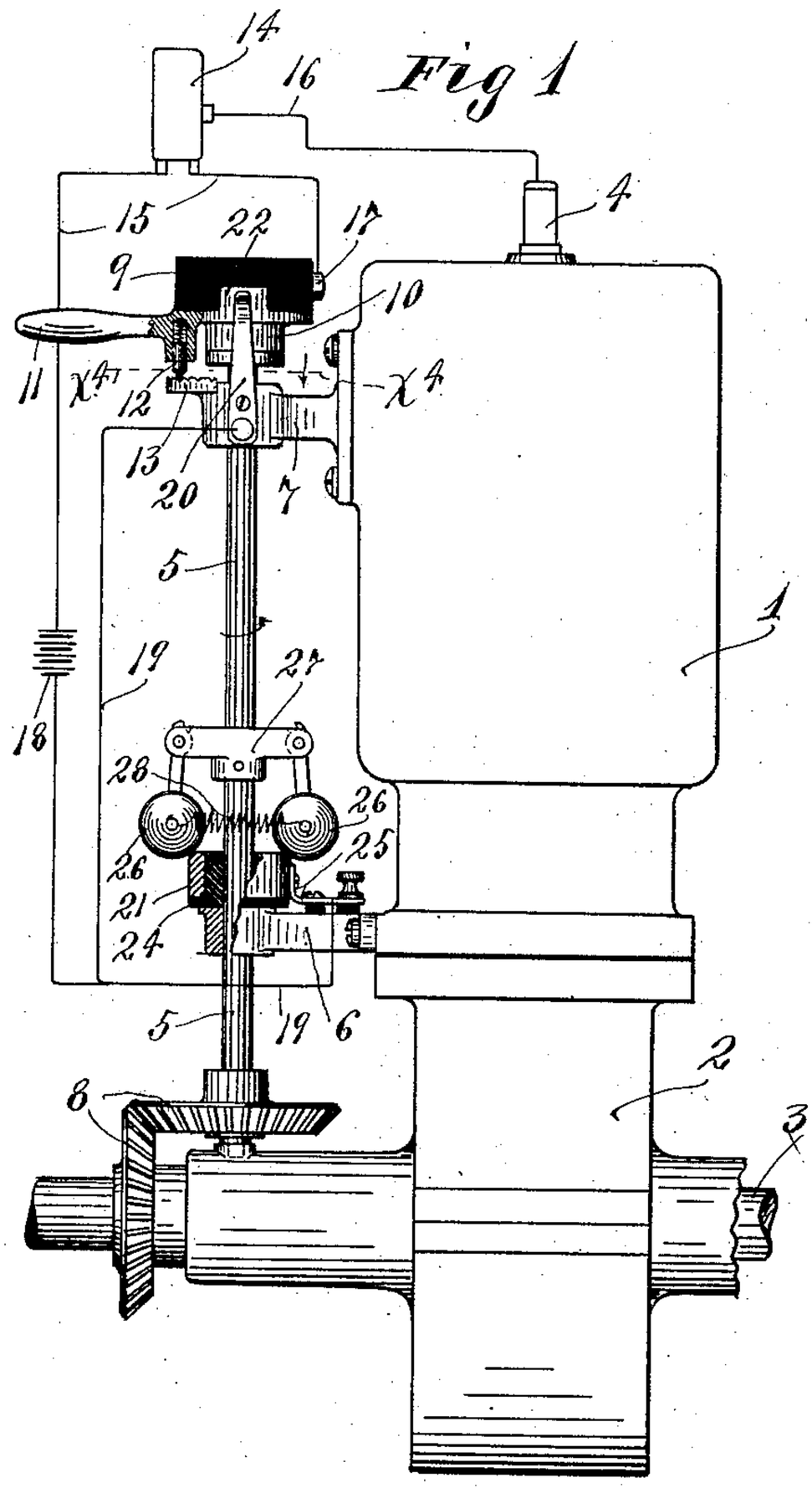


Fig. 2.

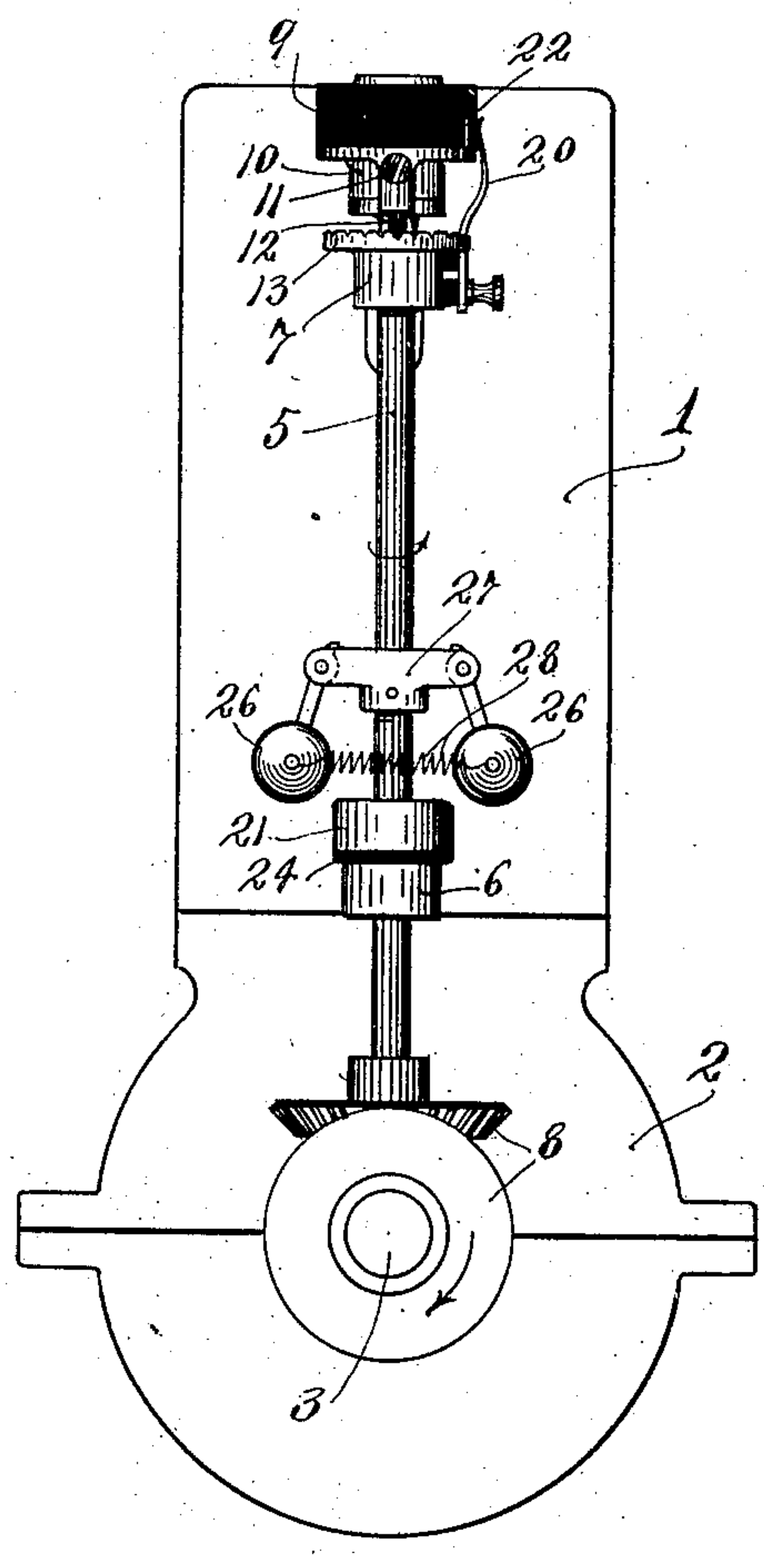


Fig. 3.

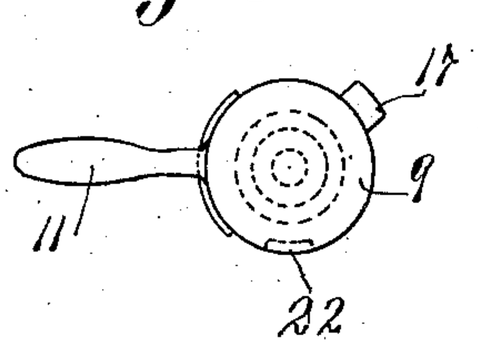
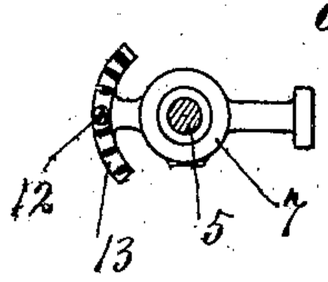


Fig. 4.



Witnesses
A. H. Opsahl.
Tyler Lee

Inventor.
C. M. Stroud.
By his Attorneys
Williamson & Merchant

UNITED STATES PATENT OFFICE.

CHARLES M. STROUD, OF HASTINGS, MINNESOTA.

REVERSING DEVICE FOR EXPLOSIVE-ENGINES.

No. 890,815. Specification of Letters Patent. Patented June 16, 1908.

Application filed May 9, 1907. Serial No. 372,774.

To all whom it may concern:

Be it known that I, CHARLES M. STROUD, a citizen of the United States, residing at Hastings, in the county of Dakota and State of Minnesota, have invented certain new and useful Improvements in Reversing Devices for Explosive-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to electric ignition mechanism for explosive engines, and particularly to those employing adjustable timers, by means of which the time of the spark may be advanced or retarded.

The invention has for its object to provide means whereby when the timer is adjusted in a direction to increase the advance or lead of the spark beyond a predetermined extent, the sparking circuit will be broken, and to provide in connection therewith means for automatically reëstablishing the sparking circuit when the engine speed falls below a predetermined point.

To the above ends the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a view in side elevation, illustrating my invention applied to a two-cycle engine. Fig. 2 is a front elevation of the said engine, some parts being sectioned. Fig. 3 is a detail showing the timer in plan; and Fig. 4 is a detail in horizontal section, taken on the line x^4 x^4 of Fig. 1.

Of the parts of the engine, it is for the purpose of this case desirable to note only the cylinder 1, the crank casing 2, crank shaft 3, the sparking plug 4, and the timer shaft 5, which latter is journaled in bearings 6 and 7 on the cylinder casting and is driven from the crank shaft 3 through a pair of miter gears 8, all of which parts are of the usual or any suitable construction.

A timer of the standard or any suitable construction may be employed, and of the parts thereof the numeral 9 indicates the insulated case section, and the numeral 10 the metallic part of the said case, the latter having a hand piece 11 by means of which the case may be adjusted around the axis of the shaft 5 for the purpose of advancing or retarding the spark. The rotating internal contact of this timer is, of course, carried by the timer shaft 5 in the usual way. To hold the case 9—10 in differently adjusted positions, a spring pressed pin 12 in the hand piece 11 is arranged to coöperate with a notched segment 13 on the upper bearing 7.

In the drawings, the invention is shown as applied in connection with a sparking coil 14, primary circuit wires 15, and secondary circuit wire 16. The secondary wire 16 connects the secondary of the sparking coil to one of the electrodes of the sparking plug 4, in the usual way, and one of the primary wires 15 extends to a contact 17 on the insulated case section 9, which contact 17 is connected in the usual way to a contact within the case of the timer with which the rotary contact of the timer coöperates in the usual way. A battery or source of electrical energy 18 is shown as interposed in the other primary wire 15, and this wire is connected by a wire 19 or other suitable means to a pair of ground contacts 20 and 21. The contact 20 is secured to but insulated from the upper bearing 7, and the free end thereof is arranged to coöperate with a contact 22 that is set into the insulated case section 9 and, as shown, is in the form of an extension of the metal case section 10.

The ground contact 21 is in the form of a metal ring that surrounds the timer shaft 5, but is insulated therefrom by an insulating bushing 24 and is held against rotation by a small metallic bracket 25 which is insulated from the lower bearing 6, and to which one end of the wire 19 is shown as attached.

For coöperation with the annular contact 21, I provide a centrifugal governor which is made up of a pair of weighted arms or arm equipped balls 26, the arms of which are pivotally connected to a transverse head 27 carried by the timer shaft 5. The balls 26 are so arranged that when the engine speed is below a predetermined point, they will drop into engagement with the annular contact 21 under the action of gravity. In the preferred arrangement, however, the governor balls are connected by a light spring 28 which assists gravity in throwing the balls against the contact 21 when the engine speed drops below a predetermined point.

The contact 22, which is carried by the case of the timer, is so located with respect to the coöperating contact 20 that it will main-

tain engagement therewith under all adjustments of the case section required to give the various lead or advance and retardation to the spark, required for different engine speeds in one direction, which we will assume is in the direction of the arrow marked on Fig. 2, and that to advance the spark the case of the timer must be adjusted in a direction reverse from that indicated by the arrows marked on the timer shaft in Figs. 1 and 2.

When it is desired to reverse the engine, the timer case is adjusted in the direction just above stated, to-wit, in a direction to increase the lead, or to advance the spark, and is moved in such direction far enough to carry the contact 22 out of engagement with the contact 20, thereby breaking the igniter circuit at that point. When this is done, while the engine is at high speed and the governor balls 26 are thrown outward as shown in Fig. 2, the igniter circuit will be broken at two points, to-wit, between the contacts 20 and 22, and the contact 21 and governor balls 26. Attention is here called to the fact that the said governor balls in the arrangement illustrated in the drawings also act as contacts for engagement with the contact ring 21.

When the igniter circuit is broken as just stated, the production of spark will, of course, be temporarily interrupted, so that the speed of the engine will be decreased until that certain predetermined speed is reached where the combined action of gravity and of the spring 28 will throw the balls 26 against the contact ring 21, and thereby close the primary of the igniter circuit.

The position in which the case of the timer is set when adjusted as just above described, throws the spark producing periods so far in advance of the inward extreme movement of the piston that the explosion produced under slow speed is sufficient to overcome the momentum of the parts and, hence, reverse the engine. This reversal of the engine, it will also be noted, is automatic and takes place only after the speed of the engine has been reduced to a point where it is perfectly safe to reverse the engine. The speed at which the engine would be thus automatically reversed may, of course, be varied and should be varied according to the load carried by the engine.

The term "timer" is herein used in a broad sense to include any kind of mechanism for controlling or timing the spark of the ignition mechanism. These timers when designed for multi-cylinder engines are frequently designated as distributers.

What I claim is:

1. The combination with an explosive engine, of electric ignition mechanism comprising a timer having a rotatively adjustable case and contacts arranged to break the ignition circuit when the said timer case is adjusted for an excessive amount of lead, and an engine driven centrifugal governor having circuit connections arranged to reëstablish the ignition circuit through said timer when the engine falls below a predetermined speed, substantially as described.

2. An ignition mechanism for an explosive engine comprising an engine driven timer shaft, a timer made up of two principal parts, one of which is carried by said shaft and the other of which is in the form of a case and is mounted for adjustment around the axis of said shaft, which case is composed of interlapped metallic and insulating materials, an ignition circuit including the metallic portion of said timer case and a relatively fixed contact, which fixed contact is adapted to be engaged with the insulating portion of said timer case to break the circuit and to be engaged with the interlapped metallic portion thereof to close the circuit, and an engine driven centrifugal governor having circuit connections arranged to reëstablish the ignition circuit through said timer when the engine falls below a predetermined speed, substantially as described.

3. The combination with an explosive engine, of electric ignition mechanism comprising a timer having contacts arranged to break the ignition circuit when said timer is adjusted for an excessive amount of lead, an engine driven timer shaft carrying the movable contact of said timer, a centrifugal governor carried by said timer shaft, and a relatively fixed annular contact and circuit connections coöperating with said governor and arranged to reëstablish the ignition circuit through said timer when the engine speed falls below a predetermined point, substantially as described.

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

CHARLES M. STROUD.

Witnesses:

MALIE HOEL,

F. D. MERCHANT.