No. 686,735. Patented Nov. 19, 1901.

C. T. JEFFERY.

ADJUSTING DEVICE FOR ELECTRIC IGNITERS FOR EXPLOSIVE MOTORS.

(Application filed Dec. 10, 1900.)

(No Model.)

Fig. 1.

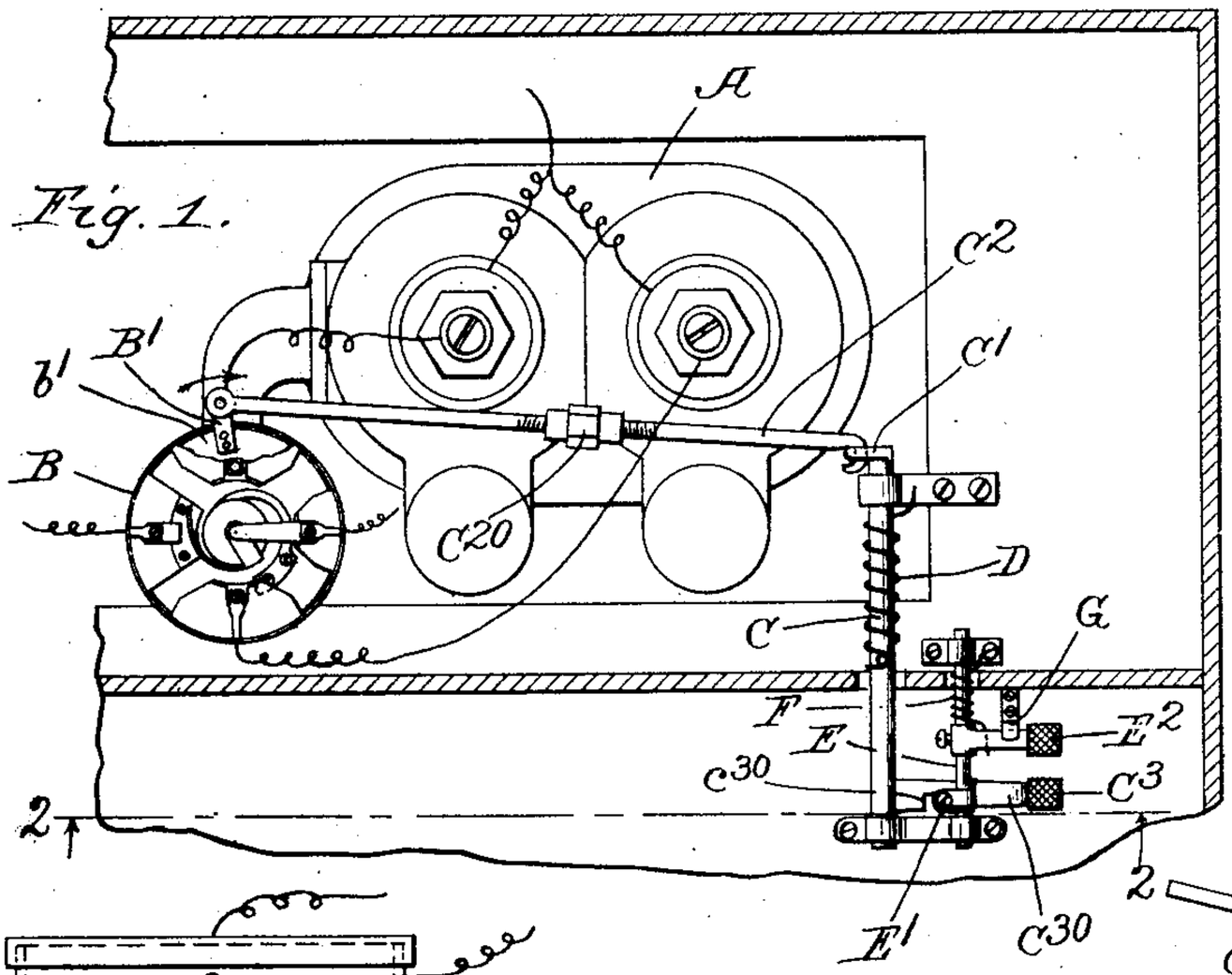


Fig. 6.

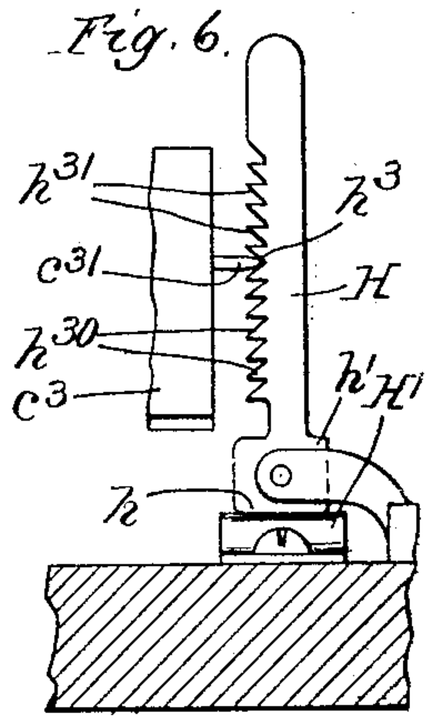


Fig. 5.

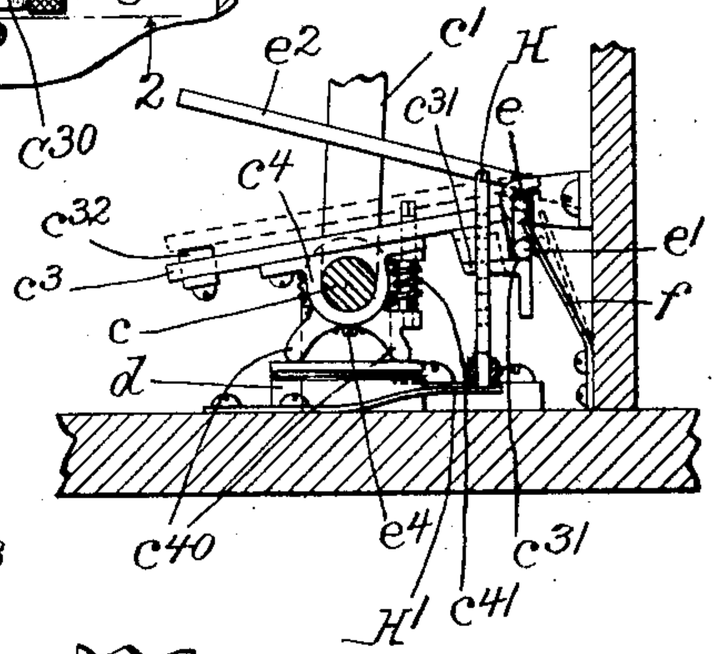


Fig. 2.

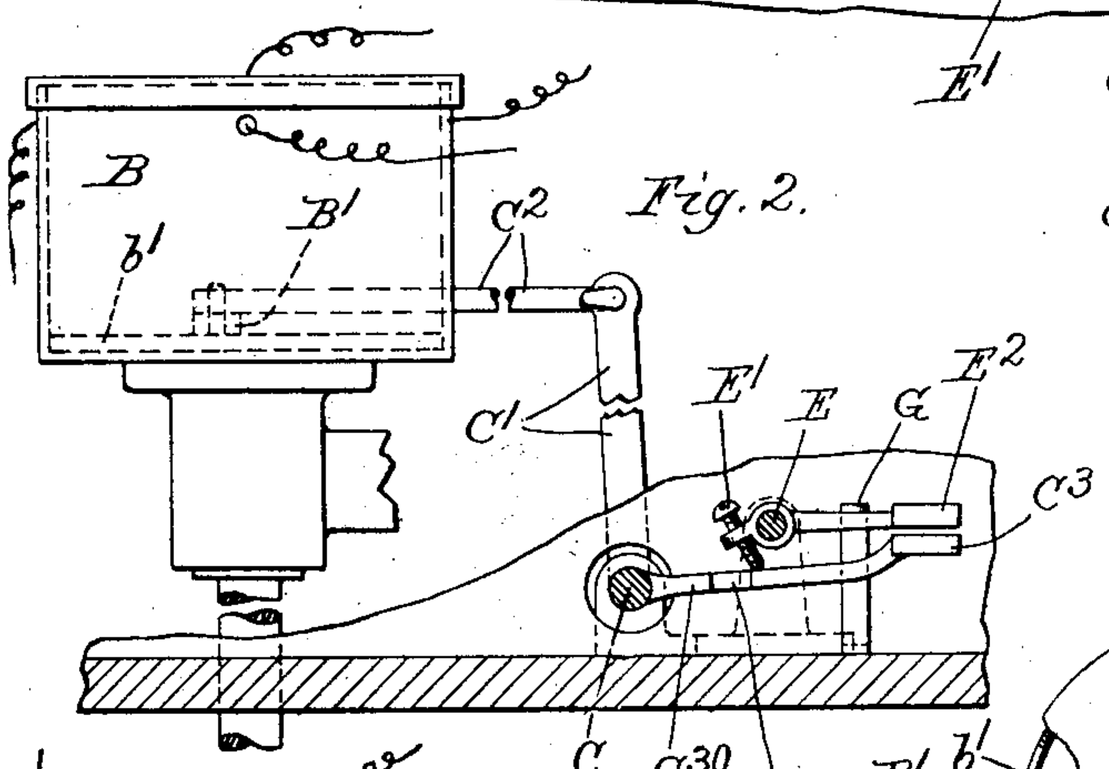


Fig. 3

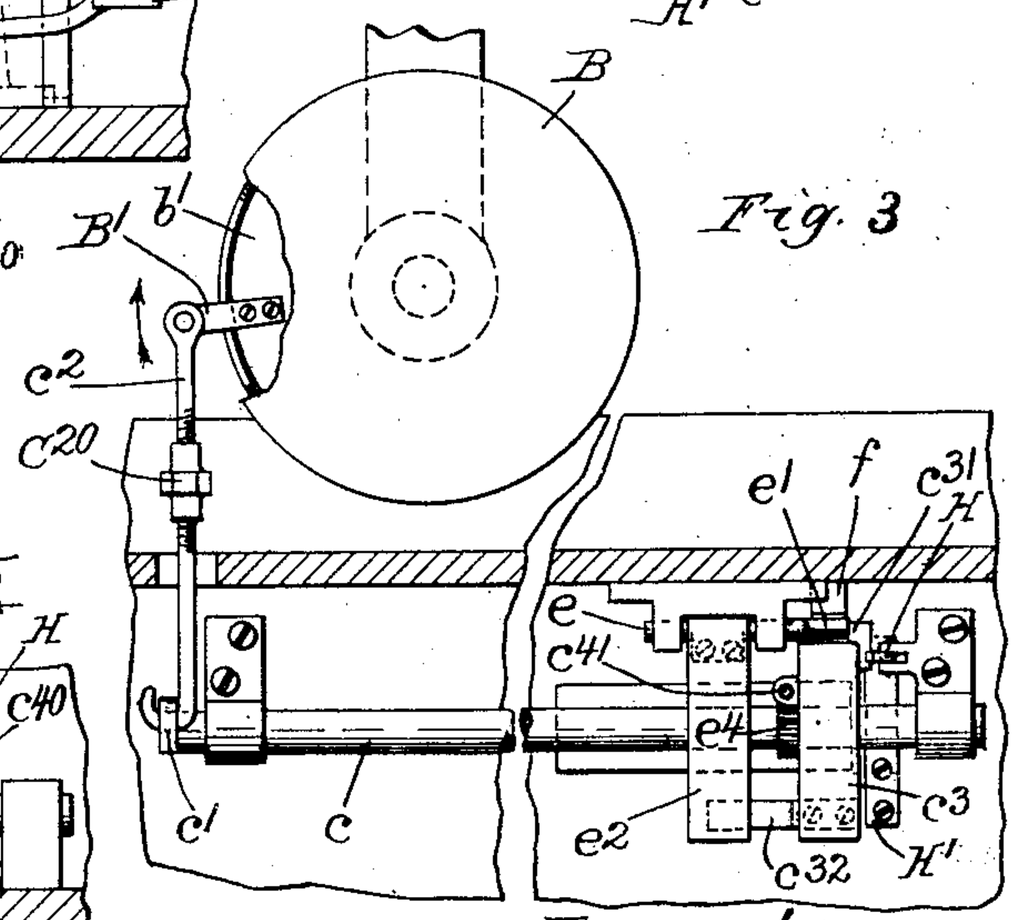
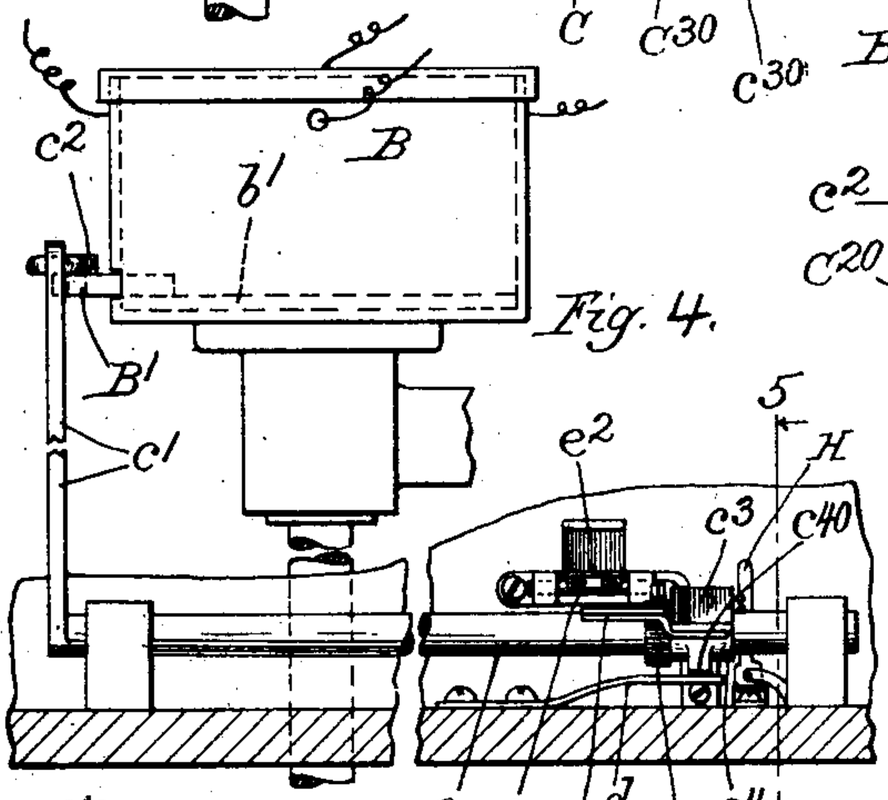


Fig. 4.



Witnesses.
Edward T. Wray.
Edgar L. Crank.

Inventor.
Charles T. Jeffery
by Burton Burton
his Atty's

UNITED STATES PATENT OFFICE.

CHARLES T. JEFFERY, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO THOMAS B. JEFFERY, OF CHICAGO, ILLINOIS.

ADJUSTING DEVICE FOR ELECTRIC IGNITERS FOR EXPLOSIVE-MOTORS.

SPECIFICATION forming part of Letters Patent No. 686,735, dated November 19, 1901.

Application filed December 10, 1900. Serial No. 39,264. (No model.)

To all whom it may concern:

Be it known that I, CHARLES T. JEFFERY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Adjusting Devices for Electric Igniters for Explosive-Motors, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide devices which can be operated at will by the operator of an explosive-motor to adjust the controller for the electric igniter to vary the time of ignition with respect to the movement of the piston in the cylinder of the motor, as is desirable for well-known reasons.

It consists in features of construction which are set out in the claims.

In the drawings, Figure 1 is a detail plan of a portion of a vehicle having an explosive-motor with the controller for the igniter provided with my improvements, the motor-cylinders appearing in end view. Fig. 2 is a detail sectional elevation of the controller and adjusting connections on a larger scale than Fig. 1, section being made at the line 2 2 on Fig. 1. Fig. 3 is a detail plan of a modified form of adjusting connections, same being shown in connection with the controller, the other parts of the motor being omitted from the view. Fig. 4 is a detail elevation of the device in the modified form shown in Fig. 3. Fig. 5 is a section at the line 5 5 on Fig. 3. Fig. 6 is a detail elevation of an automatic locking or latching device pertaining to the form of structure shown in Figs. 3, 4, and 5.

A represents the motor, and B the controller for the electric igniter. This element is of the form which is fully shown and described in application of Thomas B. Jeffery, serially numbered 3,956, filed February 5, 1900, and need not be described herein except to say that the lever-arm B′ extends from a plate b', which is adjustable, by means of said lever-arm, about the axis of the device to change the time of sparking with respect to the piston's movement, rotation in the direction of the arrow on Fig. 1 having the effect to cause the sparking to occur earlier in the piston's retreating stroke and movement in the opposite direction having the effect to retard or delay the sparking.

C is a rock-shaft, which may be mounted upon the floor of the vehicle in such position that a pedal C^3 thereon is in convenient position to be pressed by the foot of the operator. C′ is the lever-arm of said rock-shaft, connected by a link C^2 with the controller lever-arm B′.

D is a spring coiled around the rock-shaft C, stopped thereon and on one of the bearings of the rock-shaft, reacting to rock the shaft in direction to resist the movement of the controller-arm B′ in the direction of the arrow and to retract it after it is moved in that direction.

E is a second rock-shaft, suitably journaled in position to extend above the arm C^{30} of the pedal C^3, having itself a lever-arm terminating in a pedal E^2, hereinafter referred to as the "stop-pedal." A spring F, coiled around the rock-shaft E, reacting against the bearing and against the pedal-arm, tends to hold the pedal up to the limit determined by the check G. The pedal-arm C^{30} has a notch or aperture c^{30}, and the stop rock-shaft E has an arm or finger E′, which when the arm of the stop-pedal E^2 is up against the check G overhangs the pedal-arm C^{30} at one side of the notch c^{30}, checking the movement of the pedal-arm upward, that being the direction in which the spring D tends to rock the shaft. The position of the controller or lever arm B′ when the pedal C^3 is thus checked by the finger E′ is such as to cause the ignition to occur somewhat late—that is, after the piston has traveled some distance in its return stroke or stroke in the direction in which the explosion to be caused by the ignition will tend to drive it. It is desirable that ignition should be at such a stage when the engine is first started, because if the adjustment is made to cause it to occur near the limit of the piston's stroke it is liable to occur slightly before the piston has reached that limit instead of just after it has passed it and started back, and in such case the start is liable to be made by the engine in the reverse direction. After the engine has attained momentum this liability no longer exists, because even if the explosion should occur a

little prematurely the momentum of the engine will carry the piston on to the limit of its stroke and permit it to be driven back by the expansion of the gases, so as to give the crank-shaft rotation in the proper direction. If, however, the ignition is caused to occur so late after the engine has attained speed, a large fraction of the power which might be developed is lost, too large space being left for the gases of explosion, and their energy being thus prevented from developing power in the motor. It is therefore desirable that the operator should be able to advance the sparking-point gradually after the engine is started until ignition occurs immediately after the piston commences its retreat. This may be done by the device above described, for the operator, keeping his foot upon the pedal C^3 and depressing it slowly after the engine starts, would gradually advance the sparking-point, the range of movement allowed for the pedal being such as to permit the maximum advance desired. At stopping the pedal, being released from the foot, would return to the stop-finger E′, and the controller will thus always be found in position to cause the ignition to occur at a suitably-delayed point when the motor is again started, and the operator may at all times modify the speed by allowing the pedal to rise more or less, thus retarding the sparking and diminishing the power developed by each explosion. It will sometimes happen that a more retarded explosion than that which is necessary or even desirable at starting will be found desirable in order to maintain a very slow speed without resorting to other means for checking the speed, such as the use of the brake or diminution of the frequency of explosions or quantity of motive fluid supplied, and for this purpose the pedal C^3 must be allowed to rise beyond the limit determined by the stop-finger E′. When this is desired, the operator will press his foot upon the stop-pedal E^2, the first effect of which will be to rock the shaft E and carry the stop-finger E′ to the notch or aperture c^{30} in the pedal-arm C^{30}, thus releasing the pedal from the restraint of the finger by the time the heel of the operator's foot, depressed in operating the pedal E^2 with the toe or ball of the foot, reaches the pedal C^3, and he will now have the latter pedal fully under control and may permit it to rise to any degree desired, retarding the explosions and reducing the speed accordingly. Upon depressing the pedal C^3 the stop-finger E′ will be thrown in above the pedal-arm C^{30} and lock it as before.

In Figs. 3, 4, and 5 I have shown a modification of this device which may be adapted for use in a little different situation from that above described and which has certain other advantages. In this modified structure *c* is a rock-shaft, suitably supported upon the carriage-floor, having a lever-arm c', connected by a link c^2 to a controller lever-arm B′. C^3 is a pedal rigid with the rock-shaft *c*. *e* is a rock-shaft journaled independently of the rock-shaft *c* parallel therewith and having rigid with it a pedal e^2, which extends across the rock-shaft *c* above the latter alongside the pedal c^3. It will be noticed that the pedal c^3 is arranged to extend both ways from the rock-shaft, and therefore rocks over substantially its middle point, while the pedal e^2 operates as a lever-arm, extending in one direction from its rock-shaft. The rock-shaft *e* has at one end a short arm, terminating in a stop-finger e', which overhangs a shoulder c^{31}, formed on the rear end of the pedal c^3. A spring *f*, operating on the rock-shaft *e*, tends to hold the stop-finger e' engaged with the shoulder c^{31}. Rigid with the rock-shaft *c*, underneath the pedal c^3 and conveniently serving as a means of attaching the pedal to the rock-shaft, is a collar c^4, which at the lower side bears against the flat spring *d*, having two points of bearing on the spring at c^{40} c^{40} at opposite sides of the rock-shaft. This construction adapts the spring to resist the rocking of the shaft in either direction from the position at which both points bear upon the spring and to tend to return the shaft from that position when displaced therefrom in either direction. The position at which the shaft is thus normally held by the spring is such as to give the pedal c^3 the position at which it is locked by the stop-finger e'. In using this device the operator will ordinarily rest his foot upon the pedal c^3 in position to depress either end at will by rocking the shaft; but in the ordinary action he will depress the toe, carrying the stop-shoulder c^{31} away from the stop-finger and allowing it to return to that position ready for starting, the position of the controller at this position or the pedal c^3 being that which gives the proper retarded position for starting. When the operator desires to produce a still more retarded explosion, he will rest his foot upon the forward end of the stop-pedal e^2, which is normally in nearly horizontal position, as seen in Fig. 5. The first depression of the forward end takes the stop-finger e' off the shoulder c^{31} and releases the pedal c^3 from the check of said stop-finger. The pedal c^3 has at its forward end an arm or finger c^{32}, extending to the left under the forward end of the stop-pedal e^2, and the latter pedal encounters the finger c^{32} immediately after the stop-finger e' is removed from the shoulder c^{31}, and the further depression of the pedal e^2 carries down the forward end of the pedal c^3, thus moving the controller lever-arm B′ farther in the direction to retard the explosion. Whenever the operator lifts the foot without pressing it upon the other pedal, the spring *d* restores the pedal c^3 to normal position (seen in Fig. 5) and the spring *f* restores the stop-finger e' to its position above the shoulder c^{31}. There are thus provided in this construction two means for holding the pedal c^3 at what may be termed "normal" position; but while the spring *d*, having two points of bearing, as described, at opposite

sides of the fulcrum of the lever, tends to produce this result the operator would be liable to rock the pedal past the normal position in direction to retard the sparking through inadvertently pressing the heel of the pedal if the spring were the only means employed, and the stop-finger e' is therefore desirable, even when the spring is employed in this form, to furnish a positive check which is not released unless the other pedal is pressed. However, I do not limit myself to employing both these means and each has in the construction in which they are both present a desirable function, as explained.

For the purpose of varying what may be termed the "normal" limit of sparking—a limit determined by the encounter of the end of the stop-finger E′ with the pedal-arm C^{30}—adjustment may be provided for at any point in the connection for operating the lever-arm E′ between said arm and the point of encounter of the coöperating stops which determine such normal limit. A suitable and convenient place for such adjustment in the form shown in Fig. 2 is at the stop-finger E′, which may be screwed through the rock-shaft E and so made adjustable longitudinally to vary its lever-length or length of protrusion from the axis of the shaft and cause it to stop the pedal-arm C^{30} at a lower or higher position, according to such adjustment. In the form shown in Figs. 3, 4, and 5 the adjustment may be made both in respect to the action of the stop-finger e' and in respect to the action of the spring d upon the bearing-points c^{40}, so as to vary both alike to cause the limit due to the spring to agree with the limit shown by the stop-finger by adjusting the rock-shaft c angularly in the collar c^4, which may be done accurately and conveniently by means of a small worm-shaft c^{41}, journaled on one end of the collar c^4, having its thread engaging a small worm-wheel e^4 on the shaft c, as seen in Figs. 4 and 5. The same adjustment may be effected in both the forms shown by means of a turn-buckle C^{20} connecting both parts of the links C^2 c^2 and operating to lengthen or shorten the links, and thus to shift the lever-arm B′ without changing the relation of the coöperating stops.

In some instances it may be considered desirable to have the pedal locked or latched and retained at some position other than that to which it is automatically returned by the spring and locked by the stop above described at what is called "normally retarded position." Thus the operator when running at a higher speed may desire to have the pedal latched at a position to retain such speed, so that he may leave said pedal or withdraw his foot therefrom to attend to other matters about the vehicle; also, he may desire to have the pedal latched when it is set at exceptionally slow speed, thus retaining it at such slow speed while he leaves the pedal. For this purpose I provide a latch which I have shown applied to the form shown in Figs. 3, 4, and 5. This latch H is shown pivoted near the floor of the vehicle, having two shoulders h and h', which may be at right angles to each other, a spring H′ being attached to the floor and adapted to bear against one or the other of these shoulders, according to the position of the latch. When the spring bears against the shoulder h, the latch is upstanding. When it bears against the shoulder h', the latch is prostrate, and the latch can be rocked from one position to the other, and when it passes an intermediate point between the two the action of the spring, which up to that point has tended to return it to the position from which it started, will after that point tend to carry it on to the opposite position. The face of the latch has a V-shaped recess h^3, in which a single tooth b^{34}, projecting from the side of the forward end of the pedal c^3, stands when the latch is upright and the pedal is at the normal position to which the spring d tends to return it. The edge of the latch is serrated or ratchet-toothed in both directions from this V-shaped notch, the teeth above the notch being faced upward and those below the notch being faced downward, so that as the pedal c^3 is rocked downward at the forward end its tooth b^{34} engages the lower portion of the ratchet-teeth h^{30}, and thus is held at any position to which it is thus depressed. When, on the other hand, the pedal is rocked in the opposite direction, having been first released from the latch and from the stop e', the tooth b^{34} engages the teeth h^{31}, which retain it against return to intermediate position. When the operator desires to have the pedal operate free from this latch, a sideward swing of the toe of the foot will throw it over out of engagement and the spring h' will complete the throw until the latch lies prostrate, ready, however, to be lifted into position at any time that the operator desires.

I claim—

1. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will to adjust the same; coöperating stops which are normally in position to permit a range of movement of such elements, and to limit the same in the direction to retard the sparking; and means located in position for operating at will while operating said movable element to such limit to displace one of the stops, to permit further movement beyond the limit.

2. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith, movable at will to adjust the same; coöperating stops which are normally in position to permit a range of movement of such element and to limit the same in a direction to retard the sparking; and means adapted to be operated at will to displace one of the stops to permit further movement in the same direction.

3. In combination with an adjustable electric igniter for an explosive-motor, an element

connected therewith movable at will in opposite directions to vary the time of sparking between earliest and latest in the piston's stroke; coöperating stops which are normally in position to permit a range of movement of such element in spark-retarding direction, and to limit the same at an intermediate position; and means located in position for operation at will while operating such movable element to such limit to displace one of the stops, to permit further movement beyond the limit.

4. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will in opposite directions to vary the time of sparking between earliest and latest in the piston-stroke; automatic means for returning said element from either direction to a predetermined intermediate position; coöperating stops which are normally in position to limit at such intermediate position, the movement of such element in spark-retarding direction; and means located in position for operation at will while operating said movable element to such limit to displace one of the stops to permit further movement beyond the limit.

5. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will in opposite directions to vary the time of sparking between earliest and latest in the piston-stroke; coöperating stops which are normally in position to permit at an intermediate position the movement of such element and to limit the same in spark-retarding direction; and means adapted to be operated at will to displace one of the stops to permit further movement in the same direction.

6. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will in opposite directions to vary the time of sparking between earliest and latest in the piston-stroke; a spring reacting to move said element in direction to retard the sparking; coöperating stops which are normally in position to limit the movement of such element in said direction; and means located in position for operation at will while operating said movable element to said limit, to displace one of the stops to permit further movement beyond the limit.

7. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will in opposite directions to vary the time of sparking between earliest and latest in the piston-stroke; automatic means for moving said element in spark-retarding direction away from the position for earliest sparking; coöperating stops which are normally in position to limit the movement of such element in spark-retarding direction; and means located in position for operating at will while operating said movable element, to such limit, to displace one of the stops to permit further movement beyond the limit.

8. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith, movable at will in opposite directions, to vary the time of sparking between earliest and latest in the piston-stroke; automatic means for moving said element in spark-retarding direction away from position for earliest sparking; coöperating stops which are normally in position to limit the movement of such element in spark-retarding direction; and means adapted to be operated at will to displace one of the stops to permit further movement in the same direction.

9. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will in opposite directions to vary the time of sparking between earliest and latest in the piston-stroke; coöperting stops which are normally in position to permit a range of movement of such element in spark-retarding direction and to limit the same; and means connected with said element to displace one of the stops at will to permit further movement in the same direction.

10. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will in opposite directions to vary the time of sparking between earliest and latest in the piston-stroke; foot-operated means for operating such element; coöperating stops which are normally in position to permit a range of movement of such element in spark-retarding direction and to limit the same, and foot-operated means for displacing one of the stops at will to permit further movement in the same direction.

11. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will in opposite directions to vary the time of sparking between earliest and latest in the engine-stroke; foot-controlled means for operating such element; automatic means for returning said element from either direction to a predetermined intermediate position; coöperating stops which are normally in position to limit the movement of such element in spark-retarding direction; and foot-operated means for displacing one of the stops at will to permit further movement in the same direction.

12. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will in opposite directions to vary the time of sparking between earliest and latest in the piston-stroke; foot-controlled means for operating such element; a spring reacting to move said element in spark-retarding direction; coöperating stops which are normally in position to limit the movement of the element in said direction, and foot-operated means for dis-

placing one of said stops at will to permit further movement in the same direction.

13. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will in opposite directions to vary the time of sparking between earliest and latest in the piston-stroke; foot-controlled means for operating such element; automatic means for moving said element in spark-retarding direction away from the position for earliest sparking; coöperating stops which are normally in position to limit the movement of such element in said direction; and foot-operated means for displacing one of the stops at will to permit further movement beyond the limit.

14. In combination with an adjustable electric igniter for an explosive-motor, a lever-arm and connections by which it is adjusted to vary the time of sparking; foot-controlled means for adjusting such lever-arm; automatic means for moving said lever-arm away from the earliest sparking position in spark-retarding direction; coöperating stops which are normally in position to limit the movement of the arm in such direction; and foot-operated means for displacing one of the stops at will to permit further movement in said direction.

15. In combination with an adjustable electric igniter for an explosive-motor, a pedal-operated rock-shaft operatively connected to the movable element of the igniter to adjust it, the spring reacting on such rock-shaft in direction to retard the sparking; a second pedal, a stop operated thereby, and a spring reacting to move the stop in position to arrest the movement of the first pedal in spark-retarding position; said second pedal being in position to be reached by the operator's foot while holding the first pedal.

16. In combination with an adjustable electric igniter for an explosive-motor, a pedal-operated rock-shaft, operatively connected to the movable element of the igniter to adjust it; a pedal for operating such rock-shaft; a second pedal, a stop operated thereby, and a spring to hold the stop in position to arrest the movement of the first pedal in spark-retarding direction; such stop being so connected to said second pedal that the depression of the latter takes the stop out of its said stopping position.

17. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith movable at will to adjust the same, and coöperating stops which are normally in position to permit a range of movement of such element in the direction to retard the sparking and to limit such movement; one of said stops being adjustable at will to change the limit of such movement.

18. In combination with an adjustable electric igniter for an explosive-motor, a pedal-operated rock-shaft operatively connected to the movable element of the igniter to adjust it; a spring for returning the pedal from either direction to a predetermined intermediate position; coöperating stops which are normally in position to limit the movement of the pedal in spark-retarding direction, and a pedal connected with one of the stops to displace it at will, to permit the further movement of the first pedal in the same direction.

19. In combination with an adjustable electric igniter for an explosive-motor, a rock-shaft operatively connected to the movable element of the igniter to adjust the same; a pedal connected with the rock-shaft for operating it; a stop which is normally in position to limit the movement of the pedal in spark-retarding direction; a pedal connected to said stop to displace the same and permit further movement of the first pedal in the same direction, the second pedal being adapted to engage the first and move it positively in the same direction after the movement of the first pedal which displaces the stop.

20. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith, movable at will in opposite directions to vary the time of sparking between earliest and latest in the piston's stroke; means for operating such element, and automatic means for returning said element from either direction to a predetermined position.

21. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith, movable at will in opposite directions to vary the time of sparking between earliest and latest in the engine's stroke; a pedal, and connections therefrom for operating such element, and a spring connected to the pedal and reacting thereon to return it from either direction to a predetermined intermediate position.

22. In combination with an adjustable electric igniter for an explosive-motor, operating connections by which the movable element thereof is adjusted to vary the point of sparking; automatic means for moving such element in one direction; and a latch adapted to engage said connections when moved in the other direction, to retain them against return, such latch being releasable at will.

23. In combination with an adjustable electric igniter for an explosive-motor, an element connected therewith, movable at will to vary the point of sparking; automatic means for returning said element from either direction to a predetermined intermediate position, and a latch adapted to engage said element to lock it against return to said intermediate position from either direction, such latch being disengageable at will to permit such return.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 5th day of December, 1900.

CHARLES T. JEFFERY.

In presence of—
CHAS. S. BURTON,
EDGAR L. CONANT.