

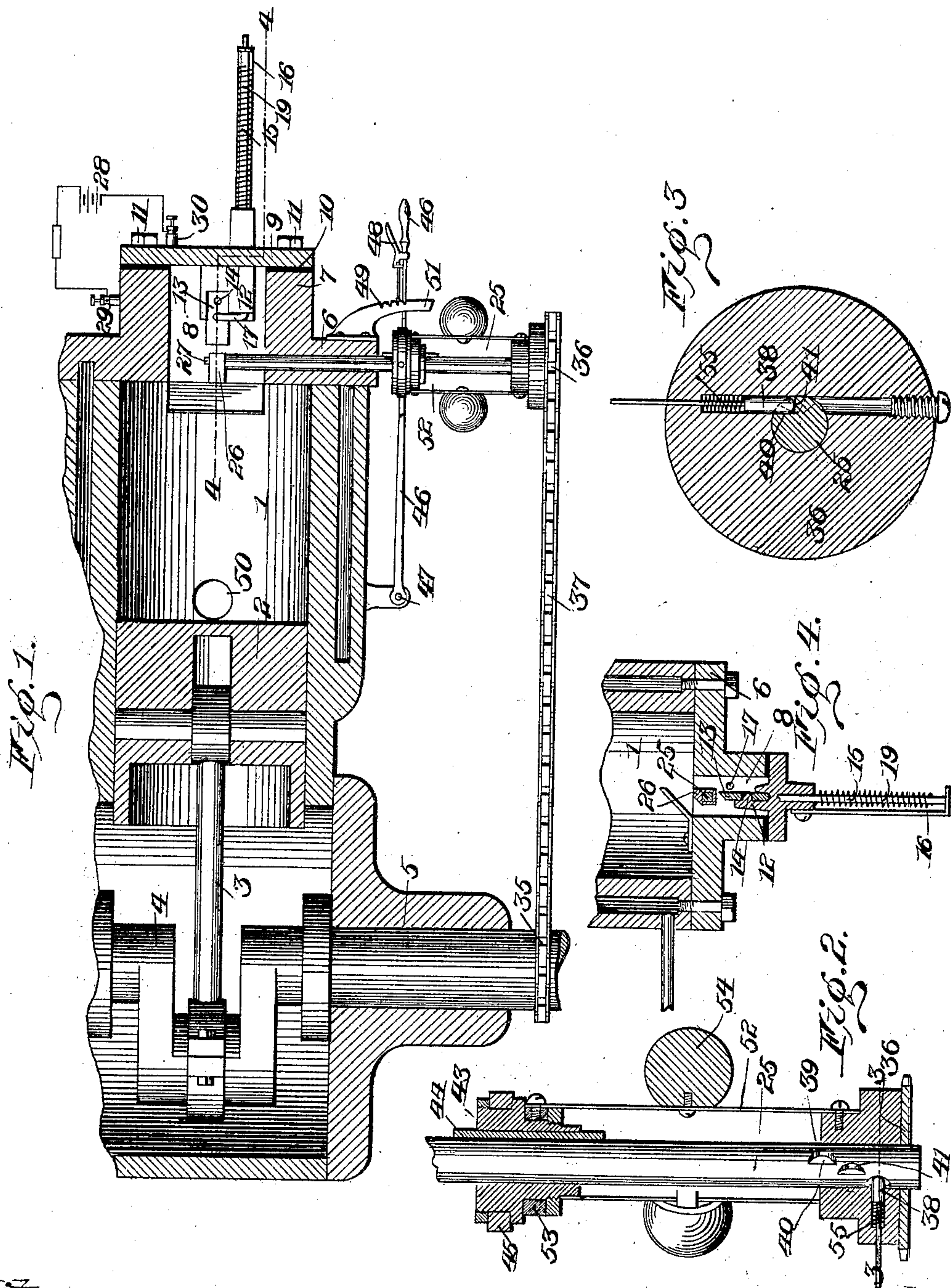
No. 688,938.

Patented Dec. 17, 1901.

J. ECKHARD.
IGNITER FOR GAS ENGINES.

(Application filed Sept. 24, 1900.)

(No Model.)



Witnesses:
 E. Willard Rich.
 Walter B. Payne.

*In witness
John Eckhard
by Church & Church
his Attorneys.*

UNITED STATES PATENT OFFICE.

JOHN ECKHARD, OF BRIGHTON, NEW YORK, ASSIGNOR TO THE ECKHARD MOTOR COMPANY, OF BRIGHTON, NEW YORK, A CORPORATION OF NEW YORK.

IGNITER FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 688,938, dated December 17, 1901.

Application filed September 24, 1900. Serial No. 30,972. (No model.)

To all whom it may concern:

Be it known that I, JOHN ECKHARD, of Brighton, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Igniters for Gas-Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

My present invention has for its object to provide an igniting or sparking device adapted to be employed upon gas-engines to cause the explosion in the cylinder that shall be simple and positive in operation, the parts of which are so arranged that they may be easily adjusted or replaced.

It has for its further object to provide a device automatically controlled for retarding the operation of the igniter, whereby the force of the exploded gas against the piston-head will be diminished and the speed of the engine controlled.

To these and other ends the invention consists in improvements in construction and combinations of parts, all as will be herein-after fully described, the novel features being pointed out in the claims at the end of this specification.

In the drawings, Figure 1 is a longitudinal sectional view through an engine, showing a plan view of an igniting device constructed in accordance with my invention; Fig. 2, a sectional view through the controller or governing device; Fig. 3, a sectional view on the line 3 3 of Fig. 2; Fig. 4, a cross-sectional view on the line 4 4 of Fig. 1.

Similar reference-numerals indicate similar parts.

In illustrating my invention I have shown it applied to a gas-engine, which may be of the usual or any preferred construction, embodying the cylinder 1, in which operates the reciprocating piston-head 2, connected by a pitman or rod 3 to the crank-shaft 4, carried in the bearings 5. The mixed gas and air may be admitted to the cylinder and exhausted therefrom through a port 50, controlled by any desired arrangement of valve or valves. Upon the outer end of the cylinder is a head

6, provided with an extension 7, forming a pocket 8, communicating with the cylinder and containing the igniting device. The pocket 8 is closed by a head or plate 9, electrically insulated by packing 10 and secured by bolts 11. Formed upon the inner side of the head or plate is an extension or lug 12, grooved upon its upper surface and having a movable contact-finger 13 lying therein and loosely secured by a pin or projection 14. A shaft 15, extending through the plate or head, is supported at its outer end in a bracket 16, and upon its opposite extremity is provided an arm 17, extending over the finger 13, and a coil-spring encircling the shaft is connected at its opposite ends to the shaft and head, tending to hold the arm against the finger 13 and to return the latter to its normal position after each operation. In the normal position the contact-finger 13 rests upon the lug 12, but is adapted to be raised against the tension of the spring 19 by a cam or wiper forming the other electrical contact and then returned to normal position by the said spring, and as the latter, controlling the contacts, is outside of the cylinder or combustion-chamber there is no liability of its being damaged by excessive heat or of the parts being injured by the explosion.

Mounted in suitable bearings in the cylinder-head is a shaft 25, extending into the pocket 8 and provided with a removable trip-finger 26, adapted as the shaft is revolved to engage with the contact-finger 13 and as the parts are disengaged to form an electric spark by the breaking of the usual circuit 28, embodying a battery and spark-coil, the terminals of which are connected to the cylinder-head and to the cap-plate or head 9, respectively, by binding-posts 29 and 30. The trip-finger 26 is provided with a rectangular aperture, whereby it is secured to the square-shouldered end of the shaft 25 and fastened thereon by a pin or cotter-key 27. This arrangement is extremely simple and permits a new trip-finger to be easily applied when required. The shaft 25 is adapted to be operated to cause the engagement of the contact-fingers at each rotation of the driving-shaft, and to accomplish this I provide the sprocket-wheels 35 and 36, mounted upon the

respective shafts and connected for simultaneous operation by means of a driving-chain 37. The shaft 25 is adapted to be revolved in one direction only, and to accomplish this I provide a ratchet connection with the sprocket 36, embodying a spring-operated pawl in the form of a pin 38, mounted in the sprocket-hub and adapted to engage one of a series of notches 39, formed, preferably, by recessing the shaft, as shown in Figs. 2 and 3. In order to control the sparking of the igniter in relation to the position of the piston-head in the cylinder and automatically retard the igniting of the charge of gas until the piston has commenced its outward movement in the cylinder, I arrange a series of notches 39 spirally upon the shaft—that is, they are arranged side by side and each slightly in rear of the one preceding—and provide means for shifting the ratchet and its connection longitudinally on the shaft to vary the time of sparking of the igniter, retarding it in proportion as the speed of the engine increases. The pawl 38 is positioned in the hub of the sprocket 36 and extends tangentially to the shaft, with its lower edge lying below its circumference, permitting its inner end to project into one of the notches and engage the shaft to rotate it in one direction. The inner or engaging end of the pawl is rounded, as shown, and the notches 39 are formed with flat bottoms, making shoulders 40, against which the pawl rests, to rotate the shaft, and their rear sides are curved, as at 41, so that when the sprocket is moved longitudinally of the shaft the rounded end of the pawl will permit the latter to be moved outwardly and to be disengaged from the shoulder. The notches are positioned in the shaft relative to the contact-finger or wiper 26, the first or outer one being arranged to operate the shaft when the engine is running under the normal conditions and to form the spark and cause the explosion of the gas in the cylinder when the piston-head has reached the limit of its outward movement and at the instant the fresh gas in the cylinder is under the greatest compression. The remaining notches being located successively in rear of the former will cause the sparking to be retarded relative to the movement of the piston-head, igniting the gas after the latter has started on its return stroke when the compression of the gas has been reduced, making the explosion less violent, and the power being exerted through a shorter stroke reduces the speed of the engine.

To provide a means under the control of the operator for governing the speed of the engine, I have arranged a sleeve 43, slidably connected to the shaft 25 by a key 44 and connected to the sprocket 36, as will be presently described. Mounted upon the sleeve is a collar 45, pivotally connected to an operating-handle 46, pivoted at 47 and adapted to be moved inwardly or outwardly to shift the sleeve and provided upon its upper end

with a latch 48, engaging notches 49, provided in a segmental arm 51, to hold the sleeve in adjusted position. Attached to the sprocket 36 are thin leaf-springs or arms 52, connected upon their opposite ends to a collar 53, revolvably mounted on the sleeve 43. Suitable weights or governor-balls 54, arranged midway between the ends of the springs, serve as the speed of the sprocket is unduly increased to shorten the distance between their ends, bending them outwardly through the centrifugal force imparted to the weights, moving the sprocket inwardly, and causing the pawl 38 to be forced outwardly against the tension of the spring 55 and to engage in one of the inner notches 39 upon the next revolution of the sprocket around the shaft. By this arrangement the revolution of the shaft 25 is temporarily arrested and the gas in the cylinder is not exploded, and the following explosions are retarded by making the contact between the fingers 26 and 13 after the piston-head has been allowed to move outwardly. The governor will retain the ratchet in this position until the speed of the engine is reduced, when the springs will move the ratchet 36 outward to the normal position. By providing the sleeve upon the shaft and connecting the operating-handle thereto I am enabled to shift the sprocket 36 and vary the speed of the engine without interfering with the operation of the governor, as will be understood.

The connections between the shaft 25 and the crank-shaft 4 are adapted when in normal position to cause the simultaneous operation of the parts and are so arranged that upon each complete revolution of the latter the former will be revolved, causing the wiper or trip-finger 26 to engage the finger 13 and to break its electrical contact therewith, forming the spark and igniting the charge of gas when under the greatest compression and at the instant the piston 2 has reached its limit of inward movement. The arrangement and operation of the contact fingers or points 13 and 26 enable me to construct these members of heavy pieces, thereby insuring their durability and in case of necessity to permit their easy removal and the substitution of new ones.

I claim as my invention—

1. In an electric igniting device for gas-engines, the combination with a cylinder having the head provided with an internal shelf or support thereon, and the rigid contact member mounted on the support and movable in one direction only, of a spring-operated finger engaging the contact member to return it to its normal position, and a cooperating contact member mounted upon a revoluble shaft and adapted to be rotated into and out of engagement with the other member.

2. In an electric igniting device for explosive-engines, the combination with the cylinder having the head provided with the internal shelf or support, and the movable non-flexible contact member mounted thereon, of

a spring-operated finger engaging the top of the contact member to return it to its normal position after each operation, and a second contact member carried on a revoluble shaft mounted in bearings on the cylinder-head.

3. In an electric igniting device for gas-engines, the combination with the cylinder-head, the support on the head and the contact-piece secured to the support and movable in one direction, of a movable finger bearing upon the contact-piece, a rotatable shaft having bearings in the cylinder-head and upon which the finger is mounted, means arranged upon the exterior of the head for operating the shaft, and a second contact-piece adapted to engage with the first-mentioned contact-piece.

4. In an electric igniting device for a gas or explosive engine having the cylinder-head, the combination with the support thereon, the contact-piece arranged upon the support and movable in one direction, and a second contact-piece adapted to engage with the former, of a finger adapted to engage the first-mentioned contact-piece, a shaft carrying the finger and the spring connected upon opposite ends to the head and shaft for operating the latter.

5. In an electric igniting device, the combination with the cylinder having the extension or pocket leading therefrom, a shelf or support arranged in the pocket, and a pin on the support, of a contact member mounted on the support and provided with an aperture with which the pin loosely engages, a spring-operated finger engaging the contact member to hold it yieldingly in position in its support, and a revoluble contact member operating in the pocket and adapted to engage the other member.

6. In an electric igniting device, the combination with a cylinder having a support therein, and a pin on the support, of a contact member mounted on the support and having an aperture with which the pin loosely engages, of a finger engaging the top of said member to prevent its removal from the pin, and a revoluble contact member engaging the former member.

7. In an igniter for gas-engines, the combination with the lug or support arranged within the engine-cylinder, and the contact-piece loosely mounted thereon, of the oscillatory shaft extending to the exterior of the cylinder having the finger engaging the contact-piece, a spring engaging the shaft and cylinder, and a movable contact-piece within the cylinder for engaging the first-mentioned one.

8. In an igniter for gas-engines, the combination with the lug or support arranged within the engine-cylinder, the contact-piece loosely mounted thereon, and the spring-operated shaft having the finger holding the contact-piece upon the support, of the revoluble shaft having the angular portion upon its inner end, the contact-finger provided with an angular aperture and adapted to engage

the shaft, and to be removably secured thereon, and means for operating the shaft to cause an engagement of the contact-fingers.

9. In a gas or explosive engine having the cylinder, the piston operating therein and the driving-shaft connected thereto, the combination with an igniting device embodying the stationary and movable contact members, of the revoluble shaft carrying the movable member and having the wheel, a clutch mechanism between the latter and the shaft to operate it in one direction only, operating devices arranged between the driving-shaft and the wheel for causing their simultaneous operation, and means for effecting the engagement of said clutch mechanism with the shaft to vary the time of contact of the members relative the movement of the piston.

10. In a gas or explosive engine having the cylinder, the piston operating therein, and the driving-shaft connected thereto, the combination with an igniting device embodying stationary and movable electrical contact members, of the shaft carrying the movable member and having notches or depressions located relative the contact member, the wheel mounted loosely upon the shaft and the pawl on the wheel engaging one of the notches to revolve the shaft in one direction, operating connections between the wheel and driving-shaft, and a governing device controlled by the latter for causing the pawl to engage with one or another of the said notches to vary the engagement of the contact members relative the movement of the piston.

11. In a gas or explosive engine, having the cylinder, the piston operating therein, and the driving-shaft operated thereby, the combination with an igniting device embodying a stationary and a movable member, of a shaft carrying the movable member having notches forming shoulders therein, a wheel provided with a pawl adapted to engage a single shoulder to rotate the shaft in one direction, connections between the wheel and the driving-shaft for causing their simultaneous operation, and operating devices for moving the wheel longitudinally on the shaft and locking it in engagement with one of the various shoulders to regulate the time of engagement of the contact members relative the movement of the piston.

12. In a gas or explosive engine having the cylinder, a piston operating therein and a driving-shaft connected thereto, the combination with an igniting device arranged within the cylinder embodying a stationary contact-finger, and a movable contact-finger, of a revoluble shaft carrying the latter and having the spirally-arranged notches or depressions, the wheel loosely mounted upon the shaft having the pawl adapted to engage the notches, and the connections between the driving-shaft and wheel, the sleeve slidably mounted upon the revoluble shaft, connections between the latter and the wheel permitting their independent rotary movement,

and an operating-handle connected to the sleeve for adjusting the sprocket on the shaft.

13. In a gas or explosive engine having the cylinder, the piston therein and the driving-shaft connected thereto, the combination with a stationary contact member arranged within the cylinder, a movable contact member adapted to engage the latter, and a shaft carrying the movable member, of a wheel loosely mounted upon the shaft, connections between the latter and the driving-shaft for causing their simultaneous operation, and a clutch mechanism arranged between the wheel and shaft, a sleeve slidably secured upon the shaft, an operating-handle for moving the sleeve and locking it in adjusted position thereon, and governing devices connecting the sleeve and wheel to control the operation of the clutch mechanism.

14. In a gas or explosive engine having the cylinder, the piston therein, and the driving-shaft operated thereby, the combination with a stationary contact member arranged within the cylinder, a movable contact member adapted to engage the latter, and a revoluble shaft carrying the movable member and having the wheel mounted thereon, of a clutch mechanism arranged between the wheel and shaft, and connections between the wheel and driving-shaft for causing their simultaneous operation, a sleeve connected to the revoluble shaft and governing devices extending between the sleeve and wheel permitting the independent rotary movement of the parts and controlling the operation of the clutch mechanism to revolve the shaft in one direction and to cause the engagement of the contact members relative to the movement of the piston.

15. In a gas or explosive engine having the

cylinder, the piston therein, and the driving-shaft operated thereby, the combination with a stationary contact member arranged within the cylinder, a movable contact member cooperating therewith, and a revoluble shaft carrying the latter and having the notches forming shoulders arranged relative to the contact-finger, of the wheel mounted upon the shaft provided with the pawl adapted to engage the shoulders, connections between the driving-shaft and wheel for causing their simultaneous operation, and a sleeve movable longitudinally upon the shaft, a governing device connecting the sleeve and wheel adapted to shift the latter into engagement with the different shoulders upon the shaft to retard the engagement of the contact members relative the movement of the piston, an operating-handle connected to the sleeve for shifting the ratchet independent of the governor, and means for securing the sleeve in adjusted position.

16. In a gas or explosive engine, the combination with an igniting device embodying a stationary and a movable member, of a shaft carrying the movable member, a rotary wheel, and a pawl-and-ratchet connection between it and said shaft to move the latter in one direction, connections between the driving-shaft and wheel for causing their simultaneous operation, and an operating device for moving the wheel and shaft relatively to disengage the pawl from the shoulder to regulate the engagement of the contact members relatively to the speed of the piston.

JOHN ECKHARD.

Witnesses:

G. WILLARD RICH,
G. A. RODA.