No. 785,922. PATENTED MAR. 28, 1905.

J. D. TERMAAT & L. J. MONAHAN.

REVERSING MEANS FOR EXPLOSIVE ENGINES.

APPLICATION FILED MAR. 5, 1904.

2 SHEETS—SHEET 1.

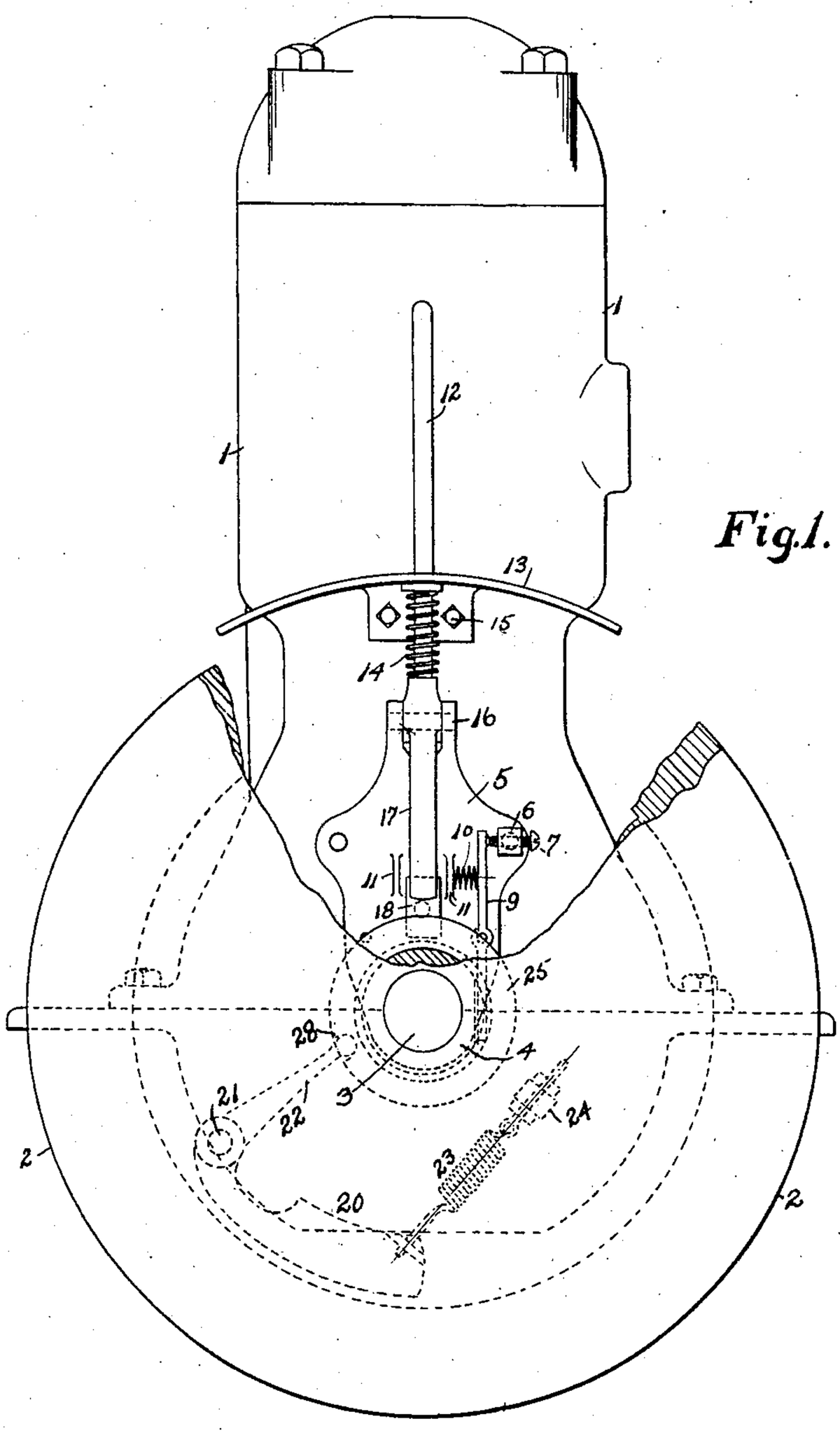

Fig. 1.

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Fig 2.

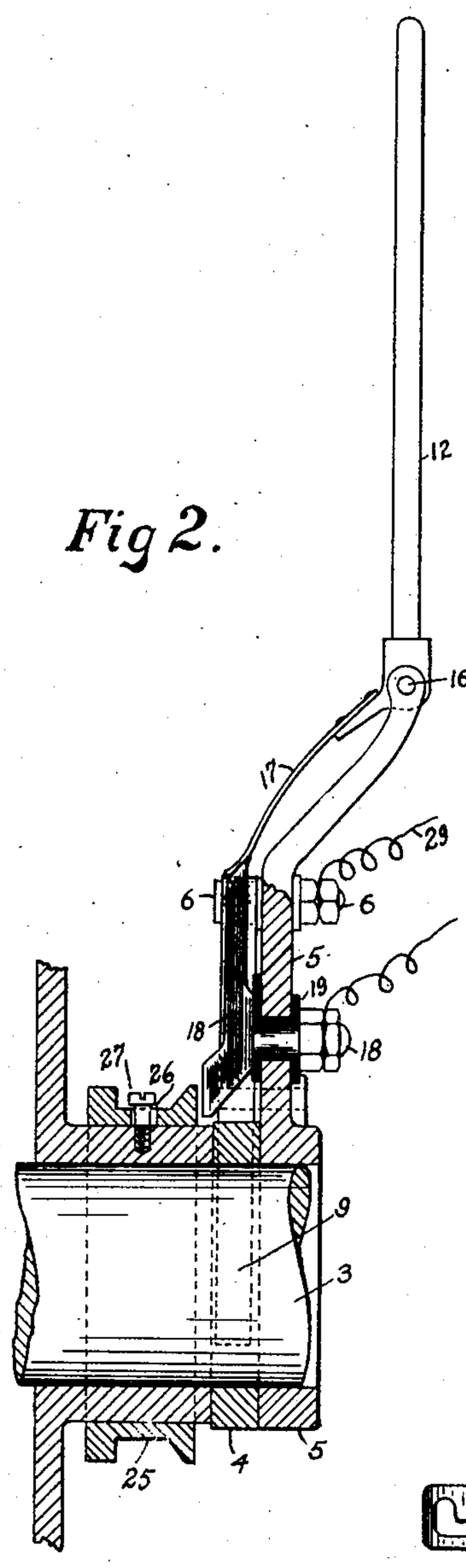
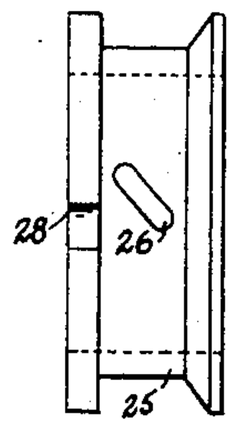


Fig 5.



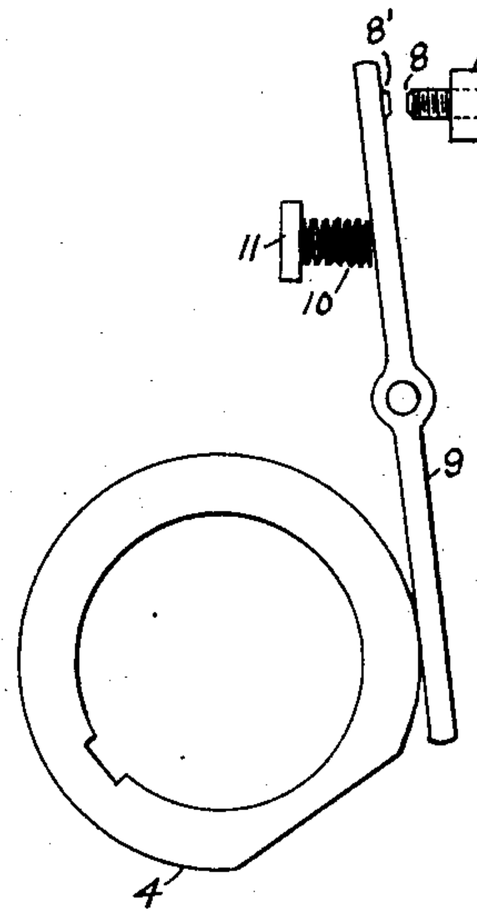


Fig 3.

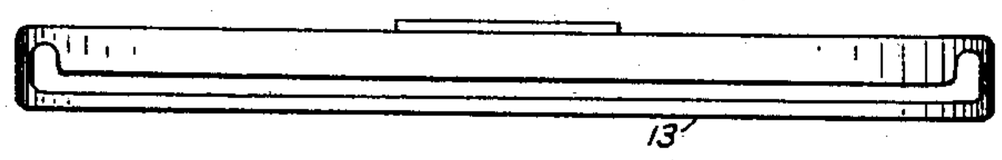


Fig 4.

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No. 785,922. Patented March 28, 1905.

UNITED STATES PATENT OFFICE.

JOHN D. TERMAAT AND LOUIS J. MONAHAN, OF OSHKOSH, WISCONSIN, ASSIGNORS TO TERMAAT AND MONAHAN COMPANY.

REVERSING MEANS FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 785,922, dated March 28, 1905.

Application filed March 5, 1904. Serial No. 196,749.

To all whom it may concern:

Be it known that we, JOHN D. TERMAAT and LOUIS J. MONAHAN, citizens of the United States, residing at Oshkosh, in the county of Winnebago and State of Wisconsin, have invented certain new and useful Improvements in Reversing Means for Explosive-Engines, of which the following is a specification.

This invention relates to a device or attachment whereby the engine may be caused to reverse its direction of rotation by means of manipulating a single lever and especially adapted to engines operating on the two-cycle principle and using the jump-spark form of ignition, although the principle may be applied to any style of electric igniter; and the object of the invention is to devise a means to automatically cause the battery-circuit to close at a given point in the speed of the engine, which point is properly adjusted, so that when the said battery-circuit is closed the piston is immediately forced in the opposite direction, which in turn reverses the direction of rotation.

A further object is to provide a means to automatically reverse the direction of rotation of an engine, the said means being simple in construction and operation and reliable in its action and substantial in wearing qualities.

A further object is to take advantage of the centrifugal force to determine the proper speed at which to make the connection in the battery-circuit to reverse the engine.

Further objects are manifested in the following specification, with the accompanying drawings.

In the drawings, Figure 1 is a front elevation of a two-cycle engine with part of the fly-wheel broken away to show the device. Fig. 2 is a side view of the device and part section. Fig. 3 is a detailed view of the make-and-break mechanism. Fig. 4 is a top view of the segmental guide for the lever 12, an elevation of which is shown at 13 in Fig. 1. Fig. 5 is a sliding collar or sleeve. (Shown at 25, Figs. 1 and 2.)

Similar figures represent similar parts throughout the several views.

The numeral 1 represents a gas-engine cylinder, and 2 a fly-wheel of the usual construction, the upper part of the fly-wheel being broken away to show the form and making of the make-and-break and reversing device.

3 is the crank-shaft. A cam 4 of the form shown is mounted on the crank-shaft, as shown, and secured thereto. A peculiar-shaped casting or bracket 5 is loosely mounted on the shaft 3 between the cam 4 and the crank-shaft bearing, or it may be rotatably mounted on the bearing, the latter being turned to fit it. The casting or bracket 5 serves the double purpose of holding the mechanism for regulating the speed of the engine by advancing or retarding the time of ignition and also a means for reversing the engine.

The make-and-break device will first be explained, which consists of an insulated lug 6, secured to the bracket 5, but not capable of conducting electricity between itself and the said bracket, it being insulated therefrom and having an adjusting-screw 7 entering through it, as shown. The end of this screw is faced with a good conducting and non-corroding material, as platinum, (shown at 8, Fig. 3,) and the screw is fitted reasonably tight in the threads to keep it in the position where it is set. A flat piece of steel 9 is pivoted at its center and fastened to the bracket 5 in the position shown and is capable of a rocking movement on said pivot. One end of the said flat piece 9 is faced with platinum or other suitable material 8′ and adapted to make contact with the point of the screw 7. A spring 10 is provided to force the flat piece into contact, the said spring being placed between the flat lever 9 and a lug 11 on the bracket. The cam 4, which normally holds the points 8 and 8′ out of contact, revolves with the shaft, and at the predetermined point in the revolution the flat portion of the cam reaches the flat piece 9, and the spring acting on the said flat piece causes the contact of the points 8 and 8′, which are adjusted to suit the length of contact desired. The cam revolving immediately causes the points to separate and repeat the operation at each revolution, causing a make and break of electrical contact at the desired point. The bracket 5, as shown, may be used for a single

or double cylinder engine by putting on another flat piece similar to 9 on the opposite side of the cam to make contact with another similar insulated contact-point, which furnishes contact mechanism for two cylinders instead of one, or it may be designed for three or four cylinders by incorporating more contact-points and flat pieces similar to the construction already shown and described. The bracket 5 is capable of an oscillating movement to right or left by means of the handle 12. A segmental guide 13 with a long slot is provided to guide the handle 12 and also to hold it in the position set without locking of same. A spring 14 is placed over the handle 12 and rests on a shoulder thereon and has a washer on top to press against the under side of the guide 13. This causes enough friction to hold the lever in any position in which it may be set. The guide is bolted to the cylinder, as shown at 15. It is obvious that the handle or lever 12 may be moved to right or left to any position within the range allowed by the guide 13. All other attachments on the said bracket is moved therewith. It is also obvious that a movement in either direction will cause the make-and-break device to operate at different points in the rotation of the shaft 3, and in this manner the make and break is caused to take place early or late in relation to the crank-shaft, as desired, this in consequence giving more or less power to the engine and causing a higher or lower speed of the engine. The reversing mechanism which operates in combination with this make-and-break and timing device is constructed as follows: The handle 12 is pivoted at 16 to rock in and out and carries a flat spring 17, as shown. An insulated electrode 18 is fastened to the bracket 5 by the insulating material 19 and does not touch anywhere else for support. This piece 18 is of a peculiar shape, having the extending parts all forming one piece. The handle 12 may be moved to bring the spring 17 into contact with the said insulated electrode 18 or it may be moved to disconnect by moving in the opposite direction. The purpose of the turned ends of the slot in the guide 13 is to allow the handle to be moved to the ends of the slot and pushed into the inward-extending part of the groove. It is obvious that by moving the handle 12 into the said turned ends of the groove the spring 17 will be lifted off the electrode 18, and thereby cause a break in the electrical circuit, and when moved to any other point in the long slot 13 it will cause a contact between the piece 18 and the spring 17. A governor-weight 20 is pivoted to the inner side of the fly-wheel at 21 and has the extending arm 22, forming part of the said weight. A spring 23 is fastened to the weight and to a lug 24 in the fly-wheel and made adjustable therein. This serves to hold the weight against the centrifugal force produced by the rotation of the wheel. A collar 25 (shown at Fig. 5) is loosely mounted on the fly-wheel hub and has a diagonal groove 26 cut through and a screw 27 is fitted loosely to the slot and screwed into the wheel-hub, as shown in Fig. 2. The fly-wheel hub is placed against the cam 4 and the collar 25 so adjusted that it will touch the electrode at one extreme and separate from it at the other extreme. Another slot, 28, is formed in the flanged part of the collar and the rounded end of the weight-arm 22 fitted thereto. It is obvious that with the parts assembled that when the weight 20 is moved in or out from the center of the wheel the arm 22 causes the collar 25 to partially revolve on the wheel-hub, and by the guiding action of the diagonal slot 26 the collar is caused to produce a compound motion of oscillating and sliding endwise on the wheel-hub. The movement desired is the latter.

In operation an electrical connection is made between the pole 29 and through the battery or primary circuit and instead of connecting the other pole with the engine in the usual way it is connected to the pole 18 and the engine started in the usual manner by turning the fly-wheel over the center and the speed regulated to suit by moving the handle 12 to the right or left, depending on the direction in which the engine is running. It will be noted that the governor-spring 23 has a light tension, so that at ordinary speeds the weight will be out against the fly-wheel rim and holding the collar 25 to its extreme position away from the electrode. To reverse the engine, the handle 12 is moved against the direction of rotation of the fly-wheel to the extreme end of the slot in the guide 13, which produces very early ignition and is pushed back into the angled extending portion of the said slot. This causes the disconnection of the spring 17 and the electrode 18, which causes a stopping of the igniting-current and the engine slows down. At a predetermined point in the rotative speed of the fly-wheel the weight 20 loses its power to stay out against the spring-tension 22 and is pulled in by the said spring, which causes the collar 25 to slide along the wheel-hub and make connection with the electrode 18, which again causes a circuit between the engine and the pole 18 and causes the ignition apparatus to operate, but the spark taking place so early in the stroke of the piston, caused by the handle being at one extreme end of its throw, the piston is caused to descend before it completes its stroke and revolves the engine in the reverse direction. The engine continues to run this way for a few strokes until the weight pulls out and breaks the circuit, which causes the engine to again miss fire but keeps on running in this direction, owing to the weight again falling toward the center and making intermittent connections and late ignition un-

til the handle is pulled out into the long groove in the guide 13 and moved toward the center to speed up the engine. The same operation is necessary to reverse in the other direction—viz., move the handle to the other side.

It will be noticed that no attention is necessary to reverse the engine with this device, as the proper speed is determined by the centrifugal force of the adjustable weight 20.

While we have described this device as applicable to two-cycle engines, we do not wish to limit the claims to this style of engine, as it is applicable to either two or four cycle engines. With a slight modification and placed on the secondary shaft of a four-cycle engine, which is capable of running in either direction by a specially-constructed exhaust-cam, it will serve the same purpose of regulating the speed and automatically reversing the engine.

Having fully described the invention, what we claim, and desire to secure by Letters Patent, is—

1. In an explosive-engine the combination with a fly-wheel, a centrifugally-acting weight pivoted thereon, a sliding collar mounted on the hub of said wheel, means for connecting the said collar and weight to cause them to move in unison, an electric igniting-circuit, an electric terminal insulated from the said engine and adapted to be in contact with the said sliding collar when the engine is at rest and out of contact when a definite rotative speed is attained due to the action of centrifugal force upon the said weight, an auxiliary connecting means between the engine and the said insulated terminal for the purpose set forth.

2. In an explosive-engine the combination with a fly-wheel, of a weight pivotally mounted thereon and having an extending arm at right angles to the said weight, an adjustable spring to normally hold the weight toward the center of the said wheel, a flanged collar loosely mounted on the fly-wheel hub and having a spiral slot in one side, a screw or pin loosely fitted to the said slot and secured to the fly-wheel hub, a recess in the said flange of the collar loosely fitted to the end of the extending arm of the said weight adapted to connect the weight and collar loosely together when the swinging movement of the weight causes a partial revolving and sliding movement of the said collar, a casting or bracket arranged at the end of the said collar and capable of a partial revoluble movement around the fly-wheel axis, a lug mounted on and insulated from the said bracket and in the range of the endwise travel of the said collar whereby connection is made between the collar and the said insulated lug, an auxiliary switch or connecting means adapted to make contact between the said bracket and the insulated lug and under control of a handle or lever, a rigid slotted guide arranged to limit the movements of the said handle for the purpose set forth.

3. In a gas or explosive engine having an electric ignition-circuit, the combination of a movable bracket mounted axially with a shaft of the said engine, a cam secured to the said shaft and having a flattened portion on its periphery, a contact finger or lever pivotally connected to the said bracket and having one end resting on the cam and the other end adapted to make contact with an insulated piece on the said bracket, a spring adapted to hold the said contact-finger against the cam, another lug of suitable form mounted on and insulated from the bracket, a handle or lever pivoted to the bracket and capable of a movement to connect and disconnect with the last said insulated lug, of centrifugal mechanism suitably attached to the said engine and capable of making contact with the last said insulated lug at definite points in the rotative velocity of the centrifugal mechanism for the purpose set forth.

4. The combination in a gas-engine of a revoluble shaft, of a bracket 5 movably mounted thereon, an insulated electrode 18 passing through the said bracket, a handle 12 pivoted to the bracket and having a spring extension 17 adapted to make contact with the insulated electrode 18, a collar 25 arranged to make and break contact with the said insulated electrode and depending on the speed of the engine for its position of touching or separating from the said insulated electrode.

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In presence of—
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OLIVE E. ARNOLD.