

**No. 676,247.**

**Patented June 11, 1901.**

**Z. S. TAYLOR.**

## STARTING DEVICE FOR EXPLOSIVE ENGINES.

(Application filed July 19, 1900.)

(No Model.)

FIG 1

FIG 2

WITNESSES:  
H. Walker  
Geo. H. Foster

INVENTOR  
Zebulon S. Taylor.

BY *Wm. D. Go*

ATTORNEYS



# UNITED STATES PATENT OFFICE.

ZEBULON S. TAYLOR, OF NEW YORK, N. Y.

## STARTING DEVICE FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 676,247, dated June 11, 1901.

Application filed July 19, 1900. Serial No. 24,179. (No model.)

*To all whom it may concern:*

Be it known that I, ZEBULON S. TAYLOR, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Starting Device for Explosive-Engines, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved starting device more especially designed for use on gas and other explosive-engines and arranged to give the desired initial movement to the cylinder-piston until the first impulse is given to the piston by the ignited explosive charge.

The invention consists of novel features and parts and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in both the views.

Figure 1 is a plan view of the improvement as applied and part of the engine being shown in section, and Fig. 2 is a sectional side elevation of the same on the line 2 2 in Fig. 1.

The device on which the improvement is shown applied is provided with two cylinders A, each of which contains a piston B, connected by a pitman C with a crank-arm D of the main driving-shaft E of the engine. On the driving-shaft E is mounted to rotate loosely a pinion F in mesh with a rack G, mounted to slide longitudinally in suitable bearings held on the engine-frame or other part of the engine, and said rack is connected with a coil-spring H, as is plainly illustrated in Fig. 1.

On the rack G is pivoted a spring-pressed catch I, adapted to be engaged by the head J' of a bar J, secured to one of the pistons B of the engine, so that when the catch I is in an outermost position by the action of a fixed cam K then the outward movement of the piston B causes the head J' of the arm J to engage the catch I and move the rack G outwardly against the tension of its spring H, as is plainly illustrated in Fig. 1.

The forward end of the rack G is formed with a head G', adapted to engage a spring-pressed catch or bolt L, mounted to slide

transversely in suitable bearings and pressed on by a spring N, so as to cause the head G' to engage the catch or bolt L at the time the rack G reaches its outermost position, as shown in Fig. 1. The catch L is pivotally connected with a lever O under the control of the operator.

When the rack G is moved outward by the action of the piston B and the bar J, as previously described, then a rotary motion is given to the pinion F in a backward direction and without affecting the movement of the shaft E. On the face of the pinion F is pivoted a spring-pressed pawl F', adapted to engage a shoulder or tooth E' on the main shaft E, and said pawl F' is provided with an upwardly-extending arm F<sup>2</sup>, adapted to be engaged by a pin G<sup>2</sup>, held on the rack G, so as to hold the pawl F' out of engagement with the tooth or shoulder E' at the time the rack G moves into an outermost position.

When the several parts are in the position shown in the drawings and it is desired to start the engine, then the operator simply imparts a swinging motion to the lever O in the direction of the arrow a' to withdraw the catch or bolt L from the head G' and allow the spring H to move the rack G inwardly in the direction of the arrow b'. The rack G in moving in this direction moves the pin G<sup>2</sup> away from the arm F<sup>2</sup>, so that the spring of the pawl F' causes the latter to engage the tooth or shoulder E' on the shaft E, and as the spring H imparts a further rearward or inward movement to the rack G and rotates the pinion F it is evident that the main shaft E is rotated, as the pinion F is now coupled to the shaft E by the pawl F'. The rotary motion given to the shaft E by the starting device, as described, causes the drawing in of an explosive charge into the cylinder, so that finally an impulse is given to the piston when the charge is exploded in the usual manner to insure continuous running of the engine.

When the rack G moves into a rearmost position, its catch I moves in engagement with the fixed cam K, so as to project the catch I outwardly into the path of the head J', and consequently the said head on the next outward movement of the piston B imparts a forward sliding movement to the rack G to move the same back into a set position against the



tension of the spring H, it being understood that when the piston B reaches the end of its outward stroke then the head G' automatically engages the spring-pressed catch or bolt 5 L and the latter now locks the rack G against return movement. The rack G remains in this position until it is again desired to start the engine by the operator actuating the lever O, as above explained. It is understood that 10 when the rack G has been moved outward by the head J' of the bar J and the piston B begins its return stroke, then the spring-catch I is released from the head J' and moves into position out of the path of the head J' to allow 15 a free reciprocation of the piston B without interfering with the inwardly-moving rack G until the engine is started.

Having thus fully described my invention, I claim as new and desire to secure by Letters 20 Patent—

1. A starting device for engines, comprising a spring device, a driving connection between the spring device and the engine-shaft, a device for locking the said driving connection 25 to the shaft to turn the same, means carried by the engine-piston for setting the said spring device against the tension of its spring, and means carried by the said spring device for releasing the said locking device, substantially as set forth. 30

2. A starting device for engines, comprising a spring device geared with the engine-shaft, a catch carried by said spring device, a setting device carried by a reciprocating part of 35 the engine for engaging said catch to set the spring device, means for moving the said catch into the path of the setting device, and means for locking the spring device in its set position, as specified.

3. A starting device for explosive-engines, comprising a pinion mounted loosely on the engine-shaft, a locking connection between the pinion and the shaft, a spring device for 40 rotating the said pinion, means carried by a reciprocating part of the engine for setting the said spring device, means for automatically locking the spring device in its set position, and means carried by the said spring device for releasing the locking connection be- 45 tween the pinion and the shaft, as set forth.

4. A starting device for explosive-engines, comprising a rack, a pinion mounted loosely on the engine-shaft and in mesh with said rack, a spring connected with said rack, means 50 carried by a movable part of the engine to impart a sliding movement to the rack against the tension of its spring, to set the rack, means for locking the rack in its set position, a device for locking the pinion to the shaft, and 55 means carried by said rack for engaging and releasing the device for locking the pinion to the shaft, for the purpose set forth.

5. A starting device for explosive-engines, comprising a rack mounted to slide in suitable 60 bearings, a spring connected with said

rack for moving it in one direction, a spring-pressed catch pivoted on the rack, a bar carried by a reciprocating part of the engine, and provided with a head adapted to engage the 70 said catch to move the rack outwardly against the tension of its spring, a pinion on the engine-shaft and in mesh with said rack and arranged to rotate the shaft in a forward direction, and a locking device under the control of the operator and adapted to automatically 75 lock the rack in its outermost position, as set forth.

6. A starting device for explosive-engines, comprising a rack, a pinion in mesh with the rack and arranged to rotate the engine-shaft 80 in a forward direction, a spring connected with said rack, a movable device carried by said rack and adapted to be engaged by a movable part of the engine to impart a sliding motion to the rack against the tension of its 85 spring to set the rack, a spring-pressed catch mounted to slide in bearings and adapted to automatically engage the said rack to hold the same in its set position, and a lever to which said catch is pivotally connected, sub- 90 stantially as set forth.

7. A starting device for engines, comprising a rack, a pinion in mesh with the rack and arranged to rotate the engine-shaft when the rack is moved in one direction, a spring con- 95 nected with the rack, a bar carried by a piston of the engine and provided with a head, a spring-pressed catch carried by the rack and adapted to be engaged by the head of said bar to set the said rack against the tension of 100 its spring, a cam for moving the said catch into the path of the said head, and a locking device under the control of the operator and adapted to automatically lock the rack in its set position, as specified. 105

8. A starting device for engines, comprising a rack having guided movement and provided with a head at its outer end, a pinion mounted loosely on the engine-shaft and in mesh with said rack, a spring connected with 110 said rack, means carried by a reciprocating part of the engine for setting the rack against the tension of its spring, a spring-pressed pawl pivoted on said pinion and adapted to engage the engine-shaft to lock the pinion 115 thereto, the said pawl being provided with an arm, a locking device for engaging the head of the rack to hold it in its set position, and a projection on the said rack for engaging the arm of the pawl to hold the latter out of en- 120 gagement with the shaft at the time the rack moves into its set position, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of 125 two subscribing witnesses.

ZEBULON S. TAYLOR.

Witnesses:

ELIZABETH GARDNER,  
MARGARET B. GARDNER.