E. P. ROBINSON.

THROTTLE CONTROLLING DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED MAR. 22, 1909.

1,040,017.

Patented Oct. 1, 1912.

Fig. 1.

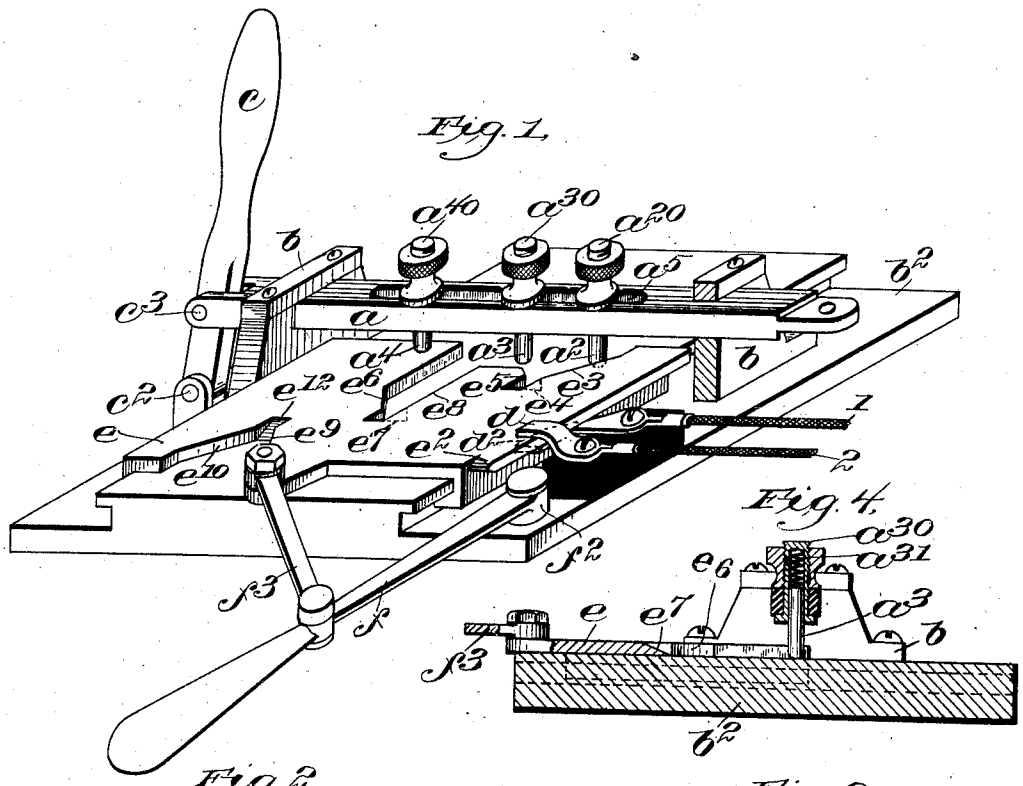


Fig. 4.

Fig. 2.

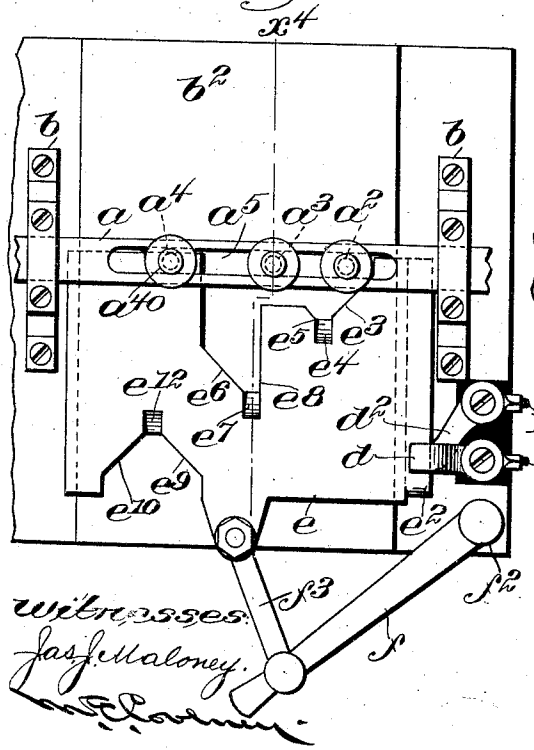
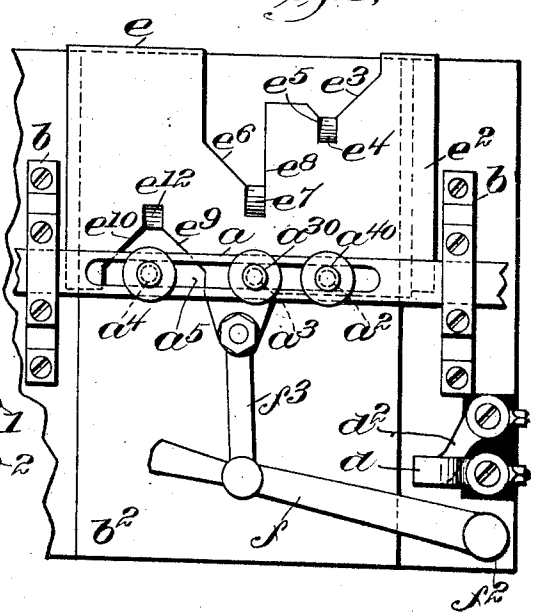


Fig. 3.



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UNITED STATES PATENT OFFICE.

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THROTTLE-CONTROLLING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

1,040,017. Specification of Letters Patent. Patented Oct. 1, 1912.

Application filed March 22, 1909. Serial No. 485,041.

To all whom it may concern:

Be it known that I, EDWARD P. ROBINSON, a citizen of the United States, residing in Malden, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Throttle-Controlling Devices for Internal-Combustion Engines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention relates to a throttle controlling device for internal combustion engines employing electric ignition, the purpose of the invention being to connect a supplemental throttle-controlling member with the switch which opens and closes the ignition circuit, so that when the switch is opened to stop the engine the throttle will be automatically set in a favorable position to speed up the engine just prior to the breaking of the circuit, thus causing the engine to make several revolutions under its own momentum. The purpose of this is to clear the cylinders thoroughly of the products of combustion, and to charge the active cylinders with fresh explosive mixture, so that the engine can be easily started on the spark when the ignition circuit is again closed. The same supplemental member is further arranged to operate in the closing movement of the switch to move the throttle to such a position as is most favorable for starting the engine, the device being provided with means for adjustment, so that any position of the throttle which may be found best may be obtained. It is sometimes desirable to provide means for moving the throttle to another position, that is to say, partially to close the same after ignition has ceased and the engine is running by momentum, since, under some circumstances, the cylinders will become charged with a richer mixture if the throttle has become partially closed during the rotation of the engine by momentum.

The device is so arranged as to become wholly disconnected from the throttle after it has performed its functions so that it does not interfere in any way with the control of the engine by the throttle when running.

The supplemental throttle controlling device may be connected, in the case of a reversing or self starting engine, with the operating lever which is utilized to stop and start the engine and at the same time to perform the necessary functions to secure the starting of the engine in either direction. In illustrating the invention, however, I have shown the device in its simplest form, indicating only the movable throttle controlling member and its actuating handle, as combined with the supplemental throttle controlling member and an actuating handle connected therewith, and also arranged to close and open the electric circuit and start and stop the engine.

Figure 1 is a perspective view of a device embodying the invention showing the parts in the position in which they are placed while the engine is running; Fig. 2 is a top plan view of the same; Fig. 3 is a similar view showing the parts in the position in which they stand after the engine has been stopped; and Fig. 4 is a section taken on line x^4 of Fig. 2.

The main throttle-controlling member is herein shown as a longitudinally movable rod or bar a adapted to be connected in any suitable way with the throttle valve, the said bar being arranged to slide in supporting guides b mounted on a base or support b^2. The said bar is arranged to be operated by means of a handle c shown as pivoted at c^2, on the base b^2, and connected at c^3 with the end of the slide a. This handle will be hereinafter referred to as the service handle. In the position shown in Figs. 1 and 2, the said slide a is free to move back and forth for the purpose of controlling the engine when running, the control being in response to the movement of the service handle c. The ignition circuit, which is indicated by the conductors 1 and 2, is controlled by a switch having stationary contacts d and d^2, and a traveling bridging contact e^2, which is shown as connected with the supplementary throttle controlling device e which, in the construction shown, consists of a slide mounted on a guide support on the base b^2, below the slide a, and movable in a direction transverse to the direction of movement of

said slide a. The slide e is arranged to be actuated by means of a lever f pivoted to the base b^2 at f^2 and connected with the slide e by means of a link f^3. Said lever f is provided with a handle, and will be hereinafter referred to as the starting lever. In stopping the engine, the starting lever f is moved from the position shown in Fig. 2 to the position shown in Fig. 3, and in such movement the traveling contact e^2 is carried out of engagement with the contacts d and d^2, thereby breaking the ignition circuit. As indicated in Figs. 1 and 2, the circuit is not immediately broken, but requires a certain amount of movement of the starting lever f, and this preliminary movement is utilized through the agency of the supplemental actuating member or slide e to move the throttle to a wide open position, regardless of the position in which it may have been standing at the time when the engine was running. For this purpose, the slide e is provided with an inclined cam surface e^3, which is adapted, in the movement of the slide e, to engage a pin a^2, or other suitable engaging portion or projection connected with the slide a. The projection a^2 is yieldingly supported so that at the end of the desired movement, the said pin will ride up an inclined surface e^4, against which it is guided by means of a shoulder e^5, until it lies upon the surface of the slide e which, therefore, affords no resistance to a subsequent movement of the slide a.

The movement of the parts is such that the pin a^2 will reach the end of the cam surface e^3 just before the contact e^2 leaves the contacts d and d^2, so that the throttle will be wide open before the ignition has ceased, thus giving the cylinders a full charge, and causing the engine to speed up before ignition ceases. This will cause the engine to make several revolutions by momentum, after ignition has ceased, this insuring a full charge of gas in the active cylinders by the time the parts have come to rest. It is desirable, in some cases, to throttle the intake more or less during the charging of the cylinders, as, under some conditions, this causes a richer mixture to be drawn into the cylinders; and for this purpose the slide a may be provided with a second cam surface e^6 inclined in the direction opposite to that of the cam surface e^3, and terminating in an upwardly inclined surface e^7 adjacent to a shoulder e^8. In the continued movement of the slide e the cam surface e^6 will engage the second pin a^3, and will cause the slide a to move in the opposite direction, thereby partially closing the throttle prior to the final stopping of the engine.

In order to move the throttle to the most favorable degree of opening for the first operation of the engine after it has been started, the slide a is arranged to be acted upon by the slide e during its movement in the reverse direction, that is, from the position shown in Fig. 3 to that shown in Fig. 2, to close the circuit and start the operation. For this purpose the slide a is provided with a third pin or projection a^4 which, when the engine is running, rests upon the top of the slide e, the said pin, however, dropping to the surface of the base b^2 at the end of the movement of the lever f which stops the engine. This pin a^4 is acted upon in the starting movement of the slide e by means of the cam surfaces e^9 and e^{10}, so as to move the slide a in either direction to the position required for the best position of the throttle valve for the starting operation. This operation is completed prior to the closing of the electric circuit, so that the throttle is moved to the desired starting position regardless of any position in which it may have been placed by the service handle while the engine was standing idle. The pin a^4 remains on the surface of the slide e during the running of the engine, while the pins a^2 and a^3 rest upon the surface of the base b^2, so that there is nothing in the path of the said pins to prevent the free manipulation of the throttle, while the engine is running, by means of the service handle c.

In the construction shown, the pins a^2, a^3 and a^4 are adjustable in position with relation to the slide a, so that any extent of movement desired in response to the engagement of the corresponding cam surface with any of said pins may be obtained. The pins are shown as contained in sockets a^{20}, a^{30} and a^{40}, each of which contains a spiral spring corresponding to the spring a^{31} shown in connection with the pin a^3, Fig. 4. The socket members are externally threaded and provided below with shoulders and above with thumb nuts, so that they may be clamped in a slot a^5 formed in the member a, being, therefore, longitudinally adjustable with relation to said member. As previously stated, the use of the pin a^3 is not essential to the operation, the secondary movement of the throttle, however, being sometimes desirable. Should it be best to dispense with this movement, however, the pin a^3 can be removed, or adjusted to such a position that it will be opposite the inclined surface e^7 when the pin a^2 is opposite the inclined surface e^4, so that the movement of the slide e will have no effect upon the pin a^3 so far as relates to producing a lateral movement thereof. The pin a^4 should be adjusted so that when it lies opposite the inclined surface e^{12} the throttle will be in the best position for starting the engine.

The operation of the device may be de-

scribed as follows: Assuming the engine to be running and the starting lever f in the position shown in Fig. 1, the engine is stopped by moving the said starting lever f in the right direction to break the circuit, which movement causes the cam surface e^3 to engage the pin a^2 regardless of the position of the slide a. This produces the necessary longitudinal movement of the slide a, and no further movement thereof will take place unless the pin a^3 is adjusted to be in such position as to engage the cam surface e^6. Just after the slide a has completed the movement due to the engagement of the pin a^2 with the cam surface e^3, the circuit is broken at e^2 and d, d^2, so that ignition ceases, the heavy charge admitted by the wide opening of the throttle having previously been ignited in one or more cylinders to give the engine a quick impulse. In the continued movement of the starting lever f, the pin a^4 drops off the slide e and lies in the path of the cam surfaces e^9 and e^{10}, as shown in Fig. 3. When the engine is to be started and the starting lever f is moved in the opposite direction, the cam surfaces e^9 and e^{10} act upon the pin a^4 to move the slide a to the starting position regardless of the position in which it may have been left by the pins a^2 or a^3, or may have been placed by the manipulation of the service handle c while the engine was standing still, and the ignition circuit is not closed until the throttle is adjusted to the most favorable position for starting the engine.

It is to be understood that the term "starting device," as used in the specification and claims, is intended to imply any device utilized independently of the controlling device or devices employed to regulate the engine when running, regardless of the function of said controlling device or devices. In other words, the term "starting lever" has been used for convenience to mean any device which is employed in the starting, stopping, or reversing of the engine, as distinguished from the "service" device or devices employed in the control of the engine when running.

Claims.

1. A throttle controlling device for internal combustion engines, consisting of a traveling member; a starting device adapted to coöperate with said traveling member; means for operating the ignition mechanism, said means also being operated by said traveling member; and means whereby the throttle is acted upon by said traveling member and moved thereby to a predetermined position during that movement of said traveling member which finally causes the ignition mechanism to operate.

2. In an internal combustion engine, the combination with the throttle provided with an actuating member having a service handle; of a switch controlling the ignition, said switch having stationary and movable members; an auxiliary throttle controlling device connected with the movable member of said switch; and means whereby the movement of said auxiliary throttle controlling device in either direction is arranged to move the throttle to a definite predetermined position, substantially as described.

3. The combination with the throttle controlling member provided with engaging projections; of a transversely movable member having inclined surfaces to engage said projections and thereby to move the throttle controlling member in one direction or the other; and means for controlling the ignition also carried by said transversely moving member.

4. In an internal combustion engine, the combination with a starting device adapted to control the ignition; of a starting means operated by said starting device for moving the throttle to a definite predetermined position; and means whereby said throttle is released and left free for independent operation while the engine is running.

5. The combination with ignition devices; of means for controlling the operation of said ignition devices; a starting lever coöperating with said controlling means; a throttle; and means for connecting said starting lever with the throttle, whereby the throttle is under the control of said starting lever during the movement thereof which starts or stops the engine.

6. The combination with an ignition controlling device; of a throttle controlling device; connecting mechanism whereby said devices are caused to coöperate in starting or stopping the engine; and means for disconnecting said parts when the engine is running whereby the throttle can be independently controlled.

7. The combination with a throttle controlling device; of a service handle; a starting lever; means for connecting said throttle-controlling device with said starting lever, whereby a movement of said starting lever in either direction is capable of imparting a movement to the throttle controlling device; and means for disconnecting said throttle controlling device from said starting lever when the engine is running, to permit the throttle to be controlled by the service handle.

8. The combination with an ignition controlling device; of an automatic throttle controlling device; connecting mechanism whereby said devices are caused to coöperate in starting or stopping the engine; and an independent service throttle controlling device.

9. The combination with means for con-

trolling the ignition in an internal combustion engine; of an actuator for said means; a throttle controlling device connected with said actuator; and means for disconnecting said throttle from said throttle controlling device, whereby it can be operated independently thereof.

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

EDWARD P. ROBINSON.

Witnesses:

JAS. J. MALONEY,

M. E. COVENEY.