No. 881,582. PATENTED MAR. 10, 1908.

H. A. HETTINGER.

GAS ENGINE.

APPLICATION FILED MAY 13, 1907. 2 SHEETS—SHEET 1.

Fig. 1.

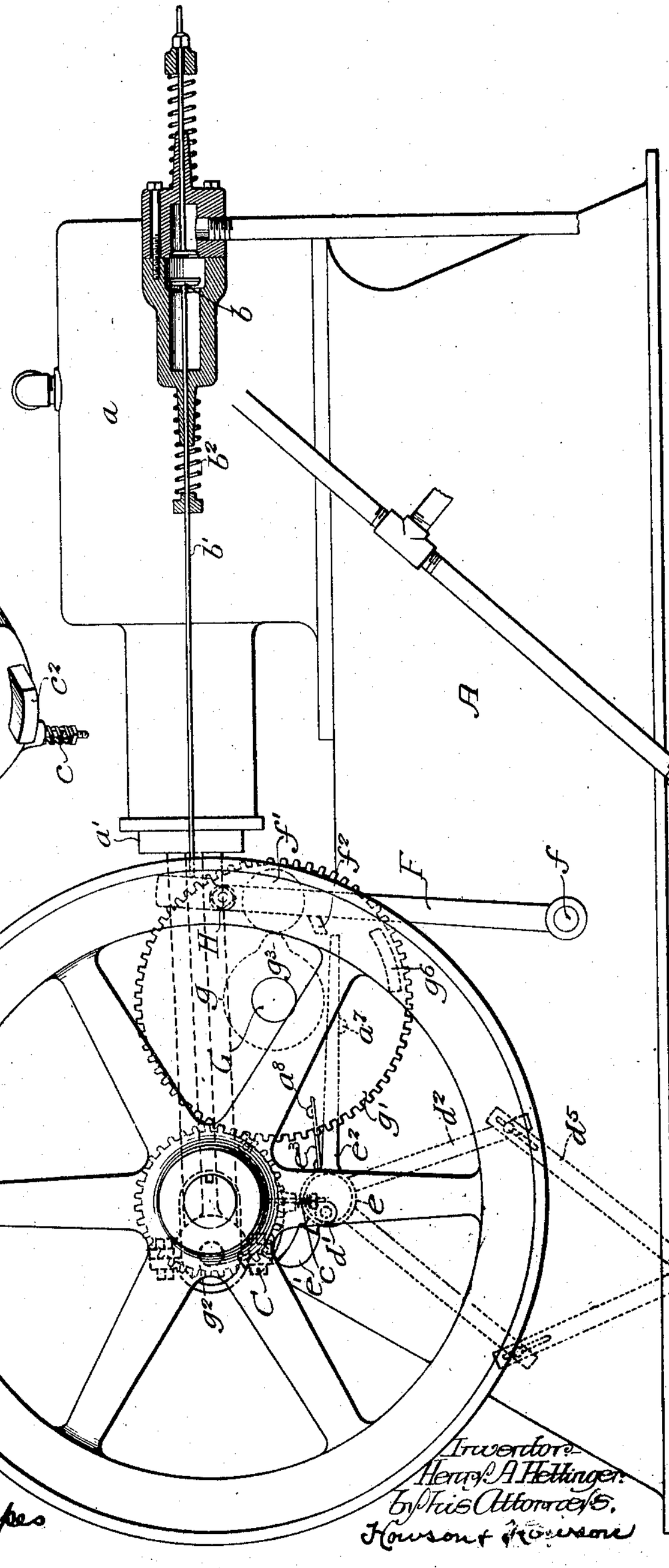
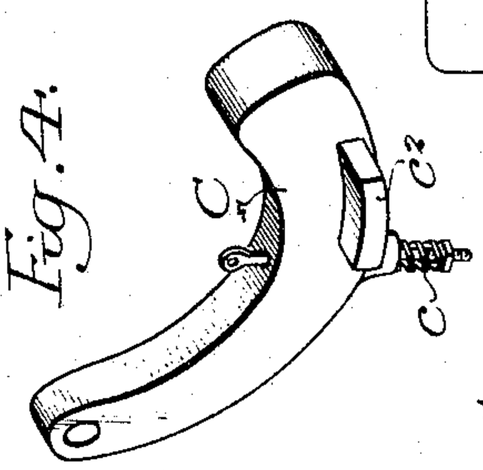


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 3.

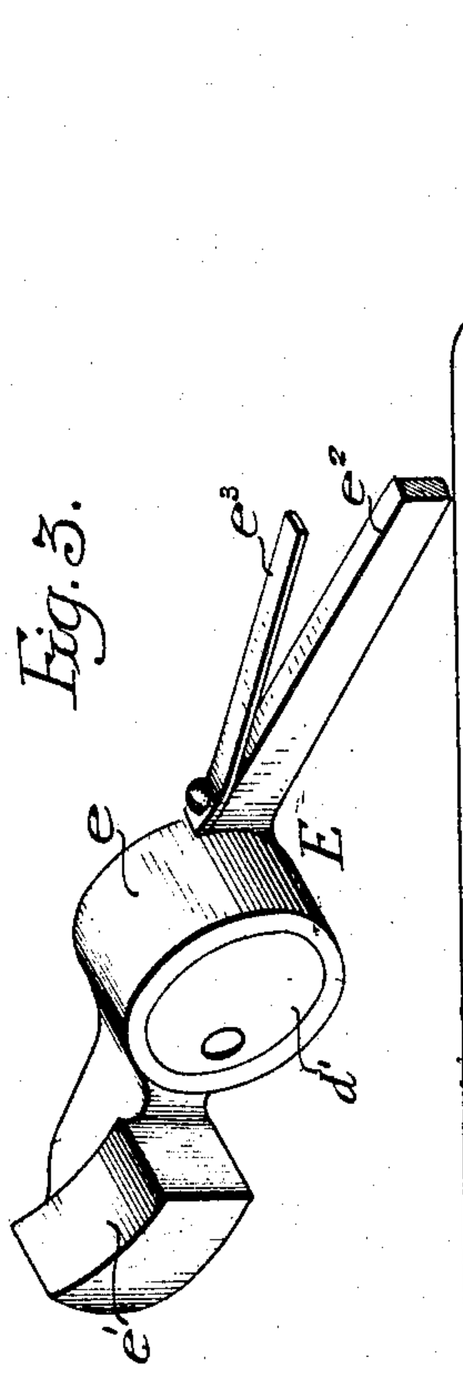


Fig. 5.

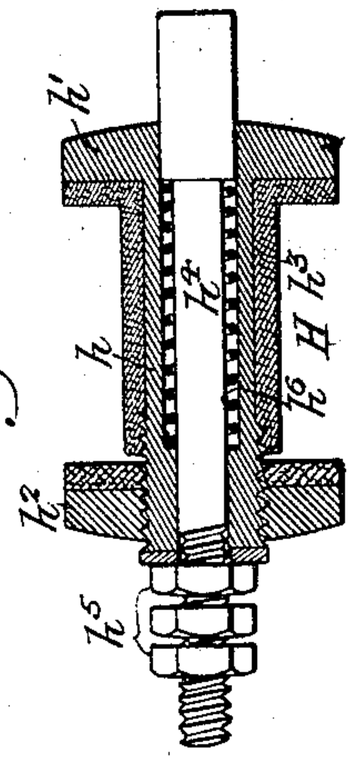
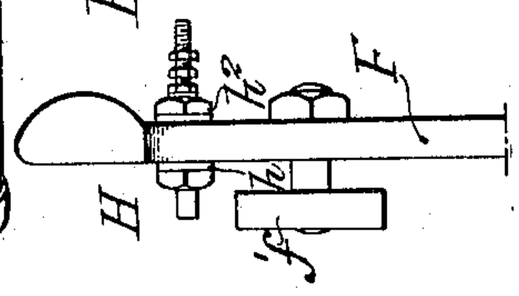


Fig. 2.

Fig. 6.



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UNITED STATES PATENT OFFICE.

HENRY A. HETTINGER, OF BRIDGETON, NEW JERSEY.

GAS-ENGINE.

No. 881,582. Specification of Letters Patent. Patented March 10, 1908.

Application filed May 13, 1907. Serial No. 373,362.

To all whom it may concern:

Be it known that I, HENRY A. HETTINGER, a citizen of the United States, residing in Bridgeton, New Jersey, have invented certain Improvements in Gas-Engines, of which the following is a specification.

One object of my invention is to provide a gas engine with relatively simple and effective speed governing means so designed and constructed as to permit the operation of the engine being controlled by hand when this is desirable.

Another object of the invention is to provide automatic speed controlling mechanism actuated by a centrifugal governor and so arranged as to regulate not only the opening of the exhaust, but also the sparking in the cylinder.

Another object of the invention is to provide simple and effective means for automatically controlling the admission of the charge to the cylinder of a gas engine.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which:—

Figure 1, is a side elevation, partly in vertical section, illustrating the construction of a gas engine made according to my invention; Fig. 2, is a plan view of the engine illustrated in Fig. 1; Fig. 3, is a perspective view of the eccentrically supported lever to which is attached hand controlling mechanism; Fig. 4, is a perspective view of the governor weight carried on the fly wheel; Fig. 5, is a vertical section of the spring contact forming part of the sparking system, and Fig. 6, is a front elevation of a portion of the lever carrying the contact illustrated in Fig. 5.

In the above drawings, A represents the base frame of an explosion engine provided with a cylinder a, a piston a' and a main shaft on which is a crank a^2 attached to the piston a' by means of a connecting rod a^3; there being also fly wheels a^4 and a^5 mounted on the main shaft. The exhaust valve of the engine is illustrated at b and has a rod b' which extends parallel to the line of the cylinder a; the valve being normally kept seated by means of a spring b^2 acting between a collar on the rod and the valve casing. One of the fly wheels has pivoted to it a weight C, preferably of the form shown in Fig. 4, and normally pressed toward the shaft by means of a spring. A shaft or stud d extends from the side of the engine base substantially parallel to the main shaft and has mounted upon it an eccentric d' to which is fixed an arm d^2. This arm is movable between the two extreme positions indicated in Fig. 1, by means of a controlling lever d^3 fixed to a shaft d^4, in turn attached to the arm through a slotted lever arm d^5. The eccentric d' has mounted upon it a sleeve e, from one side of which projects an arm e' capable of being engaged by an arm c^2 projecting from one side of the governor weight C when this has been turned on its pivot to a predetermined extent under the action of centrifugal force. Opposite the arm e' there also projects from the sleeve e a second arm e^2. Attached to the sleeve e, or, in fact, to any other desirable part of the structure E comprised by the members e, e' and e^2, is a flat spring e^3 engaging also a pin or projecting lug a^8 on the edge of the frame so as to maintain the arm e^2 normally in contact with a second stop a^7.

A cam lever F is pivoted to the engine frame at f and extends upwardly so as to be capable of being brought into engagement with the valve rod b'; there being mounted on it a roller f' designed to be engaged by a cam g carried on a short shaft G provided with suitable bearings. This cam is fixed to said shaft which is turned through a gear wheel g' meshing with a pinion g^2 fixed to the main shaft of the engine. The cam lever F is provided with a projection f^2 so placed as to be engaged by the arm e^2 of the structure E when this latter is in a certain position and thereby be maintained in its extreme position against the action of the spring b^2 on the valve rod b'. It will be noted that this spring is capable not only of holding the exhaust valve b closed, but by reason of the fact that the valve rod b' engages the end of the cam lever F, also maintains or tends to maintain this lever in such position that its roller f' will be engaged by the projecting portion g^3 of the cam once in every revolution. When, however, the structure E is turned on the eccentric d' or when the eccentric itself is properly turned, the end of the arm e^2 engages the projection f^2 and thereby prevents movement of the lever F and the closing of the exhaust valve b. The cam lever F carries in addition to its roller f', a contact device H, as illustrated in Fig. 5, which consists of a tubular bolt h having a head h' and a nut h^2 electrically insulated from the lever F by means of a fiber bushing h^3. Within this tubular bolt is carried a spring actuated plunger h^4 having nuts h^5

for the attachment of a current conductor and provided with a spring h^6, whereby it is normally caused to project beyond the surface of the head h'. On the gear wheel g' is mounted a cam g^6 so placed that when the lever F is in its normal position corresponding to the closed condition of the exhaust valve b, said cam will engage the plunger h^4, thereby completing the electric circuit and causing a spark to be formed in the engine cylinder in any of the well known ways. When however, the lever F is held in the position in which, in Fig. 1, it is illustrated as temporarily occupying by the arm e^2 being brought into engagement with the projection f^2, the cam g^6 cannot engage the spring plunger and there is, therefore, no spark formed in the cylinder.

With the above described arrangement of parts, it will be seen that under normal conditions the exhaust valve b will be opened once for every two revolutions of the main shaft, for the reason that the gear wheel g' is provided with twice as many teeth as there are on the gear wheel g^2; the cam g being therefore brought into engagement with the roller f' and turning the lever F so as to cause it to longitudinally move the valve rod b'. When, however, the speed of the engine exceeds a predetermined amount, as determined by the adjustment of the spring c, the governor weight C will fly out and its projecting portion c^2 will engage the curved surface of the arm e'. This causes an upward movement of the end of the arm e^2, which results in said arm engaging the projection f^2 of the lever F. As a consequence, said lever cannot move so as to permit closing of the exhaust valve b, and when the engine makes its suction stroke, air is drawn in instead of a new charge. There is consequently no explosive mixture in the cylinder and, moreover, owing to the fact that the lever F is held by its projection f^2 and the arm e^2 in the position away from the shaft G, the cam g^6 cannot engage the spring contact plunger and there is consequently no spark formed in the cylinder. The engine will, therefore, slow down, since it misses an explosion, and inasmuch as the governor weight is immediately drawn toward the main shaft, the arm e^2 is forced by the spring e^3 so as to clear the projection f^2, thereby permitting the exhaust valve to close and the contact plunger h^4 to be engaged by the cam g^6 at its next revolution.

If it be desired to control the speed of the engine by hand and independently of the governor, this may be done by means of the hand lever d^3, for it will be understood that when this is moved in one direction the eccentric d' will be turned so as to raise the end of the arm d^3 and cause it to engage the projection f^2 with the results above described. When the eccentric is turned in the opposite direction or beyond the point at which the projection f^2 will engage the end of the lever e^2, the spark is formed every two strokes and the exhaust valve is permitted to remain closed except when periodically opened by the cam g.

From the above it will be appreciated that there is considerable saving of the battery because the circuit is completed to form the spark only when there is a charge to be exploded in the cylinder. Moreover, the mechanism for controlling the sparking and the operation of the exhaust valve is of the simplest possible nature and yet of a substantial construction which is not likely to require attention or repairs under operating conditions.

I claim as my invention:

1. The combination in a gas engine having an exhaust valve, of a cam operated from the main shaft, a structure actuated by said cam, to periodically open the exhaust valve, centrifugal governor mechanism including a lever movable into a position to engage the cam actuated structure so as to hold the exhaust valve open independently of the cam, and means independent of the governor mechanism including a hand operated eccentric for moving said lever at will into said position.

2. The combination in a gas engine having an exhaust valve, of means including a cam actuated from the main shaft of the engine for periodically opening the valve, centrifugal governor mechanism including a structure mounted upon an eccentric for connecting the governor and the valve, with means for moving said eccentric independently of the governor and the cam, to maintain the exhaust valve in its open position, substantially as described.

3. The combination of a gas engine having an exhaust valve, a rod for said valve, a movable structure operative on said rod to open the valve, an electrical contact piece carried by said structure, a shaft driven from the main shaft of the engine, having a cam operative on the structure and carrying an electrical contact member capable of engaging said contact piece, with means for holding said structure in position to prevent engagement of the contact member with the contact piece and also to maintain the valve in its open position, substantially as described.

4. The combination in a gas engine having an exhaust valve of a rod for said valve, a movable structure operative on said rod to open the valve, an electrical contact piece carried by said structure, a member driven from the main shaft of the engine, having a cam operative to cause movement of the structure and carrying an electrical contact member capable of engaging said contact piece, with a centrifugal governor capable of

holding said structure in position to prevent engagement of the contact member with the contact piece and also of holding the valve in its open position, substantially as described.

5. The combination in a gas engine having an exhaust valve, of a rod for said valve, a movable structure operative on said rod to open the valve, an electrical contact piece carried by said structure, a member driven from the shaft of the engine having a cam operative on the structure and carrying an electrical contact member capable of engaging said contact piece, with a centrifugal governor capable of holding said structure in position to prevent engagement of the contact member with the contact piece and of holding the valve in its open position, substantially as described.

6. The combination in a gas engine having an exhaust valve, of a rod for said valve, a movable structure operative on said rod to open the valve, an electrical contact piece carried by said structure, a member driven from the main shaft of the engine having a cam operative on the structure and carrying an electrical contact member capable of engaging said contact piece, a centrifugal governor capable of holding said structure in position to prevent engagement of the contact member with the contact piece and of holding the valve in its open position, with a sleeve operative at will for holding the structure in position to maintain the exhaust valve open and the contact piece out of the path of the contact member, substantially as described.

7. The combination in a gas engine having an exhaust valve, of a rod operative thereon, a lever capable of engaging said rod, a contact piece on the lever, a wheel driven from the main shaft of the engine, a contact member on the wheel capable of engaging the contact piece, a cam capable of periodically moving the lever to open the exhaust valve, and a governor capable of maintaining the lever in position to hold the exhaust valve open and also of preventing the contact piece from being engaged by the contact member, substantially as described.

8. The combination in a gas engine having an exhaust valve, of a rod operative thereon, a lever capable of engaging said rod and carrying a contact piece, a wheel driven from the main shaft of the engine having a contact member capable of engaging the contact piece, a cam capable of periodically moving the lever to open the valve, and a governor capable of maintaining the lever in position to hold the exhaust valve open and of preventing the contact piece being engaged by the contact member, with means operative at will for maintaining the lever in said latter position, substantially as described.

9. The combination in a gas engine having an exhaust valve, of a rod for operating the valve, a contact piece, a rotatable structure having a cam capable of periodically moving the rod to open the exhaust valve and also of moving said contact piece, a contact member operated from the main shaft of the engine and capable of engaging the contact piece under predetermined conditions, an eccentric, a lever mounted thereon, a governor weight for the engine capable of moving the lever to maintain the exhaust valve open and the contact piece in position out of the path of the contact member, and means for maintaining said lever in a position out of the path of the governor weight, substantially as described.

10. The combination in a gas engine having an exhaust valve, of a rod connected to said valve, a lever, a shaft having a cam capable of moving said lever to cause it to open the exhaust valve, a rotatable structure also carried on the shaft and provided with a contact member, means for driving the shaft from the engine, a contact piece carried on the lever so as to be capable of engagement with the contact member, an eccentric, a lever mounted thereon, a governor weight for the engine capable of moving under conditions of excessive speed to engage one arm of the lever and thereby move said lever into a position to hold the valve operating lever with the exhaust valve open and the contact piece out of the path of the contact member, and a device for turning said ecentrically mounted lever at will, substantially as described.

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

HENRY A. HETTINGER.

Witnesses:

DAVID M. BOWEN,

J. EDGAR STANGER.