No. 867,279. PATENTED OCT. 1, 1907.

M. C. KESSLER.

EXPLOSIVE ENGINE.

APPLICATION FILED SEPT. 17, 1906.

2 SHEETS—SHEET 1.

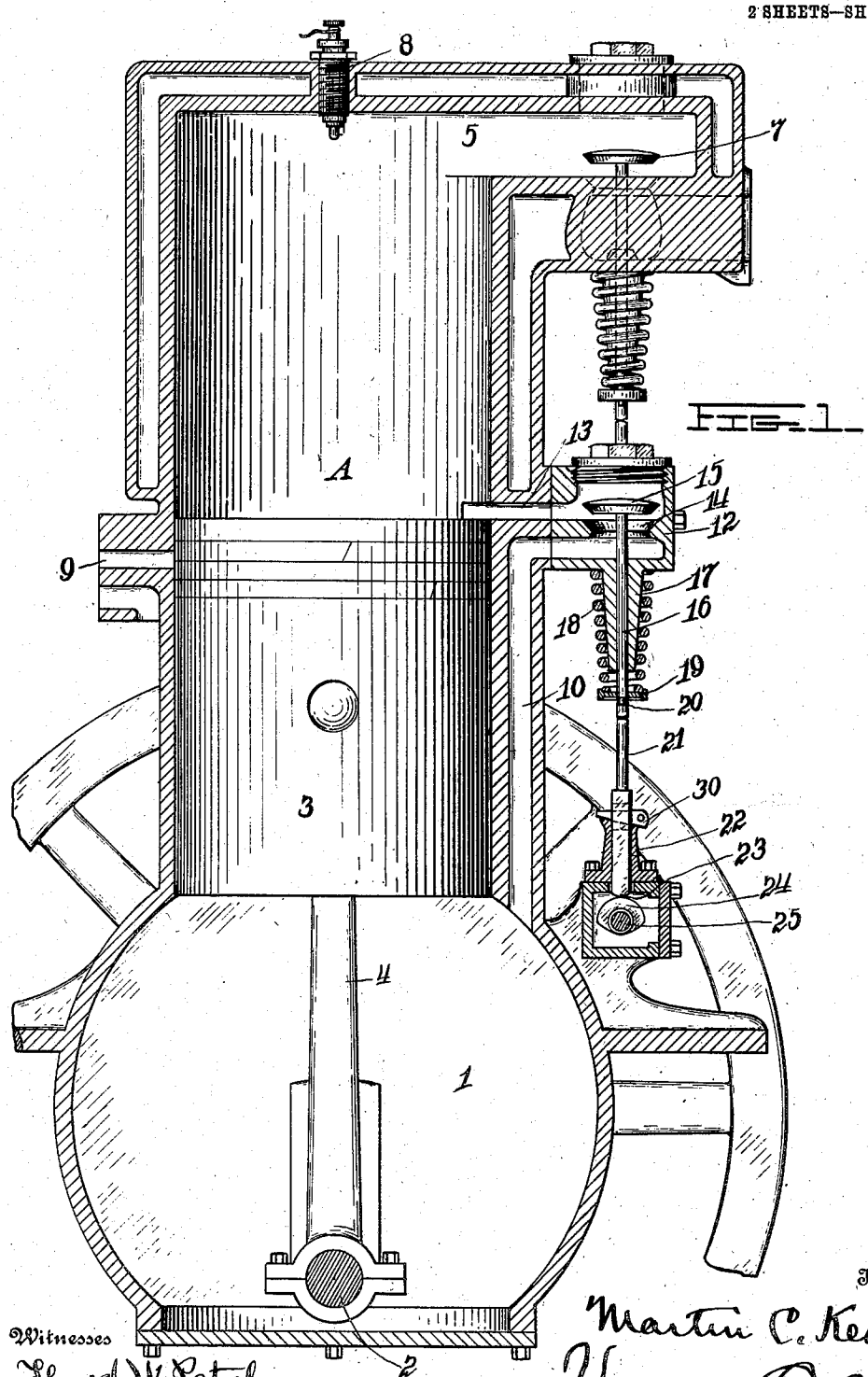

FIG. 1

Witnesses
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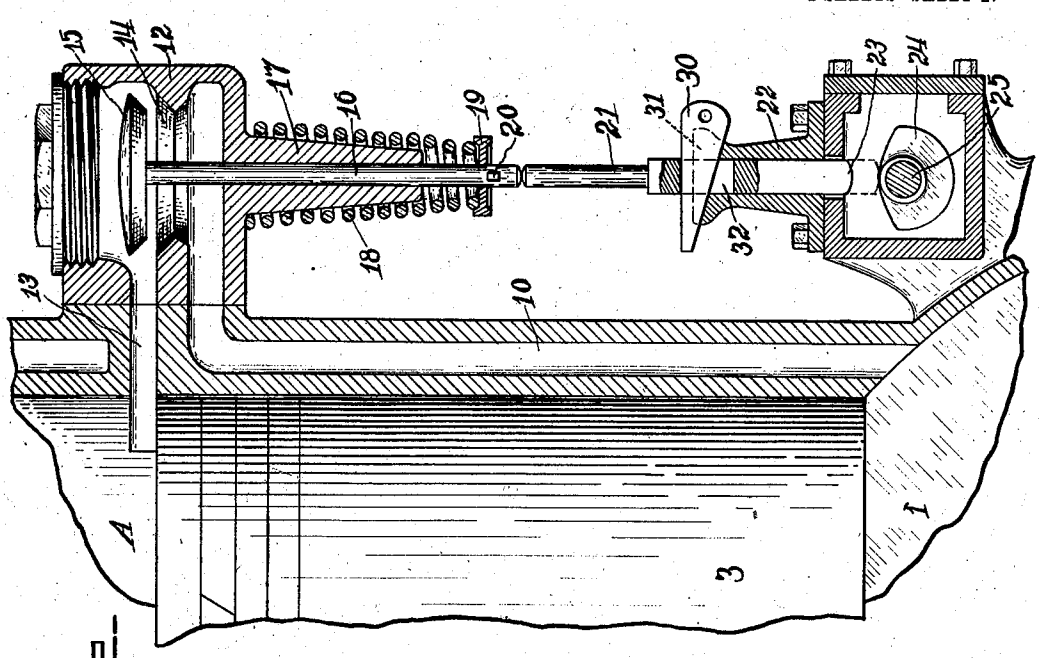

FIG. 2.

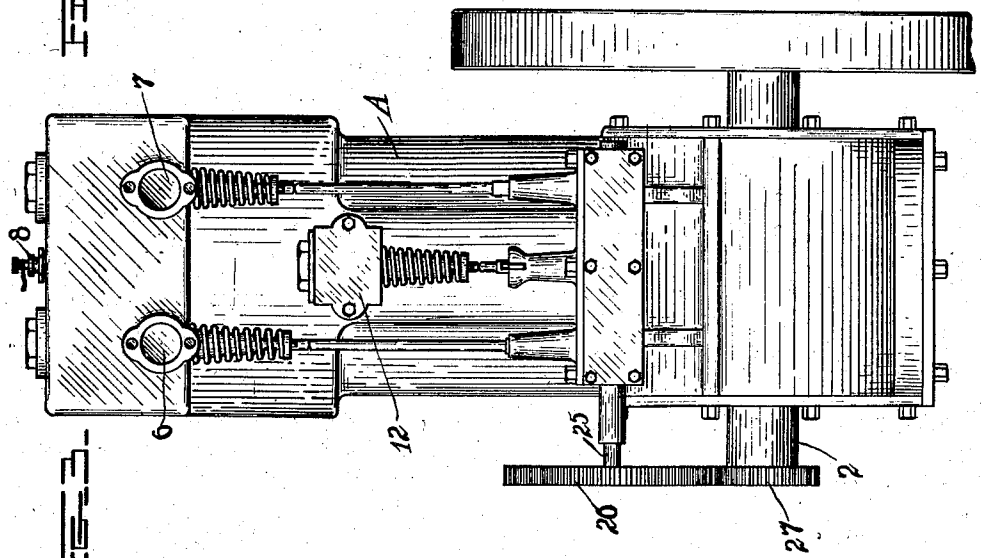

FIG. 3.

Witnesses

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UNITED STATES PATENT OFFICE.

MARTIN C. KESSLER, OF DENVER, COLORADO, ASSIGNOR TO THE KESSLER MOTOR COMPANY, OF DENVER, COLORADO.

EXPLOSIVE-ENGINE.

No. 867,279. Specification of Letters Patent. Patented Oct. 1, 1907.

Application filed September 17, 1906. Serial No. 334,926.

To all whom it may concern:

Be it known that I, MARTIN C. KESSLER, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Explosive-Engines, of which the following is a specification.

My invention relates to an improvement in explosive engines, of that type known as the Otto cycle, or those in which the explosion takes place in every second or alternate rotation of the crank-shaft and in which the spent gases and products of combustion arising from the explosion of the charge are expelled in the succeeding stroke of the piston following each power stroke, a new supply or charge of explosive mixture being drawn into the cylinder during the stroke following the exhaust stroke, which charge is compressed during the next succeeding stroke at the end of which the explosion takes place. In this type of engine there is a clearance or combustion chamber in the head of each cylinder which ordinarily is about one-fourth of the piston displacement, which chamber, after each exhaust stroke has been completed and the piston has reached the end of its stroke. is necessarily left full of exhaust or carbonic acid gas, which not only will not burn but which also has the effect of a chemical fire extinguisher in that it precludes the possibility of combustion, so that as high as 40% of loss results when the engine is taking in a full displacement of fresh air. If, therefore, there is this percentage of loss when the full complement of air is drawn into the cylinder, the loss must necessarily be greatly in excess of this, when the engine is throttled and the cylinder is allowed to take in less fresh air, so that in addition to the extravagant use of gasolene, the engine falls far short of its greatest efficiency.

The object of my invention therefore is to provide means to completely clear out the products of combustion, known as carbonic acid gas, from the working cylinders, after each working stroke, thus leaving the combustion chamber always full of fresh air after each exhaust regardless of the amount of charge taken in from the main intake of the cylinder.

In my device I propose to use crank case compression for the purpose of always delivering fresh air from the crank case to the cylinder at the end of each working stroke to blow out the products of combustion, as described, with a full port, but on the alternate revolution when the piston shall have reached the end of its intake stroke I provide means for controlling said port so that I can allow any amount of air from the crank case to assist or help make up any deficiency in the air volume in the intake stroke of the main cylinder, or I can cut this auxiliary supply of air off altogether. At high piston speeds, it is impossible to get in anywhere near the full piston displacement of air through the main cylinder but with my present invention it is possible not only to always clear out the products of combustion with full crank case volume of air poured into the cylinder after each exhaust but also with each alternate revolution the crank case volume of air may either be discharged into the cylinder in such proportions as the requirements of the service demands or else be completely cut off from the cylinder if desired and no additional air supplied to the cylinder from this auxiliary source. In other words the construction is such that it is entirely within the control of the operator. Otherwise, if the port was left wide open at all times, the engine would receive a like amount of air at each revolution and could not be regulated without cutting off the crank case compression and losing its value for its clearing out effect, and if the crank case compression is not alternately throttled when the engine is throttled, then it would be necessary to throttle the crank case compression alike with both revolutions. In that event it would be impossible to clear out the products of combustion.

My invention therefore comprises means for compressing air in the crank case with each inward stroke of the piston, the full volume of which compressed air is regularly liberated at the end of every alternate inward stroke of the piston into the cylinder for the purpose of completely scavenging it of all exhaust products, and means within the control of the operator for regulating the discharge of compressed air into the cylinder with each intermediate alternate stroke as an auxiliary means for aiding and increasing the charge when the engine is running under high speed; or for cutting off this compressed air entirely with such intermediate stroke if it is not required.

My invention further consists in certain novel features of construction and combinations of parts which will be hereinafter described and pointed out in the claims.

In the accompanying drawings: Figure 1 is a sectional view through the engine. Fig. 2 is a fragmentary view in section on an enlarged scale showing the valve for controlling the by-pass from the crank case to the cylinder and Fig. 3 is a view in side elevation taken at right angles to Figs. 1 and 2.

The engine illustrated is of the four cycle type, and the crank case is used as a compression chamber.

A, represents the cylinder of the engine, 1, is the crank case, 2 is the crank therein, and 3 indicates the piston, with the usual connecting rod 4, extending therefrom to a crank on the crank shaft.

The customary clearance chamber 5 is formed at the outer end of the cylinder, an intake valve 6, controls the supply of carbureted air, and an exhaust valve 7 regulates the exhaust from the cylinder.

The usual sparker 8 is provided at a convenient point for exploding the charge at the required intervals.

An inlet port 9 is provided for the induction of air

to the crank case, this port being uncovered when the piston 3 is at its outer stroke.

A by-pass 10 leads from the crank case 2 to the cylinder and while always in communication with the crank case at its inner end its outer end is opened by the piston only when the latter is at its inner stroke.

The provision for taking air into the crank case and discharging it into the cylinder, and its control, will now receive special attention. In the drawings, only one of many methods of controlling the air is illustrated as a means of exemplifying a feasible plan of carrying out the broad idea of my invention. A valve case 12 is secured to the side of the cylinder in any approved manner, it being chambered out to communicate with the by-pass 10 and port 13 leading into the cylinder and provided with a valve seat 14. A valve 15 is adapted to control this by-pass, it being in position to normally seat itself on the seat 14, when not otherwise prevented. The valve is guided by the valve rod 16 passing through the counter bored boss 17 and an expansion spring 18 surrounding this boss, engages a collar 19 held on the valve stem 16 by means of a key 20 and tends to seat the valve at all times. A rod 21 in alinement with the valve stem 16 is adapted to slide in and out through a box 22, and its rounded inner end 23 is normally held against a cam 24 on the rotary shaft 25 which shaft is provided with a large pinion 26 meshing with pinion 27 on the crank shaft 2, the pinion 26 being preferably double the size of pinion 27, so that the shaft 25 makes just one complete revolution to two revolutions of the crank shaft.

When the engine is running under ordinary conditions and at a moderate speed, the valve 15 opens with one instroke of the piston, and closes with the alternate instroke of the piston that is to say, with the inner stroke of the piston, caused by each explosion of a charge of gas in the cylinder, the cam 24 is in the position shown in Fig. 1 or in engagement with the inner end of the rod 21, thus holding the valve 15 positively open so that the moment the piston reaches the end of its stroke, the air compressed in the crank case is released by the piston opening port 13, thereby allowing the full charge of compressed air to expend itself in the cylinder completely scavenging and cleaning out the waste and exhaust products of combustion, they passing through the exhaust valve 7, the reverse or outer stroke of the piston assisting in this operation. With the succeeding stroke of the piston a new charge of carbureted air is drawn into the clearance space 5 through valve 6 and by the time the piston has finished this inward stroke and uncovered port 13, the cam 24 has turned to the position shown in Fig. 2, thus allowing the valve 15 to seat itself and close the by-pass, the rod 21 following the cam and taking the position at its inner end indicated by dotted lines. The foregoing has nothing to do with the manual control of the valve 15, the purpose of which is to provide an auxiliary supply of air to the cylinder to aid combustion when from the speed of the engine or otherwise, sufficient air cannot be taken in through the valve 6. Various means might be resorted to for this control of the valve and I have illustrated a very simple plan in the way of the wedge 30, which is under the control of the operator. This wedge slides in a notch 31 indicated by dotted lines in the upper end of the box 22, it passing through a slot 32 in the rod 21. In Fig. 2 this wedge is shown in its inward position showing the valve 15 full open, in other words with the by-pass unrestricted so that a full complement of air is discharged into the cylinder with every inward stroke of the piston. In this way, not only does the scavenging take place as heretofore explained with the alternate instroke of the piston, but also with the remaining, that is to say, with every instroke of the piston air is discharged into the cylinder from the crank case or compression chamber, to supplement the regular volume of air drawn in through the valve 6, with each alternate inward stroke of the piston so that when the engine is running under a high speed and more air is required than the valve 6 can supply, the volume of air is increased, thereby greatly increasing the power of the engine, as well as economizing in the use of fuel. Now the volume of air for this purpose is entirely within the control of the operator by adjusting the wedge or valve controlling device 30 for this valve may be held open never so little, fully open or at any intermediate point in accordance with the auxiliary supply of air required. Thus I am able to construct an engine of the four cycle type which will give a maximum efficiency of power with an economical consumption of fuel.

While the disclosed invention only exemplifies one means of accomplishing the objects of my invention, it is evident that a great variety of others might be illustrated and described and I do not wish to limit myself to the construction herein set forth, but:—

Having fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In an engine in which air is compressed in the crank case, means for controlling and varying the volume of air delivered from the crank case to the engine cylinder with each alternate revolution of the crank shaft.

2. In an engine in which air is compressed in the crank case by the inward stroke of the engine piston, means for discharging air from the crank case into the cylinder with every inward stroke of the piston, said means being capable of regulation and control with the alternate inward strokes of the piston.

3. In an engine in which air is compressed by the piston in the crank-case, means for discharging the compressed air in the crank-case into the cylinder with each alternate revolution of the crank-shaft, a valve which normally shuts off the air supply with the remaining revolutions of the crank shaft, and means within the control of the operator for causing the discharge of the compressed air into the cylinder with each inward stroke of the piston.

4. In an explosive engine, the combination with a cylinder, crank case and piston, the engine provided with an induction port adapted to supply air to the crank case, and having a by-pass leading from the crank case to the cylinder and means for discharging air from the crank case into the cylinder with each alternate revolution of the crank shaft, and controllable means whereby air may be discharged into the cylinder from the crank case with the remaining revolutions of the crank shaft.

5. In an explosive engine, the combination with a cylinder, crank case, crank shaft and piston, the engine provided with a by-pass having a valve seat therein, a valve which is normally held open with every alternate in stroke of the piston and normally closes with the remaining inward strokes of the piston, said valve being within the control of the operator.

6. In an explosive engine, the combination with a cylinder, crank case, crank shaft and piston, the engine provided with a by-pass having a valve seat therein, a valve which is normally held open with every alternate in stroke of the piston and normally closes with the remaining inward stroke of the piston and controllable means for regu-

lating and varying the degree of closure of said valve on the intermediate alternate inner stroke of the piston.

7. In an explosive engine, the combination with a cylinder, crank case and piston, the engine provided with a by-pass leading from the crank case to the cylinder, a valve therein and means actuated by the crank shaft of the piston for positively opening said valve during every alternate revolution of the crank shaft, means for normally closing the valve with the remaining revolutions and controllable means for preventing and limiting the amount of said valve closure.

8. The combination with a cylinder and piston, the cylinder having an air inlet port, of a valve for said port which normally opens and then closes, and means for holding it open a greater or less degree during the entire running of the engine.

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

MARTIN C. KESSLER.

Witnesses:

VERNON E. HODGES,

GEO. E. TERRY.