M. C. KESSLER.

EXPLOSIVE ENGINE.

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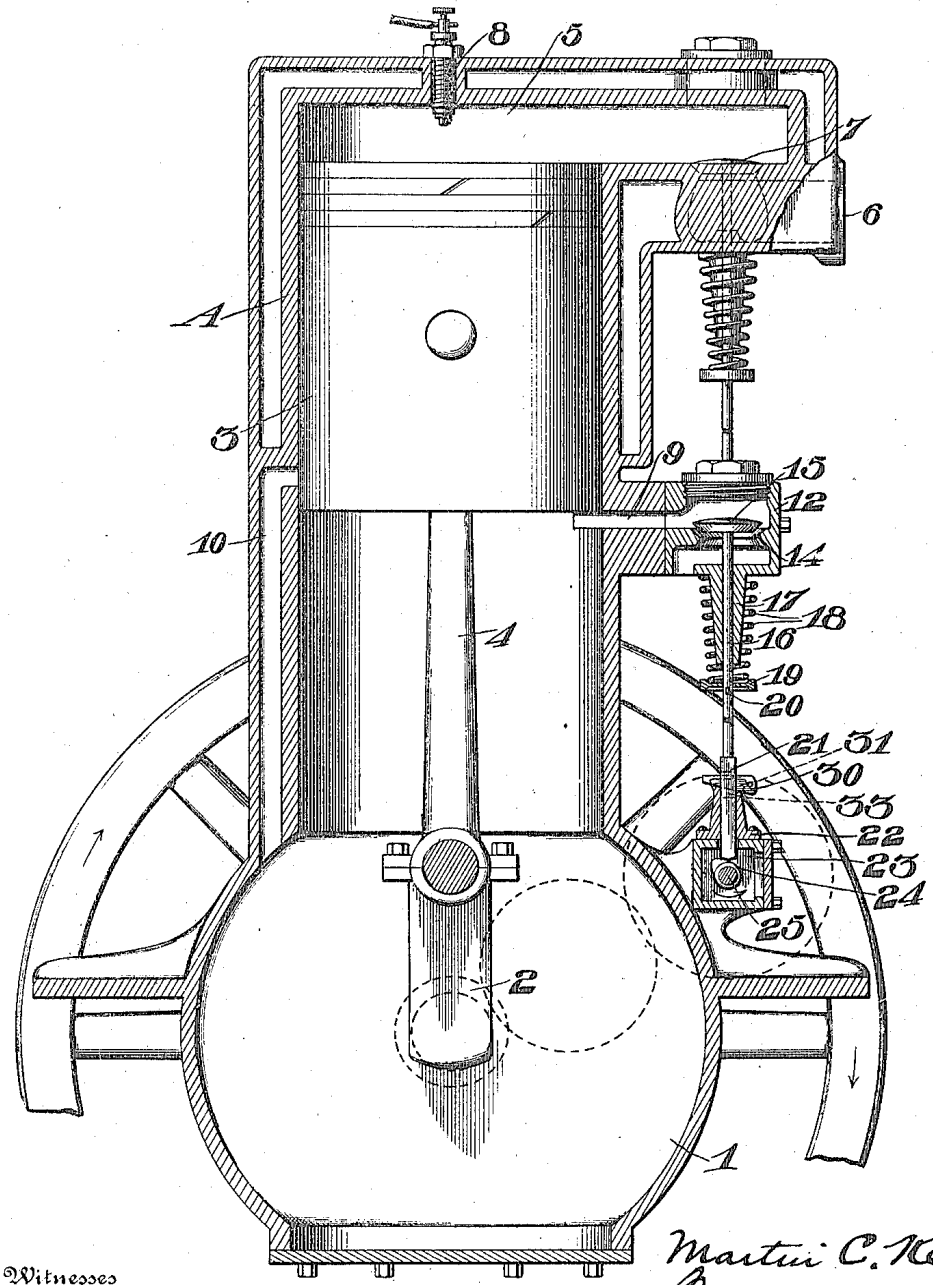
1,221,544. Patented Apr. 3, 1917.



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EXPLOSIVE-ENGINE.

1,221,544. Specification of Letters Patent. Patented Apr. 3, 1917.

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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 four cycle, or those in which the explosion takes place 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 more or less filled with burnt gases, 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 a very material loss results when the engine is taking in a full charge. If, therefore, there is this percentage of loss when the full complement of charge 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 charge, so that in addition to the extravagant use of fuel the engine falls far short of its greatest efficiency.

The object of my present invention is to provide means for completely clearing out the products of combustion from the working cylinder or 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 present engine I prefer to use crank case compression as a means of always delivering air from a source of compression to the cylinder at the end of each power stroke in order to blow out the products of combustion, but on the alternate revolution, when the piston shall have reached the end of its intake stroke, I provide means for controlling the air so that I can utilize any amount from the crank case or other source of compression to increase the explosive volume after 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 anywhere near the full piston displacement of air through the main intake, 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 be either discharged into the cylinder in such proportions as the requirements of the service demand or else be completely cut off from the cylinder, if desired, by throttling the intake to the crank case and supplying no additional air 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 were 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 intake of air into the crank case with each intermediate alternate instroke as an auxiliary means for aiding and increasing the charge when the engine is running under heavy load, or for cutting off

this air entirely with such intermediate stroke if it is not required.

In other words, the present invention is an improvement on the one disclosed in Letters Patent No. 867,279, granted to me October 1, 1907, the present invention differing therefrom in this respect, namely that in my former engine the air was controlled as it left the crank case, whereas in my present invention, it is controlled as it enters the crank case.

The accompanying drawing is a vertical sectional view through the engine.

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, and an exhaust valve 7 regulates the exhaust from the cylinder, while an intake valve, not shown but located forward of the valve 7 and having an inlet port 6, controls the supply of carbureted air in the usual manner. A sparker 8 is provided at a convenient point for exploding the charge at the required intervals.

An external air inlet port 9 is provided for the intake of air into the crank case, this port being uncovered when the piston 3 is at its outer limit of stroke.

The provision for taking air into the crank case and discharging it into the cylinder, and its control, will now receive attention. In the drawing 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 this invention.

A valve case 12 is secured to the side of the cylinder in any approved manner, it being chambered out to communicate with external air inlet port 9 and the outside air. It is also provided with a valve seat 14. A valve 15 is adapted to control the external air inlet port 9, 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 counterbored 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 cam shaft 25, the latter being adapted to make one complete revolution to two revolutions of the crank shaft.

A by-pass 10 leads from the crank case 2 to the cylinder at a point just over the head of the piston when the latter completes its instroke, so that the air compressed in the crank case is liberated just at the completion of the instroke of the piston.

When the engine is running under ordinary conditions, the valve 15 opens with the compression outstroke of the piston and the suction created in the crank case causes it to take in a full volume of air for the purpose of scavenging. In other words, when the piston is in the position shown in the drawing and is about to commence its instroke caused by the explosion of a charge, the cam 25 has just passed beneath the lower end of the rod 21 and the valve 15 has commenced to close so that after the piston has begun this instroke, valve 15 has completely closed, thus confining the air in the crank case in which it is compressed by the piston by the time it completes this instroke, and by which time the by-pass 10 is opened and the full charge of compressed air is allowed to issue into the cylinder, completely scavenging and cleaning out the waste and exhaust products of combustion, they passing through exhaust valve 7, the reverse or outer stroke of the piston assisting in this operation.

With the succeeding inward stroke of the piston, a new charge of carbureted air is drawn into the clearance space 5 through valve 6, and the valve 15 closes with the following outstroke of the piston, the cam 24 having turned to a position away from the rod 21.

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 increase the volume of the explosive charge after the maximum charge has been taken in through the valve 6. Various means might be resorted to for this control of the valve and I have only illustrated one very simple plan, this being in the form of a 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 33 in the rod 21. In the drawing this wedge is shown in its inward position showing the valve 15 full open, in other words with the port 9 unrestricted so that a full volume 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 at the completion of the alternate instroke of the piston, but also air is discharged into the cylinder with every instroke of the piston from the crank case or compression chamber to supplement the regular volume of charge drawn in from the carbureter with each alternate intermediate instroke of the piston, so that when the engine is running under full volume and more air is required than the inlet valve can supply, the volume of charge is

increased, thereby greatly increasing the power of the engine.

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, full open, or at any intermediate point in accordance with the auxiliary supply of air required.

To summarize, the present invention differs from my former invention in this particular, namely that in the former invention the valve 15 was located in the by-pass which led from the crank case to the cylinder, whereas the valve in the present invention is located in position to control the intake of air as it is drawn into the crank case.

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

1. In an explosive engine, the combination of a cylinder, crank-case, piston, a crank-shaft connected with the piston, means of communication between the crank case and cylinder controlled by the piston, an external air inlet port leading to the crank-case, a valve therein, means actuated by the crank-shaft for positively opening said valve on every alternate compression stroke of the piston, means for normally closing the valve with the other compression strokes, and controllable means for preventing and limiting the extent of said valve closure.

2. In an engine in which air is compressed in the crank case by the inward stroke of the engine piston, a crank case, means located in the air inlet port which supplies said crank case for opening the port to admit air into the crank case prior to its discharge into the cylinder with every inward stroke of the piston, and means for normally opening and closing said first-named means with alternate outstrokes of the piston, the extent of closure being capable of limitation and control.

3. In an engine in which air is compressed by the piston in the crank case, means for admitting air into said crank case and means for discharging the compressed air in the crank case into the cylinder with each revolution of the crank shaft, said first-mentioned means capable of permitting the intake of air into the crank case only with the alternate revolutions of the crank shaft.

4. In an explosive engine, the combination of a cylinder, compression chamber, crank shaft and piston, the engine provided with a by-pass leading from the compression chamber to the cylinder, an external air inlet port leading to the compression chamber, a valve in said inlet which is normally held open with every alternate outstroke of the piston and normally closes with the intermediate outward strokes of the piston, and means within the control of the operator for opening and closing the valve.

5. In an explosive engine, the combination of a cylinder, compression chamber, crank shaft and piston, the engine provided with a by-pass leading from the compression chamber to the cylinder, an external air inlet port leading to the compression chamber, a valve therein which is held open with every alternate outstroke of the piston and closes with the intermediate outward strokes of the piston, and controllable means for regulating and varying the degree of closure of said valve on the intermediate alternate outward strokes of the piston.

6. In an explosive engine, the combination of a cylinder, crank-case, piston, a by-pass leading from the crank case to the cylinder, an external air inlet port leading to the crank case, a valve therein, means actuated by the crank shaft for positively opening said valve on every alternate compression stroke of the piston, means for normally closing the valve with the other compression strokes, and controllable means for preventing and limiting the extent of said valve closure.

In testimony whereof I affix my signature in presence of two witnesses.

MARTIN C. KESSLER.

Witnesses:
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