M. C. KESSLER.

EXPLOSIVE ENGINE.

APPLICATION FILED SEPT. 6, 1907.

1,046,392.

Patented Dec. 3, 1912.

3 SHEETS—SHEET 1.

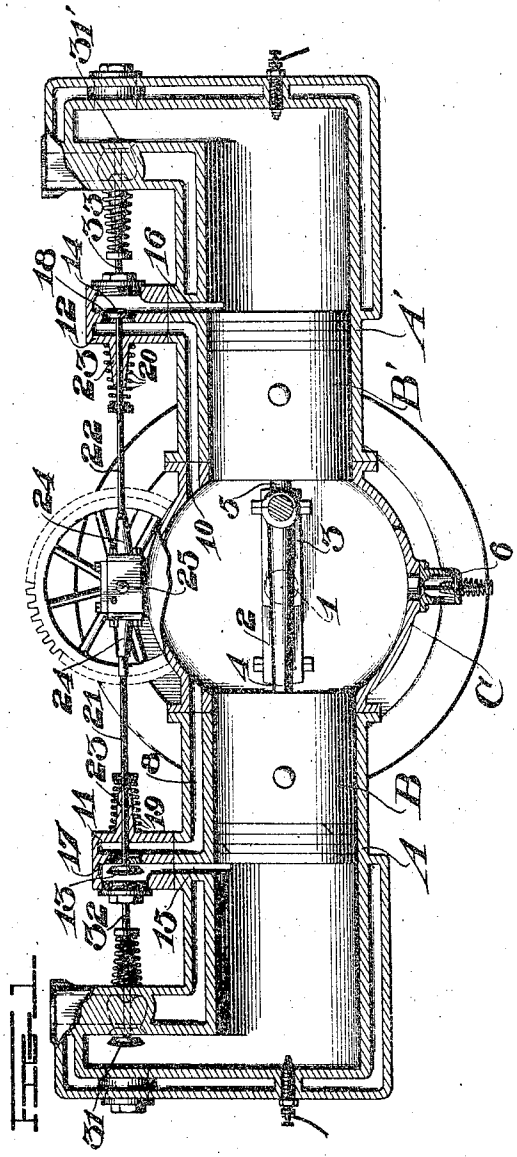

FIG. 1.

Witnesses
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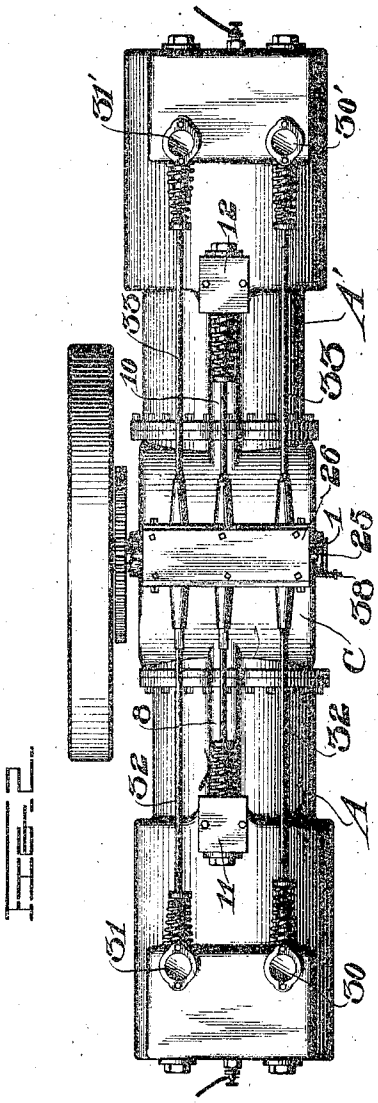

FIG. 2.

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3 SHEETS—SHEET 3.

FIG. 3.

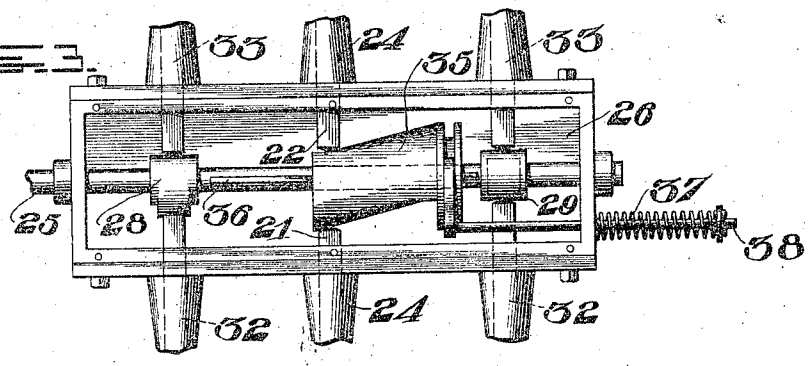

FIG. 4.

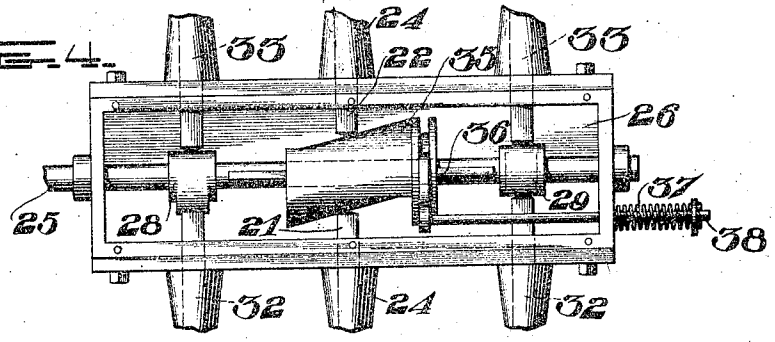

FIG. 5.

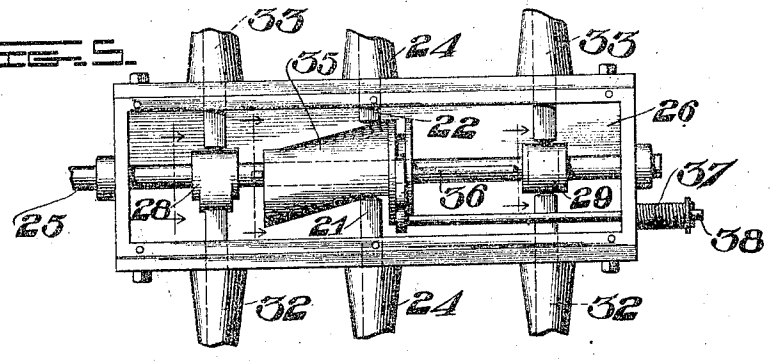

FIG. 6.

FIG. 7.

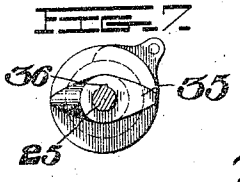

FIG. 8.

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.

1,046,392. Specification of Letters Patent. Patented Dec. 3, 1912.

Application filed September 6, 1907. Serial No. 391,675.

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, the present invention being of the type known as the four cycle with double opposed engines.

The primary object of the present invention is to provide means for making a maximum volume of air available by compressing the double piston displacement into a single crank case common to both cylinders and utilizing the full charge of air thus confined and compressed first in one cylinder and then in the other, either for scavenging said cylinders or for augmenting the new charge whereby the combined displacement of the two pistons is not only compressed into one chamber, but also any amount or all of this compressed air may be used first in one cylinder and then in the other, or the air may be divided in any proportions between the two cylinders.

With these objects in view my invention consists in a two cylinder opposed engine having a common crank shaft and crank case, the crank case compression of the two pistons being accomplished by the simultaneous inward stroke of the two pistons, thus compressing the volume of two piston displacements into a crank case common to both, in connection with valve mechanism for controlling this air to cause its discharge into one cylinder or the other for scavenging, or for augmenting the charge.

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

In the accompanying drawings:—Figure 1 is a longitudinally vertical section through the entire engine. Fig. 2 is a plan view. Figs. 3, 4, and 5 are views showing different positions of the valve controlling mechanism. Figs. 6, 7 and 8 are different views of the cams in end elevation.

A and A′ are the two cylinders, B and B′ are the pistons therein, 1 is the double crank shaft having cranks 2 and 3 extending in opposite directions, and 4 and 5 are the usual connecting rods extending from these cranks 2 and 3 to the pistons B and B′, respectively.

C is the crank case located at the center of the engine and in which air is compressed by the simultaneous instrokes of the two pistons B and B′. An automatic inlet valve 6 in the crank case admits a fresh supply of air with each outward stroke of the pistons, the air being sucked in by the tendency of the pistons to create a vacuum in the crank case. By-passes 8 and 10 lead from the crank case alongside the cylinders A and A′ respectively to valve cases 11 and 12, and the passage of air through these by-passes 8 and 10 is controlled by valves 13 and 14 respectively on its way to the ports 15 and 16 through which the air discharges into the cylinders A and A′ just above the outer ends of the pistons and which the pistons clear as they reach the end of their instrokes. These valves 13 and 14 are normally held on their seats 17 and 18 by springs 19 and 20 and they are guided by the rods 21 and 22 which slide through boxes 23, 23, and 24, 24. Thus the springs 19 and 20 normally tend to close the valves 13 and 14. Various means might be provided for controlling these valves. Of the various means possible for controlling these valves, I have shown and will now proceed to describe only one practical form of valve controlling mechanism.

The cam shaft 25 is journaled in the ends of a box or casing 26, and on one end of this shaft, a gear wheel is keyed, the teeth of which mesh with a pinion half its size (not shown) on the crank shaft 1, so that the two shafts are geared one to two, or in other words, the crank shaft makes two revolutions to a single revolution of the cam shaft. The cam shaft 25 is provided with the usual cams 28 and 29 for operating the usual intake and exhaust valves 30, 30′, and 31, 31′, respectively, shown in Fig. 2, they being controlled through valve rods 32 and 33, but this mechanism will not be described in detail as it is a well-known mechanism for the purpose.

As the means which I have illustrated for operating and controlling the valves 13 and 14 constitutes a part of my present inven-

tion, I will now describe it as one of many possible ways of operating and controlling these valves.

A cam 35, shown in Figs. 3, 4, 5, and 7, is keyed by means of the spline 36 to slide on the shaft 25 while turning with it. Thus the cam 35 is normally held in position shown in Fig. 3 by means of an expansion spring 37 on the rod 38 which rod slides through an end of box or casing 26, and is connected with the cam 35. In other words, in its normal position one end of this cam is in position between the rounded inner ends of the rods 21 and 22. This is the position when the engine is operating under the normal or ordinary conditions, that is to say, for scavenging the cylinders successively or alternately upon the completion of the instroke following the explosion of a charge. Following the engine through the four cycles, we will assume that the pistons are at their outer stroke or in the opposite position from that shown, the charge in the cylinder A is exploded, and the pistons move inward to the position shown in Fig. 1, compressing a full complement of air in the crank case. Meanwhile cam 35 has turned into the position shown in Fig. 3, opening valve 13. The moment piston B opens the port 15, the full charge of air compressed in the crank case is expelled into cylinder A clearing it of exhaust gases, the exhaust valve 31 being held full open by the cam 28. The outward stroke of piston B still further clears the cylinder, and as it moves outward the valve 13 closes. Meanwhile piston B′ which has drawn in a new supply of charge during its inward stroke corresponding to the inward stroke of piston B resulting from the explosion, now compresses its charge preparatory to an explosion. Upon reaching the limit of the outward stroke, corresponding to the outward stroke of piston B in clearing its cylinder, the explosion takes place in cylinder A′, forcing both pistons inward, compressing a new supply of air in the crank case, and piston B drawing in a new charge into the cylinder A. Meanwhile cam 35 has reversed itself and opened valve 14 so that when piston B′ opens the port 16, the full supply of air compressed in the crank case issues into cylinder A′, completely scavenging it and forcing the exhaust out through exhaust valve 31′ which meanwhile has opened by reason of the cam 28 having turned to a position the reverse of that shown in Fig. 3. The foregoing completes the cycles of both pistons and describes the effect under normal conditions and has nothing to do with the manual control of the valves 13 and 14, the purpose of which is to provide an auxiliary supply of air to the cylinders to increase the volume of combustion. This auxiliary supply is entirely under the control of the operator and is accomplished by sliding the rod 38 which is connected with the cam 35 against the action of spring 37. If it is desired to open each of the valves 13 and 14 twice during a complete cycle of the engine, the cam 35 is pushed to any intermediate position as for instance to that shown in Fig. 4, which means that both valves are operated upon simultaneously at each half revolution of the cam shaft 25, or in other words, these valves are both opened simultaneously when the two pistons shall have completed every instroke, so that while one cylinder is being scavenged, the charge in the other is being augmented by air from the crank case, and so the operation continues with first one cylinder and then the other. By pushing rod 38 and cam 35 in still farther, the scavenging is decreased and the augmenting increased. When the rod and cam are pushed way in as shown in Fig. 5 the scavenging is entirely cut off, and the air is all used for augmenting, that is, the air supply correspondingly increases or decreases as the air used for scavenging decreases or increases. There comes a time when there is such a great amount of air from the crank case used for augmenting the charge of the cylinders, that the remaining quantity of exhaust gases after the exhaust stroke becomes so small in proportion to the great amount of air used that the losses are so small, that there is more to be gained by not scavenging at all, and utilizing the total crank case compression for augmenting the explosive charge, and that is what is done by the last condition described, namely that the cam opens the valve and the air is forced in as shown in Fig. 5. When the air is thus utilized the power of the engine is correspondingly increased, and its maximum of power is attained.

It is evident that more or less slight changes might be resorted to in the form and arrangement of the several parts described without departure from the spirit and scope of my invention, and hence I do not wish to limit myself to the exact 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 two pistons operate to compress air in a common crank-case, the combination of cylinders, pistons, crank-case, means of communication between crank-case and cylinders, and means within the control of the operator for controlling and varying the passage of air from the crank-case to the engine cylinders.

2. In an engine in which two opposed pistons operate to compress air in a common crank-case, the combination of cylinders, pistons, crank-case, and means of communi-

cation between the crank-case and cylinders, and means within the control of the operator for alternately or simultaneously controlling and varying the passage of air from the crank-case to the cylinders.

3. In a four-cycle engine, the combination of a crank-case, cylinders connected therewith, pistons in the cylinders arranged to compress air in the crank-case simultaneously on their inward strokes, means of communication between the crank-case and cylinders, and means for normally discharging the full charge of air from the crank-case alternately into each cylinder for scavenging said cylinders.

4. In a four-cycle engine, the combination with two cylinders and pistons, a common crank case, and means for admitting air to the latter, the cylinders having by-passes leading from the crank case thereinto, of valves for said by-passes which normally open and then close, and adjustable means for positively opening and closing said valves alternately or simultaneously, either for scavenging, scavenging and augmenting, or for augmenting only.

5. In a four-cycle engine, the combination with two cylinders and pistons, a common crank case, and means for admitting air to the latter, the cylinders having by-passes leading from the crank case thereinto, of valves for said by-passes which normally open and then close, and adjustable means for positively opening and closing said valves alternately or simultaneously, either for scavenging, scavenging and augmenting, or for augmenting only, said means comprising a movable cam.

6. In a four-cycle engine, the combination with two cylinders and pistons, a common crank case, and means for admitting air to the latter, the cylinders having by-passes leading from the crank case thereinto, of valves for said by-passes which normally open and then close, and adjustable means for positively opening and closing said valves alternately or simultaneously, either for scavenging, scavenging and augmenting, or for augmenting only, said means comprising a movable cam which is normally held in position to cause the release of the air in the crank case to alternately scavenge the cylinders.

7. In an explosive engine, the combination of two opposed cylinders, pistons therein, a common crank case having an air inlet, a crank shaft rotatable therein, connecting rods extending from the cranks to the pistons whereby the pistons make their instrokes simultaneously to compress the displacement of air of both pistons into the crank case, means of communication between the crank case and the two cylinders, valves therein, means for opening each of said valves alternately, one on each revolution of the crank-shaft, whereby to discharge the full complement of air in the crank-case into each cylinder for scavenging.

8. In an explosive engine of the four-cycle type, the combination of two opposed cylinders, pistons therein, a common crank case, a crank shaft rotatable therein, connecting rods extending from the cranks to the pistons, means of communication between the crank case and the two cylinders, valves therein, and means for controlling said valves whereby the proportion of crank case compression for scavenging or augmenting purposes is variable and within the control of the operator.

9. In an engine, the combination with opposed cylinders, pistons therein, and a common crank case to which the cylinders are connected, and a crank shaft in the crank case connected with the pistons, of means of communication between the crank case and cylinders, valves controlling said means of communication, and a shiftable tapering cam for operating and controlling the valves.

10. In an engine, the combination with opposed cylinders, pistons therein, and a common crank case to which the cylinders are connected, and a crank shaft in the crank case connected with the pistons, of means of communication between the crank case and cylinders, valves controlling said means of communication, and a double shiftable tapering cam the opposite edges of which incline in opposite directions, said cam common to both valves for operating and controlling the valves.

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

MARTIN C. KESSLER.

Witnesses:
HERBERT C. EMERY,
H. C. BROOKS, Jr.