M. C. KESSLER.

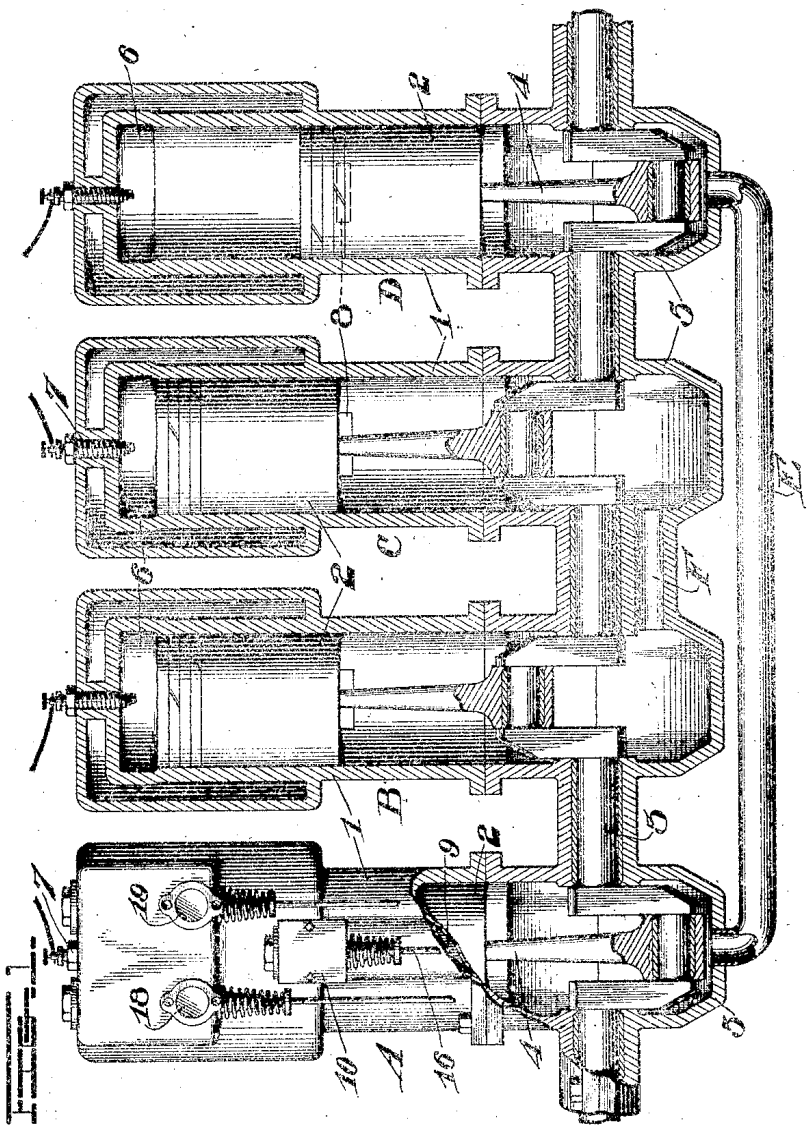
EXPLOSIVE ENGINE.

APPLICATION FILED SEPT. 12, 1907. RENEWED AUG. 12, 1916.

1,221,545.

Patented Apr. 3, 1917.

4 SHEETS—SHEET 1.



Witnesses

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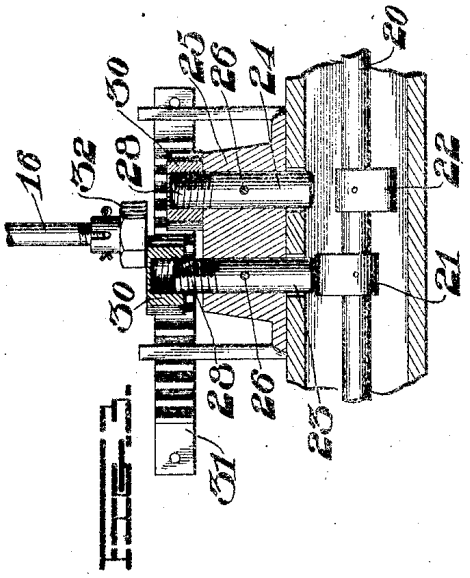

FIG. 3.

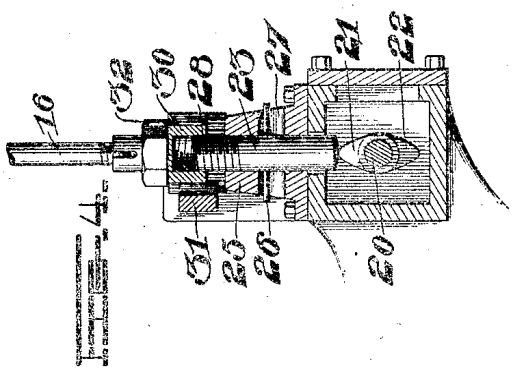

FIG. 4.

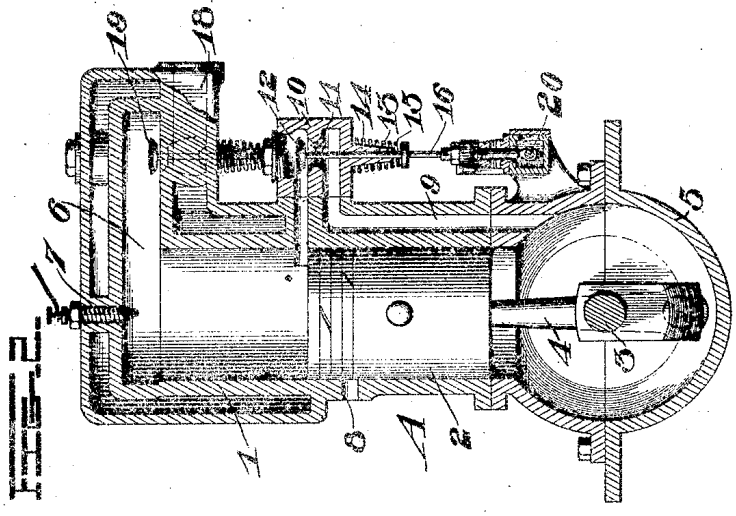

FIG. 2.

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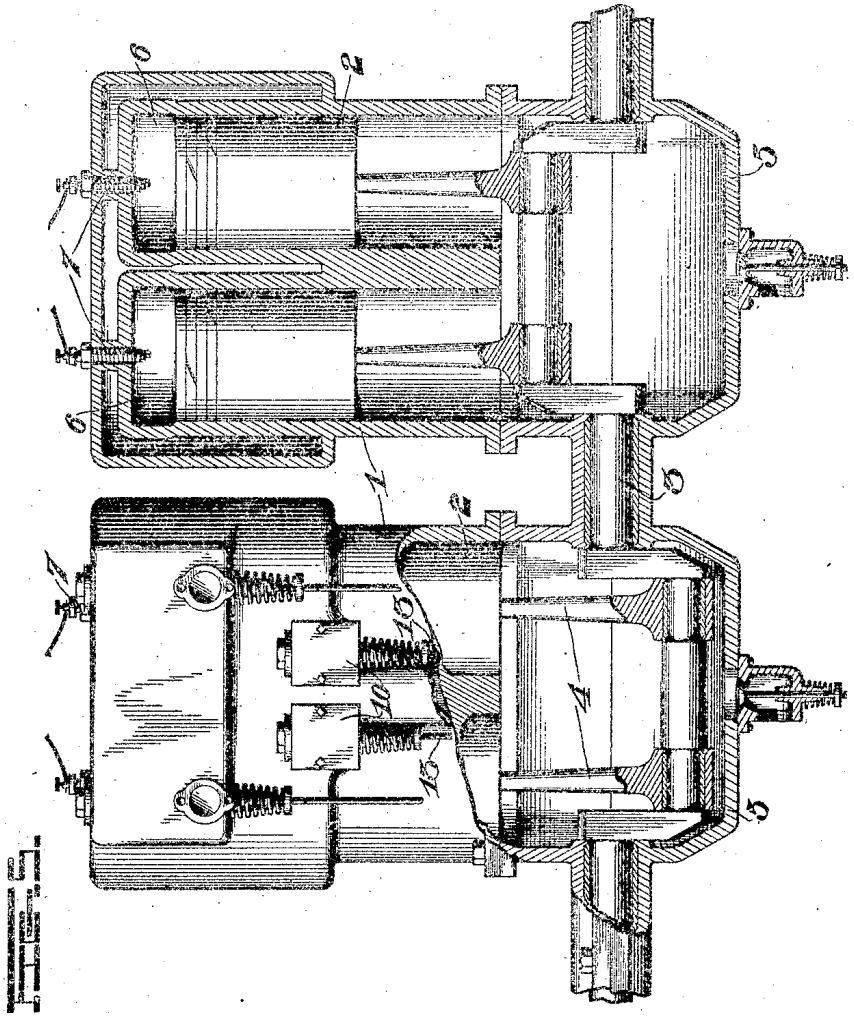

Witnesses

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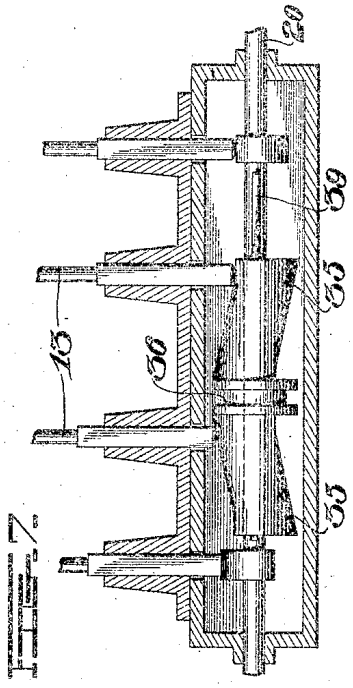

FIG. 7.

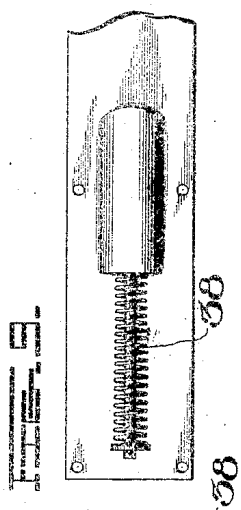

FIG. 8.

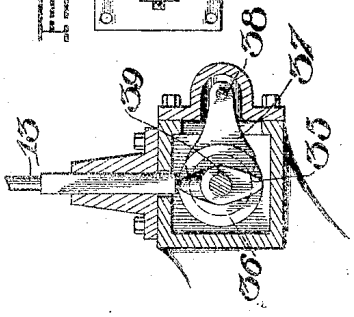

FIG. 6.

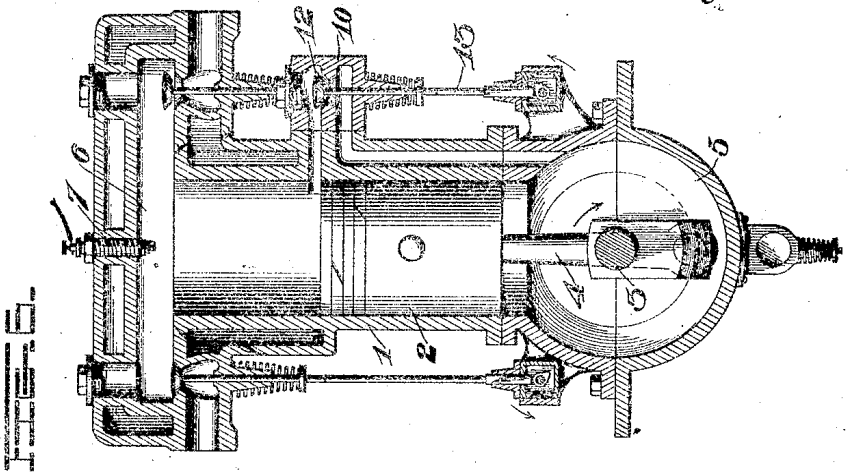

FIG. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

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

EXPLOSIVE-ENGINE.

1,221,545. Specification of Letters Patent. Patented Apr. 3, 1917.

Application filed September 12, 1907, Serial No. 392,520. Renewed August 12, 1916. Serial No. 114,624.

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 four cycle multiple cylinder type.

In a concurrently pending application Serial No. 391,675, I have disclosed a double opposed engine of the four cycle type. The present invention is in reality another form of that invention in which the engines or cylinders are in multiples of any number from two to eight, or even more, if desired, and instead of being opposed as in the application referred to, they are parallel and connected in pairs, that is to say each pair of engines or cylinders has a common or two connected crank cases, so that a maximum volume of air is rendered available by compressing the displacement of two pistons into two connected crank cases or 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 for scavenging said cylinders or for augmenting the new charge, whereby the combined compression of the two pistons is not only compressed into one chamber but also any amount or all of this compression 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 simultaneously.

With these objects in view, my invention consists in two or more cylinders in multiples disposed parallel with each other and with the crank cases connected in pairs, or a single crank case common to two engines, the crank case compression of two pistons being accomplished by the simultaneous inward stroke of both, thus compressing the volume of two piston displacements into the common or connected crank cases, in connection with suitable valve mechanism for controlling this air to cause its discharge into one cylinder or the other for scavenging or for augmenting the charge or for both scavenging and augmenting, the air being controllable and capable of division into any desired proportions between the two cylinders.

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 showing four engines arranged in a row side by side with their crank cases connected together in pairs,

Fig. 2 is a vertical transverse section through one of these engines,

Figs. 3 and 4 are enlarged details in section showing one means of controlling the valves,

Fig. 5 is a view in section with portions in elevation of another form which my improved engine might take.

Fig. 6 is a vertical transverse section of one of the engines shown in Fig. 5,

Figs. 7 and 8 are views at right angles of the valve controlling mechanism shown in Fig. 6, and

Fig. 9 is a view of the removable front plate of the valve casing.

Referring to Figs. 1 and 2, in the former figure I have shown four engines A, B, C, and D. These engines are connected in pairs, the outer engines A and B by a pipe E, and the two inside engines by the pipe F. These engines are all alike, and hence a description of one will suffice for all. The numeral 1 represents the cylinder, 2 the piston, 3 the crank shaft, 4 the connecting rod extending from the crank shaft to the piston, 5 is the crank case, 6 is a clearance space, 7 is a sparker, 8 is the air inlet port for the crank case, 9 is a by-pass extending from the crank case to the cylinder through the valve case 10. In this valve case is formed a valve seat 11 and a valve 12 controls this port. This valve has a stem 13 guided in the box 14 and a spring 15 normally tends to seat the valve. An intake valve and exhaust valve 18 and 19, shown in Fig. 1, are operated in the usual manner.

The foregoing features have been previously fully described in my application, Serial No. 334,926, filed in the U. S. Patent Office September 17, 1906, as well as in the application previously referred to, and consequently are only mentioned here in a very general way.

The valve in the construction shown in

Figs. 1 and 2 is opened by the following mechanism. A cam shaft 20 is timed to make a single revolution to two revolutions of the crank shaft 3, and on this shaft are the two cams 21 and 22 for each engine. Above these cams and in position to be engaged thereby are the slide rods 23 and 24. These slide rods are guided in boxes 25, the pins 26 retaining them in position and limiting their downward movement in slots 27. The upper ends 28 of these rods are screw-threaded with right and left threads as shown in Fig. 3. Nuts 30, 30, turn on these threads. These nuts have toothed peripheries as shown, and a sliding rack bar 31 engages these teeth. The push rod 16 has an enlarged lower end 32 in position to be engaged by one nut or the other whereby to engage the valve stem 13. The operation of this valve controlling mechanism is very simple. As the rack bar is moved in one direction, it raises one nut 30 and lowers the other, thereby lengthening or shortening the slide rods 23 and 24, as the case may be, whereby to render one or the other of the cams 21, 22, active and the other inactive for scavenging, or for augmenting or one active to a greater or less degree than the other for the purpose of varying the proportions of air used for scavenging or augmenting as fully described in the application for patent on double opposed engines previously referred to. In Fig. 1, we will suppose the parts are in the position for opening the valve for scavenging only at the conclusion of the instroke following the explosion. Then if the rack bar 31 is pushed to the opposite position, the right hand nut would be screwed up, and the left hand, down, thus adjusting the parts to open the valve for augmenting just previous to the compression stroke. In any position between these extremes, the amount of air discharged into the cylinders would be varied by the position of the rack bar and at the intermediate position would be equalized and equal amounts of air would discharge simultaneously into the two connected cylinders.

With the cylinders connected as shown in Fig. 1, each connected pair operates precisely as set forth in the previously mentioned application for patent on double opposed engines, that is to say, the two outer engines operate together, and the two inner ones together like two independent two-cylinder engines, as the two outer engines, and two inner engines are entirely independent of each other, except that they have a common crank shaft. In operation, and result, therefore, the present invention is to all intents and purposes the same as the one set forth in my application for patent on double opposed engines.

In Figs. 5 and 6, I have shown the engines connected in pairs with this slight difference that the two left hand pistons operate together, and the two right hand pistons operate together, the two pairs of pistons being connected with oppositely disposed cranks on the crank shaft. In connection with this form of engine I have shown a slightly different method of operating the valve 12 as shown in detail in Figs. 7, 8 and 9, it being to all intents and purposes the same as the valve controlled mechanism disclosed in the double opposed engines above referred to except that the double taper cams 35, 35, on the cam shaft 20 are doubled as shown in Fig. 7. A groove 36 between them receives the movable spanner 37 held by a rod 38 connected with it whereby the spanner is moved back and forth on the feather 39 which keys the double cam slidably upon the cam shaft 20. These two cams engage push rods of the two valves 13, 13, of each pair of engines, the position shown being the normal position, or that of scavenging at the conclusion of the instroke succeeding an explosion. By shifting the double taper cams, the same results are attained, as described in the application referred to.

From the foregoing, it will be seen that I have provided means for any multiple cylinder four cycle explosive engine in which the displacement of two pistons is connected whereby the combined compression of the two is first used in one cylinder and then the other, or in both simultaneously in any desired proportions.

Other 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, the combination of a plurality of cylinders, pistons and crank-cases, certain of the crank-cases in communication with each other, means within the control of the operator for controlling the discharge of air compressed in the crank-cases, and means whereby the gas compressed in a plurality of crank-cases may be delivered successively into the individual cylinders.

2. In an engine in which air is compressed in a plurality of crank cases by the simultaneous inward stroke of two engine pistons located on the same side of the crank shaft, the combination of cylinders, pistons, crank cases, means of communication between the crank cases and cylinders, and means for normally discharging the full crank case compression from the crank case alternately into the cylinders for scavenging said cylinders, said means being adjustable and controllable whereby to divide the supply of

compressed air and simultaneously discharge it into both cylinders with each instroke of the pistons for both scavenging and augmenting.

3. In an engine in which air is compressed in a plurality of crank cases by the simultaneous inward stroke of two engine pistons located on the same side of the crank shaft, the combination of cylinders, pistons, crank cases, means of communication between the crank cases and cylinders, and means for normally discharging the full crank case compression alternately into the cylinders for scavenging said cylinders, said means being adjustable and controllable whereby to divide the supply of compressed air and simultaneously discharge it into both cylinders with each instroke of the pistons for both scavenging and augmenting, said means being also adjustable to cause the discharge of the full crank case compression first into one cylinder and then into the other for augmenting only.

4. In a four-cycle explosive engine, the combination of two or more cylinders located on the same side of a common crank shaft, pistons therein, crank cases, a crank shaft rotatable therein, connecting rods extending from the cranks to the pistons, means of communication between the crank cases and the cylinders, valves therein and means for controlling said valves whereby the proportion of fluid compressed for scavenging or augmenting is variable and within the control of the operator.

5. In an engine in which two pistons operate to compress air, crank-cases, cylinders, means of communication between the crank-cases and between the crank-cases and cylinders, and means for controlling and varying the volume of air delivered from the crank-cases to the cylinders, said means comprising valves and an extensible slide rod in position to actuate each valve, these slide rods actuated alternately one at each revolution of the crank-shaft, and means for simultaneously lengthening one slide rod and shortening the other whereby one or the other or both are adapted to actuate a valve, and means for actuating the slide rods.

6. In an engine in which two pistons operate to compress air, crank-cases, cylinders, means of communication between the crank-cases and cylinders, and means for controlling and varying the volume of air delivered from the crank-cases to the cylinders, said means comprising valves and extensible slide rods in position to actuate each valve, these slide rods actuated alternately one at each revolution of the crank-shaft, and means for simultaneously lengthening one slide rod and shortening the other whereby one or the other or both are adapted to actuate a valve, said means comprising a slidable rack bar and toothed nuts which turn respectively on right and left threads on the slide rods and have their teeth intermeshed with the teeth of the rack bar.

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

MARTIN C. KESSLER.

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