

L. PETTERSON.
EXPLOSIVE ENGINE.
APPLICATION FILED APR. 14, 1906.

927,004.

Patented July 6, 1909.

2 SHEETS—SHEET 1.

Fig. 1

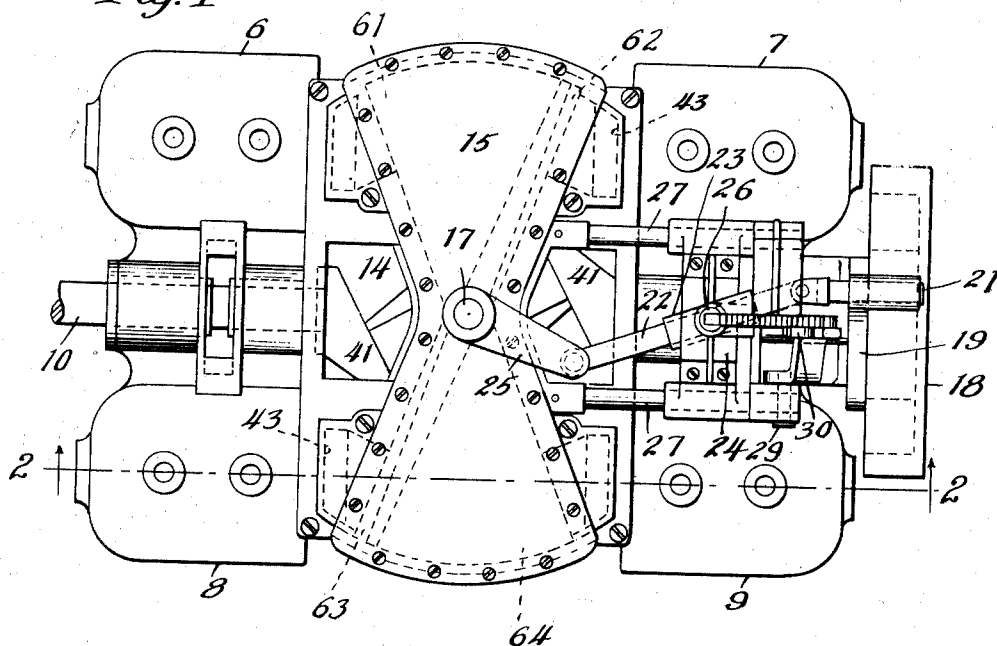
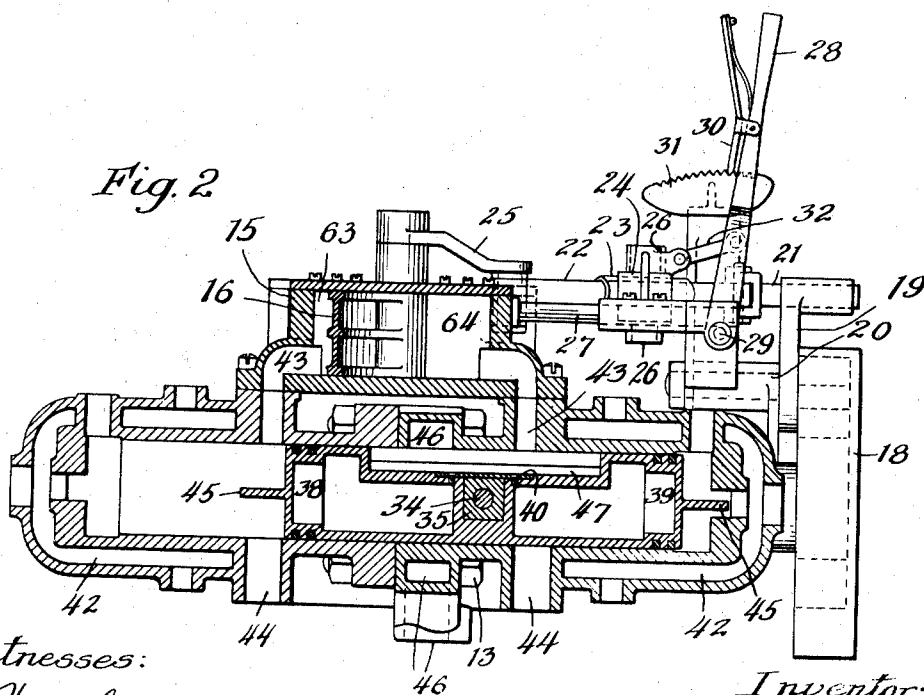


Fig. 2



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2 SHEETS—SHEET 2.

Fig. 3

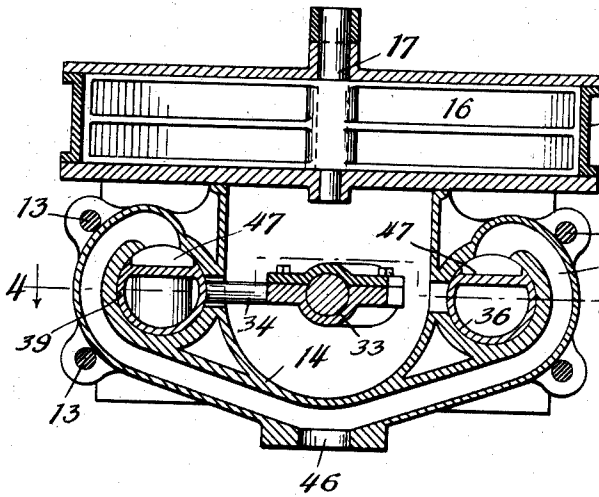


Fig. 5

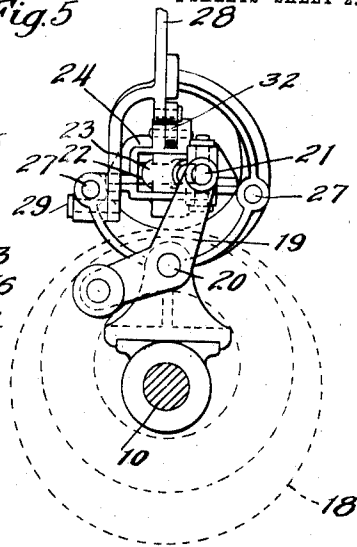
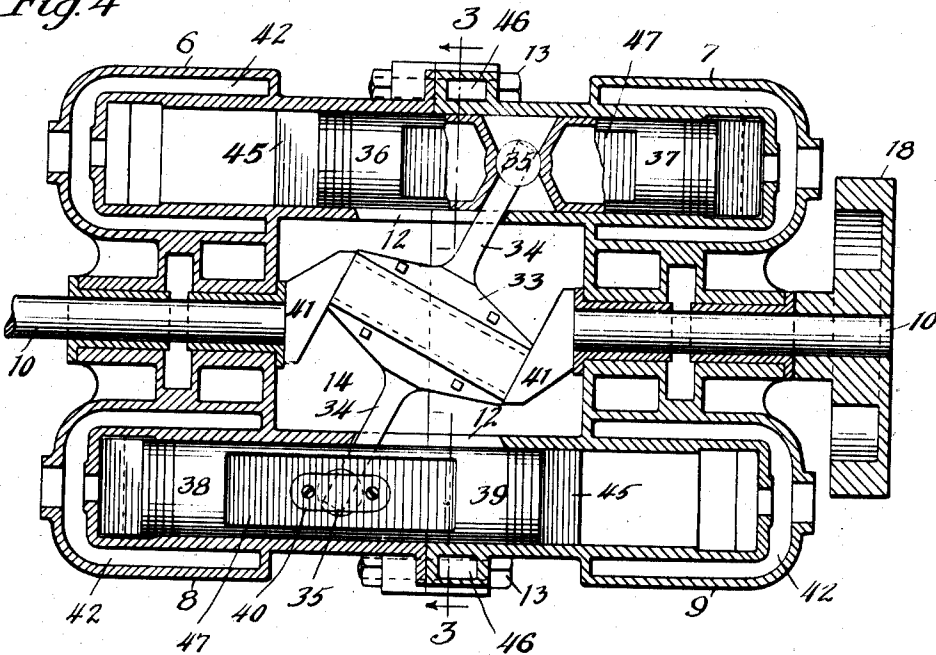


Fig. 4



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UNITED STATES PATENT OFFICE.

LUDWIG PETTERSON, OF CHICAGO, ILLINOIS.

EXPLOSIVE-ENGINE.

No. 927,004.

Specification of Letters Patent.

Patented July 6, 1909.

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To all whom it may concern:

Be it known that I, LUDWIG PETTERSON, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Explosive-Engines, of which the following is a specification.

This invention is an improvement in gasoline motors and embodies four cylinders, each having its own piston, and each two of said cylinders act simultaneously in charging, compressing, exploding and exhausting. The explosive fuel is forced into the cylinders at proper times by suitable devices. The invention is without valves, the pistons themselves controlling the entrance and discharge of the exploding fluid.

The nature of my improvement is fully disclosed in the description given below, and also in the accompanying drawing forming a part of such description, and in such drawing Figure 1 is a plan of my improved motor, Fig. 2 a section on the line 2—2 of Fig. 1. Fig. 3 is a transverse section and Fig. 4 a horizontal section, the former on the line 3—3 of Fig. 4, and the latter on the line 4—4 of Fig. 3. Fig. 5 is a partial end elevation.

Referring to said drawing, 6, 7, 8 and 9 are the cylinders of my improved motor, arranged two at each side of the main shaft 10 driven by the motor, the cylinders upon the same side of the shaft being positioned in line with each other and extended toward each other so that their proximate ends abut and make the cylinders practically continuous or double ended, open, however, upon one side as at 12 to receive the crank arms. In the preferred construction, the cylinders 6 and 8 are cast in one piece, and the same is true of cylinders 7 and 9 so that they can be united at a central, transverse plane by bolts located at 13 and passing through projecting parts upon the cylinders. The cylinders of each casting are also provided with a web 14 forming the bottom and sides of a chamber wherein the crank may be located.

The means for forcing the explosive mixture into the cylinders are located transversely of the engine above the crank chamber and form a top or cover to that chamber. They are inclosed in a casing shown at 15, of the shape shown at Fig. 1, because of the employment in it of an oscillating double blade or partition 16 located therein and moving on the stud or pivot 17, as a means for forcing

charges of air or gas into the cylinders. It will be seen that when the partition 16 stands as in Fig. 1 that at one side of each end of it a large open space is formed, while the space at the other side of it is correspondingly contracted, and that if the partition is swung to its opposite position so that its ends will be adjacent to the other walls of the casing, the open spaces shown will be contracted and the contracted ones widened. The casing and partition are thus adapted to form a pump having four separate variably sized chambers 61, 62, 63, 64 which are connected each to one of the cylinders, and also to a source of supply of the gas mixture. The partition is automatically shifted from side to side of the casing by any suitable means, as for instance, the eccentric 18 mounted on the main shaft, and operating the bell crank 19 pivoted stationarily at 20. In the upper end of the bell crank a pin 21 is slidingly supported, and this pin is pivoted to one end of an oscillating lever 22 which is supported in a sleeve 23 and the sleeve is pivoted to a movable frame or plate 24, and the other end of said lever 22 is joined to a crank 25 upon pivot 17 of the swinging partition 16. The lever 22 is permitted to slide in the sleeve, and as the sleeve is pivoted at 26, it also has an oscillating movement. The plate 24 is adjustable on the stationary rods 27, one at each end of the plate, and its position is changed on said rods when it is desired to change the position of the center 26 to modify the throw or movement imparted by the lever 22 to the crank 25. A hand lever 28 stationarily pivoted at 29, and provided with a spring pawl 30 and locking rack 31 is connected by a link 32 to the plate 24, and serves as a means of adjusting said plate 24, and also of locking it in the adjusted positions.

The crank employed in my motor is a double one of the kind shown in my application No. 211,233, filed June 6, 1904, that is to say, it is freely mounted upon a diagonal portion of the shaft with its arms extending in opposite directions to the piston at each side of the shaft, and it is oscillated by the shaft, converting the reciprocating movements of the pistons to a rotary movement by the shaft. The crank is best shown at Fig. 4, and 33 is its body portion and 34 are its arms, each of the latter moving along through the openings 12 in the cylinders and having

round bearings 35 in which they may slide, located between and fitting recesses correspondingly shaped in the proximate ends of the pistons. The two pistons 36 and 37 which are located in cylinders 6 and 7 respectively, are preferably in one piece, and the bearing 35 is held in its place between them by a retaining plate 40 as seen at Fig. 2. And the pistons 38 and 39 of cylinders 8 and 9 are made in like manner. The cylinders are preferably surrounded by water chambers 42 as seen at Figs. 2 and 4, and openings are shown at the ends of all of them for the insertion of the igniter. The diagonal portion of the shaft on which the crank is loosely mounted is supported at its ends by the heads or arms 41.

Each of the cylinders is connected with the nearest pump chamber by a passage 43 shown clearly at Fig. 2, and through such passage receives its charges of air and gas. Each cylinder is also provided with an outlet 44, and each piston carries a baffle plate or projection 45 acting to prevent too direct movement by the incoming fresh charges to the outlets.

The combined air and gas enter the inlet 46, and their admission to the pump chambers 61, 62, 63 and 64 is regulated by the pistons themselves as follows: Each pair of the pistons is provided with a longitudinal depression 47 formed in the top of the pistons, partly in each as best seen at Fig. 2, and forming a connecting passage whereby the channels 43 may be placed in communication with the inlet 46 so that the pump chambers may receive fresh charges from the source of supply. The establishing of the communication is timed of course to take place in proper relation to the swinging of the partition 16. Thus, with the parts in the positions shown at Fig. 2, the cylinder 8 has been exploded, and is exhausting and it is also receiving a fresh charge from variable pumping chamber 63 which is consequently shown as contracted. The explosion in cylinder 8 has forced the pistons to the right so that the charge in cylinder 9 is compressed and ready for ignition. At the same time the passage 43 of variable pumping chamber 64 is placed in communication with the inlet 46 and said chamber which is now at its greatest expansion is being recharged for the next operation. Cylinder 9 should now explode in proper sequence, and force the piston to the left, shutting off communication between the inlet and chamber 64, and opening communication with the passage leading from chamber 63. The explosion of cylinder 9 also results in uncovering of passage 43 from chamber 64 and of the outlet from said cylinder so that the cylinder exhausts and is ready to be recharged, and the partition 16 being now swung the charge in chamber 64 is pumped or forced by it into the cylinder.

The operations here described also occur in the case of cylinders 6 and 7 and their feeding passages 43 and chambers 61 and 62. The explosions occur simultaneously in cylinders 6 and 9 and so do also the exhaust, the charging and the compression, and the same is true in the case of cylinders 7 and 8. The shaft of the motor receives impulses alternately in opposite directions, one impulse from cylinders 6 and 9, the other from cylinders 7 and 8.

It will be noted that the exhaust passages are wider than the feed passages 43, and are relatively set so that the cylinders commence to exhaust before they commence to charge. The spent gas is by this feature and the baffle plates given every needed opportunity to escape without admixture with the fresh charges.

By my invention I insure the supplying of the cylinders with an adequate quantity of the explosive mixture, the feed ports 43 being open while the piston is traveling the full width of the ports in both directions. That is to say, the ports open as soon as the piston begins to pass them in the opening movement, and do not close until the piston has completed its stroke, reversed and moved back far enough to cover them. This feature gives the mixture ample time to enter the cylinder, and the mixture becomes somewhat compressed by the moving partition, and is prepared to enter quickly into the cylinder as soon as it is given opportunity to do so.

I claim:—

1. In an explosive engine, a plurality of power cylinders, in combination with a pump having a movable partition dividing it into a series of pumping chambers corresponding to the cylinders, each of said chambers being connected to one of the cylinders and also to the inlet for the explosive mixture, and means for actuating said partition, so as to force the mixture charges from two of the chambers to the corresponding cylinders at each actuation.

2. In an explosive engine, the combination of four power cylinders two at each side of the driven shaft, each of said cylinders acting simultaneously with one of the cylinders at the opposite side of the shaft, said shaft, separate pumping chambers for said cylinders acting to supply both of each pair of simultaneously acting cylinders at the same time, and crank mechanism to which all the cylinders are connected.

3. In an explosive engine, a shaft, a crank in said shaft, and two alternately acting pairs of power cylinders applying power in opposite directions to said crank from opposite sides thereof, each pair of the cylinders being arranged in the same line and each pair being provided with double ended pistons, controlling the movements of the explosive fluid to and from the pumping chambers, in combination with two pairs of alternately

acting pumping chambers supplying the explosive mixture to the cylinders, first to one pair and then to the other.

4. The combination with the alined cylinders and the double piston moving therein, of the means for forcing the charges to the cylinders, the central inlet 46 for the explosive mixture, and the passages connecting the charge forcing means to the cylinders, the piston having a longitudinal channel whereby the inlet is placed in communication with said connecting passages alternately.

5. The combination with a pair of alined cylinders of pumping chambers corresponding thereto, one to each, a central inlet for the explosive mixture leading into the cylinders, and a double piston for said cylinders having a longitudinal passage whereby it establishes communication between said inlet and the pumping chambers and controls the admission of the explosive mixture to the latter, said chambers having each a single port connecting them to the cylinders and through which they receive and discharge the mixture.

6. The explosive engine having pairs of alternately acting cylinders, a double piston for each pair, a shaft actuated by the pistons, a crank in the shaft connected to the pistons and adapted to convert the motion received by them to a rotary motion by the shaft, a separate pumping chamber for each cylinder, and a central inlet for the explosive mixture leading to the cylinders, said pistons having a longitudinal passage whereby it admits the explosive mixture and supplies it to the pumping chambers.

7. The combination with the cylinders having feed ports 43, and the main oil inlet, located between the ports 43; of a piston traveling in said cylinders, and opening and

closing said ports, the feed ports being open while the piston travels the full width of the ports in both directions whereby ample time for feeding the charges is obtained.

8. The explosive engine having a series of cylinders and double pistons for each pair thereof, and a series of pumping chambers one for each cylinder, said chambers being connected to their corresponding cylinders by a single port through which they receive and discharge the charges of explosive mixture, said pistons having longitudinal passages whereby they control the charges of the explosive mixture.

9. The explosive engine having a series of cylinders and double pistons for each pair thereof, and a series of pumping chambers one for each cylinder, said chambers being supplied with the explosive mixture from the cylinders, and the pistons having longitudinal passages through which the charges move to the pumping chambers.

10. The explosive engine having a pair of cylinders in alinement, a double piston in said cylinders, a separate pumping chamber for each cylinder receiving its charges of the explosive mixture therefrom, and an inlet to the cylinders for the mixture, the piston having a passage receiving the explosive mixture and delivering it to the pumping chambers.

11. The combination in an explosive engine of a pair of cylinders, pumping chambers receiving the explosive mixture from the cylinders, and a piston in said cylinders having a longitudinal passage whereby it is adapted to control the movements of the mixture to and from the pumping chambers.

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Witnesses:

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