July 12, 1932. B. S. MAHER 1,866,774

ENGINE

Filed Nov. 18, 1929 2 Sheets-Sheet 1

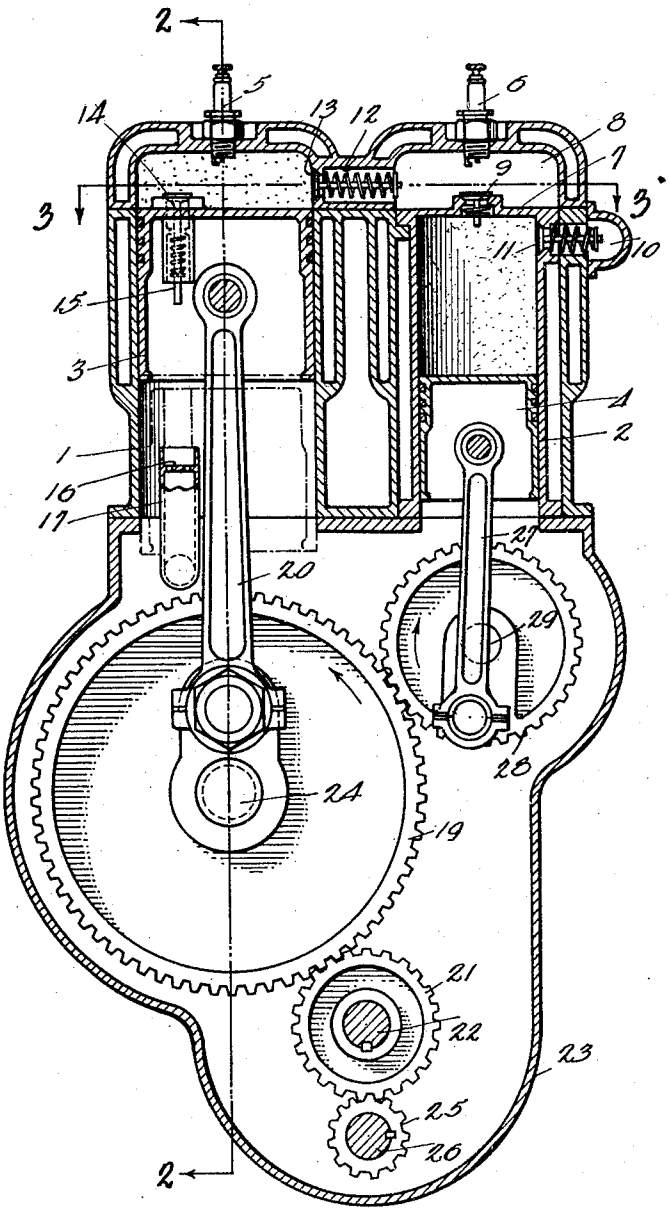


Fig. 1.

INVENTOR.
BERNARD STANLEY MAHER.
BY Munn & Co.
ATTORNEYS.

July 12, 1932. B. S. MAHER 1,866,774

ENGINE

Filed Nov. 18, 1929 2 Sheets-Sheet 2

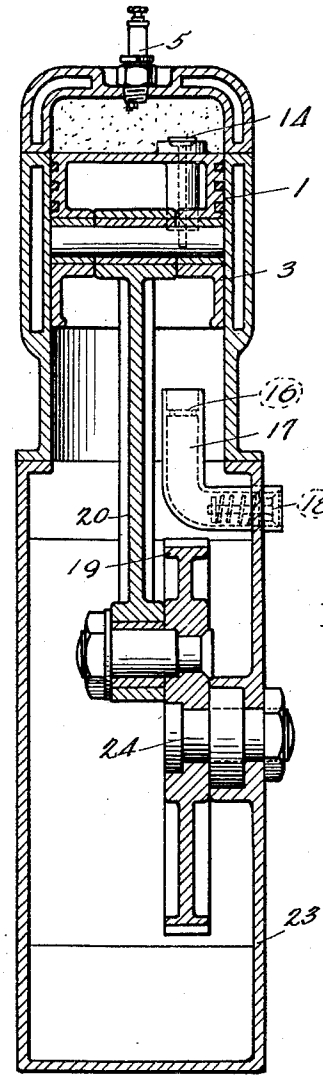


Fig. 2.

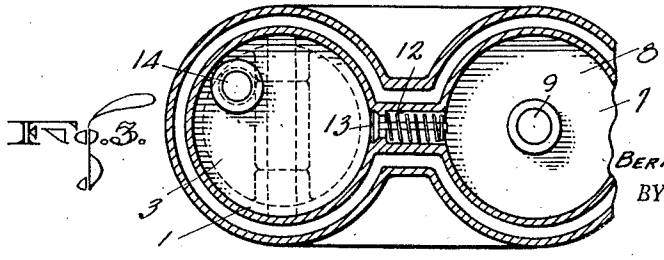


Fig. 3.

INVENTOR.
BERNARD STANLEY MAHER.
BY Munn & Co.
ATTORNEYS.

Patented July 12, 1932 1,866,774

UNITED STATES PATENT OFFICE

BERNARD STANLEY MAHER, OF OAKLAND, CALIFORNIA

ENGINE

Application filed November 18, 1929. Serial No. 408,043.

My invention relates to improvements in engines, and it consists in the combinations, constructions and arrangements hereinafter described and claimed.

An object of my invention is to provide an engine designed for consecutive multiple explosive power impulses for each power stroke of the piston. The power piston is designed to rotate a connecting crank at a slower speed than the crank shaft, the connecting crank and crank shaft having their motions intercommunicated by gearing that will accomplish this purpose.

A further object of my invention is to provide an engine that makes use of a pump and an auxiliary firing chamber for firing a gas and feeding it into the power cylinder when the power piston has moved through a part of its stroke. This causes two or more charges of gas to be exploded for each power stroke of the piston.

Other objects and advantages will appear as the specification proceeds, and the novel features of the device will be particularly pointed out in the claims hereto anexed.

My invention is illustrated in the accompanying drawings, in which:

Figure 1 is a transverse section through the engine,

Figure 2 is a section along the line 2—2 of Figure 1, and

Figure 3 is a section along the line 3—3 of Figure 1.

In carrying out my invention I provide a power cylinder 1 and a pump cylinder 2. Both cylinders may be water jacketed or otherwise cooled. A power piston 3 is mounted in the cylinder 1, and a pump piston 4 is mounted in the cylinder 2. Each cylinder is provided with a spark plug, and these are numbered 5 and 6 for the cylinders 1 and 2 respectively.

The cylinder 2 has a partition 7 that separates it from a firing chamber 8. A check valve 9 controls the flow of gas from the cylinder 2 into the chamber 8.

An intake manifold 10 conveys gas to the cylinder 2 and a check valve 11 controls the flow of gas into the cylinder. A passageway 12 places the chamber 8 in communication with the top of the cylinder 1, and a check valve 13 automatically controls the flow of gas from the chamber 8 into the top of the cylinder 1.

The piston 3 carries an exhaust valve 14, and the stem 15 of this valve engages with a perforated partition 16 in an exhaust pipe 17 when the piston 3 reaches its lowermost stroke indicated by the dotted lines in Figure 1. The valve 14 is opened and exhaust gases in the cylinder 1 will pass out through the exhaust pipe 17 and past a check valve 18 (see Figure 2).

The piston 3 is operatively connected to a large gear 19 by means of a connecting rod 20. Figures 1 and 2 clearly show how the connecting rod is radially connected with the gear 19 so that a reciprocal movement of the piston 3 will rotate the gear 19 in the direction of the arrow shown in Figure 1. The gear 19 meshes with an idler gear 21. The gear 21 is mounted upon a shaft 22 that extends across the bottom of the crank case 23, while the gear 19 is mounted upon a stub shaft 24 that is carried by one wall of the crank case 23 as shown in Figure 2.

The gear 21 meshes with a gear 25, and this gear is keyed to a crank shaft 26. The size of the gears 19, 21 and 25 is such as to cause the crank shaft 26 to turn at a greater speed than the gear 19.

The pump piston 4 is operatively connected to the gear 19 by a connecting rod 27 and a gear 28 that meshes with the gear 19. The gear 28 is mounted upon a stub shaft 29, and the diameter of this gear is such as to cause the piston 4 to reciprocate at twice the speed of the piston 3.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood.

The cycle of operation is as follows: A charge has already been placed in the top of the cylinder 1 and the piston 3 is at the top of its stroke. The piston 4 is at the bottom of its stroke. All of the valves 9, 11, 13, 14 and 18 are closed. A charge has also been drawn into the cylinder 2.

At this phase of the operation, the spark plug 5 fires and explodes the gas in the top

of the cylinder 1, this driving the piston 3 downwardly. Slightly before the piston 3 has reached the midpoint of its downward movement, the piston 4 will have compressed the gas in the cylinder 2 and will have delivered this compressed gas into the chamber 8 through the check valve 9.

The compressed charge in the chamber 8 will be fired by the spark plug 6 at the instant the piston 3 has reached the midpoint of its downward movement, and the exploding gas will pass through the passageway 12, past the check valve 13, and into the cylinder 1 where it will give an added power impulse to the piston 3 as it travels downwardly. The valve 13 remains open until the piston 3 reaches the bottom of its stroke, because the pressure in the chamber 8 is greater at all times than the pressure in the cylinder 1 during this stroke.

At the end of the power stroke, the valve stem 15 contacts with the disc 16 and opens the valve 14. The exhaust gases will flow past the valve and out through the exhaust pipe 17, opening the check valve 18 for this purpose. If desired, some suction device may be applied to the exhaust pipe 17 for assuring the scavenging of the cylinder 1, or other suitable structure may be used in accomplishing the same purpose.

Returning to the pump piston 4, it will be noted that when the engine piston 3 has moved from the center of its downward stroke to the bottom of its downward stroke, the pump piston 4 moves from slightly below the top of its stroke to the bottom end of its stroke, and in so doing the piston sucks in a new charge of gas from the intake manifold 10. On the return upward stroke of the engine piston 3, the piston 4 also starts moving upwardly and reaches the top of its stroke slightly before the piston 3 reaches the midpoint of its stroke. The compressed charge formed by the piston 4 will be delivered into the chamber 8 and from there delivered to the top of the cylinder 1 without being fired by the spark plug 6. The compressed gas is delivered into the top of the cylinder 1 prior to the piston 3 reaching the top of its stroke.

The engine piston 3 continues its upward movement from the middle of its stroke to the top and compresses the charge in the cylinder 1. Simultaneously with this upward movement of the piston 3, the piston 4 moves down to the bottom end of its stroke. All of the valves are closed, and the cycle is ready to be repeated.

It is obvious that the design of the engine shown in Figure 1 can be used in a V-type engine without departing from the spirit and scope of the invention. The same is also true of a radial type engine. In either case, there is a duplication of parts disposed about a common crank shaft.

Although I have shown and described one embodiment of my invention, it is to be understood that the same is susceptible of various changes, and I reserve the right to employ such changes as may come within the scope of the invention as claimed.

I claim:

1. An engine comprising a power cylinder, a piston mounted therein, means for delivering a gas under pressure to the cylinder during the compression stroke of the piston and prior to its completion, said means delivering another charge of compressed gas to the cylinder after the piston has moved a predetermined distance in its firing stroke, and means for igniting the second charge of gas just prior to its entrance into the power cylinder.

2. An engine comprising a power cylinder, a piston mounted therein, means for delivering a gas under pressure to the cylinder during the compression stroke of the piston and prior to its completion, means for firing the charge at the start of the firing stroke, said first named means delivering a second charge of compressed gas to the cylinder after the piston has moved a predetermined distance in its firing stroke, and means for igniting the second charge of gas prior to its entrance into the power cylinder.

3. An engine comprising a power cylinder, a pump cylinder having a chamber connecting it with the power cylinder, check valves placed between the pump cylinder and chamber and between the chamber and the power cylinder, said pump cylinder having an inlet and said power cylinder having an exhaust opening, valves for said inlet and exhaust openings, a spark plug disposed in the power cylinder and a second spark plug disposed in the chamber, pistons mounted in both of said cylinders, means interconnecting the pistons for reciprocating the pump piston at twice the speed of the power piston, whereby two charges will be delivered to the power cylinder for each power stroke of the piston, the spark plug in said power cylinder igniting the first charge, and the spark plug in the chamber igniting the second charge.

4. In an engine, a cylinder, a piston mounted therein and having an exhaust pipe, an exhaust valve carried by the piston for normally closing the pipe, a stationary exhaust pipe placed in communication with the first pipe when the piston is at the bottom of its firing stroke, and means for opening the valve when the piston reaches its lowermost position.

5. In an engine, a cylinder, a piston mounted therein and having an exhaust pipe, an exhaust valve carried by the piston for normally closing the pipe, a stationary exhaust pipe placed in communication with the first pipe when the piston is at the bottom of its firing stroke, means for opening the valve when the piston reaches its lowermost posi-

tion, and a check valve disposed in the second exhaust pipe.

6. An engine comprising a power cylinder, a piston mounted therein, a pump geared to said piston and operated in timed relation therewith and arranged for compressing a plurality of gas charges during each inward stroke of the power piston, said pump having a pasageway leading to the power cylinder, and means for igniting the gas prior to its entrance into the power cylinder and after the power piston has moved a predetermined distance of its power stroke.

7. An engine comprising a power cylinder having a piston therein, and a pump geared to said piston so as to be operated in timed relation therewith and arranged to deliver a plurality of pressure charges to the power cylinder during each inward stroke of said piston.

Signed at city of Oakland, in the county of Alameda, and State of California, this 7th day of November, A. D. 1929.

BERNARD STANLEY MAHER.