Dec. 7, 1926. 1,609,792

L. C. BROCK

INTERNAL COMBUSTION ENGINE

Filed June 1, 1925 3 Sheets-Sheet 1

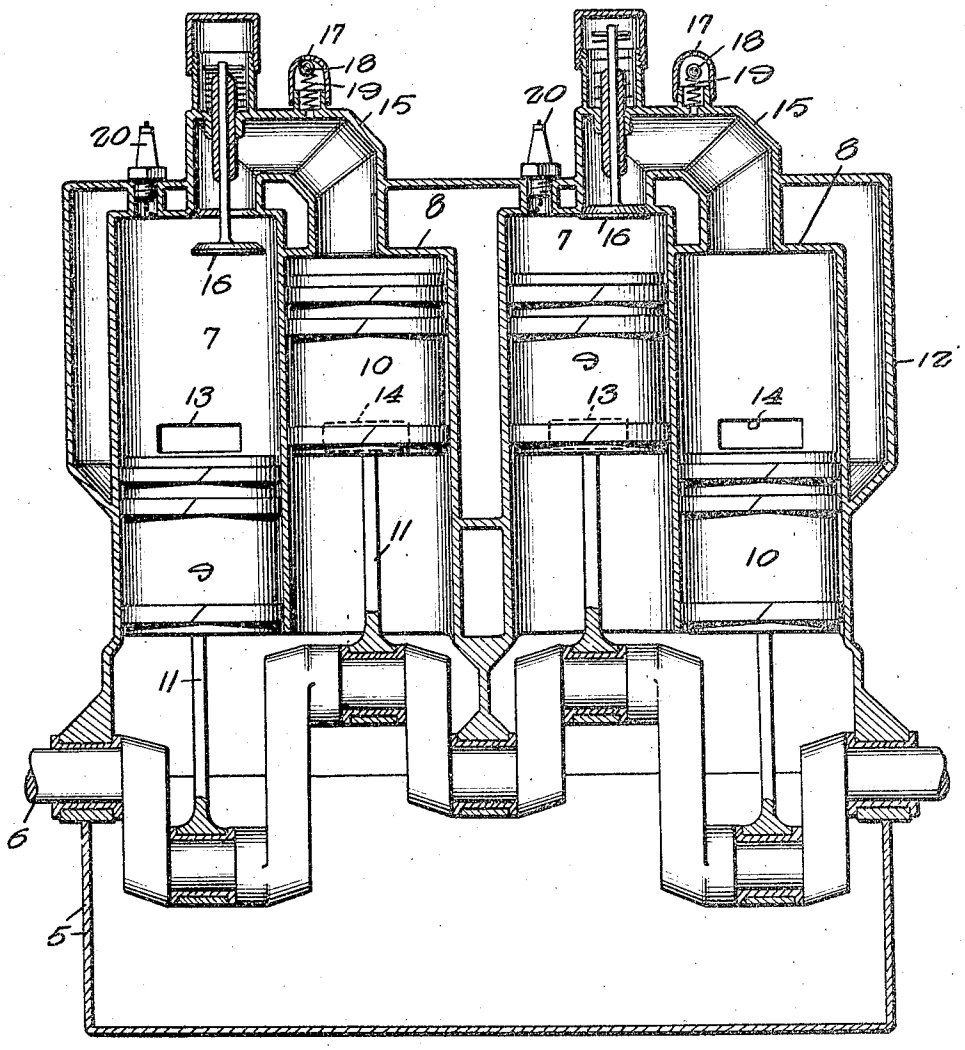


Fig. 1.

Lester C. Brock, Inventor

By Richard B. Owen.

Attorney

Witnesses
C. E. Churchman
J. Stanley Burch

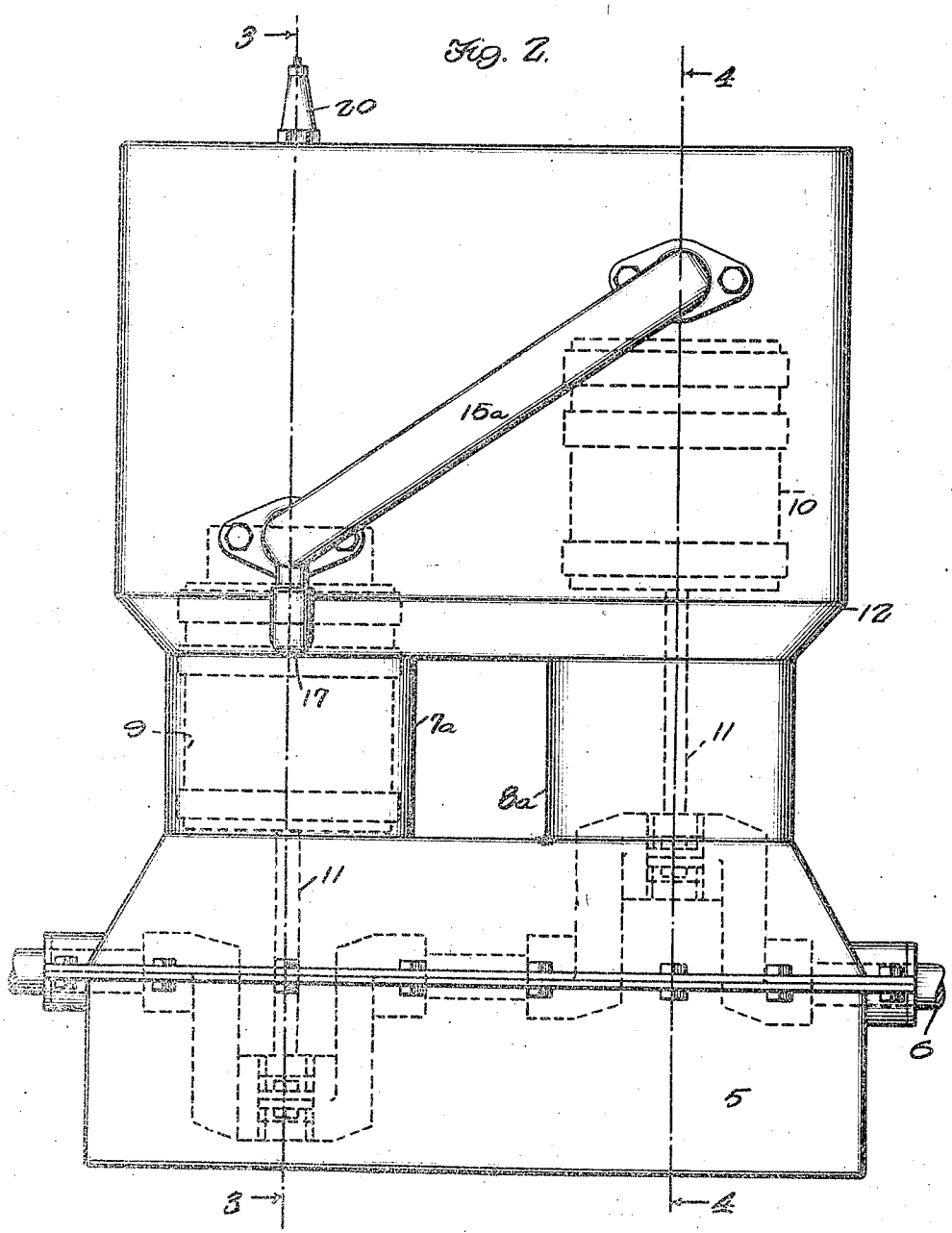
Dec. 7, 1926. 1,609,792

L. C. BROCK

INTERNAL COMBUSTION ENGINE

Filed June 1, 1925 3 Sheets-Sheet 2

Fig. 2.



Lester C. Brock, Inventor

Witnesses

By Richard B. Owen

Attorney

Dec. 7, 1926. 1,609,792

L. C. BROCK

INTERNAL COMBUSTION ENGINE

Filed June 1, 1925 3 Sheets-Sheet 3

Fig. 3.

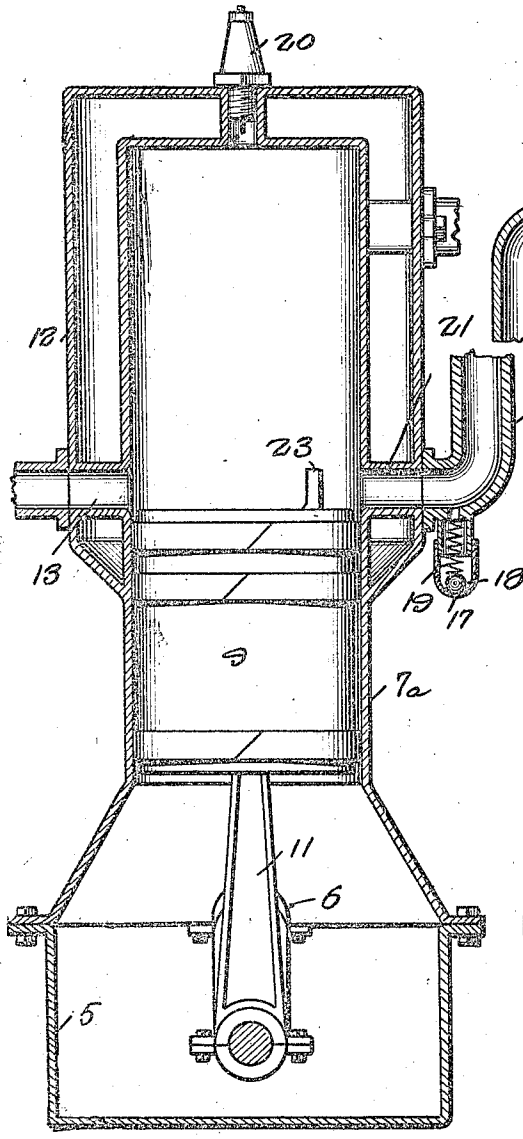
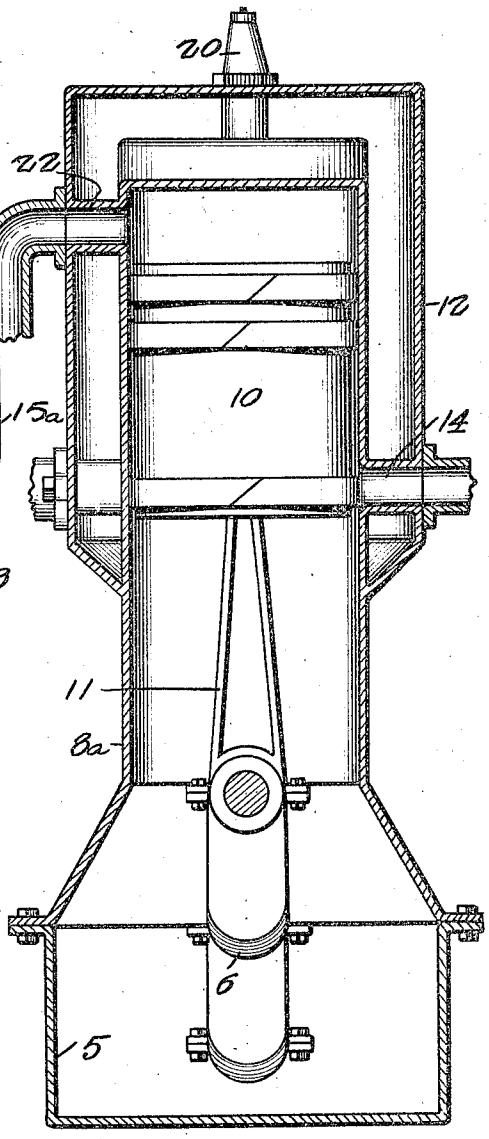


Fig. 4.



Witnesses
C. C. Linebarger Jr.
J. Stanley Burch

Lester C. Brock, Inventor

By Richard B. Owen,

Attorney

Patented Dec. 7, 1926. 1,609,792

UNITED STATES PATENT OFFICE.

LESTER C. BROCK, OF BLOOMINGBURG, OHIO.

INTERNAL-COMBUSTION ENGINE.

Application filed June 1, 1925. Serial No. 34,223.

My invention relates to internal combustion engines, and the primary object of the invention is to provide an engine embodying an intake or supply cylinder and piston and a firing or power cylinder and piston, the supply cylinder being connected to the power cylinder by a transfer passage leading from the supply cylinder into the power cylinder, the duty of the supply cylinder and piston being to take in a combustible charge and transfer the charge or mixture through the transfer passage into the power cylinder, the power cylinder and piston operating on the two cycle principle.

A further object of my invention is to eliminate a number of working parts ordinarily employed in four cycle engines such as cam shafts and gears, valve tappets, push rods and practically all of the valves, especially the exhaust valves which burn and warp and otherwise cause trouble.

Another object is to provide an engine with fewer working parts whereby the same will be quieter running and can be manufactured at a smaller cost.

A still further object of my invention is to improve upon two cycle engines so that no air or mixture used for combustion is taken into the crank case but is taken in the cylinders above the pistons, thus doing away with the necessity of having an air tight crank case and, when more than one cylinder is used, doing away with the separate air tight compartments in the crank case for each cylinder, the advantage of taking in all of the air or mixture above the pistons being to allow the lubricating oil to be carried in the crank case so that the bearings, pistons, cylinders and walls can be oiled properly by the splash or pressure systems.

With the above general objects in view, and others that will become apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings and claimed.

In the drawings wherein like reference characters indicate corresponding parts throughout the several views,

Figure 1 is a longitudinal sectional view of an engine constructed in accordance with the present invention,

Figure 2 is a side elevational view of an engine having two cylinders connected by a transfer passage in a different way so that no valves are required in the cylinders,

Figure 3 is a transverse section taken substantially upon the line 3—3 of Figure 2, and

Figure 4 is a transverse section taken substantially upon the line 4—4 of Figure 2.

The engine shown in Figure 1 embodies a crank case 5 in which is journaled a crank shaft 6 and upon which is secured a block embodying a plurality of cylinders arranged in a longitudinal row, there being a pair of working or power cylinders 7 and a pair of intake or supply cylinders 8 which alternate so that one supply cylinder is disposed behind each power or firing cylinder.

Pistons 9 reciprocate in the power cylinders 7 and pistons 10 reciprocate within the supply cylinders 8, connecting rods 11 being provided for connecting the pistons to the cranks of the crank shaft 6 whereby the latter is rotated when the power pistons are reciprocated by the explosions in the power cylinders 7. The cranks of the shaft 6 are so disposed as to secure simultaneous upward or outward movement of one power piston 9 and one supply piston 10 while the other power piston 9 and supply piston 10 are moved inwardly or downwardly. However, it is to be understood that the number of cylinders may vary without departing from the spirit and scope of the invention.

The supply cylinders 8 are preferably shorter than the power cylinders 7 so that the pistons 10 will be moved practically to the tops of the supply cylinders 8, and a water jacket 12 is preferably provided for an obvious purpose.

The power cylinders 7 are provided with exhaust ports 13, one port 13 being provided for each power cylinder intermediate the ends thereof so that the same will be uncovered immediately prior to the time when the power piston 9 reaches its innermost position, and whereby such port 13 is covered by the piston 9 at all other times. In a like manner, the supply cylinders 8 are provided with side intake passages or ports 14 adapted to be placed in comunication with a suitable charge forming device, such as a carburetor, by means of an intake manifold or the like. The ports 14 are covered and uncovered by the pistons 10 in the same manner as that

above described with respect to the ports 13 of the cylinder 7, and in this way no supply or exhaust valves are required.

The top of each supply cylinder is placed in communication with the top of the adjacent power cylinder 7 by means of a transfer passage 15, and the outlet end of each transfer passage 15 is normally closed at the top of the adjacent power cylinder 7 by means of a spring seated valve 16 which normally seats upwardly or outwardly.

Each transfer passage 15 is provided at a point between its ends with an air inlet port 17 which opens to the atmosphere, but which is normally closed by means of an outwardly or upwardly seating check valve 18 having a seating spring 19.

As each piston 9 travels downwardly or inwardly in its power cylinder 7, the cooperating supply piston 10 will travel upwardly or outwardly in its cylinder 8, as is apparent.

When a supply piston 10 travels downwardly or inwardly in its supply cylinder 8, the valve 16 of the transfer passage 15 associated with the cylinder 8, closes the transfer passage so as to make or provide an air tight compartment above the piston 10 whereby a suction is created in the cylinder 8 which effects opening of the valve 18 and causes air to be drawn inwardly so as to fill the transfer passage 15, which air is not mixed with any fuel. When the piston 10 approaches the lower or innermost position thereof, the inlet port 14 is uncovered and the suction which still exists in the cylinder 8 causes a charge to be drawn into the latter above the piston 10 behind the charge of air which was drawn through the port 17. As the piston 10 again travels upwardly or outwardly, it covers the intake port 14, trapping and compressing the gas mixture in the top of cylinder 8. As the piston 10 approaches the extreme upper or outermost position of its stroke, the piston 9 in the cooperating power cylinder 7 is nearly in the lower or innermost position of its stroke, and the force of the compression in the top of cylinder 8 opens valve 16 of this power cylinder 7 so that piston 10 drives the gaseous mixture through the transfer passage 15 into the cylinder 7 above the piston 9. However, the air which is unmixed with fuel is forced into the cylinder 7 ahead of the gas mixture or charge so as to prevent the latter from being ignited by the hot outgoing exhaust gases which are at this time driven out through the port 13 as the latter is uncovered by the piston 9 and the air and gas mixture are forced into the cylinder 7. When the piston 10 moves upwardly or outwardly, it covers the port 14 of the cylinder in which it is moved, and the spring 19 will seat the valve 18 so as to provide an air tight compartment in the top of the cylinder 7 where the gas mixture is compressed by the upcoming piston 9. As the piston 9 reaches a predetermined point of its upward or outward stroke, the gas mixture is ignited by any desired means, such as an electric spark from the spark plug 20 and produced in any well known or preferred manner. When the gas mixture is ignited, it causes an explosive force which drives the piston 9 downwardly or inwardly, and as this piston is connected to the crank shaft, the latter is caused to turn so that rotation may be transmitted therefrom to any desired machine element. As the piston 9 moves upwardly, the piston 10 will again move inwardly so that the above operation will be repeated.

The air admitted through the port 17 will enter the power cylinder 7 in advance of the explosive charge and in this way complete forcing of the exhaust gases from the cylinder 7 is insured.

In the form of the invention shown in Figures 2 to 4 inclusive, the power cylinder is indicated at 7^a and the supply cylinder at 8^a. In this form of the invention the power cylinder 7^a is provided with an intake port 21 to which is connected one end of the transfer conduit 15^a whose other end is connected with an outlet port 22 provided at the top of the supply cylinder 8^a, the port 21 being adapted to be covered and uncovered by the piston 9 in the power cylinder 7^a similarly to the manner in which the piston 9 covers and uncovers the port 13 in the form of the invention shown in Figure 1. In this way, the use of the valve 16 is eliminated, and the air intake port 17 is provided in the conduit 15^a adjacent to power cylinder 7^a as clearly shown in Figures 2 and 3.

It will thus be seen that the form of the invention shown in Figures 2 to 4 inclusive only differs essentially from the form shown in Figure 1, in that the discharge end of the transfer conduit or passage opens into the side of the power cylinder instead of the top thereof so that the use of the valve 16 is rendered unnecessary because the piston 9 of the power cylinder controls the intake port 21 of the latter. In other respects, the form of the invention shown in Figures 2 to 4 inclusive is similar to that shown in Figure 1 except as to the number of cylinders illustrated, and the provision of a deflector plate or baffle 23 on the outer end of the piston 9 as shown clearly in Figure 3. This baffle 23 is so arranged as to lie between the ports 21 and 18 of the power cylinder 7^a when the latter ports are uncovered by the piston 9 so that the preliminary charge of air and the explosive charge are directed to the outer end of the cylinder 7^a from the supply cylinder 8^a, thereby insuring driving of the exhaust gases out of

the cylinder 7ª and preventing passage of the air and explosive mixture out of the cylinder 7ª and trapping of the exhaust gases therein. This would cause an ineffective operation and would result if the baffle 23 were not provided on the piston 9. Remaining parts in the construction shown in Figures 2 and 4 are designated by similar reference characters as those employed in Figure 1.

The operation of the device shown in Figures 2 to 4 inclusive is identical to that above set forth with respect to the form of the invention shown in Figure 1, except that the piston 9 produces the results attributed to the valve 16, by covering and uncovering the intake port 21.

It is thus believed that the construction and operation of both forms of the invention will be readily understood by those skilled in the art and the advantages of the invention appreciated.

What I claim as new is:

1. In an internal combustion engine, a crank shaft, a power cylinder having a side exhaust port and an intake port, a supply cylinder having a top outlet port and provided with a side inlet port adapted for connection with a charge forming device, a transfer passage connecting the outlet port of the supply cylinder with the intake port of the power cylinder, pistons reciprocable in said cylinders operatively connected to said crank shaft and arranged to respectively and alternately cover and uncover said side exhaust and inlet ports when reciprocated, said transfer passage being in constant communication with the supply cylinder, and means to automatically admit air from the atmosphere into the transfer passage upon the inward suction stroke of the supply cylinder piston and to prevent passage of said air to the atmosphere upon the outward stroke thereof, said engine embodying provision for automatically closing communication between the outlet end of the transfer passage and the power cylinder when the supply cylinder piston moves inwardly and the power cylinder piston moves outwardly and for automatically opening communication therebetween when the supply cylinder piston approaches its outermost position with the inlet port closed and when the power cylinder piston approaches its innermost position with the exhaust port uncovered.

2. In an internal combustion engine, a crank shaft, a power cylinder having a side exhaust port and an intake port, a supply cylinder having a top outlet port and provided with a side inlet port adapted for connection with a charge forming device, a transfer passage connecting the outlet port of the supply cylinder with the intake port of the power cylinder, piston reciprocable in said cylinders operatively connected to said crank shaft and arranged to respectively and alternately cover and uncover said side exhaust and inlet ports when reciprocated, said transfer passage being in constant communication with the supply cylinder, and means to automatically admit air from the atmosphere into the transfer passage upon the inward suction stroke of the supply cylinder piston and to prevent passage of said air to the atmosphere upon the outward stroke thereof, said engine embodying provision for automatically closing communication between the outlet end of the transfer passage and the power cylinder when the supply cylinder piston moves inwardly and the power cylinder piston moves outwardly and for automatically opening communication therebetween when the supply cylinder piston approaches its outermost position with the inlet port closed and when the power cylinder piston approaches its innermost position with the exhaust port uncovered, said air admitting means embodying a check valve controlled port in the transfer passage between the cylinders.

3. In an internal combustion engine, a crank shaft, a power cylinder having a side exhaust port and an intake port, a supply cylinder having a top outlet port and provided with a side inlet port adapted for connection with a charge forming device, a transfer passage connecting the outlet port of the supply cylinder with the intake port of the power cylinder, pistons reciprocable in said cylinders operatively connected to said crank shaft and arranged to respectively and alternately cover and uncover said side exhaust and inlet ports when reciprocated, said transfer passage being in constant communication with the supply cylinder, and means to automatically admit air from the atmosphere into the transfer passage upon the inward suction stroke of the supply cylinder piston and to prevent passage of said air to the atmosphere upon the outward stroke thereof, said engine embodying provision for automatically closing communication between the outlet end of the transfer passage and the power cylinder when the supply cylinder piston moves inwardly and the power cylinder piston moves outwardly and for automatically opening communication therebetween when the supply cylinder piston approaches its outermost position with the inlet port closed and when the power cylinder piston approaches its innermost position with the exhaust port uncovered, said provision for automatically closing and opening communication between the transfer passage and the power cylinder embodying an outwardly closing valve for the intake port of the power cylinder.

4. In an internal combustion engine, a crank shaft, a power cylinder having a side

exhaust port and an intake port, a supply cylinder having a top outlet port and provided with a side inlet port adapted for connection with a charge forming device, a transfer passage connecting the outlet port of the supply cylinder with the intake port of the power cylinder, pistons reciprocable in said cylinders operatively connected to said crank shaft and arranged to respectively and alternately cover and uncover said side exhaust and inlet ports when reciprocated, said transfer passage being in constant communication with the supply cylinder, and means to automatically admit air from the atmosphere into the transfer passage upon the inward suction stroke of the supply cylinder piston and to prevent passage of said air to the atmosphere upon the outward stroke thereof, said engine embodying provision for automatically closing communication between the outlet end of the transfer passage and the power cylinder when the supply cylinder piston moves inwardly and the power cylinder piston moves outwardly and for automatically opening communication therebetween when the supply cylinder piston approaches its outermost position with the inlet port closed and when the power cylinder piston approaches its innermost position with the exhaust port uncovered, said provision for closing and opening communication between the transfer passage and the power cylinder embodying arrangement of the intake port of the power cylinder in the side of the latter to be closed and opened by the power cylinder piston.

5. In an internal combustion engine, a crank shaft, a power cylinder having a side exhaust port and an intake port, a supply cylinder having a top outlet port and provided with a side inlet port adapted for connection with a charge forming device, a transfer passage connecting the outlet port of the supply cylinder with the intake port of the power cylinder, pistons reciprocable in said cylinders operatively connected to said crank shaft and arranged to respectively and alternately cover and uncover said side exhaust and inlet ports when reciprocated, said transfer passage being in constant communication with the supply cylinder, and means to automatically admit air from the atmosphere into the transfer passage upon the inward suction stroke of the supply cylinder piston and to prevent passage of said air to the atmosphere upon the outward stroke thereof, said engine embodying provision for automatically closing communication between the outlet end of the transfer passage and the power cylinder when the supply cylinder piston moves inwardly and the power cylinder piston moves outwardly and for automatically opening communication therebetween when the supply cylinder piston approaches its outermost position with the inlet port closed and when the power cylinder piston approaches its innermost position with the exhaust port uncovered, said provision for closing and opening communication between the transfer passage and the power cylinder embodying arrangement of the intake port of the power cylinder in the side of the latter to be closed and opened by the power cylinder piston, and an outwardly projecting baffle on the outer end of the power cylinder piston for diverting the air and explosive charge from the transfer passage toward the outer end of the power cylinder and away from the exhaust port of the latter.

6. In an internal combustion engine, a power cylinder having an exhaust port and an intake port, a supply cylinder having an outlet port and provided with an inlet port adapted for connection with a charge forming device, a transfer passage connecting the outlet port of the supply cylinder with the intake port of the power cylinder, pistons reciprocable in said cylinders, and means to automatically admit air from the atmosphere into the transfer passage upon the inward suction stroke of the supply cylinder piston and to prevent passage of said air to the atmosphere upon the outward stroke thereof, said engine embodying provision for automatically closing communication between the power cylinder and the supply cylinder when the supply cylinder piston moves inwardly and the power cylinder piston moves outwardly and for automatically opening the communication therebetween when the supply cylinder piston approaches its outermost postion with the inlet port closed and when the power cylinder piston approaches its innermost position with the exhaust port uncovered.

In testimony whereof I affix my signature.

LESTER C. BROCK.