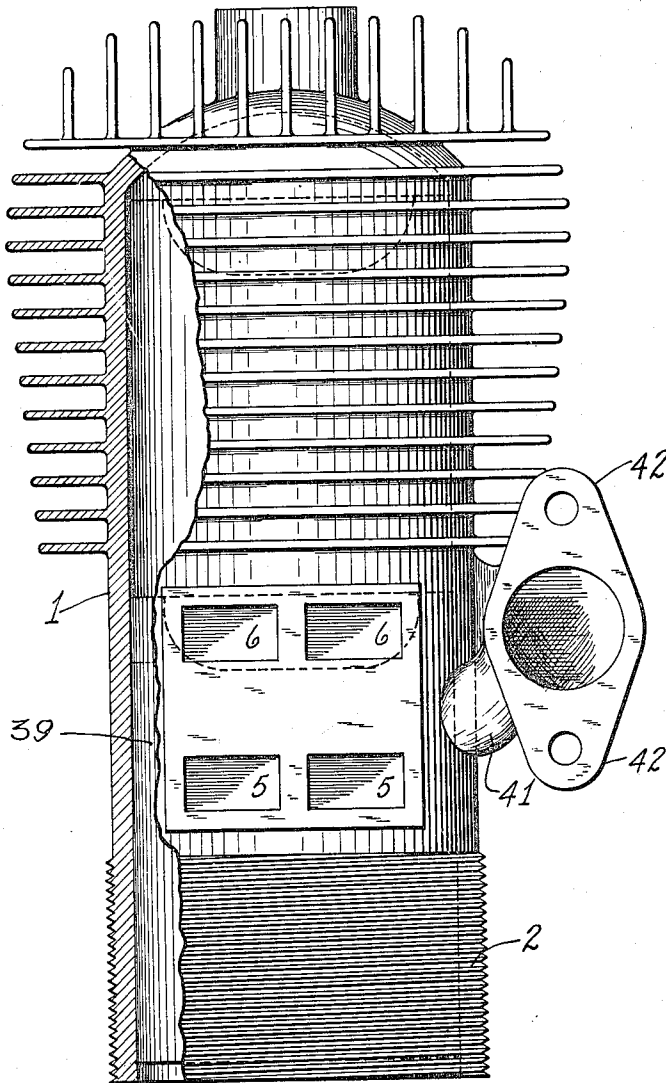


A. F. ROWELL.
COMBINED CARBURETER AND TRANSFER PORT.
APPLICATION FILED DEC. 30, 1915.

1,289,006.

Patented Dec. 24, 1918.
2 SHEETS—SHEET 1.

Fig. 1.



Inventor

Arthur F. Rowell

By Edwin E. Wheeler

Attorneys

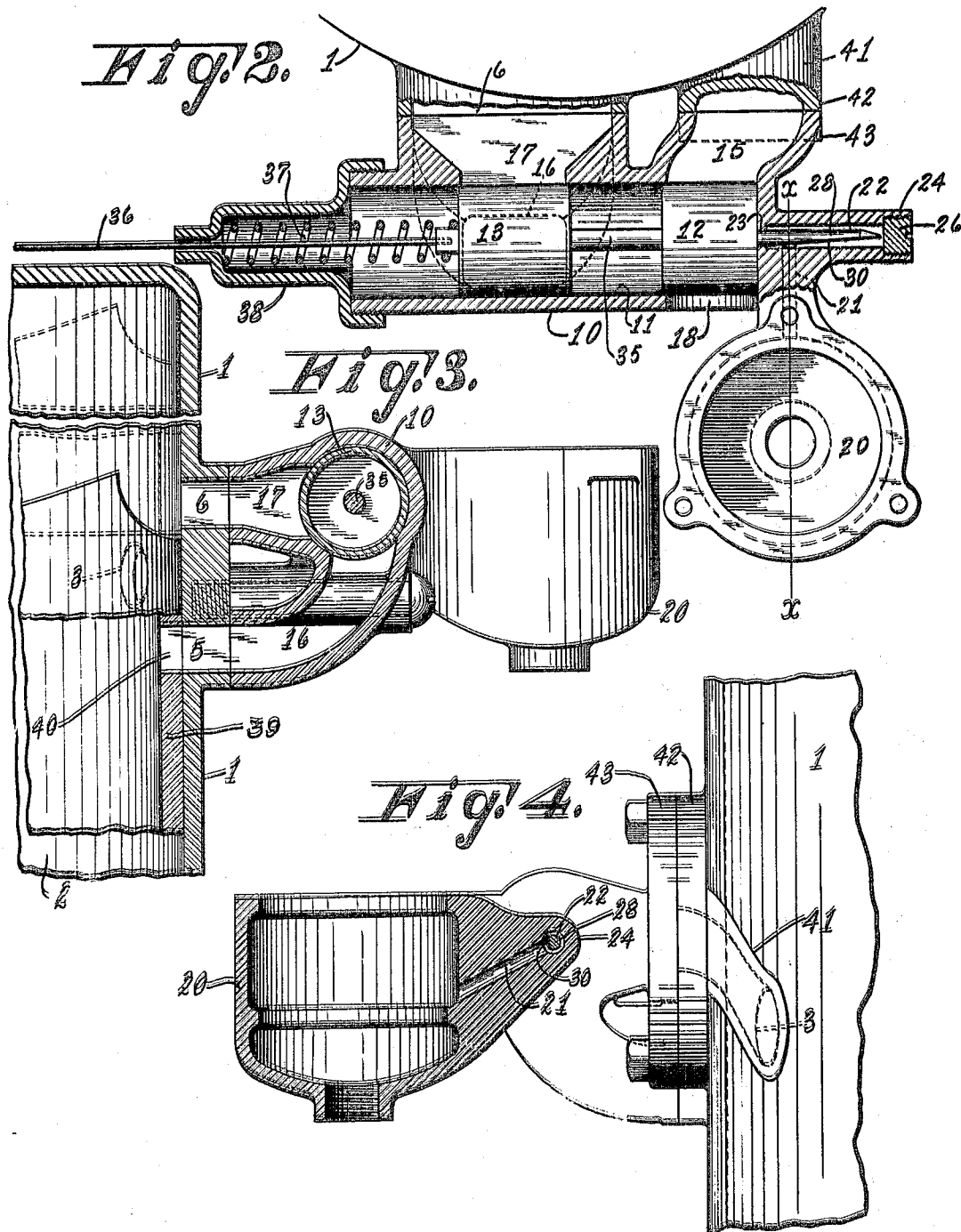
Witnesses
J. D. Bremer.

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Inventor

Arthur F. Rowell
 by E. W. Wheeler
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Witnesses
 J. A. Brown
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UNITED STATES PATENT OFFICE.

ARTHUR F. ROWELL, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO A. O. SMITH COMPANY,
OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

COMBINED CARBURETER AND TRANSFER-PORT.

1,289,006.

Specification of Letters Patent.

Patented Dec. 24, 1918.

Application filed December 30, 1915. Serial No. 69,350.

To all whom it may concern:

Be it known that I, ARTHUR F. ROWELL, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Combined Carbureters and Transfer-Ports, of which the following is a specification.

My invention relates to improvements in two cycle internal combustion engines.

The object of my invention is to combine the carbureting throttling and transfer mechanism with a view to providing for a common control with a simultaneous adjustment of the controlling or regulating members, thereby not only reducing the number of parts to be manually operated, but increasing the effectiveness of the control and securing economy of fuel, by throttling the air and fuel inlets simultaneously and in the same operation which controls the volume of the charge delivered to the cylinder.

In the drawings—

Figure 1 is an elevation of a two cycle internal combustion engine cylinder, showing the arrangement of the ports which my improved carbureting and transfer mechanism control.

Fig. 2 is a horizontal sectional view of the carbureting and transfer mechanism, drawn to a plane cutting the air inlet and transfer ports.

Fig. 3 is a vertical sectional view of the same, drawn to a plane which includes the axis of the transfer port.

Fig. 4 is a sectional view, drawn to the plane indicated by line $x-x$ of Fig. 2.

Like parts are identified by the same reference characters throughout the several views.

The cylinder 1 of my improved two cycle internal combustion engine and crank chamber 2 may be of ordinary construction. Port 3 admits carbureted air to the crank chamber, port 5 is the crank chamber delivery port, and port 6 is the inlet port of the cylinder for delivery of the combustible charge above the piston.

The controlling apparatus comprises a detachable casing 10 having a horizontal cylindrical bore 11 in which cylindrical slide valves 12 and 13 are mounted. At its inner side this casing is provided with a port 15 adapted to register with port 3, another port 16 adapted to register with port 5, and a

third port 17 adapted to register with port 6, when the casing is in position for use. The casing also has a port 18 in its outer wall directly opposite port 15 for admission of air from the exterior.

A float chamber 20 is connected with the casing 10 and is adapted to deliver fuel into the cylindrical bore 11 thereof through a transverse duct 21 and a longitudinal duct 22, the latter being contracted at 23. The duct 22 is formed in a projecting stem 24 at the end of the casing and the outer end of said duct is closed by the plug 26.

A needle valve 28 connected with the slide valve 12, is adapted to fit the portion 23 of the longitudinal duct 22. This valve is progressively flattened along one side, as indicated at 30, whereby when the valve is partially withdrawn from the duct 22, the delivery of liquid fuel from the float chamber to the interior of the valve casing 10 may be very accurately regulated, the degree of movement of the needle valve 28 determining the capacity of the opening thereby provided in the fuel inlet port 23.

The slide valves 12 and 13 are connected by a stem 35. An operating rod 36 is connected with the slide valve 13 and extends through the end of the casing opposite that occupied by the needle valve 28. A compression spring 37 interposed between slide valve 13 and this end of the casing, tends to hold all of the valves 12, 13 and 28 in closed position. A tubular extension 38 serves as a cap for the end of the casing 10 and also provides an elongated socket for the spring 37, whereby a spring of sufficient length to secure the required sensitiveness may be employed. The slide valve 13 controls communication between the transfer ports 16 and 17. The slide valve 12 controls communication between the air ports 18 and 15, while the needle valve 28, as above stated, controls the delivery of liquid fuel from the float chamber 20 into the casing. It will be observed that the liquid fuel will be admitted from the duct 22 through port 23 directly into the path of air passing from port 18 to port 15, when valve 12 is wholly or partially open.

It will be observed that the casing 10 constitutes a chambered and ported member which is sub-divided by the valves 12 and 13, and particularly by the valve 12 which, when open, either wholly or partially, serves

as a partition to separate the air passage from the transfer passage, the air passage comprising the port 18, the portion of the cylindrical bore 11 at the right of valve 12, and the port 15 leading to the crank case. The transfer passage comprises the port 16, the portion of the bore 11 between the valves 12 and 13, and the port 17. The valve 13 also serves as a partition to prevent the escape of fluid along the operating rod 36, whereby it is unnecessary to make the left hand end of the casing, beyond the piston valve fluid tight. The slide valves are preferably in the form of pistons, to facilitate making them fluid tight and for the further reason that I am thereby enabled to produce a compact and simple structure in which a perfect alinement of the valves, including the needle valve, is easily secured. These piston slide valves 12 and 13 also serve as guide members to accurately position and control the movement of the needle valve.

It will be observed that the crank chamber port 5 is so located that when the piston 39 is at or near the limit of its expansion stroke, a port 40 therein will register with port 5, the cylinder port 6 being simultaneously uncovered by the piston, whereby the charge may be delivered from the crank case through the transfer passage to the cylinder. The port 3 connects with the cylinder at an intermediate point, this port being a little below port 6 and a little above port 5. It is also preferably offset from a vertical line connecting the ports 5 and 6. In the construction shown, the port 3 leads outwardly and upwardly through a tubular projection 41, having clamping ears 42 adapted to register with similar clamping ears 43 formed on the casing 10, whereby the carbureting end of the casing 10 may be spaced from the cylinder wall and adequately supported.

In operation, during the initial upward movement of the engine piston 39, the ports 5 and 6 will both be closed by such piston. The continued upward movement will then create a partial vacuum in the crank chamber. When the piston nears the limit of its upward movement, it will first uncover port 5 and then uncover port 3, as indicated by dotted lines in Fig. 1, but port 6 will remain closed. When port 3 is uncovered, air will rush in through the air passage to satisfy the partial vacuum in the crank chamber. The suction exerted from the crank chamber will also draw a quantity of liquid fuel through the fuel inlet port 23, the fuel being discharged into the path of the incoming air, which atomizes it and carries it with the air into the crank chamber. The piston slide valves 12 and 13 are of course assumed to be wholly or partially open, being held in the desired position by means of the operating rod 36. To reduce the speed of the engine, the pull upon the operating rod

is relieved, whereupon the spring 37 will push the valves toward closed position, simultaneously throttling the transfer passage, the air passage and the fuel inlet passage. It is therefore obvious that the capacity of each of these passages is positively and mechanically controlled, and with the passages and valves properly proportioned, the relative proportions of air and fuel may be exactly regulated in accordance with the requirements of the engine, and the volume of the charge delivered to the cylinder may also be regulated, whereby the engine is made instantly responsive to a controlling adjustment of the valves. I attach considerable importance to this feature, since an independent adjustment of a throttle valve, controlling only the volume of the charge delivered to an internal combustion engine, is apt to result in an imperfect mixture with either too much or too little hydrocarbon, at least until the engine has readjusted its speed in conformity with the requirements imposed by the throttle valve in its new position of adjustment.

I claim:

1. A two cycle engine, including the combination with an engine cylinder and crank case, each having inlet ports, and the crank case having an outlet port for delivery of combustible charges to the cylinder port, of a chambered member covering said ports, and provided with air and fuel inlets, and a set of valves in said member, connected for joint operation, and adapted to both control and direct the flow of fluid through said ports, whereby the air and fuel are directed to the crank chamber and the mixture delivered therefrom to the cylinder.

2. A two cycle internal combustion engine including the combination of an engine cylinder and crank case, said crank case being ported for air admission, and the cylinder and crank case also having transfer ports of a chambered member having an inner face ported for registry with the cylinder and crank case ports and also having air and fuel inlets, and a valve mechanism arranged to vary the capacity of said ports simultaneously and also to subdivide said member into carbureting and transferring passages.

3. A two cycle internal combustion engine including the combination of an engine cylinder and crank case, said crank case being ported for air admission, and the cylinder and crank case also having transfer ports, of a chambered member having an inner face ported for registry with the cylinder and crank case ports and also having air and fuel inlets, and a valve mechanism arranged to vary the capacity of said ports simultaneously and also to subdivide said member into carbureting and transferring passages, together with a piston in said cylinder arranged to cover and uncover the

crank case and cylinder ports, to time the admission of air and fuel to the crank case and the delivery of combustible charges to the cylinder.

5 4. In combination, the cylinder and crank case of an internal combustion engine, a transfer member having a passage communicating therebetween and provided with an air inlet passage extending across one
10 end of the transfer member, a valve for said inlet passage, a controlling valve for the transfer passage in said transfer member, means for delivering liquid fuel into said
15 air inlet passage, and a needle valve controlling fuel delivery connected with the said controlling valve and air inlet valve for simultaneous operation therewith.

5 5. A combined carbureter and transfer member including the combination of a
20 chambered and ported member adapted to form carbureting and transfer passages, a valve separating said passages and controlling deliveries through one of them, a fuel inlet duct, and a valve connected with the
25 first mentioned valve and controlling deliveries through the fuel inlet duct, said valve being longitudinally alined with the first mentioned valve and both being held in fixed relation to each other.

30 6. A combined carbureter and transfer member including the combination of a chambered member, provided with carbureting and transfer passages opening
35 through its side walls, and a fuel inlet port in one end wall, a set of piston valves, controlling the carbureting and transfer passages, a rod connecting said valves and extending across the transfer passage when
40 the valves are open, a needle valve connected with the valve controlling the carbureter passage and projecting into the fuel inlet port, and an operating stem connected with the transfer passage valve.

45 7. A combined carbureter and transfer member including the combination of a chambered member, provided with carbureting and transfer passages opening
50 through its side walls, and a fuel inlet port in one end wall, a set of piston valves, controlling the carbureting and transfer passages, a rod connecting said valves and extending across the transfer passage when
55 the valves are open, a needle valve connected with the valve controlling the carbureter passage and projecting into the fuel inlet port, and an operating stem connected with the transfer passage valve, together with a spring adapted to normally hold all of said valves in closed position.

60 8. A combined carbureter and transfer member including the combination of a chambered member, provided with carbureting and transfer passages opening
65 through its side walls, and a fuel inlet port in one end wall, a set of piston valves, controlling the carbureting and transfer passages, a rod connecting said valves and extending across the transfer passage when
70 the valves are open, a needle valve connected with the valve controlling the carbureter passage and projecting into the fuel inlet port, and an operating stem connected with the transfer passage valve, said needle valve being progressively flattened along one side.

9. A combined transfer member and carbureter, including the combination of a
75 chambered and ported member, a set of piston valves subdividing the interior of said member and connected with each other, an operating stem connected with one of the valves and a fuel valve connected with the other, said member having transfer ports
80 affording communication through said member between the piston valves when the latter are in open position, and other ports affording an air passage across the fuel valve,
85 said chamber having a fuel port controlled by said fuel valve adapted when open to permit a discharge of liquid fuel.

10. A combined carbureter and transfer
90 port for two cycle internal combustion engines, including a chambered member having an inner face adapted to fit an engine body and provided with transfer ports opening through said face at different levels,
95 said member also having an air port opening through said inner face and also to the exterior through an outer face, in combination with a set of valves connected with
100 said ports to open or close each in predetermined proportion to the others, and a common operating member connected with said valves.

11. A combined carbureter and transfer
105 port for two cycle internal combustion engines, including a chambered member having an inner face adapted to fit an engine body and ported to provide crank chamber
110 inlets and outlets and a cylinder inlet, said chambered member also having a port communicating with the exterior, and a fuel inlet port, in combination with a set of connected valves subdividing said member to
115 form air inlet and transfer passages, said valves being adapted to simultaneously open or close said ports, each in definite proportion to the others.

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

ARTHUR F. ROWELL.

Witnesses:

CHAS. BOLL,
F. H. W. BECKER.