

May 9, 1933.

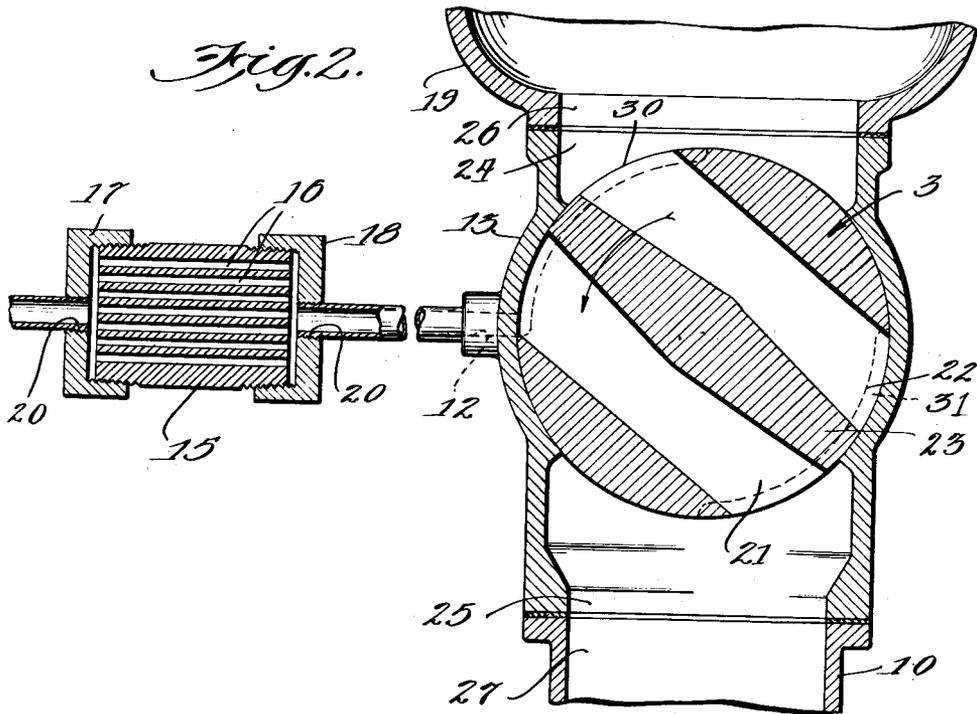
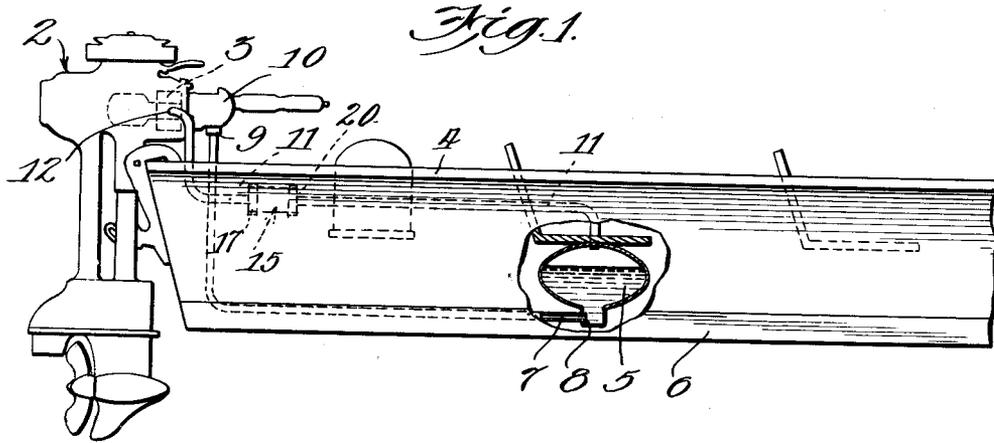
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1,907,725

FUEL SYSTEM FOR INTERNAL COMBUSTION ENGINES

Filed Feb. 26, 1931

2 Sheets-Sheet 1



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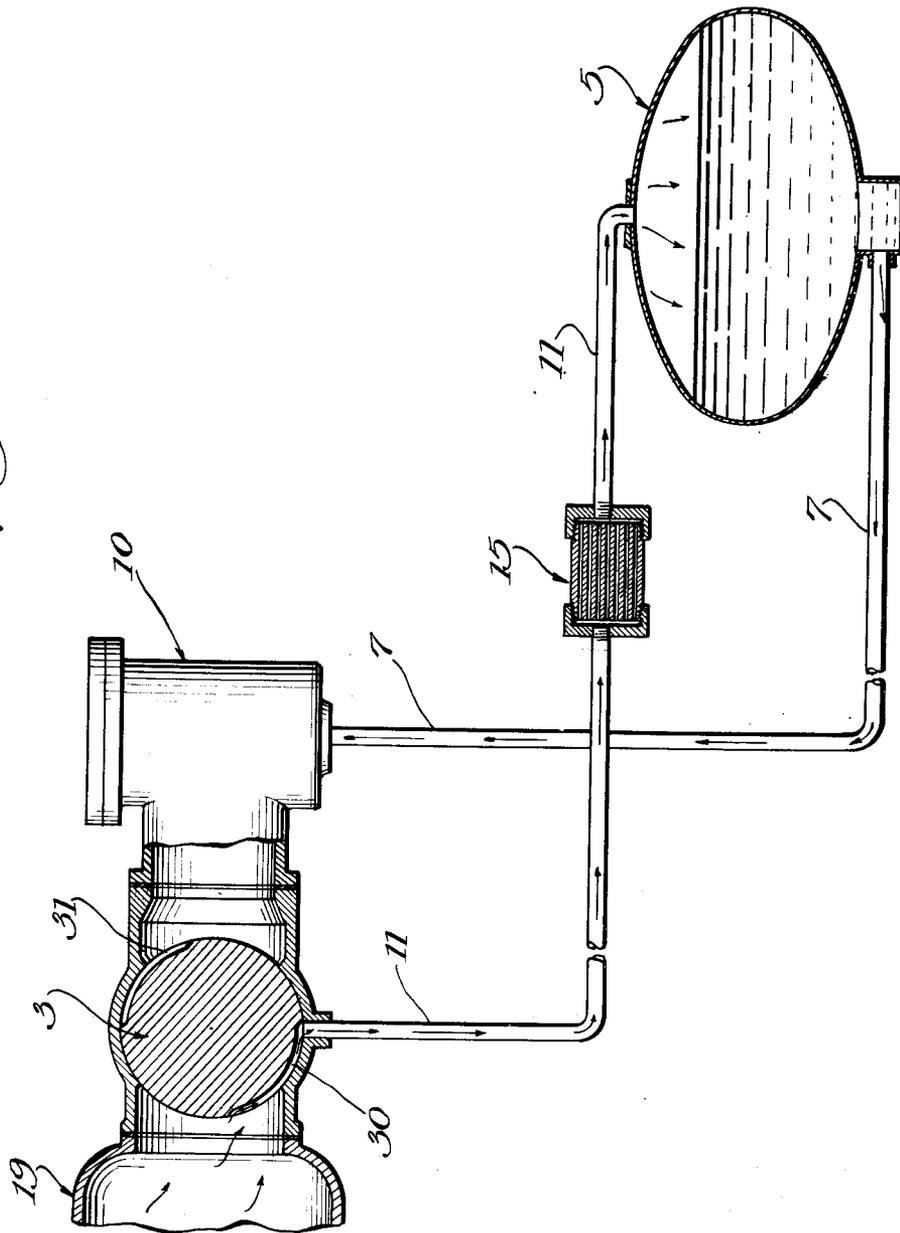
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Fig. 3.



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UNITED STATES PATENT OFFICE

ROBERT F. BRACKE, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
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FUEL SYSTEM FOR INTERNAL COMBUSTION ENGINES

Application filed February 26, 1931. Serial No. 518,470.

My invention relates to fuel supply systems for internal combustion engines and more particularly to fuel systems for two cycle engines.

6 It is the object of the present invention to provide means for lifting fuel from a low level tank to the carburetor or fuel metering or injection device mounted on or near the motor and at a level higher than the main
10 supply tank.

It is a further object of this invention to provide simple and efficient means for lifting fuel from a low level to a conventional gravity feed carburetor mounted on or near the
15 motor. It is a further and more specific object of the present invention to provide means for utilizing crankcase compression in a two cycle motor for the purpose of lifting fuel from a low level supply tank to a carburetor
20 or fuel metering device mounted on the motor.

The above features and others not specifically set forth above will be more fully hereinafter described in connection with the
25 accompanying drawings herein.

Fig. 1 is a view more or less diagrammatic illustrating a fuel supply system as applied to a portable two-cycle internal combustion engine embodying my invention, and

30 Fig. 2 is a transverse sectional view of the rotating valve of the engine and its housing to clearly illustrate the method of by-passing portions of the compressed fuel charges from the crankcase chamber of the
35 engine.

Fig. 3 is a diagrammatic view illustrating the connections between the crank case, the fuel supply tank, and the carburetor, which includes a transverse sectional view of the
40 rotating valve as positioned in Fig. 2 but showing the channels in the valve utilized for by-passing a portion of the compressed charge to the fuel supply tank.

Referring now to the drawings, and particularly to Fig. 1, there is shown more or less

in outline an internal combustion engine 2 of the portable type in which a rotary valve 3 shown dotted rotates in unison with the crankshaft of the engine and is set with relation to the rotation of the crankshaft for
50 the proper intervals of opening and closing to permit full and complete charges to be fed into the crankcase chamber, where these charges are subsequently compressed and by-passed to the firing cylinders of the engine,
55 as will be more fully hereinafter described. The engine 2 as shown is secured to the stern of an outboard motor boat 4, and a main fuel supply tank 5 suitably located forward of the engine and secured to the floor 6 of
60 the boat to guard against displacement is supplied with a suitable feed line or pipe to conduct fuel therefrom to the carburetor of the engine.

A fuel or pipe line 7 communicates at its
65 one end 8 with the bottom of the fuel tank 5 and its other end 9 with the fuel chamber of the carburetor 10 associated with the engine 2. A second pipe line 11 communicates at its one end with the top of the fuel tank
70 5 and at its opposite end with a port 12 extending through the rotary valve housing 13 and serves to by-pass portions of compressed fuel charges from the crankcase chamber of the engine into the tank 5 to maintain the
75 liquid fuel contained therein under suitable pressure, as will be more fully hereinafter described. A cooling cylinder interposed in the pipe line 11 between the port 12 and the top of the fuel supply tank 5 comprises a
80 cylinder 15 of suitable metal such as copper, having a plurality of openings 16 parallel with the major axis of the same and extending therethrough. Cap members 17 and 18 are provided which have threaded engage-
85 ment with the threaded end portions of the cylinders 15, and tapped openings 20 extending through the same receive the threaded ends of the respective sections of the pipe 11.

I prefer to use a positively driven rotary 90

valve rather than an automatic spring pressed valve, between the carburetor and crankcase. Referring to Fig. 2, there is shown in transverse section the rotary valve 3 and the housing 13 within which the valve rotates in unison with the crankshaft of the engine 2. The housing 13 is interposed between the crankcase 19 and the carburetor 10, of which fragmentary portions are shown, the housing 13 being suitably supported or secured to the crankcase 19. Ports 21 and 22 separated by a partition 23 are provided in the valve 3 and lie in planes parallel with the major axis of the valve 3. The ports 21 and 22 register with diametrically opposite openings 24 and 25 in the housing 13 during a predetermined degree of rotation of the valve 3 to permit the entry of fuel charge into the crankcase chamber 19. The openings 24 and 25 in the housing 13 are aligned or matched respectively with like contoured openings 26 in the crankcase 19 and the discharge opening 27 of the carburetor 10.

In a two-cycle internal combustion engine, the rotary valve 3 rotates in unison with the crankshaft of the engine, and is so set with relation to the rotation of the same that on the intake stroke of the pistons, that is, when the pistons are moving to firing position, the valve 3 is open to permit the fuel mixture from the carburetor 10 to be inducted into the crankcase chamber 19 through the ports 21 and 22. As the pistons reach firing position the valve 3 will have been rotated to position the separating wall 23 between the ports 21 and 22 with relation to the diametrically opposite openings 24 and 25 of the housing 13 to close the ports 21 and 22, as clearly illustrated in Fig. 2. The pistons on their return movement from firing position will now compress the fuel mixture inducted into the crankcase chamber 19 and this compressed mixture will be subsequently passed forward of the pistons as the pistons reach the end of their travel from firing position in the usual manner.

The valve 3, as shown in Fig. 2, rotates in a direction indicated by the arrow and the ports 21 and 22 are in closed position to subject the fuel mixture or charge in the crankcase chamber 19 to compression under the influence of piston movement, which in this instance is from firing position. It is this compressed fuel mixture or charge in the chamber 19 that is utilized and by-passed to the main fuel supply tank to place the fluid therein under pressure to assure a continuous supply of fuel at all engine speeds.

As shown in Fig. 2, the rotating valve 3 is provided with a pair of diametrically opposite horizontally disposed channels 30 and 31 of predetermined length formed in the peripheral face of the same. The channels 30 and 31 are positioned just below the bottom edge of the port openings 21 and 22 and

in approximate vertical alignment therewith, and are adapted to register alternately with the port opening 12 as the valve 3 rotates in unison with the crankshaft of the engine. The valve 3, as shown in Fig. 2, has just moved to closed position to position the forward end of the channel 30 in registry with the port opening 12. This registry of the channel 30 with the port 12 now permits a portion of the compressed fuel charge in the crankcase 19 to pass therethrough, but only for such interval as the channel 30 remains in communication with crankcase 19. During the interval that the ports 21 and 22 are closed, the fuel charge contained in the crankcase 19 is subjected to compression due to the engine piston movement, as already described, and during the interval that the channel 30 is in communication with the crankcase 19 this compressed charge is by-passed through the channel 30 and port 12 to the fuel supply tank 5 via the pipe line 11 and cooling cylinder 15. Thus as the diametrically opposite channels 30 and 31 alternately register respectively with the port 12 and the crankcase 19 through the opening 24 in the housing 13, compressed charges from the crankcase are by-passed through the port 12, but only for that portion or interval of time that the channels 30 and 31 are alternately in communication with the crankcase.

The crankcase 19 of the engine becomes heated during continued engine operation and the compressed fuel charges that are by-passed to the fuel tank are thus heated due to this condition. These charges, however, pass through the openings 16 of the cylinder 15 and are thus cooled to an appreciable extent before entering the supply tank 5. Should backfiring occur, the ignited gases will necessarily pass through the cylinder 15 and be cooled and extinguished before entering the fuel tank 5, precluding the possibility of firing the fuel therein.

My invention, when applied to a design of a two cycle motor illustrated, has the additional advantage of not requiring a check valve in the crankcase-to-tank line as would be desirable if applied to the three-port type of two cycle motor in which the pistons uncover a third port at the end of the suction stroke in the crankcase to permit the carburetor to deliver a charge therein.

In the fuel system as above described I have devised a means whereby the usual pump for maintaining the fuel in the supply tank to assure a constant fuel supply for all engine speeds is dispensed with. The utilization of the compressed fuel charges in the crankcase and the by-passing of such portions of the charges into the fuel supply tank while the engine is running assure a positive and substantially constant pressure in the

fuel supply tank which is automatically maintained during engine operation.

I claim:

1. The combination of an internal combustion engine with a crankcase wherein a fuel charge is compressed by engine piston movement, an engine controlled valve and a passage therein for admitting a fuel charge to the crankcase prior to the compression action of said piston, a fuel supply tank and means associated with said valve for subsequently by-passing a predetermined portion of said charge to this fuel tank to maintain a pressure therein. 70
2. The combination of an internal combustion engine with a crankcase wherein a fuel charge is compressed by engine piston movement, an engine controlled valve and a passage therein for admitting a fuel charge from the engine carburetor to the crankcase, a fuel supply tank for the engine carburetor and means associated with said valve effective during a portion of the engine piston movement to compress the fuel charge in the crankcase to by-pass a predetermined portion of said charge to the fuel supply tank to maintain the fuel therein under pressure. 75
3. The combination of an internal combustion engine with a crank case for receiving a fuel charge, an engine controlled valve and a passage therein for admitting a fuel charge to the crank case and a subsequent closing of said passage for the compression of the charge in the crank case by engine piston movement, a fuel supply tank and means associated with said valve connecting said crank case with said fuel tank for by-passing a portion of the compressed charge to said tank to maintain a pressure therein. 80
4. The combination of an internal combustion engine with a crank case for receiving a fuel charge, a valve rotating in unison with the crank shaft of the engine, a passage in said valve for admitting a fuel charge to the crank case when open and during closure to permit the compression of the charge in the crank case by engine piston movement, a pair of diametrically opposite passages in said valve connecting said crank case with said fuel tank during the compression period of said charges in said crank case to by-pass a portion of such compressed charges to said tank to maintain a pressure therein. 85
5. The combination of an internal combustion engine with a crank case for receiving a fuel charge, a valve rotating in unison with the crank shaft of the engine and a passage therein alternately opened and closed to permit admission of a fuel charge to the crank case and the compression of said fuel charge therein due to engine piston movement, a housing for said valve and an opening therein, a connection between said opening and a main fuel supply tank, and a pair of diametrically opposite passages in said valve for connecting said opening with said crank case during the compression of the fuel charge therein to by-pass a portion of such compressed charge to said tank to maintain a pressure therein. 90
6. The combination of an internal combustion engine with a crankcase for receiving a fuel charge, a valve rotating in unison with the crank shaft of the engine, a passage there-through alternately opened and closed for the admission of a fuel charge to the crankcase and the subsequent compression of the same therein, a housing for said valve and an opening therein, a fuel supply tank and a connection between the fuel tank and the engine carburetor, a second connection between said fuel tank and said opening, a pair of diametrically opposite passages in said valve connecting said crankcase and said opening during the compression of the fuel charges in the crankcase and for such time as said second passages remain in communication with said crankcase to by-pass such portion of the compressed charges through said second connection to the fuel tank to maintain a pressure therein. 95
7. The combination of an internal combustion engine with a crankcase for receiving fuel charges which are subsequently compressed therein, an engine controlled valve and a passage therethrough when open to admit a fuel charge to the crankcase and when closed to permit the compression of said charge in the crankcase, a fuel supply tank, means associated with said valve for connecting said crankcase with said fuel tank for by-passing a portion of the compressed charges to said tank to maintain a pressure therein and means interposed between said tank and said crankcase for cooling such charges before entering said tank. 100
8. The combination of internal combustion engine with a crankcase wherein a fluid is compressed by the engine piston movement, a fuel supply tank, a fuel feed line from the tank to the engine, and valve means positively actuated by the engine in timed relation to the engine cycle for by-passing a portion of the compressed fluid from the crankcase into said supply tank to maintain a pressure therein. 105
9. The combination of internal combustion engine with a crankcase wherein a fluid is compressed by the engine piston movement, a carburetor, a fuel supply tank in communication with said carburetor, and an engine controlled valve for passage of fuel from the carburetor to the crankcase, means cooperating with said valve for by-passing a portion of the compressed fluid in said crankcase into said fuel supply tank to maintain a pressure therein. 110
10. The combination of internal combustion engine with a crankcase wherein a fuel charge is compressed by engine piston move- 115

ment, a carburetor, a fuel supply tank located below the level of the carburetor, a fuel supply line extending from the fuel tank to the carburetor, a rotary valve actuated by said engine between said carburetor and said crankcase, means cooperating with said valve whereby a portion of the compressed fluid charge is by-passed from said crankcase to said fuel tank for the purpose of forcing fuel from said tank to said carburetor.

In witness whereof, I hereunto subscribe my name this 18th day of February, 1931.
ROBERT F. BRACKE.

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