W. F. PAGEL.

MEANS FOR FUEL FEED FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED JULY 15, 1918.

1,371,260.

Patented Mar. 15, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

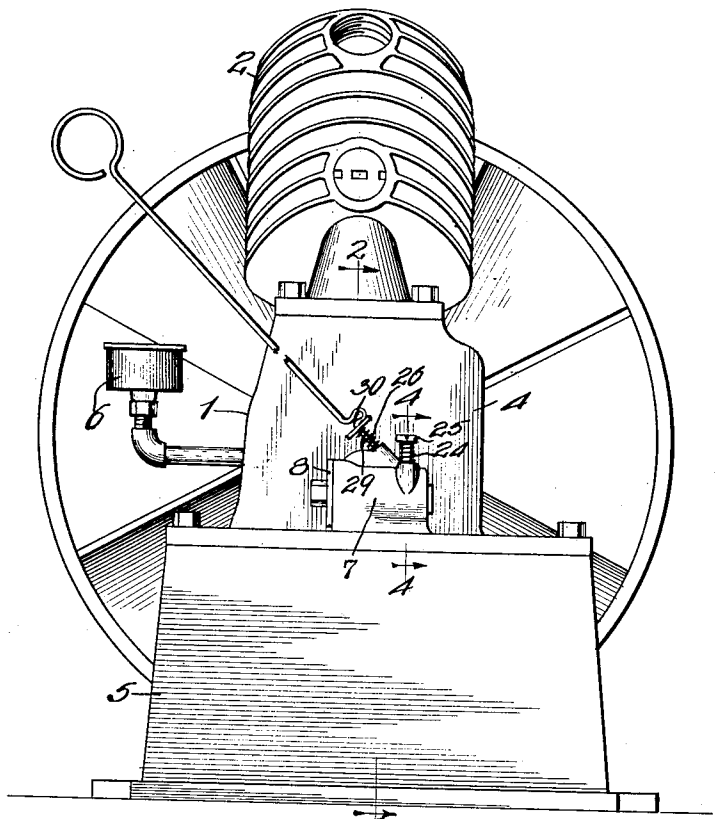
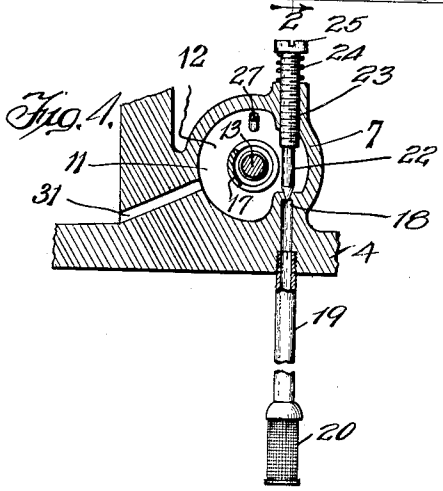


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 2.

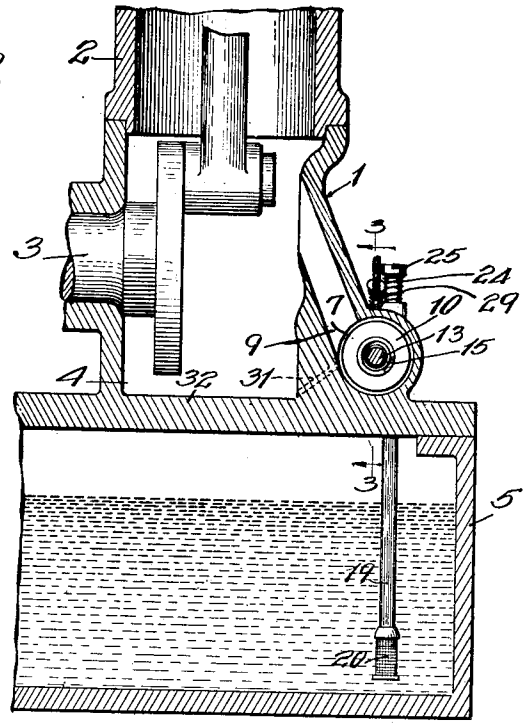
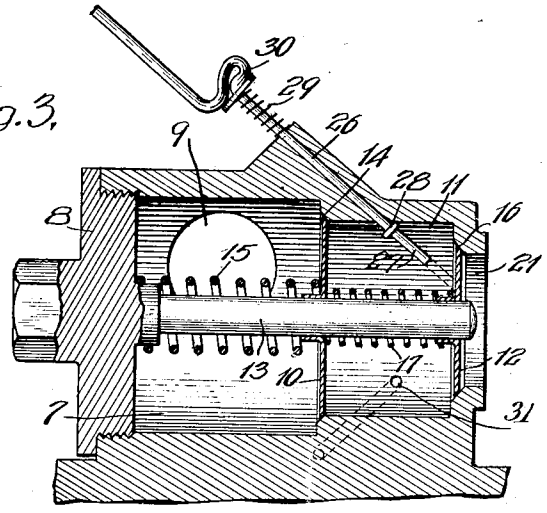


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM F. PAGEL, OF SYCAMORE, ILLINOIS.

MEANS FOR FUEL-FEED FOR INTERNAL-COMBUSTION ENGINES.

1,371,260. Specification of Letters Patent. Patented Mar. 15, 1921.

Application filed July 15, 1918. Serial No. 244,939.

To all whom it may concern:

Be it known that I, WILLIAM F. PAGEL, a citizen of the United States, residing at Sycamore, in the county of De Kalb and State of Illinois, have invented a certain new and useful Improvement in Means for Fuel-Feed for Internal-Combustion Engines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to improvements in two-cycle internal combustion engines and has special reference to improvements in means for feeding fuel to such engines.

The object of my invention is to provide a combined two-cycle engine and carbureter of simple form, which can be manufactured at low cost, which shall consist of but few parts, which carbureter shall comprise an integral part of the engine, which shall prevent the flooding of the base of the engine with liquid fuel, which shall practically vaporize all of the liquid fuel used, and which shall effectively raise the liquid fuel from a lower level and feed it into the base of the engine in prevaporized or finely divided form.

A further object of my invention is to provide a carbureter of simple form, which may in fact be formed integrally with the engine with which it is used, which comprises means for preliminarily drawing a modicum of liquid fuel from a lower level into a vaporizing chamber and then the opening of an air inlet by which the liquid thus measured is drawn into the base of the engine, mixed with the entering air.

My invention consists in the method of feeding liquid fuel to a two-cycle internal combustion engine which consists in the production of a slight vacuum, sufficient to lift the liquid from a lower level to the carbureter, the production of a stronger vacuum by which an air inlet valve is opened, admitting air with which the fuel is mixed, and the mixture is drawn into the base of the engine for feeding to the cylinder.

My invention also consists in a carbureter having a carbureting chamber in free communication with the crank case of the engine, an auxiliary valve-controlled chamber communicating with the source of supply of liquid fuel, the valve controlling communication between the first chamber and the auxiliary chamber being adapted to open in advance of the valve controlling the entrance of free air to the auxiliary chamber, whereby liquid fuel is drawn into the auxiliary chamber in advance of air being drawn into the engine crank case.

My invention also consists in means for causing the mixture of liquid fuel, trapped in the crank case of the engine, with the incoming carbureted air and hence the prevention of the flooding of the crank case with liquid fuel.

My invention also consists in the several features of construction and in the combinations and relations of devices and parts whereby I am enabled to attain the above mentioned and other objects, and all as hereinafter described and particularly pointed out in the appended claims.

My invention will be more readily understood by reference to the accompanying drawings forming part of this specification and in which:

Figure 1 is an elevation of an engine equipped with a carbureter embodying my invention;

Fig. 2 is a fragmentary vertical section on the line 2—2 of Fig. 1;

Fig. 3 is a longitudinal vertical section of the carbureter on the line 3—3 of Fig. 2; and

Fig. 4 is a fragmentary vertical transverse section of the carbureter on the line 4—4 of Fig. 1.

In said drawings I illustrate a two cycle internal combustion engine 1 having a cylinder 2, a shaft 3, and a crank case or chamber 4. The engine is secured upon a hollow base 5 which I use as a storage chamber for fuel oil such as gasolene. The crank case is provided with a breathing valve 6, of usual construction.

Upon one part of the crank case and above the base 5, I provide a small horizontal cylindrical chamber 7, which is closed at one end by a screw plug 8 and is open at its opposite end. This chamber communicates with the crank case 4 through the upward inclined passage 9. This chamber is in fact the main mixing chamber of the carbureter. Its open end opposite to the plug 8 is controlled by a valve 10 which is nearly the full diameter of the chamber 7. Beyond the valve 10 is a smaller cylindrical chamber 11 which is in fact an air inlet passage and is in alinement with the chamber 7 and into which I initially feed the liquid fuel from the base 5. Preferably, though not neces-

sarily, the outer end of the cylinder 11 is controlled by a valve 12 similar to the valve 10 but of smaller diameter.

I provide the head 8 with a central fixed pin or projection 13 extending through the chambers 7 and 11, and upon which I mount the two valves 10 and 12. I yieldingly hold the valve 10 upon the seat 14 by a compression spring 15 which surrounds the pin 13 and seats against the plug 8, and I yieldingly hold the valve 12 upon its seat 16 by a similar, though weaker spring 17, which also surrounds the pin 13 and is arranged between the two valves, which both slide upon the pin 13. I make the spring 17 weaker than the spring 16 so that normally both valves will be maintained closed.

I preferably make these valves thin and light so that they are quickly responsive to changes of pressure and do not create much noise in seating. As shown, I prefer to form the valves of thin sheet metal and I make these valve seats 14 and 16 tapered so that the valves will readily find their seats thereon.

To supply fuel to the auxiliary chamber 11 I provide an inlet passage 18 entering the lower part of the chamber and connected by a depending pipe 19 with a foot check valve 20 which is arranged near the bottom of the base 5.

Upon the outward stroke of the piston of the engine a more or less perfect vacuum is produced in the base of the engine; this is communicated to the chamber 7 through the large passage 9 and in response thereto the valve 10 is lifted against the action of the spring 15. Soon thereafter the valve 12 is also lifted or drawn inwardly to admit air through the air inlet but before this occurs, the vacuum has actually lifted the liquid fuel through the passage 18 into the chamber 11.

I control the fuel inlet passage 18 by the needle valve 22 which I mount in a threaded opening 23 in the top wall of the carbureter and in alinement with the opening 18.

I yieldingly hold the needle valve in its adjusted position by a coiled spring 24 which I mount on the stem of the valve between its head 25 and the carbureter casing.

For priming the engine in starting same I provide a simple means for holding the valve 12 on its seat. This means consists of a rod 26 which projects diagonally through the casing of the carbureter into the chamber 11 and the inner end 27 being adapted to be pushed against valve 12 and keep it from leaving its seat. To normally hold the rod 26 out of contact with valve 12 I provide a stop 28 on the inner end of the rod 26 and a spring 29 on the rod between the casing of the carbureter and a shoulder 30 which I form on the rod, by bending the rod back and forth upon itself. The spring holds the rod withdrawn with the shoulder 28 in contact with the wall of the chamber 11.

In priming the engine or at other times, more fuel may be carried into the base of the engine than can be used at the time and it may accumulate in the crank case 3, but to prevent an excess of such fuel and to make use of all fuel collected in the crank case, I provide a small inclined passage 31 which enters the chamber 11 and extends down into the crank case, which it enters close to the floor 32 thereof. The chamber 11 is normally not in communication with the crank case except through the small passage 31. Upon the in or down stroke of the piston the chamber 11 is closed off from communication with the crank case by the valve 10 held to its seat by the spring 15, and is closed off at its other end from the atmosphere by the valve 12. When pressure is produced in the crank case by the engine piston, the gases therein are forced through the small passage 31 into the chamber 11, and if any liquid fuel covers the mouth of the passage 31 it will also be forced into the chamber 11. This projection of the fuel from the crank case into the chamber 11 occurs on the compression stroke and in advance of the opening of the valves, by the partial vacuum in the crank case caused by the suction stroke and consequently in advance of the flow of the fuel through the feed inlet 18. Although but a drop or two of the liquid fuel may be thus projected from the crank case into the chamber 11 upon each stroke of the piston the result will be that normally the crank case will be kept free of trapped liquid fuel.

It should be understood that even though I make the spring 17 weaker than the spring 15, it nevertheless requires more suction to open the air inlet valve than it does to open the valve controlling the communication between the two chambers. This results from the fact that the communication valve is larger than the air inlet valve and requires a stronger spring to counteract the action of the suction and maintain this valve closed until a certain degree of vacuum is attained in the crank case. When sufficient suction is attained to open the communicating valve it moves from its seat and then the auxiliary chamber 11 is subject to the vacuum. The valve 12 being smaller than the valve 10, a spring weaker than the spring 15 is capable of holding the valve 12 closed against the suction which opens the valve 10. The first action after the valve 10 opens is to subject the fuel inlet 18 to the action of the vacuum, thus drawing liquid fuel into the auxiliary chamber 11, and then as the suction increases it finally becomes strong enough to unseat the air valve 12 and permit air to be drawn in for mixture with

the fuel previously drawn into the auxiliary chamber. The inflowing air mixes with the fuel both in the auxiliary chamber and again in the chamber 7 and finally enters the crank case through the opening 9.

It will be apparent that I have produced a very simple form of carbureter, consisting of but few parts and eminently fitted for practising my improved method of feeding carbureted air fuel to an internal combustion engine from a supply of liquid fuel.

I claim:

1. A two cycle engine having a closed crank case in combination with a fuel mixing chamber in free communication with the crank case, an auxiliary mixing chamber, a spring held valve normally closing communication between the two chambers and adapted to be opened by suction from the crank case, a liquid fuel feed for the auxiliary chamber, an air inlet for the auxiliary chamber, a spring pressed valve normally closing said inlet, the communicating valve opening with less suction than the air valve whereby fuel is drawn into the auxiliary chamber in advance of the opening of the air valve.

2. A two-cycle single acting internal combustion engine in combination with means for feeding carbureted air to the crank case thereof, comprising a carbureting chamber in communication with the crank case, a fuel feed chamber, a suction valve controlling communication between such chambers, a valve controlled air inlet for the fuel chamber, a compression spring yieldingly holding the communicating valve to its seat against the suction of the crank case and a weaker compression spring yieldingly holding the air valve to its seat.

3. A two-cycle internal combustion engine in combination with means for feeding carbureted air to the crank case thereof, comprising a carbureting chamber, a relatively large opening connecting the chamber with the crank case above the bottom thereof, an auxiliary chamber, a liquid feed entering the auxiliary chamber, a suction valve controlling communication between the two chambers, and a second passage connecting the auxiliary chamber with the crank case and entering the crank case adjacent to the floor thereof, said second passage being of relatively small area.

4. In combination, a two cycle internal combustion engine having a closed crank case, a carbureter having a suction chamber, an air inlet for said chamber, a spring held valve normally closing the air inlet adapted to be opened for the admission of air by suction produced in the crank case, and spring retracted means normally out of the path of the valve as it opens, and manually movable to hold the valve temporarily closed against said suction.

5. In a carbureter for a two-cycle engine, a normally closed carbureting chamber adapted to be automatically placed in communication with the crank case of the engine, a fuel inlet for such chamber, a normally closed air inlet for such chamber adapted to be opened by the suction produced in the crank case and spring held means normally out of the path of the valve and adapted to be manually held in engagement with the valve to temporarily hold the valve closed.

6. In combination, a two cycle internal combustion engine having a closed crank case, a main carbureting chamber in communication with the crank case of the engine, an auxiliary chamber in communication with the main chamber and having a liquid fuel inlet and an air inlet opening, the communication between the two chambers and the air inlet opening being in alinement with each other, a valve stem projecting from one wall of the main chamber and extending centrally through the chambers and the openings, a valve slidingly mounted upon the stem for controlling communication between the chambers, a spring on the stem for yieldingly holding the valve upon its seat, a second valve on the stem controlling the air inlet, a spring mounted on the stem between the two valves yieldingly holding the air inlet valve upon its seat and an auxiliary passage of relatively small area connecting the air passage with the crank case near the floor thereof.

7. In combination, a two cycle engine having a closed crank case, a carbureting chamber on the crank case of the engine in constant communication with the interior of the crank case, a fuel inlet chamber in communication with the carbureting chamber, a valve controlling communication between the two chambers, the valve being adapted to be opened by a partial vacuum within the crank case, a spring normally seating said valve and an upwardly inclined small passage connecting the fuel inlet chamber with the interior of the crank case adjacent to the floor of the latter.

8. In a two cycle internal combustion engine, a carbureting chamber on the side of the crank case in constant free communication therewith, an air inlet passage for said chamber, a fuel inlet entering the bottom of said passage, a valve normally closing communication between said passage and said chamber, and adapted to be opened by suction within said crank case and an auxiliary passage of relatively small area connecting the air passage with the crank case near the floor thereof.

9. A two cycle internal combustion engine having a closed crank case, in combination with a carbureter chamber in free communication with the crank case above its

floor, an auxiliary carbureting chamber, a spring held air valve for controlling communication between said chambers adapted to be opened by suction within the crank case, and a passage of small area connecting said auxiliary carbureting chamber with the crank case adjacent to the floor of the latter.

10. A two cycle internal combustion engine having a closed crank case, a carbureter chamber, a relatively large passage maintaining free communication between the chamber and the crank case, a valve controlling the admission of air to said chamber, an air passage for said chamber, a valve controlling the admission of air thereto, and a passage of relatively small area connecting the air passage with the crank case and entering the crank case at a lower level than said relatively large passage.

In witness whereof I hereunto subscribe my name this 14th day of June A. D. 1918.

WILLIAM F. PAGEL.