March 3, 1942. R. J. GRAY 2,274,894

CRANKCASE VENTILATING SYSTEM

Filed Feb. 5, 1940 2 Sheets-Sheet 1

Fig. 2.

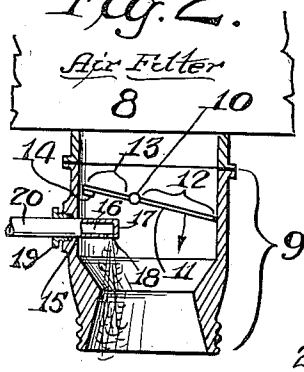


Fig. 1

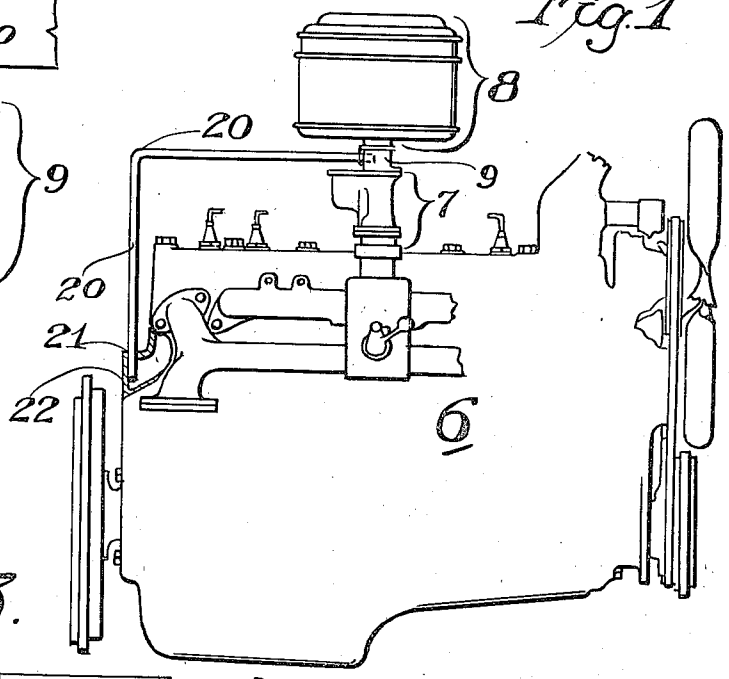
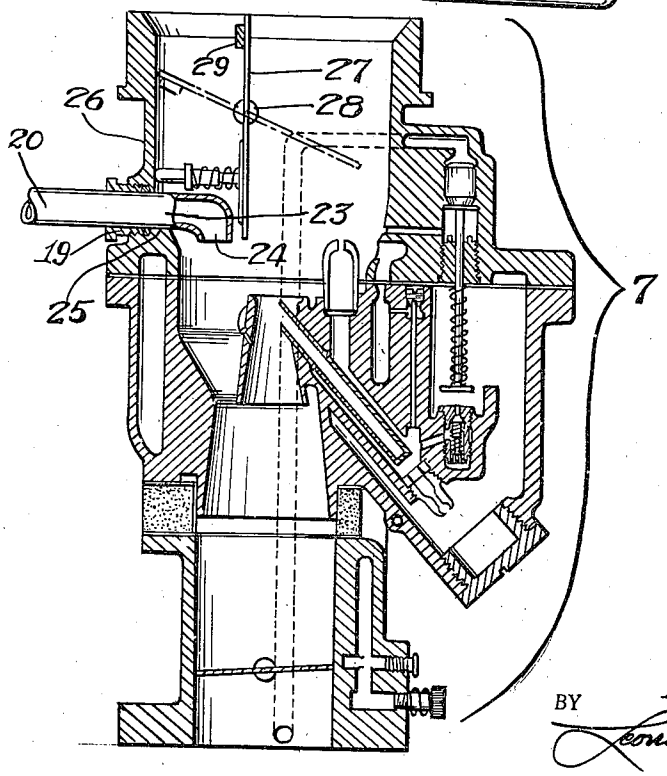


Fig. 3.



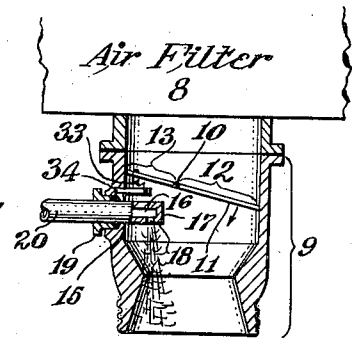


Fig. 6

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Filed Feb. 5, 1940 2 Sheets-Sheet 2

Fig. 5.

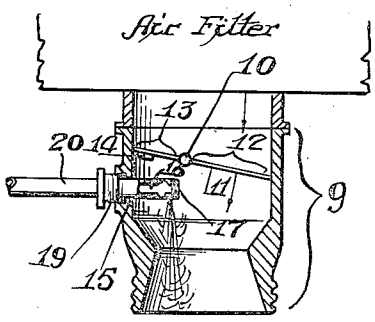
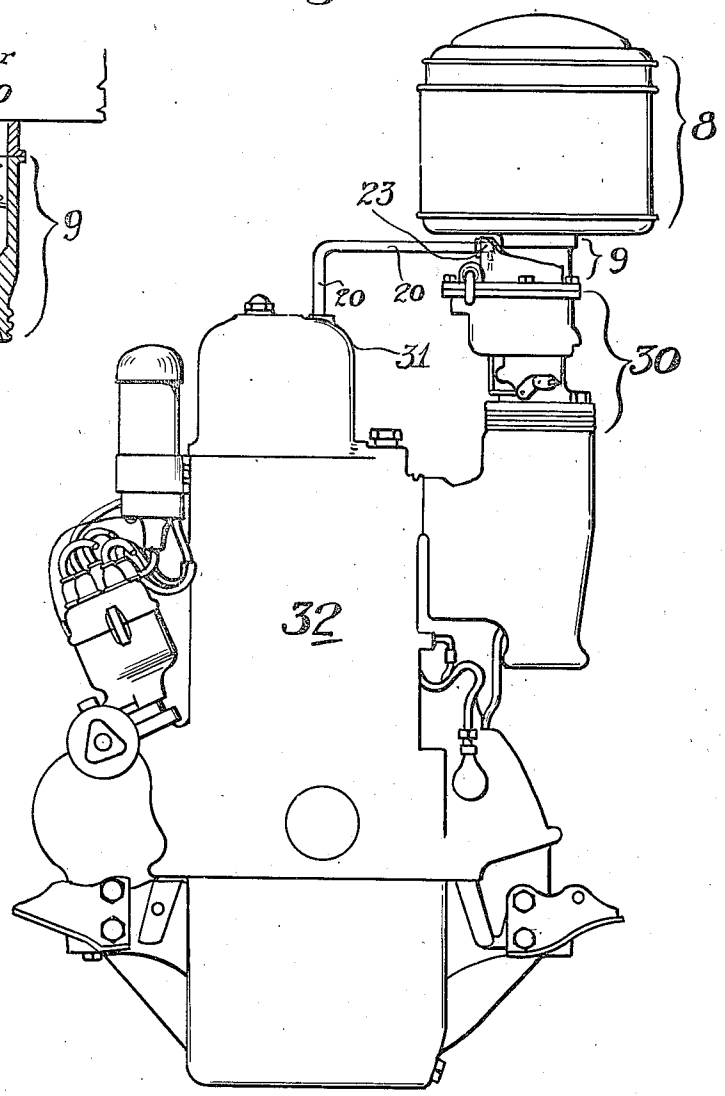


Fig. 4.



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CRANKCASE VENTILATING SYSTEM

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Application February 5, 1940, Serial No. 317,271

6 Claims. (Cl. 123—119)

The present invention relates to a certain new and useful crank case ventilator system and a certain novel construction in internal combustion engines whereby crank case fumes consisting partly of oil fumes or oils in a more or less vaporous condition are removed from the crank case and returned to the combustion chambers of the engine, thereby serving the dual purpose of removing these vapors from the crank case and also mixing them with the fuel entering the combustion chambers, so as to effect a lubrication of the piston and piston rings, particularly the uppermost rings, and also effecting a lubrication of the valve stems, and also the rocker arms in engines with overhead type valve mechanisms.

Some crankcase ventilator systems have been devised heretofore which were more or less effective while the car travelled at a comparatively high speed of perhaps 35 miles or so, but which were ineffective at lower speeds or particularly at idling speeds. There have been other crank case ventilating systems, on the other hand, which have been fairly effective at idling speeds but the efficacy of which diminished rapidly at normal running speeds or higher speeds of the engine. Still other crank case ventilating systems in the past have seriously interfered with the normal operation and normal responses of the carburetor and the entire fuel vaporizing and mixing system, and others have required such manual adjustment by the driver as to be highly impracticable in the hands of the average automobile driver.

One of the objects of the present invention is to provide a crank case ventilator system which will not at any time interfere with the normal functioning of the carburetor or the supply of vaporized fuel and air mixture and which will not require any special attention in the course of its operation, and which will be effective both at idling speeds and higher speeds through the practical range of operation of the automobile engine.

For the purpose of illustrating the invention, there is shown in the accompanying drawings forms thereof which are at present preferred, since the same have been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which the invention consists can be variously arranged and organized and that the invention is not limited to the precise arrangement and organization of the instrumentalities as herein shown and described.

In the accompanying drawings in which like reference characters indicate like parts,

Figure 1 represents a general side elevational view of an engine of the L-head type, that is, a valve-in-block type embodying the crank case ventilator system of the present invention.

Figure 2 represents a cross-sectional view of the collar 9 shown in Figure 1 and on a much enlarged scale.

Figure 3 represents a cross-sectional view of the carburetor embodying the present invention, showing a modified embodiment.

Figure 4 represents a general front elevational view of an engine of the overhead valve type, that is, a valve-in-head type embodying the crank case ventilator system of the present invention.

Figure 5 represents a cross-sectional view of the collar 9 shown in Figure 4, on an enlarged scale.

Figure 6 represents a cross-sectional view similar to that of Figure 2, but showing the butterfly valve 11 weighted by a spring 33 in place of the weight 14.

The engine represented in outline in Figure 1 is generally a valve-in-block type engine, the particular one illustrated being a Chrysler automobile engine which is designated generally by the numeral 6, having the conventional down-draft carburetor designated generally by the numeral 7. Between the carburetor 7 and the air cleaner 8, I may insert a tubular collar 9 which is shown in section on a somewhat larger scale in Figure 2; the air cleaner 8 being secured to the upper end of the collar 9 in any suitable manner or in the manner now generally used for securing the air cleaner to the top of the carburetor, while the lower end of the collar 9 is in turn secured to the upper end of the carburetor in any suitable manner, as by screw threads or bolted flanges or the like. By this means, the collar 9 merely becomes a part of the conduit leading from the air cleaner 8 to the down-draft carburetor 7.

In the collar 9, I provide a small pivot shaft 10, the ends of which are journalled in suitably apertured lugs or bosses in the side of the collar, so as to permit the pivot shaft 10 to rotate freely. The pivot shaft 10 carries a butterfly valve 11 having the general shape of the cross-section of the opening through the collar 9. The pivot shaft 10 is preferably off-center as indicated in Figure 3, so that the portion 12 of the butterfly valve 11 to one side of the pivot 10 will have a substantially greater area than the part

13 of the butterfly 11 on the other side of the pivot pin, thereby causing the butterfly valve to turn in the direction of any air flow through the collar 9 because of the greater pressure exerted by any air flow on one side of the pivot than on the other. The butterfly valve may be weighted on the smaller side 13 by any suitable weight, as for instance, the weight 14 or by any other means, just sufficiently to tend to balance the butterfly valve in a more or less closed position when there is no air flow or no suction from beneath, as for instance, when the engine is shut off or not running. Instead of permitting the butterfly valve to be entirely closed when the engine is "dead," the butterfly valve may be even then tipped to a partly open position either by a suitable stop projecting inwardly from the side wall of the collar 13 or by so balancing the two sides 12 and 13 of the butterfly valve as to cause it to remain in a somewhat open position. In any event, however, the butterfly valve is so arranged that the suction created by the running of the engine gradually opens the butterfly valve further and that the opening increases as the speed of the engine or as the suction of the engine increases. Instead of the weight 14, the butterfly valve may be weighted by any suitable type of spring of suitable strength so as to hold the butterfly valve in a partly closed position while the engine is idling but to permit the butterfly valve quickly to open as the accelerator is opened or as the speed of the engine increases. Thus, in Figure 6, there is shown the shorter end of the butterfly valve 11 attached to the coiled tension spring 33, the other end of said spring 33 being anchored to any anchorage 34 which may project inwardly from the wall of the collar 9.

Beneath the butterfly valve 11, an opening 15 is provided through the side wall of the collar 9 in which a nozzle or jet-like member 16 is mounted. The nozzle 16 may be in the form of a more or less horizontal tube closed at its inner end 17 and having a transverse opening 18 therein generally in the direction of the air flow through the collar 9. The nozzle 16 may be held in place by a screw-bushing 19 in which the nozzle 16 may be welded or brazed or otherwise secured; the bushing 19 being screw-threadedly secured in the hole 15 in the side wall of the collar 9; the hole 15 being similarly screw-threaded. The nozzle 16 is preferably arranged so that it does not extend across the entire passage through the collar or bushing 9 but merely extends slightly into the passage as indicated in Figure 3 although this may be varied so that the opening 18 may be more nearly to the center of the passageway through the collar 9 or it may be on the other side of the center. The nozzle 16 is connected through a tube or conduit 20, which may be a copper tube of suitable size or an oil-resistant rubber composition hose or synthetic rubber hose and is connected to an opening 21 at an upper part of the crank case 22 of the engine 6 and preferably at the rear of the engine, that is, at that end of the engine which is nearest the fly wheel and transmission.

The butterfly valve 11 is so weighted or balanced both by the disposition of the pivot pin 10 or the ratio between the sides 12 and 13 thereof and by the static balancing of the two sides in relation to each other, that it will offer a very slight resistance to the free flow of air past it while the engine is idling or while the engine is at low speeds while opening up entirely while the engine is at higher speeds. By this means, just sufficient suction is placed on the nozzle opening 18 to suck a steady flow of crank case gases through the opening 21 and conduit 20 and through the nozzle opening 18 both when the engine is idling as well as when it is at low speeds and when it is at higher speeds, thereby removing from the crank case the crank case gases or fumes and delivering them into the air fed to the carburetor 7 where it ultimately mixes with the fuel and air mixture and is delivered to the combustion chambers where it is partly burned and also serves to lubricate the valve stems and the upper end of the cylinder and upper piston rings of the pistons, thereby providing a smoother running engine and generally increasing the efficiency of the engine.

Instead of the construction indicated in Figures 1 and 2, I may provide a similar nozzle 23 having a down opening 24 through a similar opening 25 provided in the side wall 26 of the carburetor 7 as indicated in section in Figure 3; the nozzle being similarly held in place by a screw bushing 19 or by any other suitable means. In this embodiment of the present invention, the opening 25 through the side wall of the carburetor is provided beneath the butterfly valve 27 which already forms a part of the standard carburetor (the carburetor shown in Figure 3 being a standard Chrysler down-draft carburetor). The butterfly valve 27 is the choke valve and is carried by a pivot 28 and may be similarly weighted by a suitable weight 29 in much the same manner as heretofore indicated in respect to the butterfly valve 11 shown in Figure 2.

In this form of construction, the separate tubular collar or bushing 9 is not provided intermediate the air cleaner 8 and carburetor 7 but instead the nozzle 23 is applied directly to the carburetor through the side wall thereof as indicated.

In Figure 4 a modified form of the crank case ventilator system of the present invention is shown as applied to an overhead type engine 32 of the Buick or Chevrolet type. In this form of construction, I have again shown the collar 9 interposed between the carburetor 30 and the air cleaner 8 but the conduit 20 extends from the nozzle 16 to the casing or cover 31 which encloses the overhead valve mechanism on the top of the engine, thereby drawing off the crank case fumes as they rise from the crank case through the openings or guides through which the valve rocking rods or valve-lift rods extend upwardly.

In Figure 5 is shown the structure of the collar 9 shown in Figure 4, the construction being the same as that of Figure 2.

The crank case ventilator system of the present invention requires no manipulation or supervision or control by the operator but is fully automatic and does not interfere in any way with the normal functioning of the carburetor. Thus, it will function both at idling speed as well as at higher speeds, the amount of crank case fumes or gases being drawn off increasing generally with the speed of the engine.

If desired, the conduit 20 may be connected directly to the conventional "road" tube or breather-pipe which is usually connected to the crank case of the engine, that is, instead of having the crankcase fumes drawn off into the atmosphere through the conventional "road" tube or breather pipe, the breather pipe is diverted to the conduit 20.

Either the butterfly choke valve 27 of the carburetor or a separate butterfly valve 11 provided in the auxiliary collar 9 is so counterweighted on one side that it is normally held in a partially closed position, thereby putting a drag or suction below such butterfly, which pulls or sucks the fumes from the crank case at an idling speed. Naturally, the instant the accelerator is opened, the butterfly will immediately fly open; still keeping a partial drag or suction on the ventilator line 20. This produces a very efficient crank case ventilation and the fumes come off in large quantity and provide splendid upper cylinder lubrication and eliminate the motor noises and piston noises generally attributable to lack of upper cylinder lubrication. The crank case ventilator system of the present invention also increases the compression of the engine by reason of the improved lubrication.

Where the word "weighted" is used in the following claims, it is intended to mean not only the use of a weight but also the use of a spring or other weighting or tensioning means.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

Having thus described the invention, what is hereby claimed as new and desired to be secured by Letters Patent is:

1. A crankcase ventilating system for internal combustion engines, including a free conduit extending from the vapor-accumulating space of the crankcase to the interior of the carburetor above the fuel-inlet thereof, and terminating in a nozzle extending into the air-path between the air cleaner and said fuel-inlet, with the nozzle opening being generally in the direction of air travel, and a weighted butterfly valve above said nozzle in said air path, at least partly closing said air-path and diverting to said nozzle and conduit the greater part of the relatively slight suction created when the engine is idling and opening fully with increasing speed of the engine.

2. A crankcase ventilating system for internal combustion engines, including a free conduit extending from the vapor-accumulating space of the crankcase to the interior of the carburetor and terminating in a nozzle extending into the air-path at a point below the air cleaner, with the nozzle-opening being generally in the direction of air travel, and a weighted butterfly valve above said nozzle in said air-path, at least partly closing said air-path and diverting to said nozzle and conduit the greater part of the relatively slight suction created when the engine is idling and opening fully with increasing speed of the engine.

3. A crankcase ventilating system for internal combustion engines, including a generally tubular collar adapted for insertion between the air cleaner and the top of the carburetor to form a part of the air-passageway through which the air from the air cleaner passes to the carburetor, a weighted butterfly valve in said generally tubular collar, adapted at least partly to close the air-path therethrough when the engine is idling and adapted fully to open with increasing engine speed, a nozzle in said generally tubular collar, below said butterfly valve and extending into the air-path through said generally tubular collar, and having an opening generally in the direction of the air-flow, and a free conduit adapted to connect said nozzle with the vapor-accumulating space of the crankcase of the engine.

4. A crankcase ventilator system for internal combustion engines including a carburetor, comprising a weighted butterfly valve intermediate the air intake and the gasoline intake adapted to maintain a partly closed position against the in-flow of air while the engine is idling and adapted to open with the opening of the throttle, a suction nozzle adjacent to said butterfly and intermediate said butterfly and the gasoline intake and extending into the path of the air flow and facing in the direction of the air flow, and a conduit establishing free communication between said nozzle and a space in an engine casing in which the crank case fumes normally accumulate; said nozzle and conduit being adapted to divert the greater part of the suction from the engine to said crankcase when said butterfly valve is in its partly closed position.

5. A crankcase ventilating system for internal combustion engines comprising a free conduit extending from the vapor-accumulating space of the crankcase to the interior of the carburetor intermediate the air-intake and the fuel-inlet thereof and terminating in a nozzle extending in the direction of air travel in said carburetor and a butterfly valve intermediate said nozzle and the air-intake of said carburetor, said valve being weighted to remain substantially closed at low engine speeds whereby the relatively slight suction will be transmitted in large part to said conduit, and being weighted to open at higher engine speeds whereby a relatively smaller part of the stronger suction will be transmitted to said conduit.

6. A crankcase ventilating system for internal combustion engines comprising a free conduit extending from the vapor-accumulating space of the crankcase to the interior of the carburetor intermediate the air-inlet and the fuel inlet thereof and terminating in a nozzle extending in the direction of air travel in said carburetor and a butterfly valve intermediate said nozzle and the air-intake of said carburetor, said valve being pivoted intermediate the ends thereof to provide unequal arms, said valve being weighted to remain substantially closed at low engine speeds whereby the relatively slight suction will be transmitted in large part to said conduit, and being weighted to open at higher engine speeds whereby a relatively smaller part of the stronger suction will be transmitted to said conduit.

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