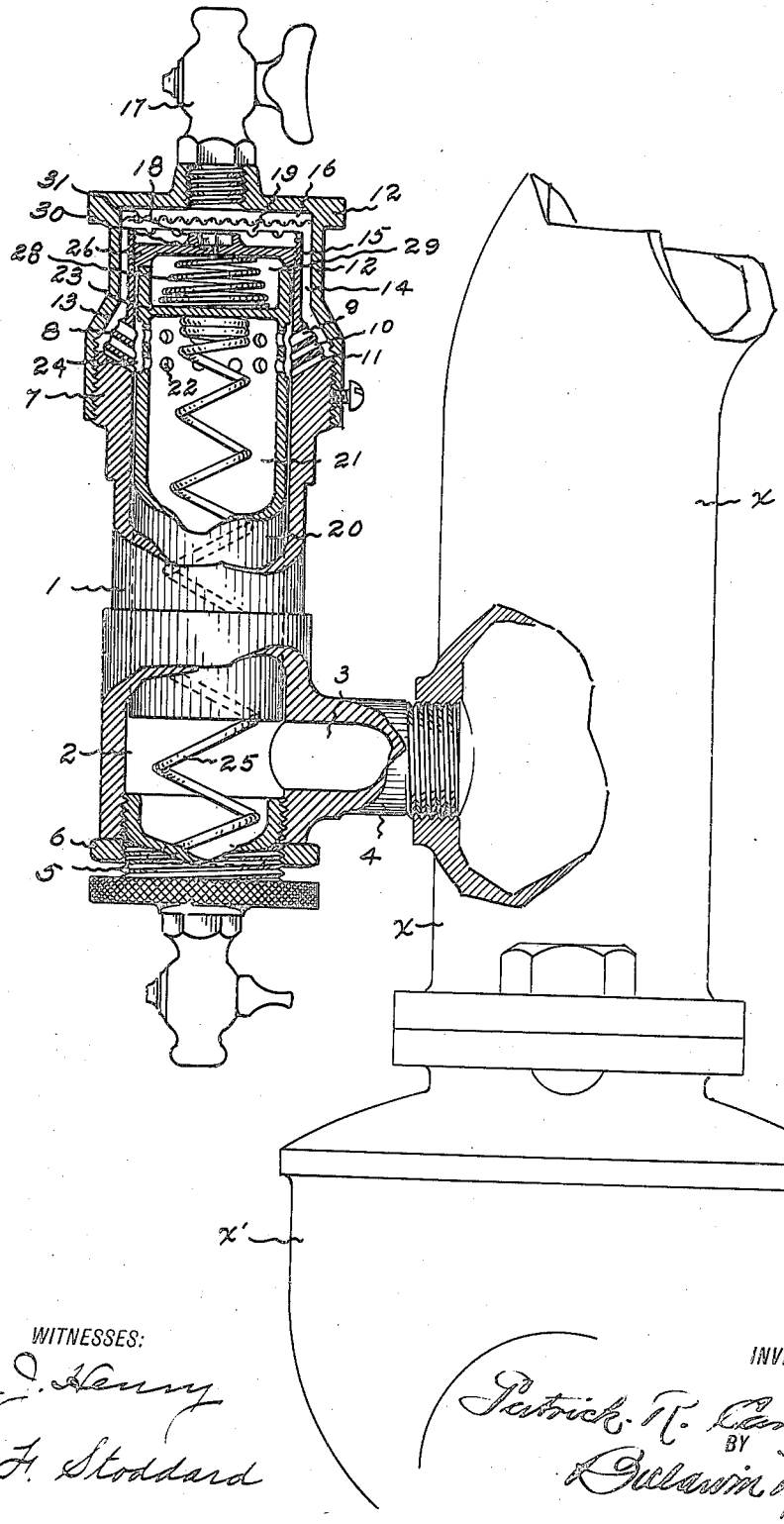
P. R. CAMPION.

AUXILIARY AIR INLET DEVICE FOR INTERNAL COMBUSTION MOTORS.

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1,301,649. Patented Apr. 22, 1919.



WITNESSES:

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PATRICK R. CAMPION, OF SAN FRANCISCO, CALIFORNIA.

AUXILIARY AIR-INLET DEVICE FOR INTERNAL-COMBUSTION MOTORS.

1,301,649. Specification of Letters Patent. Patented Apr. 22, 1919.

Application filed April 28, 1914. Serial No. 834,957.

To all whom it may concern:

Be it known that I, PATRICK R. CAMPION, a citizen of the United States, residing in the city and county of San Francisco, State of California, (whose post-office address is 1741 La Salle Ave.,) have invented a new and useful Improvement in Auxiliary Air-Inlet Devices for Internal-Combustion Motors, of which the following is a specification.

Among the objects of this invention are:

To supplement the operation of carbureters, by introducing free air into the mixture delivered from the carbureter;

To automatically control the time, and the quantity of air admitted to the manifold in accordance with the duty imposed upon the motor;

To provide means for automatically introducing auxiliary air into the intake manifolds of internal combustion motors, when the vacuum decreases and to decrease the air supply when the vacuum increases.

This invention applies more particularly to internal combustion motors, supplied with a fuel mixture through a manifold or intake pipe attached to a carbureter, wherein hydrocarbon fuels are mixed with air, to form combustible vapors or gases, to be ignited in the engine combustion chamber, for the generation of power.

In the conventional internal combustion motor, vacuum is created in the intake pipe during the suction stroke or cycle; this suction draws air through the carbureter wherein it is impregnated with the fuel in various ways, principally by spraying from a nozzle or nozzles communicating with the fuel supply.

Under normal conditions, when the motor is running at a fixed speed under a constant load, the conventional carbureter described operates more or less satisfactorily. In motors for use in automobiles, tractors, hoists, and marine work, wherein the speed is variable and the load inconstant, the vacuum rises and falls so abruptly that fuel is wasted by an over rich mixture, or the motor starved by a lean or imperfect proportion of fuel and air, particularly under rapid acceleration.

The drawings illustrate an auxiliary air intake valve, constructed in accordance with this invention, in side elevation, broken away in cross section to disclose the internal construction and arrangement of the parts, and applied to the intake pipe above the carbureter.

In detail the construction illustrated in the drawing includes the outer shell 1, having the internal bore 2 therethrough, communicating with the passage 3 through the attaching nipple 4, screwed into the intake pipe X. The lower end of the bore is closed by the screw cap 5, internally threaded therein, and locked by the jam nut 6. The upper portion of the shell 1 is provided with the enlargement 7, having the annular tapered shoulder 8 thereon, through which the inclined holes 9, 10, and 11, are bored, communicating with the internal bore 2.

The upper end of the casing is inclosed within the screw cap 12, threaded on to the enlarged portion 7, and inclosing the upper end of the casing. The screw cap 12, has the annular inclined face 13, parallel with the surface 8, to and from which it is regulated by turning the cap 12 threaded on the enlargement 7, to regulate the quantity of air flowing through the holes 9, 10, and 11, from the annular space 14, between the inside of the cap and the upper extension 15 of the casing. This annular space 14 communicates with the upper space 16 in the cap, communicating with the petcock 17, controlling the atmospheric inlet to the space 16. The air admitted through the petcock passes through the filtering screen 18, laid across the castellated or notched top of the extension 15, the air passing directly into the mouth of the passage 14 and through the notches 19. It is the function of the screen to filter dust and obstructive matter admitted through the inlet 17.

The hollow piston 20 is introduced into the bore 2 of the casing within which it has a suction or sliding fit. This piston is tubular having the inner chamber 21, provided with the perforation 22 near the head 23 which closes the top of the piston. The perforations 22 communicate with the annular groove 24, sunken into the outer surface of the piston. In the normal position this groove 24 encompasses all the inlet holes 9, 10 and 11, delivering the air passing therethrough to the openings 22 in the piston; the air thus admitted passing downward and through the passage 3 to the intake X, the piston acting as a slide valve.

The piston 20 is supported by the coil spring 25, seated in the cap 5 at the bottom, and encircling a stud formed centrally in

the head 23 at the top. The rise of the piston is determined by the abutment of its upper edges with the threaded disk 26, internally threaded into the extension 15 of the casing. The tension of the spring 25 is regulated by screwing the cap 5 in or out of the casing, locking it in the desired position by the nut 6.

The vacuum created in the intake pipe by the suction of the motor, sucks the piston 20 downward against the tension of the spring 25, drawing free air through the holes 9, 10, and 11 and into the piston as described, from whence it is drawn into the intake pipe. For example, presume that the intake pipe is supplying the manifold of a multi cylinder engine, with four or more cylinders, which create a more or less constant vacuum within the manifold.

At low engine speed the vacuum created is relatively high. At such speeds the motor is at the greatest disadvantage, being either slowed down by an access of load, or being throttled down, reducing the momentum in the fly wheel, throwing extra labor on the crank shaft in overcoming the back pressure of the compression cycle; this condition calls for a rich slow burning mixture in the combustion chamber. Reference to the drawing will show, that this condition will suck the piston downward, until the head 27 progressively closes the holes 9, 10, and 11, when all of the admission to the manifold must pass through the carbureter X′, which gives a rich mixture, unadulterated by auxiliary air through this device. As the engine speeds up under the increased opening of the throttle and the fly wheel gathers momentum the vacuum will drop, which permits the expansion of the spring 25, causing the piston to rise progressively opening the holes 11, 10, 9, admitting air to the intake pipe in quantities determined by the tension of the spring 25, that is regulated according to the suction power of the motor. The maximum and minimum action of the piston 20 has been described, but it is obvious that the range of its operation will be determined by the behavior of the motor. In practice with the device properly regulated the piston 20 floats up and down, sensitive to the slightest variation in vacuum, admitting just the right amount of air to maintain the most efficient mixture.

To prevent the piston hammering against the disk 26 when suddenly released which often happens as upon the rapid opening of the throttle, the spring 28 is interposed between the disk 26 and the head 23, to supplement the air cushioning action in the confined space 29, which is vented through the small opening 30, and to control the gradual rise of the piston 20, as in a dash pot. The spring 28 expands as the spring 25 contracts. The spring 28 being of light tension does not materially effect the action of the spring 25, except for the purpose specified, the tension of this spring may be regulated by screwing the disk 26 up and down, the wrench socket 31 being provided for that purpose.

It is desirable to make the hole 9 at the top, larger than the hole 11 at the bottom of the piston stroke. This graduation of the series causes the air to be cut off gradually and admitted gradually, at each end of the maximum piston stroke. The admission of air through these holes is regulated in volume by the screw cap 12. As the cap is screwed downward the plane 13 approaches the plane 8, cutting off the air supply. Backing off the cap 12 has the reverse effect, giving a very fine micrometric adjustment of the volume of air, according to the capacity of the motor. This regulation can be made during the performance of the motor, and under various conditions, until the exact regulation is determined and fixed by the set screw 31, threaded in the cap 12 and setting against the threads on the enlargement 7.

Practice has demonstrated, that the use of this invention in conjunction with the various forms of carbureters, has permitted the substitution of low grade fuel, such as heavy distillates in highly refined automobile motors, heretofore operatable only with gasolene and other such high grade hydrocarbons. This benefit is due to the increased combustion efficiency, following the introduction of free air as an oxidizing agent, at the proper period in the operation of the motor. A motor pulled down to low speed under a heavy load requires a slow burning mixture with the maximum of heat units, that will continue to burn and expand throughout the power stroke, or as much thereof as may be. The same motor, at high speed with the load under momentum will operate with greater economy on a lean mixture, created by the admixture of free air through this device.

With this device installed, sudden opening of the throttle, as in accelerating, does not throw a sudden pull on the carbureter, resulting in a gulp of fuel; but releases the spring 25 opening an inlet through the holes 11, 10, or 9 or all of them, thus drawing in pure air instead of an excess of fuel.

Having thus described this invention, what I claim and desire to secure by Letters Patent is:

1. A device of the character described comprising a casing provided with an air inlet passage, an annular air chamber communicating therewith, suction passages communicating with said chamber, and an air outlet, means for controlling the volume of air passing from said annular air chamber through the suction passages, a tubular

valve member mounted to reciprocate within said casing and having perforations in the wall thereof positioned to coincide with said suction passages, said valve member having a shut-off portion contiguous to the perforations, said valve member communicating at one end with the interior of said casing, and a spring for normally maintaining said valve member with its perforations in register with said air passages, said valve being movable under suction in opposition to said spring to bring said shut-off portion opposite to said air passages.

2. A device of the character described comprising a casing provided with an air passage, an annular air chamber communicating therewith, suction passages communicating with said chamber, and an air outlet, means for controlling the volume of air passing from said annular air chamber through the suction passages, a tubular valve member mounted to reciprocate within said casing and having perforations in the wall thereof positioned to coincide with said suction passages, said valve member having a shut-off portion contiguous to the perforations, said valve member communicating at one end with the interior of said casing, a spring for normally maintaining said valve member with its perforations in register with said air passages, said valve member being movable under suction in opposition to said spring to bring said shut-off portion opposite to said air passages, and means for variably controlling the air entering said annular chamber.

3. A device of the character described comprising a casing provided with air passages extending through the wall thereof and also having an air outlet near one end, a tubular valve member mounted to reciprocate within said casing and having perforations in the wall thereof and a shut-off portion contiguous to the perforations, said valve member communicating at one end with the interior of the casing, a spring for normally maintaining said valve member with its perforations in register with said air passages, said valve member being movable under suction in opposition to said spring to bring said shut-off portion opposite to said air passages, a cap adjustably mounted upon said casing and having an air inlet, said cap having a portion shaped to provide an annular air chamber around said air passages, and means for controlling the volume of air entering said chamber.

4. A device of the character described comprising a casing provided with air passages extending through the wall thereof and also having an air outlet near one end, a tubular valve member mounted to reciprocate within said casing and having perforations in the wall thereof and a shut-off portion contiguous to the perforations, said valve member communicating at one end with the interior of said casing, a spring for normally maintaining said valve member with its perforations in register with said air passages, said valve member being movable under suction in opposition to said spring to bring said shut-off portion opposite to said passages, an adjustable stop for said valve, and means coöperating with said stop for preventing hammering of said valve member.

5. A device of the character described comprising a tubular casing having a tapered annular surface thereon; a cap telescoping over said casing and having a tapered surface parallel with said annular surface; holes extending through said casing from said tapered surface to the interior of the casing; a piston slidable in said casing, and having an annular groove corresponding with said holes; an adjustable cap closing the bottom of said casing; a spring interposed between said cap and said piston, and normally holding said piston in the open position.

In testimony whereof, I have hereunto set my hand this 20th day of April, 1914.

PATRICK R. CAMPION.

Witnesses:
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