July 31, 1923. 1,463,532

W. F. KRICHBAUM

AUTOMATIC AIR VALVE FOR INTERNAL COMBUSTION ENGINES

Filed Dec. 18, 1919

Fig. 1.

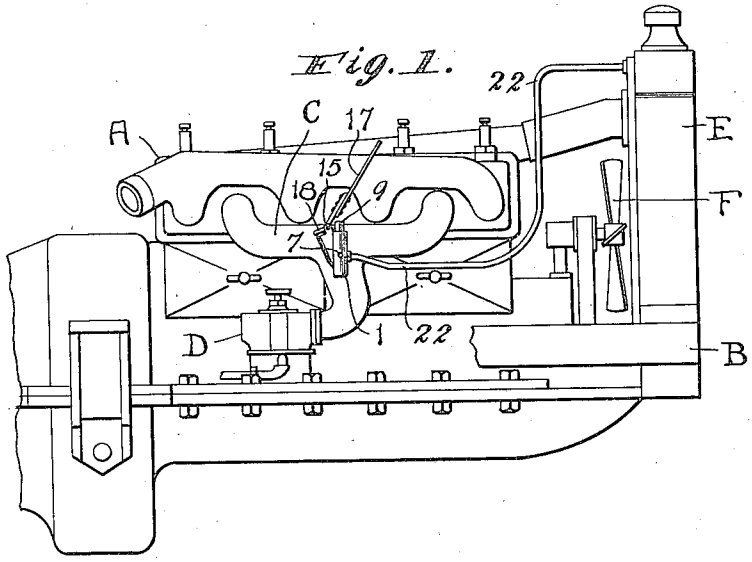


Fig. 4.

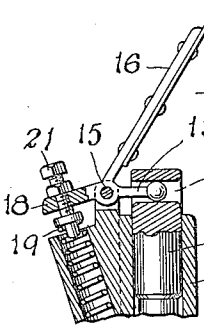


Fig. 3.

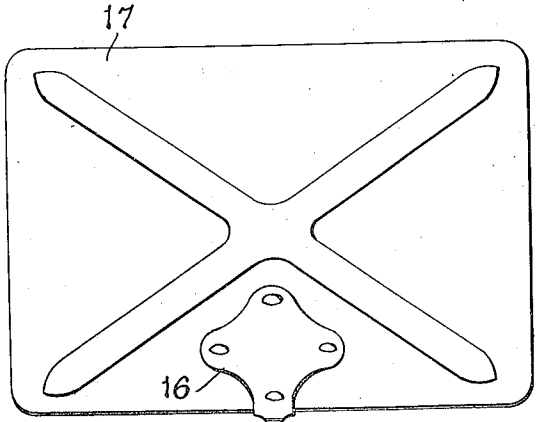
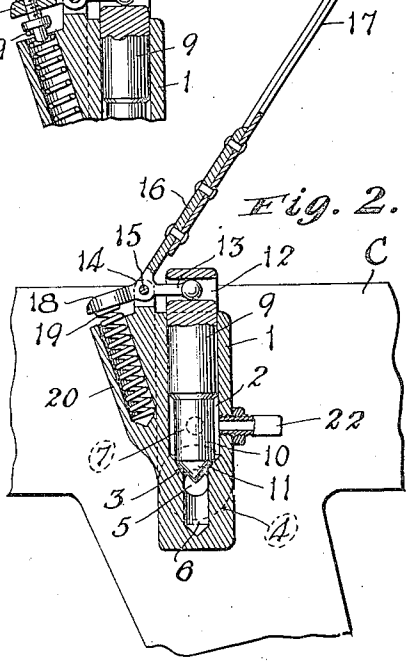
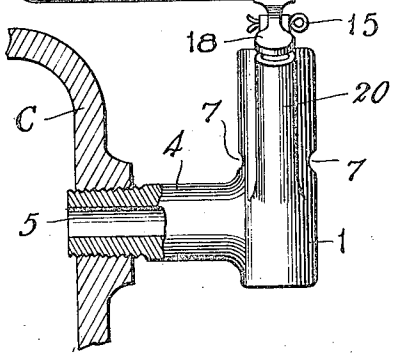


Fig. 2.





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UNITED STATES PATENT OFFICE.

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AUTOMATIC AIR VALVE FOR INTERNAL-COMBUSTION ENGINES.

Application filed December 18, 1919. Serial No. 345,857.

To all whom it may concern:

Be it known that I, WILLIAM F. KRICHBAUM, a citizen of the United States, and a resident of Irvington, in the county of Essex and State of New Jersey, have invented new and useful Improvements in Automatic Air Valves for Internal-Combustion Engines, of which the following is a specification.

This invention relates to an automatic air valve for internal combustion engines, such as are used in automobiles, airships and the like, for the purpose of controlling the admission of air to the fuel mixture before it reaches the engine cylinders so as to automatically maintain the proper mixture of air and gas at all times and under all conditions.

The objects of the invention are to provide an air valve of the character described embodying novel features of construction which is automatically operated by the air currents produced by motion of the vehicle upon which the valve is mounted; to secure an air valve which ensures proper admission of air to the engine regardless of the inclination of the vehicle as when ascending or descending a hill; to provide a valve which thus ensures proper fuel mixture at all times and under all conditions, eliminating the possibility of foul spark plugs and carbonized cylinders and reducing unnecessary and wasteful consumption of fuel; and to obtain other objects and results as may be brought out by the following description.

Referring to the accompanying drawings, in which like numerals of reference indicate the same parts throughout the several views,

Figure 1 is a side elevation of a conventional internal combustion engine such as used in automobiles, showing an air valve constructed in accordance with my invention applied thereto;

Figure 2 is a vertical sectional view through the valve;

Figure 3 is a side elevation of the valve viewing the same from a position at right angles to that of Fig. 2, and

Figure 4 is a fragmentary sectional view similar to Fig. 2, showing a modification of the invention.

In the specific embodiment of the invention illustrated in the drawings, the valve is shown as applied to the intake manifold of one conventional type automobile internal combustion engine, but it is to be understood that my valve is adapted for use with all types of internal combustion engines mounted on moving bodies, such as airships, motorcycles, and the like.

In the drawings the reference character A designates a conventional automobile internal combustion engine mounted on a chassis B, said engine having the usual fuel intake manifold C to which is connected a conventional carbureter D, and being connected with a water cooling radiator E through which air is circulated by the fan F.

The present embodiment of my invention includes a valve casing 1 which is provided with a valve chamber 2 opening through one end thereof, said valve chamber being formed at its inner end with a valve seat 3. The valve casing 1 is provided upon one side thereof with an integral threaded attaching nipple 4 arranged at substantially right angles to the valve casing and which is adapted to be screwed into the intake manifold C of the engine between the engine and the carbureter D. This nipple 4 is formed with a passage 5 opening into a passage 6 in the valve casing inwardly of the valve seat 3. The valve chamber 2 is open to the atmosphere through air ports 7 in the walls of the valve casing arranged above the valve seat 3. The valve casing is fitted into the intake manifold C of the engine, as by screwing the threaded end of the nipple 3 into an opening 7 formed in the manifold, with the valve casing disposed in a substantially vertical position, as shown by Figures 1, 2 and 3.

A valve stem 9 is slidably mounted in the valve chamber 2, the inner end of said valve stem being reduced in diameter, as at 10, to provide a clearance between it and the walls of the valve casing, the extremity of said inner end of the valve stem being formed with a valve 11 adapted to engage the valve seat 3 to close communication between the air ports 7 and the nipple 4. The outer end of the valve stem 9 is provided with a transverse opening 12 into which is slidably fitted the substantially horizontally disposed arm 13 of a bell crank operating lever 14 pivotally connected at 15 to one side of the top of the valve casing 1. The other arm 16 of the bell crank lever 14 extends upwardly and slightly overhangs the valve stem 9, having attached thereto a metal plate or vane 17. Obviously, movement of the bell crank lever

14 about its pivot 15 will cause sliding of the valve stem 9 to open and close the valve. With the bell crank arm 16 and vane 17 overhanging the valve as shown in the drawings, it will also be seen that by action of gravity the weight of the plate 17 will tend to normally hold the valve closed. In order to ensure closing of the valve under normal conditions, the bell crank lever 14 is provided with an arm 18 which is engaged by a spring 19 housed within an extension 20 formed on one side of the valve casing 1, the tendency of said spring being to force the valve 11 into closed position.

In operation, the valve casing is fitted on the intake manifold C of the engine in a substantially vertical position with the plate 17 inclining forwardly toward the front of the vehicle, as shown by Figures 1 and 2. While the vehicle is at rest the valve 11 is held closed by weight of the plate 17, the spring 19 and the suction of the engine cylinders tending to draw air through the valve. These combined forces are sufficient to maintain the valve closed against the action of the air circulating fan F. However, as the vehicle is started on forward motion the resistance of the air thus confronted acts upon the plate or vane 17 in the manner of the blade of a propeller or the tail of a weather vane so as to force the vane 17 rearwardly. This causes a swinging of the bell crank operating lever 14 about its pivot which raises the valve 11 from its seat 3. As the speed of travel of the vehicle increases the valve is opened wider, while as the vehicle slows down the valve will be gradually closed by the weight of the vane 17, spring 19 and suction of the engine. When the air resistance against the vane 17 becomes less than the combined force of the weight of the vane, the spring 19 and engine suction, the valve will be completely closed. As the valve 11 opens, air is admitted through the ports 7 and nipple 4 to the intake manifold C so as to produce a more perfect fuel mixture.

When a vehicle is ascending an incline, such as a hill, more gas is necessary to produce the required power, and usually under such conditions the fuel mixture is too rich and gas and power consequently wasted. With my valve proper fuel mixture is ensured under all conditions. When the vehicle is ascending an incline the angle of the vane 17 is changed and approaches nearer to vertical position so that less air pressure against it is necessary to open the valve 11, the inclination of the vane 17 compensating for the reduced speed of the vehicle due to ascending an incline so that the valve opens to admit air for a proper fuel mixture. When descending an incline the gas may be entirely cut off, whereupon the valve 11 will admit air to the cylinders which serves in the nature of an air brake to reduce the speed of the vehicle. As the speed of the vehicle is increased by a greater supply of fuel and vice versa, and my valve is opened wider by increased speed, and vice versa, it will be seen that air is automatically admitted to and cut off from the intake manifold at the proper times and in proportion to the amount of fuel being used, whereby a proper fuel mixture is ensured at all times. When the vehicle is suddenly brought to a stop as in a traffic jam, the valve automatically closes to prevent unintentional stopping of the engine, as is often the case when manually operated air valves are used.

For the purpose of adjusting the valve operating mechanism to compensate for the air current of the fan and to provide for opening of the valve under various pressures of air current, the angle of the valve casing 1 may be changed with respect to the vertical by turning the same forwardly or rearwardly on the nipple 4 so as to cause more or less of the weight of the vane to rest on the valve stem 9, and also to change the angle of contact of the air currents with the vane. Adjustment of the valve may also be provided for by mounting an adjusting screw 21 on the spring engaging arm 18 of the bell crank lever 14 which engages the outer end of the spring 19, as shown by Figure 4. By adjusting the screw 21 the pressure of the spring can be varied to cause the valve 11 to be opened by greater or less air pressure on the vane 17.

If it is desired to inject moisture into the engine cylinders to reduce carbon deposits or increase power, a tube 22 may be connected to the top of the radiator E and screwed into one of the ports 7 in the valve casing 1 to conduct the vapors from the top of the radiator to the engine.

While I have shown one form of my invention adapted to be applied to the fuel intake manifold of an internal combustion engine, it will be obvious that the invention is capable of being embodied directly in a carbureter. Furthermore, many modifications and changes can be made in the construction of my invention, by those skilled in the art, without departing from the spirit and scope of the invention, and I do not wish to be understood as limiting myself except as required by the following claims when construed in the light of the prior art.

Having thus described the invention, what I claim is:

1. In a device of the character described, the combination of a casing adapted to be attached to an internal combustion engine and having a valve chamber therein opening through one end thereof, said valve chamber being adapted to communicate with the atmosphere and said engine, a valve reciprocable in said chamber and controlling communication therethrough, said valve pro-

jecting from the open end of said chamber, and a vane pivoted upon the exterior of said casing and connected to said projecting end of the valve, said vane being actuated by air currents to reciprocate said valve.

2. In a device of the character described, the combination of a casing adapted to be attached to an engine, said casing having a valve chamber therein arranged in a substantially axially vertical position, said chamber being adapted to communicate with the atmosphere and said engine, a valve axially reciprocable in said chamber and controlling communication therethrough, and an air impact member pivotally mounted between its ends upon said casing, one end of said impact member being connected to said valve while the opposite end of said impact member overhangs said valve at one side of said pivotal connection whereby the weight of said impact member tends to hold the valve in a closed position, the impact member being adapted to be actuated by air currents to open said valve.

3. In a device of the character described, the combination of a casing adapted to be attached to an internal combustion engine and having a valve chamber therein opening through one end thereof, said valve chamber being adapted to communicate with the atmosphere and said engine, a valve reciprocable in said chamber and controlling communication therethrough, said valve projecting from the open end of said chamber and having the projecting portion formed with a recess, and a bell crank lever pivotally mounted on said casing exteriorly thereof with one arm arranged in said recess and the other arm carrying a vane to be actuated by air currents to actuate said valve.

WILLIAM F. KRICHBAUM.