Jan. 30, 1923. 1,443,554

F. W. ANDREWS.
AUXILIARY AIR VALVE FOR ENGINES.
FILED JAN. 3, 1919.

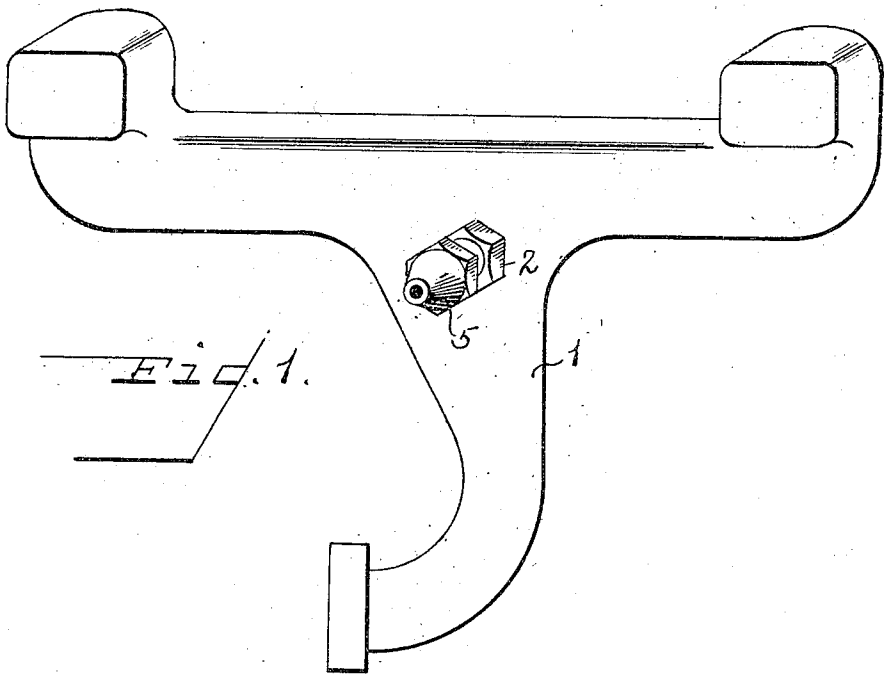


Fig. 1.

Fig. 2

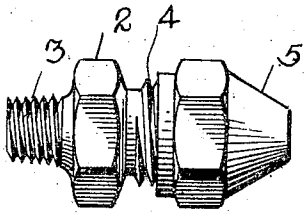
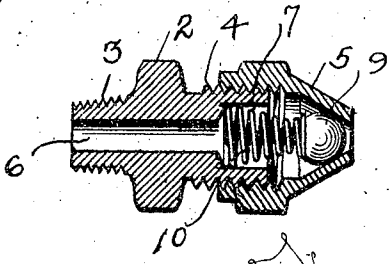


Fig. 3



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UNITED STATES PATENT OFFICE.

FRANK W. ANDREWS, OF WAPAKONETA, OHIO.

AUXILIARY AIR VALVE FOR ENGINES.

Application filed January 3, 1919. Serial No. 269,430.

To all whom it may concern:

Be it known that I, FRANK W. ANDREWS, a citizen of the United States, residing at Wapakoneta, in the county of Auglaize and State of Ohio, have invented certain new and useful Improvements in Auxiliary Air Valves for Engines, of which the following is a specification.

My invention relates to explosive engines and more particularly to a compensating valve affording an auxiliary supply of air to the intake manifold of the engine independent of the carburetor, in automatically regulated proportions, thereby varying the richness of the explosive mixture in accordance with conditions of use.

The object of the invention is to simplify the structure as well as the means and mode of operation of such devices, whereby they are not only cheapened in construction, but will be more efficient in operation, positive in action, automatic, sensitive to variations of temperature, and unlikely to get out of repair.

A further object of the invention is to provide an improved thermostatic valve control means whereby the admission of air will be varied in accordance with variations of temperature, both as to atmospheric temperature and the heat developed by the engine.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof and the mode of operation, or their equivalents, as hereinafter described and set forth in the claims.

Referring to the drawings, Fig. 1 is a perspective view of an intake manifold for an explosive engine to which the auxiliary air supply valve has been applied. Fig. 2 is a side elevation of the valve forming the subject matter hereof. Fig. 3 is a longitudinal sectional view thereof.

Like parts are indicated by similar characters of reference throughout the several views.

It has been found in practice that for economical operation of explosive engines the richness of the explosive mixture should vary inversely with the speed and temperature of the engine.

It is obvious that with increased speed the temperature of the engine increases. Likewise it is found advisable to vary the richness of the explosive mixture with variations of atmospheric temperature. When the engine is cold from long idleness, or on a cold day the engine starts sluggishly and requires an explosive mixture much richer in hydro-carbon fuel than on a warm day or after the engine has been "heated up" by long operation.

Various attempts have been made to provide compensating control features in the carburetor to automatically regulate the proportion of air and fuel in the mixture. Such constructions have not been found satisfactory, and it is found that the tendency when operating at high speed is to draw into the cylinders a mixture too rich in hydro-carbon fuel. The present invention is designed to afford a supplemental supply of air independent of the carburetor which will be effective only after the engine has been placed in full operation and will thereafter correctly and automatically proportion the supply of air to the actual needs of the engine. While spring operated valves operated by the suction of the engine have been heretofore known in this art, in the present invention the introduction into such constructions of a thermal factor whereby the resistance to the suction effect or the action of the valve under air pressure superinduced by the vacuum within the manifold is further modified by the variation of temperature. This is a most important feature of air regulation, as it enables the maintainance of the fuel supply at a more uniform temperature, avoiding extreme fluctuations in the character and quality of the fuel, and automatically reduces the proportion of fuel in the highly heated charges at which time the lesser quantity of more highly volatilized fuel affords equal efficiency, thereby conserving the fuel.

The automatic compensating device forming the subject matter hereof is connected in the intake manifold 1 of the engine, intermediate the carburetor and the entry ports into the cylinder. The valve comprises a main body portion having a polygonal head 2 with a screw threaded extension 3 for engagement in the manifold wall. At the opposite side of the head 2 the body portion is screw threaded at 4 for the reception of a tapered nozzle 5 of frusto-conical form, adjustably mounted upon the body

portion. The body portion is provided with a longitudinal bore 6, counterbored at 7 to form a spring seat and chamber. Seated within the tapered interior of the conical nozzle 5 is a ball valve 9. The ball 9 is held seated and closing the orifice of the nozzle 5 by a tapered helical spring 10 seated at one end against the shoulder formed by the counter bore of the main body portion and at its opposite end engaging the rear side of the ball 9. This spring 10 is thermostatic in character and action, being formed of heat sensitive material. This spring 10 may be formed from any suitable material having the characteristics of relaxing when subjected to increased temperature, and becoming more resistant or more stiff when cold.

While any suitable material or alloy having heat sensitive properties, whereby a variation of temperature correspondingly varies the resistance of the spring, may be employed, a material found quite suitable is a spring wire having a very high percentage of copper, alloyed with a limited amount of "bell metal".

At low temperatures the thermostatic spring 10 affords its greatest resistance to the opening movement of the ball valve 9. This initial resistance can be readily varied to agree with the conditions of use, the type or make of engine and the desire of the driver by the adjustment of the tapered nozzle 5. By the screw threaded adjustment of the nozzle the spring is placed under more or less tension. Having been initially set to the desired tension the valve will open more or less to regulate the admission of air under the influence of the suction effected by the engine operation, or rather the preponderance of air pressure over that within the manifold. However the degree to which the valve opens and the charge of air admitted is not always proportionate to the degree of vacuum produced, as in other valves of this character. Sometimes a low vacuum will induce a large charge of air and a high vacuum a small charge of air and vice versa. While the suction affords the valve actuating means the effect of the operation is to a considerable extent regulated by the variation of resistance of the spring 10. This spring being of thermostatic character varies its resistance with variations of engine and external temperature. At low temperature as on a cold day or after the engine has stood idle, the thermostatic spring 10 will be more resistant regardless of the degree of vacuum, while on a warm day or after the engine is in full operation and "heated up", the thermostatic spring will grow less resistant and will so yield more readily, and admit an increased charge of air, even under low vacuum conditions.

While the valve is operated by suction and at a given temperature the opening of the valve will vary in accordance with the suction or extent of the vacuum within the manifold, the operation of the valve will also be varied at a given constant suction or vacuum effort in accordance with temperature variations, thus one method of control overlaps or interlocks with the other in such way as to effect an ideal balanced regulation dependent upon both suction and temperature.

From the above description it will be apparent that there is thus provided a device of the character described, possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportion, detail construction, and arrangement of parts, without departing from the principle involved, or sacrificing any of its advantages.

While to comply with the statute, the invention has been described in language more or less specific as to certain structural features, it is to be understood that the invention is not limited to the specific details shown, but that the means and construction herein disclosed comprise but one mode of putting the invention into effect, and the invention is therefor claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention I claim:

1. A compensating valve for internal combustion engines, comprising a body portion adapted to be attached to the manifold of an engine, and counterbored to form therein an annular shoulder, an adjustable nozzle interiorily threaded for engagement with said body portion, the outer end of the nozzle having an apertured tapered extension, a ball valve within the counter bore of the body portion and adapted to seat within such apertured tapered extension of the nozzle, and a helical conical thermo sensitive spring abutting at one end upon the ball valve and at the opposite end upon the annular shoulder of said body portion, the resistance of said spring to the movement of the valve under influence of atmospheric pressure and varying degrees of vacuum within the intake, decreasing with an increase of temperature, substantially as specified.

2. In a valve of the character described, an exteriorly threaded tubular stem, a cap screw threaded upon said stem having an interior conical seat provided with a vent opening at the apex of the conical seat, a ball engaging said seat to close the vent orifice and a thermally sensitive spring abutting upon said stem portion and said ball tending to hold the ball upon the seat said thermally sensitive spring being so constituted

and arranged as to yield more readily to permit the opening of the valve as its temperature rises.

3. In a valve of the character described, a tubular stem portion adapted for engagement with the intake manifold of a hydrocarbon engine, a cap adjustably mounted on said stem having an air inlet orifice therein, a valve member normally closing said orifice, a thermally sensitive spring tending to maintain the valve member in closed position, the tension of said spring being variable by the adjustment of said cap upon said stem and further variable independent of such adjustment inversely as the variations of temperature under the influence thereof.

In testimony whereof I have hereunto set my hand this 26th day of December A. D. 1918.

FRANK W. ANDREWS.

Witnesses:
OTTO J. BOESEL,
VERA L. FISHER.