

UNITED STATES PATENT OFFICE.

GRIDLEY ADAMS, OF CHICAGO, ILLINOIS.

CARBURETER-GOVERNOR.

1,234,995.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GRIDLEY ADAMS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Carbureter-Governors, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved means for furnishing to a carbureter of an internal combustion engine, the air and the liquid fuel necessary for the explosive mixture in a pre-heated condition with the temperature controlled so as to be approximately uniform, notwithstanding variations in the outer air temperature and the initial temperature of the liquid fuel which results from said outer air temperature. In consists in the elements and features of construction shown and described, as indicated in the claims.

In the drawings:—

Figure 1 is a partially diagrammatic view of the nature of an elevation of the parts of the structure constituting this invention for the purpose of showing their general relation to each other.

Fig. 2 is a vertical section of a chamber in which the liquid fuel is pre-heated by the previously pre-heated air supply, section being made axially with respect to the thermostatic devices mounted on said chamber.

In the structure represented in the drawings, 1 is an air supply pipe for conducting air to the carbureter, which is reached ultimately by the terminal pipe member, 16. 2 is a branch of the exhaust pipe from the engine which is shown extending as a coil, 2^a, within the air supply pipe, 1. It will be understood that after its emergence at the end of said coil portion, said exhaust pipe branch may rejoin the main exhaust pipe, not shown, or extend to the muffler, not shown. 3 is an auxiliary air inlet branch leading into the air supply pipe, 1, at a point beyond the heating coil, 2^a. 4 is a chamber into which the air supply pipe, 1, leads after junction therewith of the auxiliary air supply pipe, 3. 5 is a liquid fuel supply pipe which is extended into the chamber, 4, and extends as a coil, 5^a, therein and there-through, emerging therefrom at the farther end as the pipe, 5^b, and extending thence to the float chamber, 6, of the carbureter. A valve, 7, is provided to control the auxiliary

air inlet, 3. 8 is a chamber casing interposed in the liquid fuel supply pipe, 5, anterior to the coil, 5^a, in said chamber, 4. It is conveniently mounted on the top of the chamber, 4, closing an opening, 4^a, in the top thereof. 9 is a thermostatic device consisting of a bi-metallic coil, the outer end of which is secured to the casing, 8, the inner end being secured to a hollow shaft, 10, which is journaled in the top and bottom walls of said casing and extends out through the bottom wall, and below the bottom wall where it extends in the opening, 4^a, in the top of the chamber, 4. It has rigid with it a lever arm, 11, extending off radially, and having the end bent into direction parallel with the said tubular shaft, as seen at 12. To said offset end portion, 12, of said lever arm, there is secured the outer end of a thermostatic element, 14, similar to the thermostatic element, 9, the inner end of said thermostatic element, 14, being rigidly connected to a shaft, 15, which extends through the hollow shaft, 10, and protruding above the casing, 8, into the auxiliary air inlet branch, 3, constitutes the stem of the valve, 7. It will be observed that the thermostatic element, 9, is exposed to the temperature of the liquid fuel supply before the latter has been heated by the air in the chamber, 4, and that the thermostatic element, 14, is exposed to the temperature of the air in said chamber, 4. The direction of coiling of the thermostatic element, 9, is such in view of the disposition of the two metals of which said thermostatic element is composed,—that having the higher coefficient of expansion being exterior,—that the colder the liquid fuel passing through the casing, 8, and acting upon said thermostatic element 9, the farther the outer end of the thermostatic element, 14, will be carried in the direction for closing the valve, 7; and the thermostatic element, 14, having the same disposition of its two metal members, as the thermostatic element, 9, is coiled in such direction that the warmer the air in said chamber, 4, the farther the inner or valve-stem connected end of said thermostatic element, 14, is moved around in direction for opening the valve. The result, it will be seen, is that the amount of air admitted through said auxiliary air inlet to temper the air which has been previously heated in the pipe, 1, by the exhaust gases passing through the coil, 2^a, will be increased by a rising temper-

ature in the air in the chamber, 4, and also will be increased by a rise in temperature of the liquid fuel. Thus, the hotter the exhaust gases, and the warmer the atmosphere, and the warmer in consequence the liquid fuel in the pipe, 5, and the mixed air coming into the chamber, 4, the more outer air will be admitted for cooling it; but this will be affected also by the temperature of the liquid fuel, which if it is quite cold, will cause the thermostatic element, 9, to adjust the thermostatic element, 14, so as to admit less cooling air through the auxiliary air inlet than if said liquid fuel is quite warm.

The thermostatic devices, 9 and 14, will be constructed and proportioned with respect to the parts which are operated by them and the passages in which they are located and the quantity of air and liquid fuel to be affected, so as to cause the liquid fuel at its emergence from the end of the coil, 5^a, in the chamber, 4, to have a predetermined temperature judged most desirable for passing to the carbureter. This result will be accompanied by a varying temperature of the air emerging from the chamber, 4, which will be warmer or cooler, according to the outside atmospheric temperature and that of the exhaust gases; but in any event, it will be at a higher temperature than the liquid fuel issuing from the coil, 5^a, because its own temperature at the entering end of said chamber, 4, will have been enough higher than the temperature of the liquid fuel entering at that end to adapt it to raise the temperature of the liquid fuel at the emergence of the latter to the desired point, and to do this the air must itself carry an excess of heat above the temperature which is to be produced in the liquid fuel. It is considered desirable that the air and the liquid fuel should reach the carbureter at substantially the same temperature, so that the temperature of the resultant mixture will not be affected by any variation in the proportions of the air and liquid fuel, such variation of proportions being made constantly for reasons well understood in respect to the operation of internal combustion engines. It is therefore desirable to provide means for reducing the temperature of the air which emerges from the chamber, 4, to the temperature of the oil which has been produced by the exposure of the liquid fuel to the previously higher temperature of the air in the chamber, 4. For this purpose there is provided a second auxiliary air inlet, 20, for admixture of outer air with the air emerging by way of the pipe, 16, from the chamber, 4, and a thermostatic device, 17, similar to those already described is located in the pipe, 16, beyond the air inlet so as to be exposed to the temperature of the air after the admixture of an additional quantity admitted

through said second auxiliary air inlet, and this third thermostat is operatively connected in substantially the manner already described in respect to the other thermostats with the valve, 21, which controls said second auxiliary air inlet. The position of the elements of said thermostatic device and the direction of coiling of the same for connection with the stem, 22, of said valve, 21, being such as to cause the valve to be opened more or less according as the temperature of the air to which the thermostatic element is exposed is higher or lower; with the result of holding the valve at a position to yield a substantially predetermined temperature of the air beyond said thermostatic device. The pipe, 16, beyond said third thermostatic device leads to the carbureter air intake at 23, and the liquid fuel conducted by the pipe, 5^b, to the float chamber, 6, at the same temperature as the air delivered to the carbureter intake is conducted at substantially that temperature from the float chamber by the pipe, 5^c, to the nozzle, 25, at which it is discharged for mixture with said air. 26 represents a valve in the air pipe which may be operated in the usual way for controlling the amount of air admitted to the carbureter. It will be understood that this valve may be in any position and operated in any manner for this purpose without departing from this invention.

I have described the pipe coil, 2^a, as conducting exhaust gases, but it may conduct hot water from the engine jacket if preferred. The dimensions would be different if the hot water instead of the hot gases were employed, but it is not intended in the drawings to indicate the dimensions for either purpose, such dimensions being left to the judgment of the mechanic according to the type of engine and the convenience in respect to making the proper connections with the hot gases or hot water as the case may be.

I claim:—

1. The combination with a carbureter of an internal combustion engine; an air supply pipe and means for pre-heating the air passing therethrough by the engine fluids; an auxiliary air inlet for admixture of outer air with said pre-heated air; a liquid fuel supply pipe, and means by which it is exposed to the temperature of said pre-heated and admixed air, and two thermostatic devices, one exposed to the temperature of said pre-heated and admixed air, and the other exposed to the temperature of the liquid fuel supply before the latter is exposed to the temperature of said air; and a valve which controls the auxiliary air inlet, both said thermostats being operatively connected for controlling said valve.

2. In combination with a carbureter, an

air supply pipe and means for pre-heating the air passing therethrough by the engine fluids; an auxiliary air inlet for admixture of outer air with said pre-heated air; a
 5 liquid fuel supply pipe and means by which it is exposed to the temperature of said pre-heated and admixed air; a valve controlling the auxiliary air inlet; a thermostatic device exposed to the temperature of said
 10 pre-heated and admixed air, operatively connected with said valve for adjusting it, and a second thermostat exposed to the temperature of the liquid fuel in said liquid fuel pipe, and operatively connected with
 15 the first thermostat for adjusting its temperature-sensitive element.

3. In combination with a carbureter, an air supply pipe and means for pre-heating the air flowing therethrough by the engine
 20 fluids; an auxiliary air inlet for admixture of outer air with said pre-heated air; a chamber through which the mixture flows; a valve which controls said auxiliary air inlet; a thermostatic device exposed to the
 25 temperature of the admixed air in said chamber, and operatively connected for controlling said auxiliary air valve; a liquid fuel supply pipe extending within said chamber for heating the liquid fuel by the
 30 air in said chamber; a second thermostat exposed to the temperature of said liquid fuel anterior to said chamber, said second thermostat being operatively connected with the first for adjusting the latter, and means
 35 for conducting the air from said chamber, and the liquid fuel from said pipe beyond said chamber, to the carbureter.

4. In combination with a carbureter; an air supply pipe and means for pre-heating
 40 the air passing therethrough by the engine fluids; an auxiliary air inlet for admixture of outer air with said pre-heated air; a liquid fuel supply pipe and means by which it is exposed to the temperature of said pre-heated and admixed air; two thermostatic
 45 devices, one exposed to the temperature of

said air and the other exposed to the temperature of said liquid fuel; a valve which controls said auxiliary air inlet, and operative connections from both said thermostats
 50 for controlling said valve; a second auxiliary air inlet for admixture of outer air with said pre-heated and previously admixed air beyond the place at which the liquid fuel pipe is exposed to the tempera-
 51 ture of said air; a third thermostat exposed to the temperature of the air beyond said auxiliary air inlet; a valve which controls said second auxiliary air inlet, and operating connections from said third thermostat
 60 for controlling said valve.

5. In combination with a carbureter, an air supply pipe and means for pre-heating the air passing therethrough by the engine
 65 fluids; an auxiliary air inlet for admixture of outer air with said pre-heated air; a liquid fuel supply pipe and means by which it is exposed to the temperature of said preheated and admixed air; two thermostatic devices, one exposed to the temperature of said air and
 70 the other exposed to the temperature of said liquid fuel; a valve controlling the auxiliary air inlet, the two thermostats each comprising a bi-metallic coil and a shaft to which the inner end of said coil is secured;
 75 a partition separating said coils, the shaft for one of the coils being tubular and having the other shaft extending through it, said tubular shaft being extended through the partition and having at the opposite
 80 side thereof from the coil whose inner end is attached to it, a lever arm, the other coil having its outer end attached to said lever arm, the shaft to which the last mentioned coil is attached at its inner end being opera-
 85 tively connected to the auxiliary air inlet valve.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 13th day of December, 1916.

GRIDLEY ADAMS.