E. G. HODGES.

AIR CONTROL AND HEAT REGULATING DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED MAR. 15, 1919.

1,351,477.

Patented Aug. 31, 1920.

3 SHEETS—SHEET 1.

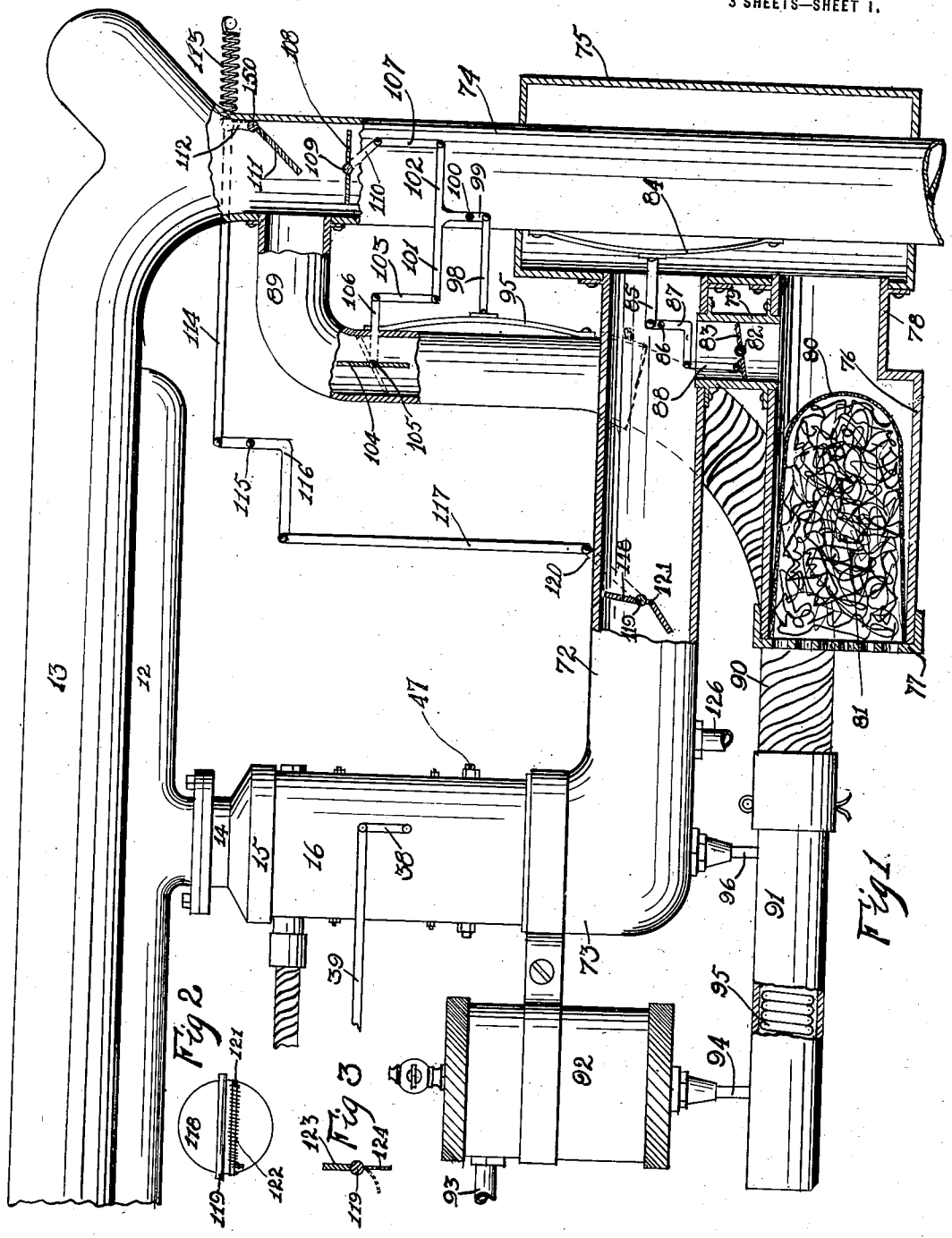


Fig 1.

Fig 2.

Fig 3.

Witness
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3 SHEETS—SHEET 2.

Fig 4

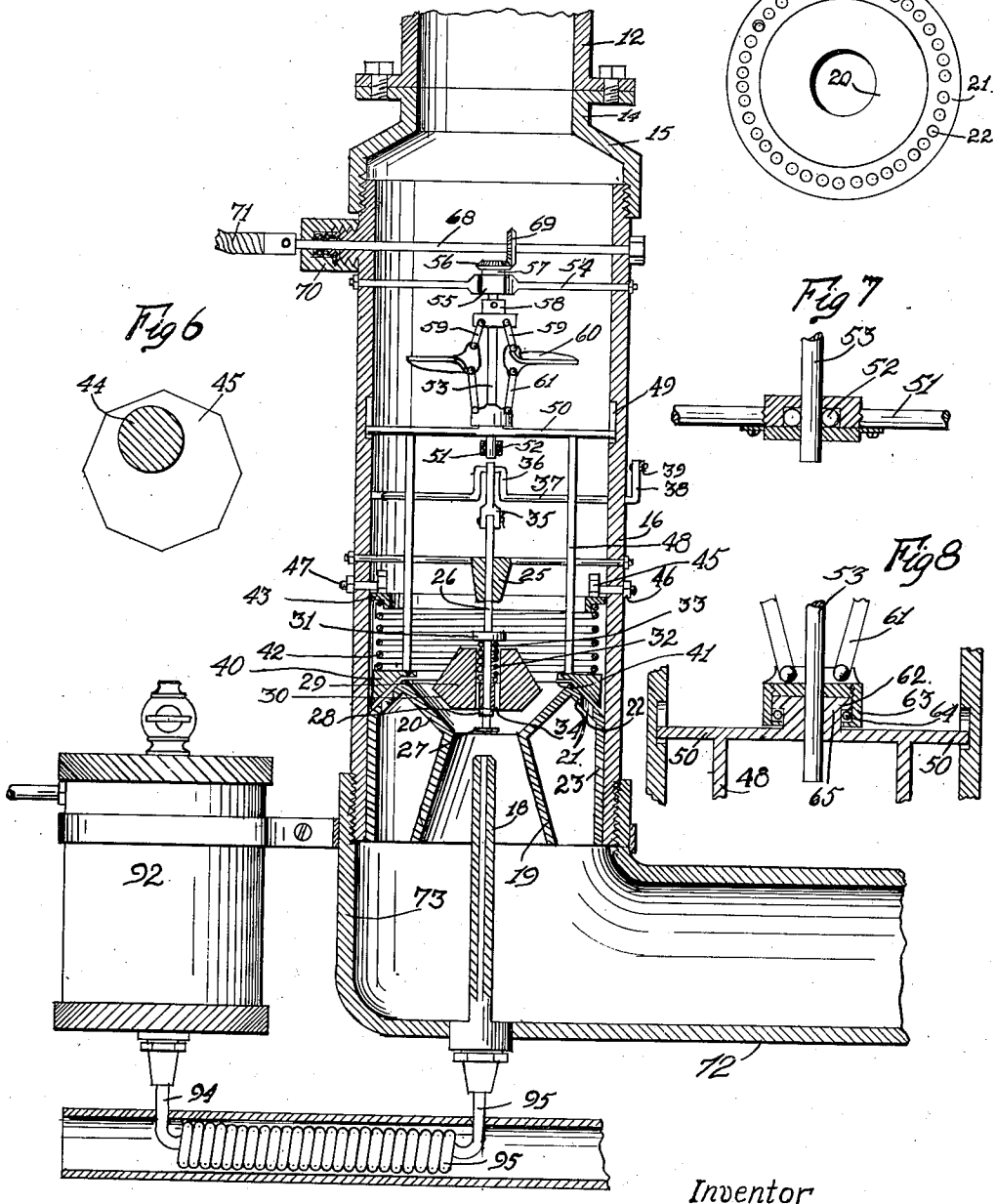


Fig 5

Fig 6

Fig 7

Fig 8

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3 SHEETS—SHEET 3.

Fig 9

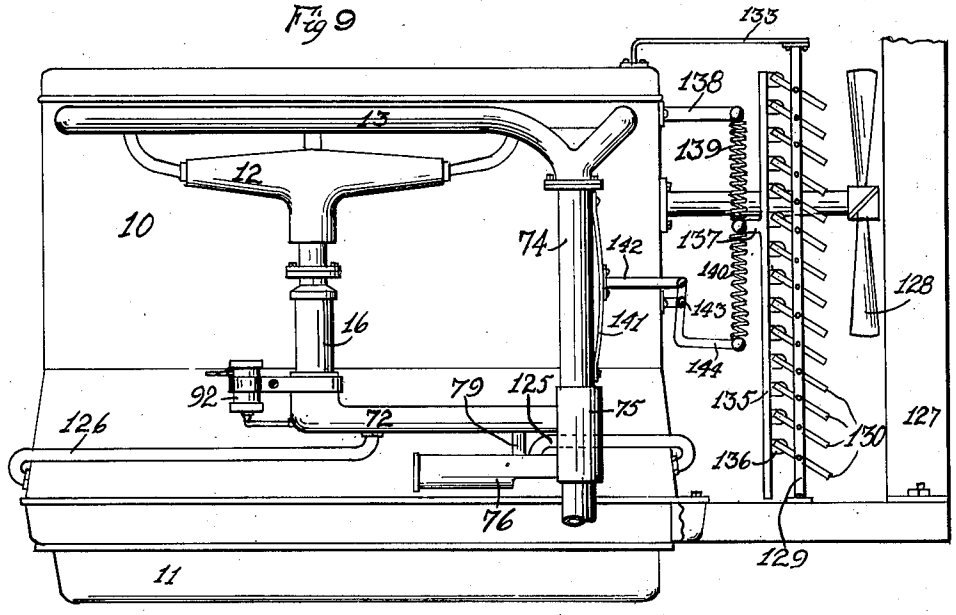
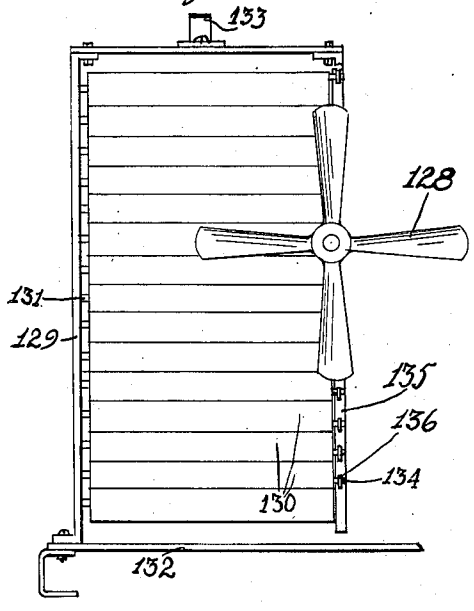


Fig 10.



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UNITED STATES PATENT OFFICE.

EDWARD G. HODGES, OF MARSHALLTOWN, IOWA.

AIR-CONTROL AND HEAT-REGULATING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

1,351,477. Specification of Letters Patent. Patented Aug. 31, 1920.

Application filed March 15, 1919. Serial No. 282,954.

To all whom it may concern:

Be it known that I, EDWARD G. HODGES, a citizen of the United States, and a resident of Marshalltown, in the county of Marshall and State of Iowa, have invented a certain new and useful Air-Control and Heat-Regulating Device for Internal-Combustion Engines, of which the following is a specification.

My invention relates to air control and heat regulating devices for internal combustion engines.

It is an object of my invention to provide such a device which will make possible the efficient and economical use of the heavier hydro-carbon oils in such engine.

A further object is to provide such a device having its parts so constructed and arranged that fuel and air supplied to the carbureter are pre-heated to a substantially predetermined temperature before being fed to the carbureter, for thereby providing more efficient carburization and furnish a properly heated mixture to the engine cylinders.

Another object of my invention is to provide in combination with an internal combustion engine and carbureter, a shutter device the position of which is regulated according to the heat of the engine, which shutter device is also so constructed and arranged as to be subjected to the pressure of air drawn through the radiator body and fan, or passing through the radiator when the vehicle is in motion.

With these and other objects in view my invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, in which:

Figure 1 shows a side elevation of a carbureting device embodying my invention, parts being broken away and parts being shown in vertical cross section.

Fig. 2 is a detail view of one of the valves.

Fig. 3 is a sectional view of a modified form of the valve shown in Fig. 2.

Fig. 4 is a vertical, sectional view through a portion of my improved carbureting device.

Fig. 5 is a top or plan view of the valve seat for the auxiliary air control valve.

Fig. 6 is a side elevation of one of the cam devices for controlling the tension of the spring above the auxiliary air valve.

Fig. 7 is a detail view of one of the ball bearing devices.

Fig. 8 is a detail, sectional view of a portion of the governor mechanism.

Fig. 9 is a side elevation of my device illustrating particularly the arrangement of the shutter and its controlling mechanism, parts being omitted; and

Fig. 10 is a front elevation of the shutter.

In the accompanying drawings I have used the reference numeral 10 to indicate generally an internal combustion engine having the crank case 11, the intake manifold 12 and the exhaust manifold 13.

My improved carbureting device comprises a fitting 14 designed to communicate with the intake manifold and having an enlarged outer end 15 which is fitted to a hollow cylinder 16, which forms the carbureting and mixing chamber.

The cylinder 16 and the member 15 may be provided with coacting screw-threads for fastening them together, as illustrated in Fig. 4.

Within the lower end of the cylinder 16 is mounted a fuel nozzle 18. Surrounding the discharge end of the fuel nozzle is a casing comprising an inner, vertically elongated hollow member 19, the upper end of which stands slightly above the upper end of the fuel nozzle.

At the upper end of the member 19 is an upwardly and outwardly extending annular flange 20 forming a valve seat for the throttle valve hereinafter described.

Extending downwardly and outwardly from the upper edge of the flange 20 is another flange 21, the upper surface of which forms a valve seat for the auxiliary air control valve hereinafter mentioned.

The flange 21 is provided with a series of holes 22 through it as illustrated in Fig. 5.

Extending downwardly from the outer edge of the flange 20 is a cylinder 23 which snugly fits and is secured to the inside of the cylinder 16.

Suitably mounted above the fuel nozzle, within the interior of the cylinder 16 is a bearing 25 in which is mounted a vertically slidable valve stem 26.

On the lower end of the valve stem 26 is

a valve 27 designed in one position to seat on the upper end of the fuel nozzle 18 and close said upper end.

Above the valve 27 on the stem 26 is a collar 28.

Above the collar 28 there is mounted on the valve stem 26, for vertical sliding movement, a block 29 having at its lower portion an annular beveled face 30 forming a valve designed to coact with the valve seat formed by the upper surface of the flange 20.

Above the block 29 on the stem 26 is a collar 31. In the upper portion of the block 29 is a recess 32 in which is received a coil spring 33 which normally projects upwardly out of said recess and engages the collar 31.

In the lower portion of the block 29 are openings 34 extending from the bottom of the recess 32 through the lower portion of said block 29.

Pivoted to the upper end of the stem 26 above the bearing 25 is a suitable link 35, the upper end of which is pivoted on a crank 36 formed on a shaft 37 mounted off center in the walls of the cylinder 16, as illustrated in Figs. 1 and 4.

On the outer end of the shaft 37, outside the cylinder 16, is an arm 38 to which is pivoted a throttle controlling rod 39 designed to be controlled by a lever on the steering post or in any suitable manner.

It will be seen, that, assuming the valve 30 to be in its raised or open position, if the rod 39 is manipulated in a certain way, the shaft 37 will be rotated and the stem 26 will be moved downwardly until the valve 30 seats against the flange 20 which will prevent any passage of air upwardly between the member 19 and the fuel nozzle.

It will be seen that when the stem 26 is moved downwardly to a certain position, the valve 30 will be held seated by the tension of the spring 33, but the valve 27 will still be spaced above the fuel nozzle. In this position of the parts air may pass upwardly between the nozzle 18 and the member 19 and through the holes 34. If, however, the stem 26 is forced downwardly a little farther the collar 31 will force the spring 33 downwardly and the downward movement of the stem 26 will seat the valve 27 on the upper end of the fuel nozzle 18 for closing said fuel nozzle and preventing the drawing of any fuel from the fuel nozzle. The parts are so arranged that at the same time the collar valve 31 seats against the upper surface of the block 29 for preventing any passage of air upwardly through the openings 34.

The manner and construction of the operation of the parts hereinbefore described will be hereinafter more fully described.

The valve 40 has an inwardly extending annular flange 41 which overhangs the outer edge of the flange 20. Above the valve 40 is a coil spring 42 which rests upon said valve 40. At the upper part of the spring 42 is an annular ring 43. Projecting through the wall of the cylinder 16 on opposite sides thereof above the spring 42 and above the ring 43 are shafts 44. On the inner edge of each shaft 44 is an eccentric cam 45. By rotating the shafts 44 to different positions the cams 45 may be rotated to different positions for regulating the tension of the spring 42.

Screwed on to the outer end of each shaft 44 outside the cylinder 16 is a lock nut 46. The outer end of each shaft 44 is grooved, as illustrated at 47, to receive a screw-driver.

Suitable means may be provided for indicating the position of the cams 45.

Extending upwardly from the valve 40 are upright rods 48. Mounted in the cylinder 16 at the upper ends of the uprights 48 for vertical reciprocation, with its ends received in guides 49, is a cross bar 50.

Below the cross bar 50 is a fixed cross bar 51 having at its central portion a ball bearing 52 in which is received the lower end of an upright shaft 53.

Spaced above the cross bar 51 is still another cross bar 54 of similar construction, having at its central portion a ball bearing 55 for the upper portion of the shaft 53.

Fixed on the shaft 53 above the upper ball bearing 55 is a beveled gear 56 having a hub 57 which rests on the upper surface of the outer portion of the ball bearing 55.

Fixed to the shaft 53 just below the bar 54 is a collar 58 pivoted to which are opposite arms 59 which support governor weights 60 which have the form of fan blades.

Pivoted to the weights 60 are downwardly extending links 61 which are pivoted at their lower ends to a collar 62.

Secured to the collar 62 is an annular member 63 forming the outer and lower portions of a ball race 64.

The cross bar 50 is provided at its central portion with an opening through which the shaft 53 extends.

On the central portion of the bar 50 is an upwardly extending member 65 forming the inner and upper member of a ball race 66.

Between the races 64 and 66 are suitable balls 67.

It will thus be seen that when the beveled gear 56 and shaft 53 are rotated rapidly, the fan blade shaped weights 60 will be thrown outwardly by centrifugal force and will thus draw the bar 50 upwardly thereby drawing the uprights 48 and the valve 40 upwardly and unseating said valve against the tension of the spring 42.

For operating the governor device just described, I have provided the following means.

Suitably mounted in the upper end of the cylinder 16 is a shaft 68 on which is a beveled gear 69 which meshes with the beveled gear 56. The shaft 68 is extended out through the walls of the cylinder 16, through a substantially packed bearing 70 and is operatively connected with a flexible shaft 71, which may in turn be connected with a proper moving part of the engine for causing the shaft 71 to rotate according to the speed of the engine.

For filtering and pre-heating the air supply for the fuel mixture I have provided the following means.

A pipe or tube 72 having the elbow 73 is screwed to the lower end of the cylinder 16.

Leading from the exhaust manifold 13 is an exhaust discharge pipe 74. Surrounding a portion of the pipe 74 is a heating drum 75, shown in Fig. 1.

It will be understood that the joints between the pipe 74 and the ends of the heating drum 75 are air tight.

One end of the pipe 72 communicates with the heating drum 75.

Suitably located preferably below the pipe 72 is an air intake pipe 76 having on one end a perforated cap 77 and having at its other end a contracted portion 78 communicating with the lower part of the drum 75.

A by-pass pipe 79 connects the air intake pipe 76 with the pipe 72 near the drum 75 as illustrated in Fig. 1.

At the intake end of the air intake pipe 76 is a suitable strainer 80 which is preferably in the form of a sack and is fitted with filtering material 81. The strainer 80 is preferably of some fine mesh material.

Mounted on a suitable stem 82 in the by-pass pipe 79 is a butterfly valve 83.

Supported on the pipe 74 within the drum 75 is a suitable thermostat device 84, secured to which is a stem 85 projecting into the pipe 72.

Pivoted on a suitable support 86 near one of its ends and within the pipe 72 is a bell crank lever 87. The stem 85 is pivoted to the end of the bell crank lever 87 adjacent to the pivot support 86. The opposite end of the bell crank lever 87 is pivoted to a link 88. The link 88 is pivoted to the valve 83 for actuating said valve.

The parts just described are so constructed that when the thermostat 84 is cold, the valve 83 is held in substantially closed position, for causing air drawn through the cap 77 to pass through the contracted portion 78 of the pipe 76, and thence through the drum 75 to the pipe 72, and from thence to the carbureter.

When, however, the thermostat 84 becomes heated to approximately a certain predetermined temperature, its expansion actuates the bell crank lever 87 for opening the valve 83 and permitting a considerable part of the incoming air to pass through the by-pass pipe 79, for preventing over-heating of the air supplied to the carbureter.

Communicating with the pipe 74, preferably near its juncture with the exhaust manifold 13 is a pipe 89, which may, in the form of my invention shown in the drawings, extend rearwardly and thence downwardly.

The pipe 89 may communicate with a flexible tube or pipe 90, which in turn communicates with a heater tube or chamber 91.

Suitably mounted is a float chamber 92.

A fuel supply pipe 93 leads to the float chamber 92, and a fuel supply pipe 94 leads from the bottom of said chamber. The fuel supply pipe 94 enters the heating tube 91 and is then formed into a coil 95 and then leaves the chamber as at 96 and communicates with the fuel nozzle 18.

For controlling the flow of exhaust gases through the heating tube 91, I have provided the following means.

On the pipe 89 is mounted another thermostat device 95 fixed to which is a stem 98.

The stem 98 is pivoted to a lever 99. The lever 99 is pivoted between its ends on a support 100.

At the opposite end of the lever 99 from the stem 98 are oppositely extending arms 101 and 102. The arm 101 is pivoted to a link 103.

Within the pipe 89 is a butterfly valve 104 mounted on a stem 105 to which is fixed an arm 106. The arm 106 is pivoted to the link 103.

Pivoted to the arm 102 is a link 107. Mounted within the pipe 74 is a butterfly valve 108 mounted on a stem 109. On the stem 109 outside the pipe 74 is an arm 110 which is pivoted to the link 107.

The valves 104 and 108 and their connecting and operating mechanisms are so arranged that when the parts are cold the thermostat 95 tends to hold the arms 101 and 102 in position for holding the valve 108 in its position shown in Fig. 1, where it is closed, and at the same time the valve 104 is in its open position.

It may be mentioned in this connection that the valve 108 is smaller in diameter than the pipe 74, so that it never entirely closes the passage through said pipe.

When the pipe 89 reaches a certain predetermined warmer temperature, the expansion of the thermostat 95 serves to actuate the lever 99 for opening the valve 108 and moving the valve 104 toward closed position.

Suitably mounted in the pipe 74, opposite the upper part of the opening from said

pipe 74 into the pipe 79, is a stem 150 on which is mounted a swinging deflector 111, which in one of its positions stands, as shown in Fig. 1, where it tends to divert the exhaust gases into the pipe 89 and which, in another of its positions, swings toward the wall of the pipe 74 where it does not have such tendency to divert such exhaust gases.

On the stem 150 outside the pipe 74 is an arm 112, shown in dotted lines in Fig. 1.

Connected with the arm 112 is a spring 113 which normally tends to hold the valve 111 in its operative position as shown in Fig. 1.

Pivoted to the arm 112 is a link 114. Suitably mounted near one of its ends on a support 115 is a bell crank lever 116. The end of the bell crank lever 116 nearest the support 115 is pivoted to the link 114 and the other end of the bell crank lever 116 is pivoted to a link 117.

Mounted within the pipe 72 is a butterfly valve 118 having a stem 119, on which outside the pipe 72 is fixed an arm 120, to which one end of the link 117 is pivoted. The stem 119 is preferably arranged substantially horizontally.

The lower part of the butterfly valve 118 is preferably hinged to the upper part thereof below the stem 119 by means of a pintle 121.

On the pintle 121 is a spring 122 which normally tends to hold the hinged portion of the valve 118 alined in the same plane with the other portion thereof.

It will be noted that the faster the speed of the engine the greater will be the pressure of the exhaust gases against the deflector valve 111.

When the valve 111 is forced downwardly from its position shown in Fig. 1, by the pressure of the passing exhaust gases, it will, during the operation just described, move the valve 118 toward open position.

It will also be noted that even though the valve 118 is held in its closed position, whenever a strong enough volume is created in the cylinder 16 for drawing a strong current of air through the pipe 72, the moving current of air in the pipe 72 will tend to swing the hinged portion of the valve 118 toward its position illustrated in Fig. 1.

In Fig. 3 I have shown a modified form of the valve 118.

In the modified form there is provided on the stem 119 a comparatively rigid upper valve member 123 and a comparatively flexible lower valve member 124.

The valve portion 124 has sufficient flexibility so that the air pressure will tend to move it from its position shown in full lines in Fig. 3 toward its position shown by dotted lines in said figure.

A pipe 125 leads from the pipe 76 near the drum 75 to the interior of the crank case, for instance, at the forward end thereof.

Communicating with the interior of the crank case, preferably at the other end thereof, is another pipe 126 which leads to and communicates with the pipe 72 near its junction with the cylinder 16.

For further and more accurately controlling the pre-heating of the air for my carbureting device and for insuring the furnishing of a fuel mixture at a uniform temperature to the engine, I have provided the following device.

In front of the parts hereinbefore described, but rearwardly of the radiator 127 and the fan 128 is an air control device of the shutter type, which I will now describe.

The shutter device about to be described extends from a point adjacent to one side of the hood laterally a sufficient distance to protect the carbureting device, hereinbefore described, from the direct current of air coming through the radiator.

The shutter device comprises a pair of uprights 129, spaced laterally from each other in the machine. A vertically spaced series of shutters 130 is arranged between the uprights 129. Each of the shutters 130 is provided at its opposite ends with spindles 131 which are rotatably mounted in the uprights 129. The spindles 131 are so located that the larger areas of the shutter members 130 are located forwardly of said spindles.

The uprights 129 may be supported in any suitable way, as, for instance, by frame devices 132 and 133.

Each of the shutter members 130 is also provided at one end near its rear edge with a spindle 134. Adjacent to the rear of the shutters 130 is an upright bar 135 having a plurality of forwardly extending ears 136 in which the spindles 134 are rotatably mounted.

In Fig. 10 I have omitted the right-hand upright 129 in order to show the bar 135 and parts connected therewith.

On the bar 135 is a rearwardly extending arm 137. Above the arm 137 is a supporting bracket 138 to which is secured a spring 139. The spring 139 is connected with the arm 137. Also connected with the arm 137 is a downwardly hanging spring 140.

On the pipe 74 is a thermostat 141 on which is a stem 142. Suitably pivoted at 143 near one end is a bell crank lever 144. The end of the bell crank lever nearest the pivot point 143 is pivoted to the stem 142. The other end of the bell crank 144 is secured to the lower end of the spring 140. The arrangement of the parts just described is such that when the engine is cold, the tension of the spring 139 is sufficient to overcome the tension of the spring 140 and hold the shutters 130 in their closed position.

The parts are so arranged that the shutters cannot at any time move farther toward closed position than their positions illustrated in Fig. 9, when the larger areas of the shutters are forwardly of their pivot pintles and inclined downwardly and forwardly therefrom.

When the pipe 74 becomes heated, the expansion of the thermostat 101 operates the bell crank lever 104 for increasing the tension of the spring 140 and thereby drawing the arm 137 downwardly for opening the shutters.

It may be mentioned in this connection that the faster the car travels the greater will be the air pressure against the forward portion of the shutters 130 and such greater pressure will tend to move the shutters 130 toward closed position.

The object of the construction of the parts so as to accomplish the function just mentioned is to maintain substantially the same air circulation between the shutters at all times during the operation of the machine.

I will now describe the practical operation of my improved carbureting device for internal combustion engines.

The parts having been installed on the engine, it will be seen that when the engine is cold the valve 83 will be held in its closed position. The valve 108 is also in its closed position while the valve 104 is in open position.

The deflector valve 111 is in its operative position shown in Fig. 1, while the valve 118 is closed. The valve 40 will be held seated by the tension of the spring 42. The shutters 130 will be closed.

It will be understood that my improved carbureting device may be used with gasolene or the lighter fuels, but is particularly designed to be used with the heavier fuels. When the heavier fuels are used, the engine must be primed with gasolene or the like by any suitable device not here shown.

When the engine is started and the throttle valve is opened by raising the valves 27 and 31 and the throttle valve 30, the suction from the engine will draw air through the pipe 76, the drum 75, the pipe 72, and between the member 19 and fuel nozzle 18 for drawing fuel out of the fuel nozzle.

The air and fuel are then mixed in the cylinder 16 above the fuel nozzle. It will be seen that the air and fuel are drawn around the block 29 which tends to assist in the mixing.

The flange 41 furnishes a sort of beveled plate structure against which the air and fuel strike for breaking up the fuel particles and mixing them with the air. The current of upwardly moving fuel and air which strike the flange 41 assist in raising the auxiliary air valve 40.

The governor 60 will be operated and will tend to thoroughly agitate and mix the air and fuel for making a proper finished mixture.

As the speed of the engine increases the increase in vacuum in the cylinder 16 tends to raise the valve 40. Thus it will be seen that as the speed of the engine increases, the governor member 60 will be thrown outwardly which will tend to draw the uprights 48 and the auxiliary air valve 40 upwardly, whereupon auxiliary air will be drawn through the holes 22 in the valve 21.

It may be noted in this connection that the fan blade shape of the governor members 60 causes said members to serve as a fan for drawing the mixture from the carbureter and for forcing it toward the engine cylinders.

By adjusting the cam 45 the tension of the spring 42 may be varied and regulated for thereby regulating the action of the auxiliary air valve 40.

When it is desired to throttle the engine down as when the engine is running under light load or is idling, the throttle controlling rod 39 may be operated for lowering the block 29 until the valve member 30 seats against the flange 20, without, however, causing the valves 31 and 27 to seat.

In this condition of the parts some air may be drawn through the small holes 34 and a small amount of fuel will be supplied to the engine.

If it is desired to entirely shut off the fuel supply, the stem 26 may be forced downwardly a short distance farther whereupon the valves 27 and 31 will be seated.

It will be noted that when the engine starts, the valve 108 is in its closed position, so that a portion of the exhaust gases will pass through the pipe 89. The deflector valve 111 being then substantially in the position shown in Fig. 1, will also tend to direct exhaust gases into the pipe 89.

The exhaust gases will thoroughly heat the fuel in the pipe 95 so that the fuel passing to the nozzle 18 will be heated.

Insomuch as the valve 83 is closed when the engine is cold, the incoming air for the carbureter after being thoroughly filtered, will then pass through the drum 75 where it will be heated by radiation from the pipe 74 and will then pass through the pipe 72 to the carbureter.

The stronger the current of air through the pipe 72, the more will be the effect on the lower hinged portion of the valve 118. It is obvious that the strength of this moving current of air is dependent upon the suction from the engine.

The faster the engine runs the greater will be the force of the pressure of the exhaust gases against the deflector valve 111,

so that it follows that the faster the engine runs the more of said exhaust gases will pass out through the pipe 74.

While the engine is being started or is run at slow speed, the lower part of the valve 118 will allow sufficient air to pass through the pipe 72 for the engine needs.

As the speed of the engine becomes greater, and more air is needed for the engine, it will be seen that the pressure of the exhaust gases against the deflector valve 111 will tend to move such valve toward its inoperative position, thereby accomplishing two desired results: namely, the allowing of a freer discharge of exhaust gases through the pipe 74, and the opening of the upper portion of the valve 118 for allowing the proper passage of a sufficient supply of air for the fuel mixture.

It will be understood, however, that the passage of exhaust gases through the pipes 74 and 89 is also effected by the thermostat 95 and parts connected therewith.

As the pipe 89 gets hot the thermostat 95 expands for moving the valve 108 toward open position and moving the valve 104 toward closed position.

Insomuch as the thermostat 95 is responsive to the heat in the pipe 89, it will be seen that such thermostat will tend to so control the flow of exhaust gases through the pipe 89 as to maintain the heat in such pipe at approximately a predetermined temperature. As result of the maintaining of substantially a predetermined temperature in the pipe 89, the fuel passing through the coil 95 will be supplied to the fuel nozzle at substantially a predetermined uniform temperature.

When the pipe 74 becomes hot the expansion of the thermostat 84 will cause the opening of the valve 83, thereby permitting a considerable portion of the incoming air to pass through the by-pass pipe 79. Thus the lower the temperature of the pipe 74 the more air will be brought in contact with said pipe 74 for heating the drum 75, and the hotter the pipe 74 becomes the more air will be allowed to pass through the by-pass pipe 79.

When the engine is started the shutters 130 are closed, but as the pipe 74 becomes hot, the expansion of the thermostat 141 increases the tension of the spring 140 and enables said spring to overcome the tension of the spring 139 for moving the shutters 130 toward open position and allowing a freer circulation of air through the shutters.

When, however, the car is being propelled over the ground it will be seen that the current of air through the shutters would naturally be much faster than when the car is stopped.

I have, therefore, arranged the shutters with their greater areas subject to the incoming current of air, as hereinbefore described, so that the force of the air passing rearwardly through the radiator will tend to strike the greater areas of the shutters 130 in front of the pintles 131 for moving the shutters toward closed position.

It should be understood in this connection that while the engine is still cool the spring 139 will be able to hold the shutters closed, but when the engine becomes hot, the spring 139 will not be effective, but the incoming current of air will close the shutters or move them toward closed position, so that the circulation of air rearwardly of the shutters will tend to be more uniform during the operation of the engine and the driving of the car.

It will be seen from the foregoing that the following features of my invention tend to maintain a uniform heat in the air and fuel supply to the carbureter: The fuel is subjected to heat in the heating tube 91. The heat in the heating tube is regulated by the thermostat 95, and the valves controlled thereby. The heating of the air is regulated by the thermostat 84. The circulation of air around the outside of the parts is controlled by the shutter structure hereinbefore described.

Some of the air drawn into the pipe 76 passes through the pipe 125 to the crank case and air from the crank case is drawn through the pipe 126 to the pipe 72.

With the air drawn through the pipe 126 there is carried sufficient oil vapor for properly lubricating the movable parts in the carbureter 16.

It will thus be seen that in my carbureting device for internal combustion engines, I accomplish a number of desired and advantageous results.

The auxiliary air supply is regulated automatically according to the speed of the engine by means of the governor device hereinbefore described.

The governor device also serves to thoroughly agitate and mix the fuel and air, and serves further to assist in forcing the mixture to the engine cylinders.

The action of the auxiliary air control valve may be regulated by the tension of the spring 42.

I pre-heat the fuel supplied to the carbureter, and maintain such fuel supply at substantially a predetermined uniform temperature.

All of the air supplied to the carbureter is thoroughly filtered and is pre-heated and is maintained at substantially a pre-determined uniform temperature.

It is obvious that it is desirable to filter all the air supplied to the carbureter for

keeping dirt and dust out of the carbureter and also out of the engine, valves and cylinders.

Thus the cylinders of an engine equipped with my desire are practically free from road dust and dirt.

Attention is also called to the fact that the desirable results hereinbefore referred to are attained by automatic devices.

Some changes may be made in the construction and arrangement of the parts of my improved carbureting device without departing from the real spirit of my invention, and it is my purpose to cover by my claims any modified forms of structure or use of mechanical equivalents which may be included within the scope of my invention.

I claim as my invention:

1. The combination of an internal combustion engine; a carbureting device; a shutter mechanism at the forward end of said engine; means for controlling the shutter mechanism according to the heat of the engine, said shutter mechanism being so mounted as to be effected by the pressure of the air against said shutter device.

2. The combination of an internal combustion engine; a carbureting device; a shutter mechanism at the forward end of said engine; a spring operatively connected with said shutter mechanism tending to yieldingly hold it in one position of its movement; a spring tending to yieldingly hold the shutter mechanism in another position of its movement; and means for varying the tension of one of said springs according to the heat of the engine.

3. The combination of an internal combustion engine; a carbureting device; a shutter mechanism at the forward end of said engine; a spring operatively connected with said shutter mechanism tending to yieldingly hold it in one position of its movement; a spring tending to yieldingly hold the shutter mechanism in another position of its movement; and a thermostat operatively connected with one of said springs.

4. The combination of an internal combustion engine; a carbureting device; a shutter mechanism at the forward end of said engine; opposed springs operatively connected with said shutter mechanism; and means for varying the tension of one of said springs according to the heat of the engine.

5. The combination of an internal combustion engine; a carbureting device; a shutter mechanism at the forward end of said engine; opposed springs operatively connected with said shutter mechanism; means for varying the tension of one of said springs according to the heat of the engine; said shutter device including a plurality of blades pivotally mounted so as to leave a greater area of the blades on one side of the pivot line and a lesser area on the other side.

6. In a device of the class described, a carbureter casing, a fuel nozzle therein, means for controlling the passage of air around said nozzle, an auxiliary air valve, means for pre-heating fuel supplied to said nozzle, means for pre-heating air supplied to the said carbureter casing, means for controlling the passage of air around the outside of said casing, said means comprising an adjustable shutter mechanism, means for regulating said shutter mechanism according to the heat of the engine, said shutter device having shutter members pivoted at such points that their greater areas are subject to the current of air passing through a radiator or the like, so that said current of air will tend to close the shutter members.

7. The combination of an internal combustion engine with a carbureting device, a shutter air controlling means arranged in front of said carbureting device, an arm operatively connected with said shutter device, springs of different tension operatively connected with said arm, and a thermostat device operatively connected with one of said springs.

8. The combination of an internal combustion engine with a carbureting device, a shutter air controlling means arranged in front of said carbureting device, an arm operatively connected with said shutter device, springs of different tension operatively connected with said arm, a thermostat device operatively connected with one of said springs, said shutter device comprising shutter members pivotally supported so as to leave greater areas on one side of their pivot lines than on the other side, whereby the greater areas will be subject to the pressure of air passing between the shutter members.

9. The combination of an internal combustion engine; a carbureter; means for inclosing said carbureter and engine; said means including a radiator; a shutter device arranged between said radiator and said engine; means for regulating the position of the shutter device according to the heat of the engine; and according to the pressure of air against said shutter device.

10. The combination of an internal combustion engine; a carbureter; means for inclosing said carbureter and engine; said means including a radiator; a shutter device arranged between said radiator and said engine; means for regulating the position of the shutter device according to the heat of the engine; and according to the pressure of air against said shutter device, whereby the shutter device tends to be forced toward closed position when the vehicle is moving and its speed increases.

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EDWARD G. HODGES.