Feb. 11, 1947. L. E. PERRINE 2,415,529

THERMOSTATIC THROTTLE STOP

Filed Oct. 24, 1940 2 Sheets-Sheet 1

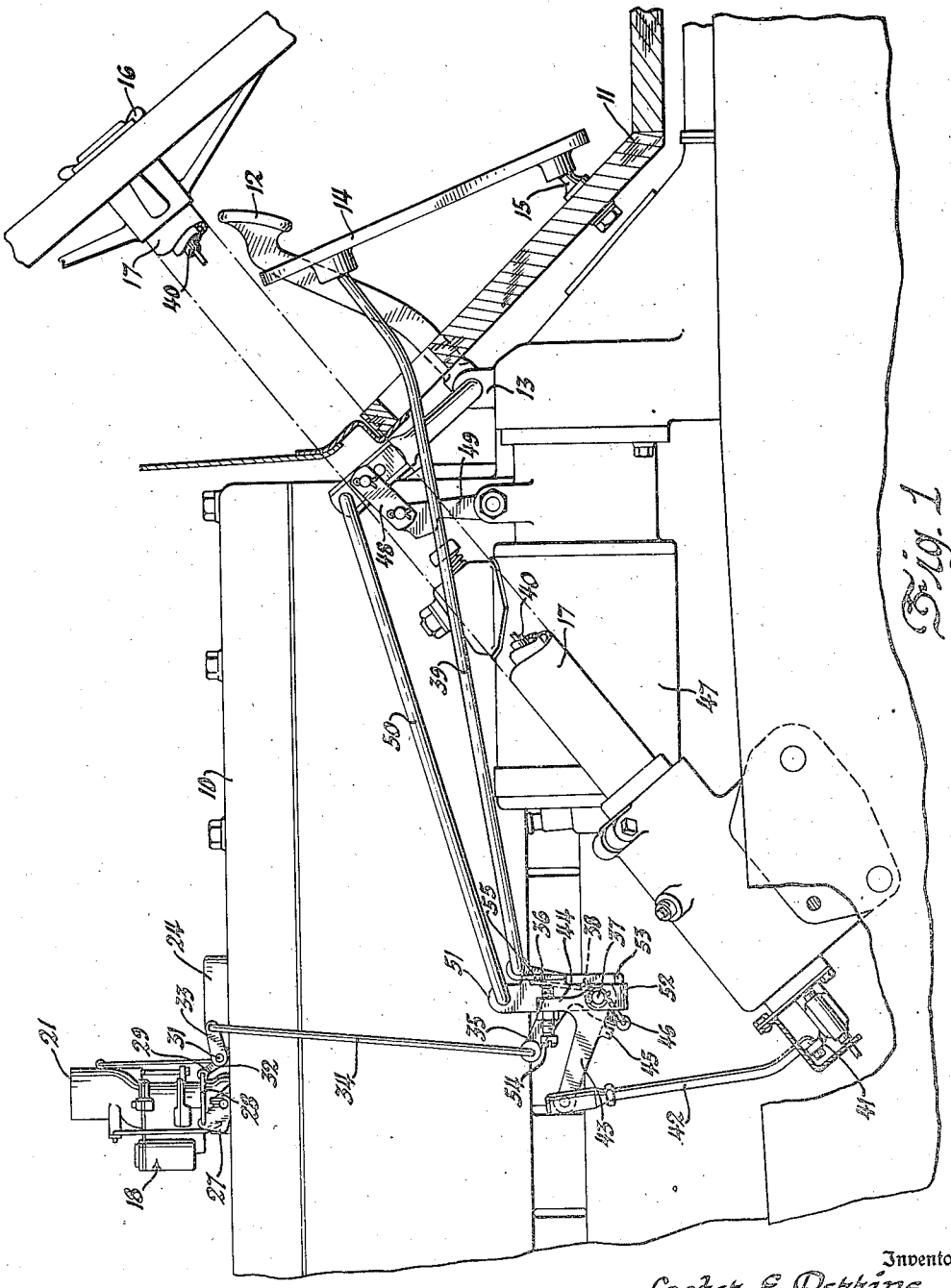


Fig. 1

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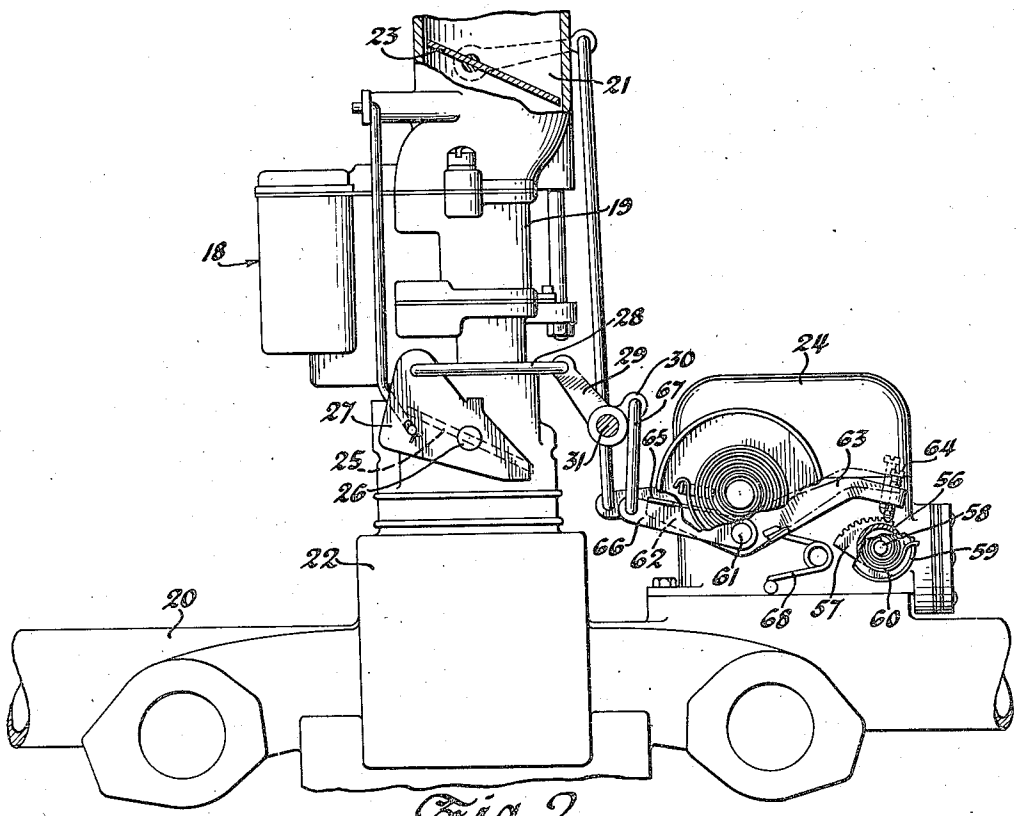


Fig. 2

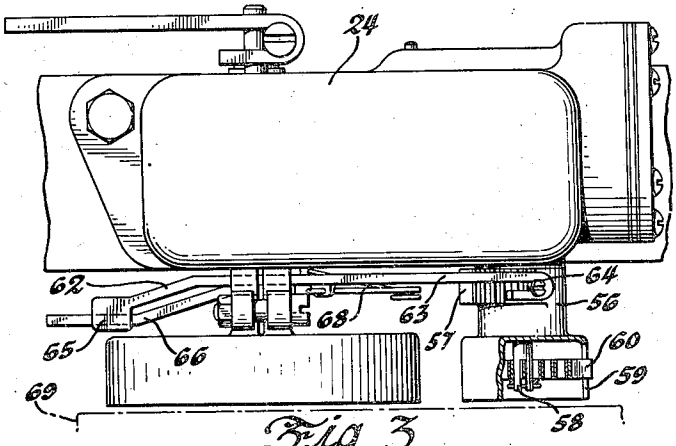


Fig. 3

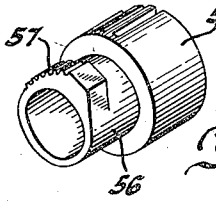


Fig. 4

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Patented Feb. 11, 1947

2,415,529

UNITED STATES PATENT OFFICE

2,415,529

THERMOSTATIC THROTTLE STOP

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Application October 24, 1940, Serial No. 362,511

11 Claims. (Cl. 123—119)

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When an automotive vehicle is brought to a temporary stop, as it is quite frequently, particularly in city driving, it is, of course, desirable to keep its propelling enginge running idly at the minimum speed at which it will operate without danger of stalling. To prevent the throttle valve of the carburetor of the engine being closed so far that the rate at which the carburetor supplies combustible mixture to the engine is reduced to such a low value that the engine cannot continue to operate on it even idly, it became general practice, long before the applicant made his invention, to provide a stop to limit the extent to which the throttle valve could be closed.

However, since, with the throttle valve opened to a given extent, an engine will idle faster when it is warmed up than when it is cold and, to keep an engine running idly without danger of stalling, the throttle valve must be opened farther when the engine is cold than when it is warmed up, the stops in use before the applicant made his invention were far from satisfactory. If they were adjusted to give the engine the desired idle speed when it was warmed up, the engine would stall if the throttle valve were closed as far as possible when it was cold; and if they were adjusted to give the engine the desired idle speed when it was cold, the engine would race with the throttle valve closed as far as possible when it was warmed up. Before the applicant made his invention, it was the general practice to adjust the stop so as to give the engine the desired idle speed when it was warmed up and to leave it to the operator of the vehicle to keep the throttle valve opened sufficiently beyond this position until the engine was warmed up. But this, of course, was not a satisfactory solution of the problem.

This invention has to do with internal combustion engines of the type used to propel automotive vehicles and for its principal object to provide a stop to limit the extent to which the throttle valve of the carburetor of the engine may be closed which is automatically adjustable upon changes in temperature of the engine so that the extent to which the throttle valve may be closed varies directly and the idle speed of the engine inversely with the temperature of the engine and has the desired value at all temperatures.

For a better understanding of the nature and objects of this invention, reference is made to the following specification in which there is described the preferred embodiment of the invention which is illustrated in the accompanying drawings.

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In the accompanying drawings:

Figure 1 shows a portion of an automotive vehicle on whose propelling engine there is provided a stop in accordance with my invention to limit the extent to which the throttle valve of the carburetor may be closed;

Figure 2 is an enlarged view of the carburetor and associated parts of the engine shown in Figure 1 as they appear when viewed from the engine side;

Figure 3 is a still further enlarged view, mainly in top plan, of the operating mechanism for the choke valve and the stop for the throttle valve of the carburetor shown in the preceding figures;

Figure 4 is a perspective view of the stop for the throttle valve of the carburetor shown in the preceding figures.

In the drawings the reference character 10 indicates the internal combustion propelling engine and the reference character 11 the floor board of the driver's compartment of an automotive vehicle. Within the driver's compartment of the vehicle, there are located the usual controls which include a starter pedal 12 mounted so that it can rock in bearings 13, an accelerator pedal 14 mounted so that it can swing on a ball-headed stud 15, and a throttle control lever 16 at the upper end of the steering column 17.

The engine 10 is equipped with a carburetor 18 which includes a body 19 which is mounted on the intake manifold 20 of the engine. Through the body 19 extends a duct 21 through whose upper end air enters the carburetor and from whose lower end a combustible mixture of fuel and air is discharged into the intake manifold 20. The portion of the intake manifold into which the combustible mixture enters from the carburetor is surrounded by a jacket 22 through which exhaust gases from the engine may be circulated to heat the combustible mixture. In the upper end of the duct 21, there is located a choke valve 23 by which the entrance of air into the carburetor and, thus, the richness of the combustible mixture supplied by the carburetor to the cylinders of the engine is regulated. The choke valve is controlled by mechanism carried by a body 24 which is mounted on the intake manifold 20 at one side of the carburetor. This mechanism is illustrated and described in detail in my application Serial No. 618,225, filed June 20, 1932, of which this application is, in part, a continuation, and in my Patent No. 2,226,580, dated December 31, 1940, which is also, in part, a continuation of my application Serial No. 618,225.

In the lower end of the duct 21, there is located a throttle valve 25 of the butterfly type by which the rate at which combustible mixture is supplied by the carburetor 18 to the cylinders and thus the speed of the engine is regulated. The throttle valve 25 is mounted on a shaft 26 which is journaled in the body of the carburetor and to which is secured an operating lever 27. The lever 27 is connected by a link 28 to one arm 29 of a two-armed lever 29—30 which is fixed on one end of a shaft 31. On the other end of the shaft 31 which extends across the engine and is journaled in brackets 32 which are mounted on the top of the engine, there is fixed a lever 33.

The mechanism by which the lever 33 and through it the throttle valve 25 is connected to the starter pedal 12, the accelerator pedal 14 and the throttle control lever 16 is like the corresponding mechanism disclosed in the Dykstra and Wauters Patent No. 2,082,538. It includes a link 34 which connects the lever 33 to one arm 35 of a two-armed lever 35—36 which is mounted so that it can rock on a pin 37 which projects from the side of the engine 10. A coil spring 38 which encircles the pin 37 tends to rotate the lever 35—36 clockwise and move the throttle valve 25 toward its closed position.

The accelerator pedal 14 is connected to the arm 36 of the two-armed lever 35—36 by a link 39 so that when the accelerator pedal is depressed the throttle valve 25 will be moved toward its opened position and when the accelerator pedal is released the spring 38 will move the throttle valve toward its closed position and the accelerator pedal back toward its original position.

The throttle control lever 16 is fixed to the upper end of a hollow shaft 40 which extends through the steering column 17. On the lower end of the hollow shaft 40 there is fixed a lever 41 whose outer end is connected by a link 42 to one arm 43 of a two-armed lever 43—44 which is mounted so that it can rock on the pin 37. On the lever 43—44 there is formed a lug 45 which engages a lug 46 on the lever 35—36 when the lever 43—44 is rotated counterclockwise. Consequently, when the throttle control lever 16 is moved in the corresponding direction the lever 43—44 moves the lever 35—36 counterclockwise and the throttle valve 25 toward its open position. There is, however, so much friction in the bearings in which the hollow shaft 40 is journaled that the spring 38 will not move the throttle valve back toward its closed position until the throttle control lever has been moved to the corresponding position.

To put into operation, when the starter pedal 12 is depressed, the motor 47 by which the engine 10 is cranked to start it, there is connected to the starter pedal by a link 48 the outer end of a lever 49. The starter pedal is also connected by a link 50 to one arm 51 of a two-armed lever 51—52 which is mounted so that it can rock on the pin 37. The arm 52 of the lever 51—52 extends to a point opposite a finger 53 on the lever 35—36 and on the arm 51 of the lever 51—52 opposite an adjusting screw 54 which extends through the arm 44 of the lever 43—44 there is formed an ear 55. The result is that when the starter pedal is depressed to start the engine, the arm 52 of the lever 51—52 engages the finger 53 and moves the lever 35—36 counterclockwise and the throttle valve 25 toward its opened position sufficiently to insure a quick and easy start of the engine and the ear 55 engages the adjusting screw 54 and moves the lever 43—44 and the throttle control lever 16 to a lesser extent in the corresponding direction. When the starter pedal is released after the engine has started a spring which is not shown in the drawings moves it back to its original position and the spring 38 moves the throttle valve back toward its closed position until the lug 46 engages the lug 45.

To limit movement of the throttle valve 25 toward its closed position there is provided a sleeve 56 with a cam 57 on it which is mounted so that it can rotate on a pin 58 which projects from the side of the body 24 of the choke valve controlling mechanism which faces the engine. On the outer end of the sleeve 56 there is formed a cylindrical housing 59 in which there is located a bimetallic coil spring thermostat 60 whose ends are fixed, respectively, to the housing 59 and the outer end of the pin 58.

On the end of a shaft 61 which is mounted so that it can rock in the body 24 of the choke valve controlling mechanism and projects from the same side of it as the pin 58 between the pin 58 and the shaft 31 there is fixed a two-armed lever 62—63. One arm 63 of the two-armed lever 62—63 extends generally in the direction of and terminates above and somewhat beyond the pin 58 and through it opposite the cam 57 there extends an adjusting screw 64. The other arm 62 of the lever 62—63 extends generally in the direction of the shaft 31 and on it there is formed an ear 65. On the same end of the shaft 61 as the lever 62—63 there is mounted so that it can rock on it a lever 66 which extends in the same general direction as the arm 62 of the lever 62—63 and underlies the ear 65 which is formed on it. The outer end of the lever 66 is connected by a link 67 to the arm 30 of the two-armed lever 29—30 which is fixed on the shaft 31. A spring 68 whose ends are connected, respectively, to the arm 63 of the two-armed lever 62—63 and the body 24 of the choke valve controlling mechanism tends to rotate the lever 62—63 counterclockwise and maintain the ear 65 in contact with the lever 66 and move the screw 64 away from the cam 57.

The exhaust manifold of the engine 10 which in the interest of clarity in the illustration of my invention has not been shown in Figure 2 but is indicated by the reference character 69 in Figure 3, extends generally parallel to and above the intake manifold 20. Consequently, when it is positioned as it has been described, the thermostat 60 is, as Figure 3 indicates, located close to and will be quickly affected by changes in the temperature of the exhaust manifold 69.

When the throttle valve 25 is moved toward its closed position the lever 66 engages the ear 65 on the arm 62 of the two-armed lever 62—63 and rotates the latter clockwise until the screw 64 engages the cam 57 which positively prevents further movement of the throttle valve toward its closed position. The thermostat 60 is so constructed and arranged that as its temperature rises it tends to rotate the cam 57 to a position in which the adjusting screw 64 is opposite the portion of the cam nearest the axis of the sleeve 56 and that as its temperature falls it tends to rotate the cam to a position in which the adjusting screw is opposite the portion of the cam farthest from the axis of the sleeve. Consequently, the extent to which the throttle valve 25 may be closed will vary directly and the idle speed of the engine 10 inversely with the temperature of the engine. The cam 57 will, of course, be so

shaped and the thermostat 60 so calibrated that at no temperature can the throttle valve be closed to such an extent as to prevent the carburetor 18 supplying to the cylinders of the engine 10 combustible mixture at the rate necessary to insure operation of the engine without danger of stalling at that temperature and that at no temperature will the carburetor supply to the cylinders of the engine when the adjusting screw 64 is in contact with the cam 57 combustible mixture at a rate in excess of that necessary to insure operation of the engine without danger of stalling at that temperature.

The thermostat 60 is not made sufficiently powerful to rotate the cam 57 while the adjusting screw 64 is held in contact with the cam by the throttle valve closing spring 38. This because of the cost and space required by a sufficiently powerful thermostat.

Because the thermostat 60 is so weak it is necessary that the throttle valve 25 be opened sufficiently to permit the spring 68 to move the adjusting screw 64 out of contact with the cam 57 before the thermostat can rotate the cam. The throttle valve is opened to this extent in normal driving and the thermostat thus given an opportunity to make the proper adjustment of the cam as the engine warms up. The interconnection between the starter pedal 12 and the throttle valve which is illustrated in the drawings and has been described also opens the throttle valve to this extent when the starter pedal is depressed to start the engine and the thermostat is thus given an opportunity to make the proper adjustment of the cam when the engine is started. Thus, without any conscious effort on the part of the operator, the thermostat 60 is given an opportunity to make the proper adjustment of the cam 57 when the engine is started after it has been stopped as well as it warms up after it has been started.

While, since in the form illustrated in the drawing the thermostat 60 is not sufficiently powerful to rotate the cam 57 while the adjusting screw 64 is held in contact with the cam by the throttle valve closing spring 38, it is necessary to employ other means to open the throttle valve to the extent necessary to insure a quick and easy start of the engine 10 and give the thermostat an opportunity to make the proper adjustment of the cam, it is, of course, possible to make the thermostat sufficiently powerful to rotate the cam while the adjusting screw is held in contact with the cam by the throttle valve closing spring and thus make it unnecessary to employ other means to open the throttle valve to the extent necessary to insure a quick and easy start of the engine or give the thermostat an opportunity to make the proper adjustment of the cam.

I claim:

1. In a carburetor having a riser heated by the exhaust of the engine with which the carburetor is associated, a throttle valve controlling the flow of combustible mixture from the carburetor, an idling control arm limiting the closing movement of said throttle valve to determine the idling speed of the engine, a cam member providing an abutment for said arm determining the idling position of said throttle valve, and a bimetallic strip engaging said cam member and operating in accordance with the temperature of the engine to rotate said cam to various positions in a manner increasing the idling speed of the engine when the same is cold.

2. In an internal combustion engine, a carburetor, means for regulating the speed of the engine including a valve which controls the passage of combustible mixture from the carburetor to the engine and means for moving the valve, means for determining the idle speed of the engine including a rotatably mounted cam so arranged that an element which is movable with the valve moves into and out of engagement with it when the valve is moved toward and away from its closed position and it opposes further movement of the valve toward its closed position after the element engages it, and a thermostat which tends to position the cam so that it is engaged by the element earlier in the course of the movement of the valve toward its closed position when the engine is cold than when it is hot and thus to adjust the idle speed of the engine so that it is greater when the engine is cold than when it is hot.

3. In an internal combustion engine, a carburetor, means for regulating the speed of the engine including a valve which controls the passage of combustible mixture from the carburetor to the engine and means for moving the valve, means for determining the idle speed of the engine including a member so arranged that an element which is movable with the valve moves into and out of engagement with it when the valve is moved toward and away from its closed position when the engine is cold and it unyieldingly blocks further movement of the valve toward its closed position after the element engages it, and a thermostat which tends to position the first mentioned member so that the third mentioned means is engaged by the element earlier in the course of the movement of the valve toward its closed position when the engine is cold than when it is hot and thus to adjust the idle speed of the engine so that it is greater when the engine is cold than when it is hot.

4. In an internal combustion engine, a carburetor, means for regulating the speed of the engine including a valve which controls the passage of combustible mixture from the carburetor to the engine and by whose movement changes in the speed of the engine are initiated, and means for determining the idle speed of the engine and adjusting it so that it is greater when the engine is cold than when it is hot including a temperature controlled member so arranged that it may move from a position in which it unyieldingly opposes movement of the valve to its normal idling position when the engine is cold and to a position in which it does not interfere with movement of the valve to its normal idling position when the temperature of the engine rises.

5. In an internal combustion engine, a carburetor, means for regulating the speed of the engine including a valve which controls the passage of combustible mixture from the carburetor to the engine and means for moving the valve, means for determining the idle speed of the engine including an element so arranged that an element which is movable with the valve moves into and out of engagement with it when the valve is moved toward and away from its closed position when the engine is cold and it unyieldingly blocks further movement of the valve toward its closed position after the second mentioned element engages it, and a thermostat which tends to position one of the mentioned elements so that the third mentioned means is engaged by an element which is movable with the valve earlier in the course of the movement of the valve toward its

closed position when the engine is cold than when it is hot and thus to adjust the idle speed of the engine so that it is greater when the engine is cold than when it is hot.

6. In an internal combustion engine, a carburetor which includes a valve for regulating admission of air into the carburetor and means for actuating the valve, means for regulating the speed of the engine including a valve which controls the passage of combustible mixture from the carburetor to the engine and by whose movement changes in speed of the engine are initiated, and means independent of that for actuating the first mentioned valve for determining the idle speed of the engine and adjusting it so that it is greater when the engine is cold than when it is hot including a temperature controlled member so arranged that it does not interfere with movement of the second mentioned valve toward its opened position and may move from a position in which it opposes when the engine is cold to a position in which it does not oppose when the engine is hot movement of the second mentioned valve to its normal idling position.

7. In an internal combustion engine, a carburetor, means for regulating the speed of the engine including a valve which controls the passage of combustible mixture from the carburetor to the engine and by whose movement changes in speed of the engine are initiated, and means for determining the idle speed of the engine and adjusting it so that it is greater when the engine is cold than when it is hot including a temperature controlled member whose movement is affected by a single engine operating attribute only, namely, temperature, so arranged that it does not interfere with movement of the valve toward its opened position and may move from a position in which it opposes when the engine is cold to a position in which it does not oppose when the engine is hot movement of the valve to its normal idling position.

8. A control mechanism for an internal combustion engine carburetor having a throttle, comprising a shaft, a thermostat element fixed to the shaft, a rotatable stop member floating on the shaft, means connecting the thermostat to the stop member to rotate the same proportionally to temperature, and means associated with the throttle and engaging the stop member to prevent closing the throttle.

9. In a carburetor having a main induction passage, a throttle shaft rotatably mounted in the induction passage, a throttle valve fixed to the throttle shaft and controlling the outlet of the induction passage, an adjustable stop member connected to the throttle shaft, manual means to actuate the throttle valve, a rotatable member adapted to coact with the stop member to limit the closing movement of the throttle valve, and thermostatic means to vary the relation between the rotatable member and the stop member in accordance with temperature.

10. A control mechanism for an internal combustion engine carburetor having a throttle adapted to control the flow of fuel mixture to the engine, manual means to actuate the throttle, means to prevent the throttle from completely closing comprising a thermostat, a cam rotated by said thermostat independently of said manual means, an arm connected to said throttle, and adjustable means on the arm engaging the cam to limit the closing movement of the throttle in a degree inversely proportional to the temperature.

11. Control mechanism for an internal combustion engine carburetor having a throttle, comprising a shaft, a stop member oscillatably floating on the shaft and eccentric with respect thereto, a temperature responsive member positioned in heat exchange relation to a portion of the engine and connected to the stop member to actuate the same, and an adjustable stop member associated with the throttle and cooperating with the oscillatable stop member to limit closing movement of the throttle in a degree varying inversely with the temperature.

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