Feb. 28, 1939. C. H. JORGENSEN 2,148,816

AUTOMATIC CHOKE FOR CARBURETORS

Filed Sept. 6, 1934 2 Sheets-Sheet 1

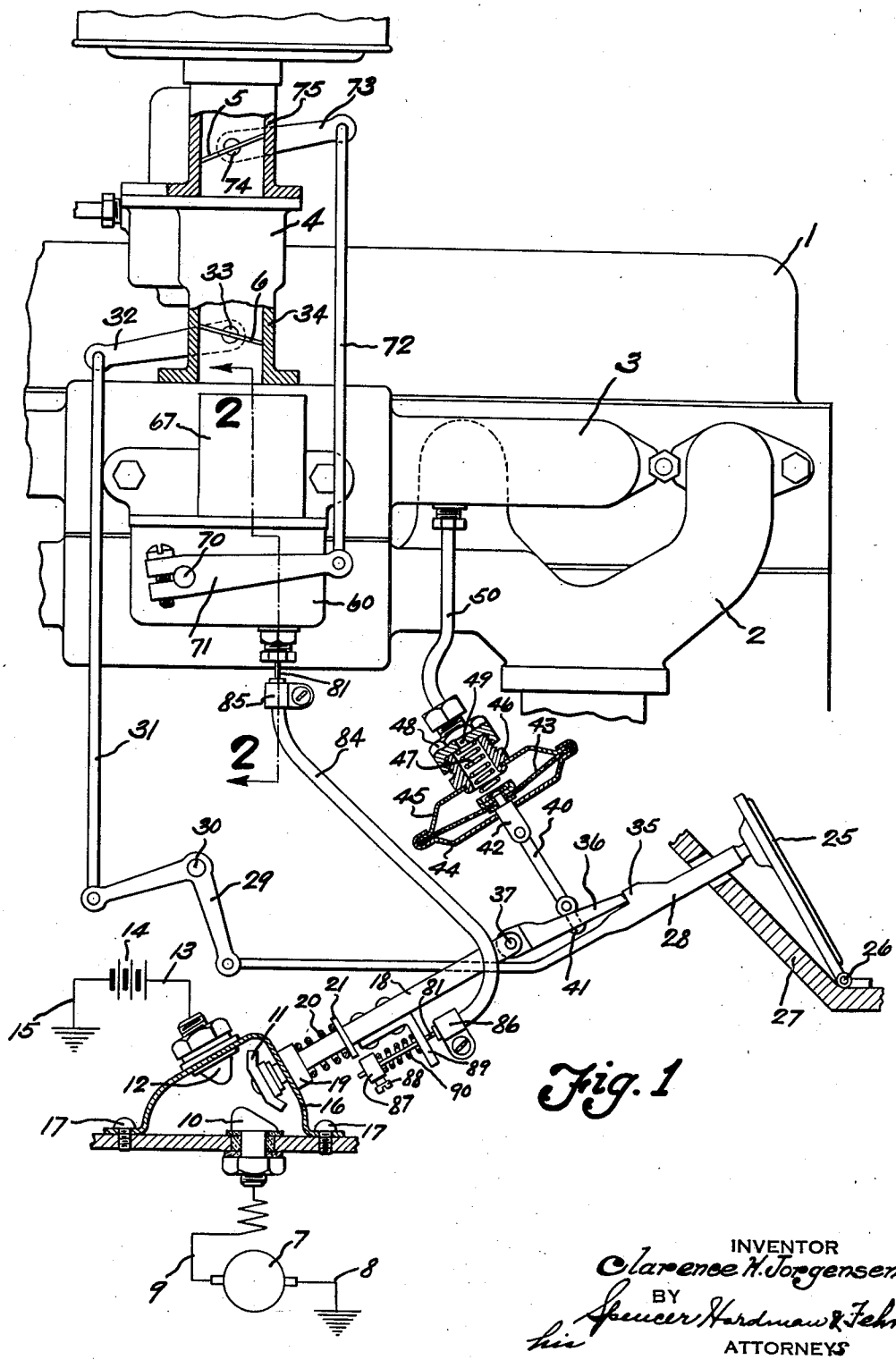

Fig. 1

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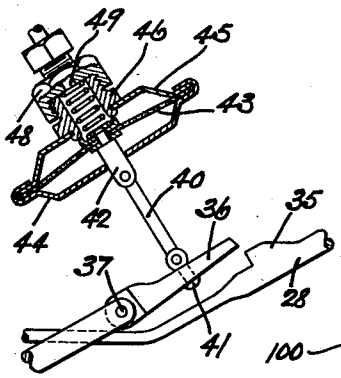

Fig. 5

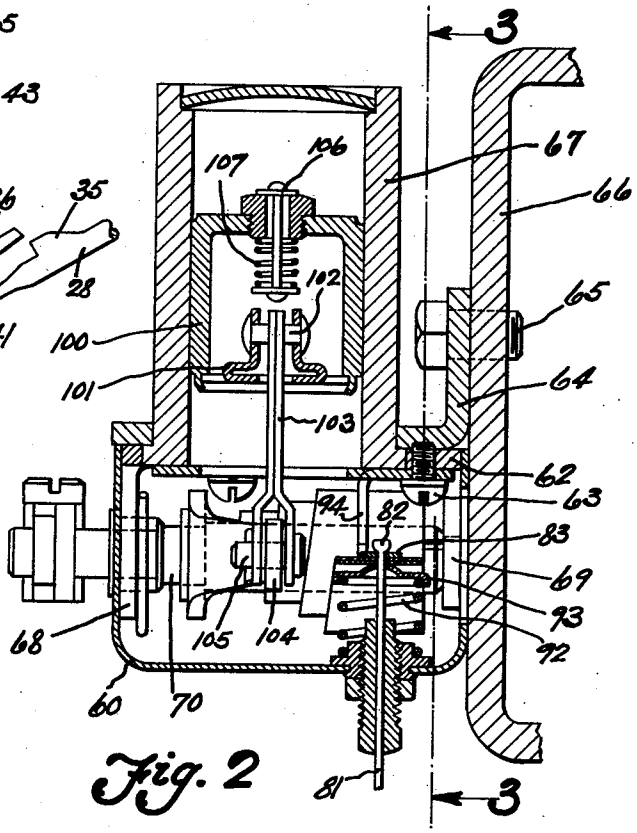

Fig. 2

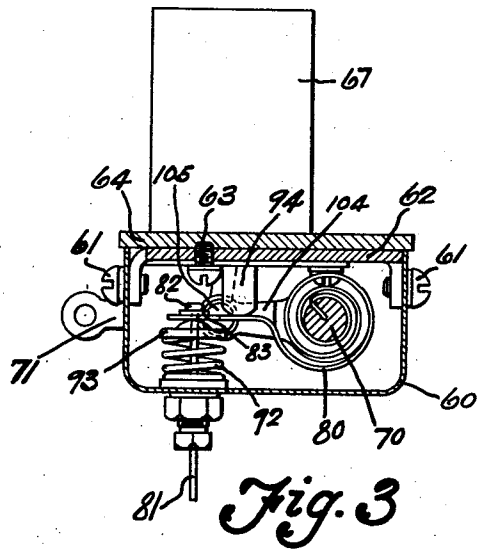

Fig. 3

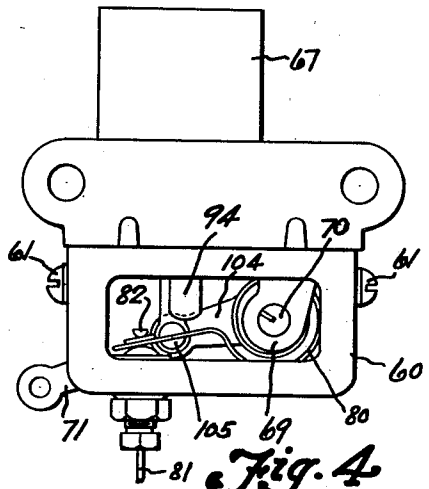

Fig. 4

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AUTOMATIC CHOKE FOR CARBURETORS

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18 Claims. (Cl. 123—179)

The present invention relates to automatic choke mechanisms for charge forming devices.

Choke mechanisms of the automatic type have been previously designed which are controlled by engine suction or temperature or both and which have been effective to properly control the fuel and air ratio of the combustible mixture which is supplied to the engine so as to facilitate the starting of the engine under all conditions which might be met in the operation of an automobile. Such devices of this type as have been previously designed and which are really successful have been somewhat complicated and expensive to manufacture and it is one of the principal objects of the present invention to provide an automatic choke mechanism for a charge forming device which will provide proper starting mixtures under all operating conditions and at all temperatures and at the same time will be relatively simple in construction, easy to manufacture and inexpensive.

It is a further object of the invention to provide an automatic choke device which is manually movable to a position to provide a relatively rich starting mixture during the operation of the starting motor but is released from control by the manual operating means when the engine starts to run under its own power and is thereafter controlled in its position by a thermally responsive device.

More specifically, it is a further object of the invention to provide an automatic choke mechanism having a valve for determining the mixture ratio which is controlled during the operation of the engine starting motor by the mechanism which controls the operation of said motor and also by a thermostat but subsequent to the starting operation when the engine is running under its own power is controlled only by a thermally responsive device.

It is a still further object of this invention to provide an automatic choke mechanism having a valve which is controlled in the manner above described and which is provided with means for retarding the movements of said valve toward its open position in order to prevent the mixture becoming too lean when the valve is released from control by the manually operable operating means.

With these objects in view, the invention consists in the provision of a member operated by the accelerator pedal for controlling the switch of the starting motor, a carburetor which is provided with a choke valve which is adapted to be moved toward its closed position by a Bowden wire cable extending from the means which closes the starter switch to a thermostat which is operatively connected to the choke valve so that when the accelerator pedal is operated to close the starter switch the choke valve is moved toward closed position by the connection above referred to, said connection operating the choke valve through the medium of the thermostat.

The member which closes the starter switch and which operates the Bowden wire connection above referred to, is adapted to be connected with the accelerator pedal for operation therewith when the engine is not running, but this connection is disabled when the engine begins to run under its own power by a diaphragm which is operated by the suction of the intake manifold. After the disabling operation referred to, the thermostat through which the Bowden wire cable moves the choke valve toward closed position becomes effective to control the position of said choke valve and when the engine is relatively cold, moves the valve toward its closed position to such an extent as is determined by the temperature.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a diagrammatic side elevation of the present invention with certain parts in section.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is a side elevation of the housing which controls the thermostat and the means for retarding the movement of the valve.

Fig. 5 is a detailed view of the means for disconnecting the switch operating mechanism from the accelerator pedal.

Referring to Fig. 1 of the drawings, an internal combustion engine of the conventional type is indicated at 1, having an exhaust manifold 2 and an intake manifold 3. A down-draft carburetor of the conventional type is shown at 4. The carburetor is provided with a choke valve 5 and a throttle valve 6 which are operated through the medium of the connections hereinafter described.

The starting motor of the engine is indicated at 7 being grounded through the connection 8 and is connected through the wire 9 to one fixed contact 10 of a starter switch which includes a movable contact 11 and a second fixed contact 12 which is connected by the wire 13 to a storage battery 14 grounded through the connection 15. The fixed contact 12 is supported in a small hous-

ing 16 which is attached by screws 17 to the top of the starting motor and the movable contact 11 is carried by a rod 18 which is slidably mounted in the bushing 19 secured to such housing and normally held in the position shown in the drawings with the starter switch opened by a coil spring 20 which surrounds the rod 18 between the bushing 19 and a collar 21 which is fixedly secured to the rod 18.

When the switch above described is closed, as in the manner hereinafter described, current will flow from the battery through the wire 13, the fixed contact 12, movable contact 11 and fixed contact 10, the wire 9 to the starting motor and through the connection 8 to ground, thence from the ground back to the battery through the connection 15 so that the starting motor is rendered operative to crank the engine in the usual way whenever the above described switch is in its closed position.

The switch is adapted to be closed by the operation of the accelerator pedal indicated in the drawings by the number 25, such pedal being pivotally mounted at 26 on the floorboard 27 of the vehicle. This accelerator pedal has connected thereto through a suitable ball and socket joint, the construction of which is not shown in detail not being a part of this invention, a rod 28 which extends to a bell crank lever 29 suitably pivoted at 30 on a fixed support having connected thereto a rod 31 which extends to an arm 32 secured to the shaft 33 on which the carburetor throttle 6 is mounted, the rod 33 being suitably journalled in the housing 34 of the carburetor. Obviously, the movement of the pedal 25 will open the throttle 6 to varying degrees to control the engine speed in the usual manner.

The rod 28 is provided with a shoulder 35 which is adapted to engage an arm 36 pivotally mounted at 37 on the end of the switch operated rod 18 previously described when the engine is not running so that the movement of the pedal 25 in a counterclockwise direction will move the rod 18 to the left in Fig. 1 to close the starting motor switch, previously described, to cause the starter motor to become operative to crank the engine, the throttle being opened to a suitable position to supply the proper amount of combustible mixture to the engine at the same time the switch is closed.

When the engine starts to run under its own power the engine suction is effective to move the arm 36 out of engagement with the shoulder 35 at the position shown in Fig. 5.

The mechanism for moving the arm 36 in this manner includes a link 40 which is pivotally connected to a pin 41 which extends through the arm 36, the link 40 being pivotally connected at the opposite end to a short link 42 which extends through and is suitably secured to a diaphragm 43. This diaphragm at the periphery thereof is clamped between two cup-shaped metal shells 44 and 45 which are secured together to form a fluid-tight joint at the diaphragm. Suitably connected to the shell 45 to form a fluid-tight joint is a nipple 46 in which a spring 47 is received. This spring is positioned between the diaphragm 43 and a nipple 48 which has threaded engagement with the nipple 46 so that the pressure of the spring is effective to hold the diaphragm in the position shown in Fig. 1 with the arm 36 in engagement with the shoulder 35. The nipple 48 is provided with a relatively small orifice 49 and is suitably connected to a suction conduit 50 which extends to the intake manifold 3 and through which the manifold suction is communicated to the diaphragm to move it to the position shown in Fig. 5 and disengage the arm 36 from the shoulder 35 as soon as the engine commences to run under its own power. When this takes place the starting motor switch is moved to open position by the force of the spring 20 irrespective of the position occupied by the accelerator pedal so as to cause the starting motor to become inoperative as soon as the engine is in operation. As long as the engine continues to run the parts are held in the position shown in Fig. 5 so that the accelerator pedal can be operated in the usual manner to control the speed of the vehicle without engaging the arm 36 and thus preventing any possible operation of the starting motor while the engine is running. The movement of the rod 18 to close the starter switch is also effective in the device disclosed herein, to move the choke valve 5 toward closed position as will be described fully hereinafter.

In order to operate the choke valve in the manner hereinafter set forth, a choke operating mechanism is contained in a housing 60 which is secured by screws 61 to a plate 62 also secured by screws 63 to a plate 64 secured by screws 65 to the manifold wall 66, which is heated by exhaust gas and which may be termed the "hot spot" into which the carburetor housing 34 drives the fuel mixture. A cylindrical housing 67 is provided with flanges which are clamped between the plates 62 and 64 and provide a chamber in which a dash pot piston, which controls the movement of the choke valve in a manner hereinafter described, slides.

Suitably journalled in ears 68 and 69 which extend downwardly from the plate 62 is a shaft 70 to which is secured an arm 71 as shown in Fig. 1 and said arm is pivotally connected at its free end to a link 72, which is pivotally connected at its upper end to an arm 73 suitably secured to the choke valve shaft 74 which is journalled in that part of the carburetor housing indicated at 75. Obviously, a downward movement of the arm 71 will move the choke valve 5 toward closed position and to move said arm in this manner the shaft 70 has secured thereto and coiled around it a bimetallic thermostat 80 which is provided at its free end with an orifice through which an operating wire 81 extends, said wire having an enlarged head 82 which engages a washer 83 received between the head 82 and the thermostat. The wire extends downwardly through the housing 60 and through a flexible housing 84 which is secured to a suitable support by brackets 85 and 86 and at its lower end there is secured to such wire a collar 87 which may be adjusted along said wire and secured in the most desirable position by a set screw 88. Surrounding the wire between this collar 87 and an L-shaped bracket 89 secured to and projecting from the rod 18 is a coil spring 90 through which the wire 81 is operated by a rod 18 to pull the free end and thermostat 80 downwardly to rock the shaft 70 and in this manner operate the check valve.

The downward movement of the thermostat, as above described, compresses a spring 92 which is received between the housing 60 and a washer 93 as shown in Fig. 3. It will be obvious that whenever the downward pull on the wire 81 is released, the spring 92 will tend to move the free end of the thermostat upwardly and move the

choke valve toward closed position until the free end of the thermostat engages a fixed stop 94 as shown in Fig. 5. The action of the thermostat when cold is to rotate the shaft 70 so as to move the arm 71 downwardly the free end of said thermostat being held between the washer 93 and stop 94 at this time to spring 92. As the thermostat becomes heated it expands so that the arm 71 progressively rises to move the choke valve toward open position.

It has been found that if upon release of the arm 36 from the shoulder 35 the movement of the thermostat upon expansion of the spring 92 to move the valve toward open position would take place very rapidly, the mixture would become too lean and, therefore, means have been provided to retard this movement of the choke valve toward its open position by the thermostat upon release from the manual operating means. The means in question is a dash pot and to this end the cylinder 67 has slidably mounted therein a piston 100 which has formed inside of it a spider 101 carrying a pin 102 which is pivotally connected to a link 103 which is bifurcated at its lower end and straddles an arm 104 secured to the shaft 70, the link 103 being pivotally connected to the arm by a pin 105, as shown in Fig. 2. As will be obvious from the drawings, the arm 104 is curved so that the end which is connected to the link 103 is offset from that portion of the arm which is secured to shaft 70 and is immediately in line with the operating link 103.

A check valve 106, normally held closed by a spring 107, is mounted in the upper end of the piston so that as the piston moves downwardly, the valve is opened to permit free movement of the shaft 70, in a direction to close the choke, but is closed upon movement of the piston upwardly so that the movement of the shaft 70 in a direction to open the choke is retarded and the opening movement of said choke when the arm 36 is disengaged from the shoulder 35 so that the manual operating connection from said choke is no longer effective, is a relatively slow movement and the mixture in this manner is prevented from becoming too lean when the manual operating means is released from its controlling action.

In brief, the operation of the device is as follows: Upon movement of the accelerator pedal to close the starter switch, the arm 18 is moved to the left as hereinafter described. When so moved the arm 89 compresses the spring 90 until the pressure thereof is greater than that of the spring 92 and the effect of the thermostat tending to move the shaft 70 in a clockwise direction so that the shaft 70 is moved in a counterclockwise direction by the pull of the operating wire 81. This movement of the shaft is effected through the medium of the thermostat and, therefore, the degree of movement of the shaft will be determined by the temperature at the time when the wire 81 is moved by the previously described connections. Thus it is clear that the wire 81 is manually operated simultaneously with the closing of the starter switch to move the choke valve to closed position to a degree determined by the thermostat. Immediately upon the engine starting to run under its own power, the arm 36 is disconnected from the shoulder 35 so that the pull of the wire 81 on the thermostat is immediately discontinued. The free end of the thermostat then tends to move upwardly until it is stopped by the fixed stop previously referred to. When the free end of the thermostat engages the fixed stop the other end of the thermostat will continue to move the arm 104 upwardly at a rate determined by the effect of the dash pot piston until the choke valve assumes such a position as is determined by the thermostat and this position will of course vary in accordance with the temperature which is effective on said thermostat. Therefore, it will be seen that the choke valve is manually moved toward its closed position during the starting operation, is released from the manual control as soon as the starting operation is over and the engine runs under its own power, after which its position is entirely determined by the action of the thermostat and its rate of movement toward such position is regulated by the above described dash pot.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of means for varying the rate of fuel discharge in said charge forming device, means for controlling the operation of said starting motor, means operated thereby for operating said means for varying the rate of fuel discharge, and a thermostat for also controlling the operation of said means for varying the rate of fuel discharge, and means operable by the engine when it begins to run under its own power to eliminate the control of the means for varying the rate of fuel discharge by the means for controlling the operation of the starting motor.

2. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of means for varying the rate of fuel discharge in said charge forming device, means for controlling the operation of said starting motor, means operated thereby for operating said means for varying the rate of fuel discharge only during the cranking of said engine and a thermostat for controlling the operation of said means for varying the rate of fuel discharge, and means operable by the engine when it begins to run under its own power for placing the means for varying the rate of fuel discharge under the control of the thermostat.

3. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of means for varying the rate of fuel discharge in said charge forming device, means for controlling the operation of said starting motor, an operating connection extending from said controlling means to the means for varying the rate of fuel discharge whereby the latter is operated by said controlling means, means for disabling said connection when the engine begins to run and a thermostat for also operating said means for varying the rate of fuel discharge.

4. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of means for varying the rate of fuel discharge in said charge forming device, means for controlling the operation of said starting motor, an operating connection extending from said controlling means to the means for varying the rate of fuel discharge whereby the latter is operated by said

controlling means, means operated by the engine for disabling said connection when the engine begins to run under its own power, and a thermostat for controlling the position of said means for varying the rate of fuel discharge after said connection is disabled.

5. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of means for varying the rate of fuel discharge in said charge forming device, means for controlling the operation of said starting motor, an operating connection extending from said controlling means to the means for varying the rate of fuel discharge whereby the latter is operated by said controlling means, means operated by engine suction for disabling said connection when the engine begins to run under its own power, and a thermostat for controlling the position of said means for varying the rate of fuel discharge after said connection is disabled.

6. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the ratio of fuel and air in the mixture supplied by said charge forming device, means for controlling the operation of said starting motor, means operated thereby for controlling the position of said choke valve, and a thermostat for also controlling the position of said choke valve, and means operable by the engine when it begins to run under its own power to eleminate the control of the choke valve by the means for controlling the operation of the starting motor.

7. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the ratio of fuel and air in the mixture supplied by said charge forming device, means for controlling the operation of said starting motor, an operating connection extending from the choke valve to said starter controlling means whereby the latter is effective to operate the choke valve, means for disabling said operating connection and a thermostat for controlling the position of said valve after said operating connection is disabled.

8. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the ratio of fuel and air in the mixture supplied by said charge forming device, means for controlling the operation of said starting motor, an operating connection extending from the choke valve to said starter controlling means whereby the latter is effective to operate the choke valve, means operable by the engine when it begins to operate under its own power to disable said operating connection, and a thermostat for controlling the position of said choke valve after said connection is disabled.

9. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the ratio of fuel and air in the mixture supplied by said charge forming device, means for controlling the operation of said starting motor, an operating connection extending from the choke valve to said starter controlling means whereby the latter is effective to operate the choke valve, means operable by engine suction when the engine begins to operate under its own power to disable said operating connection and a thermostat for controlling the position of the choke valve after said connection is disabled.

10. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the ratio of fuel and air in the mixture supplied by said charge forming device, means for controlling the operation of said starting motor, means operated thereby to move the choke valve to position to enrich the mixture during operation of the starting motor, a thermostat, and means whereby the position of said choke valve is determined wholly by the thermostat during engine operation, and means operable by the engine when it begins to run under its own power to eliminate the control of the choke valve by the means for controlling the operation of the starting motor.

11. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the admission of air to the charge forming device, means for controlling the operation of the starting motor, means operated thereby for holding the choke valve closed during the starting of the engine, means operable by the engine when it begins to run under its own power for interrupting the control of the choke valve by the starter control means, and thermally responsive means for controlling the position of the choke valve during operation of the engine under its own power.

12. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the mixture ratio of the fuel mixture supplied to the engine by the charge forming device, manually operable means for moving the choke valve to position to enrich the mixture during the starting of the engine, means for releasing the choke valve from said manual operating means when the engine starts to run under its own power, and a thermostat for controlling the position of the choke valve during engine operation.

13. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the mixture ratio of the fuel mixture supplied to the engine by the charge forming device, manually operable means for moving the choke valve to position to enrich the mixture during the starting of the engine, means operated by the engine when it begins to run under its own power for releasing the choke valve from said manual operating means, and a thermostat for controlling the position of the choke valve during engine operation.

14. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the admission of air to the charge forming device, means for controlling the operation of the starting motor, means operated thereby for holding the choke valve closed during the starting of the engine, means for interrupting the control of the choke valve by the starter control means, means for moving the choke valve toward closed position subsequent to the interruption of the control of said valve by the starter control means, and a dash pot for controlling the rate of movement of said choke valve in one direction.

15. A choke mechanism for the charge forming device of an internal combustion engine hav-

ing a starting motor, the combination of a choke valve for controlling the admission of air to the charge forming device, means for controlling the operation of the starting motor, means operated thereby for holding the choke valve closed during the starting of the engine, means for interrupting the control of the choke valve by the starter control means, means for moving the choke valve toward closed position subsequent to the interruption of the control of said valve by the starter control means, and means for retarding the rate of movement of said choke valve toward closed position.

16. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the admission of air to the charge forming device, means for controlling the operation of the starting motor, means operated thereby for holding the choke valve closed during the starting of the engine, means for interrupting the control of the choke valve by the starter control means, means for moving the choke valve toward closed position subsequent to the interruption of the control of said valve by the starter control means, a thermostat for determining the position to which said choke valve is moved, and a dash pot for controlling the rate of movement of said valve toward closed position.

17. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the ratio of fuel and air in the mixture supplied by said charge forming device, means for controlling the quantity of mixture supplied to the engine by said charge forming device, means operated by said mixture controlling means for simultaneously causing the starting motor to become operative and moving the choke valve to position to enrich the mixture, and means operable when the engine starts to run under its own power to release the choke valve from its operating means.

18. A choke mechanism for the charge forming device of an internal combustion engine having a starting motor, the combination of a choke valve for controlling the ratio of fuel and air in the mixture supplied by said charge forming device, means for controlling the quantity of mixture supplied to the engine by said charge forming device, means operated by said mixture controlling means for simultaneously causing the starting motor to become operative and moving the choke valve to position to enrich the mixture, means operable when the engine starts to run under its own power to release the choke valve from its operating means, and thermally responsive means operable during engine operation to determine the position of the choke valve.

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