Jan. 22, 1924. 1,481,306

H. R. STUART

TEMPERATURE CONTROLLING MECHANISM FOR INTERNAL COMBUSTION ENGINES

Filed Aug. 15, 1919 4 Sheets-Sheet 1

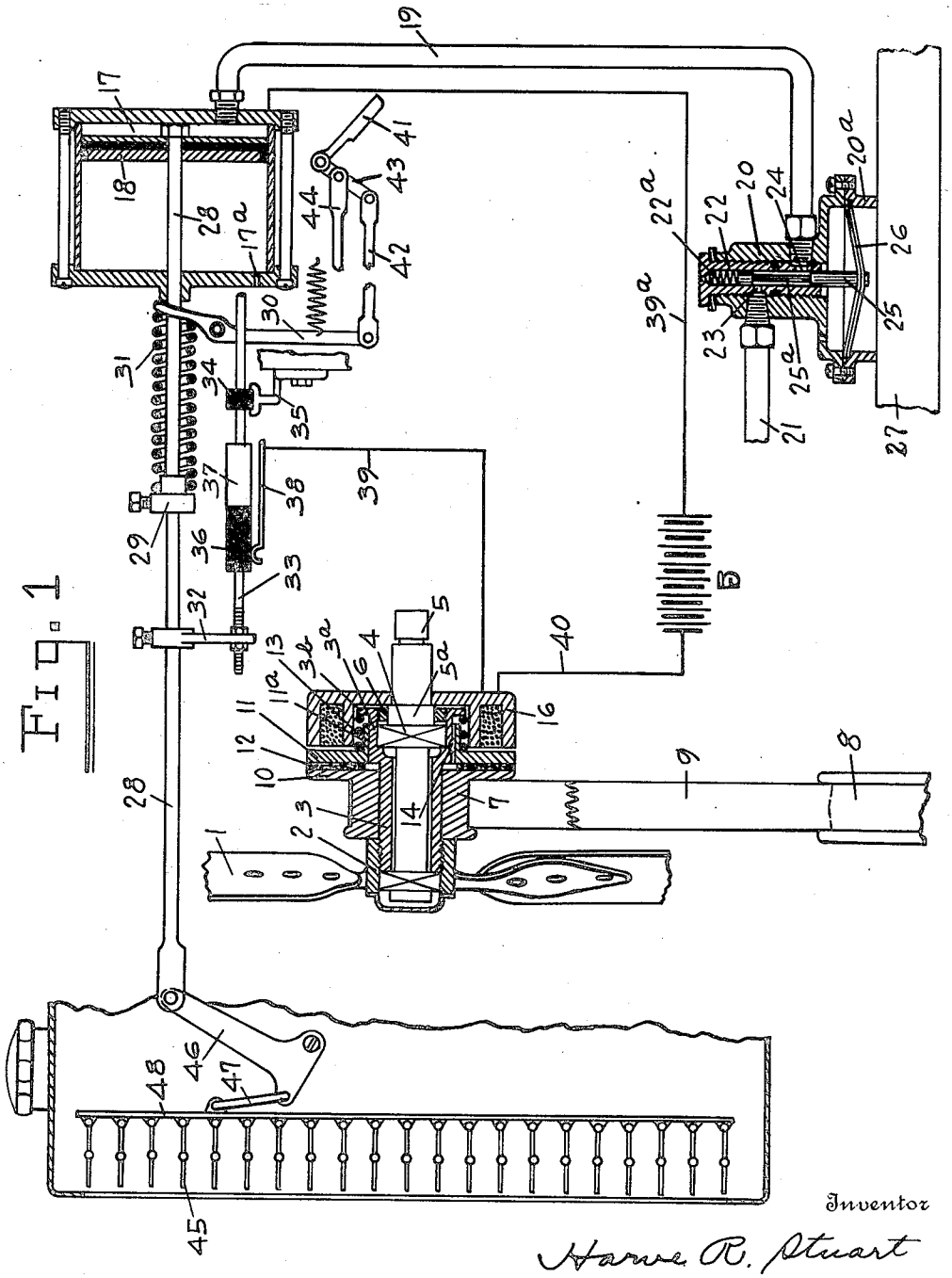


Fig. 1

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Filed Aug. 15, 1919 4 Sheets-Sheet 2

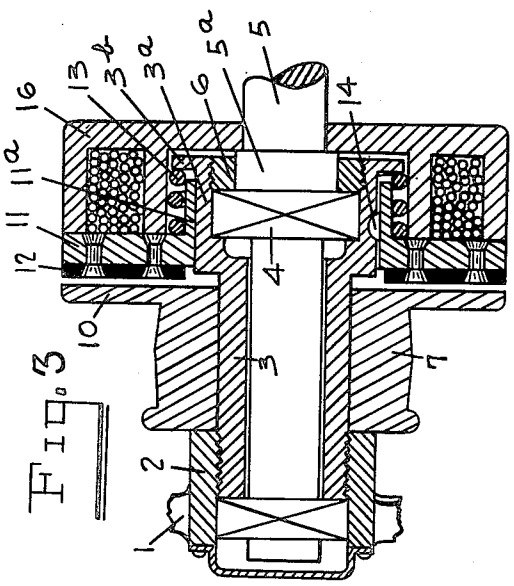


Fig. 3

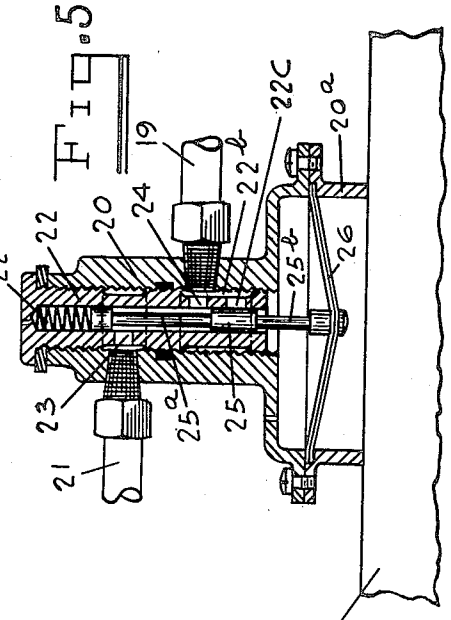


Fig. 5

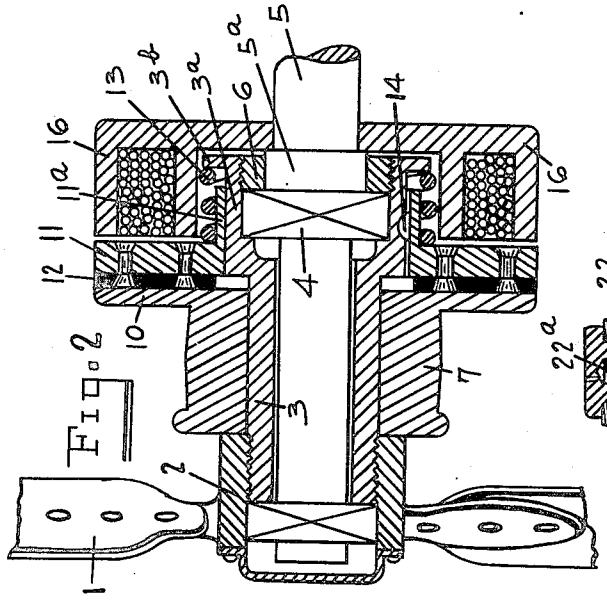


Fig. 2

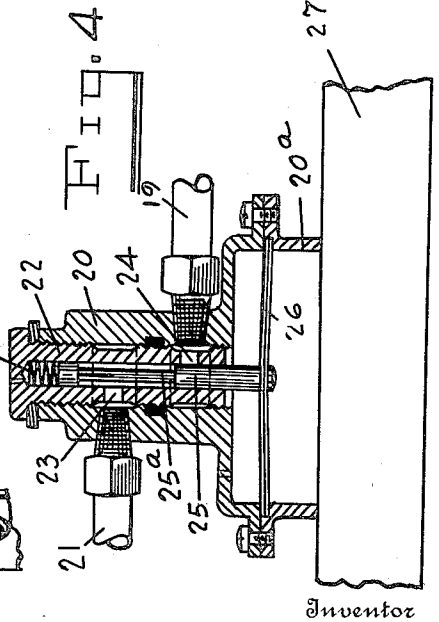


Fig. 4

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TEMPERATURE CONTROLLING MECHANISM FOR INTERNAL COMBUSTION ENGINES

Filed Aug. 15, 1919 4 Sheets-Sheet 3

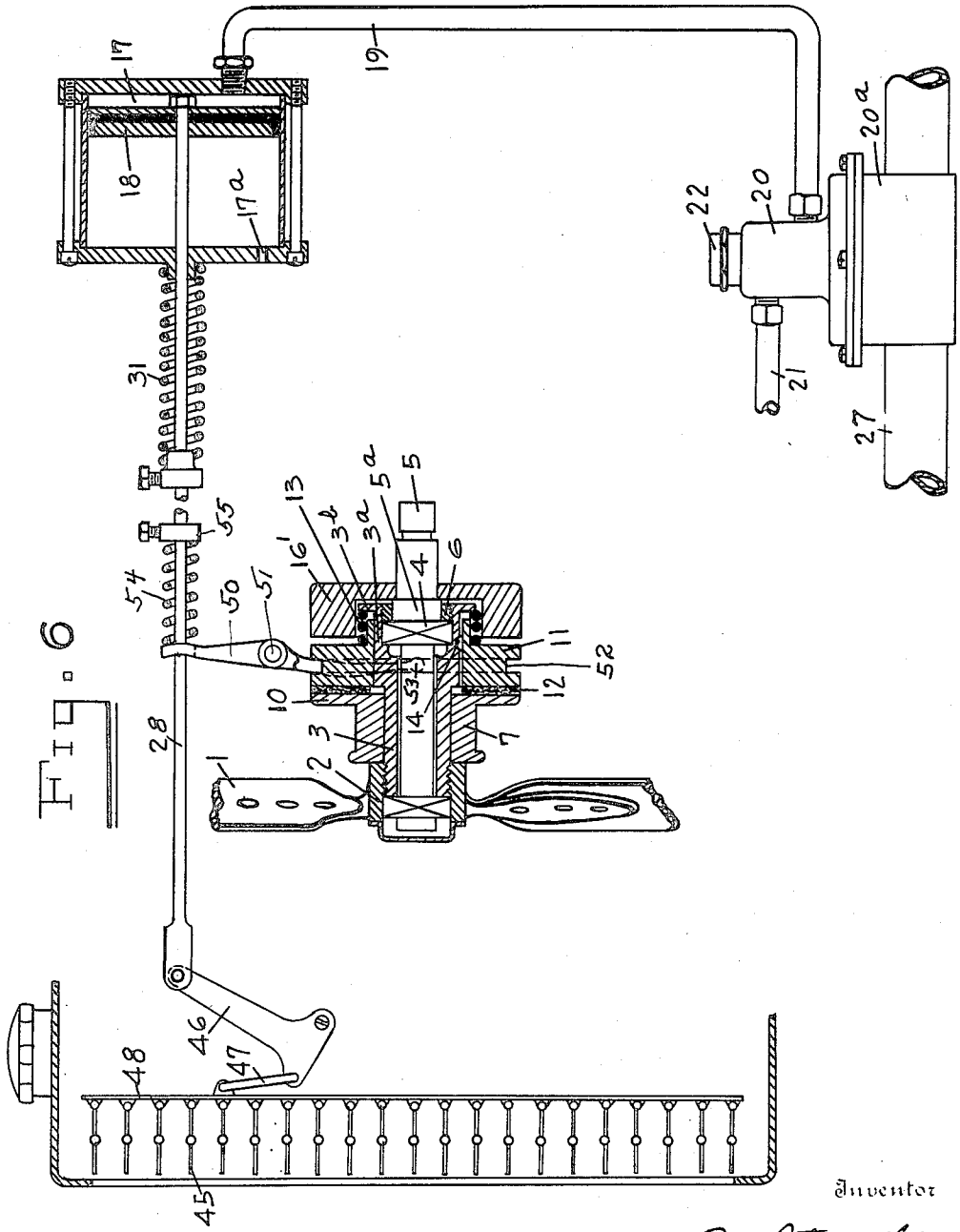


Fig. 6

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TEMPERATURE CONTROLLING MECHANISM FOR INTERNAL COMBUSTION ENGINES

Filed Aug. 15, 1919 4 Sheets-Sheet 4

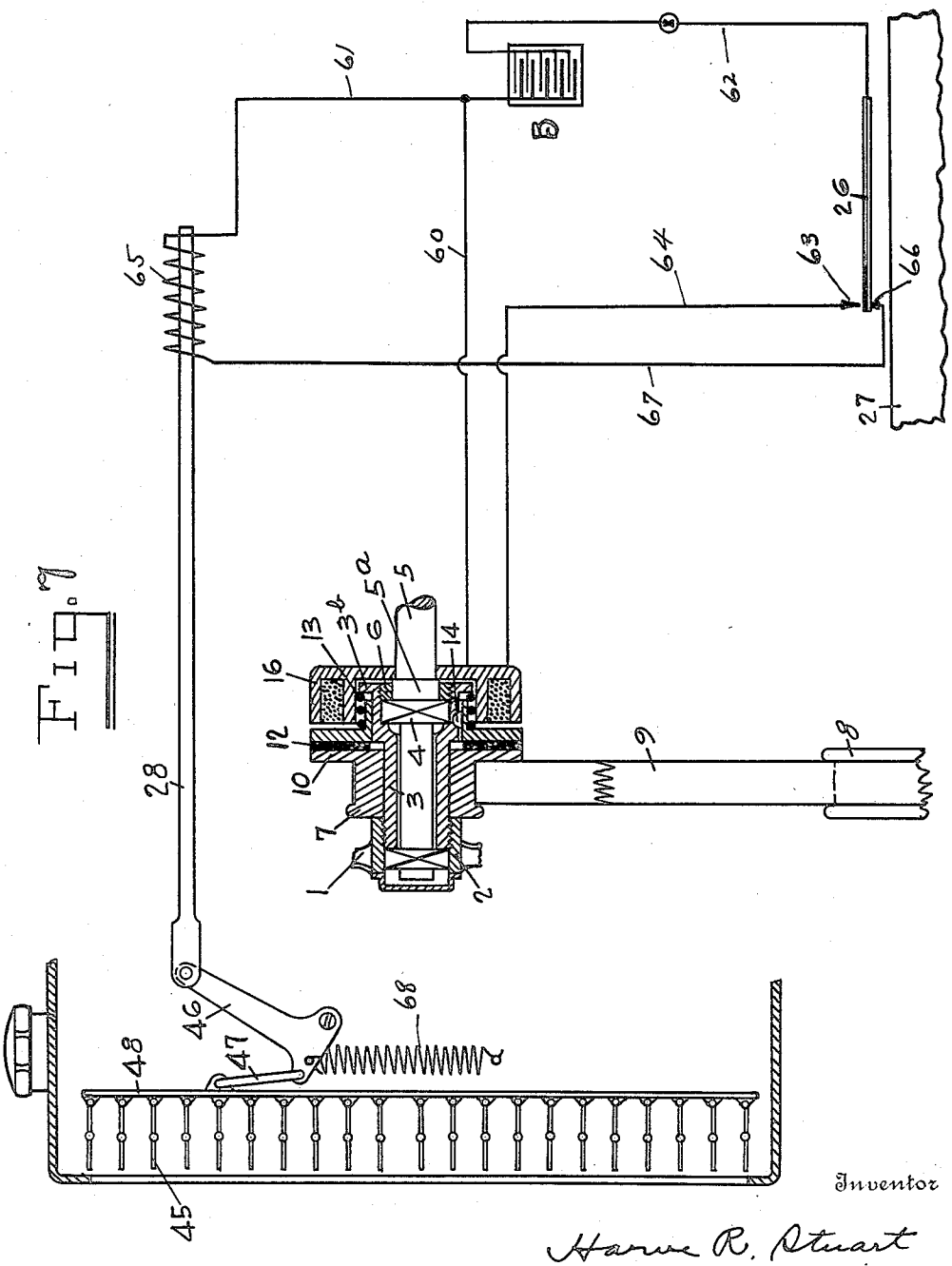


Fig. 1

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Patented Jan. 22, 1924. 1,481,306

UNITED STATES PATENT OFFICE.

HARVE R. STUART, OF SPRINGFIELD, OHIO.

TEMPERATURE-CONTROLLING MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

Application filed August 15, 1919. Serial No. 317,822.

To all whom it may concern:

Be it known that I, HARVE R. STUART, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Temperature-Controlling Mechanism for Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in devices for regulating the temperature of internal combustion engines particularly internal combustion engines used to furnish the propelling power to motor vehicles; it more particularly relating to devices of this character which are thermostatically controlled.

An object of the invention is to provide means for regulating the temperature of engines of the character referred to which will be simple in construction and effective in operation.

A further object of the invention is to provide improved devices of the nature referred to which operate not only to start and stop the suction fan but which will also cut off the circulation of air through the radiator by manipulating shutters arranged to be open and closed.

A further object of my invention is to provide, in a construction which employs a movable piston for making and breaking the circuit to the operating magnet for the clutch movable in one direction by a spring and in the other direction by the suction of the engine cylinders, means for varying the tension of the spring in proportion to the suction of the cylinders.

A further object of my invention is to provide an improved electrically operated clutch for throwing the fan into and out of operation and also to provide improved means for making and breaking the circuit to the electrically operated devices for said clutch.

A further object of the invention is to provide for closing the radiator shutters immediately upon the stopping of the engine so that the heat will be retained for a maximum period.

Other objects of my invention will appear from the accompanying specification and drawings.

In the said drawings:—

Fig. 1 is a view somewhat diagrammatic in character of the devices embodied in my invention, some of the parts being shown in vertical section.

Fig. 2 is a vertical section of the fan operating clutch showing the clutch members in engaged position.

Fig. 3 is a similar view showing the clutch members in disengaged position.

Fig. 4 is a vertical section of the controlling valve for the engine suction showing the valve in open position.

Fig. 5 is a vertical section of the valve in open position, showing a slight modification.

Fig. 6 is a modification in the manner of operating the clutch.

Fig. 7 is a further modification in the manner of operating the shutters.

Referring to the drawings, 1 represents the blades of an ordinary suction fan employed in connection with automobile engines and 2 the hub thereof. The hub has a screwthreaded connection with a sleeve 3, the rear end of which is enlarged as shown at 3^a and is mounted upon ball bearings 4 carried by a stationary forwardly-extending supporting spindle 5; the cage for the bearings being confined between the collar 5^a on the spindle and a shoulder at the inner end of the enlarged portion 3^a of the sleeve. A screwthreaded ring 6, threaded into the enlarged end 3^a of the sleeve about the collar 5^a serves to hold the sleeve 3 in position on the spindle. Rotatably mounted upon the sleeve 3 is a pulley 7 which receives motion from a pulley 8 on the crank shaft through the medium of a belt 9. The inner end of the pulley is provided with a flange 10 which forms one member of a clutch. Slidably mounted upon the enlarged portion 3^a of the sleeve is the extended hub 11^a of another clutch member 11, preferably faced with leather 12. A spring 13 about the hub 11^a and confined between an extended flange 3^b on the sleeve and the clutch member 11, normally holds the two members of the clutch in engaged position. The sleeve 3 has a key 14 which extends into a keyway 15 in the hub of the clutch member 11 so as to form a driving connection between the two parts but permit a movement of the clutch member 11 to or from engaging position. Mounted upon the spindle 5 is an electro-magnet 16 arranged in proximity to the movable clutch member 11 so that when the magnet is energized the clutch member will be withdrawn

from engaging position against the tension of the spring 13; the frictional contact between the clutch member 11 and the magnet serving to hold the fan against all movement.

Means are provided for making and breaking the circuit for the electro-magnet, which means are controlled thermostatically. Referring to Fig. 1, 17 represents a cylinder having therein a piston 18. One end of the cylinder is connected by a pipe 19 to a valve chamber 20, the valve chamber also having a connection through a pipe 21 to the intake manifold of the engine. Threaded within the valve chamber is a plug 22 having an interior bore with which communicate ports 23 and 24 leading respectively to the pipes 21 and 19. Slidably mounted within the bore of the plug is a valve 25 having a reduced portion 25^a, the lower end of the valve being connected to a thermostat 26 formed of two strips of metal having different expansible and contractible properties; the respective ends of the strips being secured in the walls of an enlarged housing 20^a at the lower end of the valve chamber, which housing is located at a point where it will receive the heat of the engine, such as upon the water manifold 27. A light spring 22^a is preferably interposed between the upper end of the valve and the end of the bore in the plug for the purpose of obviating lost motion between the valve stem and the thermostat, the connection between the two being a loose one to prevent binding.

Secured to the piston 18 and projecting through one end of the cylinder 17 is a rod 28. Coiled about the rod and interposed between a collar 29 thereon and the forked end of a lever 30 which straddles the rod, is a spring 31. Also secured to the rod is a downwardly extending bracket 32 which has a connection with a second rod 33 which is slidably mounted in a bearing 34 of insulating material supported in a bracket 35 from any convenient point. This rod 33 carries a sleeve of insulating material 36 and a conducting sleeve 37. Arranged adjacent these sleeves is a spring contact 38, the resiliency of which holds the free end thereof in contact with one or the other of the sleeves and which is connected by the wire 39 to the electro-magnet; another wire 40 leading from the magnet to the battery B. The contact sleeve 37 is also electrically connected to the battery through rod 33, bracket 32, rod 28, cylinder 17, and wire 39^a.

The lever 30 is connected to the throttle controlling devices, an ordinary foot accelerator lever 41 being shown in the present instance, through the medium of a link 42 and crank arm 43; 44 representing a portion of the connection to the butterfly valve of the carbureter.

The forward end of the piston rod 28 is connected to a series of pivoted shutters 45, which may be arranged either back or in front of the radiator in any suitable way, through the medium of a bell crank lever 46, link 47 and a rod 48, the rod 48 having a pivotal connection with all of the shutters.

The operation of the device is as follows:—

When the engine is started but still cold, the valve 25 will be in the position shown in Fig. 4, in which position the connection from the intake manifold to the rear side of the piston 18 will be closed so that the piston will occupy a position at the forward end of its chamber by reason of the influence of the spring 31, thereby making an electrical connection between the contacts 37 and 38, causing the magnet to hold the movable clutch member 11 out of engagement with the pulley clutch member 10 to arrest the fan, and also to close the shutters 45. So soon as the heat of the engine becomes sufficient to influence the thermostat, the valve 25 will be moved to the position shown in Figs. 1 and 5 to thereby establish a connection between the intake manifold and the rear side of the chamber 17, causing a vacuum to be created on the rear side of the piston, whereupon air entering the port 17^a, the piston will be driven by atmospheric pressure to the rear end of the cylinder, compressing the spring 31 and causing the collar 36 of insulating material to ride upon the spring contact member 38, thus breaking the circuit, permitting the spring 13 to throw the movable clutch member 11 into driving relation with the clutch member 10 to start the fan; this movement of the rod 28 also serving to open the shutters 45. In the event the temperature of the engine goes below normal, the thermostat will close the valve 25 and destroy the connection between the cylinder 17 and the vacuum creating source, whereupon the pressure of the atmosphere on both sides of the piston 18 will be equalized and thereby permit the spring 31 to close the magnet circuit and also close the shutters. This disengages the clutch members and arrests the fan. The fit of the valve 25 in the bore of the plug is sufficiently loose to allow for the passage of air through the port 24 and connection 19 to the rear side of the chamber 17 to equalize the air pressure. In the construction shown in Figs. 1 and 4, but in Fig. 5 there is shown a modification in which the plug 22 has an additional port 22^c and passage 22^b communicating with the pipe 19, and the valve 25 has a reduced lower end 25^b which, when the valve is in the position to close the port 24, opens the port 22^c to the atmosphere.

It should be explained that the circuit for the clutch operating magnet is controlled by the ignition switch (not shown) so that when the engine is idle the circuit will be

broken, the closing of the ignition circuit likewise closing the magnet circuit to disengage the clutch members.

At high speed it has been found that the vacuum created by the suction of the intake manifold is sometimes insufficient to overcome the tension of the spring 31 if it is of an unvarying character. To overcome this difficulty is the purpose of the connection described to the throttle control. As the operator presses down upon the accelerator lever 41 to supply additional explosive mixture for higher speeds, this causes the forked end of the lever 30 to move away from the collar 29, thus weakening the influence of the spring, and it will be seen that this varying of the spring tension will be in proportion to the amount of fuel mixture passing through the intake manifold.

In Fig. 6 there is illustrated a modification in which the fan is thrown into and out of operation by the movement of the rod 28. A lever 50, pivoted as at 51 to any convenient point, has its lower forked end straddling the clutch member 11, which is provided with a groove 52 which receives the inturned ends 53 of the fork, while the upper end of the lever is also forked and straddles the rod 28. A coil spring 54 is interposed between the upper forked end of the lever and a collar 55 secured to the rod. By this construction the clutch member 11 is shifted mechanically, the spring 54 allowing for an additional movement of the rod after the clutch has been shifted in order to complete the throw of the shutters. The movement of the piston caused by the suction of the intake manifold permits the clutch members 10^a and 11 to become engaged by the action of the spring 13 and opens the shutters, while the spring 31, moving the rod in the opposite direction, disengages the clutch members and closes the shutters. In this case the magnet 16 is displaced by the enclosing cases 16′ the construction of the clutch being otherwise the same, as is also the construction of the fluid pressure cylinder and its connections with the intake manifold, including the valve chamber and its valve, and also the thermostat.

In Fig. 7 a further modification is shown in which both the fan clutch and shutters are operated electrically. The clutch and its magnet is constructed in all respects like that shown in Fig. 1, the magnet being in circuit with the battery B through wire 60, wire 61, wire 62, thermostat 26, contact 63 and wire 64. A solenoid 65 is in circuit with a battery through wire 61, wire 62, thermostat 26, contact 66 and wire 67. The core of the solenoid may be the rod 28, or the core may be connected with the rod 28 in any suitable way. When the parts are in the position shown in Fig. 7, the circuit through the magnet is broken so that the clutch members will be in engagement and the fan in operation, while the circuit through the solenoid is closed so as to operate the rod to open the shutters. A spring 68, connected with the bell crank lever 46 serves to close the shutters when the solenoid is deenergized.

While I have shown a water cooled system in the present case in connection with my improvements, yet the improvements are equally applicable to an air cooled system, as the improvements will be equally effective in controlling the fan of such a system as well as operating a closure or air interrupter arranged at one end of the air jacket.

Having thus described my invention, I claim:—

1. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, electrically-operated devices for controlling said cooling member, and thermostatically-controlled fluid-operated mechanism for controlling said electrically-operated devices as influenced by the temperature of said engine.

2. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, electrically-operated devices for controlling the operation of said fan, a series of radiator shutters in front of said fan, and thermostatically-controlled fluid-operated mechanism for simultaneously controlling said electrically-operated devices and said shutters as influenced by the temperature of said engine.

3. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, electrically-operated devices for controlling said cooling member, fluid-operated mechanism for controlling said electrically-operated devices including a connection to a vacuum creating source and a valve in said connection, and a thermostat influenced by the temperature of said engine for controlling said valve.

4. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, electrically-operated devices for controlling said cooling member, a series of radiator shutters in front of said cooling member, fluid operating mechanism for simultaneously controlling said electrically-operated devices and said shutters including a connection to a vacuum creating source and a valve in said connection, and a thermostat influenced by the temperature of said engine for controlling said valve.

5. In a cooling system for an explosive engine, the combination of a cooling member

for said engine such as a fan, driving devices for said cooling member, electrically-operated devices for controlling said driving devices, and thermostatically-controlled fluid-operated mechanism for controlling said electrically operated devices as influenced by the temperature of said engine.

6. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, driving devices for said cooling member, electrically-operated devices for controlling said driving devices, a series of radiator shutters in front of said fan, and thermostatically-controlled fluid-operated mechanism for simultaneously controlling said electrically operated devices and said shutters as influenced by the temperature of said engine.

7. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, a clutch member connected to said fan, a driving clutch member associated therewith, electrically-operated devices for controlling said driving clutch member, and thermostatically-controlled fluid-operated mechanism for controlling said electrical devices as influenced by the temperature of said engine.

8. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, a clutch member secured to said fan, a driving clutch member associated therewith, electrically-operated devices for controlling said driving clutch member, a series of radiator shutters in front of said fan, and thermostatically-controlled fluid-operated mechanism for simultaneously controlling said electrical devices and said shutters as influenced by the temperature of said engine.

9. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, driving devices for said cooling member, electrically-operated devices for controlling said driving devices, fluid-operated mechanism for controlling said electrically-operated devices including a connection to a vacuum-creating source and a valve in said connection, and a thermostat influenced by the temperature of said engine for controlling said valve.

10. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, driving devices for said cooling member, electrically-operated devices for controlling said driving devices, a series of radiator shutters arranged in front of said cooling member, fluid operated mechanism for controlling said electrically-operated devices and said shutters comprising a connection to a vacuum creating source and a valve in said connection, and a thermostat influenced by the temperature of said engine for controlling said valve.

11. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, driving devices for said cooling member, electrically-operated devices for controlling said driving devices, a fluid cylinder having a piston therein for controlling said electrically-operated devices, a connection between one end of said cylinder and a vacuum creating source including a valve, and a thermostat influenced by the temperature of said engine for controlling said valve.

12. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, driving devices for said cooling member, electrically-operated devices for controlling said driving devices, a series of radiator shutters arranged in front of said cooling member, a fluid cylinder having a piston therein for controlling said electrically-operated devices and said shutters, a connection between one end of said cylinder and a vacuum creating source including a valve, and a thermostat influenced by the temperature of said engine for controlling said valve.

13. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, driving devices for said cooling member, electrically-operated devices for controlling said driving devices, a fluid cylinder having a piston therein for controlling said electrically-operated devices, a spring for moving said piston in one direction in said cylinder, a connection between one end of said cylinder and a vacuum creating source including a valve whereby said piston is moved in the opposite direction against the tension of said spring when a vacuum is created, and a thermostat influenced by the temperature of said engine for controlling said valve.

14. In a cooling system for an explosive engine, the combination of a cooling member for said engine such as a fan, driving devices for said cooling member, an electrically-operated device for controlling said driving devices, a series of radiator shutters arranged in front of said cooling member, a fluid cylinder having a piston therein for simultaneously controlling said electrically-operated devices and said shutters, a spring for moving said piston in one direction in said cylinder, a connection between one end of said cylinder and a vacuum creating source including a valve whereby said piston is moved in the opposite direction against the tension of said spring when a vacuum is created, and a thermostat influenced by the temperature of said engine for controlling said valve.

15. In a cooling system for an explosive engine, a fan, a movable clutch member for engagement with a clutch member on said fan, an electromagnet for operating said movable clutch member in one direction to-

gether with a spring for moving it in the opposite direction, a source of electric energy having a circuit through said electromagnet, and thermostatically-controlled fluid-operated devices for making and breaking said circuit.

16. In a cooling system for an explosive engine, a fan, a movable clutch member for engagement with a clutch member on said fan, a magnet for operating said movable clutch member in one direction, a source of electric energy having a circuit through said magnet, a fluid cylinder and a piston therein, one end of said cylinder having a connection to a vacuum creating source together with a valve for controlling the same whereby the piston is caused to be moved in one direction when a vacuum is created on one side of said piston, means for moving the piston in the opposite direction, means connected with said piston for making and breaking said circuit, and a thermostat for controlling said valve.

17. In a cooling system for an internal combustion engine, devices for creating and preventing a circulation of air about said engine, controlling mechanism for said devices including a spring for operating a movable part of said mechanism in one direction and a fluid connection to the fuel intake manifold of said engine for operating said movable part in the opposite direction, controlling devices for the fuel, and a connection from said controlling devices to said spring for varying the tension of said spring proportionately to the amount of fuel admitted to said passage.

18. In a cooling system for an internal combustion engine, devices for creating and preventing a circulation of air about said engine; controlling mechanism for said devices including a cylinder and piston therein, a spring for moving said piston in one direction and a connection to the fuel passage of said engine for causing an air pressure reduction on one side of said piston to move it in the opposite direction, fuel controlling devices, and a connection from said devices to said spring for varying the tension of said spring proportionately to the amount of fuel admitted to said passage.

In testimony whereof, I have hereunto set my hand this 13th day of August, 1919.

HARVE R. STUART.

Witness:

CHAS. I. WELCH.