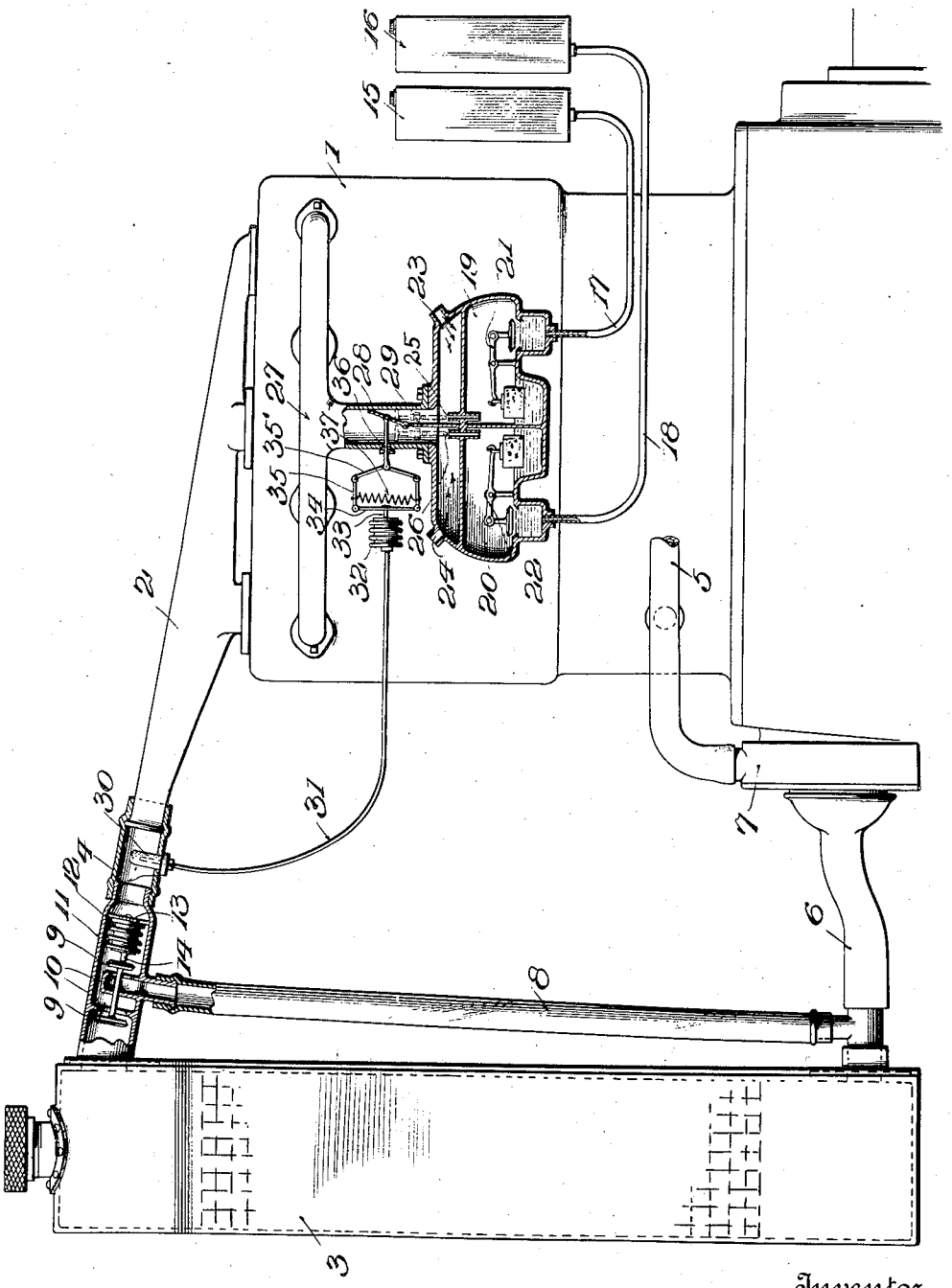
J. V. GIESLER.

FUEL REGULATING DEVICE.

APPLICATION FILED MAY 12, 1917.

1,330,700. Patented Feb. 10, 1920.



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FUEL-REGULATING DEVICE.

1,330,700. Specification of Letters Patent. **Patented Feb. 10, 1920.**

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To all whom it may concern:

Be it known that I, JEAN V. GIESLER, a citizen of the United States of America, and a resident of Knoxville, Tennessee, have invented a new and useful Improvement in Fuel-Regulating Devices, which invention is fully set forth in the following specification.

This invention relates to internal combustion engines, and while capable of use in a wide variety of engines of this type, has special utility when applied to the engine of an automobile.

It has heretofore been proposed to provide an internal combustion engine with a plurality of carbureters for supplying the engine with different fuels to enable the engine to start on a highly volatile fuel and then to run on a less volatile fuel, and in certain instances thermosensitive means have been employed for changing over from one fuel to the other. Devices of this type heretofore suggested have been complicated in construction, expensive to manufacture and install, uncertain in action and wasteful of the more volatile fuel. As fuels are becoming less and less volatile each year, and as fuels of high volatility are becoming more and more expensive, it is of the utmost importance for an efficient operation of an internal combustion engine that means be provided whereby the engine will be changed from the more volatile fuel to the less volatile fuel as promptly after the starting of the engine as may be and yet not before the engine has arrived at such operating conditions as enable its proper use of the less volatile fuel.

It is the object of this invention to provide an internal combustion engine with a plurality of carbureters and thermosensitive means for changing from one fuel to another which is simple in construction, inexpensive to manufacture and install, certain in operation, and which uses a minimum of the more volatile fuel.

A further object of this invention is to provide a device of the type characterized with thermosensitive means for changing from one fuel to another, which thermosensitive means is controlled by the temperature of the cooling medium flowing from the engine jacket, whereby the fuel-controlling means shall be promptly responsive to the variations of temperature in the engine.

A still further object of the invention is to provide, in combination with means for supplying an engine with different fuels and means for changing from one fuel to another, a cooling system for the engine comprising means for regulating the cooling effect of said system on the engine, and thermosensitive means subjected to the cooling medium and controlling the means for changing from one fuel to another, whereby the cooling medium will be promptly heated to that temperature at which the engine operates most efficiently and the fuel-controlling means will be operated promptly to shift from the more volatile to the less volatile fuel when the engine has reached a suitable operating temperature.

Stated broadly, the invention comprises, in combination with an internal combustion engine and its system for circulating a cooling medium in heat-interchanging relation therewith, means preferably in the form of a plurality of carbureters for supplying the engine with different fuels, and valve mechanism for controlling the supply of the different fuels to the engine, said valve mechanism being operatively connected with a thermostat subjected to the temperature of the cooling medium. In the preferred embodiment of the invention, the cooling system for the engine comprises an engine jacket, a radiator and connections therebetween, together with valve mechanism thermostatically controlled for regulating the passage of the cooling medium through the radiator. In the form shown, this latter valve mechanism simultaneously controls a by-pass around the radiator whereby a continuous circulation may be maintained through the engine jacket.

The invention is capable of receiving a variety of mechanical expressions, one of which is shown on the accompanying drawing, but it is to be expressly understood that the drawing is for purposes of illustration

only, and is not to be construed as a definition of the limits of the invention, reference being had to the appended claims for that purpose.

The drawing illustrates in elevation, partly in section, an internal combustion engine provided with a cooling system and means controlled by the temperature of the cooling medium for changing from one fuel to another in accordance with the present invention.

Referring in detail to said drawing, 1 designates the cylinder or cylinders of any suitable form of internal combustion engine, the same being provided with an engine jacket through which it is designed a cooling medium shall be circulated. 2 designates the outlet manifold leading from said engine jacket, 3 any suitable form of radiator, 4 the connections intermediate the outlet manifold and the radiator, 5 the inlet manifold, 6 the connections between the radiator and the inlet manifold, and 7 any suitable form of pump for maintaining a circulation through the system thus provided. While a circulating pump has been illustrated, it is to be expressly understood, however, that, if desired, the thermosiphon system of circulation may be employed instead. In the form shown, a bypass 8 is also provided between the connections 4 and 6.

Means are preferably provided for controlling the circulation of the cooling medium through the radiator and, when a by-pass is employed as shown, for controlling the circulation through the by-pass also. In the embodiment illustrated, the means for regulating the circulation of cooling medium through the radiator and by-pass comprises a pair of seating valves 9 designed to coöperate with ports 10 formed within a valve housing 11 and controlling the inlet to the radiator and the by-pass. Operatively connected to the said valve 9 is a thermostat, shown as consisting of an expansible and collapsible corrugated vessel 12 charged with a thermosensitive fluid and having one end wall fixedly secured in position within the valve housing 11 by a bracket 13 and having its opposite and movable end wall connected to said valves 9 by a stem 14. While the vessel 12 is shown as positioned within the circulating system for subjection to the temperature of the cooling medium flowing therethrough, it is to be understood that said vessel may be otherwise suitably positioned if desired.

In accordance with the present invention, means are provided for supplying the engine with different fuels. In the form shown, a plurality of fuel tanks 15 and 16 communicate, respectively, through pipes 17 and 18 with a plurality of carbureters 19 and 20 having the usual float-controlled valves 21 and 22 for regulating admission of fuel thereto, the usual air inlets 23 and 24 and the usual needle valves 25 and 26 for controlling the passage of fuel from the carbureters to the intake manifold 27. Valve mechanism is also provided for determining the supply of the fuel from the respective carbureters to said intake manifold, such valve mechanism being shown as a flap valve 28 pivoted on the partition 29 separating the fuel ducts leading from the respective carbureters and adapted in its extreme positions to cut out the respective carbureters.

A thermostat is provided for controlling the valve 28, said thermostat being subjected to the temperature of the cooling medium, preferably at a point where said medium has substantially the temperature at which it leaves the engine jacket. In the form shown, a bulb 30 is positioned within the connections between the engine jacket and the radiator and communicates through a pipe 31 with an expansible and collapsible corrugated vessel 32, bulb 30, and preferably also pipe 31 and vessel 32, being charged with a thermosensitive fluid. Vessel 32 is suitably supported with one end wall maintained fixedly in position, and with its opposite and movable end wall connected by a stem 33 and arms 34 to two pairs of links 35 and 35′ pivotally connected and respectively pivoted at opposite ends to the arms 34 and a link 36 connected to valve 28. A spring 37 connecting said links 35 normally maintains links 35, 35′ collapsed, with the valve 28 in one or the other of its extreme positions.

Assuming that the fuel supplied from tank 16 is the more volatile fluid, valve 28 will be in the position shown on the drawing when the engine is started. The fuel now passes from tank 16 through pipe 18 into carbureter 20, from which it is drawn into the engine through intake manifold 27. The cooling medium in the system when the engine is started is cold, and expansible and collapsible vessels 12 and 32 are collapsed. The passage from the engine jacket to the radiator is closed, and the passage through the by-pass is open, in this condition of the vessel 12. The cooling medium accordingly is circulated from the engine jacket through the outlet manifold 2, connections 4, by-pass 8, connections 6 and pump 7, back through the inlet manifold 5 to the engine jacket. As none of the cooling medium passes through the radiator, its temperature will rise quickly, and the engine cylinder or cylinders will be brought with promptness to that temperature at which the engine operates most efficiently. As the temperature of the cooling medium rises, the pressure of the thermosensitive

fluid within the bulb 30 increases and causes an expansion of the vessel 32. Expansion of said vessel causes a movement of the stem 33, arms 34 and links 35 toward the right, as viewed on the drawing, but inasmuch as valve 28 is bearing against the wall of the manifold, link 36 cannot be moved toward the right, and the links 35 will accordingly be separated against the tension of the spring 37 while the links 35′ will pivot on the end of the link 36 and on their connections to the links 35 until the links 35′ are moved past dead center. Spring 37 will then contract, drawing links 35 toward one another and moving the links 35′ to their extreme left-hand position. This latter movement through link 36 draws the valve 28 to its opposite extreme position, cutting out the carbureter 20 and admitting the fuel from carbureter 19 to the intake manifold 27. The fuel will now be supplied the engine from tank 15 through pipe 17 and said carbureter 19. Also, as the temperature of the cooling medium rises above that at which the engine operates most efficiently, vessel 12 will expand, correspondingly opening the passage to the radiator and closing the passage to the by-pass, whereby a proportionate amount of the cooling medium will flow through the radiator to maintain the cooling medium at the desired temperature. If the cooling medium continue to increase in temperature, the passage to the by-pass will be eventually closed, and the passage to the radiator opened wide.

While the means connecting the vessel 32 to the valve 28 has been shown as of a type producing a "snap-action" motion of said valve, it is to be expressly understood that the change from one fuel to the other may be gradual, if desired, in which event there will be a period when fuel will be withdrawn from both carbureters and intermixed in the intake manifold 27.

It will therefore be seen that an internal combustion engine has been provided with means for supplying the engine with different fuels and with means controlled by the temperature of the cooling medium for changing from one fuel to another which is simple in construction, inexpensive to manufacture and install, certain in operation, and requires the use of but a minimum of the more volatile fuel. It will furthermore be seen that a device of this type has been provided wherein the fuel-changing means is thermostatically controlled from the temperature of the cooling medium at that temperature at which it leaves the engine jacket, and which is combined with means for regulating the cooling effect of said system on the engine, whereby such cooling medium will be brought promptly to that temperature at which the engine operates most efficiently and whereby the change from the more volatile to the less volatile fuel will take place in a minimum of time after the engine has been started but not before the engine has reached such an operating temperature as enables its proper use of the less volatile fuel.

While the embodiment of the invention illustrated on the drawing has been described with considerable particularity, it is to be expressly understood that such embodiment has been selected for purposes of illustration only, and is not to be construed as a definition of the limits of the invention, as various other mechanical expressions of the invention will readily suggest themselves to those skilled in the art, while certain features of the invention are capable of use without other features thereof. Reference is therefore to be had to the claims hereto appended for a definition of the limits of the invention.

What is claimed is:—

1. In combination with an internal combustion engine and its system for circulating a cooling medium in heat-interchanging relation therewith, a plurality of carbureters for supplying said engine with different fuels, and means controlled by the temperature of the cooling medium for changing from one fuel to another.

2. In combination with an internal combustion engine and its system for circulating a cooling medium in heat-interchanging relation therewith, means for supplying said engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, and a thermostat operatively connected to said valve mechanism and subjected to the temperature of the cooling medium.

3. In combination with an internal combustion engine, the engine jacket, and the system for circulating a cooling medium through said jacket, means for supplying said engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, and a thermostat operatively connected to said valve mechanism and subjected to the temperature of the cooling medium as it leaves the engine jacket.

4. In combination with an internal combustion engine, its intake manifold, and its system for circulating a cooling medium in heat-interchanging relation with said engine, a plurality of carbureters in communication with said intake manifold for supplying said engine with different fuels, valve mechanism in said intake manifold for controlling the admission of the different fuels, and a thermostat operatively connected to said valve mechanism and subjected to the temperature of the cooling medium.

5. In combination with an internal combustion engine, its intake manifold, and its system for circulating a cooling medium in heat-interchanging relation with said engine, a plurality of carbureters in communication with said intake manifold for supplying said engine with different fuels, valve mechanism in said intake manifold for controlling the admission of the different fuels, an expansible and collapsible vessel operatively connected to said valve mechanism, and a bulb communicating with said vessel and subjected to the temperature of the cooling medium, said bulb being charged with a thermosensitive fluid.

6. In combination with an internal combustion engine and its system for circulating a cooling medium in heat-interchanging relation therewith, means for supplying said engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, an expansible and collapsible vessel operatively connected to said valve mechanism, and a bulb communicating with said vessel and subjected to the temperature of the cooling medium, said bulb being charged with a thermosensitive fluid.

7. In combination with an internal combustion engine, the engine jacket, the radiator, and the connections therebetween, thermostatically-controlled valve mechanism for regulating the flow of the cooling medium through said radiator, means for supplying the engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, and a thermostat operatively connected to said last-named valve mechanism and subjected to the temperature of the cooling medium.

8. In combination with an internal combustion engine, the engine jacket, the radiator, and the connections therebetween, thermostatically-controlled valve mechanism for regulating the flow of the cooling medium through said radiator, means for supplying the engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, and a thermostat operatively connected to said last-named valve mechanism and subjected to the temperature of the cooling medium as it leaves said engine jacket.

9. In combination with an internal combustion engine, the engine jacket, the radiator, and the connections therebetween, valve mechanism for regulating the flow of the cooling medium through said radiator, means controlled by the temperature of the cooling medium for operating said valve mechanism, means for supplying the engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, and a thermostat operatively connected to said last-named valve mechanism and subjected to the temperature of the cooling medium.

10. In combination with an internal combustion engine, the engine jacket, the radiator, and the connections therebetween, valve mechanism for regulating the flow of the cooling medium through said radiator, means controlled by the temperature of the cooling medium for operating said valve mechanism, means for supplying the engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, and a thermostat operatively connected to said last-named valve mechanism and subjected to the temperature of the cooling medium as it leaves said engine jacket.

11. In combination with an internal combustion engine, the engine jacket, the radiator, and the connections therebetween, thermostatically controlled valve mechanism for regulating the flow of the cooling medium through said radiator, means for supplying said engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, an expansible and collapsible vessel operatively connected to said last-named valve mechanism, and a bulb in communication with said vessel and subjected to the temperature of the cooling medium, said bulb being charged with a thermosensitive fluid.

12. In combination with an internal combustion engine, the engine jacket, the radiator, and the connections therebetween, thermostatically controlled valve mechanism for regulating the flow of the cooling medium through said radiator, means for supplying said engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, an expansible and collapsible vessel operatively connected to said last-named valve mechanism, and a bulb in communication with said vessel and subjected to the temperature of the cooling medium as it leaves the engine jacket, said bulb being charged with a thermosensitive fluid.

13. In combination with an internal combustion engine, its intake manifold, the engine jacket, the radiator, and the connections between said radiator and jacket, thermostatically controlled valve mechanism for regulating the flow of the cooling medium through said radiator, a plurality of carbureters in communication with said intake manifold, valve mechanism for controlling the supply of fuel from the respective carbureters to the intake manifold, and a thermostat operatively connected to said last-named valve mechanism and subjected to the temperature of the cooling medium.

14. In combination with an internal com-

bustion engine, its intake manifold, the engine jacket, the radiator, and the connections between said radiator and jacket, thermostatically controlled valve mechanism for regulating the flow of the cooling medium through said radiator, a plurality of carbureters in communication with said intake manifold, valve mechanism for controlling the supply of fuel from the respective carbureters to the intake manifold, an expansible and collapsible vessel operatively connected to said last-named valve mechanism, and a bulb in communication with said vessel and subjected to the temperature of the cooling medium, said bulb being charged with a thermosensitve fluid.

15. In combination with an internal combustion engine, the engine jacket, the radiator, and the connections therebetween, a by-pass around the radiator, valve mechanism for regulating the flow of the cooling medium through said radiator and by-pass, a thermostat controlling said valve mechanism, means for supplying said engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, and a thermostat operatively connected to said last-named valve mechanism and subjected to the temperature of the cooling medium.

16. In combination with an internal combustion engine, the engine jacket, the radiator, and the connections therebetween, a by-pass around the radiator, valve mechanism for regulating the flow of the cooling medium through said radiator and by-pass, thermosensitive means subjected to the temperature of the cooling medium for controlling said valve mechanism, means for supplying said engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, and a thermostat operatively connected to said last-named valve mechanism and subjected to the temperature of the cooling medium.

17. In combination with an internal combustion engine, the engine jacket, the radiator, and the connections therebetween, a by-pass around the radiator, valve mechanism for regulating the flow of the cooling medium through said radiator and by-pass, a thermostat controlling said valve mechanism, means for supplying said engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, and a thermostat operatively connected to said last-named valve mechanism and subjected to the temperature of the cooling medium as it leaves the engine jacket.

18. In combination with an internal combustion engine, the engine jacket, the radiator, and the connections therebetween, a by-pass around the radiator, valve mechanism for regulating the flow of the cooling medium through said radiator and by-pass, a thermostat controlling said valve mechanism, means for supplying said engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, an expansible and collapsible vessel operatively connected to said last-named valve mechanism, and a bulb in communication with said vessel and subjected to the temperature of the cooling medium, said bulb being charged with a thermosensitive fluid.

19. In combination with an internal combustion engine, its intake manifold, the engine jacket, the radiator, and the connections therebetween, a by-pass around the radiator, valve mechanism for regulating the flow of the cooling medium through said radiator and by-pass, a thermostat controlling said valve mechanism, a plurality of carbureters in communication with said intake manifold for supplying said engine with different fuels, valve mechanism for controlling the supply of the fuel from the respective carbureters to the intake manifold, and a thermostat operatively connected to said last-named valve mechanism and subjected to the temperature of the cooling medium.

20. In combination with an internal combustion engine, its intake manifold, the engine jacket, the radiator, and the connections therebetween, a by-pass around the radiator, valve mechanism for regulating the flow of the cooling medium through said radiator and by-pass, a thermostat controlling said valve mechanism, a plurality of carbureters in communication with said intake manifold for supplying said engine with different fuels, valve mechanism for controlling the supply of the fuel from the respective carbureters to the intake manifold, an expansible and collapsible vessel operatively connected to said last-named valve mechanism, and a bulb in communication with said vessel and subjected to the temperature of the cooling medium, said bulb being charged with a thermosensitive fluid.

21. In combination with an internal combustion engine and its system for circulating a cooling medium in heat-interchanging relation therewith, thermostatically controlled means for regulating the cooling effect of said system, means for supplying the engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, and a thermostat operatively connected to said last-named valve mechanism and subjected to the temperature of the cooling medium.

22. In combination with an internal combustion engine and its system for circulating a cooling medium in heat-interchanging re-

lation therewith, means for regulating the cooling effect of said system on said engine, means for supplying the engine with different fuels, and means responsive to the temperature of the cooling medium for determining which fuel is supplied to the engine.

23. In combination with an internal combustion engine and its system for circulating a cooling medium in heat-interchanging relation therewith, means for supplying said engine with different fuels, valve mechanism for controlling the supply of the different fuels to the engine, a thermostat subjected to the temperature of the cooling medium, and connections between said thermostat and valve mechanism whereby said valve mechanism admits but one fuel at a time to said engine.

In testimony whereof I have signed this specification.

JEAN V. GIESLER.