F. M. FURBER.

TEMPERATURE CONTROLLING APPARATUS FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED AUG. 4, 1915.

1,168,623.

Patented Jan. 18, 1916.

2 SHEETS—SHEET 1.

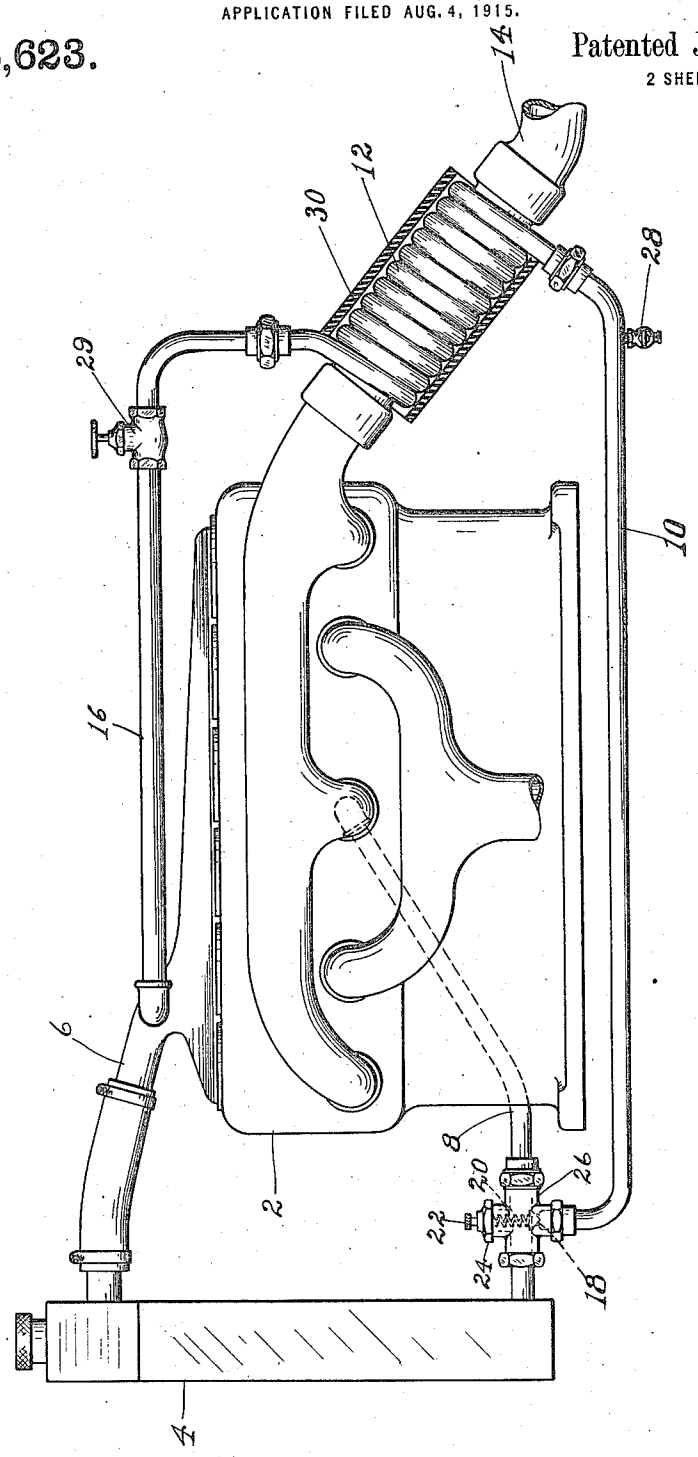


Fig. 1

INVENTOR

Frederick M. Furber

By his Attorneys

Putnam Putnam & Bell

F. M. FURBER.

TEMPERATURE CONTROLLING APPARATUS FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED AUG. 4, 1915.

1,168,623.

Patented Jan. 18, 1916.

2 SHEETS—SHEET 2.

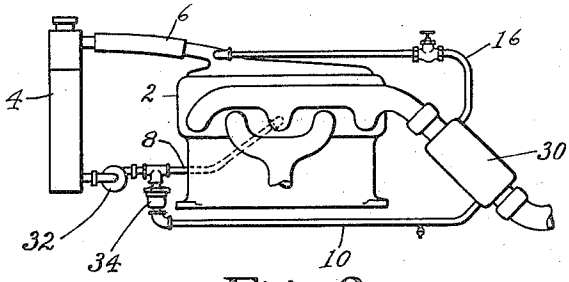


Fig. 2

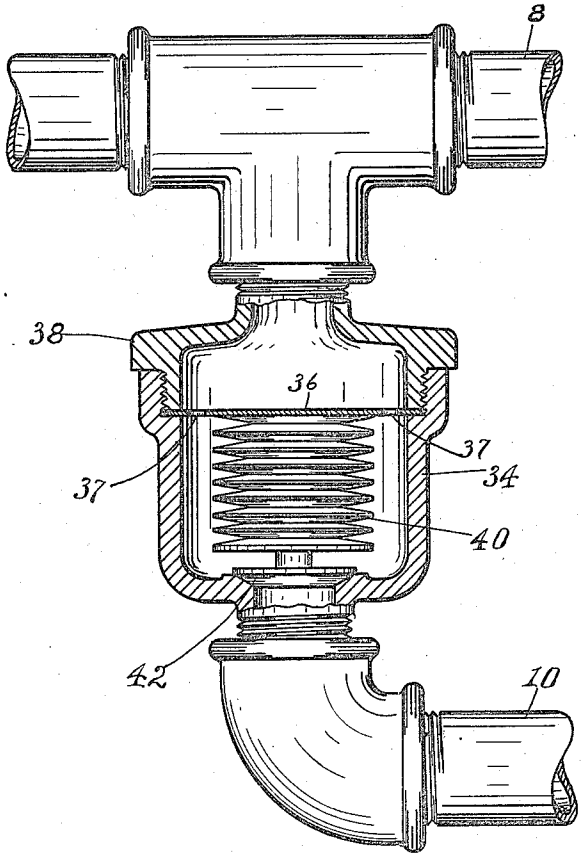


Fig. 3

INVENTOR

Frederick M. Furber

By his attorneys

Putnam Putnam & Bell

UNITED STATES PATENT OFFICE.

FREDERICK M. FURBER, OF REVERE, MASSACHUSETTS.

TEMPERATURE-CONTROLLING APPARATUS FOR INTERNAL-COMBUSTION ENGINES.

1,168,623. Specification of Letters Patent. Patented Jan. 18, 1916.

Application filed August 4, 1915. Serial No. 43,690.

To all whom it may concern:

Be it known that I, FREDERICK M. FURBER, a citizen of the United States, residing at Revere, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Temperature-Controlling Apparatus for Internal-Combustion Engines, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

Most internal combustion engines used in automobiles are equipped with a water cooling system which is designed to radiate heat from the engine with sufficient rapidity to maintain the engine at an efficiently operating temperature. These cooling systems are of course designed with particular reference to the operating conditions in hot weather and accordingly it is found that they radiate the heat so rapidly in cold weather as to reduce the temperature of the engine to a point at which it cannot operate efficiently. In very severe weather the water in the cooling system sometimes freezes even while the engine is in operation.

The present invention aims to devise means for controlling automatically the temperature of the engine in such a manner as to maintain it at substantilly all times during its operation at an efficiently operative temperature. More specifically the invention aims to avoid the undesirable reduction in temperature of the engine which takes place when it is operated in cold weather. In the embodiment of the invention hereinafter described in detail this object is accomplished by supplying from a source supplemental to the engine jacket the amount of heat required to maintain the water in the cooling system at the desired temperature. Preferably the heat of the exhaust from the engine is utilized for this purpose.

The invention will be readily understood from the following description, reference being made to the accompanying drawings, in which—

Figure 1 is a side view of an apparatus embodying the invention; Fig. 2 is a view similar to Fig. 1 showing a slightly modified construction; and Fig. 3 is a vertical, sectional view through a part of the apparatus shown in Fig. 2.

Referring now to the drawings, 2 indicates an internal combustion engine of a type commonly used in automobiles; 4, the radiator for the engine; and 6 and 8, the pipes that conduct the circulating water or other cooling fluid (hereinafter for convenience referred to as water) to and from the radiator. In the arrangement shown the warm water flows from the engine to the radiator through the pipe 6 and returns to the engine through the pipe 8 after it has been cooled, this arrangement being known as the "thermo siphon" cooling system. A shunt circuit for the cooling water is arranged in parallel with the radiator 4 and consists of a pipe or conduit 10 leading from the pipe 8 to one of the lower ends of another pipe or conduit 12 which is coiled around the exhaust pipe 14 of the engine, a third conduit 16 connecting the upper end of the coil 12 with the pipe 6. A valve 18 controls the flow of water through this shunt circuit and this valve is operated by a thermostat 20 which may be of any convenient construction but consists, in the form shown in Fig. 1, merely of a tube or rod of suitable metal wound into helical form supporting the valve 18 at its lower end and itself supported at its upper end by an adjustable screw 22 threaded through a cap 24 of a casing or fitting 26 to which the pipes 8 and 10 are joined.

The parts are so adjusted that during the operation of the engine the water in the cooling system flows from the upper part of the water jacket of the engine through the pipes 6 into the top of the radiator and gradually descends through the radiator as it is cooled, returning again to the lower end of the jacket through the pipe 8. This is the ordinary operation of a system of this type. So long as the temperature of the water as it passes through the casing 26 remains above a predetermined point, which may of course be varied by adjusting the screw 22, the thermostat 20 will be expanded sufficiently to maintain the valve 18 in its seat and thus prevent the flow of water through the shunt circuit formed by the pipes 10, 12 and 16; but when the temperature of the water in the cooling system drops below a predetermined point the thermostat 20 contracts, thus lifting the valve 18 away from its seat and allowing a certain amount of water to flow through the shunt circuit where it is heated by the exhaust from the engine and thus raises the tem-

perature of the water circulating in the cooling system. As soon, however, as the temperature of the circulating water has been raised to the desired point the thermostat 20 again closes the valve 18, thus shutting off the flow of water through the shunt circuit.

A drain cock 28 is provided at the lowermost point in the shunt circuit and a hand valve 29 is located in the pipe 16. In warm weather when there is no occasion for using the auxiliary heating means provided by this invention the drain cock 28 may be opened and the hand valve closed, thus draining the water from the part of the shunt circuit between these points. The thermostat 20 will of course keep the valve 18 in its closed position constantly during warm weather and thus prevent any flow of water into the pipe 10. The coil 12 may, if desired, be provided with a jacket 30 of some material which is a poor conductor of heat, such for instance as asbestos, to render the action of the apparatus more effective.

The arrangement shown in Fig. 2 is like that above described except that the water cooling system of Fig. 2 includes a pump 32 which creates a positive circulation of water through the system. This arrangement also includes a slightly different construction of thermostatic valve from that shown in Fig. 1. This valve is shown on a larger scale in Fig. 3 from which it will be seen that it includes a casing 34 and a diaphragm or plate 36 perforated as indicated at 37 and clamped in the casing by the cover 38. The thermostat 40 depends from the plate 36 and carries at its lower end a valve 42 which normally rests in a seat formed in the outlet from the casing 34. This thermostat is of a type readily obtainable on the market and consists of a series of thin annular metallic disks, the inner edge of each disk being united to the inner edge of the next adjacent disk on one side and to the outer edge of the adjacent disk on the opposite side, thus forming a metallic bellows which expands axially or longitudinally as its temperature is raised and contracts as the temperature drops. Thermostats of this type contain some volatile liquid, such as ether, and are much used in radiators for steam heating systems. The operation of this thermostat is of course the same as that shown in Fig. 1. Obviously, any suitable form of thermostat can be used. In both arrangements the water circulating through the cooling system flows around the thermostat which consequently responds readily to changes in the temperature of the water.

The specific arrangements above described are designed merely to set forth clearly the nature of the invention and explain a convenient mode of applying the invention to two common types of water cooling systems. It will be readily appreciated by those skilled in this art that the invention is susceptible of much modification without departing from its spirit or scope.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In an automobile, the combination with an internal combustion engine and a water cooling system therefor, of means for utilizing the heat of the exhaust from the engine to raise the temperature of the water in said system, and thermostatic mechanism for controlling the action of said means.

2. In an automobile, the combination with an internal combustion engine and a water cooling system therefor, of means for utilizing the heat of the exhaust from the engine to raise the temperature of the water in said system, and mechanism controlled by the temperature of the circulating water for controlling the action of said means.

3. In an automobile, the combination with an internal combustion engine and a water cooling system therefor, of means for utilizing the heat of the exhaust from the engine to raise the temperature of the circulating water, and mechanism controlled by the temperature of the water in said system arranged to operate automatically to render said means operative when the temperature of the water falls below a predetermined point and to render said means inoperative again when the temperature of the water has risen above a predetermined point.

4. In an automobile, the combination with an internal combustion engine and a water cooling system therefor, of a water conduit supplemental to said system arranged to be heated by the exhaust from the engine, and means responsive to changes in the temperature of the water in said system for controlling the flow of water through said conduit.

5. In an automobile, the combination with an internal combustion engine and a water cooling system therefor, of a water conduit supplemental to said system arranged to be heated by the exhaust from the engine, and a thermostatic valve operative to permit the flow of water through said conduit when the temperature of the water in said system falls below a predetermined point and to cut off said flow when the temperature of the water in said system has risen above a predetermined point.

6. In an automobile, the combination with an internal combustion engine and a water cooling system therefor including a radiator, of a shunt circuit for the water in said system, said circuit including a conduit arranged to be heated by the exhaust from the engine, a valve for controlling the flow of water through said shunt circuit and a thermostat in said system arranged to operate said valve.

7. In an automobile, the combination with an internal combustion engine and a water cooling system therefor including a radiator, of a shunt circuit for the water in said system, said circuit being in parallel with the radiator and including a conduit arranged to be heated by the exhaust from the engine, a valve for controlling the flow of water through said shunt circuit and a thermostat positioned in said system near the lower end of said radiator and arranged to operate said valve.

8. In an automobile, the combination with an internal combustion engine and a water cooling system therefor, of a water conduit supplemental to said system arranged to be heated by the exhaust from the engine, and a valve arranged to control the flow of water through said conduit.

9. In an automobile, the combination with an internal combustion engine and a water cooling system therefor, of means constructed and arranged to utilize the heat of the exhaust from said engine to raise the temperature of the water in said system, and thermostatic means responsive to changes in the temperature of the water in said system and operative to control the supply of heat from the exhaust to the water in said system.

10. In an automobile, the combination with an internal combustion engine, of a system through which cooling water for the engine circulates, said system including a conduit for water constructed and arranged to be heated by the exhaust from the engine, and thermostatic means operative to control the supply of heat from said exhaust to said system.

In testimony whereof I have signed my name to this specification.

FREDERICK M. FURBER.