F. W. KIDDER.

DRAINAGE PLUG FOR WATER COOLING RADIATORS.

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1,306,186. Patented June 10, 1919.

Fig. I.

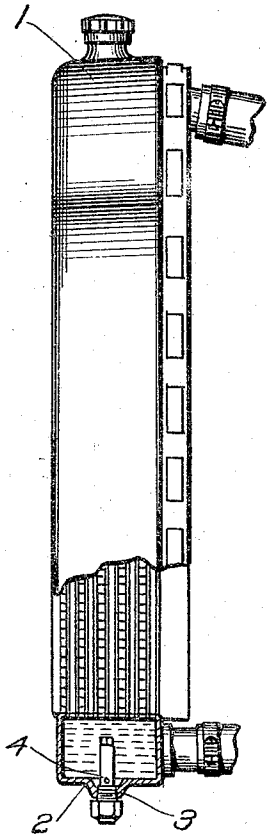


Fig. II.

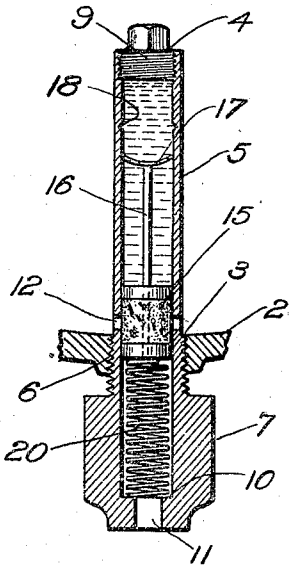


Fig. III.

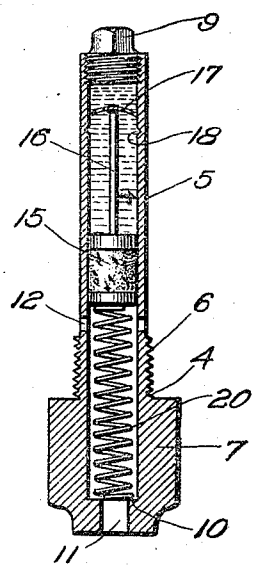
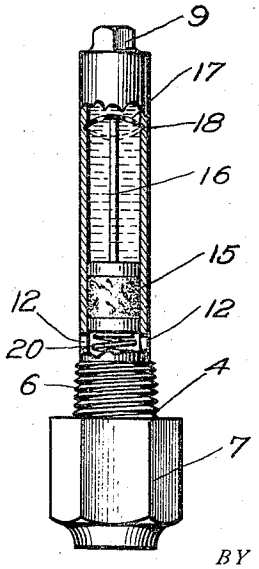


Fig. IV.



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UNITED STATES PATENT OFFICE.

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DRAINAGE-PLUG FOR WATER-COOLING RADIATORS.

1,306,186. Specification of Letters Patent. Patented June 10, 1919.

Application filed October 29, 1917. Serial No. 199,144.

To all whom it may concern:

Be it known that I, FRANK W. KIDDER, a citizen of the United States, residing at Norton, in the county of Norton and State of Kansas, have invented certain new and useful Improvements in Drainage-Plugs for Water-Cooling Radiators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to drainage plugs for water cooling radiators, and more particularly to plugs of this character applicable to the drainage openings of the conventional type of water cooling radiators used in conjunction with automobile engines; the principal object of the invention being to provide a plug, whereby, under normal conditions, water is prevented from flowing from the radiator and which contains an automatically controlled outlet which will be opened when the temperature of the water falls to or below a predetermined degree, so that the water may flow from the radiator before a freezing temperature is reached and damage done to the radiator and other water containing parts drained therethrough.

In accomplishing this object I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:—

Figure I is a vertical, sectional view of a water cooling radiator showing a drainage plug, constructed according to the present invention, applied to the drainage opening in the base thereof.

Fig. II is an enlarged vertical, sectional view of the plug, showing the drainage channel closed.

Fig. III is a similar view showing the position of the valve when the channel is open.

Fig. IV is a detail sectional view illustrating the operation of the diaphragm for effecting a quick movement of the piston valve member to open or close the outlet channel.

Referring more in detail to the drawings:

1 designates a conventional type of water cooling radiator, as is used in conjunction with automobile engines and through which water circulates from about the engine cylinders to maintain the latter at a workable temperature.

In its base 2 the radiator is provided with an opening 3, through which water from the radiator, and other water containing parts connected thereto, may be drained, and threaded into said opening to normally prevent a flow of water from the radiator and its communicating parts is a drainage plug 4 embodying the present invention.

In its preferred form, the plug comprises a tubular body portion 5 provided near its lower end with an externally threaded surface 6, whereby the device is connected to the threaded opening and when it is in functional position, that part of the tubular body above the threaded surface, extends vertically within the radiator and the portion below the threads extends accessibly from the radiator and is provided with an enlarged portion forming a wrench head 7, whereby its application to or its removal from the radiator is facilitated.

At its upper end the tubular body 5 is closed, preferably by threading a plug 9 therein, and at its lower end is provided with an internal peripheral shoulder 10 and a central discharge opening 11 through which water entering the tube through a plurality of normally closed openings 12, located in the tube above the threaded portion 5 and closely adjacent the floor of the radiator, may be drained from the radiator.

Slidably contained within the upper portion of the tube 5, and fitting snugly therein, is a piston valve 15, which is maintained, when the temperature of the water is between certain predetermined limits, at such position that the openings 12 are closed and any possible flow of water from the radiator through the plug is prevented. Connected with the upper side of the piston 15 is a rod or stem 16, which at its upper end is anchored centrally to a horizontally disposed flexible diaphragm 17, of slightly greater diameter than the inner diameter of the tube 5, which moves slidably within the tube in accordance with the movement of the piston valve, and at certain times, as will be presently described, is adapted to seat within an annular groove 18 in the inner surface of the tube.

To actuate the valve in the manner intended I fill the space between the closed upper end of the tube and the piston valve 15 with an expansible medium, preferably

mercury, the volume of which increases or decreases in accordance with temperature variations, and I perforate the diaphragm 17 so that a flow of the medium may be permitted from one side thereof to the opposite side, as its volume changes under temperature variations and proper action of the valve parts is not prevented.

Located within the tube below the piston, and bearing at one end against the peripheral shoulder 10, and at its opposite end against the under side of the piston, to urge the latter upwardly against the mercury filling the upper end of the tube, is a coil spring 20; it being apparent that an increase in volume of the mercury will force the piston downwardly and depress the spring, but by a decrease in volume of the mercury the piston will be lifted by the pressure of the spring.

When the valve is in closed position the piston 15 overlies the openings 12 and the periphery of the diaphragm 17 is located within or below the annular groove 18 in a downwardly concave position as is shown in Fig. II.

With the plug properly located in the radiator opening and the valve in closed position, under normal conditions of temperature the valve will be maintained within certain limits to cover the ports 12 and flow of water from the radiator is prevented. Assuming, however, that the temperature of the water approaches a freezing degree, it is apparent that the mercury will decrease in volume and that under pressure of the spring 20 the piston will move upwardly to ultimately uncover the openings 12 and water will be permitted to drain from the radiator before damage is done thereto as would result should it be allowed to freeze therein.

In order that the piston movement may be made quick and decisive when closing or opening the ports, so that a partial opening is not permissible, I have so located the annular groove 18 relative to the openings 12 that just prior to the final movement of the piston, which would uncover the ports as the piston moves upwardly, the diaphragm seats itself in the groove 18 in its slightly downwardly concaved condition and is temporarily checked in its upward movement, but as the mercury continues to diminish in volume the upward pressure of the spring, transmitted to the diaphragm through the intermediacy of the piston 15 and rod 16, will cause the flexible diaphragm to reverse to an opposite convex position, and the piston will be quickly moved across the openings and the passage left entirely open to permit a free flow of water therethrough and a quick draining of the radiator may be accomplished.

Movement of the valve in the opposite or downward direction to close the openings is effected by the expansion of the mercury, which moves the piston downwardly against the pressure of the spring 20. This downward movement is temporarily checked just before a final movement which would bring the valve over the ports as the diaphragm, in its upwardly concaved condition, moves into the peripheral groove 18. However, continued expansion of the mercury will snap the diaphragm to an opposite or downwardly concaved position and the piston will be moved quickly across and will entirely close the ports.

The groove 18 is not, however, made of sufficient depth to prevent a further movement of the diaphragm, but the latter may move downwardly or upwardly across the groove according to its concaved condition.

In making the device it is preferable to use metal tubing, as this is easily threaded and is substantial. However, I do not wish to limit the construction to metal, as, when mercury is used as the expansible medium, its tendency to cling to certain metals, or the difficulty in confining it in such a device, is detrimental to its operation, and glass tubing in some cases proves more effective although not as substantial.

Assuming that the device is so constructed and applied to a radiator as described, it is apparent that between certain degrees of temperature the valve piston 15 may be maintained to prevent any flow of water from the radiator, but should the temperature decrease to or below a certain degree, contraction of the mercury will permit the valve to move sufficiently to uncover the ports and the radiator will be drained therethrough.

It is also apparent that by providing a flexible diaphragm and connecting it to the piston, as described, operation of the valve to close or open the ports is made quick and decisive and a partial opening, whereby the flow could be made so slow that freezing might occur before the drainage was completed, is not possible.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters-Patent, is:

1. A plug of the character described adapted for location within the drainage opening of a water cooling radiator, comprising a tubular body having a closed upper and an open lower end and wall ports therein through which said radiator may be drained and having an annular groove in its inner surface, a piston slidable within the tube to close or open said wall ports, a flexible diaphragm slidable within the tube and operatively connected with said piston, and having a greater diameter than the inner diameter of the tube to retain the same in a concaved condition; the periphery

of said diaphragm being adapted to seat within said groove when moved thereacross to effect a reversal of the concavity of the diaphragm, and an expansible medium confined within the tube to actuate the piston, for the purpose set forth.

2. A plug of the character described adapted for application to the drainage opening of a water cooling radiator, said plug comprising a tubular body having a closed upper and an open lower end and wall ports therein through which said radiator may be drained and having an annular groove in its inner surface, a piston slidable within the tube, a rod extending upwardly from the piston, a flexible, perforated diaphragm mounted on the rod and slidable within the tube and retained thereby in a concaved condition, the periphery of the diaphragm being adapted to seat within the said annular groove as it moves thereacross to effect a reverse of the concavity thereof, and an expansible medium confined within the tube above the piston to move the piston downwardly and a spring located within the lower end of the tube to actuate the piston upwardly on contraction of the said medium, for the purpose set forth.

3. In a device of the character described, comprising a tubular body having wall ports therein and an annular groove spaced therefrom, a piston slidable within the tube to close or open said ports, a rod attached to the piston, a diaphragm attached to the rod and slidable in the tube into and across said groove; said diaphragm being of greater diameter than the inner diameter of the tube and retained in a concaved condition; the length of said rod being such that with the diaphragm seated in the said groove and concaved upwardly the piston will entirely uncover the wall ports and when concaved downwardly will entirely close said ports.

4. A draining plug comprising a tube, one end of which is closed and the other end of which is provided with a shoulder surrounding an opening, the tube being provided with ports in the wall intermediate its ends and having an annular groove therein, a piston in said tube, a stem on the piston, a flexible diaphragm on the stem movable into and out of engagement with said groove, a spring, one end of which bears against the piston and the other end of which bears against the shoulder and an expansible medium in the tube between the piston and the closed end thereof.

5. A draining plug comprising a tube, one end of which is closed, the other end of which is provided with a shoulder surrounding an opening, the wall of the tube intermediate its ends having perforations and having an annular groove therein, a piston in the tube to cover and uncover the perforations, a stem on the piston, a diaphragm on the stem and movable into and out of engagement with said groove, a spring interposed between the piston and the shoulder in the tube and an expansible medium in the tube between the piston and the closed end thereof.

In testimony whereof I affix my signature.

FRANK W. KIDDER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."