A water drain for locomotives in which an explosive squib adjacent a drain plug creates a pressure surge sufficient to force the drain plug free so that the water can drain from the water cooling system; the squib being actuated by a thermistor which triggers a firing circuit when the temperature drops to a preselected level.

4 Claims, 2 Drawing Figures
It is often necessary that a railroad locomotive be left idle on a siding for a few hours or days. This may be due to the need for repair outside the skill or training of the operating crew; or due to traffic conditions or other reasons. Should this occur during freezing weather, it is necessary that the water be drained from the water cooling system, for should the water freeze, great damage to the engine may occur.

The present invention is directed to a means whereby should freezing conditions develop, the water is automatically drained from the locomotive. A primary object is to provide a cold temperature water drain for locomotives which utilizes an explosive squib located adjacent a drain plug which, when fired, produces a pressure surge in the water sufficient to blow the drain plug free; the squib being fired when a temperature sensing means triggers a firing circuit.

A further object is to provide an automatic water drain for locomotives which is inexpensive, and of greater importance, is highly dependable, the device being capable of remaining dormant for months, even years, before operation.

A further object is to provide a device of this class, which after operation or for test, may be removed and another device substituted merely by separation of one electrical connector.

Still other objects and advantages of the cold temperature water drain for locomotives of this invention will appear from the following description and the accompanying drawings, wherein:

FIG. 1 is a partial sectional, partial side view of the cold temperature water drain for locomotives, and showing fragmentarily a drain pipe depending from the water system of the locomotive.

FIG. 2 is a wiring diagram, illustrating the circuit which controls the explosive squib.

The cold temperature water drain for locomotives includes a housing 1, having a vertical bore 2 screw-threaded at its upper end for attachment to a drain line 3 depending from the water system of the locomotive. The lower end of the bore 2 is normally closed by a drain plug 4, in the form of a concave closure disk pressed into a rudimentary counterbore 5.

The housing includes a chamber 6, located at one side of the bore 2 and provided with a cover 7 as well as a screw-threaded tubular boss 8. Mounted in the wall between the bore 2 and the side chamber 6 is an explosive squib 9.

Mounted within the side chamber is a control unit 10 involving a circuit shown within broken lines in FIG. 2. The control circuit as well as the end of the squib protruding into the side chamber is encased in a suitable potting resin 11.

The control circuit 10 includes a bridge 12, having fixed resistors 13 in two arms; the third arm is provided with an adjustable potentiometer 14, and the fourth arm is coupled to a thermistor 15. The thermistor need not be located in the side chamber but may be at a remote location in the locomotive's cooling water system, the connecting wires extending through suitable conduit, not shown, screw-threaded to the boss 8.

The bridge output goes to an integrated circuit amplifier 16, operating in open loop mode and preferably having a gain of about 60,000. The output of the amplifier 16 triggers a two-stage transistor amplifier 17, which when activated, short circuits a battery 18 and a large capacitor 19 through the squib so as to produce a voltage and current surge sufficient to fire the squib.

The battery may be maintained at full potential by trickle charger components such as a diode rectifier 20 and current limiting resistor 21 connected across the battery. An external power source from the locomotive is connected to leads 22 and 23.

Operation of the cold temperature water drain for locomotives is as follows:

Normally, that is, at temperatures above a critical low temperature, the resistance of the thermistor is such that the bridge output biases the amplifier 16 to cut off. When the temperature is lowered past the present critical point, determined by the potentiometer 14, the bridge output reverses polarity actuating the amplifiers 16 and 17, triggering the circuit through the squib 9, battery 18 and capacitor 19. Ignition of the squib produces a pressure surge in the water contained in the bore 2 sufficient to drive the drain plug 4 from the lower end of the bore 2 so that water may drain from the locomotive water system.

Thus by this invention I provide a novel cold temperature water drain which although primarily intended for locomotives, is also applicable to any closed water system which might be subjected to damage should water freeze therein. This is possible with the form of my invention herein disclosed but it is to be understood that additional embodiments and forms of cold temperature water drains may come within my invention defined by the appended claims.

I claim:

1. The combination with a water system subject to freezing temperatures, of an automatic cold temperature water drainage means, comprising, means forming a drain opening for the water system, a closure for the drain opening in contact with the water in the water system and adapted to open in response to a predetermined transitional pressure surge therein, an explosive squib adjacent the closure and also in contact with the water in the water system for producing said pressure surge in the water system, at least in that portion of the water system between the squib and closure sufficient to drive the closure from the drain opening and means sensitive to a predetermined cold temperature for activating the pressure surge producing means.

2. A drainage means as defined in claim 1 wherein, the cold sensitive activating means includes a bridge having a thermistor, an amplifier normally biased by the bridge to its off condition and responsive to predetermined change in the resistance of the thermistor to cause completion of a circuit through the squib.

3. The combination with a water system subject to freezing temperatures, of an automatic cold temperature water drainage means, comprising, a fitting adapted to be connected to a low point in the water system and having a drain bore, a plug closing the lower end of the bore and in contact with the water in the bore, the plug adapted to be driven from the bore at a predetermined surge pressure to permit drainage of water from the water system through the bore, an explosive squib having a rupturable wall in contact with the water in the bore, the explosive squib on ignition producing a pressure surge in the water within the bore sufficient to drive the plug therefrom, and means sensitive to a predetermined cold temperature for activating the pressure surge producing means.

4. A drainage means as defined in claim 3, wherein, the cold temperature activating means includes an electric power source and condenser adapted to ignite the squib, a bridge having a thermistor for sensing temperature change, an amplifier normally biased to an off condition by the bridge and responsive to a predetermined change in the resistance of the thermistor to cause completion of a circuit through the power source, condenser and squib.

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