

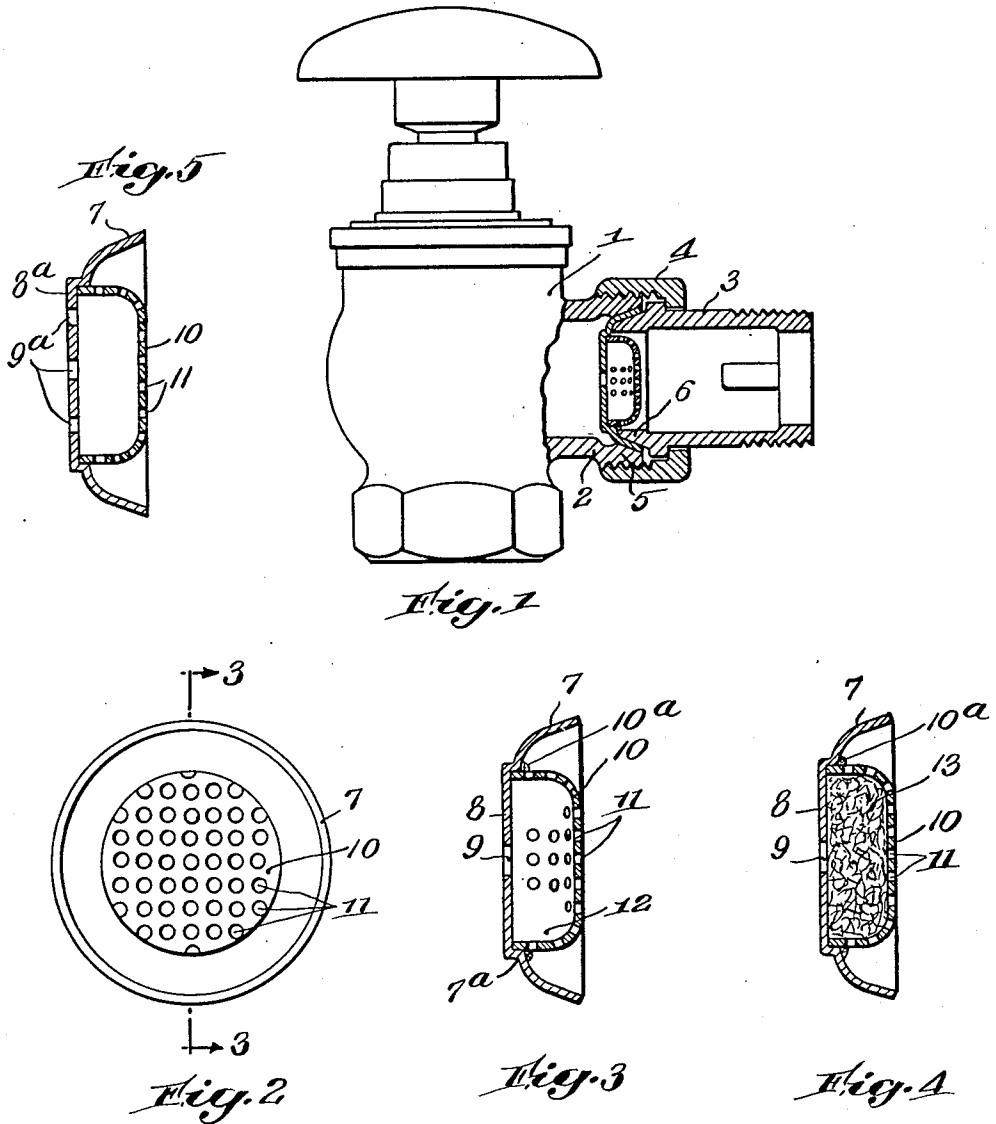
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ORIFICE DEVICE

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ORIFICE DEVICE

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Substituted for abandoned application Serial No. 191,222, February 18, 1938. This application December 5, 1938, Serial No. 243,978

3 Claims. (Cl. 181—56)

This invention pertains to fluid flow systems, for example, steam heating systems, and relates more particularly to an improved orifice device for use in such a system, the present application being a substitute for the sole application of William T. Jones, Serial No. 191,222, filed February 18, 1938.

It has been common for many years to employ orifices in low pressure steam heating systems and recently it has been attempted to employ orifices in the so-called "steam control" systems wherein varying amounts of steam are admitted to radiators or other condenser devices by changing the relative steam pressures at opposite sides respectively of an orifice in the steam line. While a correctly sized orifice provides a highly effective means for attaining the desired result in such a system, the usual orifice device has the disadvantage that it produces an audible whistling or hissing sound which is sometimes quite loud. To some people this sound is very disagreeable and in fact is so objectionable that steam control systems employing ordinary orifice devices have in many cases not proven acceptable for use in buildings such as hospitals, hotels, homes, apartments, offices and other places where noise is undesirable.

Usually the control orifice device is a thin plate or shell stamped from sheet metal, such for example as copper, and is provided with a central orifice aperture, and the orifice device is installed between the body of the radiator inlet valve and the tail piece which connects the valve to the radiator, the valve and tail piece having complementary surfaces between which the marginal portion of the orifice device is clamped and to which it readily conforms when the union nut is tightened.

Various expedients have heretofore been proposed for eliminating or reducing the noise ordinarily created when steam passes through the thin orifice plate, but so far as is known to us no satisfactory solution of the problem has been made available prior to the present invention. The principal object of the present invention is to provide an orifice device acceptable for use, for example, at the inlet of a steam radiator and which is substantially noiseless or at least does not emit a noise of objectionable intensity when in operation, although functioning in substantially the same way as an ordinary orifice of the same general type. A further object of the invention is to provide a noiseless or noise-reducing orifice device which can be made easily and cheaply and which can be installed between the

inlet valve and tail piece of a radiator without requiring any change in the latter.

Other objects and advantages of the invention will be made manifest in the following more detailed description and by reference to the accompanying drawing, wherein—

Fig. 1 is a side elevation partly in vertical section, illustrating a radiator valve of usual type and its associated tail piece and having the improved orifice device of the present invention interposed between them;

Fig. 2 is an elevation to larger scale showing the delivery side of the improved orifice device;

Fig. 3 is a section substantially on the line 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 3, but illustrating a modification;

Fig. 5 is a view similar to Fig. 3 but illustrating a further modification.

In the drawing the numeral 1 designates a radiator supply or inlet valve of usual type having the delivery nipple 2 with which is associated the tail piece 3 which is screwed into an end section of the radiator. The tail piece 3 is secured to the nipple 2 by means of the usual union nut 4. The nipple 2 comprises a part 5 having an annular beveled inner surface which is complementary to an annular beveled exterior surface on the inner end 6 of the tail piece 3, such surfaces being designed to clamp between them the marginal portion of the orifice device.

As illustrated in Figs. 2 and 3 the improved orifice device, in accordance with the present invention, is preferably made from a disk of thin sheet metal, for example copper which is dished to provide the flaring marginal rim portion 7, the disk being cupped at its central portion to provide the cylindrical wall 7^a which integrally joins the edge of the circular diaphragm plate 8, the plate 8 having the central orifice aperture 9. In use the marginal rim 7 is interposed between the parts 5 and 6, and when the union nut 4 is tightened the rim portion of the orifice device readily conforms itself to the opposed surfaces of the parts 5 and 6, so as to form a leakproof joint, the rim of soft copper, for example, acting as a gasket to prevent leakage so that the orifice aperture 9 forms the only passage for fluid between the inlet valve and the radiator.

As already noted, a thin orifice plate having therein an orifice aperture often produces objectionable noise due to vibration set up as the fluid passes through the aperture, the sound thus produced usually being of a whistling or hissing nature and of a high pitch, and thus especially

annoying to people of sensitive nervous temperament.

In accordance with the present invention the orifice device also comprises a housing 10 of more or less cup-like form, stamped or otherwise made from a suitable material, for example, sheet copper or brass, the diameter of this cup-like housing being such that its side walls fit snugly within the cylindrical wall 7^a with its edge substantially contacting the plate 8. The housing may be secured in this assembled relation in any suitable way, for example by the use of solder 10^a. The bottom of this cup-like housing is preferably flat and substantially parallel to the orifice plate 8, although the exact shape of housing herein illustrated is not absolutely essential. The bottom of the housing, and preferably the side walls also, is provided with a multitude of openings 11, the aggregate area of these openings being greater than that of the orifice aperture 9, so that the cup-like housing does not offer any substantial resistance to the free flow of fluid from the valve to the radiator. However, it has been found that the provision of this cup-like housing at the delivery side of the orifice greatly reduces the noise which is ordinarily emitted from a thin plate diaphragm, and in fact in most instances substantially eliminates such noise, apparently by breaking and diffusing the stream of fluid. In place of perforate sheet material, the housing may be made from woven fire fabric or other foraminous material.

For specific example of dimensions useful for the purpose, but without any intent thereby to limit the invention to such specific dimensions, it may be noted that when using an orifice plate $\frac{1}{16}$ of an inch in diameter with a central aperture of approximately $\frac{1}{16}$ of an inch in diameter, the perforated cup-like housing may have a depth of approximately $\frac{1}{4}$ of an inch, and its bottom may be of a diameter of approximately $\frac{1}{2}$ inch, the material of the housing being perforated with openings of approximately $\frac{1}{16}$ inch diameter.

Such an arrangement as that just described is very effective for the desired purpose, does not require any change in the radiator inlet valve or in the tail piece for its installation, is not unduly expensive to make, and may be readily installed by anyone even though unskilled.

In Fig. 5 there is illustrated a modified construction wherein the orifice plate 8^a is furnished with a plurality of orifice apertures 9^a. Such an arrangement is desirable where the device is to be used in a large conduit or under high pressure and where a division of the steam between several orifices results in a reduction of the noise, as compared with a single orifice aperture.

Under extreme conditions it may become desirable, in order to eliminate even the last vestige of noise, to place within the cup-like housing 10 a loose flocculent material 13 as shown in Fig. 4, such for example as shredded copper or other corrosion-resisting fibrous metal; spun glass; asbestos fiber or the like, but such material should

be so loosely arranged as not to reduce the quantity of fluid delivered from the inlet valve to the radiator. However, this material 13 acts further to diffuse the fluid as it escapes from the orifice, and most effectively eliminates noise.

While we have herein described certain desirable embodiments of the invention by way of example, it is to be understood that the invention is not necessarily limited to these precise embodiments, but is to be regarded as broadly inclusive of any and all equivalents thereof such as fall within the terms of the appended claims.

We claim:

1. An orifice device for use at the inlet of a steam radiator, said orifice device comprising an orifice plate having a constantly open orifice aperture therethrough and a marginal supporting portion, a cup-like housing at the delivery side of the aperture having its concavity arranged to receive the fluid delivered through the aperture, and means fixedly uniting the edge of the rim of the cup-like housing to the plate, thereby to form a unitary structure, the wall of the housing having a multitude of small openings for the passage of fluid, the aggregate area of said openings being greater than the area of the orifice aperture, the housing thereby being operative to diffuse the fluid which it receives through the orifice aperture and to prevent objectionable noise.

2. An orifice device for use at the inlet of a steam radiator, said orifice device comprising an orifice plate of thin sheet metal having a central aperture and a marginal portion designed to be clamped between opposed complemental surfaces of sections of a steam supply conduit, a housing of sheet metal having a bottom surface spaced from the orifice plate and at the delivery side of the aperture, said housing being provided with a multitude of small openings of an aggregate area greater than that of the orifice aperture, means permanently uniting the housing to the orifice plate to form a unitary structure, and a loose flocculent material within said housing operative to diffuse the fluid delivered through the aperture and thereby to reduce noise resultant from the flow of fluid through the orifice aperture.

3. An orifice device for use in the fluid supply conduit for a radiator, said orifice device comprising an orifice plate having a plurality of constantly open orifice apertures therethrough and a marginal supporting portion, a housing of sheet metal having a bottom surface spaced from the orifice plate and at the delivery side of the orifice apertures, and means uniting the housing to the orifice plate to form a unitary structure, said housing being provided with a multitude of small openings of an aggregate area greater than the aggregate area of the orifice apertures, the housing thereby being operative to diffuse the fluid which it receives through the orifice apertures and to prevent objectionable noise.

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