June 3, 1941. R. M. NEE ET AL 2,244,311

FLOW RESTRICTOR

Filed May 8, 1939

Fig. 1

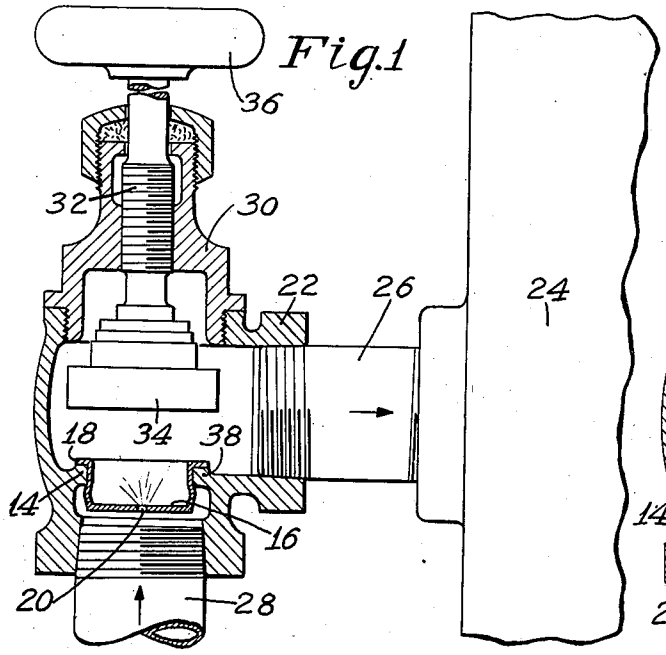


Fig. 2

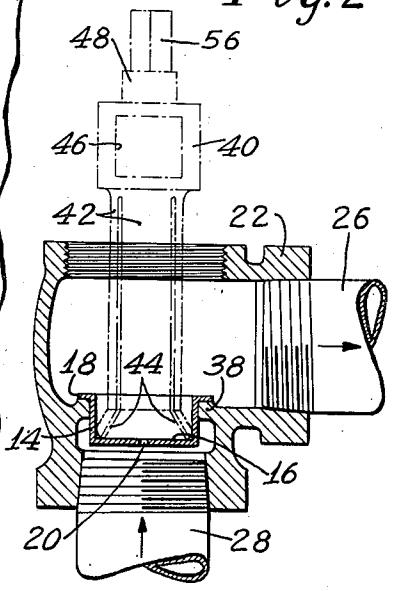


Fig. 3

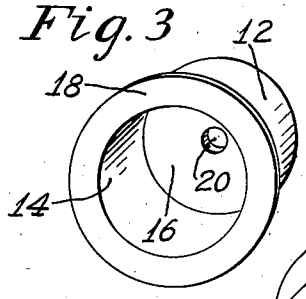


Fig. 4

Fig. 6

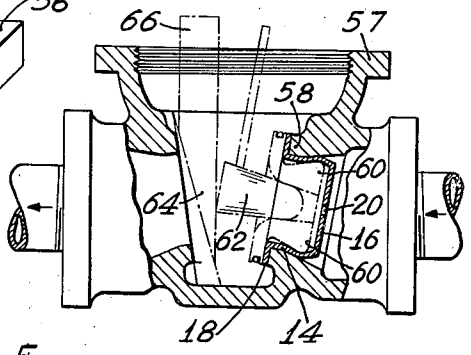


Fig. 5

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2,244,311

FLOW RESTRICTOR

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Application May 8, 1939, Serial No. 272,460

1 Claim. (Cl. 138—44)

The present invention relates to flow-reducing orifices, and more particularly to improvements in regulating orifices for use in steam heating systems and the like.

In order to equalize the flow of steam into the different radiators of a steam heating system so that each radiator may receive its proportionate share, such systems commonly employ fixed flow-reducing orifices placed in the steam supply line to each radiator. The size of the orifices employed depends on such factors as length of the supply pipes and heating requirements of the different radiators. Once the proper orifice sizes have been found, the heating effect of the radiators as a group may be raised or lowered by increasing or decreasing the supply of steam to the mains.

Each orifice is preferably located close to the radiator whose steam supply it regulates. Where a pipe union is employed near the radiator, as between the radiator hand valve and the radiator, a disk provided with an orifice may conveniently be clamped between the two parts of the union. Another common arrangement, where the hand valve is constructed with a union connection to the radiator, is to clamp the orifice disk between the valve and the radiator nipple.

In certain systems in which it is desired to install fixed orifices in the individual radiator supplies, there are no unions or similar readily disconnectible connections, near the radiators, in which the orifice disks may be inserted, the radiator hand valve being directly connected to the radiator by a short threaded nipple which prevents disconnection except by cutting the pipe.

The present invention has as its object the provision of a flow-reducing orifice of novel construction and manner of utilization, which may be quickly installed in a fluid-containing system provided with a valve, without cutting or disconnecting the pipes, or requiring the cutting of threads or other operations on the parts.

More specifically, it is an object of the invention to provide an orifice member adapted for insertion in steam heating systems and the like where, by reason of lack of separable unions or similar connections in the vicinity of the desired location of the flow-reducing orifice, use of the conventional orifice disk is impossible without cutting the pipe and inserting a union for that special purpose.

Another object of the invention is to provide a flow-reducing orifice member adapted for use in such manner as to permit the orifice to be formed in the member after the member has been inserted in operative position, or to permit the orifice size to be varied, without removing the member from position.

To this end, according to a feature of the present invention, there is provided a flow-reducing orifice in the form of a cup-shaped member having a bottom provided with an orifice, a cylindrical side wall portion, and an outwardly extending flange, the member being adapted for insertion in a valve with the flange of the member seated on the valve seat and with the cylindrical side wall portion extending along the valve passage beyond the valve seat, the member being secured in the valve by laterally expanding that portion of the side walls of the member beyond the valve seat.

The orifice member is introduced into the valve through the opening provided upon removing the valve bonnet and valve mechanism carried thereby. Expansion of the member beyond the valve shoulder is effected by a tool inserted through this same opening, the tools hereinafter described forming the subject matter of a copending application of the present inventors.

In the drawing illustrating the invention, Figure 1 is a sectional view of a globe angle valve with the flow-reducing orifice member in operative position; Figure 2 is a sectional view of a valve similar to Figure 1, but with the valve bonnet and valve mechanism removed, and with the orifice member in place but before the expanding operation has been performed, the expanding tool being indicated in dot-and-dash outline; Figure 3 is an oblique view on an enlarged scale of the orifice member before insertion, showing the flow-regulating orifice; Figure 4 is a view on the same scale as Figure 3 of a tool for expanding an orifice member in a globe valve such as illustrated in Figure 1; Figure 5 is a similar view of the head portion of the expanding tool shown in Figure 4, the tool head being shown in expanded position; and Figure 6 is a view, partly in section, of a gate valve with a flow-reducing orifice positioned therein, the bonnet and valve mechanism being removed and an expanding tool, indicated in dot-and-dash line, still in position after having completed the expanding operation.

The orifice member of the invention, indicated generally at 12, is cup-shaped in character, being turned, spun, stamped, or otherwise fashioned from some deformable material such as brass. The member 12 consists of a cylindrical wall portion 14 provided at one end with a bottom 16 and at the other end with an outwardly extending annular flange 18. Extending through the bot-

tom 16 of the member is an aperture or orifice 20 which may be of any desired size, but is generally very substantially smaller in area than the area of the steam passage within which the member is adapted to be inserted. Alternatively, the orifice may not be formed until after insertion of the member when the bottom 16 may be drilled or punched with a sharp pointed tool to provide an orifice of the proper size.

The orifice member 12 is employed, according to one embodiment of the invention, in the manner illustrated in Figure 1, wherein the member is shown positioned in a hand valve 22 in the steam supply line to a radiator 24, the valve being connected to the radiator by a short threaded nipple 26, and to a source of steam through pipe 28. The valve 22 is a conventional globe angle valve, provided with a removable bonnet 30 within which is threaded the valve stem 32 provided at one end with a valve member 34 and at the other end with a hand wheel 36 by which the stem may be rotated. Extending around the fluid passageway in the body of the valve is an annular shoulder 38, the face of the shoulder towards the bonnet forming a seat for the valve member 34 when the valve is closed.

To insert the orifice member in a valve of the type above described, the bonnet 30 is unscrewed and removed, together with the valve mechanism carried by the bonnet, thus rendering accessible the valve seat, annular shoulder 38, and fluid passageway therethrough. An orifice member having an outside diameter of the cylindrical portion 14 slightly less than the size of the passage through the shoulder portion 38 in the valve body is then inserted through the opening afforded by removal of the bonnet. As shown in Figure 2, the orifice member fits into place with the flange 18 resting on the valve seat on shoulder 38 and forming a new or supplementary valve seat, and with the cylindrical portion extending through the passageway in the shoulder.

To secure the orifice member in the valve body so that the flange does not lift from the seat under the pressure of the steam or other fluid when the valve is opened, the walls of the member are expanded laterally beneath the shoulder 38, as shown in Figure 1. A tool well adapted for this purpose is illustrated in Figures 4 and 5, this tool forming the subject matter of a copending application of the present inventors.

The tool comprises a hollow outer member 40 having a shank split longitudinally for part of its length into four parts 42, provided at their lower or split ends with flared sectors 44 forming a head or rim of frusto-conical shape and of larger diameter than the shank portion. The other end of the member 40 is formed with parallel flattened surfaces 46 to receive a wrench or similar tool.

Fitting within the bore in the member 40 is a rod 48 having a squared lower end 50 to provide flat cam surfaces 52 adapted to cooperate with the sector or head portions 44, the inner faces 54 of the sectors being rounded for this purpose. The upper end 56 of the rod 48 is likewise squared to receive a wrench by which the rod may be rotated relative to the outer member 40 to cause the surfaces 52 to force the heads 44 outwardly, as shown in Figure 5.

After the orifice member has been placed in the valve, the above described tool is positioned as shown in dot-and-dash outlines in Figure 2 with the head or lower end resting on the bottom 16 of the orifice. The outer portion of the tool is held from rotation while the rod is rotated through forty-five degrees to expand the head of the tool and thereby to force outwardly the lower wall portions of the orifice member beneath the annular shoulder 38. The rod is then rotated to allow the head to contract to normal position, permitting the tool to be withdrawn. If the orifice has not been formed in the member prior to insertion, or if the orifice size is inadequate, the member may readily be drilled or punched with the member in place in the valve. Upon replacing the bonnet and valve mechanism the installation is completed, Figure 1 illustrating the orifice member secured in position after the expanding operation.

Since the operation of inserting the orifice members of the invention requires neither the disconnection of piping nor the cutting of threads or the like, these members are particularly adapted for installation in the less modern heating systems without separable unions in the connections to the radiators and hand valves. Furthermore, installation is rapid, involving only a brief shut-down of the supply of steam or other fluid. The orifice is accessible for inspection or for enlargement by drilling or reaming, merely by unscrewing the valve bonnet, or if a smaller size of orifice is required, the orifice member may be pried loose and removed and a new member inserted.

The orifice member described is likewise adapted for use in systems in which gate valves are employed, insertion of the member in this type of valve being effected in the manner illustrated in Figure 6. Upon removal of the bonnet and the valve mechanism mounted thereon, the orifice member may be positioned in the fluid passageway in the valve body 57 with the flange 18 engaging a valve seat formed on the annular shoulder 58 surrounding the passage. Since the passage through the shoulder increases in size from the valve seat end, the orifice member is readily secured in position by expanding the cylindrical wall portion 14 of the member to the position shown in Figure 6.

The expanding operation is accomplished by means of the tool indicated in dot-and-dash outline and described and claimed in a copending application. This tool comprises an expanding plug 60 provided with a tapered bore adapted to receive a conical member 62 by which the plug may be expanded to force the walls of the orifice outwardly.

The conical member 62 is forced into the plug by the action of cooperating wedges 64 and 66, the wedge 64 being employed to protect the opposite valve seat while the wedge 66 is driven downwardly and against the member 62. Upon removal of the expanding tool parts, the valve bonnet is replaced to complete the installation.

With the orifice member installed in the inlet side of the valve, as illustrated, the valve mechanism may be removed for inspection or adjustment of the orifice without shutting off entirely the steam or other fluid in the system. Where this feature is of no importance, the orifice member may, if desired, be installed in the outlet side of the valve.

While the orifice member of the invention has been illustrated and described in its preferred form, the invention is not so limited, but shall be deemed to include orifice members of other forms and arrangements within the scope of the appended claim. Nor are the orifice members of the present invention limited to use in valves

of the types illustrated, since these orifice members are well adapted for use in valves of other types and constructions, as well as in other fluid-conducting elements provided with fluid passages in which the orifice member may be secured.

Having thus described the invention, what is claimed is:

The combination with a valve body having an annular shoulder provided with a smooth faced passageway therethrough with a seating surface normally adapted to be engaged by a valve element movable toward and away therefrom, of a cup-shaped member of thin, deformable material positioned within the fluid passageway and provided with a flange seated on the valve seat, a substantially cylindrical wall portion extending along the fluid passageway beyond the annular shoulder, and a bottom provided with a flow-regulating orifice substantially smaller in cross-sectional area than the area of the passage, the cylindrical wall portion of the cup beyond the annular shoulder and above the bottom being laterally expanded to secure the member in the valve body.

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