Dec. 9, 1930. A. J. LOEPSINGER ET AL 1,784,673

ADJUSTING UNIT FOR HEATING SYSTEMS

Filed March 25, 1927

Fig. 1

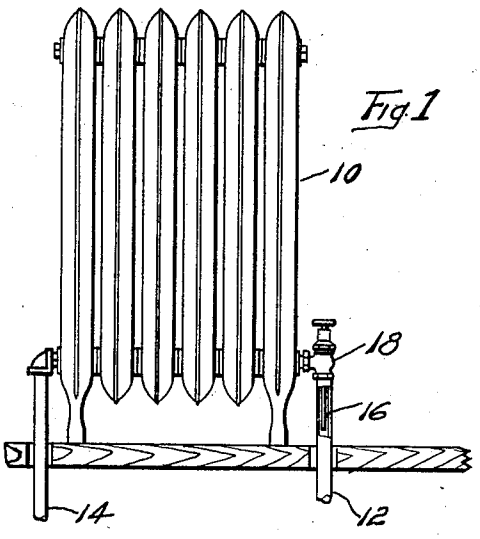


Fig. 6

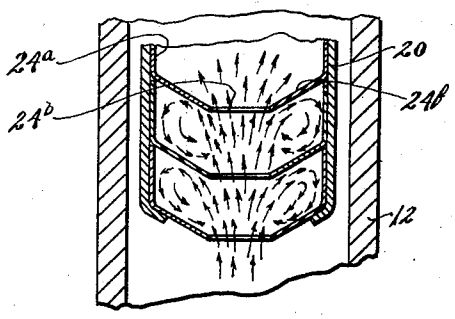


Fig. 2

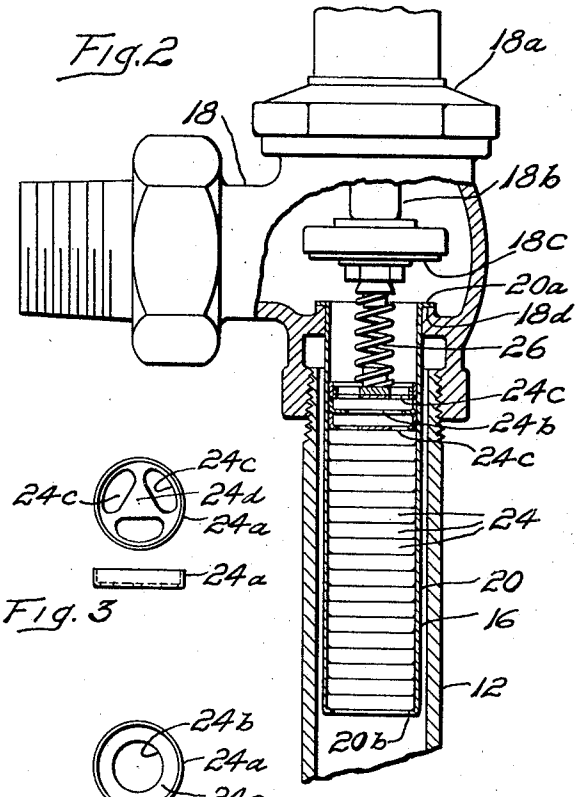


Fig. 5

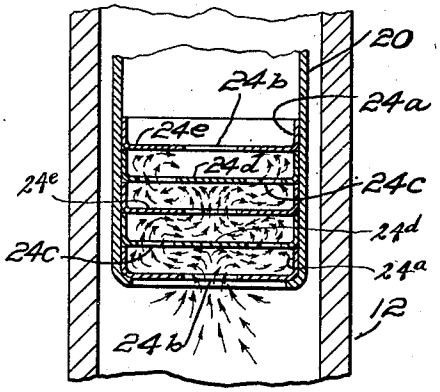


Fig. 3

Fig. 4

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UNITED STATES PATENT OFFICE

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ADJUSTING UNIT FOR HEATING SYSTEMS

Application filed March 25, 1927. Serial No. 178,365.

This invention relates to improvements in adjusting units for heating systems. More especially it relates to units for adjusting the flow of a medium, as hot water, to the radiators of the system, severally, to the end that the volume of flow through each radiator may be in approximate equality with or at least in a desired proportion to, that through other radiators of the system.

The improvements herein disclosed and claimed are particularly adapted for use in a control system such as is described in application for Letters Patent, Serial No. 178,364, filed March 25, 1927, in the name of Albert W. Moulder for improvement in "heating systems".

The present invention provides an elongated resistance for the flowing medium, which is insertable in the regular piping at each radiator where it is desired, having several improvements among which are the attaining of the total desired friction in a very short distance; the standardizing of the resistance element as to length, however their individual resistance values may be adjusted; and the providing for extremely easy and quick adjustment of the resistance, in as fine gradations as may be desired. These ends are attained with use of a capsule wherein is an elongated path for the medium (assumed herein to be hot water) and an effective means whereby the flow of water may be delayed by impact and its course at the same time being made more meticulously tortuous, so that the degree of frictional resistance required may be obtained in a small space, without the flow being seriously obstructed. It is also a feature that the resistance unit as a whole comprises a multiplicity of parts, which may be either restricting parts or non-restricting parts and which may be easily arranged in place and in such proportionate numbers as are requisite to obtain the effect desired.

The invention provides, as does that of Mr. Moulder, for the insertion of the capsule as a unit inside of the piping constituting the local circuit of each radiator, being preferably inserted through the radiator valve into the end of the feed pipe which leads to that valve. Within this capsule, which is merely a sleeve or tube and might be composed of any other suitable holding means, are certain perforated flanged disks superimposed one upon another with their flanges thus fitting within the tubes and their body portions extending across the tube. In a preferred arrangement for getting maximum resistance disks having a central perforation alternate with the disks having perforations near their flanges. The flanges are short, cylindrical, and have the effect of spacing the body part of one disk from the body part of the next adjacent disk. In practice these flanges are short and consequently the successive disks are relatively close together. Since the closed portion of each disk is in line with the opening of the preceding disk and of the succeeding disk, the water passing through an opening is impacted against the disk space as a barrier and must turn sharply aside in eddy current to find the next opening. The frictional resistance imposed upon the flowing water can be varied as desired, within a relatively short distance, by suitably arranging the number of alterations of one kind of disk to the other kind, the maximum being had where every passage from one disk to another is an alternation, and a minimum resistance where there is no alternation, all disks being of the same kind, unless, as a further measure to reduce resistance, the capsule is omitted altogether.

In the construction or adjustment of the heating system one may first determine which of the radiators will have excessive flow, this determination being made by computation or by operation, and then suitably arranged resistance capsules may be inserted, one in the local circuit of each radiator providing such resistance as is needed at the radiator to make the total resistance of flow through its circuit from the source of heat through the radiator and back to the source of heat substantially equal to the total resistance to flow through each other radiator circuit, in which case there will be an equable flow of the heating medium through all parts of the system.

It is intended that the patent shall cover by suitable expression in the appended claims

whatever features of patentable novelty exist in the invention disclosed.

Referring to the drawings:

Figure 1 is an elevation of a radiator and feed pipe leading thereto, with a part of the latter broken away to show the restriction unit therein;

Figure 2 is an elevation, on larger scale, with parts in section, of the feed pipe, valve and restriction unit;

Figures 3 and 4 are plans and elevations of the different types of disks used in the restriction unit;

Figure 5 is an elevation of a section of the unit on still larger scale, illustrating an imagined course of flow of the water through the disks; and

Figure 6 is an elevation like Figure 5, showing a modified form of disk.

Referring to the drawings, a radiator 10 receives hot water through the feed pipe 12 and returns it through pipe 14. The restriction unit 16 of the present invention is inserted through the valve 18 while its cap 18^a, valve stem 18^b and lid or cap 18^c are temporarily removed. The unit comprises a tube 20 with outturned flange 20^a at one end to rest on the valve seat 18^d and with inturned flange 20^b at the other end to form a seat for a stack of cups or flanged disks 24 that fit into the tube with their flanges 24^a against its wall. Each alternate disk has a central perforation 24^b in its body being the bottom of the cup, and the intervening disks have one or more marginal perforations 24^c distributed about the edges of their body portions, near their flanges. The tube and its contained disks make a sort of capsule or cartridge which can be previously loaded with disks as desired and then inserted while the valve is temporarily removed. As seen in Figure 5 water flollowing up through pipe 12 must enter the bottom of the sleeve 20 and pass through the opening in the lowest disk, assumed to be a central opening 24^b. The direct course upward through this opening strikes the solid center 24^d of the disk next above, so that the water must separate, and spread toward the flange 24^a of the disk, where it is again arrested and must turn to go through the marginal openings 24^c only to strike the solid part 24^e of a disk like the first one. The abrupt deflections create eddy currents and set up a turmoil between the disks. Ultimately the flow gets through the stack of disks, but only after overcoming the resistance engendered by repeatedly changing its course thus radically and circularly and passing over the more or less sharp edges of the openings, with considerable friction and absorption of energy due to the endless opposition from liquid tension, adhesion to walls, inertia, eddying, etc. The degree of this opposition to flow is in proportion to the number of alternations of the two kinds of disks, which may be arranged by the engineer designing the piping and heating system, so that each radiator's flow circuit from the source of heat medium, through the radiator, and back to the source shall have a supplemental resistance, supplied by the device of the invention, which puts it on an equality with the other radiator circuits,—or gives it such relation thereto as may be desired. Yet there is nowhere a dangerous closure of the flow passage; the valve may be operated to turn its radiator off or on at will. Subsequent adjustments can easily be made if desired.

Above the uppermost disk is a coiled spring 26 which is somewhat compressed by the valve 18 even when the latter is full open. The spring pressure holds the disks in the tube and the tube in the pipe against the upward flow of water. In case a considerable number of disks were removed, a spacing tube (not shown) equal to the flanges 24^a in diameter and thickness, and as long as desired, could be inserted under the top remaining disk so that the spring could always exert this pressure on the disks and tube.

It is a feature of the arrangement that a very great amount of resistance to flow is made available in a short length of pipe. The number of disks can be easily changed, and consequently the resistance raised or lowered quickly to meet any observed need.

In Figure 6, a modified form of disk is shown in which the solid part 24^f around the central perforation 24^b is dished or inclined toward the flange 24^a. With disks so shaped and inserted in the tube 20, with the dished portion 24^f downward, the water which naturally spreads to some extent after passing through an opening 24^b is further spread by its contact with the inclined surface of the disk, and directed against the flanges 24^b. The impact with the latter causes the water to turn back upon itself, setting up a turmoil and forming eddy curents which effectually cut down the velocity of flow through the central openings.

We claim as our invention:

1. Flow impeding means for a hot water heating system comprising in combination, a tube adapted to be inserted in the local piping circuit of a radiator so that the water flowing through the radiator passes through said tube; a multiplicity of disks each having a perforated body portion extending across said tube and having a marginal flange fitting against the wall thereof and resting against the next adjacent disk to provide a space between the disks; alternate disks having a central perforation through their body portions and the intervening disks having marginal perforations through their body portions whereby the water passing through the perforations repeatedly suffers impacts and deflections; the said spaces between the

disks having capacity of flow at least equal to the capacity of flow through the perforations.

2. Flow impeding means adapted to be inserted in the local piping circuit of a radiator of a hot water heating system, comprising a tube and a series of perforated disks extending across the tube with each disk making marginal contact with the tube wall so that all the water passing through the radiator passes through the perforations of said disks; the said perforations being in staggered relation with each alternate disk having a central perforation and the intervening disks having a marginal perforation; and the said disks being spaced apart to provide a passage between each disk as large as the passage through the perforations thereof.

3. The combination with a valve for the radiator of a hot water heating system, of a tube having an outturned flange at one end adapted to rest on the valve seat and having an inturned flange at the other end; a series of flanged disks nested in said tube with the flange of one disk resting on said inturned flange and with the flanges of the succeeding disks resting on the body portions of preceding disks; each alternate disk having a central opening and the intervening disks having a marginal opening whereby the hot water passing through the series of disks repeatedly suffers impacts and deflections.

Signed at Providence, Rhode Island, this eighteenth day of March, 1927.

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