April 12, 1938. D. N. CROSTHWAIT, JR., ET AL 2,114,139

REGULATING RADIATOR VALVE

Filed Jan. 11, 1937 3 Sheets-Sheet 1

Fig. 1

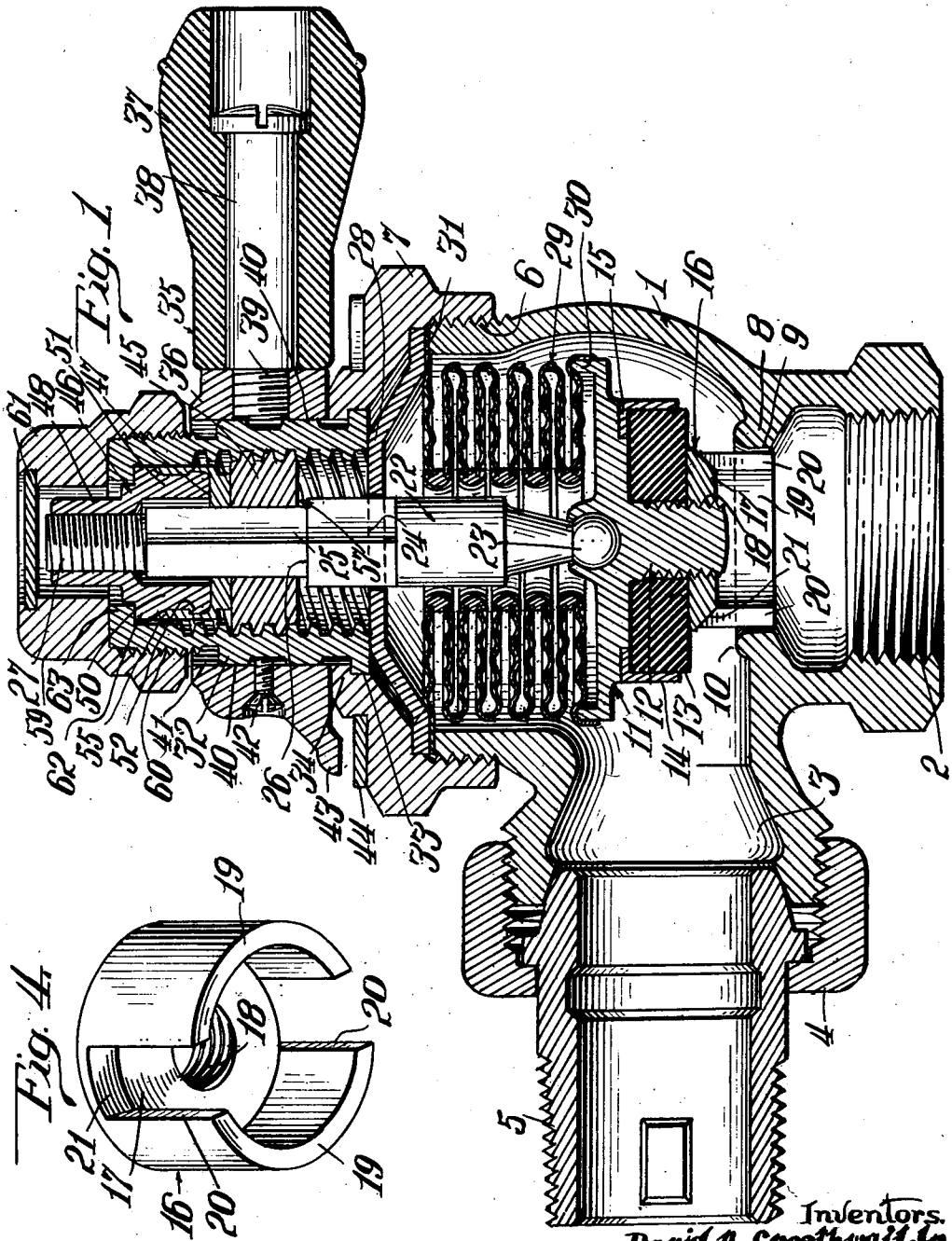


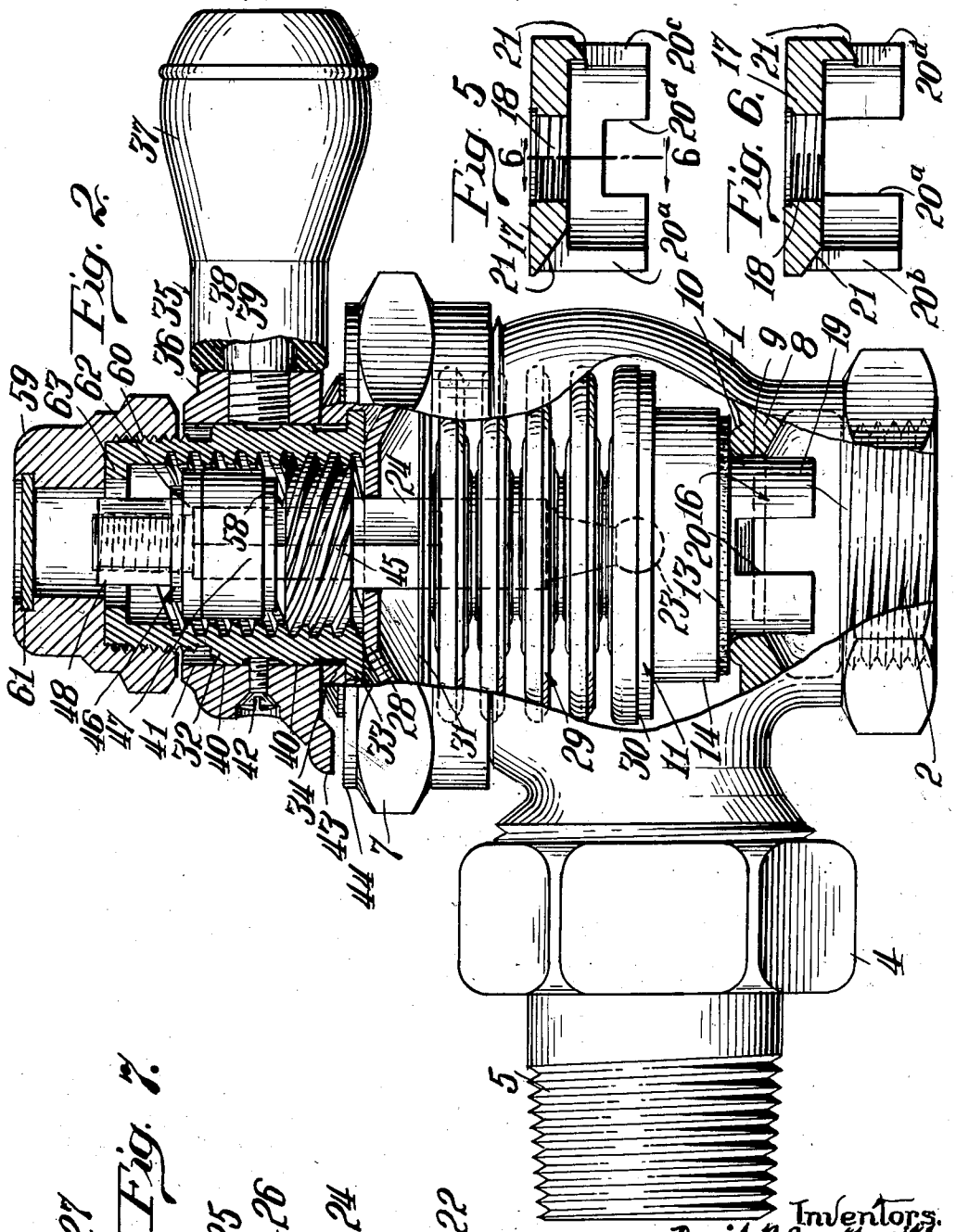
Fig. 4

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REGULATING RADIATOR VALVE

Filed Jan. 11, 1937 3 Sheets-Sheet 2



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REGULATING RADIATOR VALVE

Filed Jan. 11, 1937 3 Sheets-Sheet 3

Fig. 3.

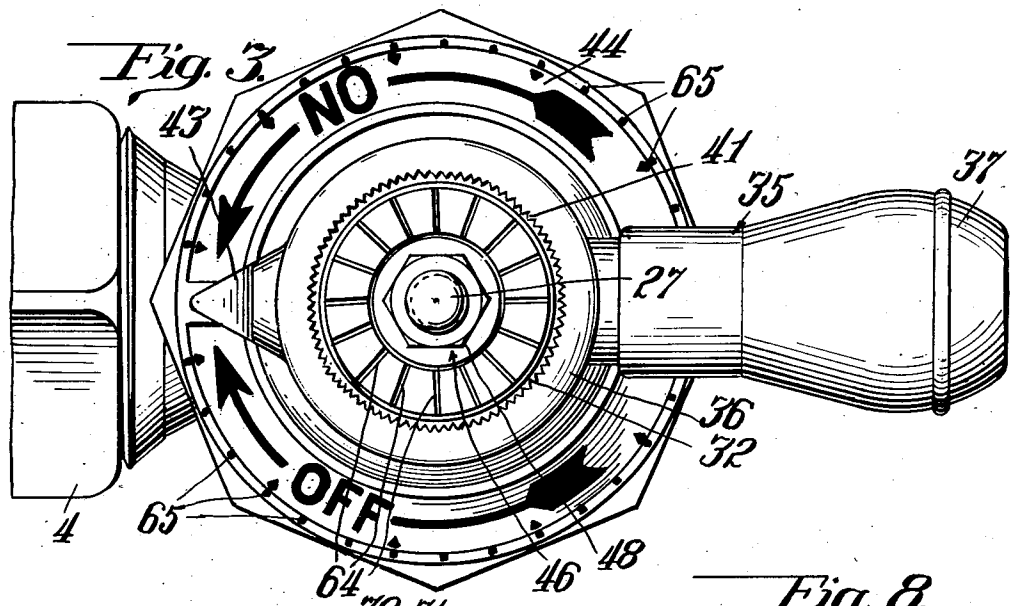


Fig. 10.

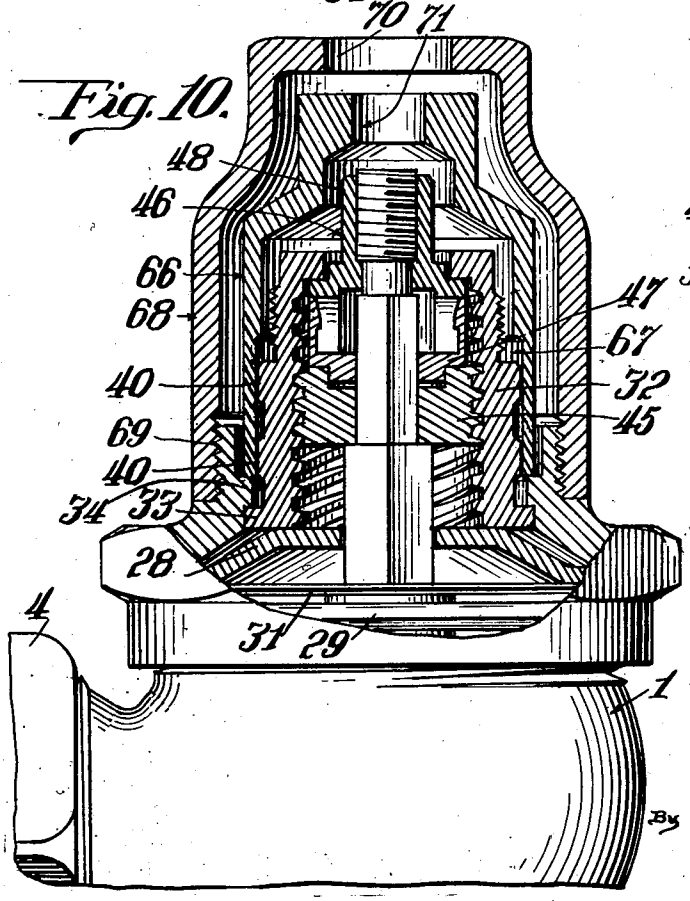


Fig. 8.

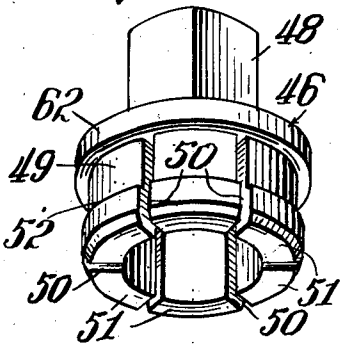
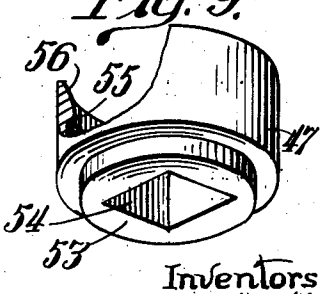


Fig. 9.



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UNITED STATES PATENT OFFICE

2,114,139

REGULATING RADIATOR VALVE

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Application January 11, 1937, Serial No. 120,018

20 Claims. (Cl. 251—45)

This invention relates to a new and improved regulating radiator valve, and more particularly to an improved inlet valve for a radiator adapted to not only cut off the flow of steam or other heating medium to the radiator, but also to regulate the rate of flow through the valve and determine the maximum rate of steam flow to the radiator when the valve is fully opened.

It is customary to provide each radiator of a heating system with a manually operable control valve positioned adjacent the inlet to the radiator so that an occupant of a room in which the radiator is located may turn on or cut off the flow of heating medium to the radiator as may seem to be desirable. Such a valve will usually be moved from fully closed to fully opened position, and in order to secure the proper distribution of steam between the several radiators of a system it is customary in many systems to provide an additional means, not under the control of the occupants of the room, for determining the maximum flow of steam or other heating medium through the radiator in accordance with the requirements of that particular radiator. There will be a difference in the friction loss to one radiator as compared to another; variations in the types and sizes of the different radiators used, as well as the fluid capacities of the several radiators; and the location of each individual radiator in the heating system will also affect the desired maximum steam flow thereinto. There will tend to be a greater flow of steam from a common supply pipe into a radiator near the source of supply than into a radiator remote from the source. For any or all of these reasons it is desirable to restrict the maximum steam flow into certain radiators with respect to the maximum flow into other radiators in order to obtain equal and proper distribution between the several radiators of the system. According to one known method orifice plates or regulating plates are positioned in the supply piping, usually between the radiator inlet valve and the radiator. Each plate is provided with an orifice which determines the maximum steam flow to the radiator, the size of this orifice being determined by the particular requirements of that radiator according to its type, size and location in the heating system, as discussed hereinabove. It is impossible to adjust such plates or replace them without opening up the piping which is inconvenient and also admits air to the system thus upsetting the circulation particularly in systems operating under subatmospheric pressures.

The improved inlet valve forming the subject matter of this invention not only serves as a cut-off valve but also as a metering device thereby taking over the function of the orifice plates hereinabove described. According to this invention the valve is provided with an apertured metering sleeve which determines the maximum steam flow through the valve in accordance with the maximum opening of the movable valve member. The valve is provided with the usual operating handle which may be swung through a predetermined angle (preferably approximately 360°) so as to move the valve from open to closed position or vice versa. The operating means between this handle and the movable valve member includes an adjusting device, normally inaccessible to the occupants of the room, which provides for a certain amount of lost-motion between the operating handle and the movable valve member so that the maximum valve opening accomplished by one complete swinging movement of the handle can be varied as desired. The valve is also provided with a packless sealing means so that none of the valve operating or adjusting mechanism is exposed to the steam, and the maximum valve opening may be adjusted without causing any leakage in the system or disturbing the circulation.

The principal object of this invention is to provide an improved radiator valve of the type briefly described hereinabove and disclosed more in detail in the specifications which follow.

Another object is to provide a valve in which a substantially constant and predetermined opening movement of the manually operable handle will serve to move the valve from a completely closed position to any selected position of maximum opening.

Another object is to provide a valve of this type in which the increments of steam flow caused by equal increments of movement of the valve operating means can be proportioned as desired.

Another object is to provide a valve of this type in which the valve adjusting means is rendered substantially inaccessible to unauthorized persons.

Other objects and advantages of this invention will be more apparent from the following detailed description of certain approved types of apparatus constructed and operating according to the principles of this invention.

In the accompanying drawings:

Fig. 1 is a central vertical section through the assembled valve, the valve being shown in open position.

Fig. 2 is a side elevation of the valve, partially

broken away and partially in central vertical section, showing the valve in closed position.

Fig. 3 is a plan view of the valve with the upper cap removed thus disclosing the adjusting nut.

Fig. 4 is a perspective view of the metering sleeve.

Fig. 5 is a vertical section through a modified form of metering sleeve.

Fig. 6 is a similar vertical section, taken substantially on the line 6—6 of Fig. 5.

Fig. 7 is a perspective view of the valve stem.

Fig. 8 is a perspective view of the adjusting nut.

Fig. 9 is a perspective view of the sectional locking sleeve withdrawn from the adjusting nut.

Fig. 10 is a central vertical section of a modification, this view corresponding to the upper portion of Fig. 1.

The valve casing comprises the main casting 1 provided with a lower inlet port 2 into which the upper end of the supply pipe or riser is connected, and with a laterally extending outlet port 3 adapted to be connected by fitting 4 with the nipple 5 which is connected into the inlet port of the radiator. The upper end of casing 1 is open and externally threaded at 6 to be engaged by the annular closure plate or nut 7. Casing 1 is formed with an internal web 8 provided with a vertically extending cylindrical passage or port 9 at the upper end of which is the valve seat 10. This valve seat is preferably of semi-circular cross section as shown, or at least is flared outwardly at the upper end of passage 9 for reasons hereinafter explained.

The movable valve member 11 comprises an upper supporting disk or plate from which depends a downwardly extending central threaded stem 12. The annular composition valve disk 13 is centered about stem 12 and partially enclosed by the ferrule 14 having an upper inwardly exending flange 15 which fits within a correspondingly shaped groove in the lower face of plate 11. The composition disk 13 is held in place by the metering sleeve indicated generally at 16 (see also Fig. 4) which screws onto the lower end of stem 12. Composition disk 13 is adapted to engage valve seat 10 and entirely cut off the flow of steam when the valve is closed as shown in Fig. 2. Mounting the composition disk 13 in removable ferrule 14 has the advantage of permitting easy removal and renewal of the valve disk which is apt to stick and perhaps cause injury to certain of the parts incidental to its removal when seated within a groove in the movable valve member as has heretofore been the practice.

Metering sleeve 16 is formed with a head portion 17 centrally threaded at 18 to engage stem 12, and with a downwardly extending hollow cylindrical skirt portion 19 which has a close sliding fit within the valve passage 9. The skirt portion 19 is cut away at intervals to form one or more (usually two) open slots 20. These slots are preferably rectangular and the upper end or base of each slot is beveled upwardly and outwardly at a suitable angle as indicated at 21 so that this base of the slot will be substantially tangential to the curved or outwardly flared valve seat 10 when the valve is closed. The purpose of this is to cause the volume of steam flow through slots 20 (which form the only steam passages through which steam can flow from inlet 2 to outlet 3) to be increased proportionately or by equal increments for each equal increment of lift of the movable valve member from its seat. It will also be apparent that the total area of the open portions of slots 20 when valve member 11 is lifted determines the maximum steam flow permitted through the valve, and thus serves the purpose of the orifice plate heretofore used. By adjusting the maximum lift of valve member 11, the area of these open slots 20 can be adjusted thus determining the maximum steam flow without necessitating opening up the valve or substituting a new orifice plate.

It will be apparent that if a greater steam flow is required for a certain type of radiator, a metering plate provided with more slots 20 can be used. In the modification shown in Figs. 5 and 6 there are four of these slots. It will also be noted that in Figs. 5 and 6 these slots are of different height so that the slots will be opened successively as the valve member is lifted. In this manner a varying increase in the flow area can be obtained for equal increments of lift of the valve member. In the form shown in Figs. 5 and 6 the slot 20^a will first be opened to form a steam passage, and then the slots 20^b, 20^c and 20^d will be successively opened as the valve member is lifted higher. In any case, and if either form of metering sleeve is used, the maximum steam flow permitted will be limited by the maximum height to which valve member 11 may be raised.

The valve stem 22 (see also Fig. 7) is formed at its lower end with a ball 23 adapted to fit within a correspondingly shaped socket in the upper face of valve member 11 so that the valve member is supported from the stem through an articulated joint whereby metering sleeve 16 and valve disk 13 can properly adjust themselves to the passage 9 and valve seat 10 respectively. The valve stem 22 is formed intermediate its length with a portion 24 of square or other non-circular cross section, and above this with another squared or non-circular portion 25 of lesser diameter so that a stop shoulder or abutment 26 is formed at the base of portion 25. The upper end of the stem is threaded as indicated at 27. The intermediate non-circular portion 24 of the stem is slidable vertically through a correspondingly shaped opening in the guide plate or disk 28 which is clamped at its outer edge to the upper surface of casing 1 by the closure nut 7. Therefore the stem 22 may be moved vertically to raise or lower the movable valve member 11, but cannot rotate.

A flexible bellows sealing diaphragm 29 of well known form is secured at its lower end to an upwardly extending flange 30 at the outer edge of valve member 11, and the upper outwardly extending portion 31 of this diaphragm is secured to the valve casing, preferably by being clamped between guide plate 28 and the casing by means of closure nut 7. It will thus be seen that in all positions of vertical adjustment of the valve member 11, no steam is permitted to reach the upper face of the valve member or stem 22 or any of the operating mechanism hereinafter described. Access may therefore be had from above to the operating and adjusting mechanism without ever breaking the seal in the valve or permitting the escape of steam or entrance of air.

The internally threaded driving nut 32 is provided at its lower end with an outstanding annular flange 33 which is rotatably journaled between the guide plate 28 and an inwardly extending flange 34 on closure member 7. The nut 32 is thus freely rotatable but is held against longitudinal movement relative to the valve casing. The handle assembly indicated generally at 35

comprises a collar 36 secured around nut 32, and the handle proper 37 mounted on screw bolt 38 threaded at 39 into a portion of collar 36. Nut 32 is provided with a pair of spaced apart outstanding collars 40, and the outer surfaces of these collars as well as the inner surface of handle collar 36 are milled or each formed with a circumferential series of rather fine vertically extending teeth 41. These teeth on the collars 36 and 40 are adapted to interengage so that the handle may be slipped into place on nut 32 in any desired position of circumferential adjustment, the parts then being locked in place by screw 42 threaded through collar 36 so that its inner end will engage in the groove between collars 40 on the nut. The pointer 43 extending from collar 36 is adapted to indicate the positioning of the valve on a dial plate 44 suitably mounted on closure nut 7. It might here be noted that for convenience of illustration the handle 35 and pointer 43 have been shown in the same vertical plane as outlet nipple 5 in all of Figs. 1, 2 and 3 whereas a matter of fact they would be positioned slightly to one side or the other of this vertical plane when in extreme "on" or "off" position, that is the oscillatory or swinging movement of the handle will not extend through quite 360°.

The externally threaded nut 45 which meshes within internally threaded nut 32 is provided with a central non-circular opening adapted to fit slidably on portion 25 of stem 22. The nut 45 will thus be held from rotation by stem 22 which is in turn held from rotation by guide plate 28. The pitch of the threads between nuts 32 and 45 is such that one complete rotation or oscillation of handle assembly 35 and nut 32 between substantially the extreme positions of the handle will move nut 45 vertically a distance sufficient to move valve member 11 between its extreme open and closed positions. The operating nut 45 is permitted a limited and adjustable vertical sliding movement on stem 22 between the lower fixed stop shoulder 26 on the stem and an upper stop member adjustably mounted on the stem. This upper stop member comprises the adjusting nut 46 and friction locking sleeve 47 (see also Figs. 8 and 9). The nut 46 comprises an upper hub portion 48 internally threaded for adjustable engagement with the upper end portion 27 of stem 22, and a downwardly extending skirt portion 49 which is split as at 50 so as to provide a plurality of downwardly extending spring fingers 51. An outwardly extending collar portion 52 is formed on the lower ends of these fingers. The friction sleeve 47 comprises a lower disk portion 53 having a non-circular opening 54 adapted for fitting slidably but non-rotatably on portion 25 of the stem. The upwardly extending hollow cylindrical portion of the sleeve is provided with an internal collar 55 beveled upwardly and outwardly as indicated at 56. When the skirt portion 49 of nut 46 is forced into sleeve 47 the spring fingers 51 will yield inwardly so that collar 52 can snap into place beneath collar 55 and thus lock the members together. The spring fingers on the nut have a tight frictional fit within sleeve 47. It will be apparent that the locking sleeve 47 is non-rotatable on the stem so that any adjustment of nut 46 on the stem must be made against the frictional resistance of the sleeve which tends to hold the nut in any adjusted position. The lower surface of the friction sleeve serves as an upper stop abutment for limiting the upward movement of nut 45 on stem 22. If nut 46 is screwed down sufficiently the operating nut 45 will be clamped in fixed position on stem 22 between the upper and lower stops. However, if adjusting nut 46 is moved upwardly on the stem, a certain amount of clearance will be provided between nut 45 and these stops so as to provide a certain amount of lost motion between the nut 45 and stem 22. This clearance is indicated between nut 45 and the lower stop at 57 in Fig. 1 when the valve is in open position. When the valve is in closed position the clearance will be between nut 45 and the upper stop as indicated at 58 in Fig. 2.

A cap member 59 adapted to be screwed at 60 onto the upper end portion of internally threaded nut 32 serves to enclose the adjusting nut 46. A name plate or other ornamentation 61 may be inserted in the upper face of cap 59. Collar 62 on the upper portion of nut 46 engages the inwardly extending collar 63 at the upper end of nut 32 so as to limit the upward travel of the movable valve assembly.

Assuming now that the valve is in the closed position shown in Fig. 2 and that it is desired to open the valve, the handle 35 will be swung in the proper direction through an angle of substantially 360° until this movement is stopped by the engagement of collars 62 and 63. During the first portion of this movement the nut 45 will simply move vertically on stem 22 so as to take up the lost-motion 58 (see (Fig. 2) and thereafter nut 45 will lift the stem-assembly including movable valve member 11 and metering sleeve 16. The distance these valve members will be lifted depends upon the amount of clearance provided between operating nut 45 and the stop members on the stem, this clearance or lost motion being deducted from the total possible lift of the valve to determine the maximum opening of slots 20 in the metering sleeve. The greater the lost-motion provided by the adjustment of nut 46 the smaller will be the maximum opening of slots 20 and hence the smaller the maximum steam flow into the radiator. In any event a complete oscillatory movement of handle 35 will produce the desired results. When the valve is to be closed, the handle is swung as far as possible in the opposite direction, thus taking up the lost-motion 57 between nut 45 and stop 26 (see Fig. 1) and forcing the composition disk 13 into engagement with valve seat 10. It will be understood that the expansive action of bellows diaphragm 29 and the weight of the moving parts both tend to move the valve members toward closed position.

In order to adjust the maximum opening of the valve and therefore determine the normal steam flow to the radiator when the valve is open, it is merely necessary to remove the screw cap 59 and then adjust nut 46 in one direction or the other on the valve stem. It will be noted (see Fig. 3) that a plurality of radial reference lines 64 are cut in the upper surface of nut 32. In the present example there are fifteen of these lines. The purpose of these equally spaced lines is to permit one who is adjusting the valve to determine the fraction of a full turn the nut has been adjusted. Thus if the slots 20 in the metering sleeve are so proportioned that the valve has a capacity of fifteen square feet of direct radiation for each complete turn of the adjusting nut 46, then each division on this scale will represent one square foot of radiation. It will also be noted that the dial plate 44 is provided with a number of graduations 65 which permit a trained operator to determine the adjustment the valve has by merely turning the handle. The experienced operator, by observing the relation of the index

finger 43 of the handle relative to the dial plate 44 can feel the point at which the operating nut 45 abuts the upper stop and starts to lift the stem. The difference in tension required to move the valve vertically by turning the handle before and after it abuts this stop is very slight and not apparent to unauthorized persons or persons untrained relative to the mechanism of the valve. However, the experienced operator can in this manner determine the amount of radiation the valve is set for. The cap nut 59 will normally be screwed on so tight that a wrench is necessary for its removal, thus preventing unauthorized persons from tampering with the adjustment of the valve.

The form of the invention hereinabove described permits any occupant of a room to turn a radiator on or off but the maximum steam flow can only be adjusted by authorized persons familiar with the mechanism. In the modification shown in Fig. 10 the valve is so designed as to prevent the occupants of the room from turning the radiator on or off, that is the valve will ordinarily be left in open or closed position until it is re-set by an experienced operator. Such parts of the apparatus as are not here specifically referred to are the same as disclosed in Figs. 1 and 2. In lieu of the handle assembly 35, a closure member 66 is secured over the internally threaded nut 32, this closure member being provided with internal teeth 67 engaging the ribs 40 on nut 32 in the same manner as the collar 36 in the previously described form of the invention. The cap member 66 is then enclosed by a second closure or cap member 68 which is threaded at 69 onto a portion of closure plate 7. In order to open or close the valve, a suitable key wrench must first be inserted through opening 70 in cap member 68 and engaged in socket 71 in the upper portion of cap 66 so as to oscillate cap 66 in the same manner as handle 35 was manipulated in the first described form of the invention. In order to adjust the maximum opening of the valve passages, cap member 68 is removed and cap 66 lifting off and then nut 46 may be adjusted in the manner already described. This type of valve is not intended to be adjusted at all except by an authorized operator.

It will now be apparent that with a valve of either type hereinabove described the valve may be moved to a maximum open position by an extreme movement of the operating handle, but this maximum opening is adjusted permanently, or only at such times as changes in the heating system as a whole may require, by a proper adjustment of the stop nut 46. At the same time the valve may be set to any partially open position by moving the operating handle 35 to some intermediate position thus partially closing steam passages 20 in the metering sleeve. In other words the steam flow may be modulated between zero and the predetermined maximum by means of the manually operable handle.

It will be noted that all of the movable parts whereby the valve is lifted or adjusted are outside of the steam space, that is they are separated from the steam space by the flexible sealing means 29 so that there can be no air leaks while the mechanism is being adjusted, nor will any of these moving parts be incrusted by exposure to the steam.

We claim:

1. A radiator inlet valve comprising a valve casing having an internal valve seat, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a manually operable member mounted on the casing for swinging movement between two predetermined extreme positions to open and close the valve, and operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means including adjustable lost-motion connections whereby the maximum opening of the valve is selectively determined.

2. A radiator inlet valve comprising a valve casing having an internal valve seat, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a manually operable member mounted for swinging movement between two predetermined extreme positions to open and close the valve, and operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means comprising a guide member fixed to the casing through which the stem is non-rotatably slidable, an internally threaded nut rotatably mounted on the casing to which nut the manually operable member is secured, an externally threaded nut keyed on the stem for longitudinal movement thereon and meshing within the internally threaded nut, and stops on the stem for limiting the longitudinal movement of the nut in each direction on the stem, one of the stops being adjustable.

3. A radiator inlet valve comprising a valve casing having an internal valve seat, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a manually operable member mounted for swinging movement between two predetermined extreme positions to open and close the valve, and operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means comprising a guide member fixed to the casing through which the stem is non-rotatably slidable, an internally threaded nut rotatably mounted on the casing to which nut the manually operable member is adjustably secured, an externally threaded nut keyed on the stem for longitudinal movement thereon and meshing within the internally threaded nut, and stops on the stem for limiting the longitudinal movement of the nut on the stem in each direction, one of the stops being adjustable.

4. A radiator inlet valve comprising a valve casing having an internal valve seat, a movable valve member cooperating with said seat, a flexible sealing diaphragm secured at its respective ends to the casing and movable valve member, a longitudinally movable stem carrying the valve member, a manually operable member mounted on the casing for swinging movement between two predetermined extreme positions to open and close the valve, and operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means including adjustable lost-motion connections whereby the maximum opening of the valve is selectively determined.

5. A radiator inlet valve comprising a valve casing having an internal valve seat, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a manually operable member mounted for swinging movement between two predetermined

extreme positions to open and close the valve, operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means comprising a guide member fixed to the casing through which the stem is non-rotatably slidable, an internally threaded nut rotatably mounted on the casing to which nut the manually operable member is secured, an externally threaded nut keyed on the stem for longitudinal movement thereon and meshing within the internally threaded nut, and stops on the stem for limiting the longitudinal movement of the nut on the stem in each direction, one of the stops comprising a nut adjustably threaded on the stem, and means for locking the last-mentioned nut in adjusted position.

6. A radiator inlet valve comprising a valve casing having an internal valve seat, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a manually operable member mounted for swinging movement between two predetermined extreme positions to open and close the valve, operating means between the manually operable member and stem whereby oscillation of the member imports longitudinal movement to the stem, said means comprising a guide member fixed to the casing through which the stem is non-rotatably slidable, an internally threaded nut rotatably mounted on the casing to which nut the manually operable member is secured, an externally threaded nut keyed on the stem for longitudinal movement thereon and meshing within the internally threaded nut, and stops on the stem for limiting the longitudinal movement of the nut on the stem in each direction, one of the stops comprising a nut adjustably threaded on the stem, means for locking the last-mentioned nut in adjusted position, and a removable cap normally enclosing the adjustable nut.

7. A radiator inlet valve comprising a valve casing having an internal valve seat, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a manually operable member mounted for swinging movement between two predetermined extreme positions to open and close the valve, operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means comprising a guide member fixed to the casing through which the stem is non-rotatably slidable, an internally threaded nut rotatably monted on the casing to which nut the manually operable member is secured, an externally threaded nut keyed on the stem for longitudinal movement thereon and meshing within the internally threaded nut, stops on the stem for limiting the longitudinal movement of the nut on the stem in each direction, one of the stops comprising a nut adjustably threaded on the stem, and a sleeve non-rotatably keyed on the stem and frictionally engaging the last-mentioned nut to lock the nut in adjusted position.

8. A radiator inlet valve comprising a valve casing having an internal valve seat, a movable valve member cooperating with said seat, a flexible sealing daiphragm secured at its respective ends to the casing and movable valve member, a longitudinally movable stem carrying the valve member, a manually operable member mounted for swinging movement between two predetermined extreme positions to open and close the valve, operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means comprising a guide member fixed to the casing through which the stem is non-rotatably slidable, an internally threaded nut rotatably mounted on the casing to which nut the manually operable member is secured, an externally threaded nut keyed on the stem for longitudinal movement thereon and meshing within the internally threaded nut, stops on the stem for limiting the longitudinal movement of the nut on the stem in each direction, one of the stops comprising a nut adjustably threaded on the stem, and a sleeve non-rotatably keyed on the stem and frictionally engaging the last-mentioned nut to lock the nut in adjusted position.

9. A radiator inlet valve comprising a valve casing having an inner substantially cylindrical port provided with a valve seat at its inner end, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a manually operable member mounted on the casing for swinging movement between two predetermined extreme positions to open and close the valve, operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means including adjustable lost-motion connections whereby the maximum opening of the valve is selectively determined, and a metering sleeve secured to the movable valve member and slidably fitted within the port, said sleeve being apertured to determine the maximum flow of fluid through the port and sleeve.

10. A radiator inlet valve comprising a valve casing having an inner substantially cylindrical port provided with a valve seat at its inner end, a movable valve member cooperating with said seat, a flexible sealing diaphragm secured at its respective ends to the casing and movable valve member, a longitudinally movable stem carrying the valve member, a manually operable member mounted on the casing for swinging movement between two predetermined extreme positions to open and close the valve, operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means including adjustable lost-motion connections whereby the maximum opening of the valve is selectively determined, and a metering sleeve secured to the movable valve member and slidably fitted within the port, said sleeve being apertured to determine the maximum flow of fluid through the port and sleeve.

11. A radiator inlet valve comprising a valve casing having an inner substantially cylindrical port provided with a valve seat at its inner end, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a manually operable member mounted on the casing for swinging movement between two predetermined extreme positions to open and close the valve, operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means including adjustable lost-motion connections whereby the maximum opening of the valve is selectively determined, and a metering sleeve secured to the movable valve member and slidably fitted within the port, said sleeve being longitudinally slotted to determine the maximum flow of fluid through the port and sleeve.

12. A radiator inlet valve comprising a valve casing having an inner substantially cylindrical port provided with a valve seat at its inner end, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a manually operable member mounted on the casing for swinging movement between two predetermined extreme positions to open and close the valve, operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means including adjustable lost-motion connections whereby the maximum opening of the valve is selectively determined, and a metering sleeve secured to the movable valve member and slidably fitted within the port, said sleeve being provided with longitudinal slots of differing lengths to proportion the increment of fluid flow through the valve for each increment of valve opening.

13. A radiator inlet valve comprising a valve casing having an inner substantially cylindrical port provided with a valve seat at its inner end, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a manually operable member mounted on the casing for swinging movement between two predetermined extreme positions to open and close the valve, operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means including adjustable lost-motion connections whereby the maximum opening of the valve is selectively determined, and a metering sleeve secured to the movable valve member and slidably fitted within the port, said sleeve being longitudinally slotted to determine the maximum flow of fluid through the port and sleeve, the valve seat being outwardly flared at the outlet of the port and the bases of the slots being outwardly beveled so as to be substantially tangential to the flared surface of the seat so the increase of steam flow through the valve will be directly proportional to successive increments of valve opening.

14. A radiator inlet valve comprising a valve casing having an inner substantially cylindrical port provided with a valve seat at its inner end, a movable valve member cooperating with said seat, a flexible sealing diaphragm secured at its respective ends to the casing and movable valve member, a longitudinally movable stem carrying the valve member, a manually operable member mounted on the casing for swinging movement between two predetermined extreme positions to open and close the valve, operating means between the manually operable member and stem whereby oscillation of the member imparts longitudinal movement to the stem, said means including adjustable lost-motion connections whereby the maximum opening of the valve is selectively determined, and a metering sleeve secured to the movable valve member and slidably fitted within the port, said sleeve being longitudinally slotted to determine the maximum flow of fluid through the port and sleeve, the valve seat being outwardly flared at the outlet of the port and the bases of the slots being outwardly beveled so as to be substantially tangential to the flared surface of the seat so that the increase of steam flow through the valve will be directly proportional to successive increments of valve opening.

15. In a valve-adjusting mechanism, a valve stem having a threaded portion and a non-circular portion adjacent thereto, a nut adjustable on the threaded portion of the stem, and a sleeve keyed on the non-circular portion of the stem for movement with the nut longitudinally of the stem, the sleeve and nut having overlapped frictionally engaged portions whereby the sleeve tends to lock the nut in adjusted position.

16. In a valve-adjusting mechanism, a valve stem having a threaded portion and a non-circular portion adjacent thereto, a nut adjustable on the threaded portion of the stem and having a split skirt portion extending from one end thereof, and a sleeve having a hub portion keyed on the non-circular portion of the stem for movement with the nut longitudinaly of the stem, said sleeve being forced with a tight frictional fit over the skirt portion of the nut so that the sleeve tends to lock the nut in adjusted position.

17. In a valve-adjusting mechanism, a valve stem having a threaded portion and a non-circular portion adjacent thereto, a nut adjustable on the threaded portion of the stem and having a split skirt portion extending from one end thereof, and a sleeve having a hub portion keyed on the non-circular portion of the stem for movement with the nut longitudinally of the stem, said sleeve being forced with a tight frictional fit over the skirt portion of the nut so that the sleeve tends to lock the nut in adjusted position, the skirt and sleeve being formed respectively with outwardly and inwardly extending shoulders which snap into engagement to lock the sleeve to the nut.

18. A radiator inlet valve casing having an inner substantially cylindrical port provided with a valve seat at its upper end, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a guide member fixed to the casing through which the stem is non-rotatably slidable, a metering sleeve secured to the valve member and slidably fitting within the port, said sleeve being longitudinally slotted to provide passages for the flow of fluid through the valve, a flexible sealing diaphragm secured at its respective ends to the valve casing and movable valve member, an internally threaded nut rotatably mounted on the casing coaxial with the stem, an externally threaded nut keyed on the stem for longitudinal movement thereon and meshing within the internally threaded nut, upper and lower stops on the stem for limiting the longitudinal sliding movement of the nut on the stem, the upper stop comprising an adjusting nut threaded on the upper portion of the stem, means for locking the adjusting nut in adjusted position, a handle member adjustably secured to the internally threaded nut for rotating the same, and a cap removably secured to the internally threaded nut for enclosing the adjusting nut and preventing access thereto.

19. A radiator inlet valve casing having an inner substantially cylindrical port provided with a valve seat at its upper end, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a guide member fixed to the casing through which the stem is non-rotatably slidable, a metering sleeve secured to the valve member and slidably fitting within the port, said sleeve being longitudinally slotted to provide passages for the flow of fluid through the valve, a flexible sealing diaphragm secured at its respective ends to the valve casing and movable valve member, an internally threaded nut rotatably mounted on the casing coaxial with the stem, an externally threaded

nut keyed on the stem for longitudinal movement thereon and meshing within the internally threaded nut, upper and lower stops on the stem for limiting the longitudinal sliding movement of the nut on the stem, the upper stop comprising an adjusting nut threaded on the upper portion of the stem, means comprising a sleeve non-rotatably mounted on the stem and frictionally engaging the adjusting nut for locking the adjusting nut in adjusted position, a handle member adjustably secured to the internally threaded nut for rotating the same, and a cap removably secured to the internally threaded nut for enclosing the adjusting nut and preventing access thereto.

20. A radiator inlet valve casing having an inner substantially cylindrical port provided with a valve seat at its upper end, a movable valve member cooperating with said seat, a longitudinally movable stem carrying the valve member, a guide member fixed to the casing through which the stem is non-rotatably slidable, a metering sleeve secured to the valve member and slidably fitting within the port, said sleeve being longitudinally slotted to provide passages for the flow of fluid through the valve, a flexible sealing diaphragm secured at its respective ends to the valve casing and movable valve member, an internally threaded nut rotatably mounted on the casing coaxial with the stem, an externally threaded nut keyed on the stem for longitudinal movement thereon and meshing within the internally threaded nut, upper and lower stops on the stem for limiting the longitudinal sliding movement of the nut on the stem, the upper stop comprising an adjusting nut threaded on the upper portion of the stem, means for locking the adjusting nut in adjusted position, a cap provided with a wrench socket in its upper end and removably secured over the internally threaded nut so as to enclose the adjusting nut, and a closure member secured to the casing and enclosing the last-mentioned cap member, said closure being provided with an opening in its upper end through which a key wrench may be engaged with the socket in the cap to rotate the cap.

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