

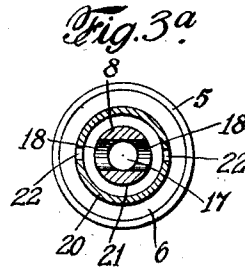
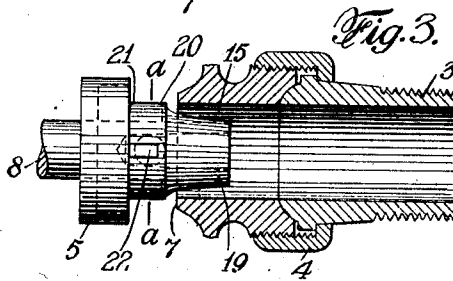
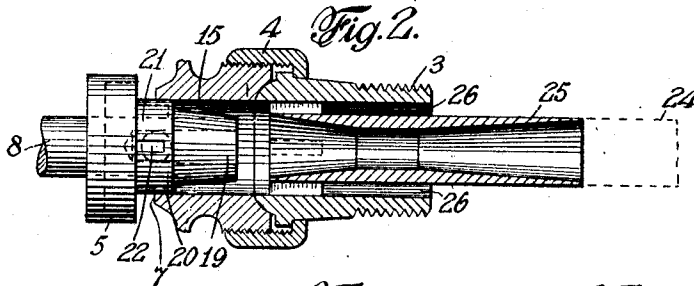
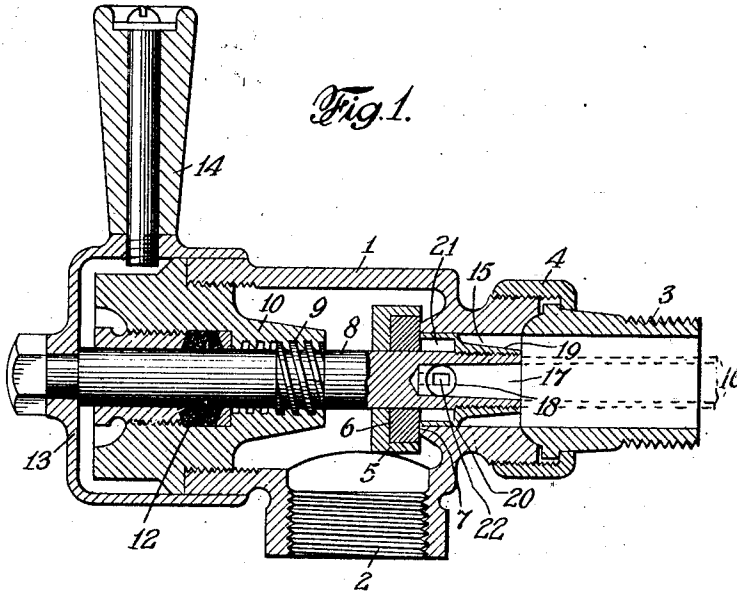
Feb. 12, 1929.

1,701,716

C. S. BROWN
HEATING APPARATUS

Filed Dec. 13, 1924

2 Sheets-Sheet 1



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Feb. 12, 1929.

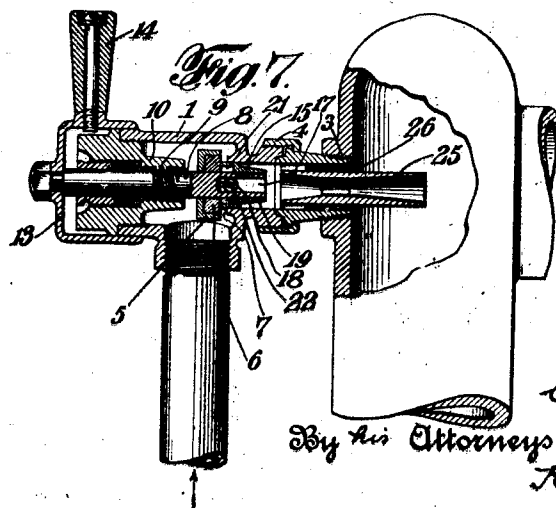
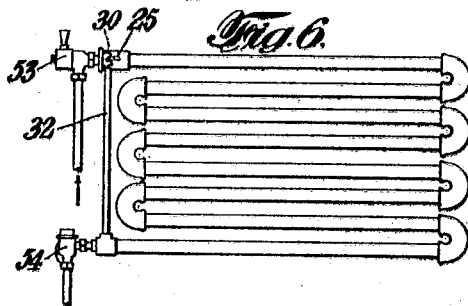
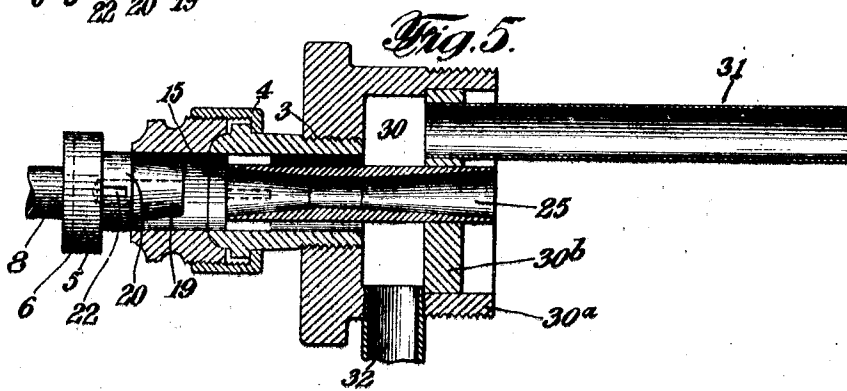
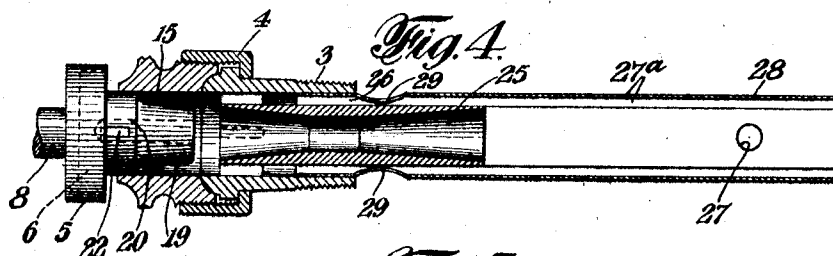
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C. S. BROWN

HEATING APPARATUS

Filed Dec. 13, 1924

2 Sheets-Sheet 2



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HEATING APPARATUS.

Application filed December 13, 1924. Serial No. 755,639.

My invention consists of an improved apparatus for heating by means of steam.

The object of my invention is to provide an apparatus by means of which the radiator or heater may be heated to any desired temperature between that of the air and that of the steam and by which the temperature within the radiator can be very quickly raised to that of the steam at full pressure when it becomes desirable to do so.

By means of my improved apparatus, the steam is so supplied to the radiator that the steam and air are mixed so as to form a humid mixture in which the heating medium is the steam or vapor carried by the air and in which the mixture is maintained throughout the radiator. The apparatus is so constructed that some of the steam is introduced in the form of a jet so as to cause a rapid and continuous circulation of the humid mixture in the radiator, and a supplementary supply of steam can be introduced when needed around or in contact with the jet. As is well known, steam alone at atmospheric pressure has a temperature of 212° and cannot have a lower temperature without being under a lower pressure. But it is a well-known fact that steam can exist mixed with air at lower temperatures than its boiling point at atmospheric pressure, the amount of steam or water vapor carried being very small with lower temperatures of the air but increasing as the temperature of the air increases. I take advantage of this fact in my invention and am able to form a mixture of air and steam at any pressure desired. By introducing some of the steam in the form of a jet at high velocity, the mixture of air and steam is produced in the radiator and is maintained therein, and this mixture is caused to circulate rapidly and continuously as a result of which uniformity of temperature is maintained. The apparatus is provided with a second supply opening arranged near or around the jet by means of which when the temperature of the radiator falls below the desired point or for any reason it is desired to heat the radiator very quickly, a supplementary supply of steam may be introduced around or in contact with the jet. The velocity of the jet can be increased by increasing the pressure of the steam supplied to it. By introducing the supplementary supply of steam around the jet, this steam is actively and rapidly circulated in the radiator

together with the steam which flows from the jet itself.

The apparatus is also provided with a pipe or passage extending from some part of the radiator to a point adjacent to the jet by means of which a current of air or humid mixture may be caused to flow from the radiator to the point of introduction of the steam and to be mixed with the inflowing steam at that point.

The accompanying drawings illustrate various forms or embodiments of my improved apparatus. I do not confine myself to the exact details shown as these may be modified materially without departure from the fundamental principles of my invention.

Fig. 1 is a central vertical section of a valve embodying one form of my improved apparatus. In this figure, the valve is shown as closed.

Fig. 2 shows a section of the inner part of the valve connection with the valve proper shown in elevation and with an additional device for increasing the action of the apparatus. In this figure the valve is shown partly open.

Fig. 3 shows the valve fully open.

Fig. 3^a is a cross section on the line *a-a* of Fig. 3, showing details of construction.

Figs. 4 and 5 show auxiliary devices for promoting circulation and the mixing of air with the steam in certain types of radiators.

Fig. 6 shows a method of connecting the parts of the radiator to produce positive circulation through the same.

Fig. 7 discloses a radiator equipped with the valve shown in Fig. 2.

In Figure 1 I have shown one form of admission valve embodying my invention. It is constructed with two openings or passages. The central one is in the form of a jet. The other passage surrounds the jet and is adapted to admit a supplementary supply of steam when the valve is fully opened. When the valve is only partly opened, the steam is caused to flow into the radiator in the form of a jet of high velocity which produces a humid mixture of steam and air within the radiator and a continuous circulation of this mixture therein. This mixture may be maintained in the radiator at any desired temperature between that of the air and that of the steam itself at normal pressure. This is accomplished by regulating the jet. When it

is desired to raise the temperature quickly or to the full temperature of the steam itself, the valve is fully opened and a supplementary supply of steam is admitted through the second opening and around the jet.

The valve consists of a body 1, with steam inlet 2, and a spud 3 for connection with the valve to the radiator by means of a union nut 4. The body contains a valve 5 proper which may be fitted with the usual composition disc 6 for effecting closure of the valve on the valve seat 7. The valve 5 is actuated by the valve stem 8, preferably supplied with a multiple threaded screw 9 acting in the nut 10 for securing quick and full opening of the valve with a partial turn of the screw. The valve stem 8 extends through the usual stuffing box 12 and to the outer end of the stem is attached a cap 13 enclosing the nut and stuffing box. To this cap is attached the handle 14 for the actuation of the valve. In this form of valve a three-quarter turn of the handle throws the valve from fully open to fully closed position or vice versa. The valve stem 8 extends through the valve 5 into the passage 15 leading to the radiator, and the stem may be extended into the radiator itself as far as may be desired, as indicated by dotted lines 16, but I prefer to confine it within the limits of the valve body itself, as shown in full lines.

The extension of the valve stem 8 contains a passage 17, with which one or more transverse openings connect. The passage 17 is made long enough and of such a small diameter as to cause the steam to be projected into the radiator in the form of a jet. I have found that this result will be effectively secured by making the passage $17\frac{3}{4}$ ths of an inch long and $\frac{1}{16}$ ths of an inch in diameter. 18 are the transverse openings connected with the passage 17. The valve stem extension is threaded to receive a conical sleeve 19 which has a cylindrical extension 20 accurately fitting the bore of passage 15 so as to be approximately steam-tight. The cylindrical extension 20 contains a chamber 21 into which one or more preferably rectangular ports 22 open, as is more clearly shown in Figures 2 and 3.

If the valve is partly opened, as shown in Figure 2, the cylindrical portion 20 of sleeve 19 will be partly withdrawn from passage 15, exposing a portion of the port or ports 22 so that steam will pass through the ports 22 into the chamber 21, then through the ports 18 into the passage 17, from which it will be discharged into the radiator at high velocity in the form of a jet tending to circulate the steam and the air in the radiator and to mix the two together to form a saturated humid mixture, and thus heating the air. The amount of steam supplied is varied by opening and closing the valve so as to expose as much or as little of the port or ports 22 to

the passage of the steam as may be desired, and in this manner the temperature of the mixture may be maintained at any desired point. The introduction of the steam in the form of a jet, as described, causes the steam and air to continuously circulate in the radiator so that their mixture is maintained, and the steam is prevented from accumulating in one part of the radiator and the air in another.

If it is desired to fill the radiator quickly or to use steam at full pressure or at a pressure that cannot be secured by the jet alone, as in very cold weather, the valve may be fully opened or may be opened as shown in Figure 3, and is so designed as to furnish fully half the area of the passage 15 in effective opening. The effect of this is to cause a supplemental supply of steam to be fed into the radiator through the passage 15 and around the jet which flows through the passage 17.

While the jet and its controlling apparatus, as above described, serve to mix and to circulate the heating medium within the radiator with good effect, I have found it possible to increase its effectiveness and to produce, thereby, a substantially uniform temperature throughout the radiator, by placing a Venturi tube or diffuser 25 (Figure 2) in the path of the steam jet. This Venturi tube is suitably supported within the spud 3 so as to form an annular passage 26 around the diffuser and between it and the spud.

In this arrangement, the inductive effect of the steam jet draws steam from the passage 15, carrying it with the steam of the jet through the diffuser 25 and forming a partial vacuum in the passage 15 which causes a current of air to flow from the radiator through the annular passage 26 around the diffuser, from which it is drawn into the Venturi tube by the jet of steam and thus a continuous circulation of the mixture is maintained from the radiator through the passage 26 and through the Venturi tube back into the radiator.

In Figure 4 I have shown a form of valve in which the diffuser is extended to any desired point within the radiator, or entirely across the radiator. In this construction the diffuser is preferably provided with openings 27 so spaced as to discharge the flowing mixture at desired points, or the diffuser may be enclosed by a tube 28, as shown, with similar openings 27^a to permit the discharge of the mixture into the radiator. In such construction I provide the tube 28 with openings 29 opening into the passage 26, as shown, for the admission of air or the humid mixture from the radiator into the passage 26 and so into the passage 15. If the tube 28 is used, the diffuser is not extended.

In Figure 5 I have shown another form of fitting for the attachment of the valve,

where it may be desirable to draw the air supply for the diffuser from a distant point. For this purpose the vacuum chamber 30 is formed around the diffuser, and an air tube 31 leads to any point in the radiator from which it is desired to draw the air or the mixture. A tube 32 may also be connected with the chamber 30 by means of which another connection may be formed with another part of the radiator. One or both of these tubes may be used. In Figure 5, 30^a is a fitting adapted to screw into the radiator, provided with a wall 30^b through which the Venturi tube and the tube 31 extend, and which forms the vacuum chamber 30 already referred to.

In Figure 7 I have shown another form of radiator which is in the form of a continuous coil having an inlet valve 53, such as shown in Figure 5, provided with a tube 32, connected to the discharge end of the coil, by means of which a continuous circulation of humid mixture is maintained throughout the coil. In this case the tube 31 is omitted. 54 represents any suitable form of discharge valve.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a heating system for heating with steam, the combination of a radiator and an inlet valve provided with two passages, one of which is of such dimensions as to cause the heating fluid to flow into the radiator in the form of a jet and the other of which is arranged to admit a supplemental supply of steam in contact with the jet.

2. In a heating system for heating with steam, the combination of a radiator and an inlet valve provided with two passages, one of which is of such dimensions as to cause the heating fluid to flow into the radiator in the form of a jet and the other of which is arranged to admit an additional supply of steam around the jet, and means for controlling these passages.

3. In a heating system for heating with

steam, the combination of a radiator, and an inlet valve provided with two passages, the first of which is centrally located in the valve and is of such dimensions as to cause the heating fluid to flow into the radiator in the form of a jet and the second of which surrounds the first and is adapted to introduce a supplemental supply of steam around the jet and in contact therewith, substantially as described.

4. In a heating system for heating with steam, the combination of a radiator and an inlet valve provided with a central passage of such dimensions as to cause the heating fluid to flow into the radiator in the form of a jet and provided with a second passage arranged to introduce a supplemental supply of steam in contact with the jet and a Venturi tube arranged in front of the jet opening and surrounded by a passage leading from the radiator to the jet.

5. In a heating system for heating with steam, the combination of a radiator and an inlet valve provided with a body having a steam inlet, a stem, a valve proper carried by the stem, a valve seat, an extension of the stem projecting beyond the valve proper and having a passage of such dimensions as to cause the heating fluid to flow through the same in the form of a jet, a sleeve surrounding the stem and forming a chamber between the sleeve and the valve, the stem being provided with ports connecting the chamber and the passage in the stem, and a cylindrical extension connected with the sleeve and accurately fitting the passage in the valve body provided with ports leading into said chamber, the cylindrical extension of the sleeve being so arranged that it can be withdrawn entirely from the passage in the valve body so as to admit a supplemental supply of steam around the jet.

In testimony whereof, I have signed my name to this specification.

CHARLES S. BROWN.