No. 854,054. PATENTED MAY 21, 1907.

C. C. PECK.

METHOD OF CIRCULATING HOT WATER IN A HEATING SYSTEM.

APPLICATION FILED JUNE 28, 1905.

2 SHEETS—SHEET 1.

FIG. 1.

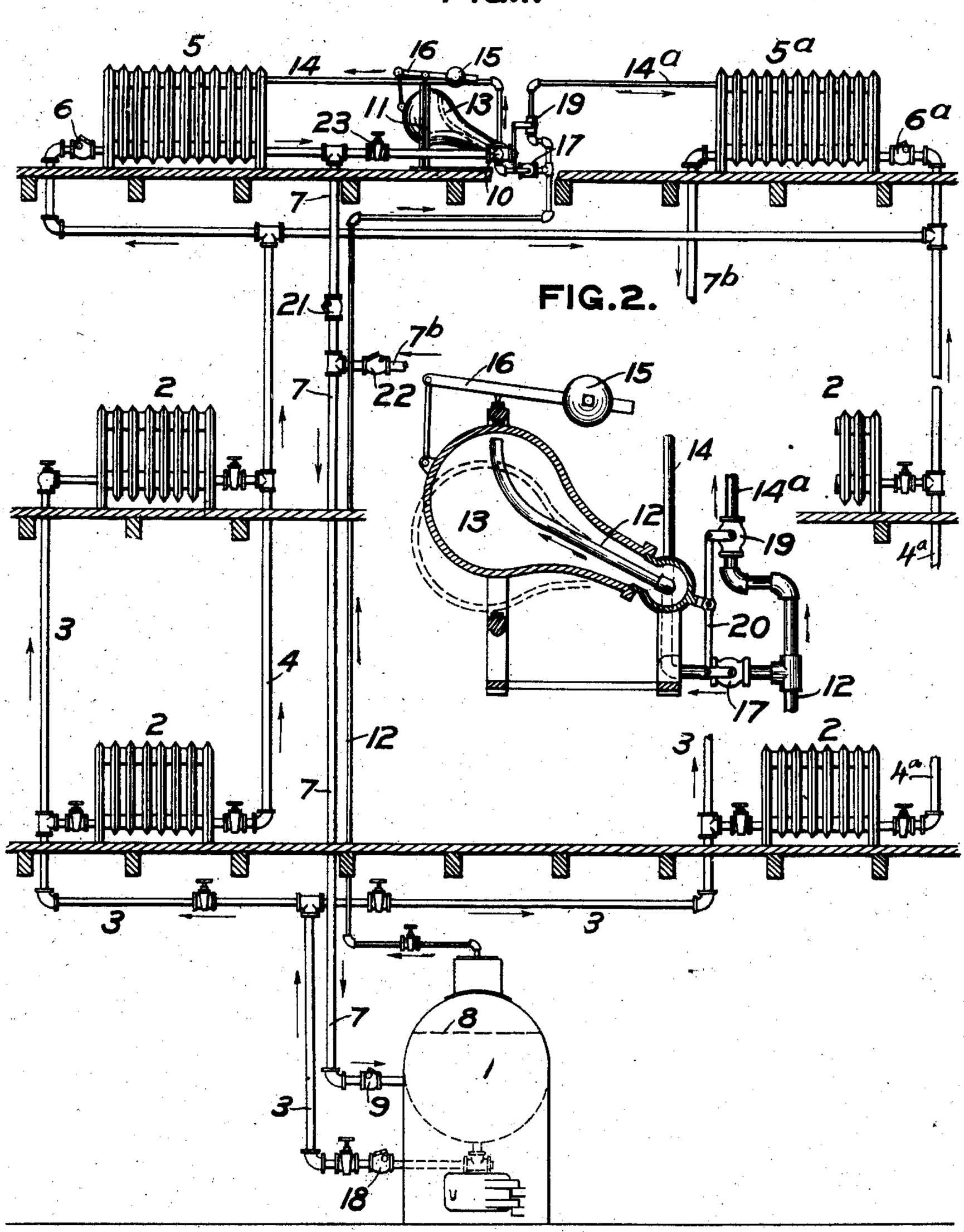

FIG. 2.

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2 SHEETS—SHEET 2.

FIG.3.

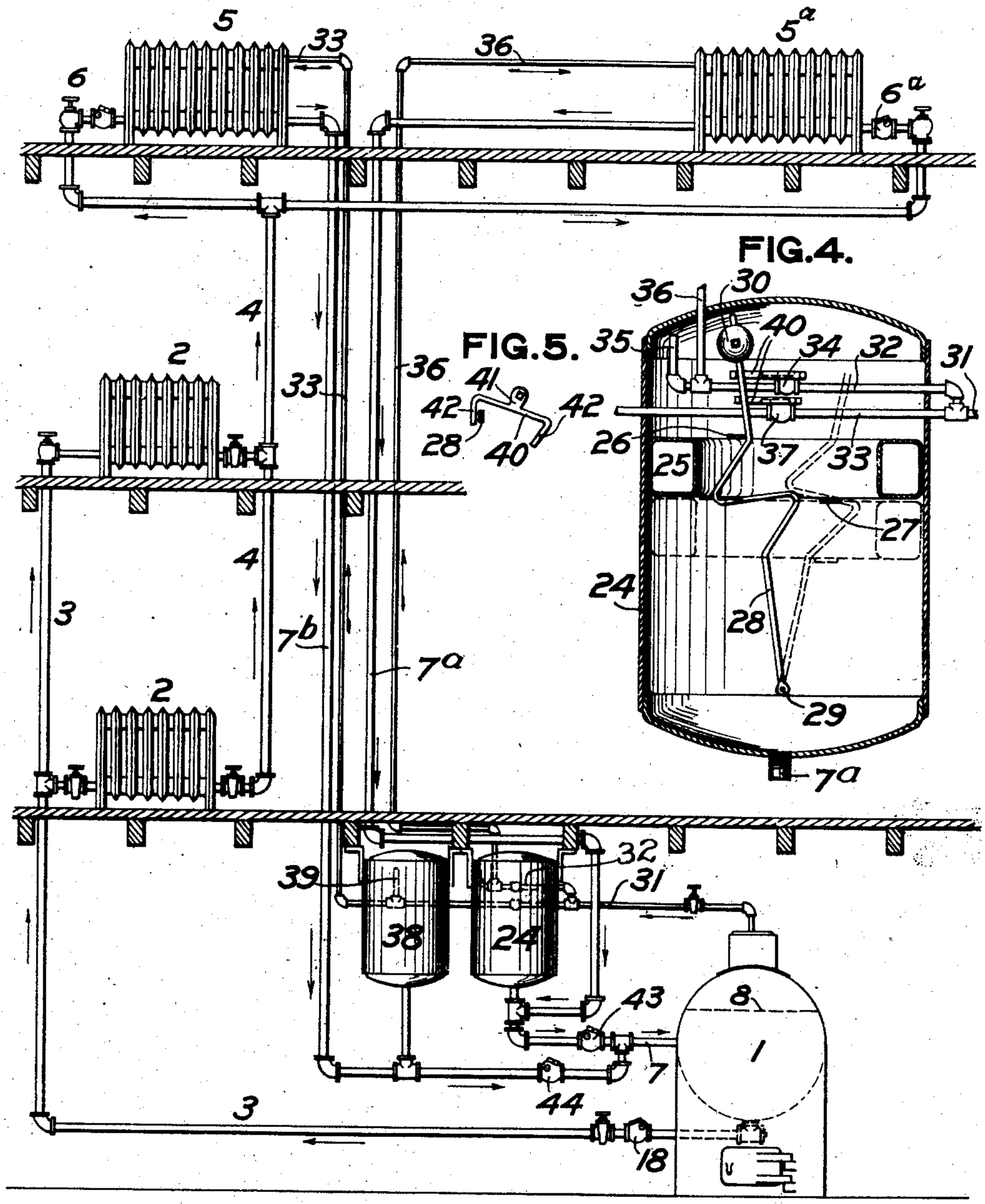

FIG.4.

FIG.5.

WITNESSES:

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METHOD OF CIRCULATING HOT WATER IN A HEATING SYSTEM.

No. 854,054. Specification of Letters Patent. Patented May 21, 1907.

Application filed June 28, 1905. Serial No. 267,378.

To all whom it may concern:

Be it known that I, CASSIUS CARROLL PECK, residing at Rochester, in the county of Monroe and State of New York, have invented a new and useful Method of Circulating Hot Water in a Heating System, of which the following is a specification sufficient to enable others skilled in the art to which it appertains to make and use the same.

My invention relates to hot water heating, and has for its object the forcible circulation of the water of the heating circuit by pressure of steam on its surface, and its automatic return after passing through the circuit to the combined steam and water chamber from which it proceeded. The method of thus effecting circulation will be described in general and in detail hereinafter.

In the accompanying drawings like parts in the figures are represented by the same letters. Feathered arrows indicate the direction of steam circulation and unfeathered arrows indicate the flow of water.

Figure 1 is a vertical elevation showing the several parts of my heating system in operative relation and exemplifying one arrangement of devices suitable for carrying out my method of circulating hot water, the floors of the containing building being shown in cross section. Fig. 2 is a central, vertical section on a larger scale than Fig. 1 of an automatic regulator for effecting and controlling circulation in a heating circuit as shown in Fig. 1, the steam supply valves being shown in elevation. Fig. 3 is an elevation of another arrangement and construction of apparatus suitable for carrying out my method of circulating hot water. Fig. 4 is a central vertical section on an enlarged scale of the automatic regulator shown in elevation as suspended from floor beams in Fig. 3. Fig. 5 is a detailed plan view of the valve lever shown in Fig. 4.

In Figs. 1 and 3 of the drawings, 1 illustrates a steam boiler typical of any steam generator, or steam chamber, partially filled with water of a heating circuit. 2, 2, are water radiators connected to the water space of steam generator 1 by supply pipes 3, the discharge, or return, pipes, 4 from said radiators being connected into the combined steam and water radiators 5, 5^a, these pipes being preferably provided with a check valve, as 6, 6^a, respectively. Discharge pipe 7, which returns water which has been circulated through the aforesaid pipes and radiators by pressure of steam on surface of water in steam generator 1, is connected into said steam generator preferably below the water line 8, and is provided with a check valve 9 to prevent return of water from said generator. This pipe has also a branch 10 connecting it with the circulation regulator 11, (this number being intended to indicate the regulator as a whole), this regulator also having a steam pipe connection 12 with the steam generator, said pipe being extended into the bowl 13, as shown in broken lines in Fig. 1 and elevation in Fig. 2. The steam pipe 12 has also an extension 14 to the steam space at the upper portion of radiator 5, and an extension 14^a to the radiator 5^a. Fig. 2 is intended to show the same arrangement of regulator 11 and steam supply pipes 12, 14 and 14^a as Fig. 1. The bowl 13 is mounted to turn on trunnions.

The operation is as follows: When steam pressure above pressure of the atmosphere has formed above the water line 8 in steam generator 1, it presses the water out through pipe 3, which is preferably provided with check valve 18, into and through radiators, as 2, 2, and thence into the combined steam and water radiators 5 and 5^a. Regulator 11 is set at a proper level with radiators 5, 5^a, so that they may be filled with water simultaneously and to about the same level, or each in succession. When a predetermined water level has thus been reached, the weight of water in the bowl 13 of the regulator is arranged for overbalancing counterweight 15 on lever 16, which allows said bowl to tilt downward and assume the position shown in broken lines in Fig. 2. A bar 20, pivoted to a lug on the bowl 13, outside of the trunnion on which the bowl turns, is fastened to the handles or levers of the valves 17 and 19. When the bowl tilts downward, the bar 20 is raised and the valves opened, admitting steam to radiators 5, 5^a, and bowl 13 which, equalizing the pressure, allows the water contained in the radiators and regulator bowl to flow out and down through pipe 7 into the boiler, check valves 21, 22 and 9 preventing it from being forced back into the radiators. Valves 17 and 19 may also be so set that the latter will be opened when the former is closed, in which case radiators 5 and 5^a will fill and empty alternately, for when the regulator bowl is up, and being filled with water

from the radiator 5, valve 17 will be closed and valve 19 will be open and admitting steam to radiator 5ª; when the regulator bowl is so far filled as to tilt down the water contained in bowl and in radiator 5 will flow back to the boiler, as described above, and valve 19 being thus made to close, steam will be shut off from radiator 5ª. Steam in this radiator will then rapidly condense, and water from the boiler will be forced through supply pipe 4ª and check valve 6ª to take its place. When the regulator bowl has discharged its contents, the weight 15 will suddenly raise bowl 13 to the position shown in full lines in Fig. 2, which will close valve 17 and open valve 19; steam imprisoned in radiator 5 will immediately commence to condense, and water will be forced into the partial vacuum so formed. The steam admitted to radiator 5ª will equalize the pressure on the water therein with pressure in the boiler, and water will then flow out by gravity through pipes 7ᵇ and 7 into the boiler (check valve 22 preventing its return), and the cycle of operations will begin again. In order to give time for steam in the radiators 5 and 5ª to condense sufficiently between the rise and the fall of the regulator bowl, it may sometimes be necessary to place a valve 23 in the pipe 7 leading from the regulator (Fig. 1) to throttle the discharge.

In Figs. 3, 4 and 5 the same general form of apparatus as that just described is shown in connection with another type of regulator, which is a tank 24, within which is a circular float 25, free to move up or down. On top of the float is fastened a bar 26, and a similar bar 27 is attached to the bottom. A bar 28 is pivoted on a rod 29 near the bottom of the tank. Bar 28 has a weight 30 fixed to its upper end, for a purpose to be set forth. The steam supply pipe 31 from boiler 1 branches near the tank into two pipes 32 and 33. Pipe 32 has a valve 34, and beyond this valve the pipe has a short branch 35, with the end opening into the tank, and a branch 36 extending to the top of the condensing radiator 5ª. Pipe 33 has a valve 37, and beyond this valve the pipe extends into another tank 38, and through said tank to top of radiator 5. Tank 38 contains no float, valves, or bar like those in tank 24. To the stem of each of the valves 34 and 37 is fixed a yoke 40 (see Fig. 5) at the end of a short arm 41, adapted to be engaged by bar 28 which comes in contact with the end of hooks 42, thereby operating or turning the valves when the bar is moved from one side of the tank to the other. Operation of the system as constructed in this manner is as follows: The pressure of steam in boiler 1 forces water up through supply pipe 3 and radiators 2, 2, into the condensing radiator 5ª, and thence overflows through pipe 7ª into the regulator 24, raising the float 25 therein. As the float rises, the bar 27 on its lower side presses against the bent portion of the vertical bar 28, and forces it to the left, When the float has risen high enough, bar 28 has been carried so far over that it has just passed the vertical plane of its pivotal support, and weight 30 then causes it to suddenly fall the remaining distance to the position shown in full lines in Fig. 4. In so doing bar 28 engages the yoke on each of the valves 34 and 37, swinging said yokes into position shown in Fig. 5. In this position valve 34 is arranged to be open, and valve 37 closed. Then steam will flow through valve 34 into the top of tank 24 and radiator 5ª, equalizing steam pressure and allowing water to flow by gravity into the boiler through check valve 43 and pipe 7. As water leaves the tank, the float gradually sinks, and bar 26 presses on the slanting portion of bar 28, and before the float reaches its lowest level the center of gravity of the bar passes the vertical plane of its pivotal support and falls over to the right (shown by dotted lines in Fig. 4) engaging the operating yokes 40 as before, and, reversing the valves, shuts off steam from tank 24 and radiator 5ª, and admits it to tank 38 and radiator 5. This will allow water which has largely filled said tank and radiator by reason of the boiler pressure and the condensation of steam admitted to them through valve 37 in the first operation, to flow back to boiler 1 through check valve 44 and pipe 7. Steam inclosed within tank 24 and radiator 5ª then begins to condense, water is forced in from the boiler, the float rises, and the cycle of operations is again repeated.

It is not necessary that regulator 11 should be located at the top of the circuit, or on the same level as radiators 5, 5ª. It may in fact be located in a basement and but little above the level of the steam-water supply chamber.

The duplicate system of condensing radiators is especially advantageous in large heating systems, as flow from, and return to, the steam generator can thus be made practically continuous, and piping for the system as a whole can be made smaller for a given volume of circulation; but it is obvious that radiator 5ª with its connecting pipes and valves can be omitted when an intermittent flow through the heating system is admissible. Also that if valves 17 and 19 be set to open at the same time and close at the same time, the two circulation circuits will be operated as one; in which case the said valves as shown in the position in Figs. 1 and 2 will both be closed.

I do not confine myself to the apparatus herein described and shown in the accompanying drawings, as equivalent instrumentalities may be employed for embodying the general method which I claim of effecting water circulation in a hot water heating system, further variations in design and ar-

rangement being shown and described in my concurrent application (which has gone to issue) on mechanical features.

This method of forcibly circulating water of a hot water heating circuit is suited to meet most situations where either live steam, or any other arrangement of a hot water circuit, would otherwise be employed. When the system is properly arranged and installed as herein described, it is automatic in operation, requiring no special attention, and possesses all the desirable qualities which go with a mechanically forced circulation of hot water, such as small supply and return pipes not requiring to be run on any fixed grade, evenly heated radiating surfaces, avoidance of water-hammer, easy protection against freezing, no trouble with air in pipes or radiators, etc.

What I claim and desire to secure by Letters Patent is:

1. The method of circulating hot water in a hot water heating circuit, consisting in forcing water by steam pressure on its surface through a portion of the circuit to a higher level, return flow through said portion being prevented; automatically and suddenly admitting steam to the circuit above the upper level of the water, thus permitting the water to flow by gravity through the remainder of the circuit to its starting point; and automatically and suddenly shutting off the steam to the upper portion of the circuit, thus permitting the pressure in said upper portion to be diminished by condensation.

2. The method of circulating hot water contained in a steam boiler in a hot water heating circuit, consisting in forcing the boiler water by steam pressure on its surface through a portion of the circuit to a higher level, return flow through said portion being prevented; automatically and suddenly admitting steam to the circuit above the upper level of the water, thus permitting the water to flow by gravity through the remainder of the circuit back into the boiler; and automatically and suddenly shutting off the steam to the upper portion of the circuit, to permit the pressure in said upper portion to be reduced by condensation.

3. The method of circulating hot water in a hot water heating circuit, consisting in forcing water by steam pressure on its surface through a portion of the circuit to a space at a higher level, return flow through said portion being prevented; automatically and suddenly admitting steam to said space, thus permitting the water to flow by gravity through the remainder of the circuit to its starting point; and automatically and suddenly shutting steam off from said space, thus permitting steam pressure in the space to be diminished by condensation, the supply of steam to said space being controlled according to the water level therein.

4. The method of circulating hot water in a hot water heating circuit, consisting in forcing water by steam pressure on its surface through a portion of the circuit to a higher level, return flow through said portion being prevented; automatically and suddenly admitting steam to the circuit above the upper level of the water, thus permitting the water to flow by gravity through the remainder of the circuit to its starting point; and automatically and suddenly shutting off the steam to the upper portion of the circuit, and condensing it on radiating walls in the circuit, to reduce steam pressure in said upper portion of the circuit.

5. The method of circulating hot water in a plurality of hot water heating circuits, consisting in forcing water by steam pressure on its surface through a portion of each circuit to a higher level, return flow through said portion being prevented; automatically and suddenly admitting steam to each circuit above the upper level of the water, to permit the water to flow by gravity through the remainder of each circuit to its starting point, return through this portion of the circuit being prevented; and automatically and suddenly shutting off the steam to the upper portion of each circuit and reducing its pressure therein by condensation, to permit water of the circuit to be forced into said upper portion to replace the steam.

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Witnesses:

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