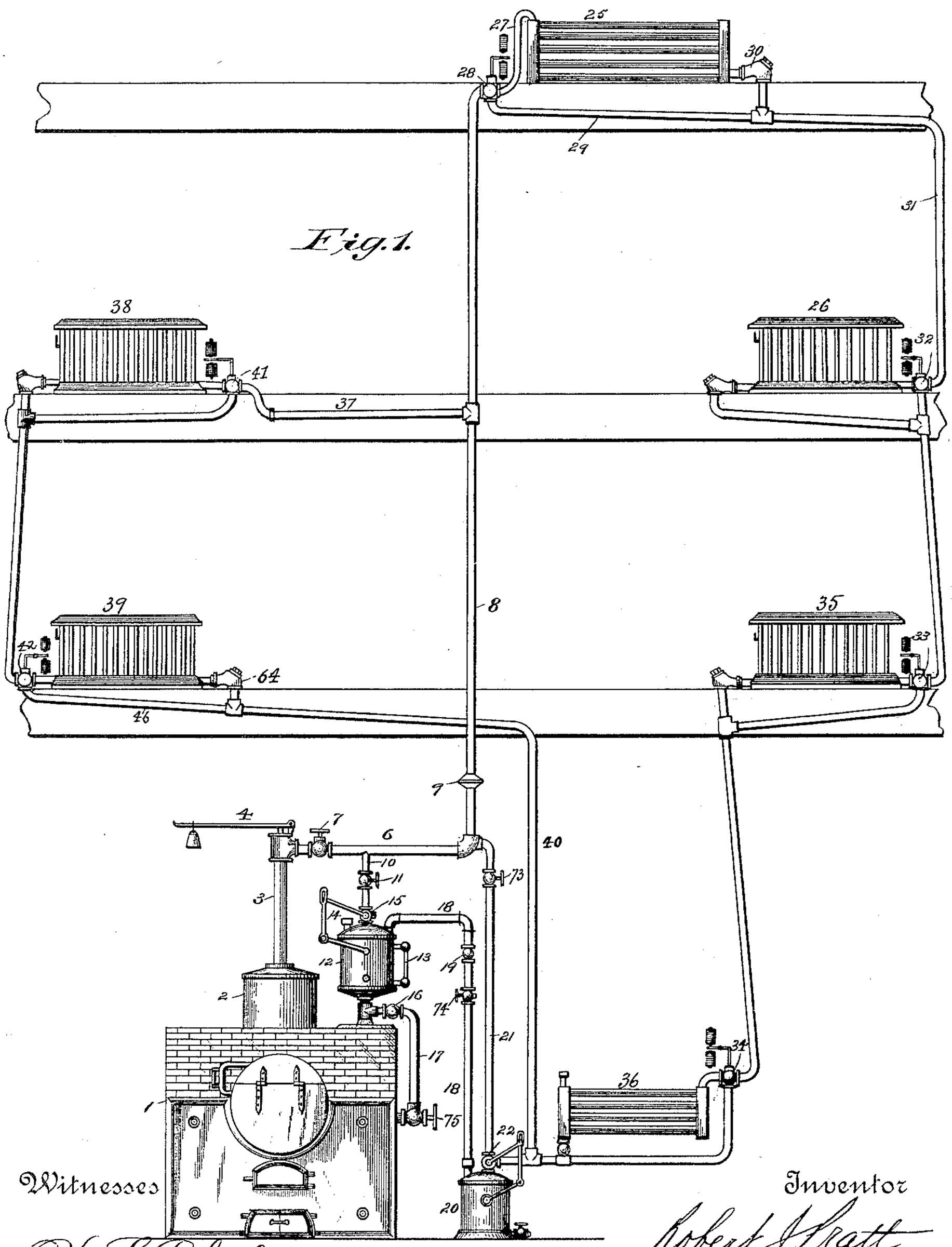
(No Model.) 3 Sheets—Sheet 1.

R. J. PRATT.

SYSTEM OF TEMPERATURE REGULATION.

No. 433,147 Patented July 29, 1890.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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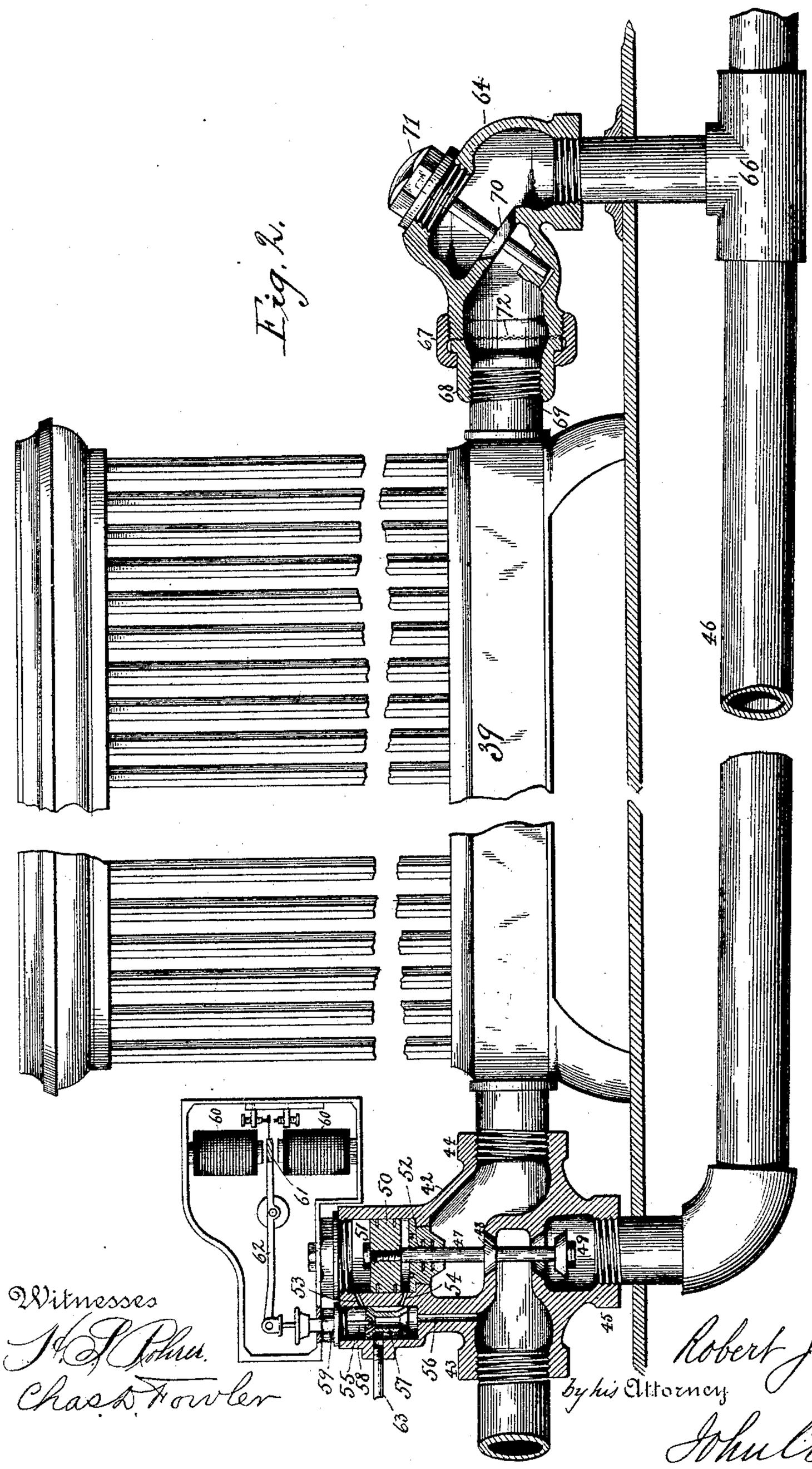
Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

R. J. PRATT.

SYSTEM OF TEMPERATURE REGULATION.

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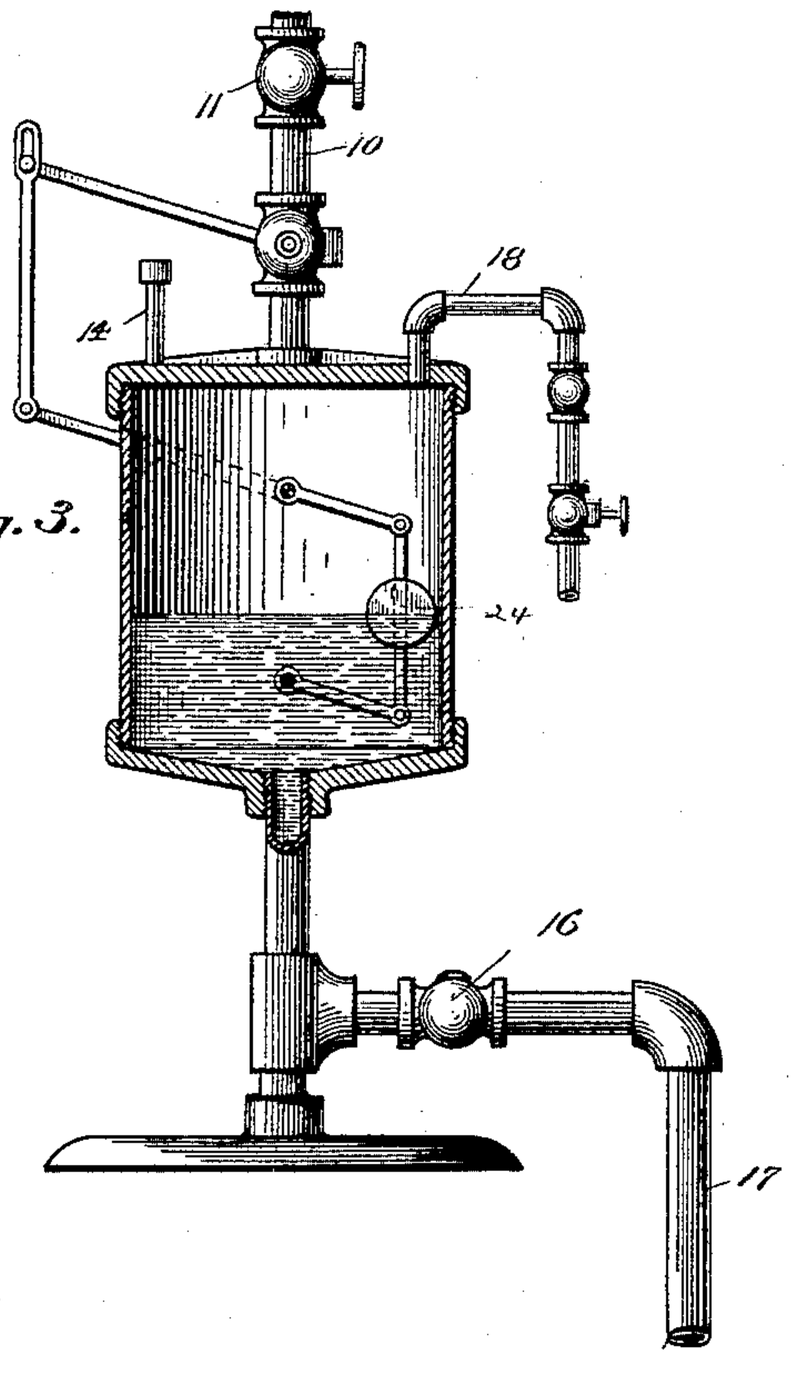


Fig. 3.

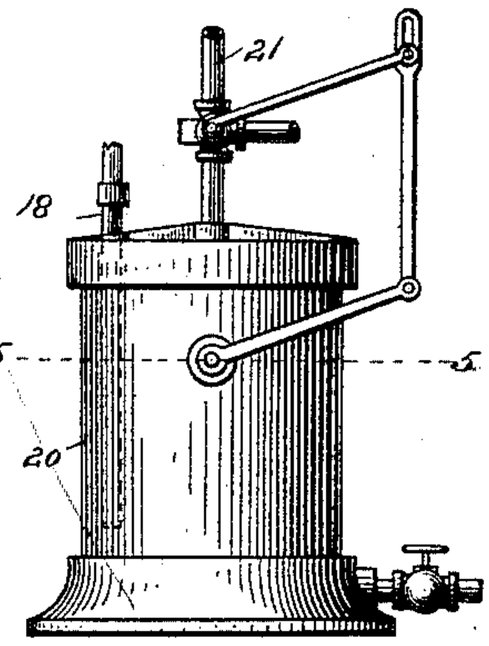
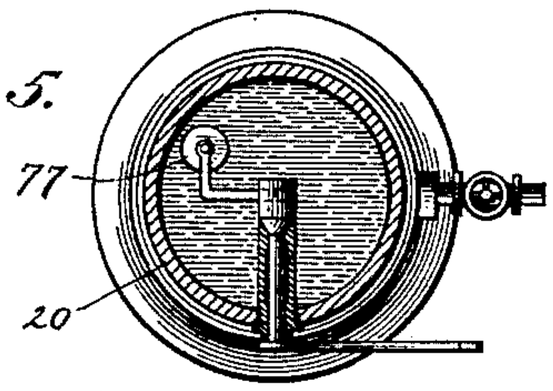


Fig. 1.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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SYSTEM OF TEMPERATURE-REGULATION.

SPECIFICATION forming part of Letters Patent No. 433,147, dated July 29, 1890.

Application filed September 12, 1888. Renewed December 30, 1889. Serial No. 335,323. (No model.)

To all whom it may concern:

Be it known that I, ROBERT J. PRATT, a citizen of the United States, residing at Greenbush, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Systems of Temperature-Regulation; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful improvements in systems of regulating temperature by the circulation of a heating or cooling fluid, and is particularly designed for the distribution of heat by means of steam or the like from a central point in a building to a series of distant apartments.

In the accompanying drawings, Figure 1 represents the general arrangement of a system of radiators, supply and return pipes, steam-generator, and accessories embodying my invention. Fig. 2 represents, on a larger scale, one of the radiators with its regulating-valve and pipe-connections. Fig. 3 represents in detail, partly in section, my preferred construction of steam-trap for returning the water of condensation to the boiler. Fig. 4 represents in detail elevation the hot-water-well steam-trap, and Fig. 5 represents a cross-section of the same on a plane indicated by the line 5 5 of Fig. 4.

Similar numerals of reference indicate similar parts throughout the several views.

The steam-supply is derived from a generator of any convenient construction adapted for the ready production of a sufficient quantity of steam under the requisite pressure to meet the needs of the distributing system employed. In the form illustrated in the drawings I have shown the steam-boiler dome 2 as provided with an exit-pipe 3, surmounted by the usual safety-valve 4, and communicating by a T-connection with a cross-pipe 6, said cross-pipe having the usual shut-off globe-valve 7, and supplying the main distributing-pipe 8 of the system. At a point in said main distributing-pipe, intermediate of the pipe 6 and the first radiator supplied, is interposed a pressure regulating or reducing valve 9, which valve, as will hereinafter appear, discharges important functions in the general system. A descending branch 10, having a globe-valve or shut-off 11, connects with the steam-trap 12, suitably mounted, as shown, and provided with the water-level gage 13 and the air-valve 14. The branch 10 is provided with an automatic cut-off 15, (preferably of the kind illustrated in Fig. 1 of the joint application of Joseph Robison and myself for improvements in valves, filed August 31, 1888, Serial No. 284,219,) the actuating-stem of said cut-off being connected by suitable links or the like, as shown, with the float 24 in the interior of the trap 12, the arrangement being such that when the float is at its highest point the cut-off will be thrown open, thereby establishing steam communication between the branch 10 and the trap 12, so as to force the water of condensation contained within the trap 12 past the check-valve 16, through the pipe 17, and into the boiler below the level of the water therein.

From the upper portion of the trap 12 extends a pipe 18, provided with a check-valve 19, and entering the hot-water-well steam-trap 20 to near the bottom thereof, as indicated in dotted lines in Fig. 4. From the upper portion of said trap 20 a pipe 21 communicates with the main steam-pipe 6. The pipe 21 communicates also with the return or drip piping from the various radiators, said communication taking place through the intermediacy of a two-way valve 22, preferably of the kind illustrated in Fig. 2 of the joint application of Robison and Pratt, hereinbefore referred to. The valve-stem in this instance is so connected with the float in the trap 20 that except when the float 77 is in its highest position communication between the pipe 21 and trap 20 will be cut off, while between the return-piping and trap 20 it will be open. When the float 77, however, is in its highest position, these conditions will be reversed, so that communication between the return-piping and trap 20 will be cut off and between the pipe 21 and trap 20 will be open. The advantage of this general arrangement of the trap 20, trap 12, and their connections, in their relation to the remaining features of the general system will be hereinafter more fully described.

The main distributing-pipe 8 above the reducing-valve 9 extends to the radiators lo-

cated in the various apartments to be heated by means of an ascending pipe, which may, as shown, extend directly to a bank of coils or radiator 25 in the uppermost apartment, which radiator connects by return-piping with a series of radiators 26, 35, and 36, and finally with the trap 20. A branch 37 from the main distributing-pipe 8 leads to the uppermost radiator of a second series, as 38 39, which by a return-pipe 40 finally communicates with the return-pipe of the first series, so that both return-pipes have a common outlet into the trap 20 through the valve 22. It will be noted that at the point of entrance into each radiator is located one of the two-way Robison-Pratt valves, as indicated by the numerals 28, 32, 33, 34, 41, and 42 in Fig. 1. The function of each of these valves (whose particular construction is shown in Fig. 2) is to direct the steam either through the particular radiator to which it is attached, so as to heat the same, or through a by-pass pipe, so as not to enter said radiator, the arrangement being such that in either event the steam will pass on freely to the next radiator in the series.

In Fig. 2 I have shown, on an enlarged scale and in partial section, the application of the said valve to one of the radiators, as 39, and said view will serve as an illustration of the similar application of the said valve to each of the other radiators. The valve consists of a steam-pipe fitting, as 42, having screw-threaded coupling-extensions 43 44 45 for the reception of the threaded ends of steam-conveying pipes. The steam-supply pipe enters the extension 43, and the extension 45 connects with a by-pass pipe 46, having a dip or inclination sufficient to insure the flow of the water of condensation toward the trap 20. The flow of steam from the supply-pipe to the radiator or by-pass pipe is regulated by means of a compound valve having a guide-stem 47, provided with the conical valves 48 49, having corresponding seats, as shown, in the interior of the fitting. At its outer end the valve-stem is provided with a piston-head 50, of larger area than either valve and working within a chamber 51, forming a portion of the fitting, said piston being suitably packed and the valve-stem passing through a stuffing-box 52. All communication is thus cut off between the chamber 51 and the steam-supply pipe, except through ports 53 54, communicating with the chamber 55, which opens freely into the steam-supply pipe by means of the passage 56, formed in the wall of the fitting. Within the chamber 55 is located a piston slide-valve having a longitudinal opening 57 and governing the ports 53 54. The said piston slide-valve is provided with a stem 58 passing through a suitable stuffing-box 59. The valve as thus constructed I prefer to operate by means of an electro-magnet, as 60, governed by a double-contact thermostat located in the apartment containing the radiator, the armature 61 of said magnet, being connected to the stem 58 by means of a pivoted lever 62. The details of this means for automatically operating the series of valves I will set forth in a subsequent application for Letters Patent. It is of course evident that the valve-stem 58 could be operated by other mechanism than that referred to, or even manually, if desired, and as such operating means forms no part of the claims of this application I do not consider it necessary herein to further describe them.

The discharge-leg of the radiator consists, preferably, of an elbow-piece 64, connected at its lower end to the by-pass pipe by means of a T-piece 66. The other end of the elbow-piece is externally threaded to receive the internally screw-threaded collar or clamping-nut 67 of a union, the other member 68 of said union being screwed upon a nipple 69, projecting from the base of the radiator and communicating with its interior. This construction enables me to connect and disconnect the T-piece 66 and nipple 69 with great facility. The elbow-piece contains a check-valve 70, seated at an angle, as shown, which permits the employment of a short elbow-piece, and accessible through the cap-nut 71 at the summit of the elbow. The function of this check-valve is to prevent the steam from backing up into the radiator from the by-pass pipe when the supply from the two-way valve to the radiator through the extension 44 is cut off.

Between the adjacent edges of the elbow-piece and the member 68 of the union is interposed a wire screen or strainer 72, whose function is to prevent particles of rust and dirt from the radiator and pipes from gaining access to the check-valve and lodging on the check-valve seat, so as to prevent the check-valve from fully closing. This screen is clamped in place by the union, and may be readily removed and cleaned should it become clogged.

To compensate for the obstruction opposed to the passage of the steam by the presence of the screen, it will be especially noted that I have enlarged the cross-section of the elbow and of the part 68 at the point where the screen is located, the purpose being to have the total space between the meshes of the screen sufficiently great to equal the normal cross-section of the steam-pipe, so that the said screen shall not interfere with the free passage of the steam.

The parts of my invention being constructed and arranged as described, the operation thereof is as follows: We will assume that the trap 20 and the trap 12 are empty at the beginning of the operation. Consequently their floats will be at the lower limit of their play, the valve 15 will be closed, and the valve 22 will establish communication between the trap 20 and the return-piping from the radiator system and will close communication between the trap 20 and the pipe 21. Steam being now

formed in the generator 1, all of the globe-valves 7, 11, 73, 74, and 75 are opened. The steam passes upward through the reducing-valve 9 and enters the main distributing-pipe 8 under a predetermined low pressure suitable to the needs of the system. The steam passes through the various radiators or their by-pass pipes (according to the adjustment of the two-way valves at the entrance of the radiators) and by the return-piping to the trap 20 and trap 12, driving before it the air in the entire system, which air passes out finally through the air-valve 14 of the trap 12, whereupon the air-valve is closed. The steam in passing upward to the bank of coils or radiator 25 enters the two-way Robison-Pratt valve 28, located thereat, said valve, as before explained, being of the construction shown in Fig. 2. At the time of entrance of the steam into said valve 28 the piston slide-valve may be in one of two positions within its chamber. Thus, as illustrated in Fig. 2, it may be in such adjustment as to place the port 54 in communication with the exhaust-pipe 63 and the port 53 in communication with the steam-supply pipe. In this case the steam entering the chamber 55 through the channel 56 will pass through the hollow interior 57 of the piston slide-valve and entering the port 53 will force the piston 50 downward, carrying with it the valve-stem 47, thereby seating the valve 48 and opening the valve 49. The area of the piston 50 being greater than that of the valve 48, said valve is held firmly to its seat by preponderance of pressure. The steam is therefore shut off from the radiator 25, and instead of passing through the up-take leg 27 into the bank of coils 25 it is shunted through the by-pass pipe 29 to the pipe 31, leading to the next radiator 26, all backflow of steam into the bank of coils 25 being prevented by the check-valve in the elbow 30. If, however, at the time of entrance of the steam into the valve 28 the piston slide-valve is in such adjustment as to place the port 53 in communication with the exhaust-pipe 63 and the port 54 in communication with the steam-supply pipe, the steam will pass through the port 54, forcing the valve 50 upward, thereby seating the valve 49 and opening the valve 48, the exhaust taking place through the port 53 and as before through the exhaust-pipe 63 to any convenient receptacle. In this case, therefore, the steam will pass into the radiator and through the elbow 30 to the pipe 31, the opening into the by-pass pipe being entirely cut off. In like manner, throughout the system, the steam, as it reaches the two-way valves 32, 33, 34, 41, and 42, will either pass into the corresponding radiator or through its by-pass pipe, according to the adjustment of the piston slide-valve in each instance; and this adjustment may, as hereinbefore described, be effected automatically by thermostatic or other mechanism, or by hand. In any case the system permits, by the simple movement of the piston slide-valve, any particular radiator or number of radiators to be either supplied with steam or cut out without interfering with the circulation of the steam to the remaining radiators of the system. The water of condensation flows by the return-piping to the valve 22 and through said valve into the trap 20. As the level of the water rises in said trap 20, the float 77 rises with it, sliding upon the float guide-rod until, having attained its highest position said float actuates the link-connections attached to the stem of the two-way cock 22, which is accordingly operated so as to close communication with the return-piping and open communication with the pipe 21. As said pipe 21 is connected with the steam-supply at a point between the generator and reducing-valve 9, full steam-pressure is at once exerted upon the surface of the water in the trap 20, and accordingly the water of condensation is at once forced up at full pressure through the pipe 18 and check-valve 19 into the trap 12. Thereupon the float 77 drops to its normal position, closing communication with the steam-pipe 21 and opening communication with the return-piping from the radiators, as before. In a similar manner the water of condensation forced up into the trap 12 will cause the float therein to slide up upon its guide-rod until it attains its highest point, whereupon it will actuate the link-connections to open the valve 15. The full pressure of steam from the boiler will therefore be communicated through the equalizing-pipe 10 to the surface of the water in the steam-trap, and therefore the said water will pass down past the check-valve 16 and through the pipe 17 into the boiler, the descent of the float again closing the cut-off 15. The return of the water of condensation from the trap 20 to the boiler will thus be continued intermittently and automatically under the most favorable conditions by full pressure of steam, while at the same time the required reduced pressure is maintained in the distributing system.

Having thus described my invention, what I claim is—

1. The combination, with a steam-generator, of a circulating system, a trap communicating with a source of steam and with the return-pipe of the system, a single valve controlling the flow of water from the return-pipe and also the flow of steam to the trap, and a float in the trap connected to said valve, substantially as and for the purposes set forth.

2. The combination, with a steam-generator, of a circulating system, a reducing-valve between said generator and circulating system, a trap communicating with a source of steam and with the return-pipe of the system, a single valve controlling the flow of water from the return-pipe and also the flow of steam to the trap, and a float in the trap connected to said valve, substantially as and for the purposes set forth.

3. The combination, with a steam-genera-

tor, of a circulating system, a reducing-valve between said generator and circulating system, a trap connected with the return-pipe of the system, a second trap located above the generator and connected therewith and with the feed-pipe of the circulating system, a valve for controlling the entrance of steam to the said second trap, and a float in said second trap connected with the valve, substantially as and for the purposes set forth.

4. A system of temperature-regulation consisting of a steam-generator, radiators supplied therefrom, said radiators being provided with return-piping, a trap into which said return-piping empties, a reducing-valve located in the steam-supply at a point between the generator and radiators, a second trap communicating with the first trap and with the generator, and branch pipes leading from the first and second traps, respectively, to the steam-supply at points between the generator and reducing-valve, the return-pipe and first trap branch being united by a two-way valve connected with the float in said first trap, whereby when the return-pipe is open the branch from the first trap is automatically closed, and vice versa, thereby enabling the water of condensation to be raised to the second trap under full pressure of steam without increasing the pressure in the radiators, substantially as described.

5. A system of temperature-regulation consisting of a generator, distributing-pipes, radiators located in shunts or by-paths with respect to said pipes, two-way cocks for directing the steam either through the radiators or past them, and check-valves at the exit of the radiators for preventing backflow of steam into them, substantially as described.

6. In a system of temperature-regulation, the combination, with a radiator, of a return-pipe therefrom, and an elbow connecting the radiator and return-pipe, said elbow being provided with a check-valve set at an angle and accessible from the bend of the elbow, substantially as described.

7. In a system of temperature-regulation, the combination, with a radiator, of a return-pipe therefrom, an elbow containing a check-valve, a union for connecting said elbow to the radiator, and a strainer clamped in place at the union-joint, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT J. PRATT.

Witnesses:

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SCHUYLER DURYEE.