No. 771,628. PATENTED OCT. 4, 1904.

E. H. GOLD.

ADJUSTABLE LOW PRESSURE HEATING SYSTEM.

APPLICATION FILED JUNE 27, 1904.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 2.

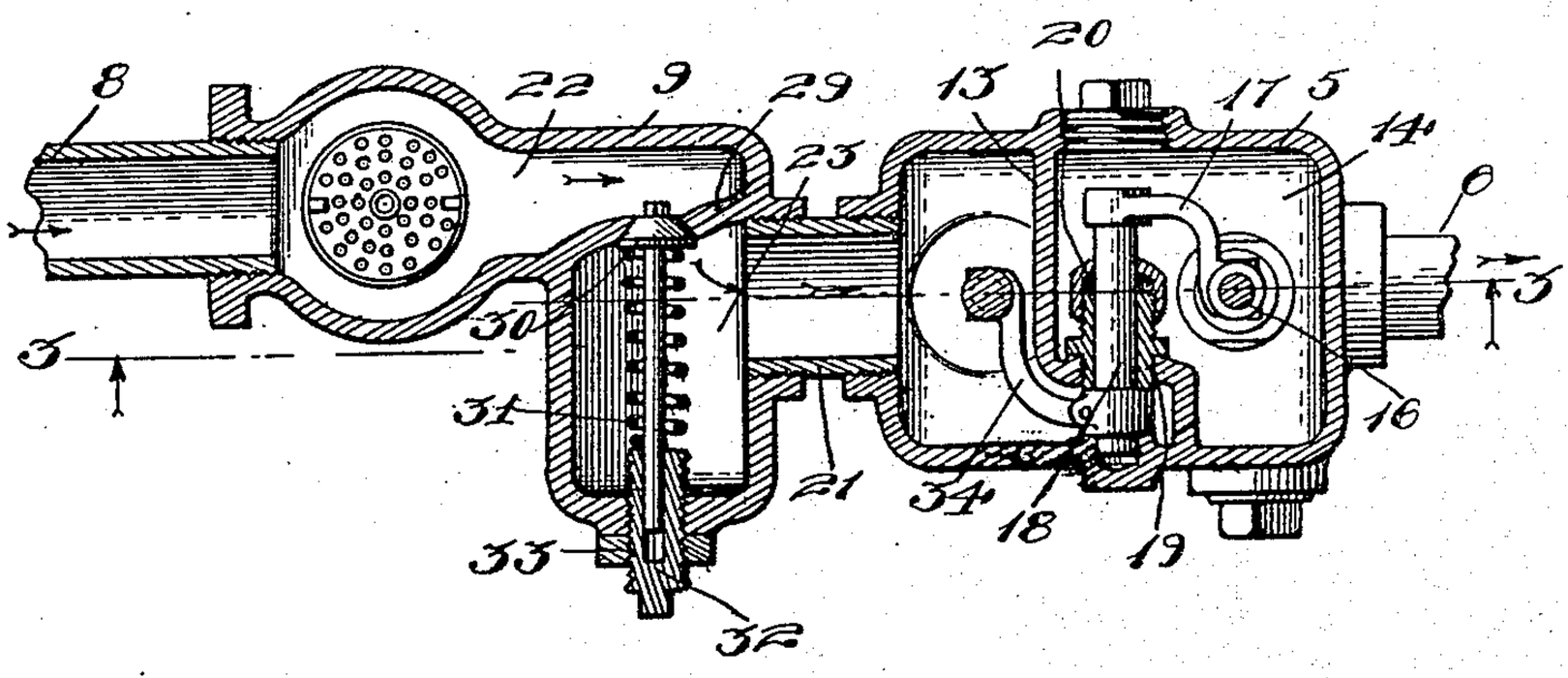
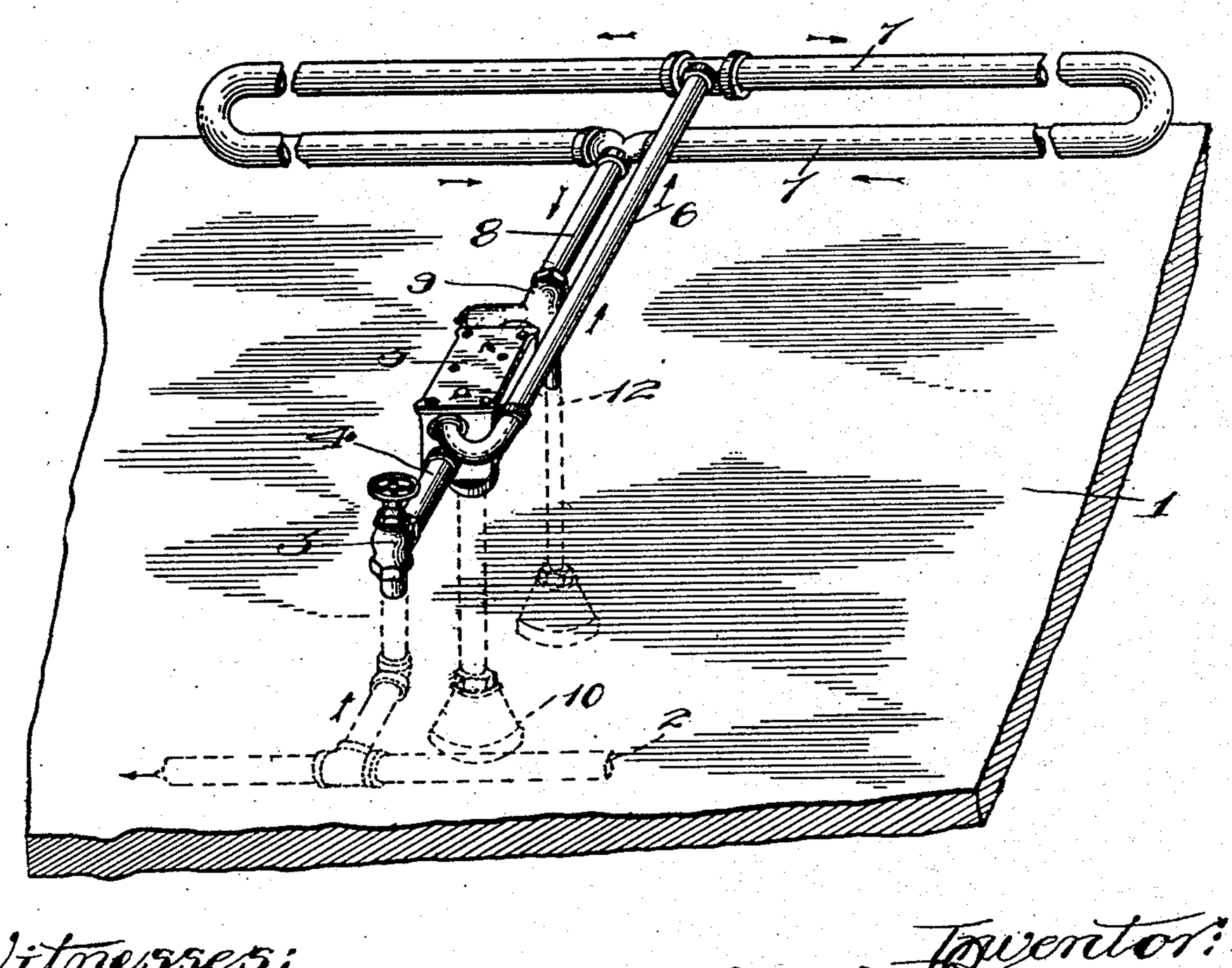


Fig. 1.



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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 3.

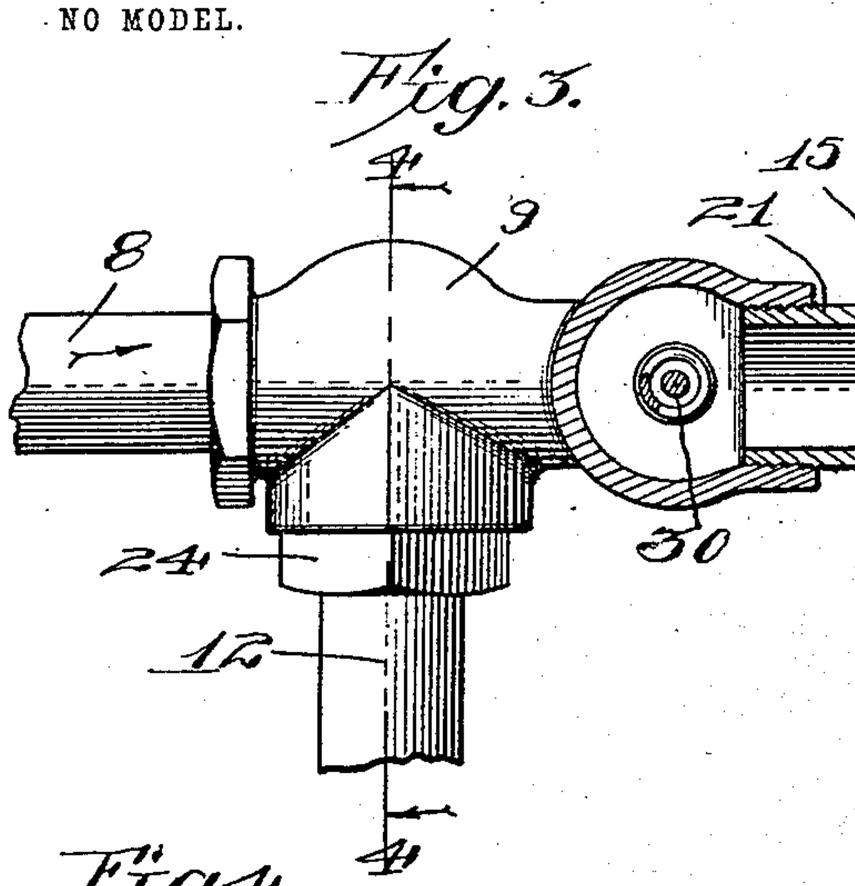


Fig. 4.

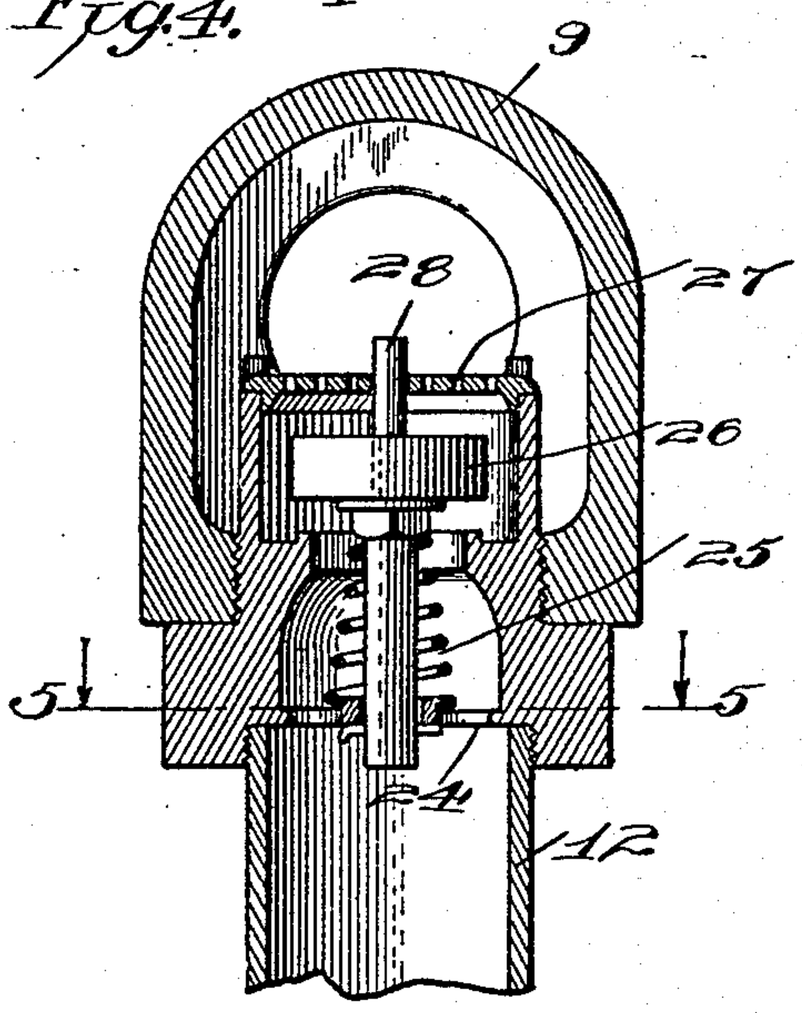
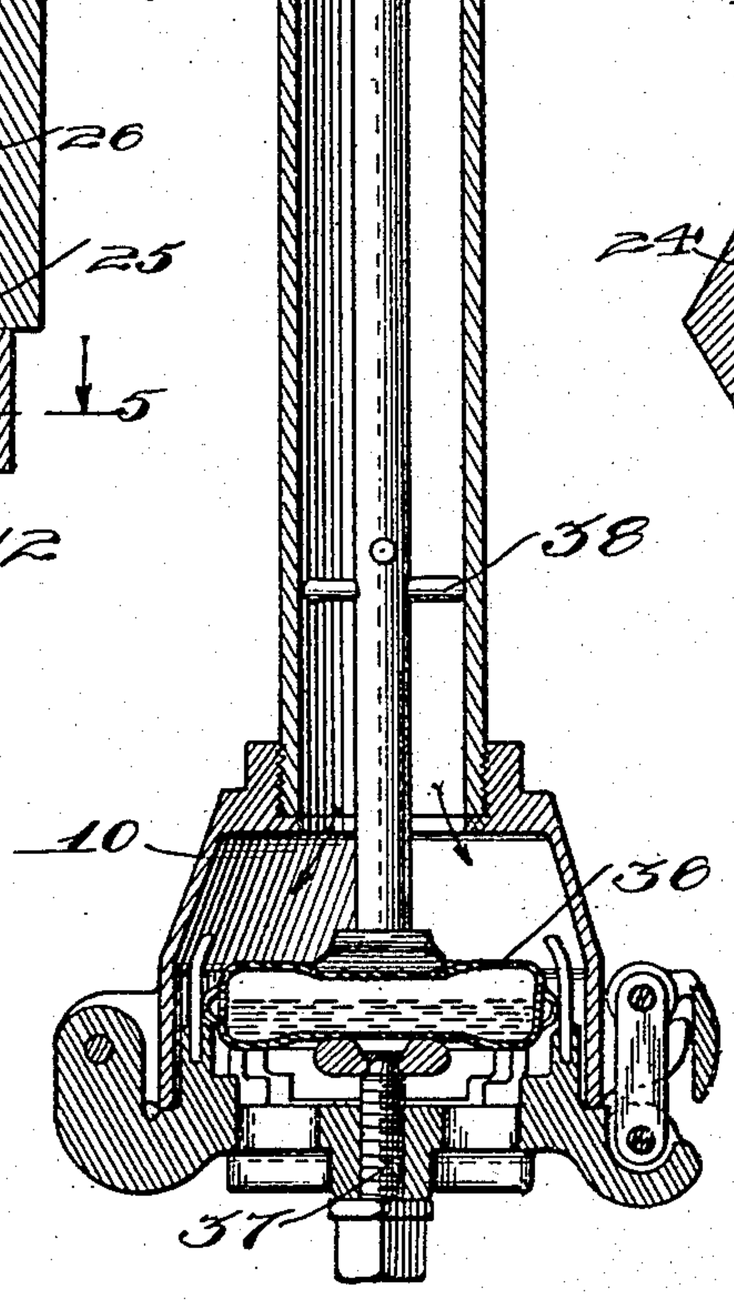
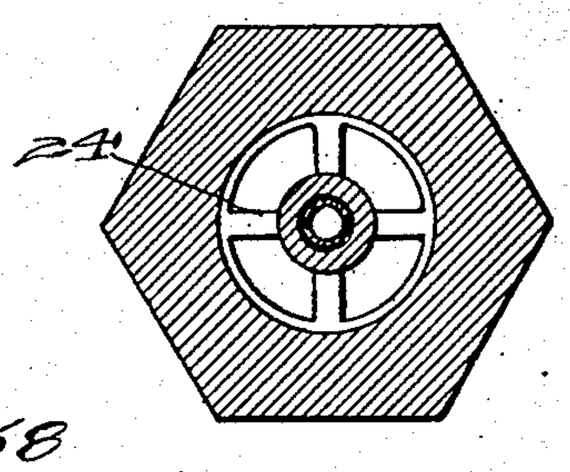


Fig. 5.





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No. 771,628. PATENTED OCT. 4, 1904.

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ADJUSTABLE LOW PRESSURE HEATING SYSTEM.

APPLICATION FILED JUNE 27, 1904.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 7.

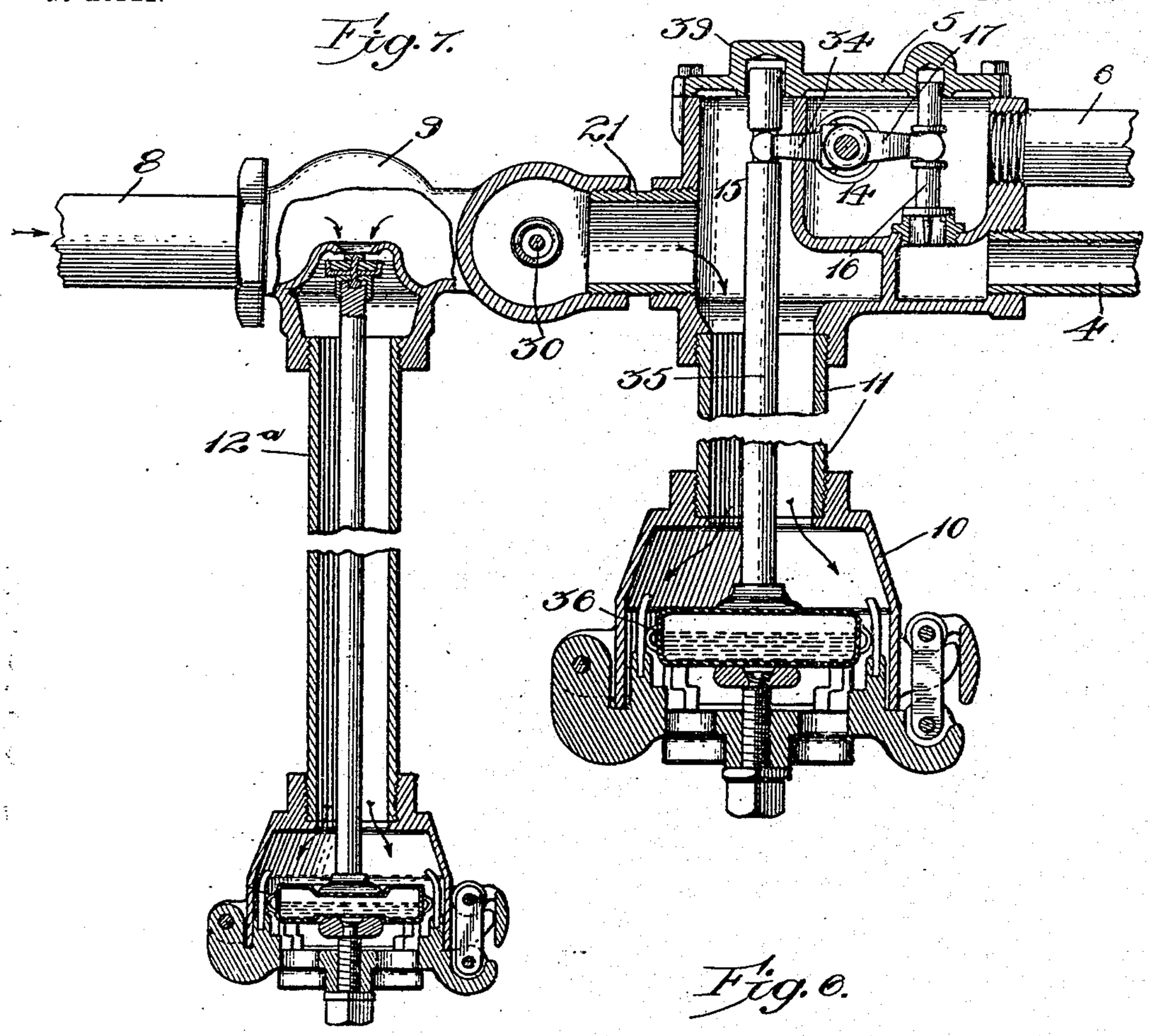
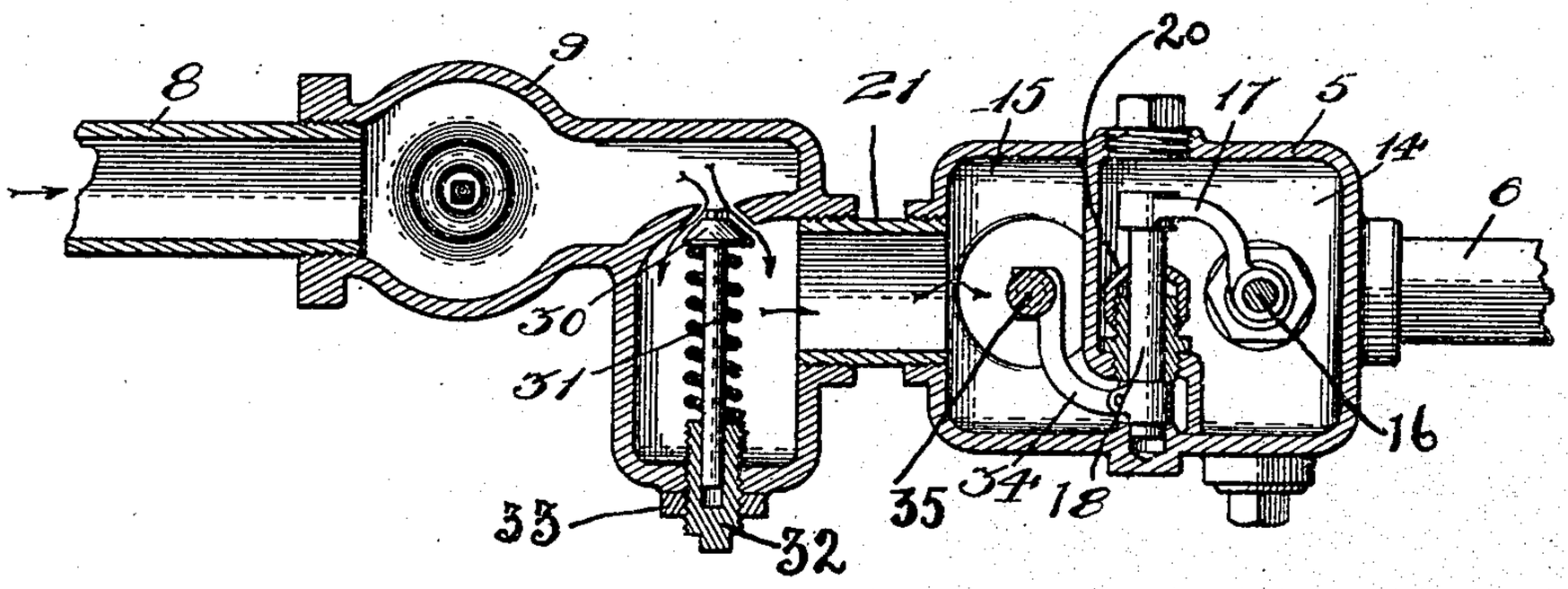


Fig. 6.



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771,628. Patented October 4, 1904.

UNITED STATES PATENT OFFICE.

EGBERT H. GOLD, OF CHICAGO, ILLINOIS.

ADJUSTABLE LOW-PRESSURE HEATING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 771,628, dated October 4, 1904.

Application filed June 27, 1904. Serial No. 214,301. (No model.)

To all whom it may concern:

Be it known that I, EGBERT H. GOLD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Adjustable Low-Pressure Heating Systems, of which the following is a specification.

The object of my invention is to provide a heating system which while suitable generally for heating purposes is especially adapted to meet the requirements and exigencies of heating railway-cars.

Among the special objects of my invention is to provide such a system by means of which the various cars of a train may be heated alike and by means of which a constant temperature may be maintained within the cars regardless of the varying temperatures and pressures of the heating medium in the main or train pipe which supplies the radiating system in each car. This heating medium is commonly live steam supplied by the locomotive-boiler, and although this steam is supplied at a high pressure and a high temperature it is well known that there is a wide variation to the pressure and temperature of the steam in the train-pipe according to the condition of the fire in the locomotive and the work being done by the locomotive.

A further and special object of my present invention is to provide such a system which shall be so arranged that the heating medium within the radiating system in the cars may be automatically maintained at any desired temperature less than the temperature of the heating medium as it leaves the train-pipe to enter the radiating systems.

It is also another object of my invention to provide a compact, simple, and effective apparatus for controlling the flow of the heating medium from the train-pipe into the radiating system.

These and such other objects as may hereafter appear are attained by the convenient embodiment of my invention shown in the accompanying drawings, in which—

Figure 1 indicates diagrammatically the radiating system of one side of a car, together with a portion of the train-pipe. Fig. 2 is an enlarged horizontal section of my controlling apparatus. Fig. 3 is a view, partly in vertical section, of my controlling apparatus, the view including a section on the line 3 3 of Fig. 2 looking in the direction indicated by the arrows. Fig. 4 is an enlarged vertical section of one form of blow-off valve on the line 4 4 of Fig. 3 looking in the direction indicated by the arrows. Fig. 5 is a horizontal section on the line 5 5 of Fig. 4. Fig. 6 is the same as Fig. 2, showing the pressure-controlling valve in open position; and Fig. 7 is a vertical sectional view showing a thermostatically-operated blow-off valve, the supply-valve being shown in closed position.

Referring to Fig. 1, 1 indicates the floor of the car.

2 (shown in dotted lines) is a portion of the usual train-pipe extending beneath the car.

3 is a common form of manually-operated shut-off valve.

4 is a supply-pipe leading from the train-pipe to the radiator in the car.

5 is the casing of my control apparatus.

6 is a feed-pipe leading from said casing to the radiator.

7 is the radiator.

8 is the return-pipe.

9 is the casing for the blow-off valve and for the adjustable pressure-control valve.

10 is the thermostat-casing.

11 is the blow-off pipe leading from the casing 5 to the thermostat-casing, and 12 is the discharge-pipe leading from the blow-off valve to the atmosphere.

The casing 5 is divided by a partition 13 into an inlet-chamber 14 and an outlet-chamber 15. The supply-pipe 4 opens into the inlet-chamber 14. The opening from the pipe 4 into the chamber 14 is controlled by a valve 16. This valve 16 is mounted upon an arm 17, which is rigidly secured to a spindle 18. This spindle 18 is journaled at one end within the casing 5 and is also journaled within a sleeve 19, said sleeve being mounted in the partition 13 and carrying a stuffing-box 20, through which passes the spindle 18. This stuffing-box or packing 20 makes a sufficiently tight joint between the chambers 14 and 15. The chamber 14 communicates with the radiator 7

through the supply-pipe 6. There is no direct communication between the inlet-chamber 14 and the outlet-chamber 15; but the outlet-chamber 15 communicates with the radiator 7 through the casing 9 and discharge-pipe 8, the casing 9 and casing 5 being suitably connected, as by a short section of pipe 21 leading from the casing 9 to the chamber 15 and the casing 5.

The casing 9 comprises two compartments 22 and 23. Obviously it is a mere matter of convenience whether the compartments 22 and 23 are contained in one casing or in separate connected casings. The discharge-pipe 8, leading from the radiator, connects with the compartment 22, which is provided with an outlet-valve for the discharge of water of condensation, cold air, &c. This outlet-valve may be controlled by a thermostatic trap of the usual construction, as shown in Fig. 6, comprising a normally opened valve through which the cold air and water escape until as the pipe fills with live steam the steam escapes through the valve and expanding the valve-controlling thermostat causes the valve to be closed, or this outlet-valve may be of any other suitable construction—as, for example, the simple and convenient form shown in Figs. 4 and 5, comprising a spider 24, mounted upon the usual end of the discharge-pipe 12 and carrying a helical spring 25, which surrounds the stem of a valve 26. This valve 26 is arranged to control the outlet-port leading from the chamber 22 to the outlet-pipe 12, is held normally open by the spring 25, and is guided in any suitable manner—as, for example, by the spider 24 and by a perforated diaphragm or spider 27, mounted above the valve 26 and guiding a secondary valve-stem 28. It will be seen that this form of valve is normally open to permit of the escape of water of condensation, cold air, and the like and will remain open until the fluid-pressure within the chamber 22 is sufficient to close said valve, whereupon it will remain closed until the pressure is sufficiently lessened by condensation or otherwise.

The chamber 22 is separated from the chamber 23 by a partition 29, provided with a port affording communication between said chambers. This port is normally, but yieldingly, closed in any suitable manner—as, for example, by the valve 30, which is yieldingly held to its seat by the spring 31, said spring abutting at one end against the valve 30 and at the other end against an adjustable plug 32, which is screwed into the casing 9 and is locked in any given position by the lock-nut 33. However, any equivalent or familiar means of yieldingly closing the port between the chambers 22 and 23 may be used. With the structure shown it is obvious that the force with which the valve 30 is held to its seat may be adjusted by adjusting the position of the plug 32.

The chamber 23 communicates through pipe-section 21 with the outlet-chamber the casing 5. The outlet-chamber 15 co nicates with the thermostat-casing 10—a example, through the pipe 11, where, as sh it is deemed desirable to mount the th stat-casing 10 in an exposed position at distance from the casing 5, so that the mostat will be readily cooled.

Extending into the chamber 15 is an a. 34, which is readily mounted upon the spi dle 18. This arm 34 is in operative engage ment with a thermostat. In the embodiment of my invention shown in Fig. 3 this is attained by having the arm 34 in operative engagement with a stem 35, which extends through the pipe 11 into the thermostat-casing 10 and engages a thermostat 36, which in the drawings is in the form of an expansible diaphragm containing a volatile fluid. The thermostat-casing 10 opens at its bottom to the atmosphere and is provided with the usual screw 37 for adjusting the tension of the thermostat 36. As shown in Fig. 3, the stem 35 is guided within the pipe 11 by pins 38 and is guided at its upper end by projecting into a guideway 39, formed therefor in the top of the casing 5.

With my invention embodied in the illustrative form of apparatus shown and described the operation will be as follows: Steam from the train-pipe will pass through the supply-pipe 4, past the valve 16, into the chamber 14 within the casing 5, thence through the pipe 6 to the radiator, and from the radiator through the outlet-pipe 8. The inflowing steam will force out the cold air and any water of condensation which may be within the system and, the blow-off valve 26 being open, the cold air and water of condensation will freely escape, while the pipes of the system fill with steam. However, although such an outlet is provided through the pipe 12, the port leading from the chamber 22 to the chamber 23 will be tightly closed by the valve 30, so that the pipes will fill with steam at a constantly-increasing pressure and temperature until such pressure overcomes the spring 25 and closes the valve 26, whereupon the only outlet from the system will be closed and the pressure will rise more rapidly. Whenever the pressure within the radiating system is sufficient to overcome the expansion of the spring 31, the valve 30 will be forced open, as shown in Fig. 7, whereupon the live steam at a high temperature and under pressure will fill the outlet-chamber 15 and will expand the thermostat 36, thereby lifting the stem 35 and the arm 34, rocking the spindle 18 and closing the valve 16, with the result that the inflow of steam from the train-pipe is immediately sl off. The pressure within the chamber 22 h ing been lowered, the valve 30 will be resea and the radiating system will be filled w steam at the desired pressure and temp

ture. The flow of steam from the chamber 22 to the thermostat having been shut off, the thermostat will quickly cool and contract, thereby reopening the valve 16 and again admitting steam from the train-pipe and increasing the pressure until the valve 30 is opened, and the steam rushing through the chambers 23 and 15 and carrying with it any accumulated water of condensation will again expand the thermostat, and so on. However, it will be found in actual practice that ordinarily instead of the intermittent action above described the parts of the apparatus will so adjust themselves with relation to each other that the pressure within the system will suffice to keep the valve 30 slightly unseated, thus providing a thoroughfare through which there is a slight, but constant, escape of very hot steam. This small quantity of steam as it escapes will be materially cooled between the valve 30 and the thermostat 36, but will retain enough of its heat to keep the thermostat 36 partially expanded, and thereby keep the valve 16 partially closed, so as to provide a thoroughfare which will admit just enough live steam at high pressure from the train-pipe to maintain the desired pressure in the radiating system. Obviously by adjusting the means which holds the valve 30 to its seat the pressure within the radiating system can be varied, as desired.

Where a thermostatic trap is used in place of the valve 26 for the discharge of water of condensation, the trap will quickly adjust itself in the usual manner, so as to leave a very slight opening through which the water of condensation and some live steam will constantly escape, thereby preventing any considerable accumulation of water in the pipes; but this is a familiar operation and *per se* does not constitute a part of the present invention.

While I have shown my invention embodied in what I now consider to be its preferred form, it is evident from the foregoing explanation of the principles of operation that numerous variations in detail may be made without departing from the spirit of my invention, the essence of which consists in interposing in the system a yielding and preferably an adjustable obstruction whereby the heating medium is kept from operative relation with the thermostat which controls the operation of the inlet-valve. With this understanding of the fundamental characteristics of my invention numerous means may be devised for carrying it out and for adapting it to various conditions and services; but the exact form, character, or position of the thermostat or of the inlet-valve or of the operative connections between the valve and the thermostat or of the yielding obstruction interposed between the thermostat and the inlet-valve or of like details does not matter. Neither is it material as to how the resistance afforded by such obstruction to the pressure within the system may be adjusted. These are all mere matters of detail, choice, and mechanical skill.

I do not herein claim the process as disclosed by the foregoing description, as the same forms the subject-matter of a separate and copending application filed August 26, 1904, Serial No. 222,242.

I claim—

1. In a heating system, the combination with a supply-valve arranged to control the supply of a heating medium to said system, of a thermostat within said system arranged to operate said supply-valve, and a yielding obstruction interposed in said system between the supply-valve and the thermostat and arranged to be operated by the condition of the heating medium within said system.

2. In a heating system, the combination with a valve arranged to control the supply of a heating medium to said system, of a thermostat arranged to operate said valve, and a yieldingly-movable, pressure-operated valve interposed in said system to obstruct the flow of the heating medium through said system from said supply-valve to said thermostat.

3. In a heating system, the combination with an inlet-valve arranged to control the supply of a heating medium to said system, of a thermostat arranged to operate said supply-valve, a pressure-actuated valve interposed in said system to close communication between said supply-valve and said thermostat and arranged to be opened by fluid-pressure within said system, and a normally opened discharge-valve leading from said system to the atmosphere and interposed between the supply-valve and said pressure-valve and arranged to be closed by the condition of the heating medium within said system.

4. In a heating system, the combination with an inlet-valve arranged to control the supply of the heating medium to said system, of a thermostat arranged to operate said inlet-valve, a pressure-valve interposed in said system between said inlet-valve and said thermostat, and adjustable means for yieldingly holding said pressure-valve seated against the pressure of the heating medium flowing into the system through said inlet-valve.

5. In an apparatus of the class described, means for controlling the supply of a heating medium, said means comprising an inlet-chamber communicating with the inlet end of said system, an outlet-chamber communicating with the outlet end of said system, said chambers being separated from each other, a spindle extending into said chambers, an inlet-valve mounted within said inlet-chamber and arranged to control the inflow of a heating medium to said system, operative connections between said valve and said spindle, a thermostat in free communication with said outlet-chamber, and operative connections between said thermostat and said spindle, all so arranged that the operation of said thermo-

stat will rock said spindle and will open and close said valve.

6. In an apparatus of the class described, a casing provided with a partition dividing said casing into an inlet-chamber communicating with the inlet end of said system, and an outlet-chamber communicating with the outlet end of said system, a spindle extending through said partition and into each of said chambers, means for making a steam-tight joint around said spindle and between said chambers, a valve mounted within said inlet-chamber to control the inflow of a heating medium to said system, operative connections between said valve and said spindle, a thermostat exposed to a heating medium flowing through said outlet-chamber, and operative connections between said spindle and said thermostat.

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