A. G. PAUL.

HEATING SYSTEM.

APPLICATION FILED MAY 15, 1900.

899,838.

Patented Sept. 29, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

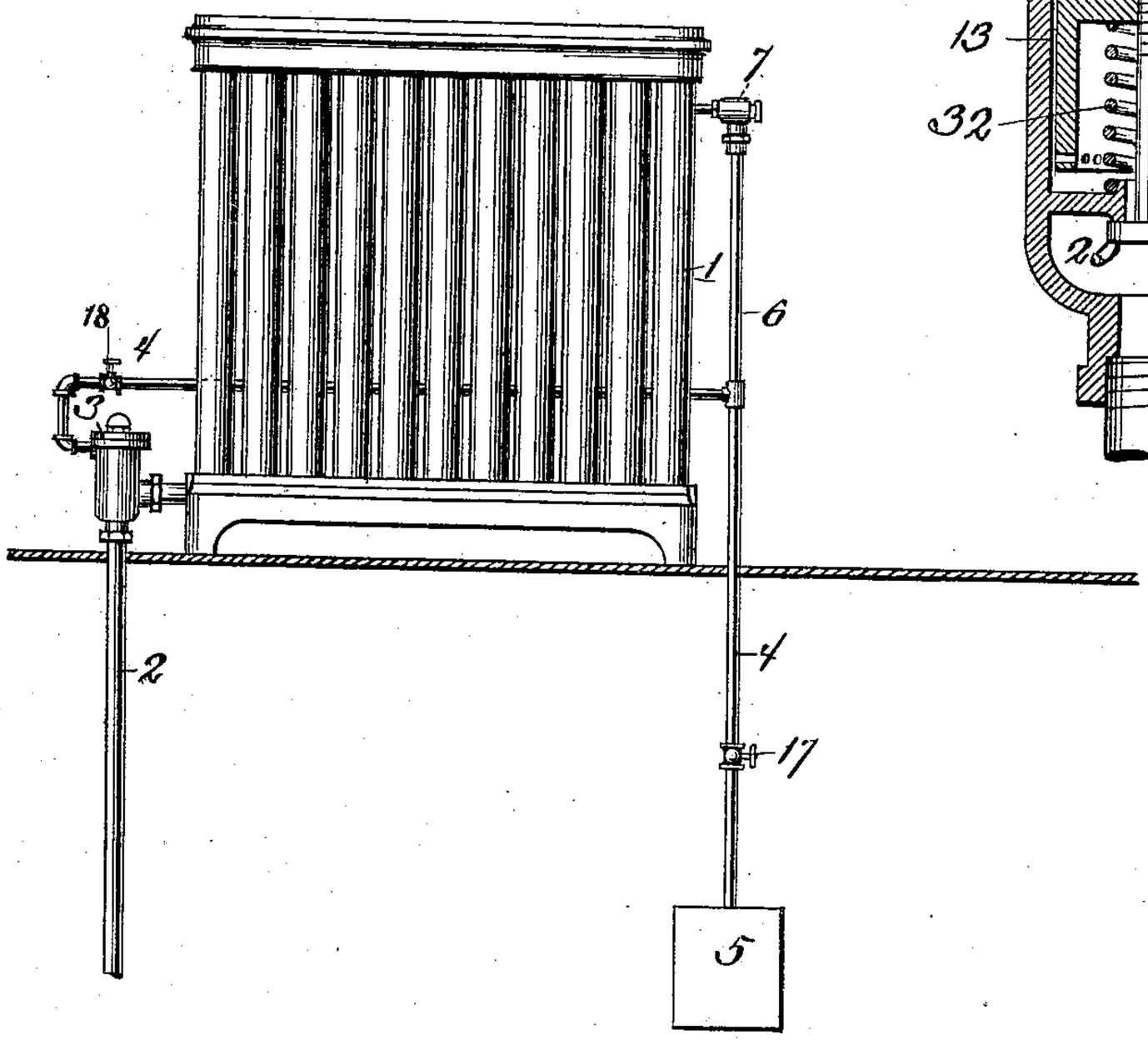


Fig. 5,

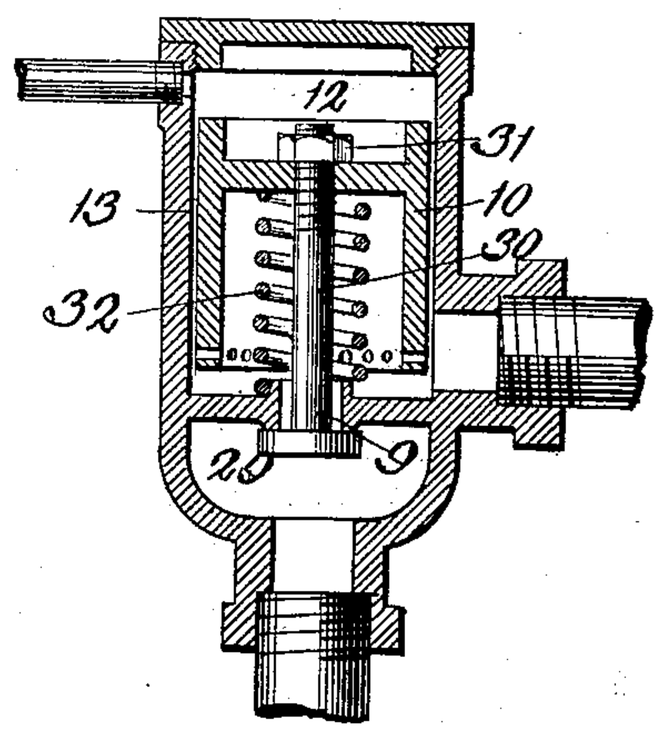
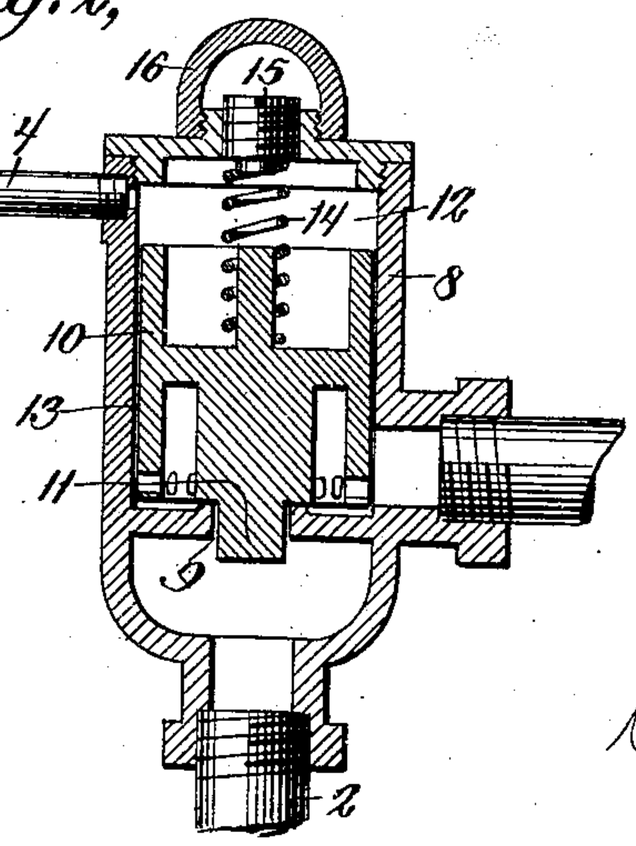


Fig. 2,



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2 SHEETS—SHEET 2.

Fig. 3,

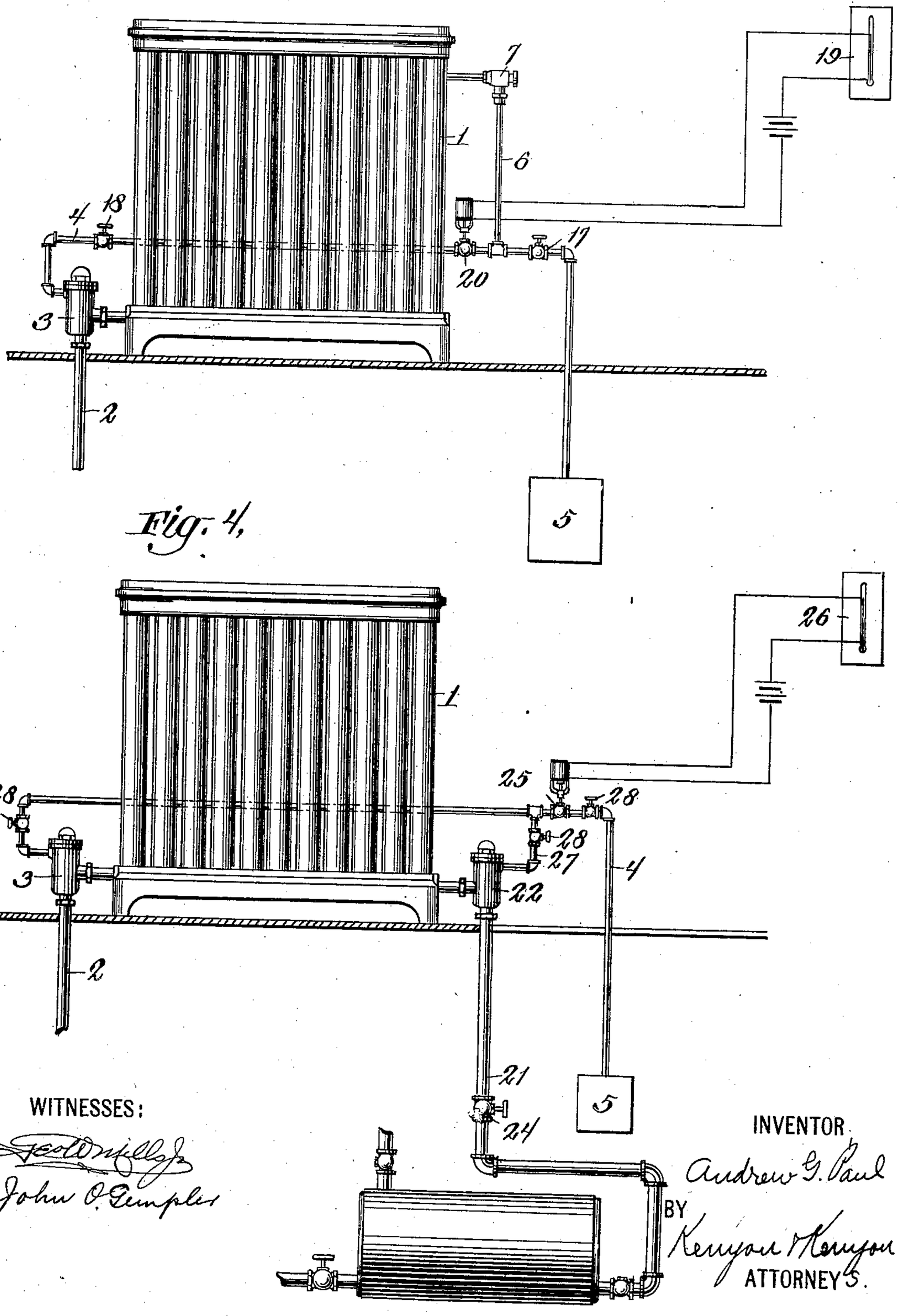

Fig. 4,

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HEATING SYSTEM.

No. 899,838. Specification of Letters Patent. Patented Sept. 29, 1908.

Application filed May 15, 1900. Serial No. 16,809.

To all whom it may concern:

Be it known that I, ANDREW G. PAUL, a citizen of the United States, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Heating Systems, of which the following is a full, clear, and exact specification, reference being had to the accompanying drawings, which form a part hereof.

This invention relates to a heating system wherein steam or other suitable heating agent is circulated for the purpose of conveying and imparting heat to the places desired, and it consists in an improved construction and arrangement of the parts of such a system.

The object of my invention is to control the discharge of the air and the water of condensation from the radiator, and also, in addition to this, to control the supply of the heating vehicle thereto and at the same time to prevent the loss or waste of the heating vehicle through the discharge pipe.

My invention consists first in the combination in a heating system, of a supply pipe, a heater or radiator, a valve device on the supply pipe having a suitable valve casing, and a supply port and a fluid pressure motor controlling said supply port and fluid pressure chambers on opposite sides of said motor, one being in direct or free communication with the interior of the radiator, the valve device being provided with an equalizing passage connecting the two chambers, and a fluid containing device connected with the other fluid pressure chamber and means for varying the pressure in the fluid containing device.

In the best form of my invention a piston is used and it is made somewhat smaller than the interior of the valve casing so as to form an equalizing passage between the piston and the wall of the casing.

My invention also consists in providing the discharge pipe with a valve constructed in a similar manner.

My invention also consists in employing a thermostat placed upon the wall of the room or in any other suitable position to control a valve upon the pipe or passage connecting the fluid pressure chamber of the supply valve, or the fluid pressure chambers of both the supply and return valves, with the exhauster, by means of which the exhauster can be cut out of operation and these valves can be closed.

My invention also consists in certain other features of construction and combinations of parts, hereinafter described and claimed.

My invention is fully shown in the accompanying drawings in which

Figure 1 shows a system having my improved valve upon the supply pipe and having a single exhauster to operate said valve and at the same time to remove the air from the radiator. Fig. 2 is a sectional view of my improved form of valve. Fig. 3 shows a system in which the pipe connecting the supply valve with the exhauster is controlled by the operation of a thermostat. Fig. 4 shows a system in which my improved valve is used both upon the supply pipe and the discharge pipe, and in which an exhauster is connected by means of a pipe with the fluid pressure chambers of the valves, this connecting pipe being controlled by a thermostat. Fig. 5 shows a form of valve adapted for use with fluid under pressure.

Similar numbers denote similar parts in the different figures.

Referring to Figs. 1 and 2, 1 is a radiator or heater of any suitable form, 2 is a supply pipe, 3 is my improved valve placed upon the supply pipe, 4 is a pipe connecting the fluid pressure chamber of this valve with the exhauster 5, and 6 is a branch leading from the pipe 5 to the upper part of the radiator and provided with the usual thermostatic valve 7. The construction of my improved valve is shown in Fig. 2. 8 is a suitable casing provided at its lower end with a supply port 9, 10 is a piston provided at its lower end with a valve 11 controlling the supply port. 12 is a fluid pressure chamber above the piston. The piston is made smaller than the interior of the casing so as to form an equalizing passage 13 between the piston and the wall of the casing. The size or area of this equalizing passage is less than the area of the pipe 4 running to the exhauster. 14 is a spring bearing upon the upper end of the piston 13, and adapted to be regulated in tension by means of the screw 15 which screws into the upper part of the casing. 16 is a cap screwed to the upper part of the casing to cover and protect the screw 15. 17 is an ordinary valve by means of which the exhauster can be cut out of operation. 18 is

a valve on the pipe 4 near the supply valve, by means of which the exhauster can be shut off from the supply valve.

The operation of this form of my improved system is as follows. When the valves 17 and 18 are opened, the exhauster produces a vacuum or minus pressure in the fluid pressure chamber 12, thereby causing the piston 10 to rise and open the supply port 9, admitting the heating vehicle to the radiator. At the same time the air is drawn out from the radiator through the branch pipe 6 until steam reaches the air valve 7 and closes the same. When it is desirable to shut the radiator off the valve 18 is closed. The pressure underneath the piston 10 escapes up through the equalizing passage 13 until the pressures on both sides of the piston are equalized or nearly so, when the spring 14 causes the piston to descend and closes the supply valve. By closing the valve 17 the air pipe can also be shut off.

In Fig. 3 the construction is the same as that already explained with the addition of the thermostat 19 constructed in any usual form and adapted to be placed upon the wall of the room, or in any other suitable position. This thermostat is adapted to control the valve 20 upon the pipe 4. Any suitable connecting means may be employed between the thermostat 19 and the valve 20, for example, an electric circuit as shown, and the valve 20 may be made in the form of a solenoid valve. The operation of this form of system is the same as that already explained, except that when the room is heated to the desired point the thermostat closes the valve 20 and thus shuts the connection between the exhauster and the supply valve and thereby closes the supply valve.

In Fig. 4 the parts are constructed in the manner already explained with the following additions. 21 is a separate discharge or return pipe which is provided with a discharge valve 22. This discharge valve is similar in construction to the supply valve shown in section in Fig. 2. 24 is an ordinary hand valve in the discharge pipe. 25 is a valve on the pipe 4 which is controlled by the thermostat 26 adapted to be placed upon the wall of the room or in any other suitable position. The connections between the thermostat and the valve 25 may be made in any ordinary form as shown. The pipe 4 has a branch 27 running to the fluid pressure chamber on the discharge valve. 28, 28 are ordinary shut off valves. The operation of this system is substantially as already explained. When the room is heated to the desired degree the valve 25 is closed and the exhauster is thereby shut off from connection with the fluid pressure chambers of the valve. The pressure on the opposite ends of the pistons of these valves equalize in the manner already explained, and the valves are closed by the operation of the springs, thus shutting off the radiator. When the temperature of the room falls the valve 25 is opened and the exhauster operates to open both the supply and the discharge valves.

In Fig. 5 I have shown a form of valve similar to the valve shown in Fig. 2 except that it is adapted for use with a fluid pressure device adapted to supply fluid under pressure. 29 is a valve which is connected with the piston 10 by means of the stem 30 provided with a screw thread at its upper end. The valve 29 in this case is below the supply port 9 and is adapted to close that port when the piston 10 is raised by means of the coiled spring 32. The spring 32 bears at its lower end against the casing of the valve and at its upper end against the head of the piston. The tension of the spring 32 can be varied by means of the nut 31 which screws upon the upper end of the stem 30. In this form of valve the fluid under pressure from the fluid pressure motor is admitted to the chamber 12 and forces the piston 10 down and opens the port 9. When the fluid pressure motor is cut off from the fluid pressure chamber 12 by means of a hand valve or the operation of a thermostat, the pressures on the two sides of the piston 10 are equalized through the equalizing passage 13, and the spring 32 thereupon forces the piston up and closes the valve.

Some of the advantages of my improvement are as follows. The admission of the heating vehicle to the radiator and the discharge of the water and air therefrom, are easily and quickly controlled. The system is economical. It can be put into operation or put out of operation, easily and readily. The system can thus be accurately and quickly controlled. The valves are simple in construction and not liable to get out of order and are self-contained, that is to say, no vents are necessary to the external atmosphere.

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

1. In a heating system, the combination of a supply pipe, a heater or radiator, a valve device on the supply pipe having a suitable valve casing, a supply port in said casing, a motor controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said motor, one being in free communication with the interior of the radiator, and the valve device being provided with an equalizing passage connecting the two chambers, and a fluid containing device connected with the other fluid pressure chamber and means for varying the pressure of the fluid in said containing device, substantially as set forth.

2. In a heating system, the combination of a supply pipe, a heater or radiator, a valve device on the supply pipe having a suitable

valve casing, a supply port in said casing, a motor controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said motor, one being in free communication with the interior of the radiator, and the valve device being provided with an equalizing passage within the valve casing connecting the two chambers, and an exhausting device connected with the other fluid pressure chamber, substantially as set forth.

3. In a heating system, the combination of a supply pipe, a heater or radiator, a valve device on the supply pipe having a suitable valve casing, a supply port in said casing, a piston controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said piston, one being in free communication with the interior of the radiator, and the valve device being provided with an equalizing passage between the piston and the wall of the casing connecting the chambers on opposite sides of the piston, and a fluid containing device connected with the other fluid pressure chamber and means for varying the pressure in said containing device, substantially as set forth.

4. In a heating system, the combination of a supply pipe, a heater or radiator, a valve on the supply pipe having a suitable valve casing, a supply port in said casing, a piston controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said piston, one being in free communication with the interior of the radiator, and the other being connected with an exhausting device, the valve device being provided with an equalizing passage connecting the chambers on opposite sides of the piston, and a spring adapted to move the piston in the opposite direction from the exhausting device, substantially as set forth.

5. In a heating system, the combination of a supply pipe, a heater or radiator, a valve device on the supply pipe having a suitable valve casing, a supply port in said casing, a piston controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said piston, one being in free communication with the interior of the radiator, and the other being connected with an exhausting device, the valve device being provided with an equalizing passage connecting the chambers on opposite sides of the piston, and a spring adapted to move the piston in the opposite direction from the exhausting device, and means for adjusting the tension of the spring, substantially as set forth.

6. In a heating system, the combination of a supply pipe, a return pipe, a heater or radiator, a valve device on the supply pipe having a suitable valve casing, a supply port in said casing, a motor controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said motor, one being in free communication with the interior of the radiator, and the valve device being provided with an equalizing passage connecting the two chambers, a valve device on the return pipe having a suitable valve casing, a discharge port, a motor controlling the discharge port, the return valve device being provided with fluid pressure chambers on opposite sides of said motor, one being in free communication with the interior of the radiator, and the return valve device being provided with an equalizing passage connecting the two chambers, and a fluid containing device connected with fluid pressure chambers of the valve devices of the supply pipe and return pipe and means for varying the pressure of the fluid in said containing device, substantially as set forth.

7. In a heating system, the combination of a supply pipe, a return pipe, a heater or radiator, a valve device on the supply pipe having a suitable valve casing, a supply port in said casing, a piston controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said piston, one being in free communication with the interior of the radiator, and the valve device being provided with an equalizing passage connecting the two chambers, and an exhausting device connected with the other fluid pressure chamber, a valve device on the return pipe having a suitable valve casing, a discharge port, a piston controlling the discharge port, the return valve device being provided with fluid pressure chambers on opposite sides of said piston, one being in free communication with the interior of the radiator, and the return valve device being provided with an equalizing passage within the valve casing connecting the two chambers, the other fluid pressure chamber being connected with said exhausting device, substantially as set forth.

8. In a heating system, the combination of a supply pipe, a return pipe, a heater or radiator, a valve device on the supply pipe having a suitable valve casing, a supply port in said casing, a motor controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said motor, one being in free communication with the interior of the radiator, and the valve device being provided with an equalizing passage connecting the two chambers, a valve device on the return pipe having a suitable valve casing, a discharge port, a piston controlling the discharge port, the return valve device being provided with fluid pressure chambers on opposite sides of said piston, one being in free communication with the interior of the radiator, and the return valve device being provided with an

equalizing passage between the piston and the wall of the casing connecting the two chambers, and a fluid containing device connected with fluid pressure chambers of the valve devices of the supply pipe and return pipe and means for varying the pressure of the fluid in said containing device substantially as set forth.

9. In a heating system, the combination of a supply pipe, a heater or radiator, a return pipe, a valve device on the return pipe having a suitable valve casing, a discharge port in said casing, a motor controlling said discharge port, the valve device being provided with fluid pressure chambers on opposite sides of said motor, one being in free communication with the interior of the radiator, and the valve device being provided with an equalizing passage connecting the two chambers, and a fluid containing device connected with the other fluid pressure chamber and means for varying the pressure of the fluid in said containing device, substantially as set forth.

10. In a heating system, the combination of a supply pipe, a heater or radiator, a valve device on the supply pipe having a suitable valve casing, a supply port in said casing, a motor controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said motor, one being in free communication with the interior of the radiator, and the valve device being provided with an equalizing passage connecting the two chambers, a fluid containing device, a pipe connecting the fluid containing device and the other fluid pressure chamber and means for varying the pressure of the fluid in said containing device, and a thermostat controlling said connecting pipe, substantially as set forth.

11. In a heating system, the combination of a supply pipe, a return pipe, a heater or radiator, a valve device on the supply pipe having a suitable valve casing, a supply port in said casing, a piston controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said piston, one being in free communication with the interior of the radiator, and the valve device being provided with an equalizing passage connecting the two chambers, a valve device on the return pipe having a suitable valve casing, a discharge port, a piston controlling the discharge port, the return valve device being provided with fluid pressure chambers on opposite sides of said piston, one being in free communication with the interior of the radiator, and the return valve device being provided with an equalizing passage connecting the two chambers, and a fluid containing device connected with the two fluid pressure chambers which are not in direct communication with the radiator and means for varying the pressure of the fluid in said containing device, substantially as set forth.

12. In a heating system, the combination of a supply pipe, a return pipe, a heater or radiator, a valve device on the supply pipe having a suitable valve casing, a supply port in said casing, a motor controlling said supply port, the valve device being provided with fluid pressure chambers on opposite sides of said motor, one being in free communication with the interior of the radiator, and the valve device being provided with an equalizing passage connecting the two chambers, a valve device on the return pipe having a suitable valve casing, a discharge port, a motor controlling the discharge port, the return valve device being provided with fluid pressure chambers on opposite sides of said motor, one being in free communication with the interior of the radiator, and the return valve device being provided with an equalizing passage connecting the two chambers, and a fluid containing device connected with the two fluid pressure chambers which are not in free communication with the radiator, and a thermostat controlling the connection between the fluid containing device and the said fluid pressure chambers and means for varying the pressure of the fluid in said containing device, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

ANDREW G. PAUL.

Witnesses:
THOMAS K. PETERS,
NANNIE FINLEY.