A. G. PAUL.

HEATING SYSTEM.

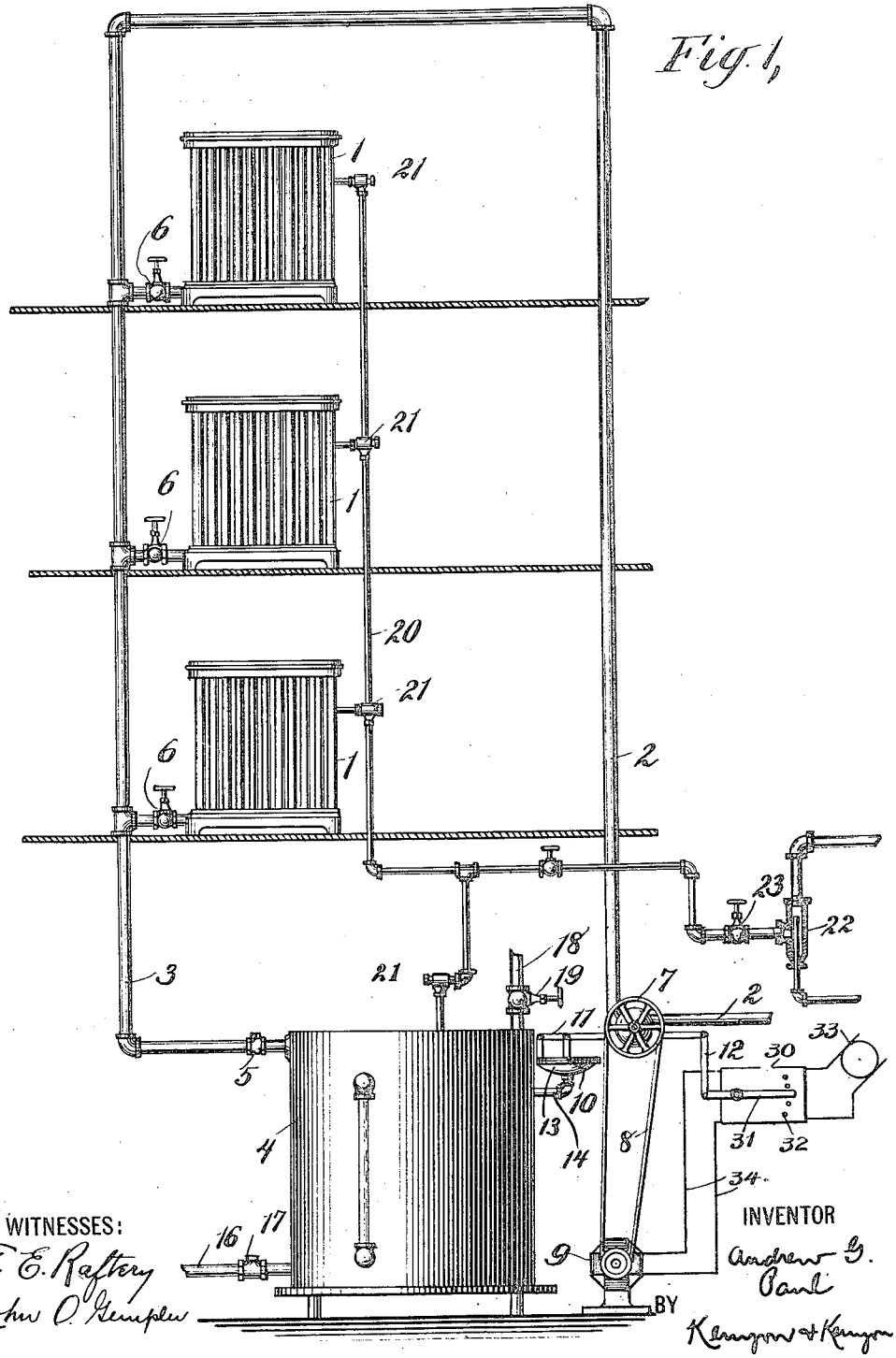
APPLICATION FILED APR. 16, 1901.

1,045,605.

Patented Nov. 26, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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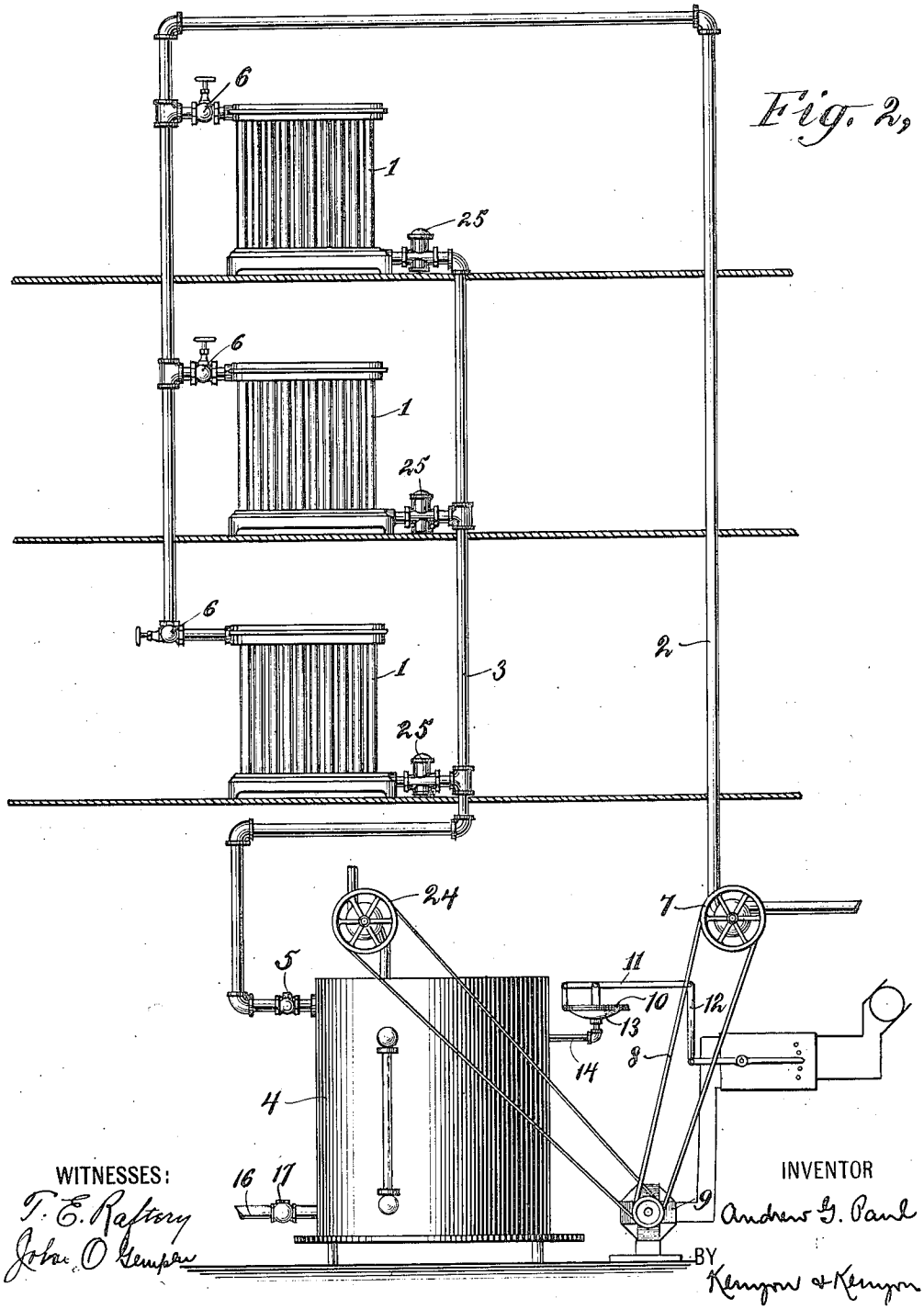
3 SHEETS—SHEET 2.

Fig. 2.



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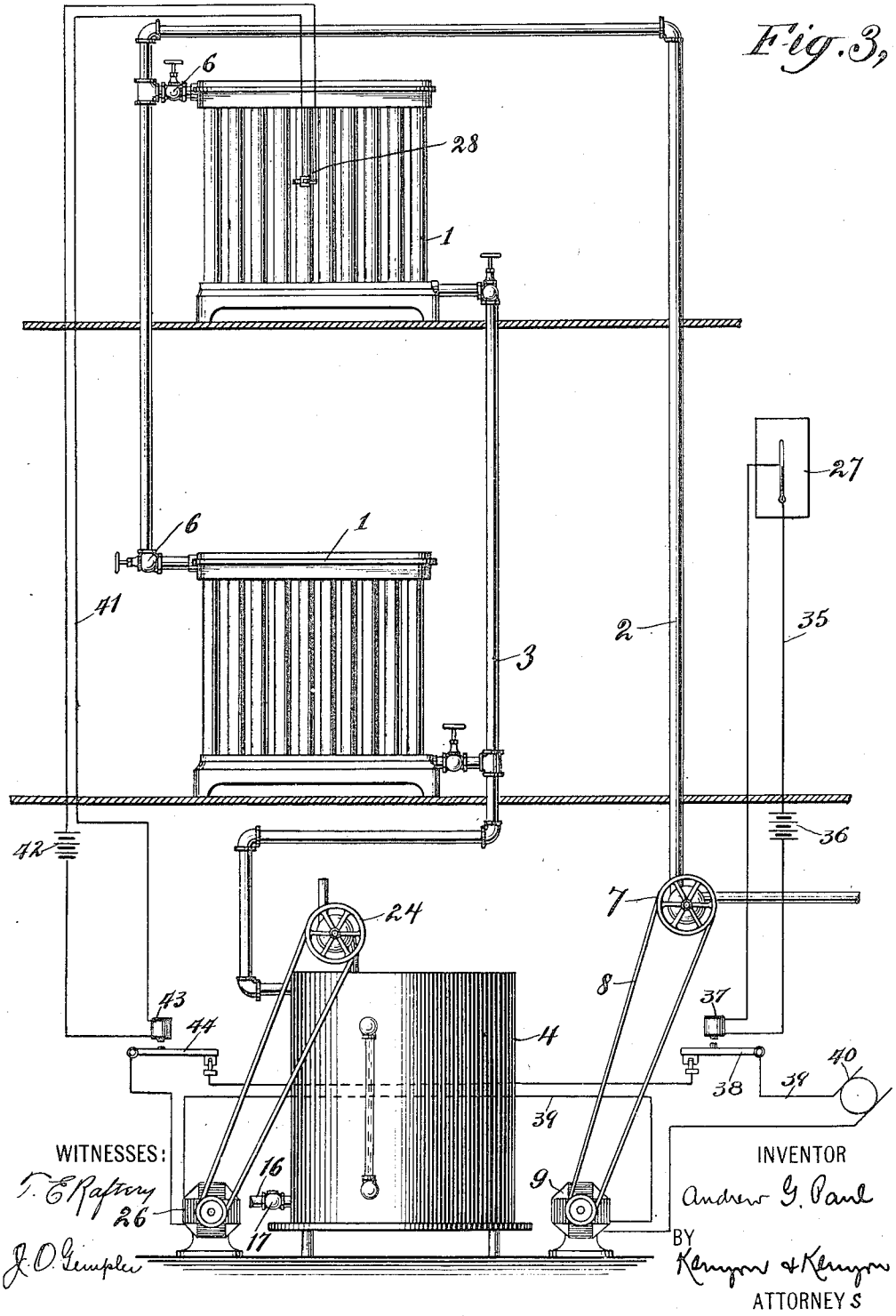
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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HEATING SYSTEM.

1,045,605. Specification of Letters Patent. Patented Nov. 26, 1912.

Application filed April 16, 1901. Serial No. 56,059.

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 secure an efficient and satisfactory circulation of the heating vehicle in a heating system, and a circulation which is positive in its character and which is not dependent upon the condensation of the heating vehicle in the radiator.

My invention consists in the combination in a heating system of a heater or radiator, a supply pipe, a mechanical motor connected with the supply pipe and adapted to circulate the heating vehicle through the system, and a fluid pressure motor for controlling the mechanical motor and communicating with the interior of the system so as to be governed by the pressure therein.

My invention also consists in the combination in a heating system, of a heater or radiator, a supply pipe, a mechanical motor connected with the supply pipe, and adapted to circulate the heating vehicle through the system, and a sealed escape pipe for the water of condensation, and an exhausting apparatus which is connected directly or indirectly with the escape pipe.

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

My invention is fully illustrated in the accompanying drawings, in which—

Figure 1 shows my invention applied to a system containing three radiators; Fig. 2 shows a modification of my invention; Fig. 3 shows a further modification of the invention.

Similar letters denote similar parts in the different figures.

Referring to Fig. 1, 1, 1 are radiators of any suitable form; 2 is a supply pipe leading from any suitable generator or other source of supply of the heating vehicle; 3 is a return pipe through which the water of condensation flows to the tank or reservoir 4; 5 is any suitable form of check valve at the lower end of the return pipe 3 and controlling said passage; 6, 6 are supply valves in the branch pipes leading from the supply pipe to the radiator; 7 is a mechanical motor, preferably a rotary pump or fan, which is placed in, or in some manner connected with, the supply pipe, so that it is adapted to circulate the heating vehicle through the said pipe and through the system. In the form shown, the motor 7 is driven by means of the belt 8 from the engine 9. Any means may be employed to drive the motor 7; for example, any suitable form of engine may be employed or an electric motor may be used. 10 is a diaphragm or other suitable fluid-pressure motor, which is suitably connected with the driving mechanism 9 so as to turn on or off or control the mechanical motor 9. 11 is a lever which is operated by means of the diaphragm 10 and which is connected by the rod 12 with the engine or other source of power so as to control the same. 13 is a fluid pressure chamber underneath the diaphragm 10, and this chamber is connected by means of the pipe 14 with the tank 4 or with any other suitable part of the system. As a result of this, whenever the pressure in the part of the system with which the fluid pressure chamber 13 is connected became higher than the predetermined point, the diaphragm 10 would be moved and the motor 9 would be entirely stopped or else decreased in speed.

In the form of connection shown the rod 12 is connected with a rheostat 30 by means of a pivoted lever 31, the free end of which moves over the contact points 32 of the rheostat. This rheostat is connected in the ordinary manner with a source of electric energy 33 and is also connected by means of wires 34 with the driving mechanism 9.

16 is a pipe through which the water of condensation can be removed from the tank 4. This pipe is provided with any suitable form of valve 17.

18 is an outlet pipe for allowing air to escape when forced outward by the pressure and steam, or for drawing off vapor for any desired purpose. This pipe, however, does

not form any part of the system claimed by me as my invention. The pipe 18 is provided with any suitable form of valve 19. The valve 19 is ordinarily kept closed. It will thus be seen that the escape or return pipe from the system is sealed.

By reason of having the escape or return pipe sealed the pressure in the various parts of the system can be controlled as may be desired by the operation of the motor or can be automatically controlled by the operation of the motor. The motor itself can be so arranged as to be automatically controlled by the pressure in the system and thereby maintain the pressure at a given point.

20 is an air pipe which is connected by suitable branches with the different radiators, and these branches are provided with automatic air valves 21. The air pipe also has a branch leading to the tank 4 which is also provided with an automatic air valve 21.

22 is an exhausting apparatus which is preferably in the form of a steam or water jet.

23 is a shut-off valve for disconnecting the exhauster.

The operation of this apparatus is as follows: The mechanical motor 9 being started, the heating vehicle is caused to flow positively through the supply pipe 2 into the radiators. The water of condensation flows down through the return or escape pipe 3 into the tank 4. Any uncondensed vapor may also flow down through the pipe 3, and also any air that is contained therein or that is not removed from the system through the air pipe. When the exhauster 22 is in operation the air is drawn out from the radiators and also from the tank 4 through the air pipe, the automatic valves 21 operating to prevent the waste of the heating vehicle. If the exhauster is not used the air can be blown out through the air pipe in the automatic valves by the pressure in the system and if necessary, through the pipe 18. When the exhausting apparatus 22 is in operation it is connected through the branch of the air pipe that leads to the tank 4 with the escape pipe 3, and thus tends to accelerate or improve the circulation.

In Fig. 2 the parts are constructed as already explained, with the following additional features. The escape or return pipe 3 leads directly from the radiators to the tank or reservoir. 24 is a suitable exhausting apparatus, such, for example, as a fan which is connected with the upper part of the tank 4 and which operates to accelerate or aid the circulation of the heating vehicle through the system by drawing the air or steam from the tank, thus pulling the steam and air, if any there be, through the return pipe 3. In this case there are two pumps which operate to produce the circulation of the heating vehicle, the pump 7 which is connected with the supply pipe in the manner already explained, and the exhausting apparatus 24 which is connected with the tail end of the system. In this system I place valves 25 on the various branches of the return pipes leading from radiators which operate to permit the escape of the water of condensation and the air, while preventing the loss or waste of the heating vehicle.

In Fig. 3 I have shown a modification of my system embodying two radiators in which the parts are similar to those already described in connection with Fig. 2, with the following additional features. 26 is an additional motor which is connected with the exhausting device by a belt as shown. 27 is a thermostat which is adapted to be placed upon the wall of the room, or in any other suitable position, so as to be controlled by the heat of the apartment or other place where it is put, and which is connected in any suitable way with the motors 9 and 26; for example, by means of an electric circuit containing a battery, an electromagnet and an armature lever.

In Fig. 3, 35 is an electric circuit adapted to be opened or closed by the thermostat 27. 36 is a battery in said circuit. 37 is an electromagnet in said circuit. 38 is an armature lever in a circuit 39, which circuit includes a source of electric energy 40 and the motors 9 and 26. When the heat of the apartment reaches the desired or predetermined point, the thermostat 27 operates to stop the motor 9 and the motor 26, thus stopping the supply of the heating vehicle to the system. When the temperature of the apartment falls below the predetermined point, the thermostat operates to start the motor 9 again and the motor 26. In this figure I have shown another form of thermostat, to wit, the thermostat 28, which is adapted to be applied directly to the radiator or any other part of the heating system so as to be heated thereby. When the temperature of that part of the system to which the thermostat is applied reaches the desired or predetermined point, the motor 9 and motor 26 are shut off in the manner already explained. In Fig. 3 the thermostat 28 is shown as included in a circuit 41 which also includes a battery 42 and an electromagnet 43. The electromagnet 43 operates an armature lever 44 in circuit 39. When the temperature falls below this point, the motor 9 and motor 26 are started again. The two forms of thermostats 27 and 28 may be used in the one system or they may be used separately, that is, one or the other, whichever it is desired, may be used.

In my improved system the circulation of the heating vehicle is positive and certain and is controlled irrespective of the pressure in the generator or the source of supply from which the heating vehicle

comes. When an additional motor is used at the tail end of the system, the circulation of the heating vehicle is thereby improved or accelerated. In some cases, especially in large plants, the additional assistance rendered by the motor at the tail end is very important, and would enable the size of the piping in the system to be materially decreased, thereby securing economy.

Another advantage resulting from my invention is the automatic control of the mechanical motor according to the conditions existing in the system or according to the requirements or needs of the system. The mechanical motor can thus be controlled by the pressure existing in any part of the system or by the heat given off from the system.

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

1. In a steam heating system, the combination of a radiator, a supply pipe, a mechanical motor arranged in the supply pipe, and adapted to circulate the steam directly through the system irrespective of the pressure in the source of steam supply, means for driving said motor independently of the steam within the system, means connecting with the system at some point beyond the inlet to the radiator for controlling the motor according to the requirements of the system, and a sealed return pipe for the water of condensation.

2. In a steam heating system, the combination of a radiator, a supply pipe, a mechanical motor arranged in the supply pipe and adapted to circulate the steam through the system irrespective of the pressure in the source of supply, means for driving said motor independently of the steam in the system, a sealed return pipe for the water of condensation, and an exhausting apparatus connected with the return end of the system above the point where the water of condensation collects for aiding the circulation in the system, substantially as set forth.

3. In a steam heating system the combination of a radiator, a supply pipe, a mechanical motor arranged in the supply pipe and adapted to circulate the steam directly through the supply pipe and through the system irrespective of the pressure in the source of supply, means for driving said motor independently of the steam within the system, a sealed return pipe for the water of condensation, an exhausting apparatus connected with the return end of the system above the point where the water of condensation collects for aiding the circulation in the system, and means connected with the system for controlling the motor and the exhausting apparatus, substantially as set forth.

4. In a steam heating system the combination of a radiator, a supply pipe, a rotary fan arranged in the supply pipe and adapted to circulate the steam directly through the supply pipe and the system irrespective of the pressure in the source of supply, means for driving said fan independently of the steam in the system, an exhausting apparatus connected with the return end of the system above the point where the water of condensation collects for aiding the circulation in the system, a fluid pressure motor for controlling the fan and the exhausting apparatus and communicating with the interior of the system so as to be governed by the pressure therein, substantially as set forth.

5. In a steam heating system, the combination of a radiator, a supply pipe, a rotary fan arranged in the supply pipe and adapted to circulate the steam through the supply pipe and through the system irrespective of the pressure in the source of supply, means for driving said fan independently of the steam in the system, a sealed return pipe for the water of condensation, a tank for collecting the water of condensation with which the return pipe is connected, and an exhausting apparatus communicating with the tank above the point where the water of condensation collects, substantially as set forth.

6. In a steam heating system, the combination of a radiator, a supply pipe, a rotary fan arranged in the supply pipe and adapted to circulate the steam through the supply pipe and through the system irrespective of the pressure in the source of supply, means for driving said fan independently of the steam in the system, a sealed return pipe for the water of condensation, a tank for collecting the water of condensation with which the return pipe is connected, and an exhausting apparatus communicating with the tank or receptacle above the point where the water of condensation collects, and means for controlling the fan and the exhausting apparatus and communicating with the interior of the system so as to be governed by the pressure therein, 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:
EDWIN SEGER,
JOHN O. GAMPLEE.