C. C. PECK.

AUTOMATIC FAN SYSTEM OF HEATING.

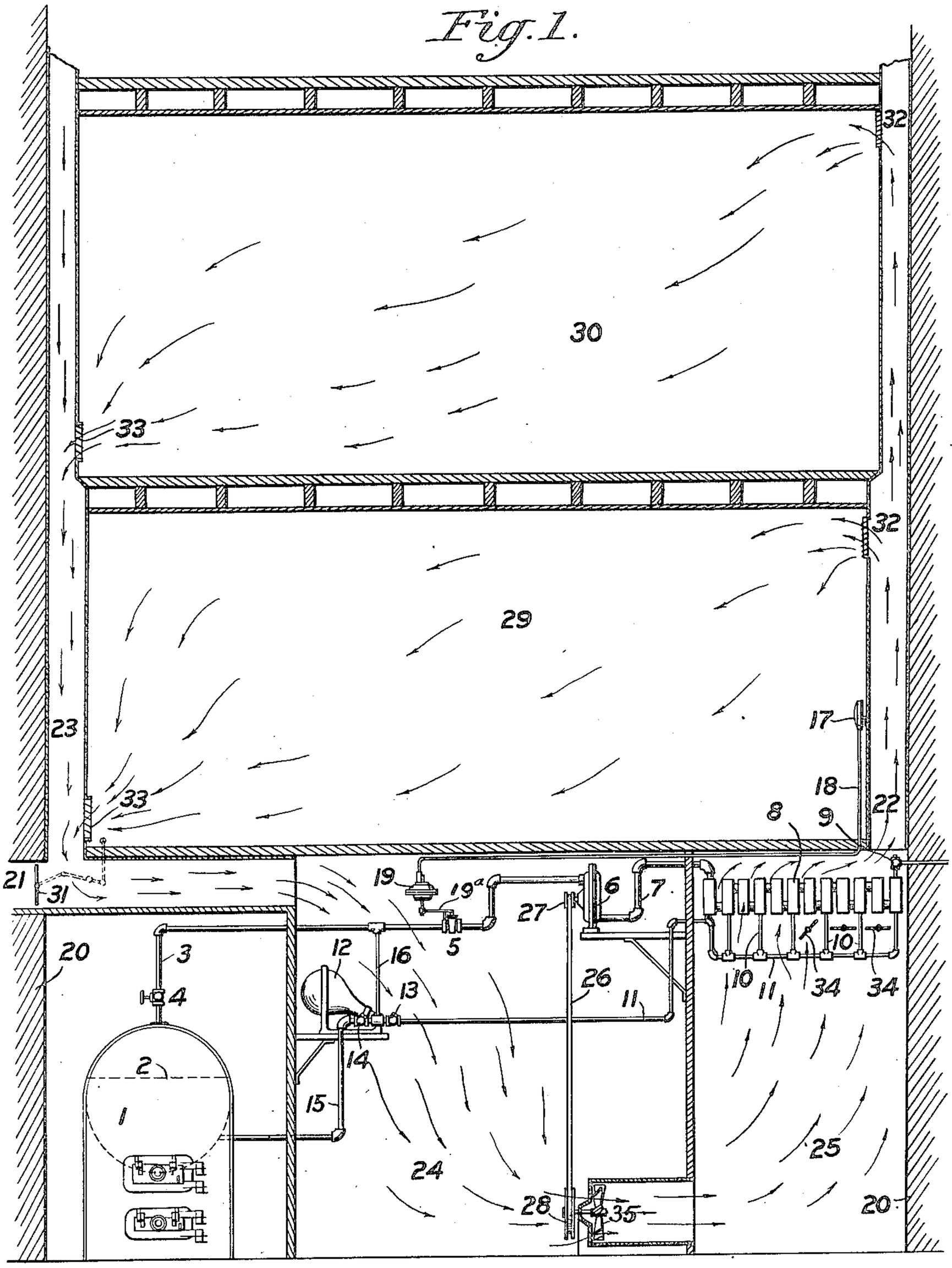
APPLICATION FILED MAR. 3, 1908.

917,483.

Patented Apr. 6, 1909.

2 SHEETS—SHEET 1.

Fig. 1.



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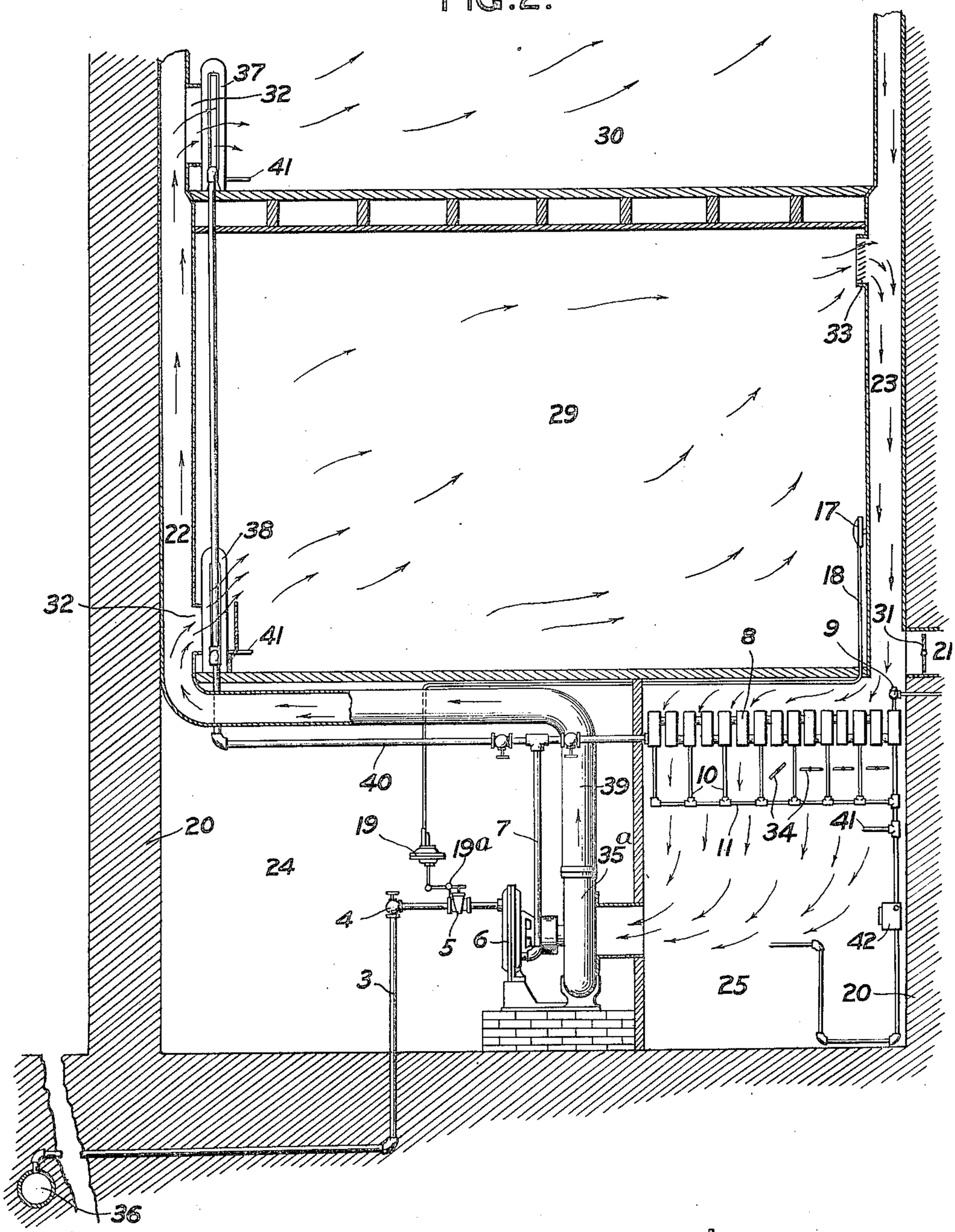
2 SHEETS—SHEET 2.

FIG. 2.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC FAN SYSTEM OF HEATING.

No. 917,483. Specification of Letters Patent. Patented April 6, 1909.

Application filed March 3, 1908. Serial No. 418,993.

To all whom it may concern:

Be it known that I, CASSIUS C. PECK, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Automatic Fan System of Heating, of which the following is a specification.

My invention relates to the class of heating apparatus in which a fan blower, or exhauster, is employed to circulate air in contact with heaters, and thence to the place of use.

Fan systems of heating by forced circulation of air are now extensively used for heating, and at the same time ventilating, public buildings, factories, drying rooms, etc., where an engineer is available for attending to the driving mechanism of the fan, the steam supply, and other operative details, but on account of requirement for an engineer such systems could not be used for ordinary residences and other similar situations.

The special object of my invention is to adapt a fan system to house heating, and this end is attained by first applying, in the form of steam, the heat required for warming purposes to driving the fan engine, and then using the exhaust of said engine for heating air supply of the fan, and returning water of condensation to the source of steam supply. Also in automatically supplying needful amount of steam and air, arranging the air heating surfaces so that practically all exhaust steam entering the air heater shall be condensed, and returning automatically resulting water of condensation to the source of steam supply, usually a steam boiler; the several steps and details being shown on the accompanying drawing and described in the following specification.

The drawings show in Figure 1 a vertical front elevation of the mechanical elements of my invention combined with a vertical cross section of a portion of a building served thereby. Fig. 2 is a vertical elevation similar to Fig. 1, but showing certain modifications in construction and arrangement of apparatus to suit varying conditions.

Referring mostly to Fig. 1, the source of steam supply for heating will usually be a steam boiler, which is illustrated in the drawing by the numeral 1, having water line 2, except that in district systems of heating steam supply will be derived from a street main as shown at 36 in Fig. 2. The steam supply pipe 3, having stop valve 4, and automatically controlled throttling valve 5, derives the steam required for the heating system from typical engine 6, preferably of the turbine class, the exhaust from which passes through pipe 7 to indirect radiating sections 8, which are intended to represent any preferred type of air heating surface. It is essential, however, that in flowing through the heater the steam supply should follow a continuous course from the entrance end to the air discharge end, which has the check valve 9 usually discharging to atmosphere, the steam progressing in such way as to successively heat all the surfaces which it passes in regular succession from the entering point. In the heater as shown provision is made by branch pipes 10 connecting into the heater sections and into main drain pipe 11 for well draining the several sections, and for delivering water of condensation into return trap 12, having check valves 13 and 14, which symbolizes any form of return trap which provides for automatically returning the water through pipe 15 to boiler 1. Steam supply for equalizing pressure in the trap with that in the boiler, to allow water to flow by gravity from the former to the latter in accordance with the well known method, is provided through pipe 16. A thermostat 17, of any preferred design, is here shown as connected by tube 18 with a diaphragm 19, which actuates valve 5 through changes of atmospheric temperature in the room acting on the thermostat. Walls of the containing building are indicated by 20, the inlet passage for fresh air by 21, the hot air rising flue by 23, the fan-engine room by 35, and heating, or plenum, chamber by 25.

Steam turbine 6 is here shown as connected with the fan blower 35 by a belt 26 running over pulley 27 on the turbine and pulley 28 on the fan, but under suitable conditions the engine and fan may be direct-connected as shown in Fig. 2. Ordinary house heating boilers are available, as the fan-driven engine is preferably proportioned so as not to require over 15 lbs. steam pressure, and such boilers usually have steam pressure automatically controlled by a diaphragm acted on by said pressure, or by some equivalent mechanism for automatically operating the dampers and drafts according to steam requirements. As such provision for auto-

matically maintaining steam supply at the desired pressure to suit weather conditions is no part of my invention, it is not shown.

Operation of the system is as follows: Steam pressure from the source of steam supply being admitted to engine 6 by opening stop valve 4, the engine is thereby put in operation and drives fan 35 which circulates air in direction shown by arrows, that is first in contact with air heater 8, which is intended to be proportioned so as to suitably heat the air, then through rising air flue 22, and registers 32, into and through rooms 29 and 30, from whence more or less of the air can be returned through registers 33 by flue 23 to the fan engine room 24 for recirculation. The proportion of fresh air used in the system is regulated by damper 31 in the fresh air inlet 21; and the supply of heated air to individual rooms can be controlled by said registers, which are provided with the usual shutter dampers. For regulating flow of air through heater 8 to suit varying conditions of weather, gates, or dampers, 34 are provided to direct the current of air through such portion of the heater as is needful to condense the amount of steam which is being used. Water of condensation drains through pipes 10 into pipe 11, which is formed with a U trap to preserve a water seal between the several sections of the heater, and which conducts it to trap 12, which intermittently returns it to boiler 1. The office of thermostat 17 is to open and close the engine throttle valve 5 in accordance with heat requirements of the heating system by acting through diaphragm 19, the lever 19^a of which is attached to said valve. Thus when temperature of the room where the thermostat is located falls below the desired point, said thermostat acts to open throttle valve 5 in proportion to the amount of heat needed to maintain the room temperature at the predetermined point. Engine 22 and fan 35 will consequently be run at speed corresponding to the volume and pressure of steam entering the engine, and delivery of heat and air to apartments will therefore be in corresponding proportion, thus maintaining temperature of air practically uniform whatever the volume handled by the fan. Engine 6 thus fills the double office of circulating air which conveys heat to the point where required, and of a reducing pressure valve for changing relatively high steam pressure to the lower pressures usually employed in heating systems.

While thermostatic control of the engine throttle is not indispensable, as the heating system can be operated by hand control of said throttle, or by dispensing with the said throttle and regulating by stop valve 4, it constitutes a desirable means of rendering the system automatic in operation to maintain heating effect uniform.

Heating surface in air heater 8 is intended to be proportioned so as to condense all steam admitted into said heater during maximum requirements for heat. At end of the heater opposite the admission end it is provided with a vent pipe to atmosphere having an outwardly opening check valve 9, which can be loaded so as to carry any desired amount of back pressure on the engine to make up for small allowance of heating surface and maintain higher temperature in the heater to meet extreme requirements for heat. When starting the system, steam entering one end of the heater forces air in the heater before it to the opposite end where it finds egress under sufficient back pressuie to open the check valve.

Because in case of turbine engines no oil mingles with exhaust steam, I much prefer to use this type of engine in some one of the forms in which it is, or may be, manufactured.

Special advantages of this system are that (*a*) it combines well controlled heating with any desired amount of ventilation; (*b*) that by proper arrangement of inlet and outlet registers, rooms can be evenly warmed from floor to ceiling, or more nearly so than in any system unprovided with mechanically forced circulation; (*c*) and that all heating apparatus can be avoided in occupied rooms.

The fan engine is preferably proportioned to commence running on very low steam pressures, say two or three pounds, which also provides for increasing speed as steam pressure is increased. Thus if steam pressure completely fails during the night, causing the engine and fan to stop, they will start automatically when light steam pressure has again been established; and the pressure to be maintained during hours of use will be determined by weather conditions, or other conditions governing requirement for heat; that is steam pressure will be increased in proportion as requirement for heat increases. Fan speed, and consequent volume of air circulated, being dependent on volume and pressure of steam entering the fan engine, there will always be a correct and corresponding balance between air and heat capacity applicable to the heating system.

I do not confine myself to the exact construction and arrangement of apparatus shown and described, as the essential features of the invention can be embodied in many different ways, and indeed require various modifications to suit varying local conditions of use. Thus in Fig. 2, an exhausting fan 35^a is substituted for the forcing fan shown in Fig. 1, 35^a being arranged for drawing air by induction through the air heater 8 and then forcing it to the point of use: and air heaters 37 and 38 are located at the points where air is to be used for heating,

37 being of the direct type, and 38 of the direct-indirect type of heater, air being delivered from the fan 35[a] through pipe 39 to the heaters, and exhaust steam from fan engine 6 being similarly conducted through pipe 40 to said heaters, the water of condensation therefrom returning through pipe 41 to meter 42, whence it goes to any place for use, or to waste.

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

1. In a fan system of heating, the method of governing heat supply and delivery for the system by first using the steam required for supply of heat to the heating system to drive air-moving mechanism; condensing the exhaust steam from said mechanism in air heaters; moving air by said mechanism over the air heaters and delivering it to the space to be heated; and governing air and heat supply for the system by the speed at which the air-moving mechanism is made to run, substantially as set forth.

2. In a fan system of heating, the method of first using the amount of steam required for heating to drive the fan engine and connected fan by connecting the engine with a source of steam for driving it; delivering the engine exhaust into air heaters; connecting the fan with said heaters and delivering heated air forced by the fan to the place of use; governing speed of the combined engine and fan so as to supply the amount of heat and air required in the heating system; and automatically regulating said speed by thermostatic control.

3. In a fan system of heating, the method of first using the amount of steam required in supplying heat for the heating system to drive the fan engine with the attached fan by connecting the engine with a steam supply; conveying the exhaust steam from the engine into air heaters; delivering air from the fan to said heaters and to the place of use; automatically draining water of condensation from said air heaters and discharging it into the source of steam supply to the engine; and governing speed of the combined engine and fan to supply heat and air as required by the heating system.

4. The method of operating automatically a fan system of heating, consisting in connecting a fan engine, having an attached fan, to a source of steam supply; using the engine as a reducing valve to deliver into air heaters the reduced pressure steam needed to furnish the amount of heat required by the heating system; delivering air from the fan to said heaters and to the place of use; venting said heaters to atmosphere and automatically closing the vents against entrance of air; automatically draining water of condensation from said air heaters back into the source of steam supply to the fan engine; condensing in the heating system the pressure steam required in operating the drainage mechanism; and governing thermostatically the speed of the combined engine and fan to automatically supply the amount of heat and air required for the heating system.

5. In a fan system of heating, the method of using the fan engine as a reducing valve for reducing pressure of steam required to drive the fan engine by discharging the exhaust steam into air heaters; venting said heaters to atmosphere at the end opposite the steam inlet; condensing the steam in said heaters by guiding it in a continuously progressive course through successive portions constituting one or more passages of sufficient length to condense the steam before reaching the vented end; delivering air from the fan to said heaters and to the place of use; automatically draining water of condensation from said heaters; and governing speed of the combined engine and fan so as to supply heat and air in amount required by the heating system.

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Witnesses:
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