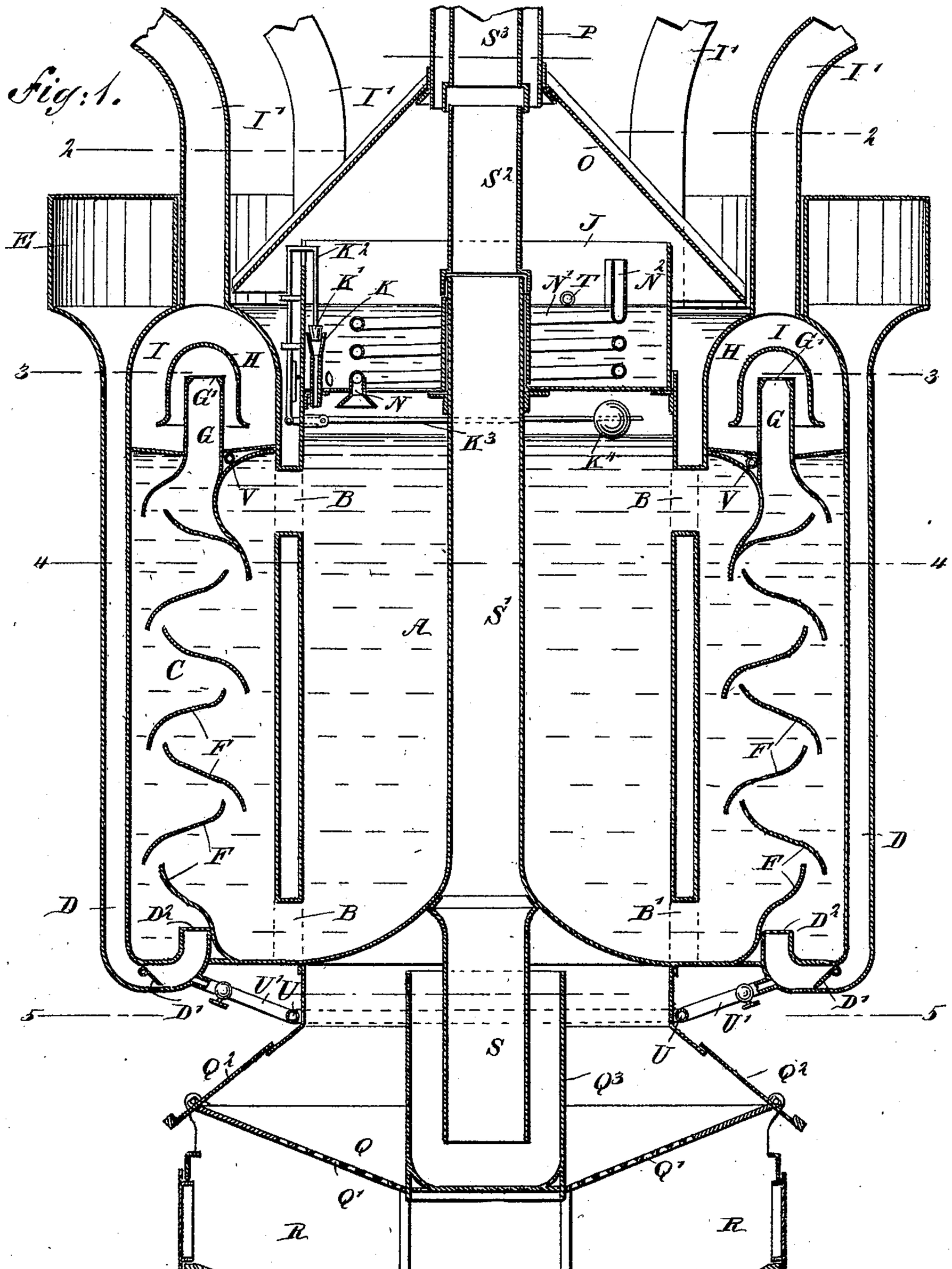
(No Model.) 2 Sheets—Sheet 1.

E. F. RUEHR.

COMBINED HEATER, COOLER, AND VENTILATOR.

No. 516,405. Patented Mar. 13, 1894.

Fig: 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig: 2.

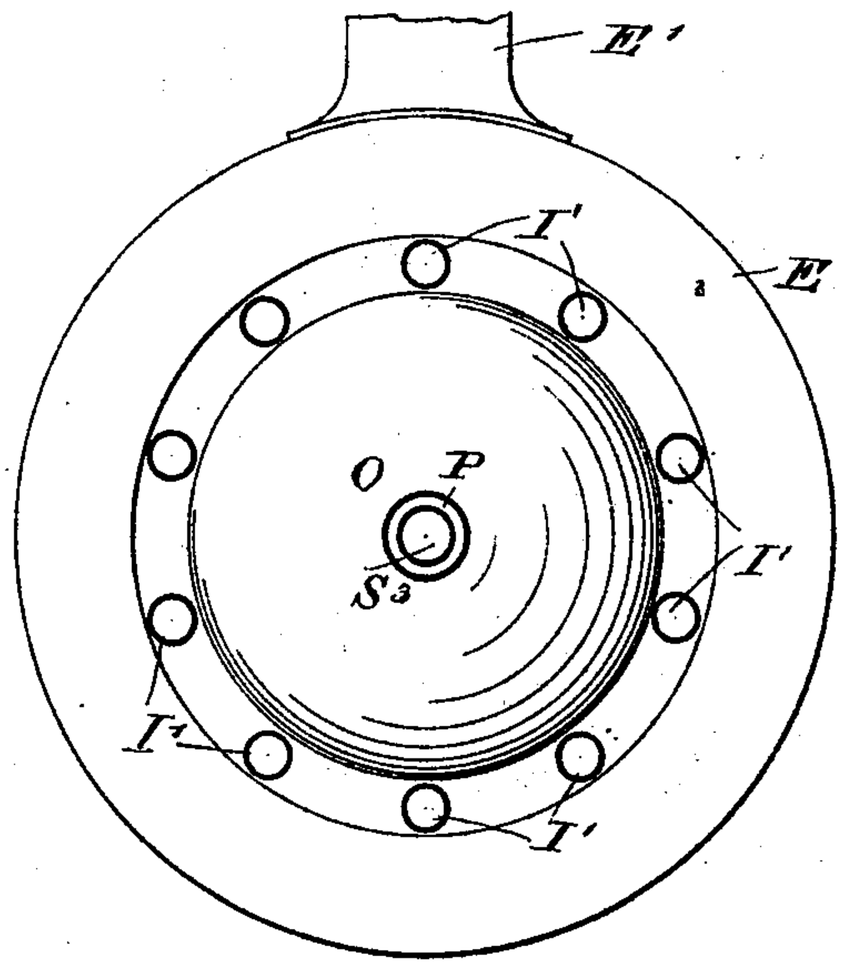


Fig: 3.

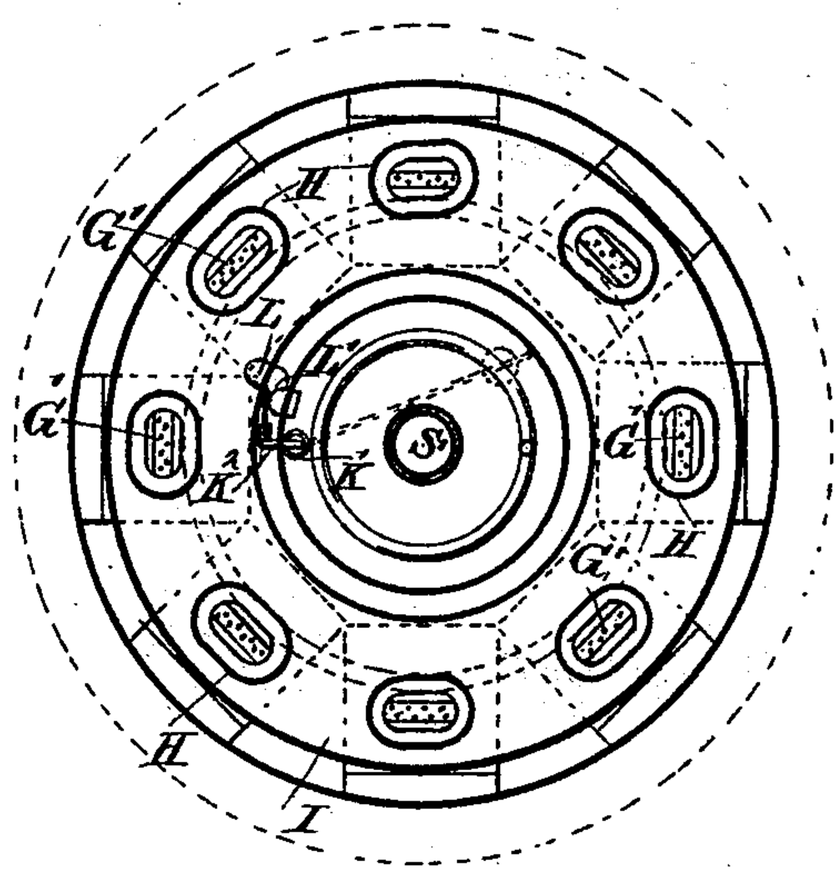


Fig: 4.

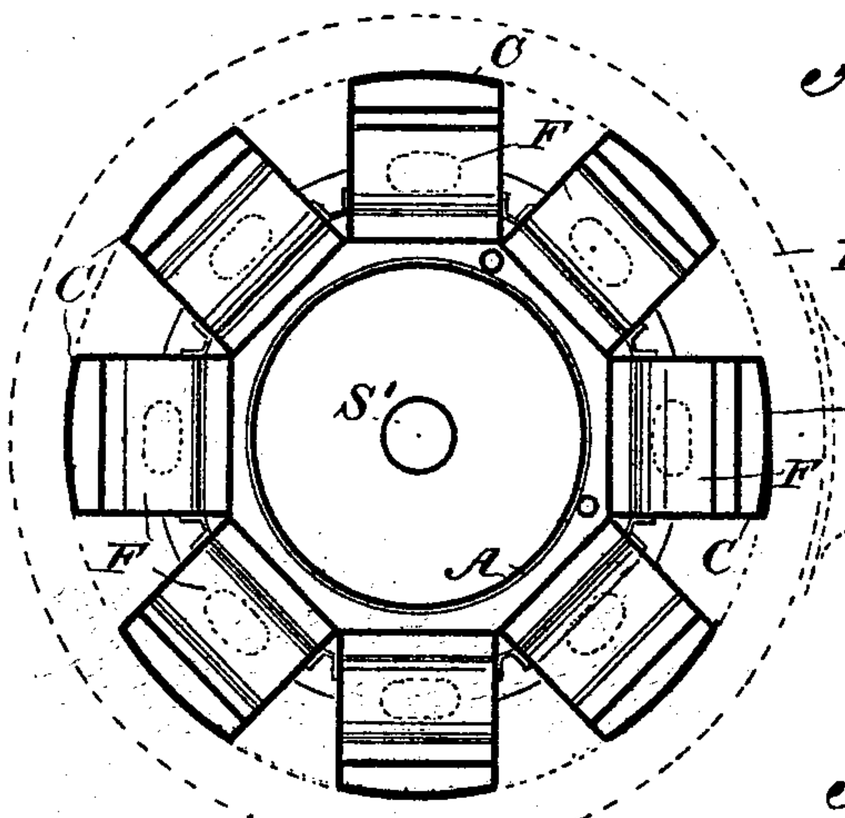
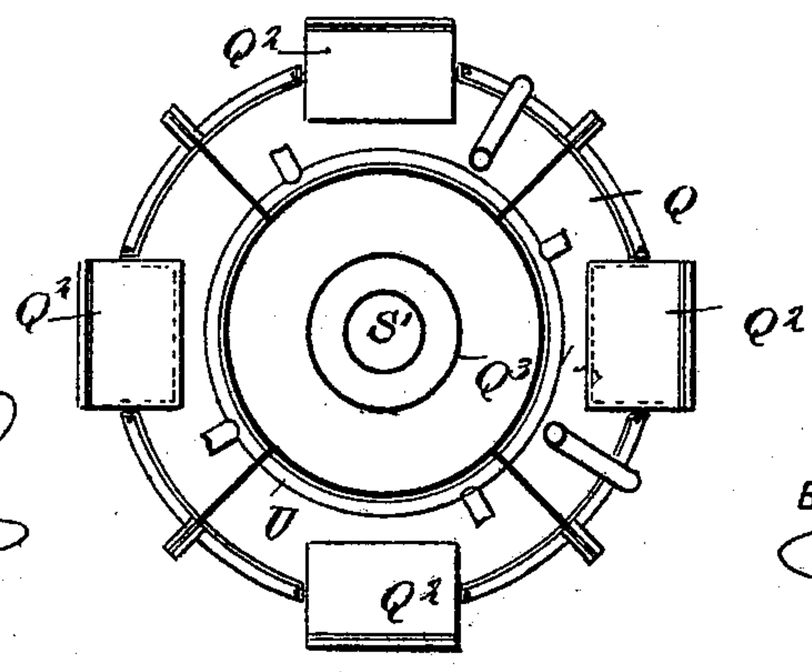


Fig: 5.



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EMIL F. RUEHR, OF VIENNA, AUSTRIA-HUNGARY.

COMBINED HEATER, COOLER, AND VENTILATOR.

SPECIFICATION forming part of Letters Patent No. 516,405, dated March 13, 1894.

Application filed July 3, 1893. Serial No. 479,522. (No model.)

To all whom it may concern:

Be it known that I, EMIL FRANZ RUEHR, a subject of the Emperor of Austria-Hungary, at present residing in Vienna, Austria-Hungary, have invented a new and Improved Combined Heater, Cooler, and Ventilator, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved combined heater, cooler and ventilator, which is durable and comparatively simple in construction, very effective in operation and more especially designed for use in dwellings, and other buildings, to supply the same with pure, fresh air in either a cooled or heated condition.

The invention consists principally of a central boiler, water compartments surrounding the boiler, and in communication therewith, and an air supply pipe discharging into the lower end of each of the said compartments to force the air through the water to wash and purify the same, and change its temperature according to the temperature of the water in the compartment.

The invention also consists of certain parts and details, and combinations of the same, as will be hereinafter described and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement. Fig. 2 is a reduced sectional plan view of the same on the line 2—2 of Fig. 1. Fig. 3 is a similar view of the same on the line 3—3 of Fig. 1. Fig. 4 is a like view of the same on the line 4—4 of Fig. 1; and Fig. 5 is a similar view of the same on the line 5—5 of Fig. 1.

The improved apparatus is provided with a centrally-arranged boiler A containing water adapted to be heated or cooled, and connected near its upper end by branch pipes B with water compartments C, surrounding the said boiler A, as plainly shown in Figs. 1 and 4. The lower end of each compartment C is connected by a branch pipe B′ with the lower end of the boiler A, so that when the water is heated it rises in the boiler A, passes through the branch pipes B into the compartments C to travel downward therein to finally pass through the branch pipes B′ back into the bottom of the boiler A, thus establishing a circulation of the water.

Into the lower end of each compartment C discharges an air pipe D containing, near its lower end, an inwardly-opening valve D′ to prevent water from passing from the respective compartment C to the pipe D extending along the outside of the compartment, as plainly illustrated in Fig. 1. The inner and vertically-turned end of each pipe D is covered by a strainer or sieve D^2, so as to divide the incoming air into small bubbles, which rise separately through the water contained in the respective compartment C. The upper end of each pipe D connects with an annular channel E connected with the air supply pipe E′ containing a blower E^2 or other suitable device for forcing air through the air supply pipe E′ to the channel E and from the latter through the individual air pipes D into the lower ends of the water compartments C. It is understood that the air in its downward passage in each of the pipes D opens the valve D′ against the pressure of the water contained in the respective compartment C to finally pass through the sieve D^2 to form bubbles as above described, which rise through the compartment in a zigzag course, owing to curved deflecting plates F, arranged one above the other within each compartment, as plainly shown in Figs. 1 and 4. The uppermost of the deflecting plates F in each compartment delivers the air bubbles in a purified state to a pipe G having its upper contracted end covered by a sieve G′ through which the purified air passes into a bell H arranged within an annular channel I located above the compartments and below the channel E, as will be readily understood by reference to Fig. 1. From this channel I lead a number of supply pipes I′, which conduct the air in a purified state to the several rooms of the building to be supplied. It is understood that when the air bubbles issuing through the screened ends D^2 of the pipes D pass through the water contained in the wa-

ter compartments C, then the said bubbles are washed by the water in their upward movement, so as to finally pass in a purified state to the annular channel I and through the pipes I′ into the rooms to be heated, cooled and ventilated.

In order to supply the boiler A with the necessary amount of water, I provide a supply tank J forming the top for the boiler and containing a short pipe K connecting the tank with the upper end of the boiler A. The top of the pipe K is adapted to be closed by a valve K′ held on a valve stem K^2 pivotally-connected with a lever K^3 extending into the upper end of the boiler A and carrying at its free end a float K^4 rising and falling with the water in the boiler A. Thus, when the water in the boiler A sinks below a normal level, the float K^4 moves with it and thus imparts a swinging motion to the lever K^3 whereby the valve K′ is unseated from the upper end of the pipe K, and water can pass from the tank J into the boiler A to fill the same until the normal level is reached. The valve stem K^2 is also connected with the valve L′ of a water supply pipe L connected with a suitable source of water supply and discharging into the tank J. Thus, when the valve K′ is unseated the valve L′ is opened to admit water to the tank J to fill the same and to compensate for the amount of water passing from the tank to the boiler A. When the float rises with the filling of the boiler, the valves K′ and L′ are closed, and the supply of water to the boiler and the tank J, shuts off simultaneously.

In order to heat the feed water contained in the tank J previous to discharging it into the boiler A, I provide a steam inlet pipe N arranged in the bottom of the tank J and connected with a coil of pipe N′ arranged within the tank J, so that the steam arising from the boiling water in the boiler A can pass through the pipe N and coil of pipe N′, to heat the feed water in the tank J. The said pipe N and coil of pipe N′ at the same time form an outlet for the steam which may arise in the boiler when the latter is heated, as hereinafter more fully explained. The upper end N^2 of the coil of pipe N′ discharges under a cone-shaped hood O connected at its apex with a steam discharge pipe P leading to the outside.

In order to heat the boiler A any suitable furnace may be employed but I prefer the furnace shown in Fig. 1, in which the fire box Q is provided with an inverted cone-shaped grate Q′ discharging into a circular ash pit R provided with the usual doors for removing ashes. The top of the fire box Q is cone-shaped and is provided with pivoted doors Q^2, as will be readily understood by reference to Figs. 1 and 5.

Within the fire box Q is arranged a short cylinder Q^3 open at its upper end to permit the heat after heating the bottom of the boiler A, to pass down the said cylinder into the smoke pipe S extending within the said cylinder Q^3 to within a short distance of the bottom thereof.

The smoke pipe S connects with a central smoke pipe S′ arranged within the boiler A and the upper end of this central smoke pipe S′ connects by a branch pipe S^2 with a smoke pipe S^3 located concentrically within the steam escape pipe P and leading, like the latter, to the outside.

In order to prevent overflow of the tank J, I provide the same with an overflow pipe T discharging into a circularly arranged pipe U surrounding the upper part of the fire box Q and connected by a series of branch pipes U′ with the lower ends of the pipes D between the valves D′ and the sieves D^2 so as to carry off any water which may accumulate in the said pipes between the valves and sieves. The branch pipes U′ are preferably provided with valves for opening and closing the same whenever desired. A pipe V is arranged in the upper end of each compartment C for the purpose of carrying off any water of condensation which might form in the channel I; the said pipe opening into the channel and discharging into the pipe U.

The operation is as follows: In order to supply a building with pure heated air, fuel is burned within the fire box Q to heat the water in the boiler A or the latter may also be accomplished by other means than the one described. By heating the water in the boiler A a circulation is established as previously described, the water rising in the boiler A and passing through the branch pipes B into the compartments C to flow downward therein, to finally return to the boiler through the branch pipes B′. At the same time, the blower E^2 or other means for forcing air into the channel E is set in motion, so that a current of air passes through each of the supply pipes D into the lower end of the corresponding water compartment C to be divided in bubbles, as described, and to pass through the water to be washed and purified, and also to take up the heat contained in the hot water moving downward in the respective compartment C. It will be seen that by this arrangement the air bubbles travel in an opposite direction to the movement of the water, and thus the air first comes in contact with the cooler water and gradually with water of a higher temperature, until the air bubbles finally leave the water at the upper part in the compartment to pass in a heated state to the channel I and from the latter, by the pipes I′, to the several rooms in the building.

When it is desired to supply the building with cool, pure air, then the water in the boiler A is not heated but may be left at its ordinary temperature or subjected to the action of a cooling medium to reduce its temperature. The air then passes in the same manner as above described, through the water in the compartments C to be purified and cooled to the temperature of the water. The

air in its cooled and purified state finally passes from the channel I and pipes I' into the several rooms to be cooled and ventilated.

In case of very large buildings, I provide a central boiler connected by steam pipes with several apparatus of the class described, the steam pipe passing through the boiler A in the shape of a coil of pipe to heat the water therein.

A central air supply pipe is provided with a blower connecting by branches with the several channels E of the various apparatus to supply same with the necessary air, which passes through the water and is purified, heated or cooled as above described.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. An apparatus of the class described, comprising a central boiler, water compartments surrounding the boiler and connected therewith at the top and bottom, and an air supply pipe discharging into the lower end of each of the water compartments, whereby the air will be forced through the water in an opposite direction to the travel of the water, substantially as and for the purpose set forth.

2. An apparatus of the class described, comprising a central boiler, water compartments surrounding the said boiler and in communication therewith, an air supply pipe discharging into the lower end of each of the said compartments, to force the air through the water to wash and purify the same and to change its temperature according to that of the water, and a series of deflecting plates arranged in each of the said compartments, to guide the air in a zigzag manner through the compartment, substantially as shown and described.

3. An apparatus of the class described, comprising a central boiler, water compartments surrounding the said boiler and in communication therewith, an air supply pipe discharging into the lower end of each of the said compartments, to force the air through the water to wash and purify the same and to change its temperature according to that of the water, each of the said pipes being provided at its discharge end with a sieve to cause the air to form bubbles, substantially as shown and described.

4. An apparatus of the class described, comprising a central boiler, water compartments surrounding the said boiler and in communication therewith, an air supply pipe discharging into the lower end of each of the said compartments, to force the air through the water to wash and purify the same and to change its temperature according to that of the water, each of the said pipes being provided at its discharge end with a sieve to cause the air to form bubbles, and a valve in each of the said pipes to prevent a return flow of the water, substantially as shown and described.

5. An apparatus of the class described, comprising a central boiler, water compartments surrounding the said boiler and in communication therewith, an air supply pipe discharging into the lower end of each of the said compartments, to force the air through the water to wash and purify the same and to change its temperature according to that of the water, a series of deflecting plates arranged in each of the said compartments, to guide the air in a zigzag manner through the compartment, a pipe arranged in the upper end of each of the said compartments, a hood over the said pipe, and an air channel into which discharge the several pipes and hoods and which is connected by a series of branch pipes with the several rooms in the building, substantially as shown and described.

6. An apparatus of the class described, comprising a central boiler, water compartments surrounding the said boiler and in communication therewith, an air supply pipe discharging into the lower end of each of the said compartments, to force the air through the water to purify the same and to change its temperature according to that of the water, a series of deflecting plates arranged in each of the said compartments to guide the air in a zigzag manner through the compartment, a pipe contracted at its upper end, arranged in the upper end of each of the said compartments, and provided at its contracted end with a sieve, a hood over the said pipe, and an air channel into which discharge the several pipes and hoods and which is connected by a series of branch pipes with the several rooms in the building, substantially as shown and described.

7. An apparatus of the class described, comprising a central boiler, water compartments surrounding the said boiler and in communication therewith, an air supply pipe discharging into the lower end of each of the said compartments, to force the air through the water to purify the same and to change its temperature according to that of the water, a feed water supply tank forming the top for the said boiler and provided with a water supply pipe, a pipe arranged in the bottom of the said tank and connecting with the top of the boiler, a coil of pipe connected with the said pipe and arranged within the said tank to form an outlet for the steam and to heat the water contained in the tank, substantially as shown and described.

8. An apparatus of the class described, comprising a central boiler, water compartments surrounding the said boiler and in communication therewith, an air supply pipe discharging into the lower end of each of the said compartments, to force the air through the water to wash and purify the same and to change its temperature according to that of the water, a feed water supply tank forming the top for the said boiler and provided with a water supply pipe, a pipe arranged in the bottom of the said tank and connecting with the top of the boiler, a coil of pipe con-

nected with the said pipe and arranged within the said tank to form an outlet for the steam and to heat the water contained in the tank, and a water supply pipe for the said boiler and arranged within the said tank, a valve adapted to open and close the said water supply for the boiler, and a float mechanism for controlling the valves of the said supply pipes for the tank and boiler, substantially as shown and described.

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