(No Model.) 6 Sheets—Sheet 1.

J. GAMGEE.

SYSTEM OF PRODUCING AND CONTROLLING CURRENTS OF AIR FOR COOLING, WARMING, VENTILATING, &c.

No. 265,256. Patented Oct. 3, 1882.

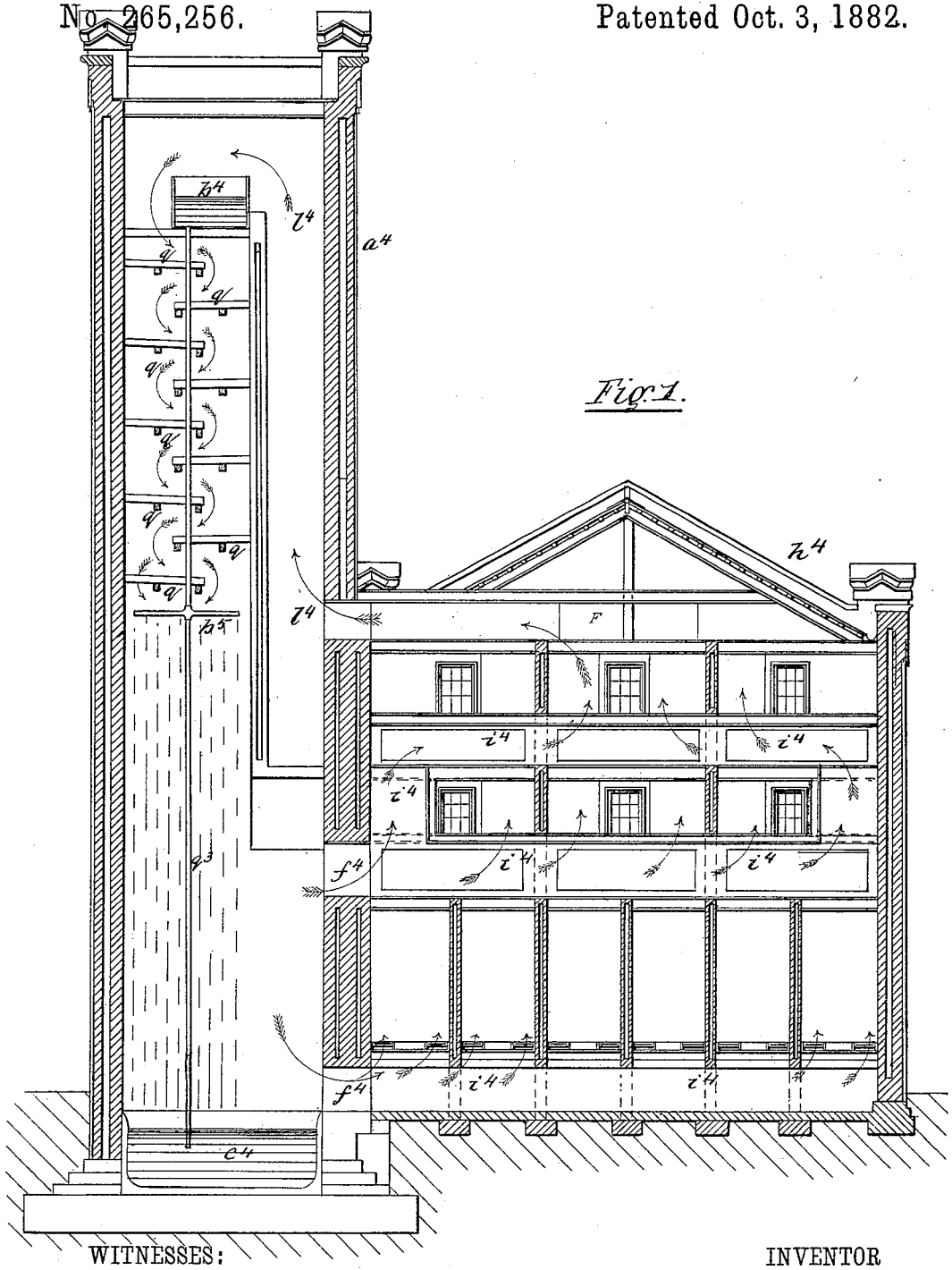

Fig. 1.

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his ATTORNEY

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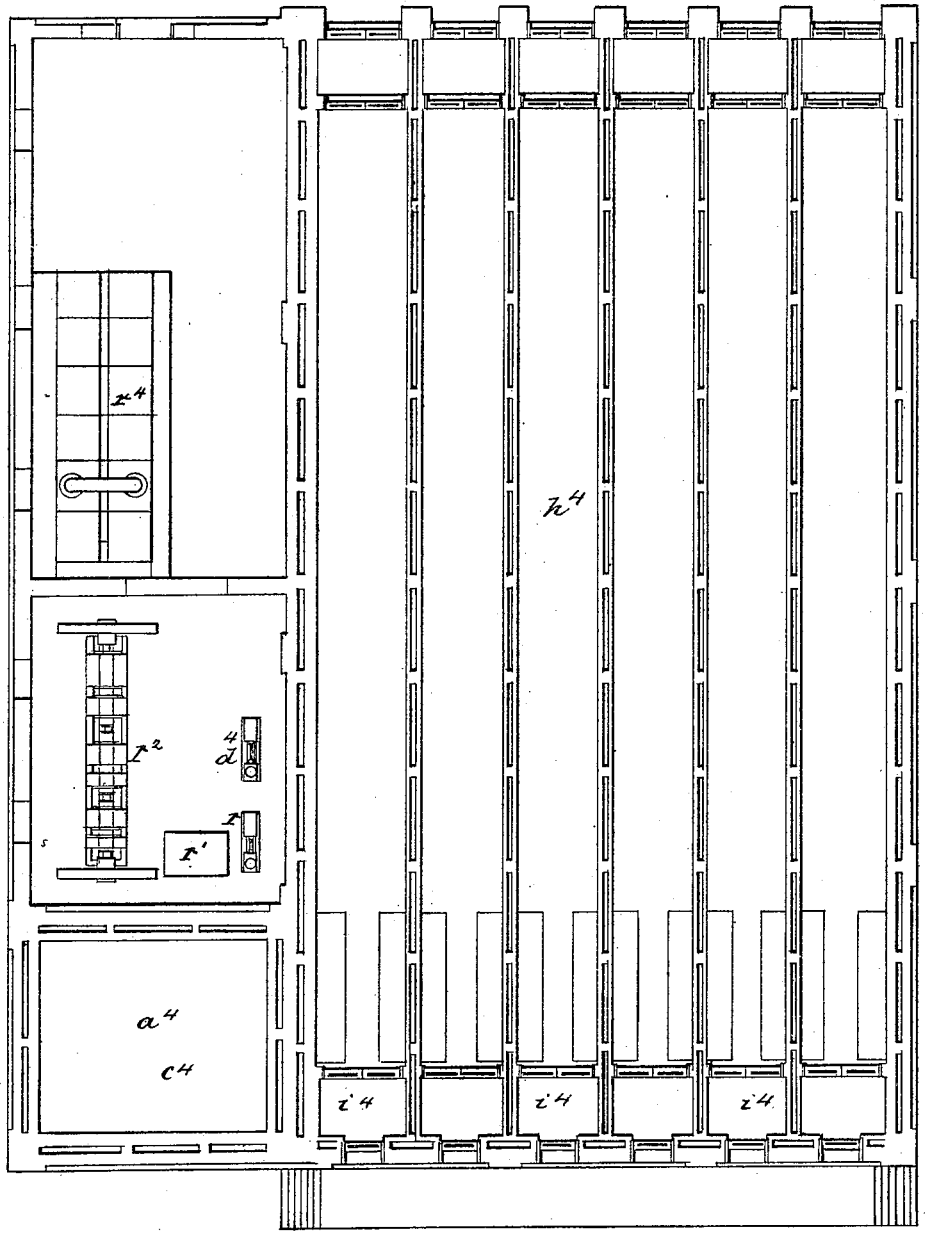
Fig. 2.



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J. GAMGEE.

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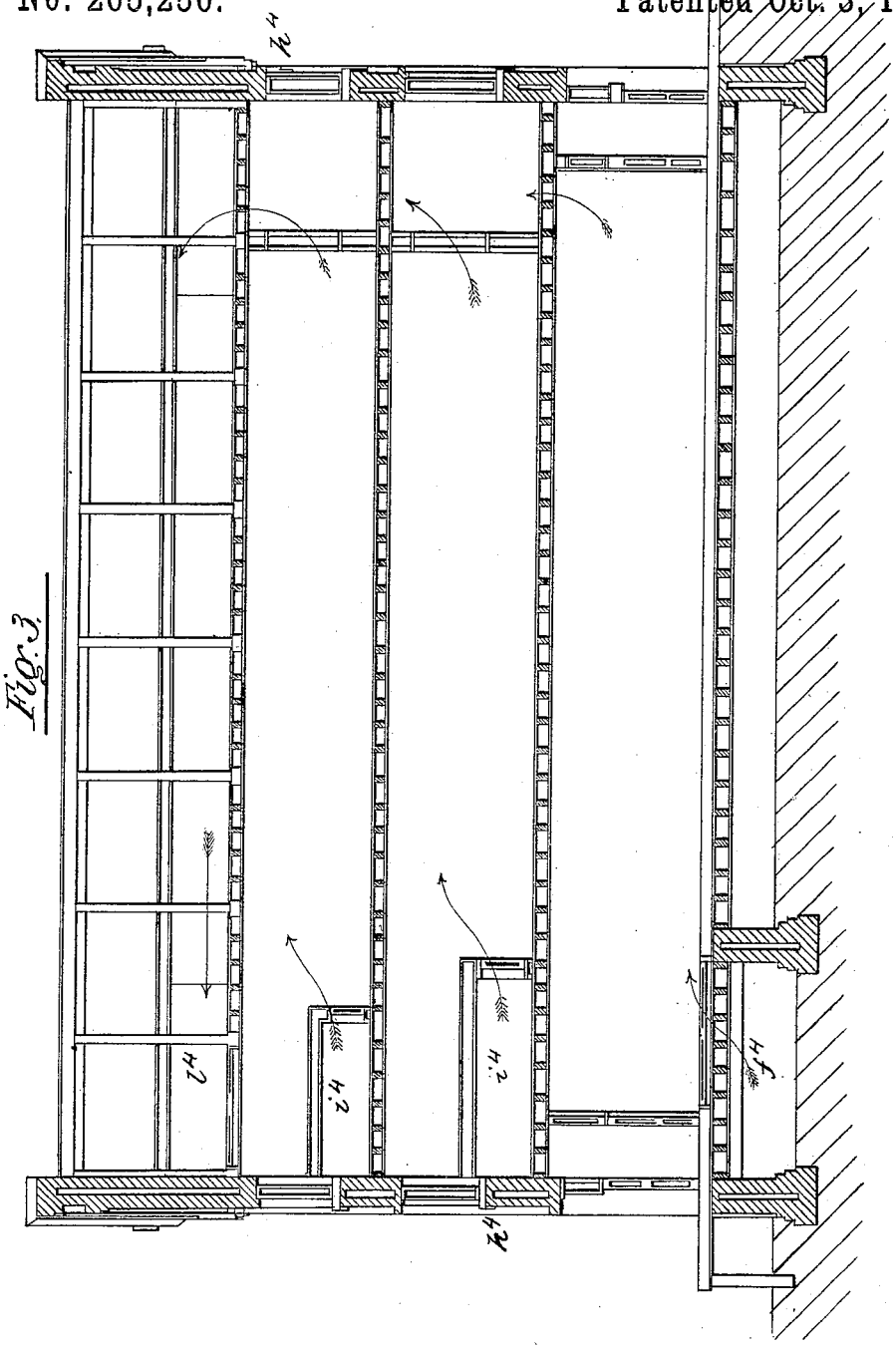

Fig. 3.

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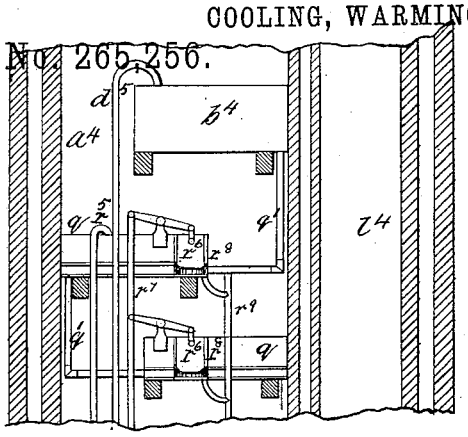
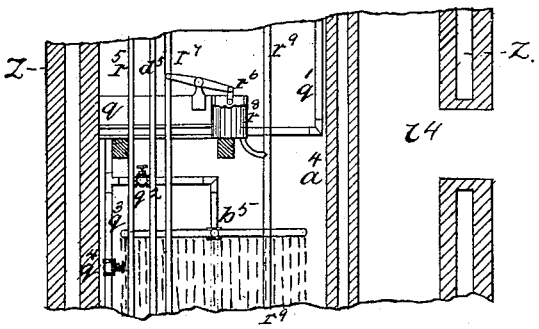


Fig. 4



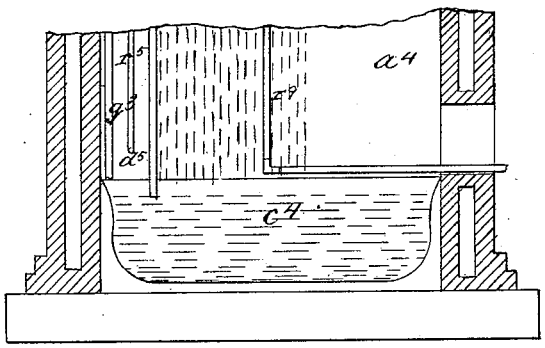
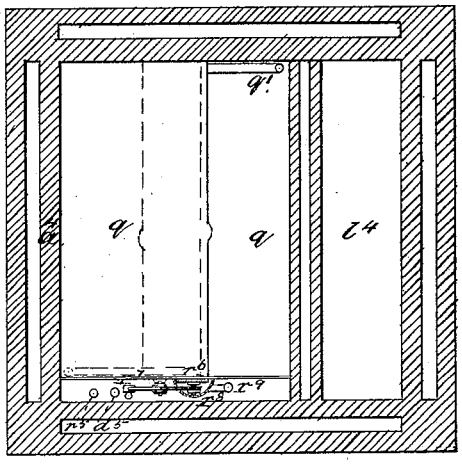


Fig. 5



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SYSTEM OF PRODUCING AND CONTROLLING CURRENTS OF AIR FOR COOLING, WARMING, VENTILATING, &c.

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Fig. 6

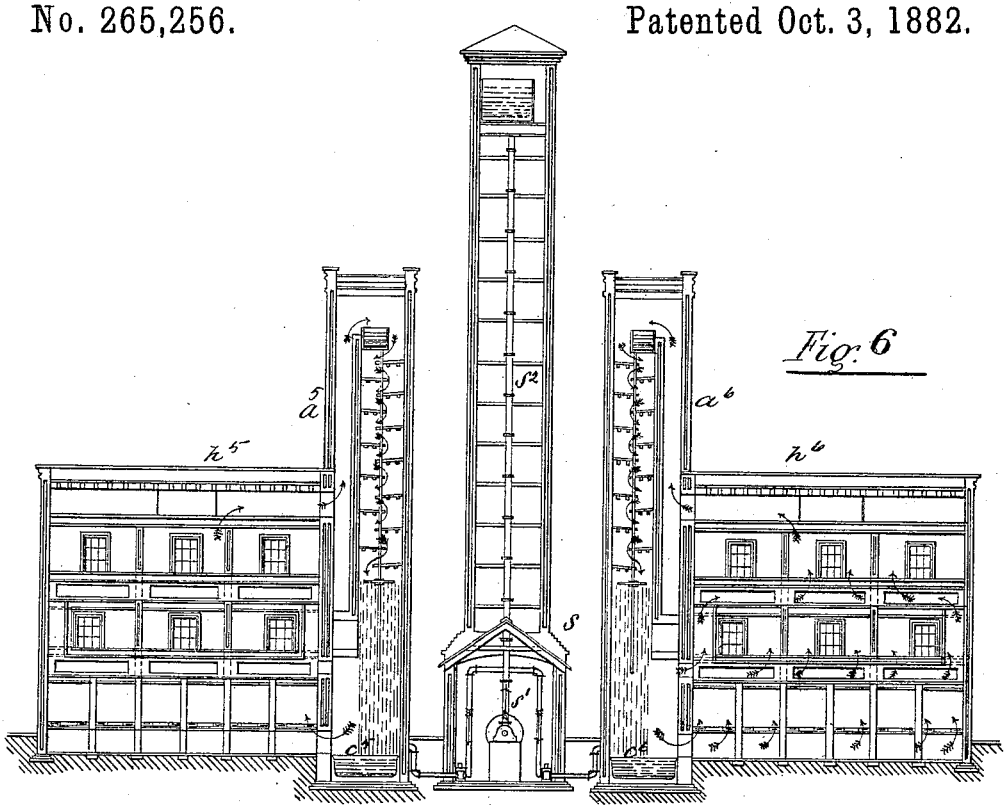
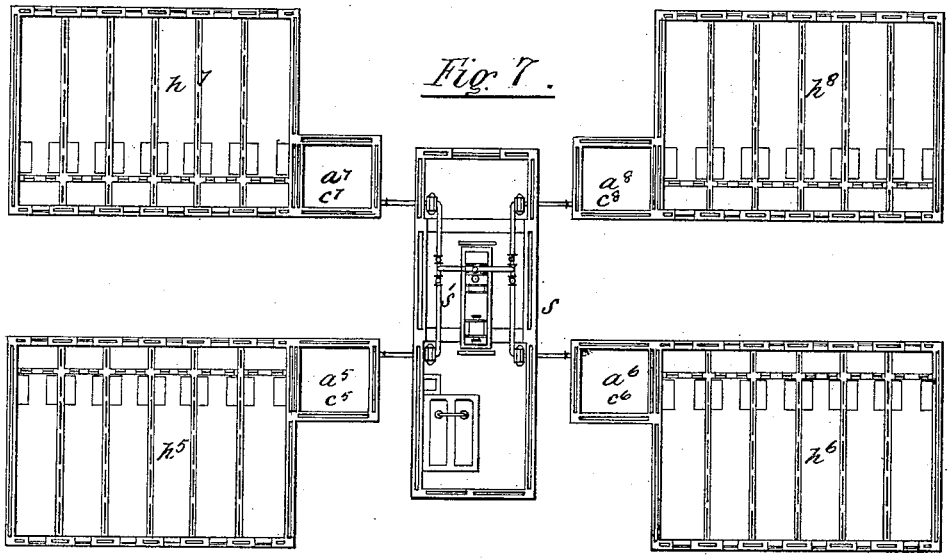


Fig. 7.



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SYSTEM OF PRODUCING AND CONTROLLING CURRENTS OF AIR FOR COOLING, WARMING, VENTILATING, &c.

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Fig. 9

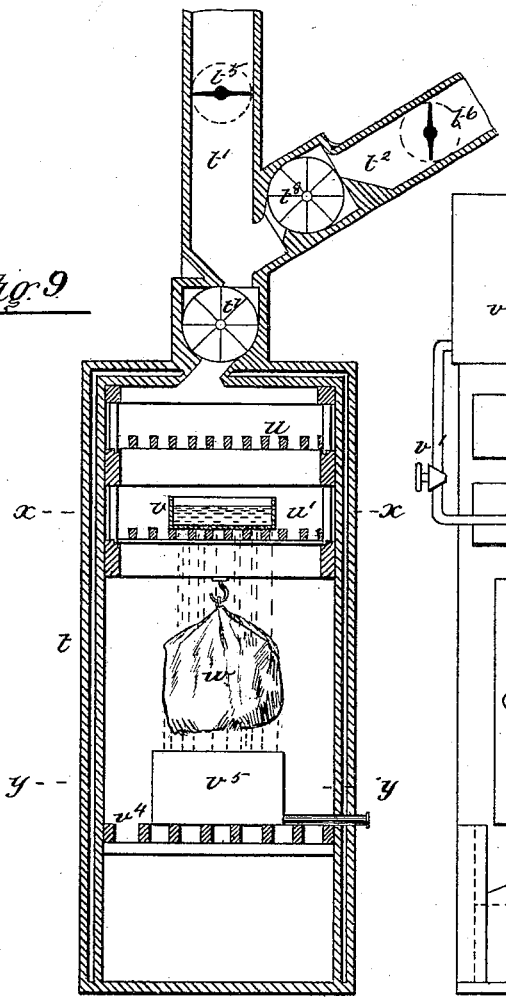


Fig. 8.

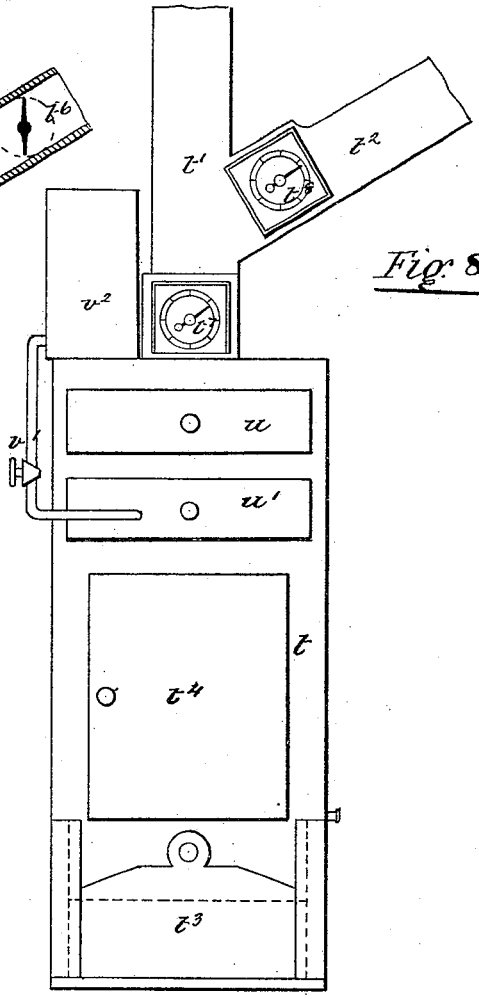


Fig. 10

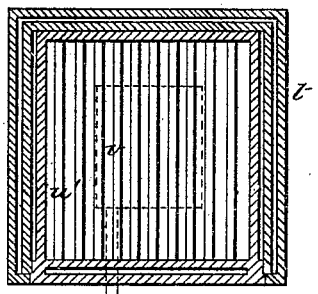
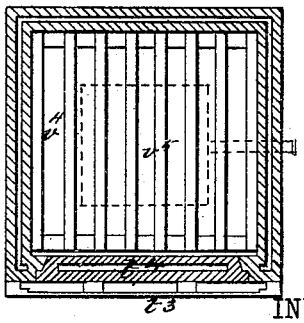


Fig. 11



WITNESSES:

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UNITED STATES PATENT OFFICE.

JOHN GAMGEE, OF LONDON, ENGLAND.

SYSTEM OF PRODUCING AND CONTROLLING CURRENTS OF AIR FOR COOLING, WARMING, VENTILATING, &c.

SPECIFICATION forming part of Letters Patent No. 265,256, dated October 3, 1882.

Application filed January 30, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN GAMGEE, a subject of the Queen of Great Britain, and a resident of London, England, temporarily residing in New York, county and State of New York, have invented certain new and useful Improvements in the Method of and Apparatus for Producing Currents of Air for Ventilating, Cooling, &c., of which the following is a specification.

My improvements are based upon the known fact that currents of air can be produced by means of liquids showered or caused to fall in drops down through an air-shaft. Under my invention I produce currents of air of desired temperature by the action of a liquid falling in showers in a confined space, in combination with suitable devices adapted to change the temperature of said currents after the entrance thereof through the ingress-openings in said tower. When the air is to be cooled the air cooling or refrigerating device is placed in the upper part of the tower or air-shaft above the point from which the liquid is showered, and the air-inlet to such tower is so placed that the air caused to enter therethrough by the action of the falling liquid will be caused to pass over or in contact with the refrigerating device, and will consequently be cooled. This arrangement is advantageous in that the refrigerating device assists the current-inducing action of the showered liquid, and will serve to maintain air-circulation if the fall of the liquid should be checked from any cause. I also make use of the same liquid—as, for instance, chloride solution, or a liquid uncongealable at temperatures obtained by freezing-machines—which is used as the refrigerant or freezing agent in the cooling device to produce the air-currents, for this purpose discharging it in the form of a shower from the cooling device after it has done its work there. Further, I in some instances employ as the liquid to be showered one containing or charged with suitable chlorides or other deodorizing or antiseptic agent in solution, so that the air whose circulation is induced by the falling liquid will by that same liquid be deodorized and purified. This feature is particularly useful in cases—as, for instance, in cold stores or other storage buildings or rooms—where the same is used over and over again, there being, as it were, a closed circuit between the room or building to be ventilated and the air shaft or tower. For the same purpose, in lieu of employing a liquid of the character last above named, I may employ a disinfectant or purifier and screens or other suitable means to exclude dust, infectious matter, or noxious odor, and insure a supply of pure air to the room or building to be ventilated.

The nature of my improvements and the manner in which the same is or may be carried into effect can best be explained and understood by reference to the accompanying drawings, in which—

Figure 1 is a sectional view of a building provided with a cold-air-producing tower having refrigerating-shelves to accumulate ice to be used in combination with the falling liquid. Fig. 2 is a ground plan of the same. Fig. 3 is a longitudinal sectional elevation of the building. Fig. 4 is an enlarged view of the tower shown in Fig. 1, showing somewhat in detail the construction of the refrigerating-shelves and liquid-supply apparatus. Fig. 5 is a transverse sectional view of the same. Fig. 6 illustrates the application of my invention to the cooling of a number of stores from one central supply-tower. Fig. 7 is a plan view of the same. Fig. 8 is an elevation of a portable device embodying my invention, adapted to cool, ventilate, and disinfect rooms. Fig. 9 is a central section of the same. Fig. 10 is a section on line *x x*, Fig. 9. Fig. 11 is a section on line *y y*, Fig. 9.

In order to obtain a convenient cooling device in the tower a^4 of the structure represented in Figs. 1, 2, and 3, I arrange in the upper part of the tower a series of alternating shelves, *q*, provided with false bottoms, through which the refrigerating-liquid is caused to flow from the tank b^4, and to finally be showered from the perforated tray or pipes b^5 into the tank c^4, which is, as in other cases, thoroughly isolated from the ground heat. On the shelves *q* water is placed, which, by the action of the refrigerating-fluid flowing through them, is converted into solid ice, and as the air passes over these shelves its temperature is much re-

duced and moisture extracted therefrom before it is acted on by the falling drops of fluid. The cooled air passes from the tower a^4 through the openings f^4 f^4 and flues or pipes i^4 i^4 to one end of the various floors of the building h^4, and, after passing through the building to its other end, it passes back over the top floor or under the roof to the upshaft l^4, which is here shown as built in one side of the tower a^4, and over the top of this upshaft it again passes down the cooling-tower. The direction of the air is shown by the arrows. The inlet-openings from the flues to the different floors are provided with doors to regulate the quantity of cold air allowed to pass.

In ground plan, Fig. 2, d^4 represents the circulating-pump for forcing the fluid to the top of the tower a^4; r, a pump for operating the ice-machine or refrigerating-machine r' r^2, through which the refrigerating-fluid is passed to extract therefrom the heat taken up by it from the air caused to circulate down the tower. r^4 represents steam-boilers.

Ice will form on the shelves q q from the moisture in the air passing over them; but I prefer to supply them with water, so as to provide them with solid slabs of ice for the purpose of producing a considerable surface of ice, which will aid in maintaining a uniform temperature in the passing air while the refrigerating-liquid is circulating, and when from any cause the flow of the refrigerating-liquid is stopped the ice there so accumulated will serve to continue to some extent the circulation of the air at a low temperature, as by its coming in contact with the ice in the shaft the air will be cooled, and thereby deprived of moisture and become more dense, so as to fall down the shaft and continue displacing the warmer air in the building.

The construction of the refrigerating devices in the tower is clearly shown in the enlarged views, Figs. 4 and 5. The shelves q q are shallow trays having false bottoms, as shown, or each one has a system of radiating pipes arranged in it. The refrigerating-fluid, which is raised into the tank b^4 by the pump through the pipe d^5, flows therefrom successively through the false bottoms of the shelves q q by means of the connecting-pipes q' q', and, after passing through the lowest shelf, it is caused to descend to the bottom of the tower in drops by means of the perforated pipes b^5. The pipe connecting the perforated pipes b^5 to the lowest shelf is provided with a stop-cock, q^2, and is continued by the extension q^3 down the tower to the receiving-tank c^4, and may be continued to the receiving side of the pump. This extension q^3 of the pipe is also provided with the stop-cock q^4. By closing the stop-cock q^2 and opening the stop-cock q^4 the refrigerating-liquid is caused to descend directly into the tank c^4, or to the pump after traversing the shelves q q, without passing through the dropping pipes b^5. The object of this arrangement of pipes and stop-cocks is to afford means for rapidly forming a supply of ice upon the shelves q q when desired, as when the spraying device is stopped the currents of air flowing down the shaft are comparatively feeble and their retarding effects on the formation of the ice proportionally reduced.

r^5 represents a water-pipe, with an exit over the top shelf for the purpose of supplying water to the shelves. The first being filled, the overflow fills the second, and from the second to the third, and so on through the series; and r^6 is a gate or valve formed in the side of each shelf, all being connected to the actuating-rod r^7, by means of which these gates or valves are opened when the supply of the refrigerating-fluid is cut off to allow the water formed on the upper surface of the slabs of ice in the shelves by the action of the air passing over them to flow off as soon as formed, so that an ice-surface is always presented to the downrushing air. To prevent said water and the overflow of water from last shelf when filling them mixing with the refrigerating-fluid in the tank c^4, drip-cups r^8 are provided, which cups are connected to the discharge-pipe r^9.

Any number of separate buildings—as h^5 h^6 h^7 h^8, Figs. 6 and 7—each provided with a tower, a^5 a^6 a^7 a^8, as before described, may be connected to one central supply-station, s, provided with suitable pumping and freezing machinery, s', and a stand-pipe, s^2, up which to or in which at a suitable elevation a liquid is forced or produced to be distributed therefrom to the various separate buildings, as desired. The liquid from the receiving-tank c^5 c^6 c^7 c^8 of the respective buildings flows back to the pumping machinery s' of the central station, to be used over and over again.

The application of my improved system of ventilating, cooling, deodorizing, and disinfecting may be made to a portable device adapted to be placed in any compartment of buildings or wards of hospitals. Such device is represented at Figs. 8, 9, 10, and 11, consisting of a high box, t, having an inlet-pipe, with two branches, t' and t^2, at its upper end and an exit at its lower end, provided with the adjustable door t^3. In the upper part of the box are fitted the two drawers u and u', with slatted or perforated bottoms. The top drawer, u, is for the reception of a disinfectant, an antiseptic, or deodorizer, and the drawer u' is designed to hold a perforated water-tank, v, connected by the pipe v' to the outside tank, v^2. In Fig. 11 said tank is shown by dotted lines. A tank, v^5, also shown by dotted lines in Fig. 11, rests on slats v^4, near the bottom of the box, and receives the water dropped from tank v or the drippings from the bag of ice, w, suspended in the center of the box, or from both.

t^4 is a door by which the interior of the box is reached for removing and replacing the bag of ice w, and for cleaning the box, &c.

The dropping tray v and bag of ice w may be used together or separately, as desired.

One of the branches of the inlet-pipe—as, for instance, the one t'—may be arranged to receive air from the outside of the building, and

the other one, t^2, opens into the room in which the apparatus is placed. They are respectively provided with a valve, t^5 and t^6, for the purpose of regulating the supply of outside air and the amount of confined air of the room to be passed through to be cooled, &c., and may be further respectively provided with a light fan and registering device, t^7 t^8, to indicate the volume of air passing into the apparatus from either source.

It is evident that for certain purposes the atmospheric air used in the closed-circuit system may be mixed with other gases, or other gases may be used to the exclusion of the atmospheric air; and other liquids than those named—such as chloride or other antiseptic or disinfectant solutions—may be showered down the shaft to create the currents, and at the same time to deodorize or purify the air.

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

1. The combination, with a building provided with suitable air-conduits, of a tower connected therewith, provided with means for producing ice in the upper part thereof, and for producing and maintaining a downward current of air through the same by the falling of a liquid in showers therein, and with openings connecting the interior of the tower with the conduits of the building for the ingress and egress of the air, and constructed to operate substantially as described.

2. In combination, a tower provided with an ingress-opening at its upper part and egress-openings at its lower part, a building connected thereto by said ingress and egress openings, a series of refrigerating-shelves located in the upper part of said tower and adapted to hold water to be frozen, and a spraying or showering device located beneath the bottom refrigerating-shelf and connected thereto, adapted to shower the refrigerant liquid to the bottom of the shaft after it has passed through the refrigerating-shelves, as and for the purpose set forth.

3. In combination, the shelves q q, tank b^4, connecting-pipes q' q', water-supply pipe r^5, and tower a^4, substantially as and for the purpose set forth.

4. In combination, the shelves q q, tank b^4, connecting-pipes q' q', water-supply pipe r^5, showering device b^5, and tower a^4, substantially as and for the purpose set forth.

5. In combination, the shelves q q, tank b^4, connecting-pipes q' q', water-supply pipe r^5, showering device b^5, pipe q^3, and tower a^4, substantially as and for the purpose set forth.

6. The refrigerating-shelves q q, located in the upper part of the tower a^4, adapted to hold water, and provided with discharge gates or valves r^6, and drip-cups r^8, and pipe r^9, in combination, substantially as and for the purpose set forth.

7. The method of producing currents of air of any desired temperature by the action of a liquid falling in showers in a tower or confined space, in connection with devices adapted to change the temperature of the said currents after the entrance thereof into said tower, substantially as set forth.

8. In the method of producing currents of air by means of liquids showered or caused to fall in drops down through a tower or confined space, the employment of liquids containing in solution or charged with deodorizing or antiseptic agents, whereby the air whose circulation is induced by said falling liquid will by that same liquid be deodorized or purified, substantially as hereinbefore set forth.

9. In the hereinbefore-described system of ventilating and cooling, the application and use, as both the refrigerating and the air-current-producing agent, of a refrigerating-liquid such as employed in freezing or ice machines, which first exercises refrigerating action upon a cooling or ice-making device, and then is showered or caused to fall in drops through the tower or other confined space, substantially as hereinbefore set forth.

In witness whereof I have hereunto set my hand, at New York, county and State of New York, this 28th day of January, A. D. 1882.

JOHN GAMGEE.

In presence of—
JAMES A. HUDSON,
WALTER LARGE.