D. E. SOMES.

Cooling and Ventilating Buildings.

No. 46,596. Patented Feb. 28, 1865.

Fig. 1.

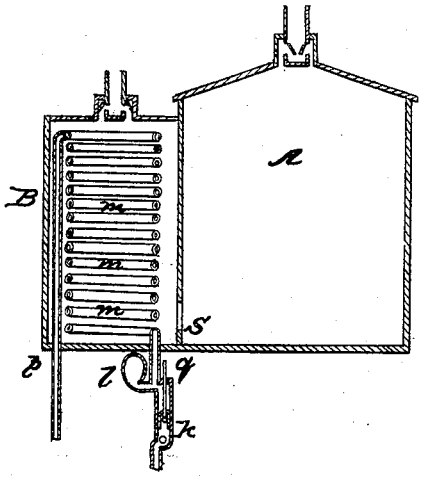


Fig. 2.

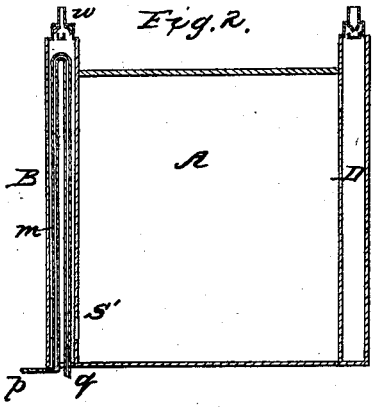


Fig. 3.

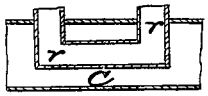


Fig. 4.

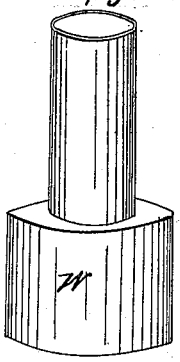


Fig. 5.

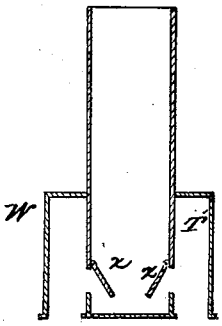


Fig. 6.

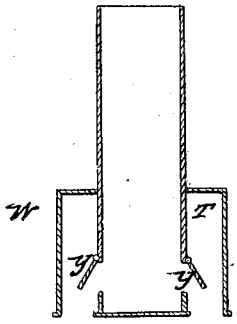


Fig. 8.

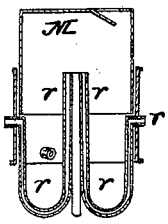


Fig. 7.

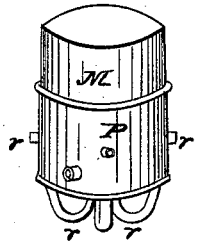
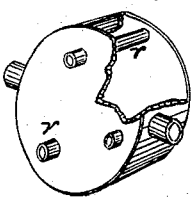


Fig. 9.



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UNITED STATES PATENT OFFICE.

DANIEL E. SOMES, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVED MODE OF COOLING AND VENTILATING DWELLINGS, CHURCHES, HOSPITALS, THEATERS, AND OTHER BUILDINGS.

Specification forming part of Letters Patent No. **46,596**, dated February 28, 1865.

To all whom it may concern:

Be it known that I, DANIEL E. SOMES, of the city of Washington, in the District of Columbia, have invented a new and useful Mode of Cooling and Ventilating Dwellings, Churches, Hospitals, Theaters, and other Buildings; and I hereby declare that the following is a full and exact description of the same, reference being had to the annexed drawings, making a part of this specification.

The nature of my invention consists in equalizing and lowering the temperature of the air in dwellings, churches, hospitals, and other buildings, so as to keep it as near as desirable to the mean annual temperature of the place where the building may be situated.

My invention also consists in certain arrangements and combinations of devices for the purpose of cooling the air to be introduced into buildings by means of the cooling-power of the earth at certain depths below the surface, and also in devices for introducing cold and fresh air into buildings and for removing warm and foul air from buildings, so as to effect both the cooling and ventilating of all the various kinds of buildings occupied by men and other animals.

It is well known that, except in the tropics, the mean annual temperature is not so high as to be disagreeable or oppressive to man or to any of the warm-blooded animals. The heat becomes oppressive only because it is not evenly distributed over the entire year. Thus the mean annual temperature of Boston, Massachusetts, is about 50° Fahrenheit, that of New York City, Philadelphia, and Cincinnati is about 53° Fahrenheit, and that of Washington city is about 55 Fahrenheit. At places farther south it is generally higher, but nearly the whole of the United States is embraced between 45° Fahrenheit and 65° Fahrenheit of mean annual temperature. It is also well known that at a comparatively short distance below the surface of the earth the temperature is nearly constant throughout the year, and is nearly the same as the mean annual temperature of the place; hence it is that the temperature of well water is nearly the same the year round, and is about the mean annual temperature of the place. No exact rule can be given for the depth below the surface at which the mean annual temperature will be found, as it varies some with the latitude of the place, and also with the nature of the soil; but at depths of from thirty to fifty feet below the surface the temperature will be generally found to vary but slightly during the year. At less depths a low and quite constant temperature will often be found, as is well known. Water placed in the earth, or in vessels made of good conducting materials and surrounded by moist earth, will soon acquire the same temperature as the earth, and if this is of sufficient depth below the surface of the earth the temperature will be the mean annual temperature of the place.

Now, my invention consists in using the low temperature which exists below the surface of the earth to cool the air in buildings, and this I accomplish by a current of water, which is made first to descend to the cooler regions below the surface of the earth, and then to ascend and cool the air, either in the building to be cooled or in a separate air-cooling chamber or refrigerator, from which it may be passed into the building to be cooled.

The following descriptions and illustrations will enable others to make and use my invention.

In the drawings, Figure 1 shows a vertical sectional elevation of a house with my invention applied for cooling the air and ventilating. Fig. 2 is a similar view of another mode of applying my invention. Fig. 3 is a mode of cooling air in water-pipes, and Figs. 4 and 5 show a means of forcing air into buildings and cooling it at the same time. Figs. 6, 7, and 8 show devices for admitting air into and out of buildings, the same device being shown on a smaller scale in Figs. 1 and 2. Fig. 9 shows the mode of cooling the air which is to be forced into buildings by the apparatus shown in Figs. 4 and 5, or other equivalent means.

The same letters denote the same or equivalent parts in all the figures.

In cities and places where there is a system of water-supply which may be made to rise into the refrigerating-pipes the following is a convenient mode of using my invention: The water-pipes passing near the building to be cooled are first made to descend to a depth below the surface sufficient to give the water the required low temperature. In order that the water may be thoroughly cooled, it is nec-

essary to have the pipes traverse a considerable distance at the cold point, which may be accomplished most conveniently by a system of coiled or zigzag pipes, or one or more reservoirs may be employed, the descending water being made to enter at the top or upper part of the reservoir and to leave near the bottom or lower part of the reservoir. The water, having been cooled by remaining in the subterranean reservoir or passing through pipes lying deep in the earth, is conveyed through pipes in the building to be cooled or through a system of pipes or conduits in a separate chamber or refrigerator. In the drawings, B, Fig. 1. shows such a refrigerating-chamber. The air enters by valves, which open inward, as shown in Fig. 6, at the top of the chamber or building, and in passing through among the tubes *m* is cooled and falls into the building. The foul and warm air in the building is conveyed off by any suitable mode of ventilation. As it is warmer than the external air, it may be made to rise through shafts, and when the natural draft is not sufficient it may be forced by air-blowing machinery, or by jets of gas burning in the ventilating shafts or flues, or other mode of heating the air in the flues. The ventilating-shafts should have valves opening outward, as shown in Fig. 5.

When water cannot be obtained from waterworks or abundant-flowing springs with sufficient head to rise into the refrigerating-pipes, I construct my cooling apparatus in the following manner: Reservoirs or pipes are constructed in the earth or in a well, and also a series of pipes or channels in the building to be cooled or in a separate air-refrigerator. These two systems are connected so that the water in them may be made to circulate through both systems.

In the drawings, Figs. 1 and 2 illustrate the mode of cooling the air in buildings. The water in the lower system of pipes is made to circulate entirely through the system of air-cooling pipes. Only a small expenditure of force is necessary to cause a circulation, since the ascending and descending columns of water nearly balance each other, and, in addition, there is only the friction of the water in flowing through the pipes to be overcome. If the cold water were in the upper pipes and the warm water in the lower, this circulation would be spontaneous, as in the well-known water-back and reservoir in kitchen-ranges; but since the cold water from the lower pipes must be made to rise into the upper pipes and the warmer to descend, some force is necessary to cause a circulation. This force may be applied by means of a simple vibrating piston, as shown at *k* in Fig. 1. A rotary pump may be employed to cause a circulation, or a propeller-screw at any point of the circulation may be used to move the water through the pipes, so as to bring the water from the lower to the upper pipes. Air-vessels, as usually attached to pumps, should be fixed in the pipes at one or more places, as shown at *l*, Fig. 1, so as to prevent the bursting of the pipes by any sudden check or force exerted upon the flowing of the water, and also to allow for any expansion and contraction of the volume of the water. In this mode of applying my invention the same water is used over and over again. It is cooled in the lower system of pipes, (not shown in the drawings,) is made to rise into the air-refrigerating room or building, where by cooling the air its temperature is raised, and then it passes down into the lower tubes, to be again cooled, and it is then ready to ascend and cool more air.

In the mode of cooling as first above described—that is, where the water cooling and air cooling systems are connected with main water-pipes—no machinery is necessary to keep up the circulation.

Fig. 2 shows a mode of cooling and ventilating by placing the cold-water pipes or channels in the walls of the buildings in a flue or hollow space, with room for the air cooled therein to descend into the building by openings, and also placing in other parts of the walls ventilating flues or shafts.

By the arrangements shown in Figs. 1 and 2 the air is cooled either in the separate apartment B or in the flues B in the walls of the building. The cold water for the pipes *m* is brought from the subterranean coolers by the pipes *q*. The air as it is cooled falls by its own weight into the building by the opening S′, at which should be a suitable register or valve.

The warm or foul air is removed from the building by means of ventilators at the top, as shown in Fig. 1, or by the ventilating-shaft D. In this shaft may be placed any heating devices or other contrivance to assist the draft; or where rapid and certain draft is necessary it may be effected by any suitable blowing apparatus, such as bellows, fan-wheels, air-pumps, or other means.

In Figs. 7 and 8 is shown a means of causing a blast, and at the same time cooling the air. M is a vessel, similar to a gas-holder, with its lower edge dipping into the water. The pipes *r* rise above the surface of the water. In the top of M is a large valve, opening inward, so as to admit air when M is raised. The pressure of M, weighted, if necessary, will force air to descend the tubes *r*, which are carried deep into the earth or into cold water at any depth, or these pipes *r* may be carried through the water-pipes lying deep in the earth, as shown in Fig. 3, or through a water-vessel such as shown in Fig. 9. By these means the air is cooled, so that as it rises in the other part of the pipe *r* it may be conveyed into buildings, as described. This process therefore consists in carrying the air in pipes down through water or into the cold earth, as explained in my patent dated September 13, 1864. The cooling effect of the air will, however, be greater if it is condensed in the pipes *r* or in suitable reservoirs, and after it has acquired the temperature of the medium

surrounding the pipes r or of the reservoir into which it has been compressed it is then released and permitted to expand. The temperature will thereby be greatly lowered, as is well known. By this means air may be obtained of almost any degree of coldness, even below the freezing-point of water, and the same principle has been employed for the manufacture of ice.

For the purpose of aiding the entrance of air in the device shown in Fig. 6 the space I′ may be filled with water-pipes or a reservoir connected with subterranean coolers, as explained in reference to the pipes in apartment B.

I have thus explained the several principles of my invention and the modes in which I propose to apply them in the cooling and ventilating of buildings.

I have not specified many of the mechanical details required in constructing buildings with my invention, nor those necessary in applying it to buildings already constructed, since these are matters well understood by architects and builders skilled in their professions. Many of these details must vary with the practical purpose for which the building is intended. In dwellings either of the plans shown in the drawings will answer. In chambers, halls, and hospitals, where a large amount of air must be rapidly changed, all the methods explained may be employed in the same building.

In applying my invention to theaters and opera-houses, the unoccupied spaces and lobbies usual in such buildings will furnish abundant space for the air-cooling apparatus constructed according to my invention. The towers, galleries, vestibules, and other parts of churches may serve for containing the cooling apparatus, or special apartments may be constructed for the purpose. The subterranean coolers may be immediately under or by the building, or at some considerable distance off, and connected by pipes. In iron buildings the channels for containing the cold water may be formed in the walls and partitions of the buildings.

It is obvious that in cold weather my system of cooling buildings becomes a mode of warming, for the temperature of the subterranean coolers being nearly constant throughout the year, in winter they will be warmer than the air at the earth's surface, and water from the surface passing through them will have its temperature raised, so that in winter my invention is available to some extent as a means of warming buildings. By still further warming the water by means of steam, a furnace, or other means of heating, which flows through the apparatus, all the devices as above described as coolers may be employed as apparatus for warming buildings.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. Cooling and ventilating dwellings, chambers, hospitals, theaters, and other buildings, substantially as herein set forth and described.

2. The combination of a system of subterranean pipes, tanks, or reservoirs with a corresponding system of pipes, channels, reservoirs, or their equivalents, in or near the building to be cooled, so as to cool and ventilate, substantially as described.

3. Cooling air by conducting it through or around water-pipes, or compressing it in pipes, tanks, or reservoirs in contact with any cooling medium, and then permitting it to expand, so as to cool and ventilate buildings, substantially as described.

4. Cooling and equalizing the temperature of buildings by means of a refrigerating chamber or chambers, with water-pipes or their equivalent, for conveying a current of water, in combination with suitable devices and apparatus for cooling the water, all substantially as set forth.

5. Cooling buildings by means of pipes or other channels for water placed in the walls, between two walls, or in the buildings to be cooled, and connected with a subterranean refrigerating apparatus, as set forth and described.

6. Combining with the devices herein described for equalizing the temperature of the earth below its surface devices for heating or warming such water, so as in cold weather to warm buildings, constructed substantially as herein set forth and described.

7. The construction of iron buildings with tubes, channels, or spaces in the walls, in combination with cooling and warming apparatus, constructed substantially as herein set forth and described.

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