No. 774,811. PATENTED NOV. 15, 1904.

J. C. WITTER.

AIR REFRIGERATING DEVICE.

APPLICATION FILED OCT. 19, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

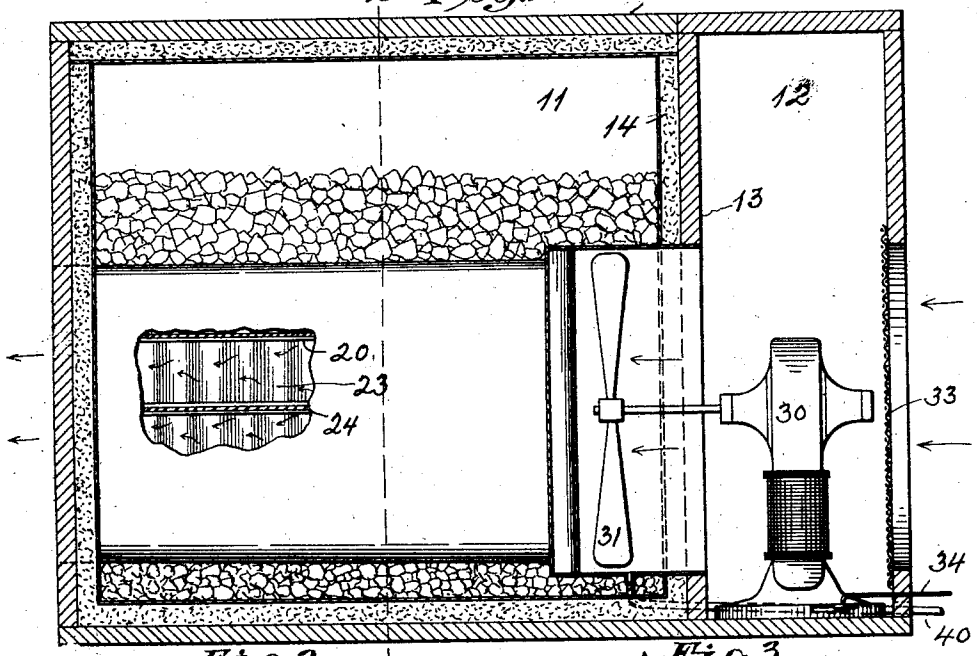



Fig. 2.

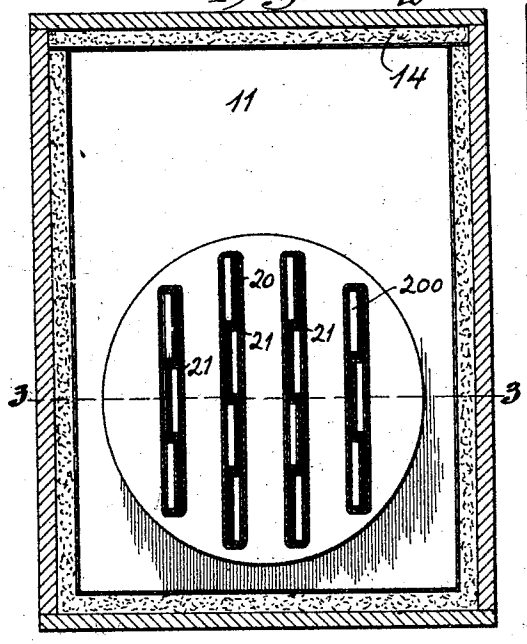



Fig. 3.

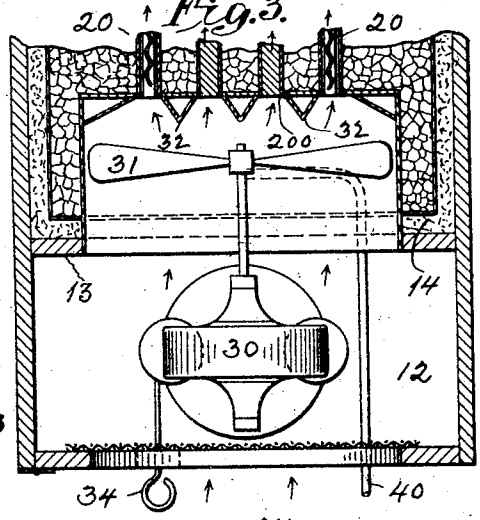
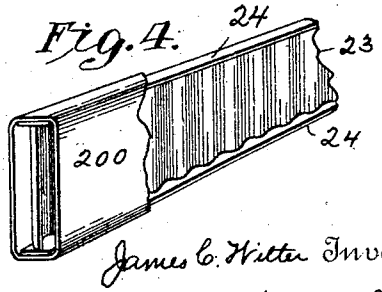



Fig. 4.




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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 5

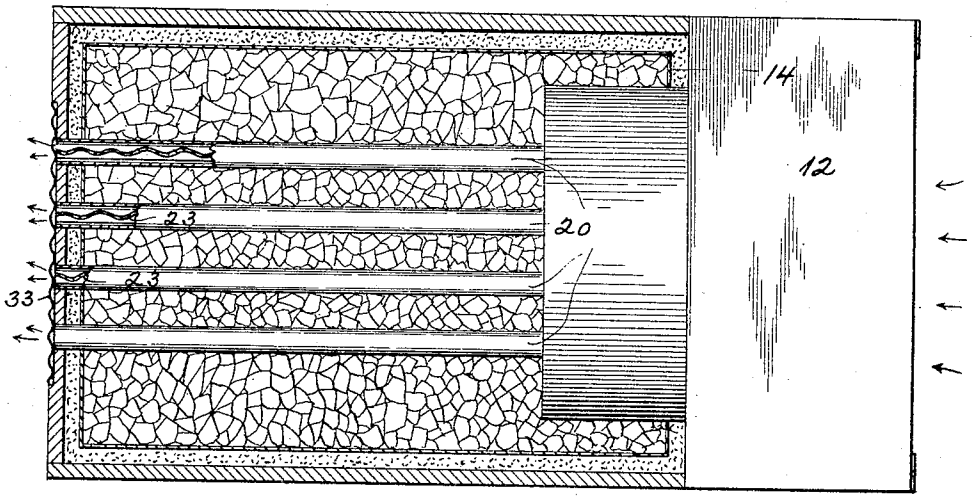



Fig. 6

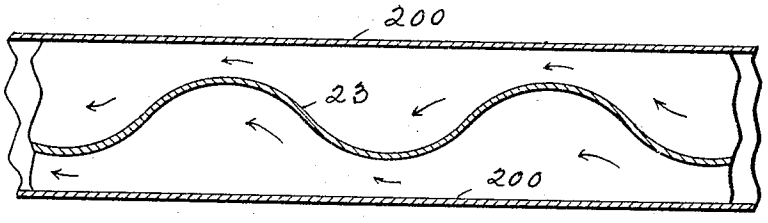
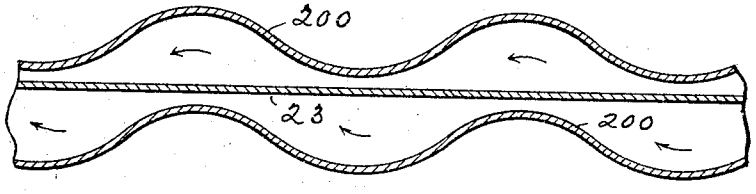



Fig. 7




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No. 774,811. Patented November 15, 1904.

# UNITED STATES PATENT OFFICE.

JAMES C. WITTER, OF NEW YORK, N. Y.

## AIR-REFRIGERATING DEVICE.

SPECIFICATION forming part of Letters Patent No. 774,811, dated November 15, 1904.

Application filed October 19, 1903. Serial No. 177,522. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES C. WITTER, a citizen of the United States, and a resident of the borough of Manhattan, city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Air-Refrigerating Devices, of which the following is a specification.

My invention relates to apparatus for cooling the air in rooms and the like, and its novelty consists in the construction and adaptation of the parts.

The apparatus consists, first, of a vessel adapted to hold refrigerating material or other refrigerating means; second, of a system of pipes or conduits placed within the vessel and which pipes or conduits communicate with the outer air and are adapted to be cooled by the refrigerating material spoken of; third, means for passing a current of air through the pipes or conduits, and, fourth, means for alternately expanding and compressing, and thus delaying or retarding, the current of air in its passage through the pipes. There are also certain attachments and adjuncts which are valuable in connection with the elements mentioned, but which form no part of my invention.

There has long been needed a simple and cheap contrivance for cooling air in the heat of summer similar in size and convenience to an ordinary household stove employed for the opposite purpose in winter. Many attempts have been made to supply this want; but, so far as known to me, they have not been practical or successful. There are some fundamental necessities which must be complied with. The apparatus must be portable and handy. It must be simple and uncomplicated. It must be relatively small and measurably efficient to effect the desired results within the range of ordinary temperatures. It is easy enough to cool air by forcing it through long straight pipes immersed in a refrigerating material. Such an apparatus is too large and too clumsy. It would naturally be thought that the size of the apparatus could be reduced by coiling the pipe. It requires, however, a relatively large amount of energy to force air through a coiled pipe, which in practice is prohibitive. If, however, the air-conduits could be made comparatively straight and yet short and the air delayed in its passage through them a sufficient length of time to become properly chilled, the problem would be solved. Having in view these conditions, I attempted to delay the passage of the air through such conduits by different kinds of obstructors and baffle-plates; but I discovered that these were inefficient unless the air was permitted to flow past surfaces having easy curves and free from abrupt angles or corners. Otherwise the pipes would choke and the air would not be delivered in sufficient quantity.

The apparatus which I have made and which forms the subject-matter of this application for Letters Patent is based upon the principles referred to, and by its use I have secured surprising results.

In the drawings, Figure 1 is a vertical longitudinal medial section through a preferred form of my apparatus, showing the fan and motor in elevation, a part of the wall of the refrigerating-chamber being broken away to show the concealed parts back of it. Fig. 2 is a vertical transverse section of the same on the plane of the line 2 2 in Fig. 1. Fig. 3 is a partial horizontal section on the plane of the line 3 3 in Fig. 2 and a plan view of certain of the parts. Fig. 4 is an enlarged detail in perspective of a part of one of the air-tubes and its retarding-plate. Fig. 5 is a view similar to Fig. 3, but extending the length of the apparatus. Fig. 6 is an enlarged horizontal section of one of the air-tubes and its retarding-plate. Fig. 7 is a view similar to Fig. 6 of a modified form of such air-tube and plate.

In the drawings, 10 is a box or a vessel made of any suitable size and material and divided longitudinally into two compartments 11 and 12 by means of a partition 13. The walls of the compartment 11 are preferably provided with a lining 14, of non-conducting material. In the lower part of this compartment 11 there is arranged a system of air

pipes or conduits 20, which communicate front and rear with the outer air through suitable openings formed in the walls of the compartment.

The conduits 20 are divided by horizontal partitions 21 into tubes 200, within which is placed a retarding-plate. This plate consists of a long fluted or corrugated undulated sheet of material 23 and is provided along its edges with stiffening-ribs 24, which serve as guides when inserting the plates within the tubes. The flutings or corrugations of the plates 23 are made in relatively long easy curves, while at the same time they extend in their outward curves sufficiently close to the walls of the tubes and sufficiently distant from the medial longitudinal axes of the tubes to alternately expand and compress and effectually to prevent the really free passage of the air. Within the compartment 12 is placed a small motor 30 of any ordinary form, and mounted upon its shaft is a propeller-fan 31, the rotation of which serves either to drive the air from the fan through the pipes or to suck it through the pipes toward the fan. Guides 32 serve to direct the air into the tubes 200. A screen or air-sieve 33 is placed in front of the motor, and a similar sieve may be placed at the outlet end of the apparatus, if desired. The starting-lever 34 of the motor is extended outside of the wall of the apparatus, so that it may be actuated without opening the apparatus.

The mode of using the apparatus is as follows: The conduits 20, which may be arranged in a suitable framework, are placed within the compartment 11, and the latter is filled with ice and salt or any similar suitable refrigerating material surrounding them. The fan is then actuated by the motor and the air is forced through the tubes 200 in whichever direction may be desired. It would pass freely through the tubes were it not for the retarding-plates contained therein. In the form of plate illustrated in Fig. 6, and which form I prefer, it will readily be seen that there are formed in the tubes on each side of the plate alternating chambers of somewhat-extended capacity, connected with each other by means of contracted passages, the chambers and passages each having one straight side and one side formed in long easy curves, so that the current of air while being forced through the narrow passages is compressed by reason of their limited capacity, but is permitted to expand when it reaches the chambers, the compression again taking place at the next contracted passage, and so on until the air is discharged from the end of the tubes. Owing to the construction of these chambers, each with a straight side and with a side formed of long easy curves, flutes, or corrugations, and the entire absence therein of any abrupt partitions or baffle-plates, the air while being permitted to expand in the chambers and being contracted or compressed while passing through the narrow passages is retarded and kept in contact with the cool surface sufficiently long to decidedly lower its temperature. It is at the same time permitted to pass easily into and out of the chambers and through the passages and is not choked up, as I have found to be the case in many forms with which I have experimented, said choking often occurring to such an extent as to destroy the utility of the device for its intended purposes. I have found by actual experiment that while tubes constructed as hereinabove described will permit the passage of air in sufficient quantities to be effective for the purposes intended, with the use of an ordinary electric fan such a fan will not force sufficient air through the tubes containing angular or abrupt partitions or baffle-plates to render the device practical.

In Fig. 7 I have illustrated a modified form of the air-tubes, in which the walls of the tube are corrugated and the retarding-plate is straight. This is obviously a complete equivalent of the form shown in Fig. 6. A drainage-pipe 40 serves to convey away any water within the fan-compartment, and a similar drainage-pipe (not shown) may be connected to the bottom of the refrigerating-chamber.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. An air-tube provided with a longitudinal partition fluted or corrugated in long gradual easy curves, said partition having along its edges stiffening-ribs which strengthen it and serve as guides when inserting the partition in the tube.

2. An air-cooling apparatus for rooms, comprising a plurality of air-passages each provided with one substantially straight side or wall and one wall corrugated or fluted with long gradual easy curves, means for driving the air through said passages, and means for refrigerating the walls of said passages.

3. An air-cooling apparatus for rooms, comprising a plurality of substantially straight air-tubes connecting with the outer air, means for refrigerating the tubes, means for forcing air through the tubes, and means for retarding the passage of the air, consisting of a longitudinal partition of undulating form in each tube, the undulations being in long gradual easy curves from end to end of the tube.

4. An air-cooling apparatus for rooms comprising a box or casing for the reception of refrigerating material, a chamber adjacent thereto, a fan located in said chamber, a plurality of air-tubes passing through the refrigerating-chamber and connecting the fan-chamber with the open air at the opposite end of the refrigerating-chamber, each of said air-

tubes being substantially straight and being provided with an inner longitudinal partition of undulating form, the undulations of which are in long gradual easy curves, and means for operating the fan to force a current of air through the tubes.

Witness my hand this 17th day of October, 1903, at the city of New York, in the county and State of New York.

JAMES C. WITTER.

Witnesses:
HERMAN MEYER,
BARTLETT J. SMITH.