May 31, 1932. H. P. GANT 1,860,357

APPARATUS FOR COOLING AIR

Filed Aug. 8, 1928

Fig. 1.

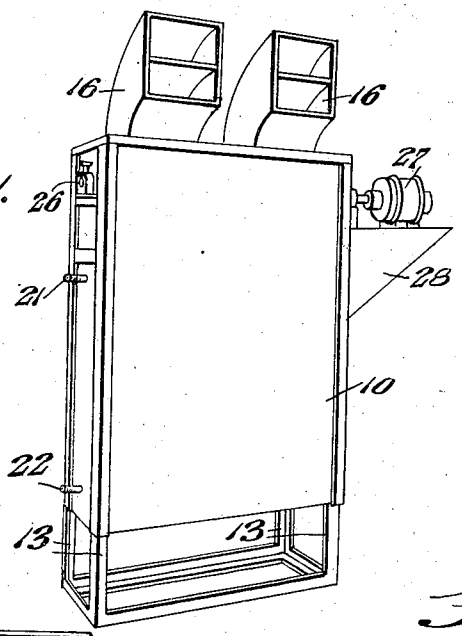


Fig. 2.

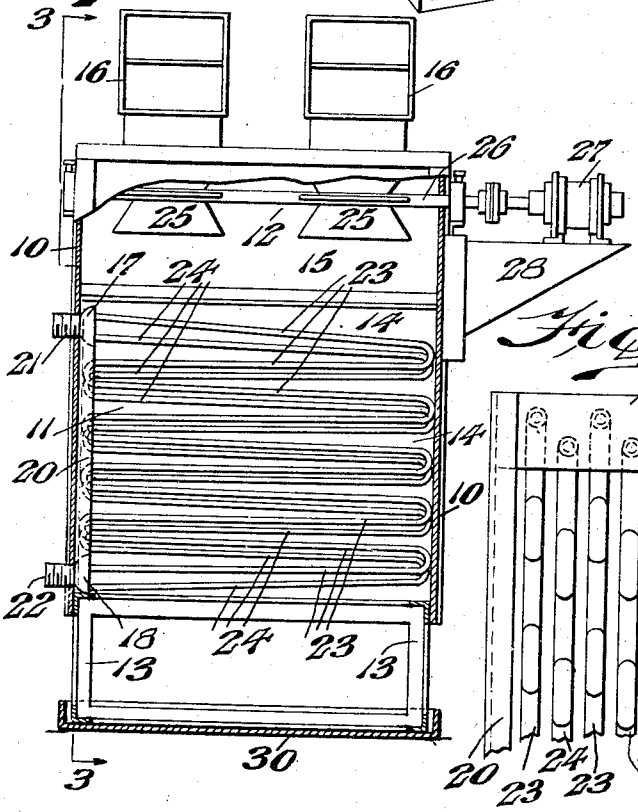


Fig. 3.

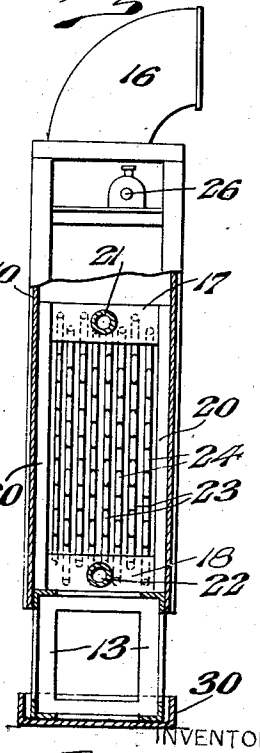


Fig. 4.

INVENTOR:
Harris Paul Gant,
BY Robert M. Barr.
ATTORNEY.

Patented May 31, 1932 1,860,357

UNITED STATES PATENT OFFICE

HARRIS PAUL GANT, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CARRIER RESEARCH CORPORATION, OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY

APPARATUS FOR COOLING AIR

Application filed August 8, 1928. Serial No. 298,177.

The present invention relates to air cooling apparatus and more particularly to a complete self-contained unit for maintaining the temperature of a room at a predetermined low point.

Air cooling apparatus as heretofore employed commercially has consisted of coils suspended from the ceiling or hung upon the walls of a room and through which the brine or other refrigerating medium is caused to circulate while the air in the room has a natural circulation about the coils. Cooling coils of this type are generally known in the trade as "bunker coils" and in the absence of other cooling means to more nearly fulfill the needs and requirements have been accepted and used to a considerable extent. While this bunker type of coil has a relatively wide use, it is only acceptable by the users because nothing better can be had and the purchasers have had to put up with inefficiency, high first cost, excessive operating expense, poor sanitation, melting frost, labor losses and loss of temperature due to necessity of defrosting.

Some of the objects of the present invention are to provide an improved air cooling method and apparatus; to provide an apparatus in the form of a self-contained unit for cooling the air of a room; to provide a simple, practical and economical method for maintaining a substantially constant lower temperature in a room; to provide an air cooling apparatus wherein the moisture content of a room is kept relatively high; to provide a cooling apparatus wherein damage due to corrosion is prevented; and to provide other improvements as will hereinafter appear.

In the drawings, Fig. 1 represents an elevation of a cooling unit embodying one form of the present invention; Fig. 2 represents an end elevation of one form of cooling coil; Fig. 3 represents a section on line 3—3 of Fig. 2; and Fig. 4 represents a detail of the end elevation of the coil structure 11.

Referring to the drawings, one form of the present invention consists generally of a casing 10, a cooling coil 11 and a fan assembly 12, all assembled and arranged as a self-contained unit for passing a column of air under suction through and about the coil 11, reducing the temperature of the air, and finally discharging the cooled air to a room or other place which is to be maintained at a predetermined low temperature.

In the preferred construction, the casing 10 is open at the bottom and is supported in spaced relation to the floor by a skeleton base 13 so that air has free access to the bottom of the casing from both sides and both ends of the base 13. As here shown, the lower portion of the casing 10 forms a chamber 14 for the coil 11 and the upper portion forms a chamber 15 for the fan assembly 12 while the top of the casing 10 supports one or more outer elbows 16 for discharging the cooled air from the casing 10. Two such ducts 16 are shown by way of example and each takes care of the discharged air from one fan, though this is a detail which may be varied without departing from the invention.

For circulating the ammonia or other refrigerant for air cooling purposes, the coil 10 preferably consists of two superposed headers 17 and 18 interconnected by side frame bars 20 whereby a substantially rectangular open frame is formed with the headers 17 and 18 as top and bottom members. The upper header 17 is provided with an inlet pipe 21 which is connected to the supply of liquid refrigerant, while the lower header 18 likewise has an outlet pipe 22 for the return to the system. The flow of the liquid refrigerating medium from one header to the other header takes place through a plurality of pipe coils, one end of each communicating with the same header and being welded thereto, and the other end of each communicating with and being welded to the other header. For most efficient operation, the pipe coils are arranged in two series 23 and 24, each consisting of a plurality of sets of pipe convolutions with the pipes of one set all lying in the same vertical plane while the sets of pipes themselves form transverse rows in parallel planes. As to the relative arrangement of the two series there is a staggered relation considered horizontally but the two series overlap one another. In other words,

the convolutions of one series start as a row of pipes entering the upper head 17 in the same horizontal plane and then continue in a plurality of reverse bends with interconnecting inclined lengths to terminate as a row of pipes entering the lower header 18. The convolutions of the other series start from the upper header 17 as a row which is parallel to the row of the other series but having the pipes respectively vertically staggered, and then continue with the same reverse bend configuration to terminate in the lower head 18 in a row which is parallel to the row of the first series but having the pipes also respectively vertically staggered. This arrangement of the two series of pipes results in a coil unit in which the pipes are in relatively close proximity since one series of coils has its pipes respectively opposite to the space of the other series of coils and hence the travelling air follows a tortuous path through passages which are so restricted in dimension as to cause the air to frictionally contact with the pipe surfaces.

The fan assembly 12 serves to induce the desired high air velocity about the coil 11 and consists of one or more fans 25 mounted to rotate with a shaft 26 journaled transversely of the chamber 15 and driven, in the present instance, by an exteriorly located electric motor 27 supported in any suitable manner such, for example, as a bracket 28. The fan speed is such as to create a movement of air through the coils which will be reduced in temperature and expelled in the room to be maintained at a low temperature while the velocity of the air traversing the restricted passages retards the collection of frost, which if it were not for the present novel construction would soon collect in quantity and clog the air passages entirely.

If desired, the base 13 can be associated with a drip pan 30 to collect water dripping from the coils and which can be discharged from the pan by suitable connections to a drain.

To prevent corrosion, the pipe coils 11 and casing 10 are preferably galvanized and the latter is also coated internally with a compound to resist the action of moisture laden air.

The foregoing describes one form of apparatus for carrying out the method embodied in the present invention and which consists broadly of causing a medium to be cooled, such as air, to pass at a relatively high velocity through the restricted passages of a coil in which a refrigerating medium is being circulated. Applicant is aware that attempts have heretofore been made to construct an air cooling coil having pipes arranged in such close proximity as to form a narrow passage or passages for the air to traverse but such attempts have resulted in failure because of frost collecting so rapidly as to completely obstruct the passages, thereby preventing the circulation of air and rendering the appaartus inoperative. The present invention has solved this problem of clogging due to frost by ingeniously correlating a novel restricted passage coil structure with an air velocity which so retards the collection of frost as to render that difficulty negligible.

Having thus described my invention, I claim:—

1. An air cooling apparatus comprising a casing having an air inlet and an air outlet, a header in said casing adjacent said inlet, a header in said casing adjacent said outlet, refrigerating coils connecting said headers in parallel slightly spaced series of convolutions arranged in alternate staggered relation, and means in said casing for impelling air therethrough between and through said coils at a high velocity.

2. An air cooling apparatus comprising a casing having an air inlet and an air outlet, means for passing a current of air through said casing from inlet to outlet, a frame supported internally of the casing on a wall thereof between said inlet and outlet, headers carried by said frame at opposite ends thereof, and a refrigerating coil structure in the casing between said headers and connecting thereto, said headers having refrigeration system connections extending through the adjacent casing wall.

Signed at Philadelphia, county of Philadelphia, State of Pennsylvania, this 30th day of July, 1928.

HARRIS PAUL GANT.