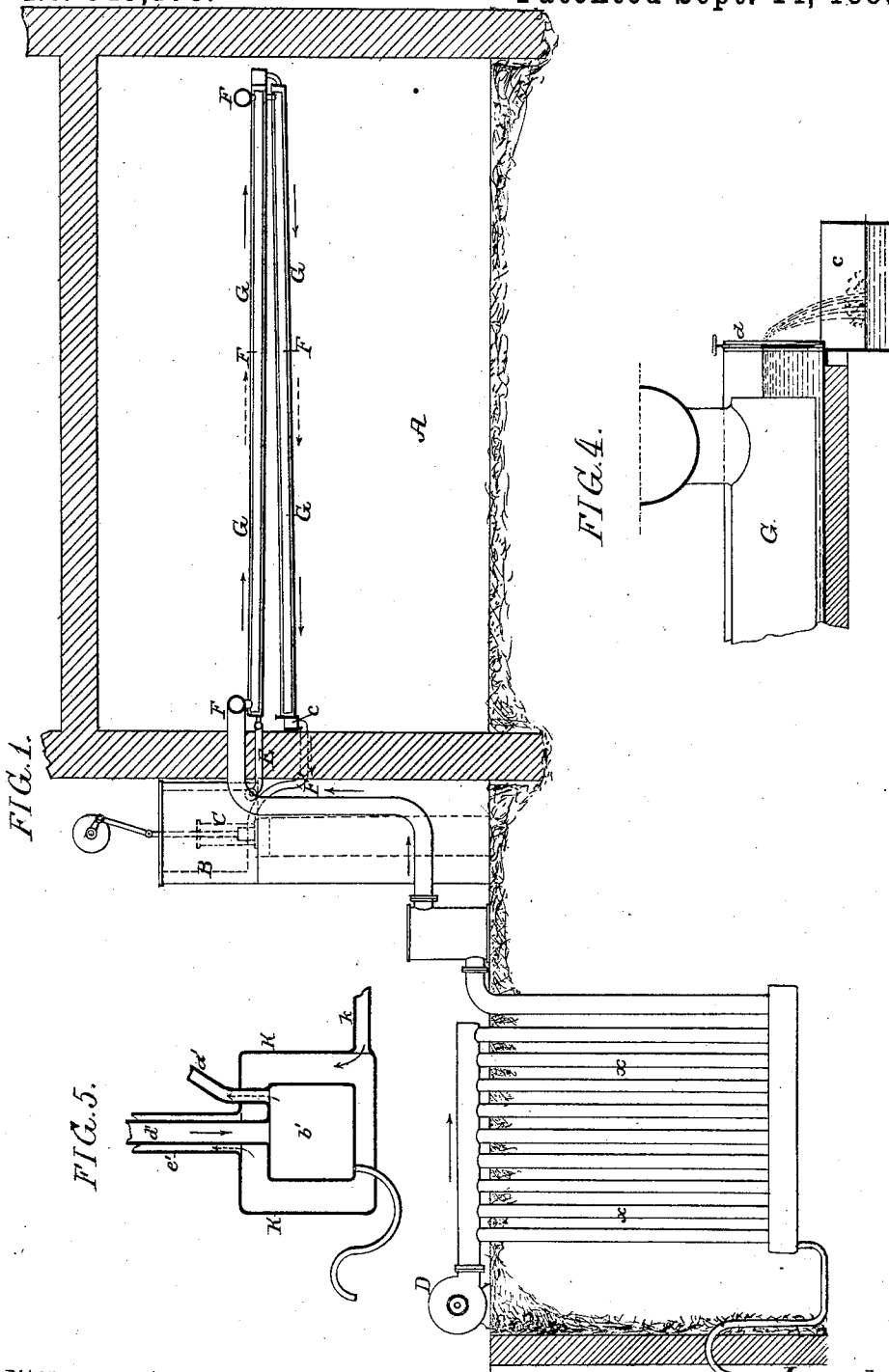


S. H. ROUART.

COOLING AIR AND APPARATUS THEREFOR.

No. 349,178.

Patented Sept. 14, 1886.



Witnesses:
John E. Parker
William D. Conner

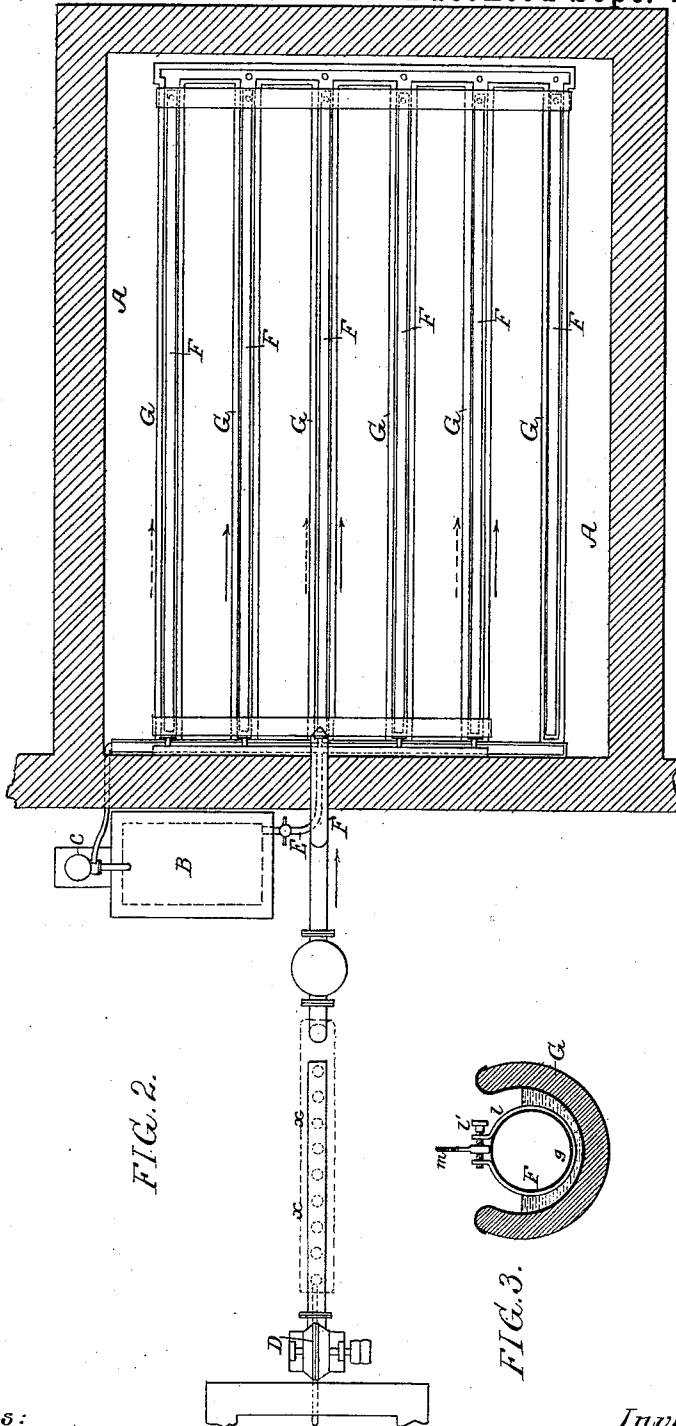
Inventor:
S. H. Rouart
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UNITED STATES PATENT OFFICE.

STANISLAS HENRI ROUART, OF PARIS, FRANCE.

COOLING AIR AND APPARATUS THEREFOR.

SPECIFICATION forming part of Letters Patent No. 349,178, dated September 14, 1886.

Application filed December 26, 1884. Serial No. 151,191. (No model.) Patented in France September 21, 1882, No. 151,199; in Belgium October 28, 1882, No. 59,403; in England November 1, 1882, No. 5,219; in Germany November 7, 1882, No. 23,601, and in Austria-Hungary February 3, 1883, No. 37,332.

To all whom it may concern:

Be it known that I, STANISLAS HENRI ROUART, a citizen of the Republic of France, and residing in Paris, France, have invented certain Improvements in Apparatus for Cooling Air, (for which I have obtained a French patent, No. 151,199, dated September 21, 1882; British Patent No. 5,219, dated November 1, 1882; German Patent No. 23,601, dated November 7, 1882; Belgian Patent No. 59,403, dated October 28, 1882, and Austro-Hungarian Patent No. 37,332, dated February 3, 1883,) of which the following is a specification.

The main object of my invention is to effectively cool the air of rooms or spaces in which it is necessary or desirable to maintain a free circulation of air—as, for instance, in cellars for storing or treating beer, &c. This object I attain in the manner which I will now proceed to describe.

In the accompanying drawings, Figure 1 is a longitudinal section of a chamber provided with my refrigerating apparatus. Fig. 2 is a sectional plan view of the same. Fig. 3 is a transverse section, drawn to an enlarged scale, of part of the apparatus. Fig. 4 is a sectional view of another part of the apparatus, and Fig. 5 is a view of a cooling device which may be used in connection with my invention.

Referring to Figs. 1 and 2, A is a room or chamber to be cooled. B is a refrigerating apparatus for the uncongealable liquid or cooling agent. C is a pump for producing the circulation of the uncongealable liquid for the cooling of the air. D is a fan for the supply of air. E is the pump through which the uncongealable fluid or cooling agent is supplied to the cooling-troughs in the chamber. F' is the return-pipe for the said liquid to the pump, and G is a series of communicating channels or troughs in the room or chamber for the circulation of the cooling agent. These channels or troughs may be of any convenient size or number corresponding to the degree of coolness which it is desired to obtain. In the drawings I have shown two sets of troughs arranged longitudinally one above the other and communicating at the outer end, so that the liquid which is pumped in through the pipe

E into the upper series of pipes passes longitudinally, as indicated by the arrows, through them to the opposite end, which then distributes the liquid to the lower series of longitudinal troughs, from whence the liquid overflows into a common transverse conduit, c, Figs. 1 and 4, from which it is pumped back through the pipe F to the cooling-box B. These channels, one of which is shown in cross section in Fig. 3, are composed of open troughs of earthenware or enameled or other suitable metal, so connected at the ends as to form one continuous water-tight conduit open at the top. These conduits are covered on their under sides with non-conducting material—such as wood or fiber, for instance—to prevent the formation of hoar frost thereon, owing to the freezing of the condensed vapor, which would be liable otherwise to cause an objectionable drip of water when the working of the apparatus is interrupted. Within these troughs G are laid communicating pipes F, which have on their under sides, as shown in Fig. 3, longitudinal slots, openings, or perforations g, so that when the troughs are wholly or partially filled with uncongealable liquid and air is supplied under pressure to the piping F by the fan or blower D the air will be forced out through the slots or openings at the bottom of the piping F and through the uncongealable liquid in a state of fine division. The air bubbles up through the liquid and becomes cooled by direct contact therewith, and is thus distributed into the room or chamber that is to be refrigerated. The troughs and pipes may be arranged at any desirable height in the chamber, so that the cooling of the air by forcing it directly through the bodies of uncongealable liquid may be practically obtained without occupying an undue amount of space for the apparatus. The piping F may be supported by screw-supports m, by adjusting which the depth of immersion of the pipes in the liquid may be altered to regulate the amount of cold to be imparted to the air at any particular part of the chamber. The shape of the trough may be varied from the form of a wide and shallow channel to that of a trough or tube with an opening along its

upperside. The depth of liquid in the troughs may also be regulated by any suitable device at the outlet ends of the transverse troughs. Thus in Fig. 4 I have shown at the ends of the longitudinal troughs G vertically-adjustable slides *d*, to regulate the height of the overflow into the transverse conduits *c*. The amount of air supplied through the pipes may be regulated, when the pipes F are provided with longitudinal slots on their under sides, by the consequent elasticity of the sides of the pipe, collars *l*, Fig. 3, provided with adjusting-screws *l'*, being employed to compress the pipe to regulate the size of the opening *g*.

In order to work the apparatus as economically as possible, it is advisable to take advantage of natural means for lowering the temperature of the air which is to be supplied to the above-described refrigerating apparatus. In some cases the cool ground at a distance below the surface or flowing spring-water may be used to lower the temperature of the air to be supplied to the refrigerating apparatus. In Figs. 1 and 2 I have shown a series of pipes, *x*, as arranged between the fan or pump D and the refrigerating apparatus, and extending considerably below the surface of the ground and in such a way that the air will have to pass downward through these pipes to the lowest level before it can pass upward again to the refrigerating apparatus. I may also avail myself of the air which comes from the refrigerating-chamber to give a preliminary cooling to the air supplied to the refrigerating apparatus, for the air from the cooling-chamber is necessarily at a much lower temperature than that which is supplied from the pump or fan D. For this purpose an apparatus such as that illustrated in Fig. 5 may be employed. Its construction may vary to suit convenience. In the present instance I have shown an outer casing, K, having an inlet, *k*, for the cool air from the chamber, and an outlet, *c'*, while within this casing K is a chamber, *b'*, having an inlet, *d'*, from the fan, and an outlet, *a'*, leading to the refrigerating apparatus, so that the fresh air which is thus passed through the chamber *b'* on its way to the refrigerator receives a preliminary cooling from the air which passes through the surrounding jacket from the cooling-chamber, as indicated by the arrows, the currents of cold and warm air circulating in opposite directions.

These apparatus—that is, the piping *x* or collar K—may be used in connection with ice-houses of ordinary construction. In such case the air which is to be cooled is caused to pass along the inner tubes, while the air escaping from the ice-house circulates in the outer tubes—that is to say, in the annular

space surrounding the inner tubes or chambers.

The apparatus may be placed in a horizontal or inclined position, as found most convenient for making the connections with the passages or conduits for the supply and delivery of air.

In many cases the preliminary cooling apparatus may be simplified by employing only the inner parts of the apparatus illustrated in Fig. 5, and arranging these parts in the outlet for the air from the ice-house or cold room. If required, the motion of the air from the cooling-chamber may be accelerated by mechanical means.

I claim as my invention—

1. The combination of a cooling-chamber with a series of open troughs for the circulation of a cooling-liquid, with pipes partially immersed in the liquid in said troughs, and having slots or other openings along their under sides, substantially as described.

2. The combination of a cooling-chamber with a series of open troughs, a pump for causing a circulation of the cooling-liquid therethrough, a refrigerator for the cooling-liquid, and a series of pipes partially immersed in the liquid in the troughs, and having slots or other openings along their under sides, substantially as and for the purpose set forth.

3. The combination of the cooling-chamber containing open troughs for the circulation of the cooling-liquid and pipes partially immersed in the liquid, having openings along their under sides, with a pump to produce the circulation of the liquid, and a refrigerating apparatus for the latter, and an air pump or fan to supply air under pressure to the pipes, all substantially as set forth.

4. The combination of a cooling-chamber containing an air-refrigerating apparatus with an air-supply and a preliminary or cooling device between the said supply and the refrigerator, all substantially as specified.

5. The combination of the open troughs for the circulation of the cooling-liquid with air-pipes to be partially immersed in the liquid therein and adjusting supporting-rods *n*, as and for the purpose described.

6. The combination of the open troughs of a refrigerating-chamber for the circulation of the cooling-liquid with air-pipes F, having slots along their under sides, and adjusting-bands *l*, as and for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

STANISLAS HENRI ROUART.

Witnesses:

LÉON FRANCKEN,
ROBT. M. HOOPER.