L. B. WOOLFOLK.

Process and Apparatus for Cooling Liquids.

No. 159,997. Patented Feb. 16, 1875.

Fig. 3.

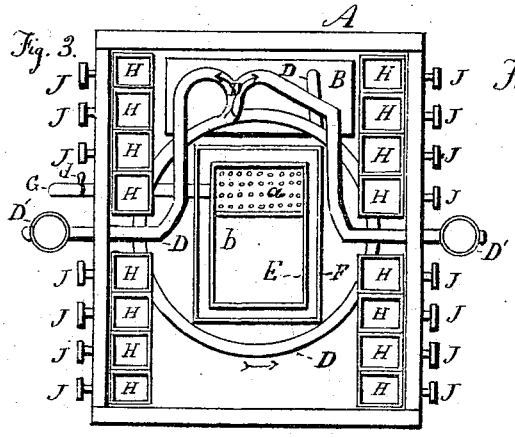


Fig. 1.

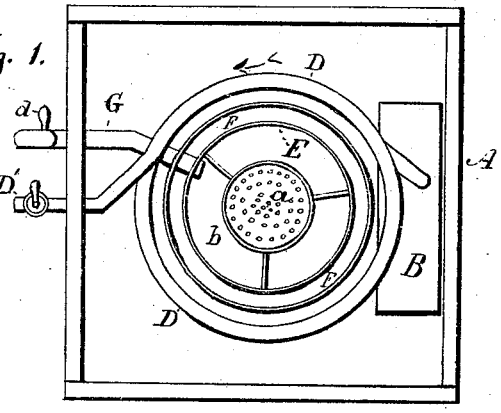


Fig. 4.

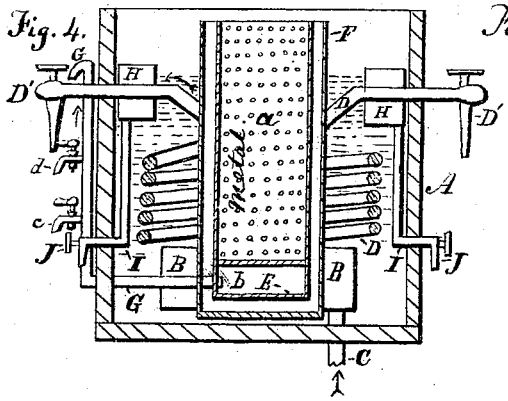


Fig. 2.

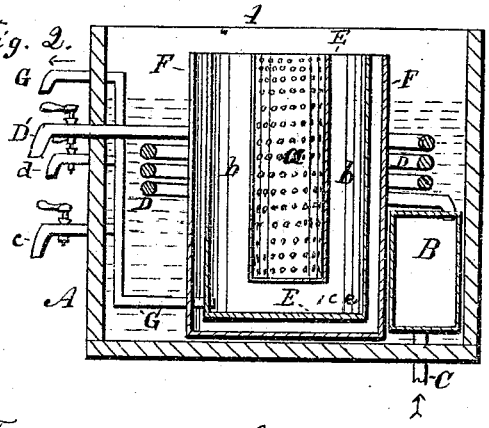


Fig. 5.

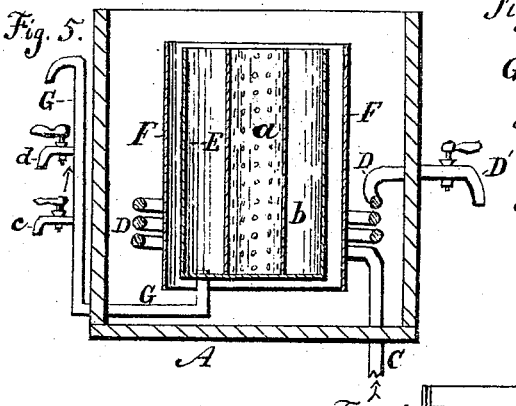


Fig. 6.

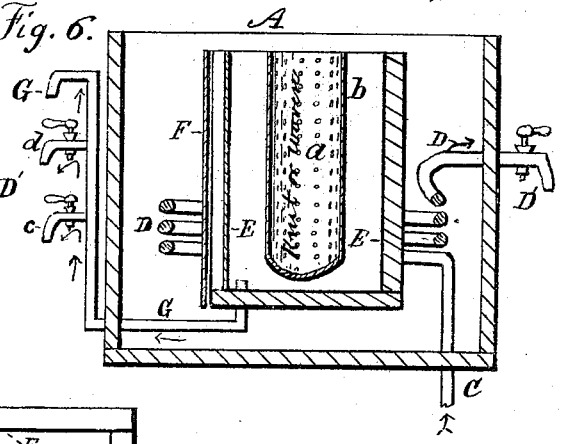
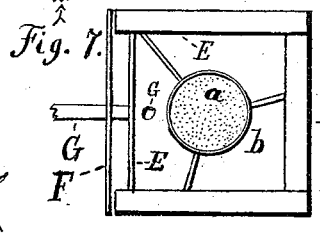


Fig. 7.



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UNITED STATES PATENT OFFICE.

LUCIEN B. WOOLFOLK, OF LEXINGTON, KENTUCKY.

IMPROVEMENT IN PROCESSES AND APPARATUS FOR COOLING LIQUIDS.

Specification forming part of Letters Patent No. **159,997**, dated February 16, 1875; application filed November 7, 1874.

To all whom it may concern:

Be it known that I, LUCIEN B. WOOLFOLK, of Lexington, in the county of Fayette and State of Kentucky, have invented a new and useful Process for Cooling Beer, Soda-Water, and other Liquids, of which the following is a specification:

My invention consists in cooling liquids contained in pipes or vessels wholly or partially immersed in water, by means of ice and salt contained in a vessel, in separate compartments or receptacles, and which impart their chill to the water surrounding the pipes or vessels containing the liquid to be cooled through the medium of water contained in a casing-vessel attached to the refrigerating-vessel.

Figures 1 and 2 represent my invention as applied to a beer-cooler, of which Fig. 1 is a plan with covers removed, and Fig. 2 is a vertical section of same, taken through the center. Figs. 3 and 4 represent a modification of my invention, which is here applied to a soda-fountain; Fig. 3 is a plan with covers removed, and Fig. 4 is a vertical section of same, taken through the center. Fig. 5 is a vertical section taken through the center, representing a modification of the invention. Fig. 6 is a vertical section, representing another modification of the invention, taken through the center. Fig. 7 is a plan of the refrigerating-vessel and casing-vessel, as shown in Fig. 6.

A is a box of any ordinary construction, made of plank or other suitable material, in any desired form. B is a cooling-box, into which the liquid to be cooled flows through the supply-pipe C. D is the cooling-pipe, through which the liquid to be cooled passes to the faucet D′. It may either encircle the refrigerating-vessel, or may be placed in any form desired. E is the refrigerating-vessel, made, preferably, of sheet metal, and containing the salt-receptacle *a* and the ice-compartment *b*. The refrigerating-vessel E may be either round, as in Figs. 1, 2, and 5, or square, as in Figs. 3, 4, 6, and 7, or of any other suitable shape. It may extend with the casing-vessel down to the bottom of the box A, as in Figs. 1, 2, 3, and 4; or it may extend only part of the way down, as in Figs. 5 and 6. The salt-receptacle *a* is constructed, preferably, of sheet metal, though it may be made of any material that will contain the salt, while allowing it to come in contact with the brine. A knitted sack or a cloth bag, as is represented in Figs. 6 and 7, will make a receptacle for salt quite as good as one constructed of sheet metal. When constructed of sheet metal the salt-receptacle is perforated, so as to admit of the free communication of the salt with the brine in the ice-compartment *b*.

The salt-receptacle may be of any form, the shape being wholly immaterial. It may be placed in the center of the refrigerator, with the ice-compartment around it; or it may be on one side of the refrigerator; or several receptacles may be placed around the sides of the refrigerator. Again, the salt-receptacle may extend to the bottom of the refrigerator, or only part of the way to the bottom.

These various modifications of material, form, and position are wholly immaterial, as they do not affect the operation of the salt upon the brine and the ice; the object of the construction being to have the salt in a separate receptacle, for the purpose of keeping the salt in contact with the top of the brine, and thus fully saturating the brine with salt, so that it may melt the ice at a low temperature and keep the brine at a uniform temperature far below the freezing-point of water.

The ice-compartment *b* occupies all the area of the refrigerator that is unoccupied by the salt-receptacle.

F is the casing-vessel, attached to the refrigerating-vessel E, for the purpose of containing water. It is constructed of sheet metal, so that the cold of the water which it contains will be readily imparted to the water in the box A.

The casing-vessel F may be open at the bottom, as in Fig. 6, so as to allow the water in the box A to rise within it. As chilled water rises when near the freezing-point, instead of sinking, this cylindrical form of F will intercept the water-currents, and be equally effective in arresting the impartation of the exces-

sive cold of the ice and salt as when it is constructed as a tight box.

It is not at all essential that the refrigerating-vessel E be placed in the center of the box A. It may be placed on one side, though not so efficient as when in the middle of the box. Nor is it essential that the casing-vessel surround the refrigerating-vessel. It may be constructed on one side only of the refrigerating-vessel E, as is represented in Figs. 6 and 7, while the other sides of E are constructed of non-conducting material; but it is more efficient by encircling the vessel E, and thus exposing the greatest amount of surface to the water in the box A.

G is the waste-pipe, through which the brine passes off from the refrigerator E. It takes the brine, preferably, from the bottom of the refrigerator, because it is warmest there; and the pipe G is made to rise to the level at which the brine is desired to stand in the refrigerator E, while it is furnished with two off-let pipes, *c* and *d*, supplied with faucets, by opening which the brine in *e* will sink to that level.

It is not essential to insert the waste-pipe G in the bottom of the refrigerator. It may be inserted at the level at which it is desired to draw off the water from the refrigerator, and two other pipes may be inserted into the refrigerating-vessel at the level of the off-let pipes *c* and *d;* but as the brine is coldest at the top, where it is in contact with the ice, it is injudicious to draw off the coldest brine, leaving the warmest in the refrigerator. The construction I adopt of drawing it off from the bottom is much the best, as it withdraws the brine that has imparted its chill, and allows its place to be taken by the colder brine above.

Figs. 3 and 4 represent certain parts peculiar to soda-fountains. H H are the sirup-boxes. I I are the sirup-pipes leading to the sirup-faucets J J.

In Figs. 3 and 4 the pipe D is divided, in order to supply both the soda-faucets D′.

The process of operating this apparatus is as follows: The box A is filled with water to a level higher than the pipe containing the liquid to be cooled. In the soda-fountain the water stands above the top of the soda-pipe, and almost to the top of the sirup-cans. Next, the ice-compartment and the salt-receptacle are filled with their respective refrigerating materials, and strong brine is poured into the ice-box *b* until it stands at the level of the top of the waste-pipe G. Then the casing-vessel F is filled to the top with water. The refrigerating materials soon reduce the brine in the ice-compartment to the temperature of about 10° above zero, at which it stands as long as the supply of ice and salt is kept up. This excessive cold of the brine is imparted to the water in the casing-vessel F, freezing a body of ice about half an inch thick upon the outside of the refrigerating-vessel E; but if the water in the casing-vessel F is kept at a higher level than the brine in the refrigerator E, the water in F will not freeze into solid ice, though its temperature will be reduced slightly below the freezing-point. This water in the casing-vessel F will impart its chill to the water in the box A, which, in turn, will chill the liquids in the pipe D and the cooling-box B; but the water in the box A will not by this process be made so cold as to freeze the liquid in the pipe D, but will be kept at a temperature near the freezing-point. When the water in the box A is thoroughly chilled, it will be unnecessary to keep the brine in the refrigerator E at so high a level as the top of the waste-pipe G. By opening either of the faucets *c* or *d* the brine will sink to that level, and the refrigerating materials will be consumed with sufficient rapidity only to maintain the required temperature in the water in the casing-vessel F.

It will be seen that the salt-receptacle *a* and the casing-vessel F are essential parts of the apparatus used in my process. Without the salt-receptacle *a* the salt mixed with the ice would soon sink to the bottom, where it would remain in a mass, while the melting of the ice would soon freshen the top of the brine in contact with the ice. Thus freshened the brine would not melt the ice at a low temperature, and the refrigerating materials would soon grow so warm as to cease to chill the water in A. On the other hand, without the casing-vessel F the excessive cold of the ice and salt would so chill the water in the box A that it would freeze the liquids in the pipe D.

By the use of the salt-receptacle *a* the brine in the refrigerating-vessel E is constantly kept at a very low temperature; and by the use of the casing-vessel F the excessive cold of the brine in the refrigerating-vessel is intercepted, and only a degree of cold near the freezing-point is imparted to the water in the box A.

My process differs from that in common use, in that, instead of employing ice in direct contact with the pipes containing the liquid to be cooled, I surround the pipes with water, and chill this water to a temperature near the freezing-point by means of the cold of ice and salt transmitted through the medium of water contained in a casing-vessel, thus securing both efficiency and a properly-regulated temperature.

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

1. The process of cooling liquids by the use of ice and salt placed in separate receptacles in a refrigerating-vessel, and imparting their cooling effect through the medium of water in contact with pipes or vessels containing the liquid to be cooled.

2. The combination, with the pipe D, of the

refrigerator E, the salt-receptacle *a*, the ice-compartment *b*, the waste-pipe G, and the casing-vessel F, in the manner and for the purpose set forth.

3. In combination with the refrigerating-vessel E, the salt-receptacle *a*, for the purpose of causing the salt to remain in contact with the top of the brine, and keep it so far saturated as to melt ice at a very low temperature, substantially as described.

4. In combination with the refrigerating-vessel E and the cooling-pipe D, the casing-vessel F, for the purpose mentioned.

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