

UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN COOLING AIR AND LIQUIDS AND IN MAKING ICE.

Specification forming part of Letters Patent No. 77,669, dated May 5, 1868.

To all whom it may concern:

Be it known that I, DANIEL E. SOMES, of Washington, in the county of Washington, District of Columbia, have invented a new and useful Process for Cooling Air and Making Ice; and I do hereby declare that the following is a full, clear, and exact description thereof.

The nature of my invention consists in cooling and refrigerating by the use of liquids atomized in the form of spray or mist, produced by means of forcing or drawing any liquid by the action of a blast of air or gases, or their equivalent, through atomizing-tubes or through gauze or small holes.

It also consists in generating carbonic acid and drawing or forcing it into a vacuum or partial vacuum, and then compressing it in a receiver, to be used in a vacuum for cooling or freezing purposes, in the manner hereinafter described.

To enable others to use my invention, I will proceed to describe its application in the improvement of the following mechanic arts, processes, and manufactures.

First, for cooling liquid: This is accomplished by passing through the liquid to be cooled tubes or channels, through which is forced the atomized spray or vapor; or the spray is forced against or around tubes or channels or vessels containing liquids. Beer and water coolers come under this head.

Second, for cooling air: This I accomplish by forcing or drawing atomized or vaporized liquid or spray through tubes or channels surrounded by the air to be cooled, or against or around tubes or channels or chambers or vessels containing the air to be cooled.

Third, condensing vapor in the process of distillation: In the distilling apparatus the atomized liquid and vapor take the place of the ordinary cold water which surrounds the worm of the still or its equivalent part.

Fourth, for cooling and refrigerating buildings and apartments and cars: For this purpose the air cooled by the spray is conducted through tubes or channels which run through the apparatus to the apartments to be cooled; or liquid or air or gas may be conducted, in like manner, through tubes or channels which are surrounded or inclosed by tubes or chan-

nels of a larger size, so that air may be forced or drawn through the space between the larger and smaller tubes. If the smaller tubes be covered or wound with tow, hemp, cotton, or an equivalent substance, and kept moist by means of water admitted through perforated pipes or otherwise, the air or liquid in the smaller pipe will be still further cooled by means of evaporation.

I will now describe the apparatus for producing refrigeration and gas.

I construct, of metal, glass, or other suitable material, an air-tight vessel or chamber having a cross-section of a size and form most convenient for the purpose to which it is to be applied—as, for instance, in the freezing of cream or the cooling of small quantities of water, beer, milk, wine, &c., a comparatively small area of cross-section would be required, while for the manufacture of ice for the market, and for cooling buildings or cars, it might be necessary to have the chamber large enough to admit the body of a man, so that he could have ample room to work. In this chamber are constructed cases or recesses extending across from the outside of the chamber, where they are open, nearly to the back or inner side plate of the chamber. Their mouths are closed by tight doors, which are hinged to one side or both sides of the case. Air or gas pipes extend through the chamber, having flanges or other means of connection with continuations.

An air-pump for drawing gas or air from the chamber and forcing it into pipes or a receiver, and thence to the chamber again, is conveniently located with connecting-pipes between it and the chamber, from which the gas or air is drawn on one side, and pipes on the other side connecting with the receiver and again with the chamber, and also another pipe between the pump and a gas-retort or gas-generator, hereinafter more fully described. All of said pipes are provided with valves or stop-cocks. The chamber and the receiver are also provided with stop-cocks and safety-valves. One of the latter is so constructed and arranged as to open communication between the receiver and the chamber whenever a given amount of pressure is found in the former.

The pipe which connects the receiver with the chamber terminates in a minute aperture or apertures, giving a horizontal direction to whatever of fluids or gases may be ejected through it. The end of the pipe or nozzle may terminate in a slit or in a round aperture. Whatever may be its shape, it will be mated by another pipe having a similar shaped aperture. This latter pipe is in a vertical position, the lower end extending down nearly to the floor of the chamber, and inside of said chamber. The orifices of these two pipes thus constituting an atomizer are so near together that their jets will impinge against each other, and produce a lateral spreading of the fluid or gas; or whatever may be ejected through them.

The floor of the chamber should be made to slope toward the atomizing-pipes, so that the liquid which falls upon it shall flow around the end of the vertical pipe, to be drawn up and again broken into spray.

I also insert small vessels in the chamber several inches apart, made air-tight in their connections with said chamber. These vessels contain water, cream, milk, beer, or any liquids or solids to be cooled or frozen, and are so arranged that when the pump or its equivalent is put in motion, which may be done by a lever, crank, pulley, or any other convenient device, and operated by any power, the spray produced by the atomizing of the liquids shall strike against their sides and pass through the spans between them; or the spray may be forced through tubes running through said vessels, or both methods may be adopted at the same time.

A small apparatus may be made and worked by hand, which may serve as a substitute for refrigerators or water-coolers and the like now in use, which are cooled by means of ice. A few strokes of the lever or turns of the crank will cause the spray to dash against these small vessels, which will cool or freeze their contents.

When constant refrigeration is desired, I provide the shaft with weight or spring and gears or pulleys, so that by winding up this portion of the apparatus a continuous power is secured.

When the apparatus is to be used for manufacturing ice, or for cooling apartments, cars, steamboats, canal-boats, granaries, or other buildings or vessels, it may be economy to compress air or gas to such a degree as to produce heat in the pump and receiver, and the pipes connecting them together.

In this case I make provision for conducting away the heat thus produced by submerging the pumps, pipes, and receiver in cold water or other cold substance, as salt and water, ice, and such chemicals and compounds as are set forth in Patents No. 69,955, granted to me on the 15th day of October, 1867, or any other cooling substance.

The chamber may be constructed with

two or more walls, with air-spaces between them; or said spaces may be filled with cotton, wool, tow, hemp, charcoal, or any other non-conductor, to preserve the temperature within from being affected by the outside air. The chamber may also be lined with any material that will resist the action of acids and protect the iron plates from corrosion, as copper, glass, lead, tin, wood, cork, brick, porcelain, enamel, &c.

In the operations of my apparatus such volatile cooling agents as ether, ammonia, hydrocarbon, alcohol, carbonic acid, chloroform, benzine, naphtha, petroleum, sulphurous acid, carbonic oxide, sulphuric acid, chlorine, spirits or oil of turpentine, anhydrous acid, rhigoline, or any other volatile substance, or gas of any kind, either singly or in combination, are placed or drawn into the chamber to be atomized.

As many of the above-named gases or substances are combustible, I propose to use carbonic acid with them, either in a gaseous, liquid, or solid form; and in order to secure a ready and cheap supply, at all times and under any circumstances, of this fire-extinguisher, I locate at a convenient distance from the chamber and receiver a gas-retort or gas-generator of a suitable kind, and connect it, by means of tubes or channels, with the chamber and the receiver and the pump. These tubes are provided with stop-cocks or valves to regulate the flow of gas or other substance that may pass through them.

The retort is supplied with coke, coal, peat, or oily or fatty or other carbonaceous substances, coke or charcoal being preferable.

I will now describe the operation of my apparatus.

The chamber being made tight by closing all the valves in the tubes connecting the retort or receiver with it, the pump is set in motion. As there is no inlet to the chamber, the pump soon draws the gas or air from it and forces it into the receiver. The valve in the tube leading from the retort or from an intermediate gas-holder is now opened, when the gas rushes through a horizontal nozzle and over the end of the vertical nozzle within the chamber, which has become a partial vacuum by the action of the pump.

The ether or other liquid on the bottom of the chamber is drawn up the vertical tube by the rush of gas in the horizontal tube, and atomized and forced in all directions in the form of spray. This process is continued until the desired number of atmospheres is forced into the receiver, when the valve should be closed in the gas-tube and that in the pipe leading from the receiver opened.

The flow of gas or air from the receiver is regulated by the valve, so that the pump will keep a constant vacuum or partial vacuum in the chamber.

As many pairs of atomizers as are necessary may be provided in the chamber, and

each pair may be connected with both the receiver and the retort, or may be arranged separately.

The heat produced by compression having been conducted away, as hereinbefore described, the gas or air suddenly becomes very cold by expansion in the vacuum-chamber. When any liquid is atomized it loses a portion of its latent heat, and when atomized in a vacuum it loses still more.

I am enabled by my invention to compress air and gases to conduct off the heat produced by compression to expand said air and gases in a vacuum, to atomize any liquid in said vacuum, to generate gases, and to mingle combustible gases and liquids with non-combustible gases and liquids, all at the same time and at the same operation, and without any appreciable loss of material, thus causing the temperature in the vacuum-chamber to fall so low as to rapidly freeze liquid in the cases and small vessels connected with the chamber, and to cool air passing through the tubes that extend through it. The cooled air may be conducted to rooms or chambers below the apparatus, or forced to apartments, or to any desired point above. When I wish to use air instead of gas, or air and gas together, I open a valve or stop-cock connected with the chamber and let it flow in till a supply has been secured, while the valve in the gas-pipe is closed. The chamber and receiver are provided with cocks for drawing off the liquids, and also another set for the admission or escape of air or gas.

What I claim as new is—

1. Atomizing liquid over and over in a chamber or vessel without removing it from said chamber or vessel, substantially as and for the purpose set forth.

2. Atomizing liquid in a vacuum or partial vacuum over and over again without removing it from said vacuum or partial vacuum.

3. Generating and using gas, substantially in the manner and for the purpose set forth.

4. A small portable cooler, constructed and operated, substantially as set forth, as an article of manufacture.

5. The atomizers and chamber, in combination with the pump or its equivalent, substantially as described.

6. The atomizers and chamber, in combination with pipes or channels and means for conducting away heat, substantially as described.

7. The atomizers and chamber, the receiver, the pump, and means for cooling or freezing, substantially as described.

8. The atomizers and chamber, the gas-generator, and pump or its equivalent.

9. The atomizers and chamber, the gas generator and receiver, the pipes, and means for cooling, substantially as described.

10. The atomizers and chamber, the pump or its equivalent, and the gases, air, or liquids, substantially as set forth.

11. Means for regulating the supply of gas, air, or liquids, in combination with the atomizers and chamber, substantially as set forth.

12. The chamber and apartments, with non-conducting substances, and double or multiple walls, substantially as and for the purpose set forth.

D. E. SOMES.

Witnesses:

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