R. H. LUCAS.

ICE-MACHINE.

No. 186,589. Patented Jan. 23, 1877.

*Fig. 1*

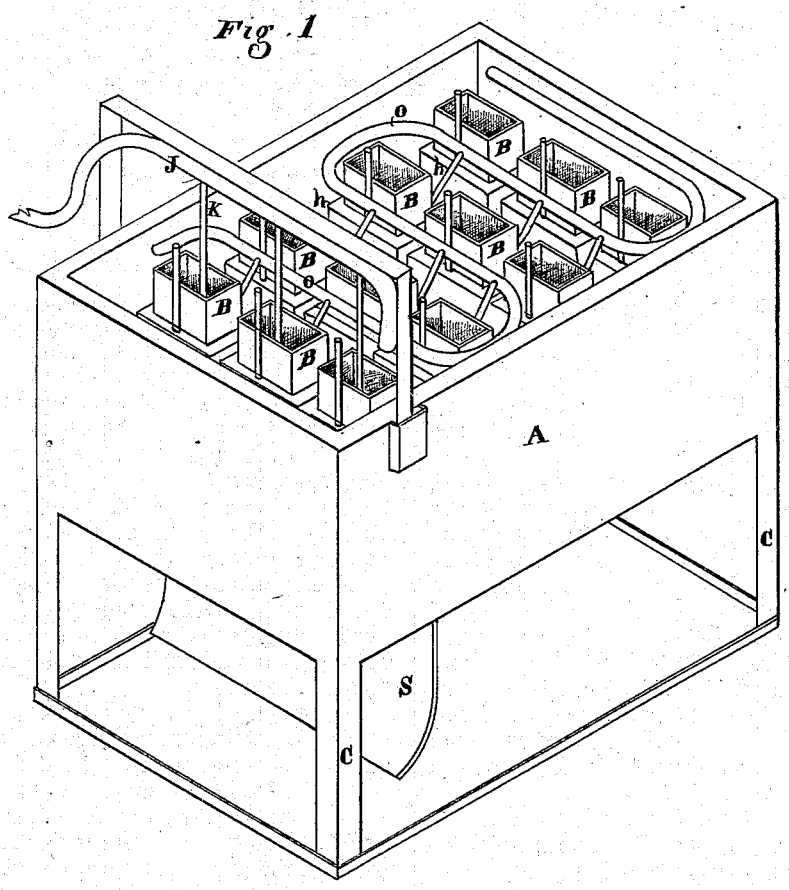
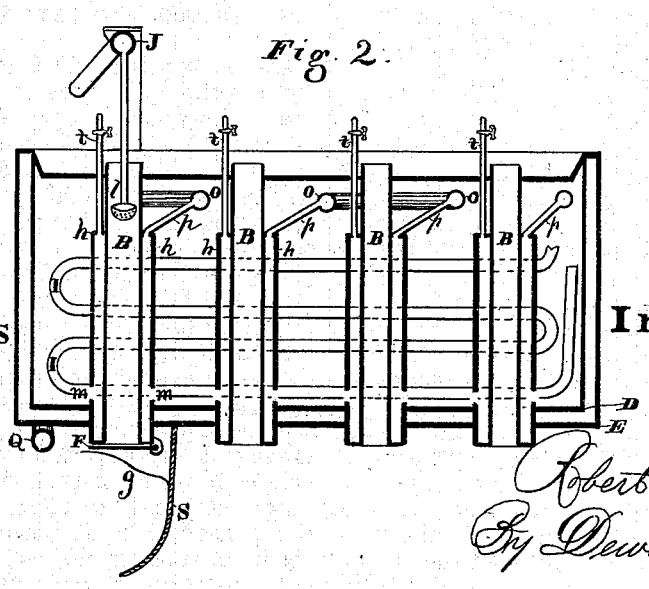



*Fig. 2.*




Witnesses

Geo. H. Strong,

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Inventor

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# UNITED STATES PATENT OFFICE.

ROBERT H. LUCAS, OF SAN FRANCISCO, CALIFORNIA.

## IMPROVEMENT IN ICE-MACHINES.

Specification forming part of Letters Patent No. **186,589**, dated January 23, 1877; application filed November 6, 1876.

*To all whom it may concern:*

Be it known that I, ROBERT H. LUCAS, of the city and county of San Francisco, and State of California, have invented an Improved Ice-Machine; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention does not relate to any particularly novel step or new discovery in the chemical process of refrigeration by which artificial ice is produced, but rather to the mechanical construction and arrangement of the apparatus employed.

The object which I attain is the production of ice in the ice molds or forms of an ice-machine, and the automatic removal of the blocks, cakes, bars, or sheets of ice from said forms or molds without manual labor, thus reducing the cost of its production to the minimum point.

To accomplish this I necessarily remodel the ice-machine, and provide certain mechanical improvements, all of which are represented in the accompanying drawings, and explained in the following description.

Referring to the accompanying drawings, Figure 1 is a perspective view of my invention. Fig. 2 is a vertical section.

A is the tank, inside of which the molds or forms B B are placed, at proper distances apart, in the usual way. This tank I support upon legs C C, so as to raise its bottom a short distance from the floor, for the purpose hereinafter specified. The tank is provided with two bottoms, D E, which are placed at a short distance apart, so as to provide a space between them and the forms or molds B B, which are simply tubes of any desired configuration, passed down through both these bottoms, so that their lower ends terminate below the lowest bottom. To one side of the lower end of each tube or form I hinge a door, F, which may be kept closed against the lower end of the tube by means of a spring, *g*, or weight, as most convenient. Each of the tubes or molds B I surround with an outer case, *h*, which extends from near the upper end of the tube down to its lower end, thus forming a jacket around each tube. A hole or opening, *m*, just above the upper bottom D, connects the interior of this jacket-space with the interior of the tank. I is the pipe which conveys the refrigerant-gas through the tank, and it is coiled around between the molds, so as to subject every part of the interior of the tank to the refrigeratory action.

Over each row or series of molds I lead a water-pipe, J, from which a branch pipe, K, leads down into, and terminates in, the upper open end of each mold. The main pipe J connects with a pump or other water-supply, and a rose or sprinkler, *l*, is attached to the lower end of each pendent tube or branch pipe K inside of the molds, so that when the water is turned on it will be sprayed through the rose or sprinkler inside of and against the sides of the molds.

The tank A I fill, or partially fill, with a saline solution or other non-congealable liquid, so that it will cover the refrigerant-pipes I, and rise in the jackets around the tubes as high as the solution stands in the tank.

Now, when the refrigerant-gas is allowed to circulate through the pipes, and the spray of water is turned into the molds or forms, the water will be frozen on the sides of the molds until each mold has been filled by gradual accretions.

O is an air-pipe, which is coiled back and forth in the upper part of the tank A, so as to pass between each two series of molds. A short branch pipe, *p*, connects this pipe with the jacket which surrounds each mold. The air-pipe O is connected with an air-pump, so that when the molds have been filled with ice, as above specified, I can force air through the pipes O *p* into the surrounding jackets, and drive out the saline or other solution which is contained in them, through the openings *m*, into the tank *y*, thus interposing an air-jacket between the saline solution and the ice.

Another pipe, Q, passes along under the tank A, and conveys hot water against the lower ends of the jackets or tubes below the hole *m*, in which a portion of the saline solution constantly remains, so that by heating this portion of liquid the heat is conveyed to the inner sides of the molds and doors, and thus dislodges the blocks or cakes of ice, which will then drop, by their own gravity, out of the tubes, falling upon the floor be-

neath. Their weight will be sufficient to force the spring-doors open. Inclines or deflectors S can be applied underneath the tank, to direct and convey the blocks or cakes of ice to a point away from under the tank.

To facilitate the automatic removal of the blocks or cakes of ice, I prefer to make the molds or tubes B tapering, or gradually wider toward their lower end, so that they will, when loosened by the heat, drop freely from the forms.

*t t* are short exhaust-pipes, through which the air in the jackets can be exhausted, and thus allow the water to resume its level in the jackets.

It will thus be seen that I produce ice and remove it from the molds in which it is manufactured without manual labor in handling the blocks. One person can attend to the entire machine, and his attention will only be required as engineer, to start and stop the pumps and turn the cocks which admit and exhaust the gas, air, and water, as each is respectively required.

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

1. The elevated tank A, provided with upright molds or tubes B B, the lower ends of which pass through the bottom of the tank, water-pipes J K, and sprinkler *l*, refrigerant-pipes I, and hot-water pipe Q, substantially as and for the purpose described.

2. The upright open-ended ice-molds B B, placed in an elevated tank, A, and surrounded by jackets *h*, said jacket having openings *m*, which connect the interior of the jackets with the interior of the tank, in combination with the air-pipe O and exhaust-pipes *t t*, substantially as and for the purpose described.

3. The elevated tank A, provided with two bottoms, D E, and having the upright open-ended molds or tubes B, their lower ends passing through the double bottom, the hinged spring-door F, and inclines or deflectors S, in combination with a series or coil of pipes, I, water-pipes J K and sprinkler *l*, air-pipes O *p*, exhaust-pipes *t t*, and hot-water pipes Q, all combined and arranged to operate substantially as and for the purpose described.

In witness whereof I have hereunto set my hand and seal.

ROBERT H. LUCAS. [L. S.]

Witnesses:

FRANK A. BROOKS,

OLWYN P. STACY.