

H. S. HELLER.
ICE MACHINE.
APPLICATION FILED SEPT. 5, 1916.

1,252,801.

Patented Jan. 8, 1918.
3 SHEETS-SHEET 1.

Fig. 1

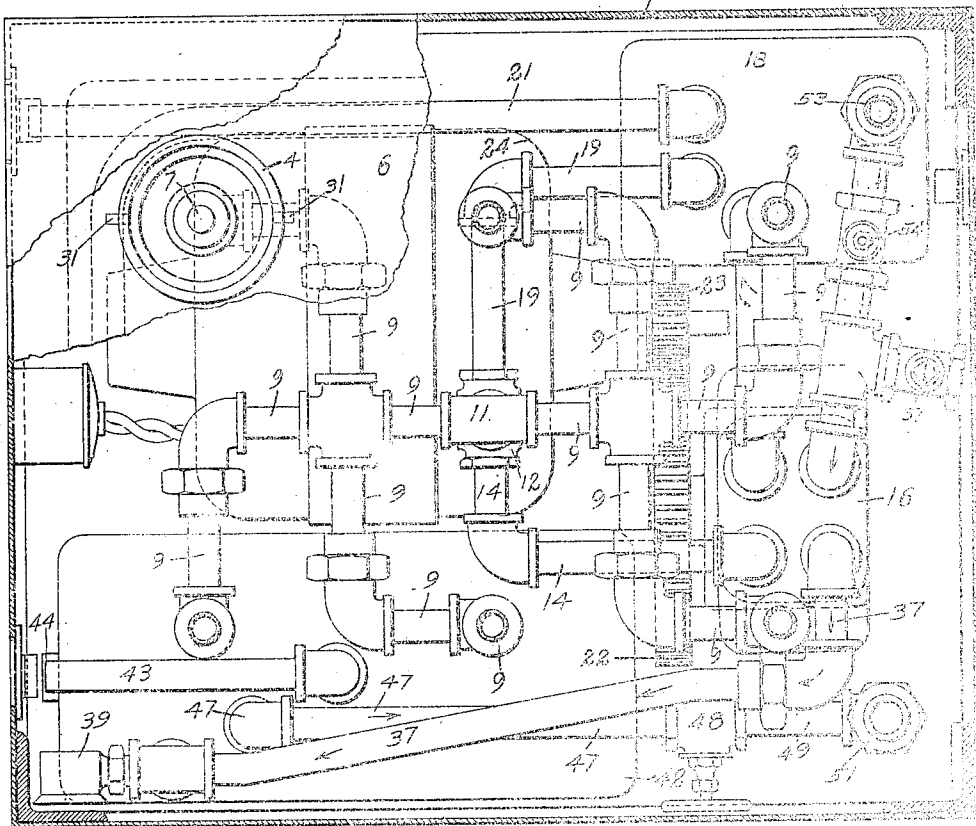
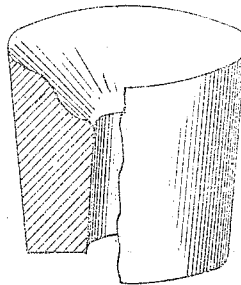


Fig. 4



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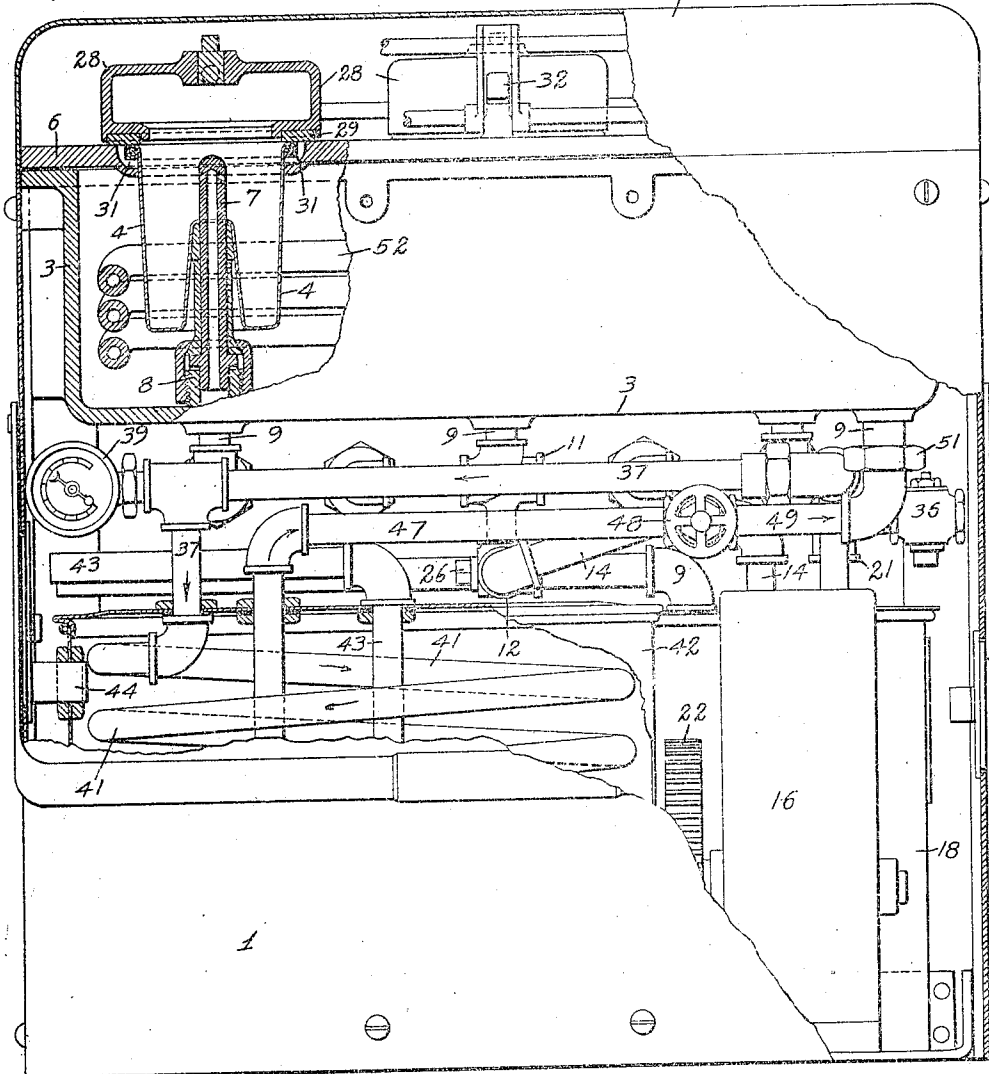


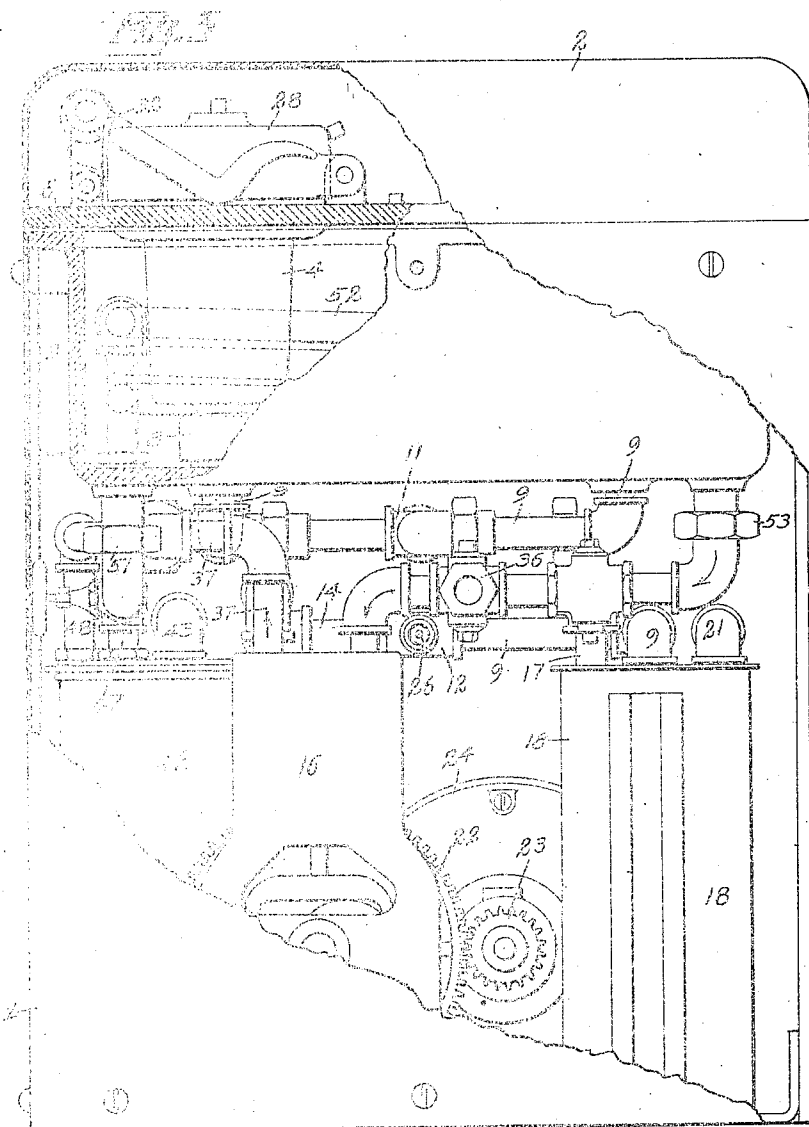
Fig. 2

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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

HERMAN S. HELLER, OF SAN FRANCISCO, CALIFORNIA.

ICE-MACHINE.

1,252,801.

Specification of Letters Patent.

Patented Jan. 3, 1918.

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To all whom it may concern:

Be it known that I, HERMAN S. HELLER, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented a certain new and useful Improvement in Ice-Machines, of which the following is a full, clear, and exact description, such as will enable those skilled in the art to which it appertains to make and use the same.

My invention relates to ice machines for producing tubular blocks of ice wherein a tubular chamber is first cooled and then sprayed with water whereby a tubular cake of ice may be produced; and the objects of my invention are—

First, to provide an improved ice machine adapted to produce tubular blocks of ice;

Second, to provide an improved ice machine adapted to produce blocks of ice having a maximum radiating surface with a minimum quantity of ice;

Third, to provide an improved ice machine adapted to produce a block of ice within the shortest possible period by quickly congealing water in layers or laminations as the same is sprayed onto the cooled walls of a sealed chamber;

Fourth, to provide an improved ice machine adapted to more effectively, quickly and economically produce a block or cake of ice by first reducing the atmospheric pressure within the cooling chambers; and

Fifth, to provide an improved ice machine wherein the reduction of atmospheric pressure within the cooling chamber may be utilized to draw the liquid to be frozen into said chamber.

I accomplish these and other objects by means of the device disclosed in the drawings forming a part of the present specification, wherein like characters of reference are used to designate similar parts throughout the said specification and drawings, and in which—

Figure 1 is a broken plan view of my improved ice machine disclosing one of the congealing chambers and the connections between the various and several members or parts of the said machine.

Fig. 2 is a broken side elevation of Fig. 1 disclosing one of the sealed cooling or congealing chambers and the spraying nozzle therein connected to the pump and water supply.

Fig. 3 is an end elevation partly broken disclosing an exterior view of one of the cooling chambers and the connections thereto; and

Fig. 4 is a broken perspective view of a piece of tubular ice as produced by my improved ice machine.

The present state of the art discloses various devices and machines for producing blocks or cakes of ice generally rectangular in shape. In producing this form of ice a container is first filled with water and exposed to a lowered temperature until the entire quantity of water has become congealed or frozen. This not only requires the expenditure of considerable energy for a prolonged period but is expensive, comparatively, and ultimately produces a block or cake of ice having a comparatively small radiating surface in proportion to the mass or quantity of ice produced.

As a radiating surface or area of a cake or block of ice is an important and economic factor in the art of refrigerating by artificial ice involving expense and efficiency I propose to produce a tubular cake of ice having less mass and a greater radiating surface thereby reducing the time and cost required and increasing the efficiency of said cake of ice by means of the device which may be described as follows:

Referring to the drawings, and more particularly to Fig. 2 as the figure containing or disclosing the greatest number of the parts and their coöperative relations and functions, the numeral 1 is used to designate a box or housing within the upper portion of which is container 3 having a plurality of substantially tubular congealing chambers 4 detachably inserted or held within the said container 3 by being suspended from the cover 6 thereof.

Each tubular chamber 4 is provided with a concentrically disposed spraying nozzle 7; said spraying nozzle being connected by means of a suitable slip-joint 8 to the connections 9, which in turn are connected by means of a suitable T 11 to the controlling cock 12, one port of which is connected by means of a suitable connection 14 to one side of the casing 16 containing a single acting air pump and also an ammonia compressor, said connection 14 leading to intake of air pump within said housing 16 and a similar connection 17 leading from the outlet or exhaust port of said air pump to the water

container or reservoir 18 located in the lower portion and one corner of the housing 1.

The opposite bore of the control cock 12 has a connection 19 directly connected to said reservoir or container 18 which may be supplied with a sufficient quantity of water to fill all the congealing chambers 4 to a point slightly below the apertures of the spraying nozzle 7 and also of the connections 8, 9, 14, and 17 with water by means of a suitable supply pipe 21 leading from any suitable source of water supply not shown.

The housing or casing 16 referred to, which contains the air pump and compressor, is provided with a suitable driving gear 22 meshing with a pinion 23 of the motor 24 by means of which said compressor and pumps are operated. The three-way or controlling cock 12 is provided with a stem 26 by means of which the same may be controlled and operated in order to approximately evacuate the congealing chambers 4. The chambers 4 are each provided with a hollow cap 28 provided with a gasket 29 arranged to tightly engage the upper surface of the cover 6 of the container 3 and also the tops of said tubular chambers 4. The aperture of the cover 6 through which the chambers 4 are suspended are provided with diametrically opposed slots 31 by means of which said slots the removal of said chambers 4 may be facilitated.

The caps 28 may be rigidly retained against the cover 6 by any suitable locking mechanism, a portion of which is disclosed as at 23 in Figs. 2 and 3 of the drawings.

An ammonia or other suitable refrigerant intake valve 36 provides a means whereby any suitable refrigerant, preferably ammonia, may by means of the ammonia compressor within the housing 16, be introduced in the direction indicated by the arrows through the connections 37, provided with a suitable gage 39, to the ammonia coil 41 within a suitable condenser 42 which is also provided with a connection 47 to a standard expansion valve 48 whereby the refrigerant may be conducted by means of a suitable connection 49 and slip-joint 51, to the circulating coil 52 within the container 3, then through the slip-joint 53 to the valve 54 and back to the compressor within the housing 16.

The operation is as follows:

Water to be frozen is first introduced by means of a connection or pipe 21 from any suitable source to the container 18.

By means of the motor 24, pinion 23 thereof, and gear 22, the pump and compressor within the housing 16 are operated. An extension, not shown, engages the stem 26 of the three-way cock or controlling valve 12 and turns the same so that the interior of the congealing chambers 4 are connected

with the air pump as the said chambers are hermetically sealed by means of the hollow caps and gaskets 28 and 29 respectively.

It is evident that the atmospheric pressure within said chambers 4 will be rapidly reduced by means of the suction of the pump within the housing 16. A vacuum will be formed within said chambers 4 which vacuum or reduction of pressure will tend to facilitate the lowering of the temperature within the said chambers 4 and thereby assist the cooling agent circulating through the ammonia coils 52. The container 3 may or may not be filled with a suitable conductor, such as brine or the like.

An ammonia compressor within the housing 16 assists in lowering the temperature within the chambers 4 in the following manner: Ammonia is pumped through the connection 37 in the direction indicated by the arrows throughout the several views at a pressure that will cause the same to condense to liquid form in the lower portion of a coil 41 within the condenser 2 where the heat due to compression will be partially removed by means of the water flowing through a supply 43 and through an overflow 44 thereof. As the heat of compression is removed the cooling agent or ammonia, in the form of a liquid, is carried from the coil 41 by means of a suitable connection 47 to a standard expansion valve 48 whereby the pressure and the temperature is rapidly reduced to such an extent that the connection 49, beyond said valve 48, is filled with a liquid spray which forms an effective cooling agent which will be expended through the slip-joint 51 and coil 52 thereby effectively cooling the interior of the container 3 and the congealing chambers 4 suspended therein. This liquid spray is evaporated into gas by the heat from the water being frozen. The gas is returned by means of a slip-joint 53 and valve 54 to the ammonia compressor within the housing 16.

It is obvious from the foregoing that following a well known principle or law of physics that the reduction of atmospheric pressure reduces the volume of air and thereby said temperature may be effectively cooled at a greatly reduced melting capacity. Therefore it is evident that the vacuum produced in the cooling chambers 4 by means of the pump within the housing 16 through the connections 9, 14, and the three-way cock 12 will tend to facilitate a rapid lowering or reduction in the temperature of said congealing chambers 4.

The vacuum within said chambers 4 will also tend to spray water onto the cooled walls of the tubular cooling chambers 4 and thereby produce a substantially tubular block of ice in the following manner:

The chambers 4 having been cooled in

the manner hereinabove described, viz.; by reducing the air pressure and circulating the refrigerant through the refrigerating coil 52, the control cock 12, by means of the stem 26, is operated to disconnect the said chambers 4 from the air pump within the housing 16 and to connect the said chambers 4 to the water container 18 through the connection 19.

This operation causes the air within the water container 18 to be exposed to the reduced pressure of vacuum that has been created within the chambers 4 and said water is thereby sucked into the said chambers through the apertured nozzles by means of which said water is sprayed onto the walls of the said chambers congealing in layers as rapidly as it comes into contact with said walls or the layers of ice already formed upon it until a piece of ice of the desired quantity has been formed.

The flow of water or velocity thereof is regulated by the restricted area of the nozzle so that water will not be introduced too rapidly to freeze.

When the desired amount of ice has been formed by the above process the control cock 12 is operated to again connect the chambers 4 with the pump in the housing 6 which causes the water in all connections below the apertures of the nozzles 7 to be pumped back into the water container 18 by means of the connection 17. The chambers may then be opened by unlocking and removing the caps 23 and the chambers 4.

A short exposure to the warm atmosphere will cause the outer walls of the removed chambers 4 to convey sufficient heat to melt the outer portion of the tubular ice cake and thereby facilitate the removal of said cake from said chamber, or the same may be accomplished by the application of artificial heat in any suitable manner.

The small tubular block of ice thus formed possesses advantages, owing to its shape, not found in the usual rectangular or other solid forms. The chief advantage of this tubular form being that a greater radiating area is provided with a smaller mass of ice. Consequently a greater amount of liquid may be cooled in less time with a given quantity of ice.

A further advantage is that when placed within small ordinary drinking tumblers the tilt of the glass when drinking will retain the ice away from the lips of the consumer and leave the water in the glass readily accessible.

It is also evident that as the air has been extracted from the cooling chamber before the introduction of the water practically no air bubbles will be formed within the ice and a clear transparent and attractive piece of ice will therefore be produced.

Another advantage is the novelty of serv-

ing ice in this form which is intended to appeal to hotel and café managers. It is neat and sanitary and thus will no doubt appeal to consumers of iced water.

It is obvious from the foregoing that I have provided an improved ice machine adapted to produce small quantities of tubular ice within a comparatively small space or period of time. It is also evident that I have produced an improved ice machine adapted to produce a cake or block of ice having an increased radiating or cooling surface or area and therefore having increased efficiency.

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

1. An ice machine comprising a container arranged to contain a suitable cooling agent such as brine or the like; a coil within the container arranged to conduct a refrigerant; congealing and cooling chambers inserted within the container; means adapted to temporarily seal the chambers; a water container connected to the chambers; suitable pumps connected to the chambers and the coil within the container and adapted to compress and circulate a refrigerant through said coil and to lower the air pressure within the chambers whereby said lower pressure may be utilized to draw water from the container and spray the same onto the cooled walls of the chambers; and means adapted to connect the chambers to the water container or the pumps and means adapted to expand the refrigerant within the coil and thereby lower the temperature of said refrigerant.

2. An ice machine comprising a container arranged to contain a suitable cooling agent such as brine or the like; a refrigerating coil within the container arranged to contain a refrigerant; tubular cooling and congealing chambers detachably inserted within the container; hollow caps detachably secured to the top of the container and arranged to hermetically seal the chambers; locking means for said hollow caps; a spraying nozzle arranged within each chamber and concentric thereto; a water container in connection with said nozzle; a pump connected to the nozzles whereby the air pressure within the chambers may be lowered; means adapted to connect the nozzles to the pump or to the water container; a second pump connected to the refrigerating coil within the container, and adapted to circulate a refrigerant therethrough; an expansion valve arranged between the last mentioned pump and the refrigerating coil whereby the pressure and temperature of the said refrigerant may be lowered; and means arranged to remove the heat due to compression from the refrigerant.

3. An ice machine comprising a container

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 and the refrigerating coil whereby the pres-
 sure and temperature of the said refrigerant
 may be lowered; and a suitable condenser
 adapted to remove the heat of compressor 25
 from the refrigerant.

In witness whereof I hereunto set my sig-
 nature.

HERMAN S. HELLER.