Aug. 1, 1933. H. B. RUDD 1,920,526

ICE FORMING DEVICE

Filed Nov. 17, 1928 2 Sheets-Sheet 1

Fig. 1.

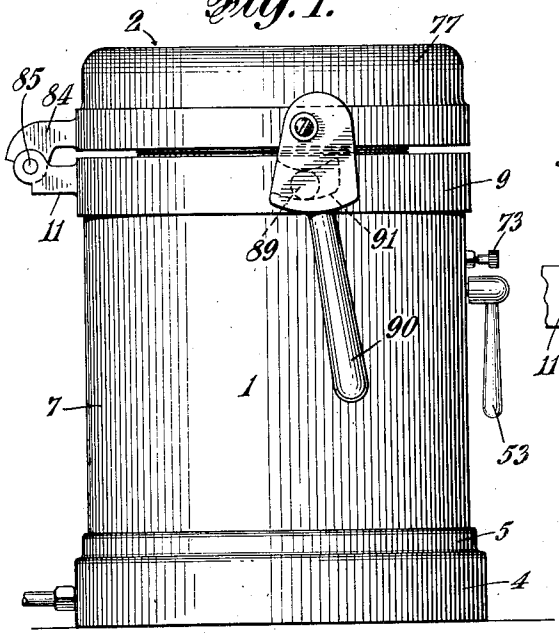


Fig. 3.

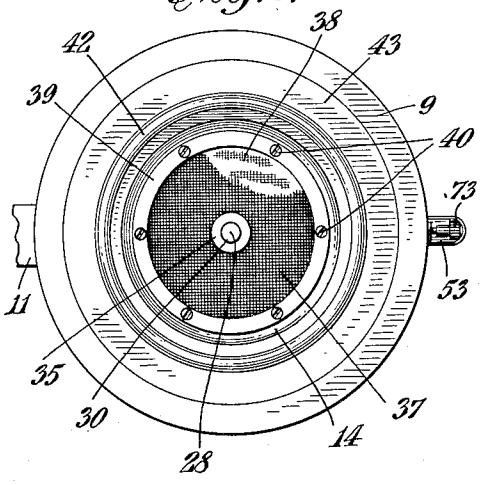


Fig. 5.

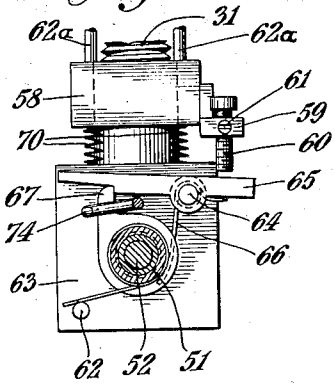
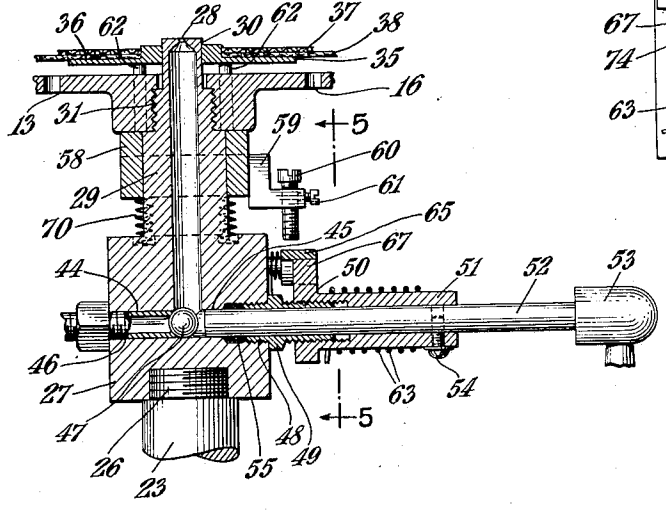


Fig. 4.



INVENTOR
Harry B. Rudd.

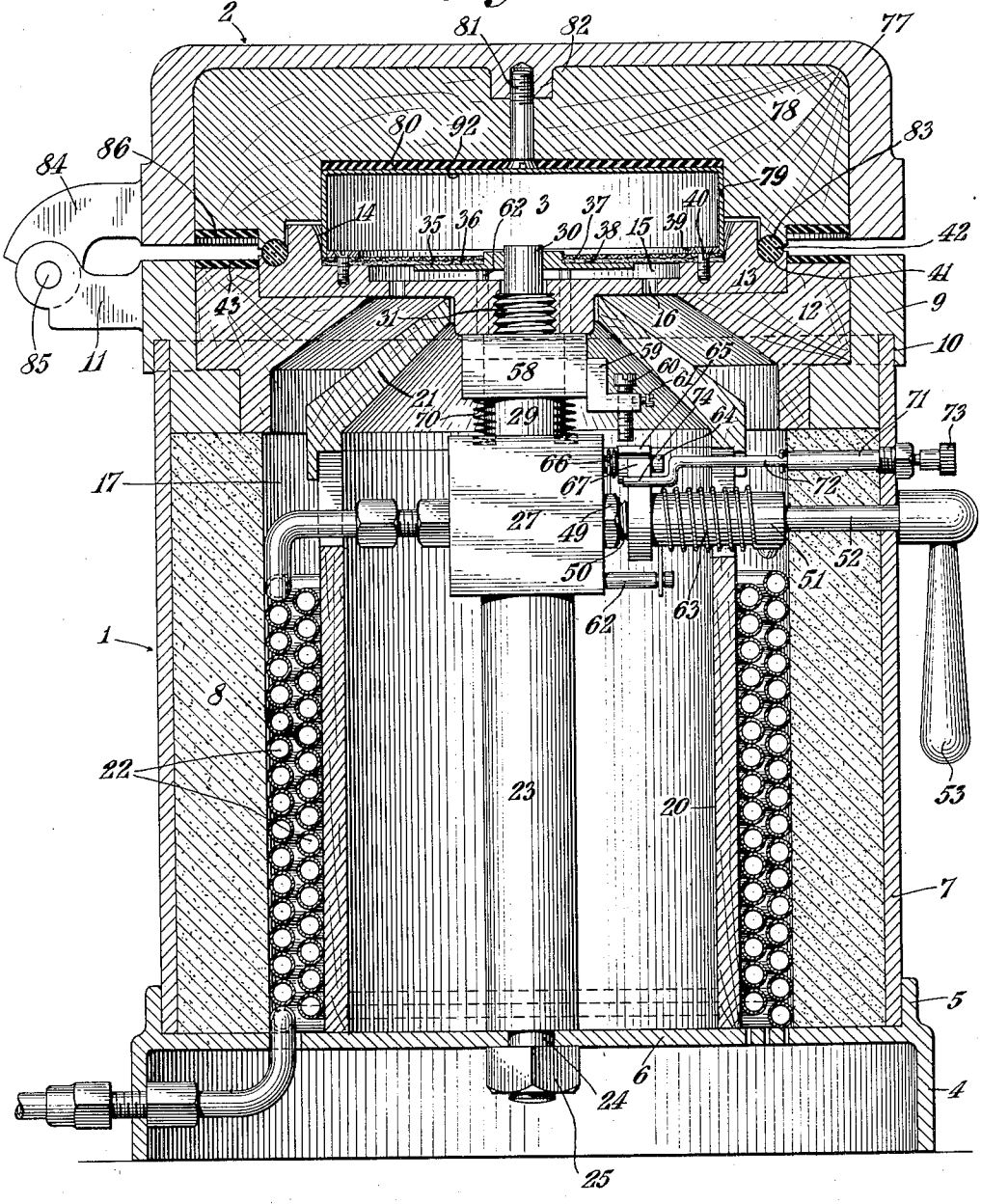
BY
Ward & Crosby
his ATTORNEYS

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ICE FORMING DEVICE

Filed Nov. 17, 1928 2 Sheets-Sheet 2

Fig. 2.



INVENTOR
Harry B. Rudd.

BY
Wright Crosby
his ATTORNEYS

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UNITED STATES PATENT OFFICE

1,920,526

ICE FORMING DEVICE

Harry B. Rudd, Douglaston, N. Y.

Application November 17, 1928
Serial No. 320,060

19 Claims. (Cl. 62—121)

The invention relates in general to the art of making ice-like material such, for example, as carbon dioxide snow and, more particularly, the invention relates to apparatus for expanding carbon dioxide or other fluid medium directly into a solid or semi-solid cake or mass.

The objects of the invention include the provision of a relatively simple, dependable, highly efficient and convenient apparatus of the type above indicated.

Various further and more specific objects, features and advantages will clearly appear from the detailed description given below taken in connection with the accompanying drawings which form a part of this specification and illustrate merely by way of example one embodiment of the apparatus of the invention.

The invention consists in such novel features, arrangements and combinations of parts as may be shown and described in connection with the apparatus herein disclosed by way of example only and as illustrative of a preferred embodiment.

In the drawings, Fig. 1 is an outside elevational view of the apparatus;

Fig. 2 shows a vertical section therethrough;

Fig. 3 is a top plan view of the base member of the apparatus, with the cover member removed;

Fig. 4 is a detail section through a valve and nozzle, comprising parts of the device of Fig. 1; and

Fig. 5 shows a section on the line 5—5 of Fig. 4.

In the following description and in the claims, parts will be identified by specific names for convenience, but such names are intended to be as generic in their application to similar parts as the art will permit. Like reference characters denote like parts in the several figures of the drawings.

Referring now to the drawings for a detailed description of one example of the invention, the apparatus there shown comprises in general a base member 1 and a cover member 2 hingedly connected thereto. An ice cake-forming chamber denoted by 3 is provided, partly in the base member and partly in the cover member, and into which the carbon dioxide is expanded to form the ice cake.

The base member 1 comprises a base plate 6 supported by a cylindrical flange 4 and having an upstanding flange 5. Resting on the base plate 6 is a cylindrical casing 7 which may be of metal and lined with a sleeve 8 of insulating material, such as cork. Seating on the casing 7 is a metal ring 9 having a groove 10 in which the casing fits, this ring having a hinge bracket 11 secured thereto. The metal ring 9 has an inner seat in which is seated a wooden ring 12 having an inner seat to receive a supporting plate 13 forming part of the receptacle for the ice cake.

Also resting on the base plate 6 is an inner sleeve 20 of insulating material such as wood, supporting a conical wooden member 21 seated over the inner sleeve and extending up to the supporting plate 13.

An annular space 17 is formed between the sleeves 8 and 20 in which is positioned a cylindrical coil of pipe 22 passing through the base 6 and adapted to be connected to a tank (not shown) of carbon dioxide under pressure.

In the center of the base plate 6 an arbor 23 is provided having a reduced portion 24 passing through a hole in the base plate. A nut 25 is threaded on the reduced portion to rigidly secure the base plate and arbor together. The upper end of the arbor 23 has a reduced threaded portion 26 on which is threaded a valve casing 27. The valve casing 27 is provided with a projecting nozzle having a small nozzle opening 28 in the end. The nozzle has a cylindrical portion 29 at the base and a reduced cylindrical portion 30 at the top. Connecting the cylindrical portions 29 and 30 is a threaded portion 31 on which is threaded the supporting plate 13.

The supporting plate 13 is provided with a large recess 14 forming part of the cake-forming chamber 3 and an inner shallow recess 15 which has openings 16 communicating with the coil chamber 17.

Disposed in the shallow recess 15 is a pressure plate 35 slidably mounted on the cylindrical portion 30 and having an annular seat 36. An upper layer 37 of wire mesh and a lower layer 38 of fabric is disposed at the bottom of the larger recess 14 and rests on the seat 36 on the pressure plate. A flat ring 39 holds the discs 37 and 38 in position, screws 40 passing through the ring 39 into the supporting plate 13.

The supporting plate 13 is provided with an external annular recess 41 in which is disposed a gasket 42. Resting on the wooden ring 12 and flush with the metal ring 9 is a flat bakelite ring 43 to protect the wooden ring 12 against moisture and to improve the appearance of the device when the cover is removed.

The valve casing 27 has aligned transverse openings 44 and 45 intersecting the nozzle opening and in the transverse opening 44 is disposed

a liner member 46 communicating with the coil pipe 22. The liner member 46 has a conical seat on which seats a ball 47. The transverse opening 45 is enlarged, providing a stuffing box in which is threaded a gland member 48, said gland member having a wrench engaging portion 49 and a threaded projection 50. A sleeve 51 is threaded on the threaded projection, and through the sleeve and gland member passes a spindle 52 having an operating handle 53 on the end thereof. The spindle 52 and sleeve 51 are arranged to rotate together by a set screw 54 threaded into an opening in the spindle. Suitable packing 55 in the stuffing box keeps the carbon dioxide from escaping around the spindle. The sleeve 51 has an arm 67 secured thereto.

The valve casing 27 has a projecting pin 62 and a coil spring 63 surrounds the sleeve 51, one end being secured to the pin 62 and the other end being secured under the set screw 54. The coil spring acts in such a way that, when the spindle 52 is rotated to move away from the ball 47, the spring 63 tends to move the spindle back against the ball to close the valve.

A second pin 64 projects from the valve casing and a latch member 65 is pivoted thereto. A coil spring 66 surrounds the pin 64, one end being positioned under the latch member and the other end against the gland member 48 to continually urge the latch 65 against the arm 67 on the sleeve 51. When the spindle 52 is unscrewed to allow carbon dioxide to pass through the nozzle, the latch 65 engages the arm 67 to hold the spindle in this position which is indicated in Fig. 5.

A slidable sleeve 58 is mounted on the cylindrical portion 29, this sleeve having an arm 59 in which is threaded an adjusting screw 60, held in adjusted position by a set screw 61. Disposed between the pressure plate 35 and the sleeve 58 are pins 62*a* passing through the supporting plate. Suitable coil springs 70 are provided between the sleeve 58 and the casing member 27 to continually urge the pressure plate upwardly, these springs seating in recesses in the casing member 27.

An auxiliary device is provided for tripping the catch when desired. This device comprises a sleeve member 71 threaded into the casing 7 and passing through the insulating sleeve 8, in which is disposed a shaft 72 having a knurled finger-engaging portion 73 on the end. The inner end of the shaft 72 is bent to form a crank 74 which is disposed under the catch 65.

It will be seen that the construction is such that the arbor 23 holds in place the supporting plate 13, the wooden ring 12, metal ring 9, sleeves 7, 8 and 20, pipe coil 22 and the valve mechanism is positioned on the base plate 6, and thus assembly of these parts is very simple.

Referring now to the cover member 2, this comprises a metal casing 77 having a wooden lining 78 therein, the wooden lining having a recess 79 complementary with the recess 14 in the supporting plate, these recesses together forming the ice-forming chamber 3. The bottom of the recess 79 has a bakelite disc 80 and a screw 81 passes through the bakelite disc 80 and the wooden liner 78, into a boss 82 on the casing 77 to hold these members together. The wooden liner has a projecting tongue 83 fitting against the gasket 42 when the cover member is in closed position to provide a seal against escape of the gas. The casing 77 is provided with a hinge bracket 84 and a pintle 85 passes through brackets 11 and 84. A flat ring 86 of bakelite extends between the casing 77 and the tongue 83 to match the ring 43.

The metal ring 9 is provided with a projecting lug 89 and a cam member having a handle 90, and cam groove 91 is pivoted to the cover casing 77 so that the cover may be clamped tightly onto the base member by moving the handle 90 to force the lug 89 into the groove 91.

To use the apparatus the cover is opened and a receptacle 92 of hard rubber or other relatively hard smoothly finished insulating material, in which the ice cake is to be formed, is placed in the recess 79. The cover is then closed and clamped to the base. The handle 53 is turned to open the valve 27, 47, allowing carbon dioxide under high pressure to pass through the pipe coil 22. The carbon dioxide is suddenly expanded through the small opening 28 into the ice-forming chamber 3 where its rapid expansion causes it to form a cake of carbon dioxide snow. As the cake is being formed, the excess gas passes through the mesh of the wire and fabric sheets 37, 38, into the coil space 17, around the coil of pipe and out through holes 93 in the base plate, precooling the carbon dioxide flowing through the pipe. As soon as the cake is completed, pressure is exerted on the pressure plate 35, forcing the sleeve 58 down to cause the adjusting screw 60 to engage and trip the latch 65. This allows the spring 63 to rotate the spindle 52 to close the valve, thus shutting off the supply of carbon dioxide. The cover is then lifted and the cake of ice within its container, is removed. If the container is made of hard rubber or other suitable material, preferably a heat insulator, and finished with smooth hard surfaces, the ice cake may be easily slid out of the container for use wherever desired. A container of this type avoids any objectionable sticking of the cake therein.

There are many advantages of the present invention. The utilization of the excess expanded gas to precool the carbon dioxide traversing the coil 22 results in a material saving of carbon dioxide to produce a cake of given size. Furthermore, the automatic arrangement for shutting off the carbon dioxide supply when the cake is completed provides an additional saving in carbon dioxide since none of the latter can be wasted after the cake is formed. The apparatus is particularly advantageous in ice-cream stores since, the carbon dioxide may be turned on when the customer orders the ice cream, and while the clerk is packing the ice cream, the ice is being made. The clerk being assured that the carbon dioxide will be automatically shut off when the ice is formed, is relieved of further attention to this apparatus and can devote his time to other duties. Furthermore, the apparatus is thoroughly insulated so that the low temperature is preserved, resulting in additional savings of carbon dioxide. The device is relatively simple and inexpensive, yet rugged and efficient, and may be easily used by the ordinary clerk. If for any reason it is desired to stop the formation of the ice cake before completion, the knurled finger member 73 may be turned and the latch tripped to shut off the carbon dioxide.

In the appended claims, the references to "carbon dioxide" shall be understood as generically comprehending any other equivalent fluid medium, and the references to "carbon dioxide snow" shall be understood as generically comprehending a resultant product of the aforesaid fluid medium.

While the invention has been described with respect to certain particular preferred examples

which give satisfactory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed is:

1. Ice forming apparatus comprising a base plate, an outer sleeve on said base plate, a top ring seating on said sleeve, a ring of heat insulation seating on said top ring, a receptacle seating on said insulation ring, a sleeve of insulation lining said outer sleeve, a cylindrical coil of pipe within said insulation sleeve, an inner sleeve of insulation within said coil, and a member within said inner sleeve and connecting said base plate and receptacle to hold the elements assembled, said pipe communicating with said receptacle.

2. Ice forming apparatus comprising a base, concentric sleeves on said base, an ice forming receptacle above said sleeves, and a coil of pipe between said sleeves and feeding said receptacle with carbon dioxide which expands therein and thereby forms an ice cake, said receptacle communicating with the space between said sleeves to cool said coil by the expanded gas.

3. Ice forming apparatus comprising a base plate having an upstanding flange, a sleeve within said flange, a top ring seating on said sleeve, a ring of heat insulation seating in said top ring, a receptacle having a recess and seating in said insulation ring, a sleeve of insulation lining said first sleeve, a cylindrical coil of pipe within said insulation sleeve, an inner sleeve of insulation within said coil, a member within said inner sleeve and connecting said base plate and receptacle to hold the elements assembled, a cover comprising a casing, an insulating lining having a recess complementary to said first recess to form a cake forming chamber, and a hinge connecting said top ring and casing, said receptacle having communication with the coil space, said coil of pipe communicating with said chamber.

4. In ice forming apparatus, a receptacle comprising sections, means for separating said sections to remove the ice cake when formed, a pressure member in said receptacle, a coil of pipe for supplying carbondioxide under pressure to said receptacle, a chamber in which said coil is located, said receptacle having outlet into said chamber for expanded gas, a valve in said pipe, and means operated by said pressure member to close said valve when the cake is formed.

5. In ice forming apparatus, a cake forming receptacle, a valve casing, a conduit connecting said receptacle and valve casing, a valve seat in said casing, a valve spindle for closing said seat, a threaded connection between said spindle and casing, a coil spring surrounding said spindle for urging said spindle to close said seat, an arm secured to said spindle, a catch secured to said casing and adapted to engage said arm, a pressure member in said receptacle, and a member passing through the wall of said receptacle and connecting said pressure member and catch to release said spindle to the influence of said spring when the completion of the cake operates the pressure member.

6. In ice forming apparatus, a cake forming receptacle, a valve casing having a projecting nozzle extending into said receptacle, a collar on said nozzle, said valve casing having aligned transverse openings and a nozzle opening intersecting them at right angles, a valve seat in one of said transverse openings, the other transverse opening forming a stuffing box, a gland member threaded into said stuffing box, said gland member having a threaded extension, a sleeve threaded on said extension, a spindle passing through said sleeve and gland member and fixed to said sleeve, a ball between said seat and spindle, a catch arm on said sleeve, a catch lever pivoted on said casing and adapted to engage said arm, a coil spring surrounding said sleeve and having one end secured to said sleeve and the other end to said casing, a pressure plate in said receptacle and slidable on said nozzle, and a pin passing into said receptacle and disposed between said pressure plate and collar to cause said dollar to operate said catch lever to close the valve.

7. In ice forming making apparatus, a base member comprising a base plate, an arbor standing on said base plate, a valve casing secured to the upper end of said arbor, said valve casing having an upstanding nozzle, a supporting plate secured to said nozzle, said supporting plate having a cake holding recess and a shallow recess within said cake holding recess, a pressure plate sliding on said nozzle and disposed in said shallow recess, a layer of porous material in said cake holding recess and resting on said pressure plate, outer and inner upstanding cylindrical casings on said base plate and extending to said supporting plate, a coil of pipe between said cylindrical casings, said supporting plate having openings connecting said shallow recess and space between casings, said coil communicating with said valve casing, a sleeve slidable on said nozzle, pins between said sleeve and pressure plate and passing through said supporting plate, valve devices in said casing, means for operating said devices by said sleeve to close said valve when the cake is formed, and a cover member having a cake holding recess complementary with said first recess.

8. In ice forming apparatus, a cake forming receptacle, a valve casing, a conduit connecting said valve casing and said receptacle, said valve casing having a valve seat and a stuffing box, a gland member threaded into said stuffing box, said gland member having a threaded extension, a sleeve threaded on said extension, a spindle passing through said sleeve and gland member and fixed to said sleeve, a coil spring surrounding said sleeve having one end secured to said sleeve and the other end to said casing, catch devices to hold said spindle away from said seat against the action of said spring, and means responsive to completion of a cake to release said catch devices to allow said spindle to close said seat under influence of said spring.

9. In apparatus of the character described, a casing, a chamber in said casing, coil structure in said casing and having a conduit communicating with said chamber, and a passage leading from said chamber toward said coil structure, said coil structure being traversed by carbon dioxide which passes through said conduit and expands in said chamber to form a mass of carbon dioxide snow, carbon dioxide gas from said chamber passing along said passage and coming into heat-exchanging relation with respect to the carbon dioxide traversing said coil structure.

10. In apparatus of the character described, a casing, a cover for said casing and in part defining a chamber, coil structure in said casing and having a conduit communicating with said chamber, and a passage leading from said chamber toward said coil structure, said coil structure

being traversed by carbon dioxide which passes through said conduit and expands in said chamber to form a mass of carbon dioxide snow, carbon dioxide gas from said chamber passing along said passage and coming into heat-exchanging relation with respect to the carbon dioxide traversing said coil structure.

11. In apparatus of the character described, a casing, a cover for said casing and in part defining a chamber, a cartridge in said chamber and having a wall of porous material, coil structure in said casing and having a conduit communicating with said cartridge, and a passage leading from said porous material toward said coil structure, said coil structure being traversed by carbon dioxide which passes through said conduit and expands in said cartridge to form a mass of carbon dioxide snow, carbon dioxide gas from said cartridge passing through said porous material, along said passage, and then into heat-exchanging relation with respect to the carbon dioxide traversing said coil structure.

12. In apparatus of the character described, a casing, a cover for said casing and in part defining a chamber, a cartridge in said chamber and having a wall of porous material, a lining of heat insulating material interiorly of said casing, coil structure interiorly of said lining below said cartridge and having a conduit communicating with said cartridge, a passage leading from said porous material downwardly toward said coil structure, said coil structure being traversed by carbon dioxide which passes through said conduit and expands in said cartridge to form a mass of carbon dioxide snow, carbon dioxide gas from said cartridge passing through said porous material, along said passage, and then into heat-exchanging relation with respect to the carbon dioxide traversing said coil structure, a valve in said casing, and a valve actuating handle extending laterally through said lining and said casing.

13. In combination, means forming a chamber, a conduit for passing a phase-changeable fluid medium into said chamber to produce a mass of solid or semi-solid material, a valve in said conduit, and automatic means for closing said valve to discontinue the passage of said fluid medium to said chamber, said valve remaining closed after said mass of material is removed from said chamber.

14. In combination, means forming a chamber, a conduit for passing a phase-changeable fluid medium into said chamber to produce a mass of solid or semi-solid material, a valve in said conduit, and means for automatically closing said valve in response to pressure exerted by said mass of material, said valve remaining closed after said mass of material is removed from said chamber.

15. In combination, means forming a chamber, a conduit for passing a phase-changeable fluid medium into said chamber to produce a mass of solid or semi-solid material, a valve in said conduit, means for biasing said valve to closed position, means for holding said valve in open position against the action of said biasing means, and means for nullifying the action of said holding means upon formation in said chamber of said mass of material.

16. In combination, means forming a chamber, a conduit for passing a phase-changeable fluid medium into said chamber to produce a mass of solid or semi-solid material, a valve in said conduit, means for biasing said valve to closed position, means for holding said valve in open position against the action of said biasing means, and means actuated by the pressure of said mass of material for releasing said holding means to permit operation of said biasing means.

17. In combination, means forming a chamber, a conduit for passing a phase-changeable fluid medium into said chamber to produce a mass of solid or semi-solid material, a valve in said conduit, means for biasing said valve to closed position, means for holding said valve in open position against the action of said biasing means, and means for actuating said holding means to permit operation of said biasing means.

18. In apparatus of the character described, a casing, a chamber in said casing, means for passing carbon dioxide into said chamber, means for discontinuing the passage of carbon dioxide to said chamber upon formation therein of a cake of carbon dioxide snow, and mechanism manually operative independently of said means for discontinuing the passage of carbon dioxide to said chamber.

19. In apparatus of the character described, a casing, a chamber in said casing, a conduit for passing carbon dioxide into said chamber, a valve in said conduit, means for biasing said valve to closed position, means for holding said valve in open position against the action of said biasing means, means for releasing said holding means upon formation of a cake of carbon dioxide snow in said chamber, and mechanism manually operative independently of said releasing means for actuating said holding means.

HARRY B. RUDD.