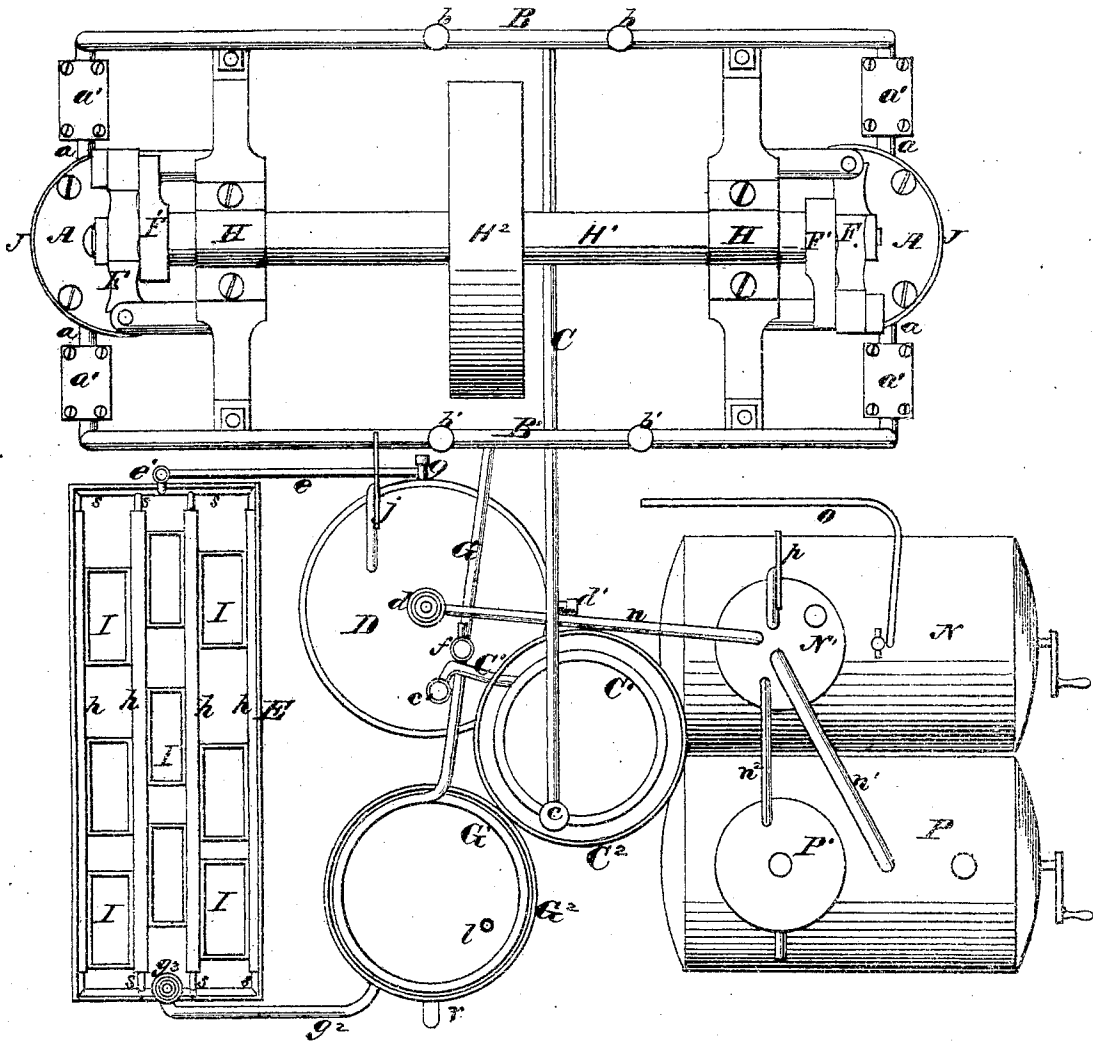


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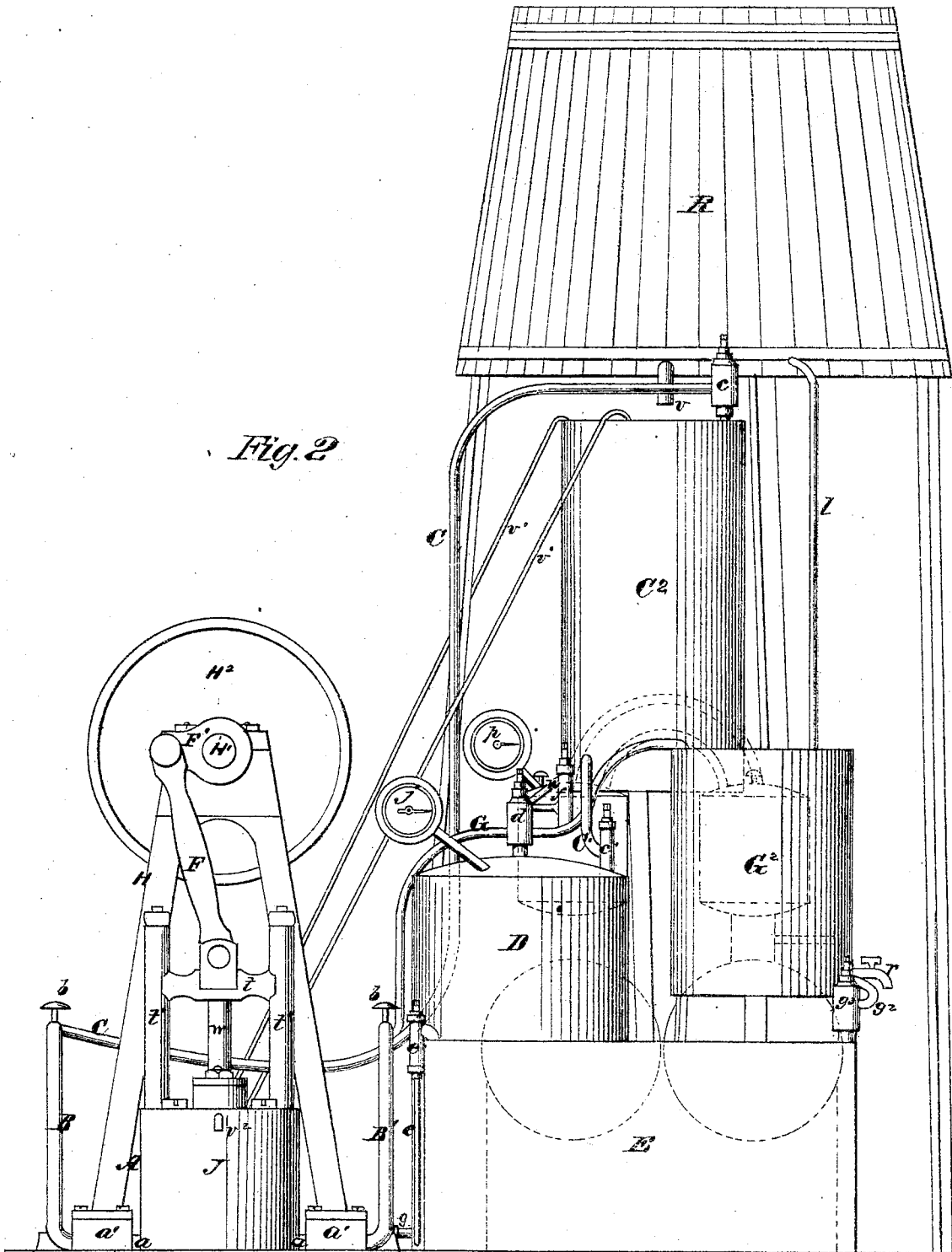
*Fig. 1*



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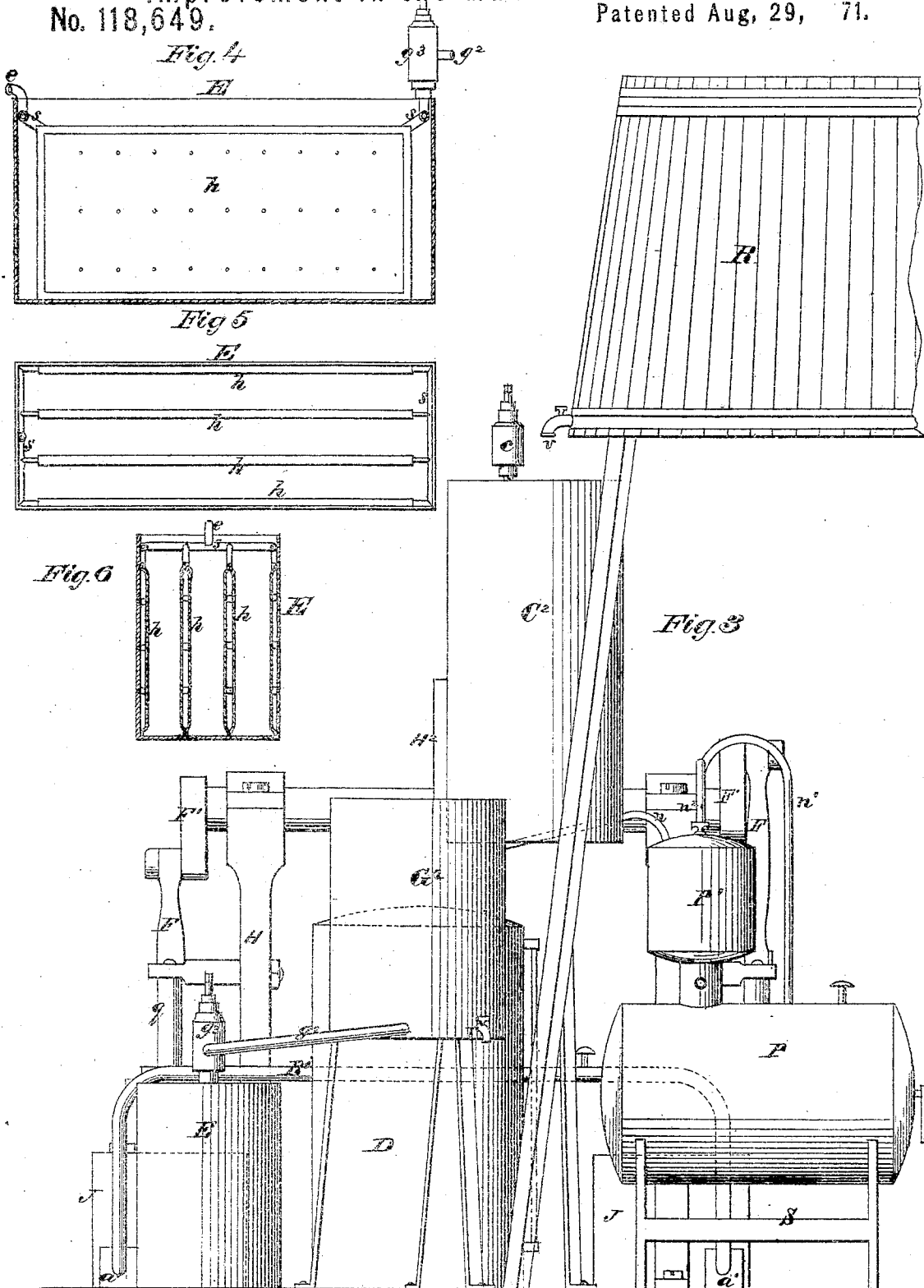
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# UNITED STATES PATENT OFFICE.

JAMES E. SEARS, OF WACO, TEXAS.

## IMPROVEMENT IN APPARATUS FOR THE MANUFACTURE OF ICE.

Specification forming part of Letters Patent No. 118,649, dated August 29, 1871.

*To all whom it may concern:*

Be it known that I, JAMES E. SEARS, of Waco, in the county of McLennan and State of Texas, have invented certain new and useful Improvements in the Manufacture of Ice; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing making part of this specification, in which—

Figure 1, Plate 1, is a top view of the apparatus with the cistern for water removed. Fig. 2, Plate 2, is an elevation of one side of the apparatus. Fig. 3, Plate 3, is a side elevation of the apparatus looking at it from another point. Figs. 4, 5, and 6 are views, showing the construction of the freezing-chest.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates, in part, to certain improvements on machinery for the manufacture of ice, wherein are employed one or more exhausting-pumps for effecting the rapid vaporization of highly-volatile fluids in a freezing-chest. The invention also relates to a novel mode of treating volatile fluids, whereby they are made much lighter and more highly volatile, and whereby fluids are made available in the manufacture of ice, which are more easily reclaimed than fluids which have hitherto been used for this purpose.

The following description of my invention will enable others skilled in the art to understand it.

In the accompanying drawing I have represented two double-acting pumps, A A; but, if desired, a single pump may be used. These pumps are mounted upon a substantial foundation, and their cylinders incased by jackets J J, which form water-chambers around them, through which chambers water is caused to flow constantly. The water is conducted into said chambers from a vessel, C<sup>1</sup>, by means of pipes v<sup>1</sup> v<sup>1</sup>, and flows out of the chambers through outlet-pipes v<sup>2</sup>. In this way the pump-chambers are kept cool, and the fluid which passes through them will not be vaporized in them. Those surfaces of the pumps which are exposed to the fluids used for refrigerating should be constructed of materials which will not be readily oxidized by acids, and to this end I propose to make the pump-cylinders of bronze metal, and the packings I make of lead

or copper, while the stuffing-boxes are filled with gutta-percha. If desirable, the cylinders of the pumps may be made of cast-iron lined interiorly with some non-corrodible materials. Rising from the upper heads of the pump-cylinders are two guide-rods for the cross-heads t of the piston-rods w, which cross-heads are connected to cranks F' on a horizontal shaft, H<sup>1</sup>. The shaft H<sup>1</sup> is mounted in journal-boxes upon a frame, H, as shown in the drawing, and is driven by means of a belt passed around the wheel H<sup>2</sup>, and any convenient power may be applied to turn it. From the pumps A pipes a extend to valve-boxes a', and from these valve-boxes extend arched pipes B B', so that the exhaust-valves of both pumps are connected together by a pipe, B', and the repulsing or outlet-valves of both pumps are connected together by the pipe B. The arched pipes B B' are provided with cocks b b' b' b', which will allow communication to be cut off when it is desired to use only one of the pumps. The arched pipe B is in communication with a worm-pipe, C<sup>1</sup>, in vessel C<sup>2</sup>, by means of a pipe, C, and the arched pipe B', for the exhaust, is in communication with a worm, G<sup>1</sup>, in a vessel, G<sup>2</sup>, by means of a pipe, G. The cooler G<sup>2</sup> is supplied with water by means of a pipe, l, leading out of an elevated reservoir, R, and cool water is drawn therefrom by means of a cock, r. The worm in this cooler communicates with chambers formed in the freezing-chest by means of a pipe, g<sup>2</sup>, to which a valve, g<sup>3</sup>, is applied. The liquefier C<sup>2</sup> is supplied with a constant stream of water from the reservoir R by means of a cock, v, whose discharging capacity is just double that of both the pipes v<sup>1</sup> v<sup>1</sup>, which conduct water into the chambers that surround the pump-cylinders. A valve, e, is applied at the junction of the pipe C with the worm C<sup>1</sup>, and the lower end of this worm extends out of the liquefier, and communicates with the upper end of a vessel, D, by means of a valve, e'.

The vessel D is designed for containing the refrigerating fluid, hereinafter explained, and this vessel is in communication with the chambers of the freezing-chest by means of a pipe, e, and valves g and e. On top of the vessel D is a valve-box, to which a pipe, n, is connected, leading into the upper end of a carbonic-acid-gas purifier, N'. There is also an indicator, j,

applied to the top of the vessel D for indicating pressure. The purifier N' is mounted upon a vessel, N, which is designed for containing an extra supply of the refrigerating liquid, and which is provided with a stirrer inside for agitating the liquid with carbonic-acid gas. The vessel is provided with a pipe, *o*, which is flexible, and by means of which the liquid can be conducted into the vessel D. The pipe *o* serves also several purposes hereinafter explained.

Alongside of the vessel N, and mounted on the same frame S therewith, is a carbonic-acid-gas generator, P, on which is mounted a chamber, P', for containing acid used in the production of the gas. The gas is conducted from the generator into the purifier N' by means of a pipe, *n*<sup>1</sup>, and by means of a pipe, *n*<sup>2</sup>, connecting the purifier and acid-box together, a pressure is established in the latter for supplying acid to the generator. An indicator, *p*, on the purifier N' will indicate the pressure therein.

The freezing-chest E is a rectangular vessel, properly surrounded or incased in non-conducting walls, and provided interiorly with a number of hollow vertical partitions or walls, *h h*, which leave spaces between them for receiving the ice-boxes I, shown in Fig. 1. The hollow walls *h* communicate with the valve-boxes *e*' and *g*<sup>3</sup> by means of branch pipes, and through these boxes with their respective pipes *e* and *g*<sup>2</sup>.

The vessel D is charged with gasoline, or other suitable light volatile liquid, through the valve-box *d*, and, if desirable, the vessel N is also charged with a similar liquid to be kept in reserve. The ice-boxes containing water are introduced into the freezing-box in saline water, and this box tightly closed. The cock *v* is opened to supply the vessel C<sup>2</sup>, and from this vessel the water is conducted into the chambers surrounding the pump-cylinders by means of pipes *v*<sup>1</sup> *v*<sup>1</sup>. The vessel C<sup>2</sup> is also supplied with the water from the reservoir R, which will be cooled, and can be used in the ice-boxes I. Carbonic-acid gas is produced in the generator P, and, when purified, it is conducted into the vessel D by means of pipe *n* and valve-box *d*, and mixed with the gasoline therein, for a purpose hereinafter explained. The pumps are then started and the valves are all opened for the purpose of driving out the air, which will escape through a cock, *f*. After the air is all driven out, the cock *f* is shut and the cock *g* is opened for allowing the volatile liquid mixed with carbonic-acid gas to pass through the chambers of the freezer E, and thence through valve-box *g*<sup>3</sup>, pipe *g*<sup>2</sup>, worm G<sup>1</sup>, pipes G and B back to the pumps. From the pumps the vapor is forced through pipes B C, valve-box *e*, and worm C<sup>1</sup> back again into the vessel D. On its way from the freezing-chest E back to the vessel D large quantities of the vapor of the gasoline will be condensed, especially in the two worm-vessels C<sup>2</sup> and G<sup>2</sup>, which are kept filled with water. The water in these vessels being very cool is used as above stated, for cooling the pumps, and also for the ice-boxes I.

The flexible pipe O, which is connected to the vessel N is used: First, for catching any liquid which may escape from the pipes when the cock *f* is opened to allow the escape of the air at the commencement of the operation, and conducting the same into the vessel N. Second, for conducting gasoline from the vessel N into the vessel D. Third, for conducting a resupply of liquid from the vessel N directly into the pipe B' through cock *b* when it is not desired to conduct the liquid into the vessel D.

The pipe *n* may be disconnected from the valve-box *d* and connected either to the cock *b*' or to the valve-box *e*, when it is desired to ascertain the degree of pressure in the pumps and the pipes B B' C C<sup>1</sup>.

As the main object of my invention is to obviate the labor, expense, and loss of time required to reclaim a liquid after it has been gasified, as under the old process of manufacturing ice artificially, I have constructed the above-described apparatus so that the vapor of the liquid used will, after it has passed through the freezing-box, be immediately condensed into liquid again and returned back into the vessel D from which it was drawn.

I use gasoline, turpentine, sulphuric acid, and wood spirits, any of the light hydrocarbons, methylic ether, chloric ether, or other very light volatile liquid. Many of the liquids may be used alone, such, for instance, as chloric ether, rhigoline; but the heavier liquids, as gasoline or turpentine, require to be highly charged with carbonic-acid gas by means of the apparatus above described or an apparatus equivalent thereto.

When thoroughly mixed with liquids of the nature last named, carbonic-acid gas has the effect of rendering them very volatile, and enabling me to readily convert them into vapor in the manner above set forth.

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

1. The water-jacket J around the pump A, in combination with the worm-vessel C<sup>2</sup> and pipe *v*<sup>1</sup>, whereby a stream of cold water is supplied to the chamber inclosed by said jacket, and the pump kept cool, substantially as described.

2. The condenser G<sup>2</sup>, containing a worm, G<sup>1</sup>, which communicates with the chambers in the freezer, and also with the exhaust-pipe B' of the pump, and also with the liquid-receptacle D, substantially as described.

3. The combination of the liquid-receptacle D, the freezer E, and worm-vessel C<sup>2</sup>, when there is a communication between these vessels, and also between the worm C<sup>1</sup> and repulsion-pipe B of the pump, by means substantially as described.

4. The blow-off cock *f*, applied to the pipe G, which leads from the worm G<sup>1</sup> to the exhaust-pipe B', substantially as described.

5. The elevated reservoir R and its discharge-cock *v*, in combination with the worm-vessel C<sup>2</sup>, pump or pumps A, and liquid-receptacle D, substantially as described.

6. The auxiliary liquid reserve N, communicating with the liquid-vessel D by means of a valve-box, A, and pipe *o*, substantially as described.

7. The combination of a carbonic-acid-gas generator with a vessel, D, an exhausting-pump and a freezing-box, substantially as described.

8. The treatment of volatile liquids to be used in the manufacture of ice, with carbonic-acid gas, substantially as described.

J. E. SEARS.

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(87.)