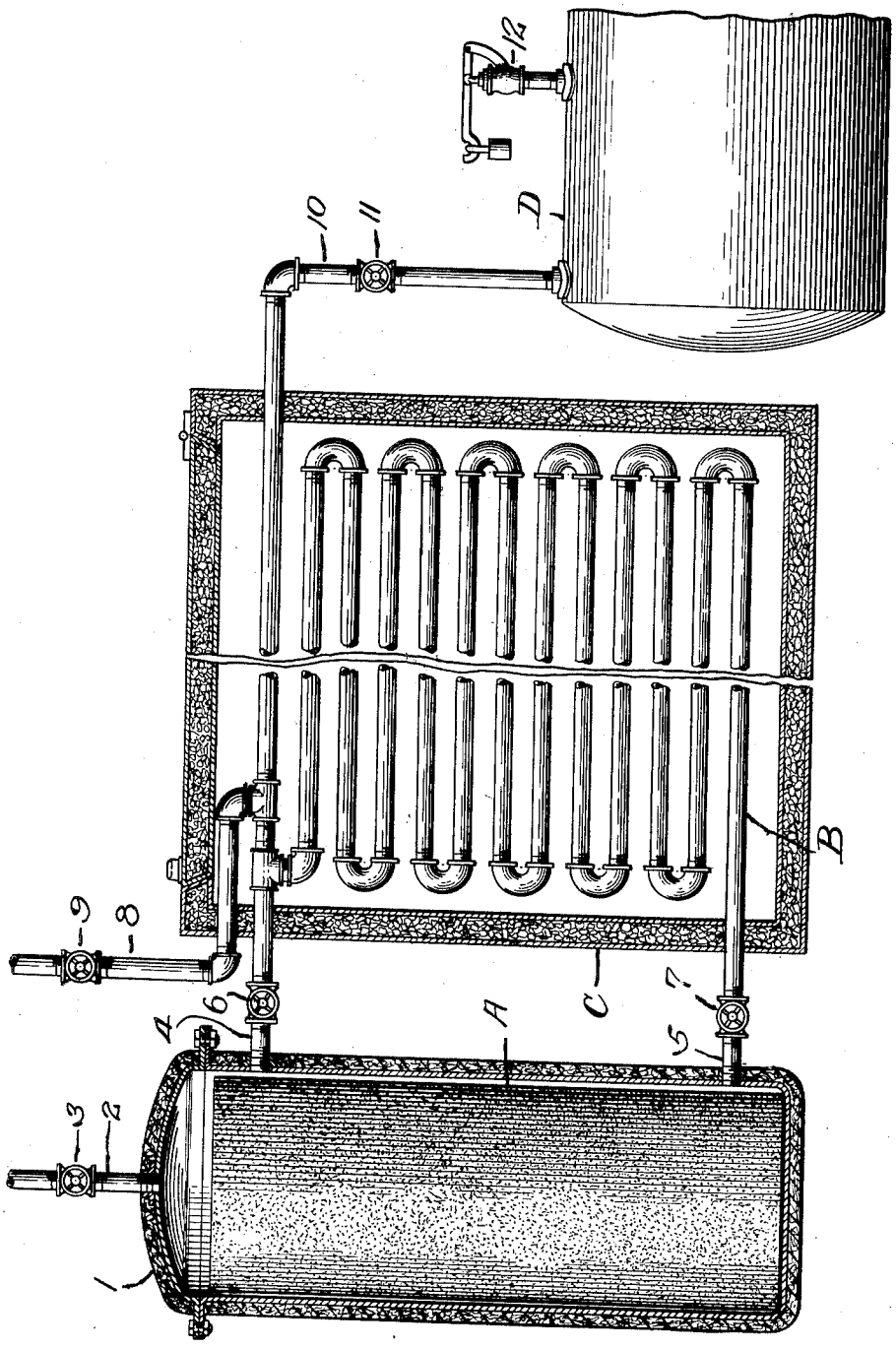
April 5, 1932. W. D. WILCOX 1,852,388

APPARATUS FOR THE UTILIZATION OF SOLID CARBON DIOXIDE

Filed June 17, 1929



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Patented Apr. 5, 1932 1,852,388

UNITED STATES PATENT OFFICE

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APPARATUS FOR THE UTILIZATION OF SOLID CARBON DIOXIDE

Application filed June 17, 1929. Serial No. 371,603.

My invention has to do with apparatus designed to facilitate the use of carbon dioxide received initially as a solid. This gas has a wide use in the carbonation of what are commonly known as soft drinks. It is ordinarily distributed for this purpose compressed to a liquid in steel cylinders which, to have the strength necessary to resist the internal pressure of the gas, must be of a heavy weight. The cost of delivering and of returning these cylinders from which the gas has been exhausted to atmospheric pressure adds very materially to the price which must be charged for the gas.

More recently there has developed a considerable use of carbon dioxide as a refrigerant. It is lowered in temperature until it becomes a snow. It is then compressed into a solid block. Used as a refrigerant it has the advantage as compared with water ice that as it absorbs heat it becomes a gas, and passes off as such, for which reason it has been given the name of "dry ice".

The apparatus disclosed by the accompanying drawing is designed to permit the use of solidified carbon dioxide compressed in suitable form as a refrigerant and at the same time conserve the gas given off when it melts to be used for carbonation (or other purposes) or where refrigeration is not needed to permit the delivery to the consumer of the solidified carbon dioxide enclosed merely in a fibre container of light weight and of small cost so that its return to the plant will be a matter of no consequence, and its subsequent transfer to a suitable tank or container from which it may be drawn as needed.

In the drawing is a steel container A, preferably of cylindrical form and surrounded by a jacket of insulating material. B is a pipe coil of any desired design which may be placed in or adjacent to a refrigerator box, C. D is a gas storage tank which will be of a strength sufficient to retain the gas under a pressure considerably in excess of atmospheric.

1 is a removable lid in the upper part of A, which may be strongly and tightly clamped to it by suitable means;

2 is a gas discharge pipe which is used to relieve the pressure in A, prior to removing the lid as a preliminary to the introduction of solidified carbon dioxide;

3 is a valve opening and closing discharge pipe 2;

4 and 5 are outlets from A connecting it with B and D, one of which will be in the upper part of A, one near the bottom;

6 and 7 are valves closing these outlets;

8 is a discharge pipe by which gas may be withdrawn for use;

9 is a valve on this outlet;

10 is a pipe connection between B and D;

11 is a valve on this pipe;

12 is a safety or relief valve by which the carbon dioxide may be released, should the pressure of the gas in D rise above that which it is designed to safely support.

The manner of use can be readily understood. The frozen carbon dioxide will be formed into cylinders of a diameter slightly less than the interior diameter of A, or of any dimensions corresponding to other dimensions given to the containing chamber. Assuming A to be filled with gas, possibly with a small residue of solid carbon dioxide, it is refilled by closing valves 6 and 7, and opening valve 3 on 2 to relieve the pressure. Lid 1 is then unclamped and opened; the cylinder of solidified carbon dioxide introduced; the lid is reclamped and valve 3 closed; valve 7 is opened; valve 6 partially opened.

It is apparent that as the temperature of the gas in B rises through the absorption of heat, it will pass through into A and into contact with the cylinder of solid carbon dioxide and being cooled and causing a further evolution of cold gas from the cylinder, will pass down and into B through outlet 5. By regulating the size of the opening of valve 6, a considerable control may be exercised over the rate of gas evolution from A. An automatic device may readily be placed on 4 to control either the temperature of the gas in B, or to maintain a constant pressure, there being a rate of withdrawal through 8 not less than the rate of gas evolution due to impact of heat through the insulated walls of A.

It need hardly be said that where no use for a refrigerant exists, B and C may be elimi-

nated, leaving only a mere pipe connection between 4 and 5 to permit a circulation of gas, and the pipe 10 to storage tank D by which the gas evolved more rapidly than it is withdrawn through 8 for use may be stored. There are very many situations where such apparatus being installed, the carbon dioxide can be delivered in solid form with a great reduction in handling costs between the plant where produced and the place of consumption and both the refrigerating value due to its extremely low temperature and its value as a gas fully utilized.

What I claim as new and desire to protect by the issuance to me of Letters Patent is:

1. In apparatus for the utilization of solid carbon dioxide, the combination of an insulated container, an opening therein with closable means for introducing solid carbon dioxide into the container, closable outlets at the upper and lower extremities of the container, an exterior connection between these outlets, a storage tank, means for passing gas from the container into the storage tank, means of withdrawing gas from the apparatus.

2. In apparatus of the sort described, the combination of a pressure resistant container, heat insulating materials surrounding the container, a lid thereto, means of firmly closing the lid, a discharge pipe from the container to the air, means of opening and closing the discharge pipe, outlets from the upper and lower extremities of the container, means of opening and closing these outlets and of varying the degree of opening therein, a refrigerating coil having its terminals joined to these outlets, a discharge pipe from the coil and means of opening and closing the discharge pipe.

3. In apparatus of the sort described, the combination of a pressure resistant container, heat insulating materials surrounding the container, a lid thereto, means of firmly closing the lid, a discharge pipe from the container, means of opening and closing the discharge pipe, outlets from the upper and lower extremities of the container, means of opening and closing these outlets, a system of pipes having its terminals connected with these outlets, a storage tank, a pipe connecting the system of pipes with the storage tank, a closable outlet from the pipe system.

4. In apparatus for the utilization of solid carbon dioxide, a pressure resisting container, heat insulating materials surrounding the container, means of introducing solid carbon dioxide into the container, means of reducing the pressure within the container, outlets in upper end lower extremities of the container, means of opening and closing these outlets, and of varying their size, a system of pipes having its terminals connected to these openings, means of circulating gas evolved from the solid carbon dioxide through the system of pipes and downward through the container, a closable outlet for withdrawing evolved gas from the system of pipes.

5. In apparatus for the utilization of solid carbon dioxide, the combination of an insulated container, a firmly closable lid upon the container for the introduction of solid carbon dioxide, a system of pipes having its terminals connected to and opening into the upper and lower extremities of the container, means of closing and regulating the size of these openings, means of causing evolved gas to circulate through the system of pipes from the opening in the lower extremity of the container and down through the container, means of withdrawing evolved gas from the system of pipes.

6. In apparatus for the utilization of solid carbon dioxide, the combination of an insulated pressure resisting container, means of introducing solid carbon dioxide into the container, means of reducing the pressure within the container, outlets from the upper and lower extremities of the container, means of closing and varying the size of these outlets, a closed circuit of pipes having its terminals connected with these outlets, means of withdrawing evolved gas from this circuit.

In testimony whereof, I have affixed my signature.

WILLIAM D. WILCOX.