(No Model.) 2 Sheets—Sheet 1.

E. A. QUISENBERRY.

METHOD OF AND APPARATUS FOR MANUFACTURING ICE.

No. 460,028. Patented Sept. 22, 1891.

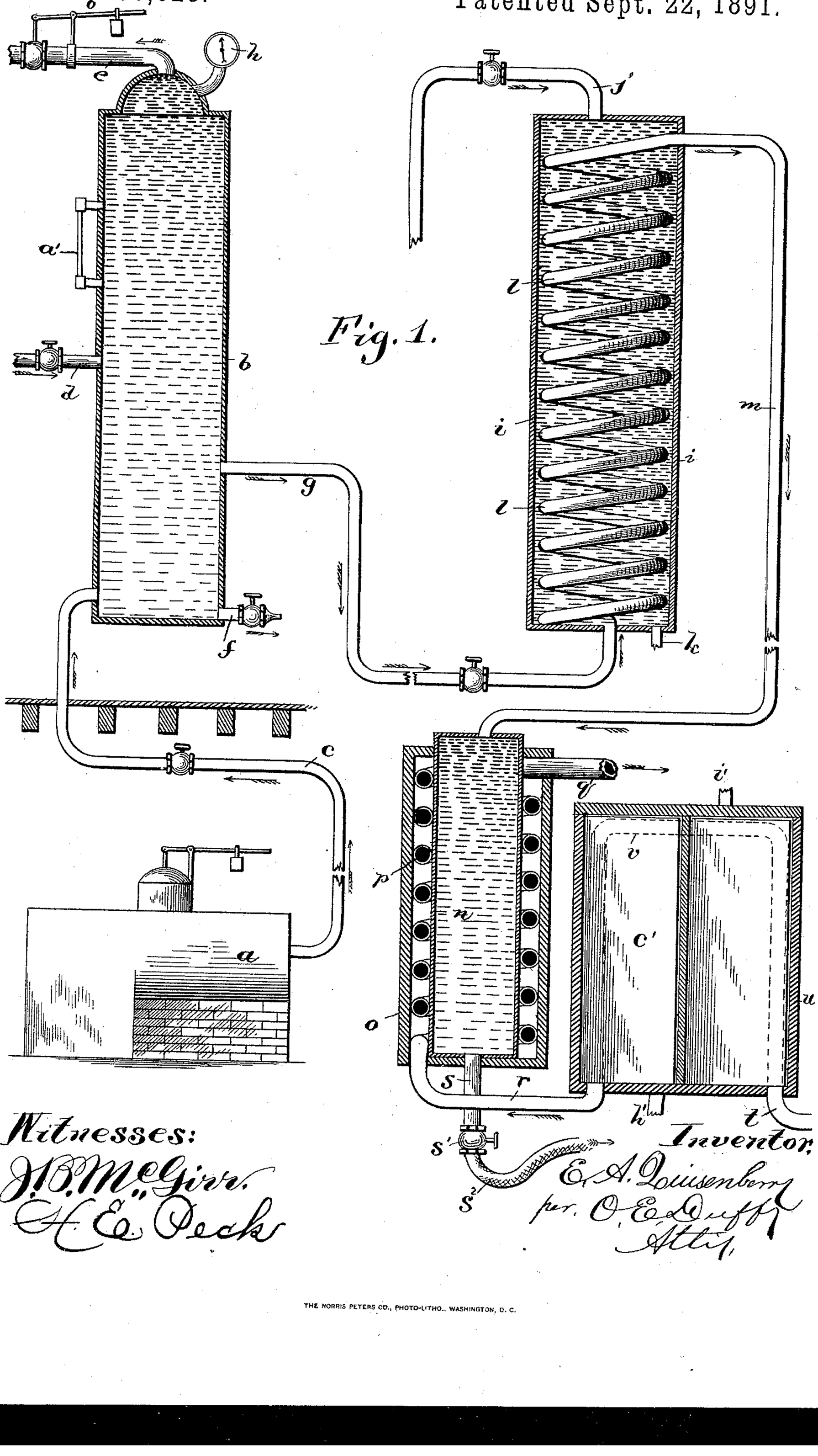

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

E. A. QUISENBERRY.

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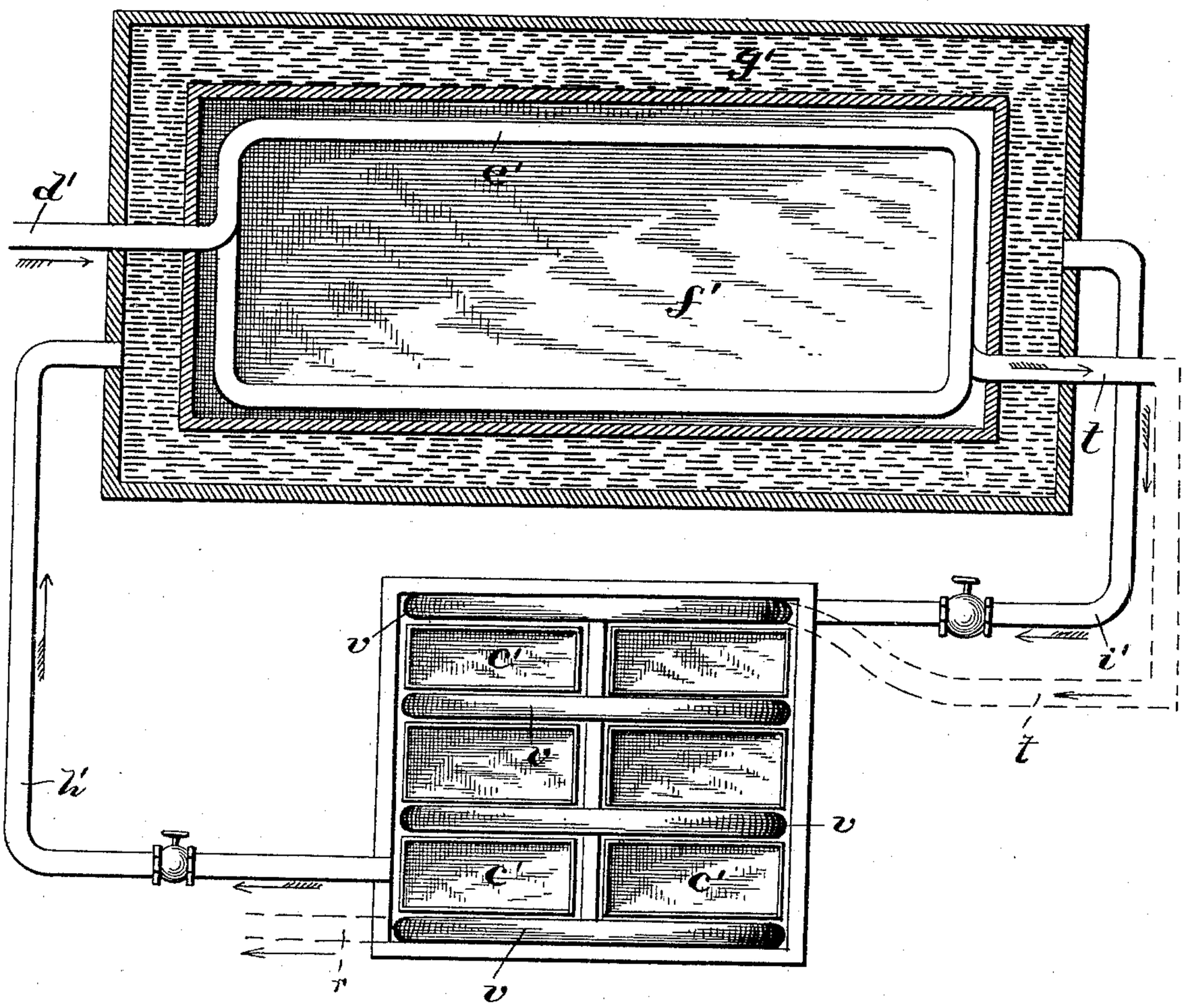
Fig. 2



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UNITED STATES PATENT OFFICE

EDWARD A. QUISENBERRY, OF LEXINGTON, VIRGINIA.

METHOD OF AND APPARATUS FOR MANUFACTURING ICE.

SPECIFICATION forming part of Letters Patent No. 460,028, dated September 22, 1891.

Application filed May 20, 1890. Serial No. 352,470. (No model.)

To all whom it may concern:

Be it known that I, EDWARD A. QUISENBERRY, of Lexington, in the county of Rockbridge and State of Virginia, have invented certain new and useful Improvements in Methods of and Apparatus for Manufacturing Ice; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention relates to certain improvements in methods of and machines for making ice.

The objects of this invention are the production of an improved method of and machine for producing artificial ice of a superior quality, to reduce the time required in manufacture to a minimum, to reduce the labor required and the cost of production, and to economize materials. These objects are accomplished by the method hereinafter set forth, and in certain novel features of construction and in combinations of parts more fully described hereinafter, and particularly pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a partial sectional elevation of the apparatus. Fig. 2 is a sectional plan of a portion of the apparatus.

In the drawings, the reference-letter *a* indicates any suitable steam-generator.

b is a suitably-supported closed air-tight water-purifying vessel constructed of sufficient strength to withstand an internal pressure of, say, twenty to one hundred pounds. A steam-supply pipe *c* extends from the generator into the lower end of the purifying-tank to supply steam thereinto. A water-supply pipe *d* discharges into the said tank between its ends, and this pipe is provided with a suitable stop-cock, as shown.

f is a blow-off pipe from the bottom of the tank, provided with a valve.

The top of the tank is preferably provided with a dome, as shown, from the top of which a blow-off pipe *e* extends, and this pipe is provided with a safety-valve *b'*. The tank is also provided with a pressure-gage *h* to indicate the pressure in the tank, and with a water-gage *a'*, by which the height of the water in the tank can always be seen.

i is a closed cooling cylinder or chamber provided with inlet-pipe *j* and discharge-pipe *k*. A coiled cooling-pipe *l* extends longitudinally through this cylinder, and a pipe *g* extends from the purifying-tank a distance above its bottom to the lower end of said coil, and a pipe *m* extends from the upper end of the coil into the upper end of a cooling-cylinder *n*. The bottom of this cooling-cylinder is provided with a discharge-pipe *s*, having a valve *s'*, and preferably provided with a short section of hose or flexible tubing s^2. This cooling-cylinder *n* is embraced and surrounded by an exterior cooling-coil of pipe *p*, inclosed within an outer casing *o*.

u is the closed freezing-tank, so constructed that it can be readily opened to place the ice-cans therein or to remove the same therefrom. This tank is provided, as usual, with coiled ammonia-pipes *v*, having spaces between them, in which the ice-cans *c'* rest and are removably located. The pipe *r* extends from the discharge end of the ammonia-coils *v* in the freezing-tank to one end of cooling-coil *p*, and the opposite end of said cooling-coil *p* is connected with the usual pump or ammonia treating and circulating machine (not shown) by pipe *q*.

From the pump or ammonia-condensing machine the condensed ammonia is forced through pipe *d'* into the coiled pipe *e'* in the cooling-chamber *f'* of a condenser, where the ammonia is thoroughly cooled and condensed. This condensing-chamber is surrounded by a water jacket or space *g'*. An ammonia-pipe *t* conducts the condensed ammonia from the condenser-coil *e'* to the induction end of the coils *v* in the freezing-tank. The freezing-tank when in operation is filled with brine or other suitable solutions, which do not freeze at as high a temperature as pure water. Brine-circulating pipes *h'* and *i'* connect the freezing-tank and the cooling-jacket *g'* of the

ammonia-condenser. All pipes, when necessary, are provided with suitable valves.

In operation the purifying-tank is filled full to the top through pipe *d* with the water to be purified and frozen. When this tank is filled, a stream of steam is discharged through pipe *c* into the bottom of the said tank and forces itself through the confined bottom of water therein, thereby thoroughly agitating and heating the water and releasing the air therein and relieving the water from all impurities held suspended therein. The heavier impurities and sediment from the water sink to the bottom of the tank and are blown out through pipe *f* at suitable intervals, while the air and lighter particles and impurities rise to the top of the tank and are blown out through pipe *e*, which pipe extends to the exterior of the building. By means of the water-gage *a'* the attendant will know when the water in the purifier has lowered from the top and how much to blow out through pipes *f* and *e*, and thus can always keep said tank full. The pressure in the tank is usually kept from twenty to one hundred pounds per square inch. By this means the air and impurities from the water are removed, whereby a superior quality of ice is produced, solid and clear and free from all air-bubbles, and the water will freeze quicker than ordinary water. The cooling-tank is kept filled with cold water from any suitable source, and the water is circulated through the same by means of pipes *j k*. The hot purified water from the purifier is passed through pipe *g* to coil *l*, through which it is passed and wherein it is cooled, and from the cooling-coils the cool water passes through pipe *m* into the supply tank or reservoir *n*, where it is kept exceedingly cold by the ammonia passing from the freezing-tank through coil *p*. The ice-cans *c'* are of suitable construction and are filled with pure water from the supply-reservoir through pipe s^2, the flexible pipe being extended to the bottom of the cans, and the cans being thus filled from the bottom, thereby preventing the water from being permeated with air, as would be the case if the water were poured in from the top. When the cans are filled with the pure water, they are placed in the freezing-vessel, as usual. The freezing-tank, being suitably filled with brine, the ammonia is set in operation by the pump and passes through the condenser and pipe *t* to and through the freezing-coils of the freezing-tank, wherein the liquid ammonia expands and vaporizes and takes up heat from the brine in the freezing-tank, thereby reducing the brine to such low temperature as to quickly and solidly freeze the water in the cans. From the freezing-coils the partially-expanded ammonia flows through the coil *p* around the pure-water-supply vessel, thereby reducing the temperature of the pure water therein by absorbing the heat thereof. The expanded ammonia flows from coil *p* through pipe *q* to the pump, where it is partially condensed, and is forced through the pipe *d'* into the condenser, where it is thoroughly cooled and condensed, and from thence passes through pipe *t* to the freezing-coils. The condenser is kept at a very low degree of cold by being connected with the brine-tank, so that the cold brine therefrom is kept circulating through the jacket *g'*. By this means the condenser is cheaply and economically kept cool without the necessity of a constant supply of spring-water or ice. It should be observed that the water has an air-tight course from the purifier to the cool supply-vessel *n*.

The great advantages and utility of this method and apparatus are obvious.

It is evident that various changes might be made in the form and arrangements of the parts described without departing from the spirit and scope of my invention. Hence I do not wish to limit myself to the precise construction herein set forth.

What I claim is—

1. In the manufacture of ice, the herein-described mode of deaerating water, which consists in completely filling a closed tank with the water to be frozen, forcing a stream of live steam directly into said confined body of water, blowing off a portion of said water from the upper end of the tank, thereby removing air and impurities contained therein, removing the purified deaerated water from said tank at a point above its bottom, cooling the same out of contact with the outer air, discharging the same into the freezing-cans, and freezing the same without admitting air thereto, as set forth.

2. In combination, the closed boiler-tank having valved discharges, a water-supply pipe thereinto, a steam-generator having a steam-pipe opening into said boiler-tank, a water-cooling coil surrounded by a cooling-tank, a closed supply-tank surrounded by a cooling-coil and having a valved discharge-pipe, a pipe extending from the boiler-tank to said water-cooling coil, and a pipe from the opposite end of said water-cooling coil into said reservoir, as set forth.

3. In combination, the brine-tank, the cooling-coils therein, the ammonia-condenser containing an ammonia-coil connected with the brine-tank coils and through which the ammonia flows to the brine-tank coils, and a brine-chamber surrounding said condenser-coil and brine-circulating pipes between the brine-tank and said chamber, as set forth.

4. The mode of purifying and deaerating water in the manufacture of ice, which consists in completely filling a closed boiler-tank with the water to be frozen, discharging a stream of live steam directly into said confined inclosed body of water, blowing off part of the water containing impurities, air, &c., from either end of the tank, and then after

being sufficiently treated drawing off the remainder of the water from the tank between its ends, substantially as described.

5. In combination, a steam-generator, a closed boiler-tank having a steam-pipe from the generator into its lower portion, a water-discharge from said tank, and valved blow-off pipes from its opposite ends, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

EDWARD A. QUISENBERRY.

Witnesses:
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E. O. DUFFY.