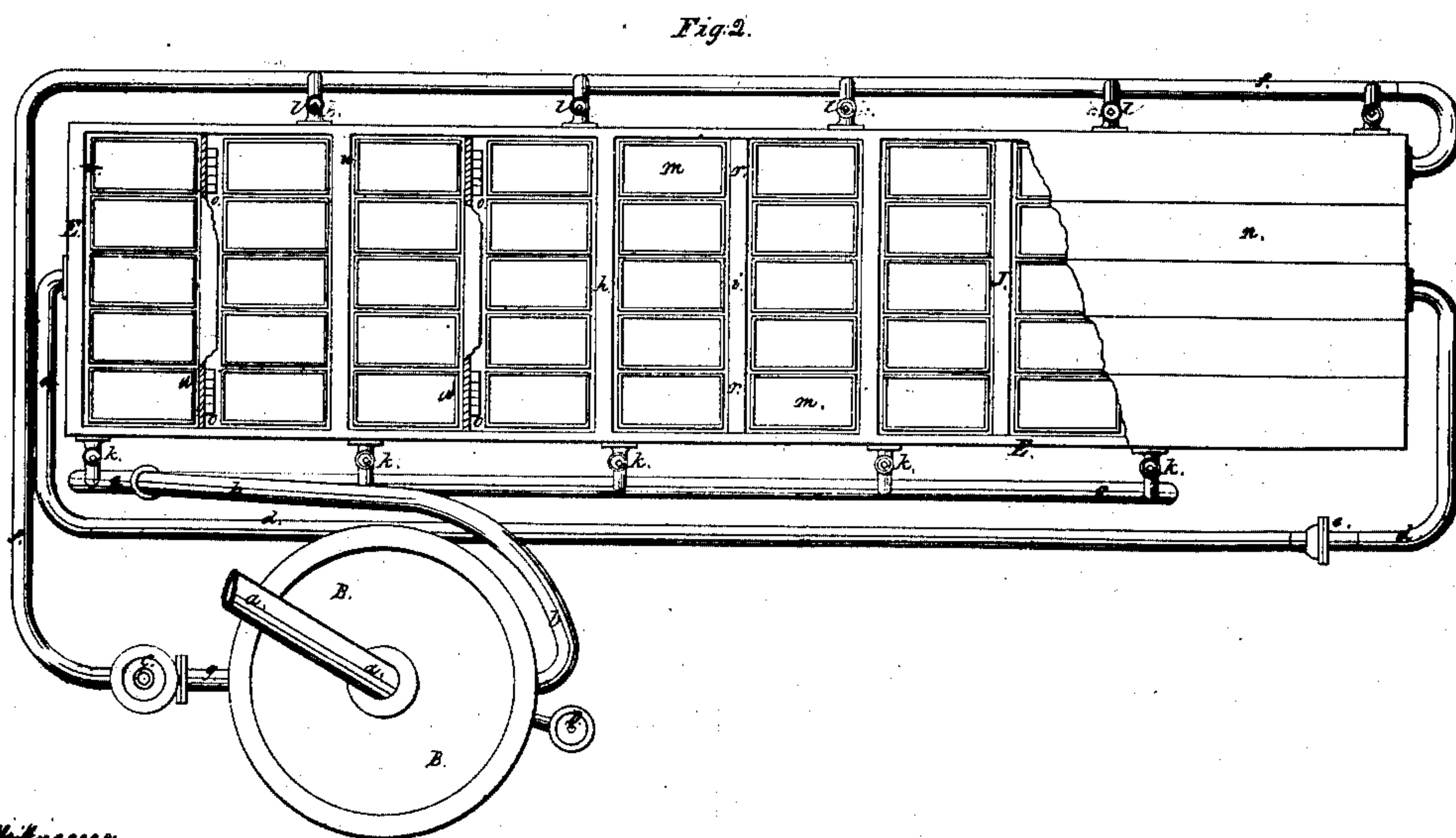
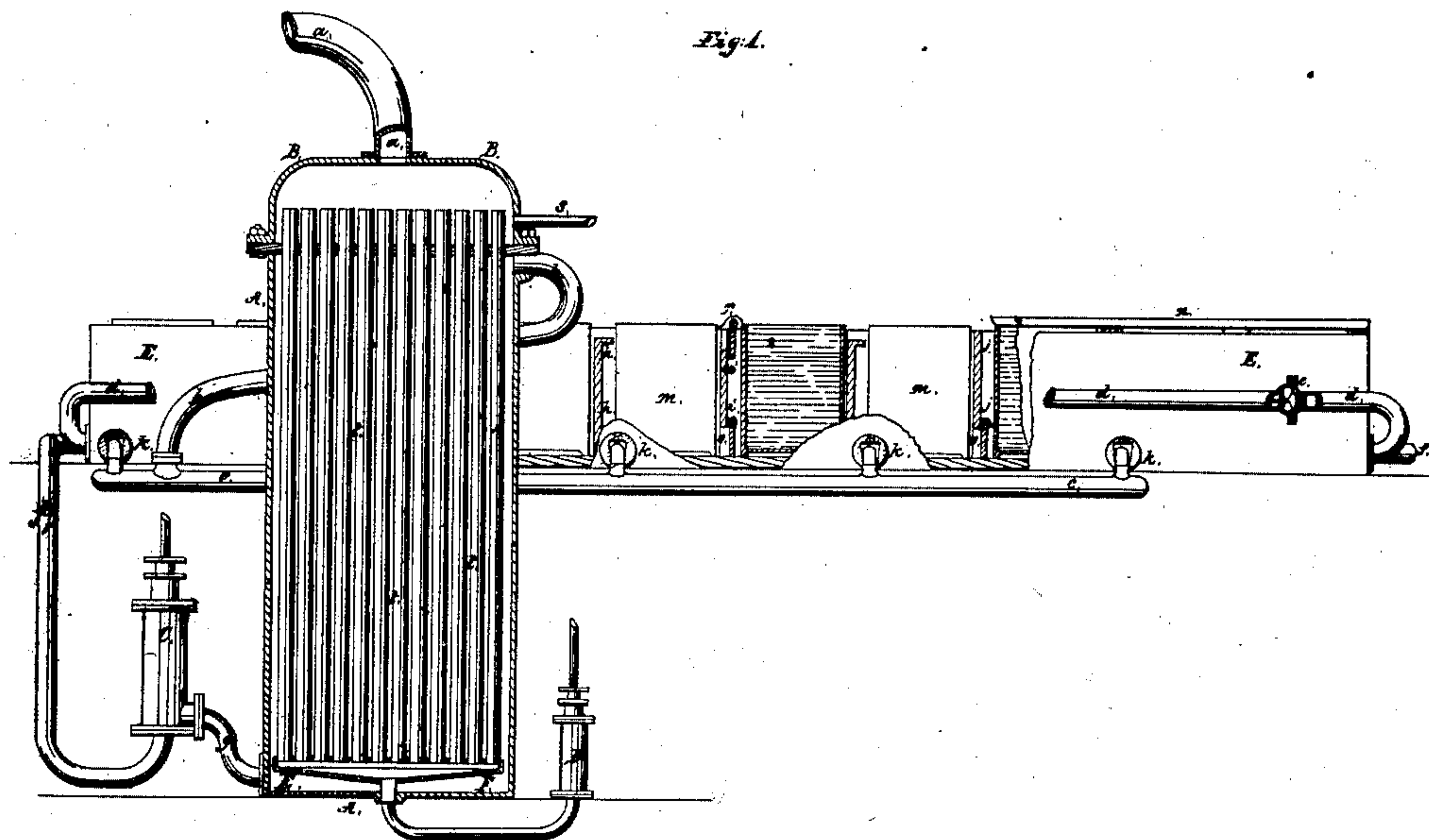


A. C. Twining,

Ice Machine,

N^o 34,993,

Patented Apr. 15, 1862.



Witnesses:

*John C. Boyd
Henry Hallick*

Inventor:

A. C. Twining

UNITED STATES PATENT OFFICE.

ALEXANDER C. TWINING, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN APPARATUS FOR MAKING ICE.

Specification forming part of Letters Patent No. 34,993, dated April 15, 1862.

To all whom it may concern:

Be it known that I, ALEXANDER C. TWINING, of New Haven city, New Haven county, State of Connecticut, have invented a new Improvement in the Art of Making Ice and of Refrigeration, of which the following is a full and exact description.

My improvement applies particularly to those known methods of making ice and of refrigeration in which the cold is produced by the escape of vapor from a volatile liquid or liberation of a gas from a liquid state or a state of solution.

The apparatus or means which I employ were drawn and described in part in my specification A. D. 1853, and are fully shown by the accompanying drawings.

A A A is a tight vessel, through which passes or is forced, as by the pump C, a liquid uncongealable at the temperatures employed—for example, water holding alcohol or a salt in solution. If the liquid enters through the channel *g* at bottom, its exit may be through *b b* at top. This liquid surrounds a system of pipes, *t t t*, which open below into a tight cavity, F F, and above into another tight cavity contained by the cover B B and the upper head of A A A, or any equivalent plate or bottom, through which the pipes *t t t* pass with a tight joint, so that the interior of the pipes forms with those cavities an air-tight compartment with only an opening below by a pipe into D and above by the channel *a a* into an evaporating-pump or into another closed compartment. Now, let the liquid which is to produce the cold be introduced into the cavity F F—by the pump D, for example—so as wholly or partially to fill the pipes *t t t*, and suppose *a a* to lead to the suction of a working air or vapor pump, or to some other means of withdrawing vapor or gas from the compartment B B *t t*. Then the cooled liquid in the pipes will cool the liquid in the vessel A A A; or if the evaporable or cooling liquid is regulated to enter at top through the pipe *s* it will rise to the top of the pipes *t t t* and above them, so as to run down the interior surfaces of those pipes in a thin sheet, affording a better escape for the vapor or gas out of the pipes during the production of cold, and through the bottom pipe any residuum may be drawn off from F F and by D.

It is obvious that the cavity B B *t t* F F and the cavity A A A may be made to exchange offices and form a strict equivalent to the above by simply entering *s* and *b b* interchangeably compared with their present positions in the drawings, also making the pipe *g* to enter F F, in place of the pipe now entering from D, and making *a a* to come into the cavity A A A at top instead of into B B. The last arrangement will simply bring the cold-producing liquid outside and around the pipes *t t*, &c., and the liquid pumped by C on the inside.

Suppose, now, the liquid in A A A to be cooled below a freezing temperature and to flow through *b b* into a vat, E E, Figures I and II, containing thin vessels *m m*, &c., Figs. I and II, filled with water, and to flow in a current, giving place to other equally-cooled liquid; the vessels *m m*, &c., would at length have their contents frozen. This method I reserved the right to claim for a future patent in the specification of my patent dated from July, 1856; but there is still further an improvement, which I proceed to describe.

It is obvious that the vessels which are first subjected to the freezing-current will be soonest frozen, because the current is warmed by the vessels and their contents. I remedy this defect by shifting progressively the first impact from vessel to vessel in a regular circuit, bringing the coldest current upon vessels already frozen up in part and the least cold upon the vessels containing the recently-introduced water. By this ice is produced more rapidly on the average, and of uniform quality in all the vessels. I effect this by dividing the vat into cross-troughs *u u u u*, Fig. II, each containing its own vessels *m m*, &c. The partitions between the troughs are alternately lower and higher, as *i i h h*, and the higher have at bottom valves *o o o*, &c., opening in the direction of the current, but preventing regress. I provide, also, three pipes lengthwise of the vat. One, *c c*, receives the exit-pipe *b b* and opens by cocks *k k*, &c., into the troughs alternately. The opposite pipe, *f f*, opens only by the cocks *l l*, &c., out of the troughs alternately and leads to the suction of C. The third, *d d d*, leads from the last trough in the vat back to the first. It is interrupted by a valve, *e*, which allows flow only in a direction from parts preceding in the cir-

cuit to the parts following. The operation will be as follows: Into whatever trough you wish the coldest of the current to enter you open the corresponding cock *k* and close all others in *c c*. At the same time you open, opposite, the cock *l* in *f f* where you wish the current to flow out, but you close all other cocks in that pipe, the extremity of which pipe farthest from *C*, be it noticed, is close and does not open into the vat, as might appear. Thus the current flows out of *c c* into the accessible trough and through its valves *o o* and over the next partition (which is therefor made lower, or else with upper valves similarly acting with the under) into the succeeding trough. If introduced at an intermediate trough, as *h h i i*, it flows onto the extreme trough—say on the right—thence back through *d d* and *e* to the preceding end of the vat, thence again toward *h h i i*, leaving the vat wherever *l* is opened for that purpose. Now, after a certain time the cocks last open are to be closed and those next in order in the circuit to be opened, shifting the process forward one pair of troughs, and so on successively. The pipe *c c* and its cocks might be dispensed with by making *b b* a hose dipping into the troughs directly, and to be shifted from trough to trough. The same of *f f* and its cocks; also, by a suitable provision of upper valves, as at *r*, in the lower partitions, cocks might be allowed for each cistern instead of each alternate. I denominate this shifting process distinctively the "progressive circuit of cold currents."

It is not essential that *A A A* be closed by the plate which closes underneath the cavity covered by *B B*; but *A A A* may itself open above, provided that it be sufficiently above the vat. Covers *n* are provided, and the vat above, below, and on all sides is to be protected in the best manner from conduction and radiation of heat.

What I claim and desire to secure by patent is not any particular method or process for producing a freezing or refrigerating temperature, but the following:

1. The combination of the following four things or any combination substantially the same, viz: the cooling-vessel, as *B B t t F F*, the liquid cooled by contact with the preceding, as above, the pump *C*, or other equivalent means, by which the said liquid leaves *A A* and returns; also a containing vessel or vessels in which or upon whose contents said liquid is to perform its congealing or refrigerating work.

2. The employment, in combination, of a freezing-liquid shifted progressively by means of a hose or of pipes, valves, or cocks, substantially as above described, from one part to another of a trough or vat, with freezing-vessels contained therein, so as to create substantially what is above denominated "the progressive circuit of cold currents;" also the vat, with its troughs, pipes, valves, and cocks, such as may be necessary, or any combination or construction substantially the same for effecting that circuit.

3. The following four parts in combination for a generator, *B B t t F F*, of cold, viz: the opening or pipe *s* for introducing the liquid or solution from which vapor or gas is to expand and produce the cold; the pipes or narrow compartments *t t t*, down which the above is to flow by gravity in thin sheets of liquid, the lower compartment, *F F*, opening into the pump *D*, for removing residuum, and the exterior liquid in *A A A* cooled and made to circulate, all substantially as above described.

ALEXR. C. TWINING.

Witnesses:

S. DOUGLAS TWINING,
THEOD. W. TWINING.