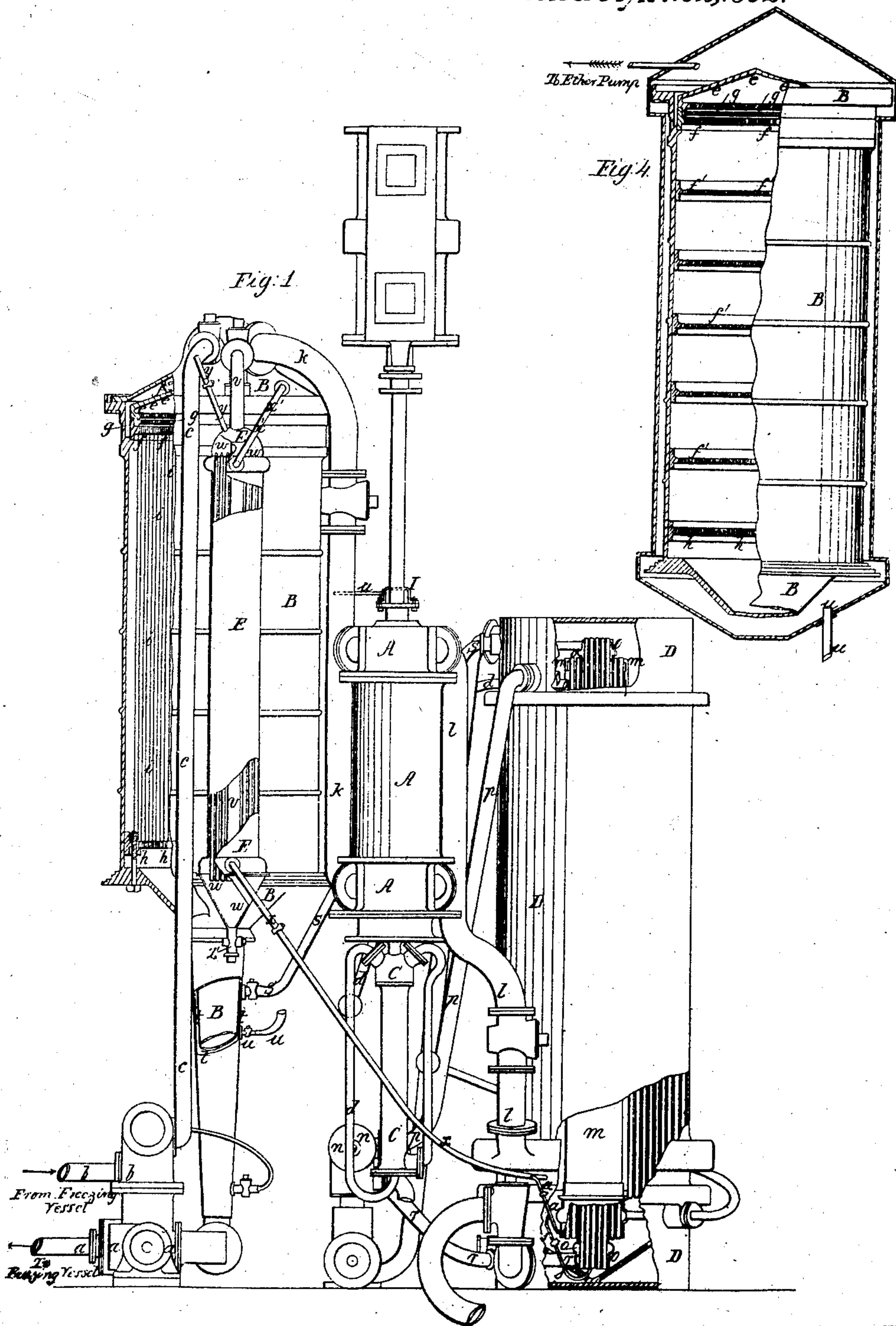


A. C. Twining.
Refrigerating Apparatus.

Sheet 1-2, Sheets.

N^o 35,051.

Patented Apr. 22, 1862.



Witnesses
John G. Smith
L. H. Smith

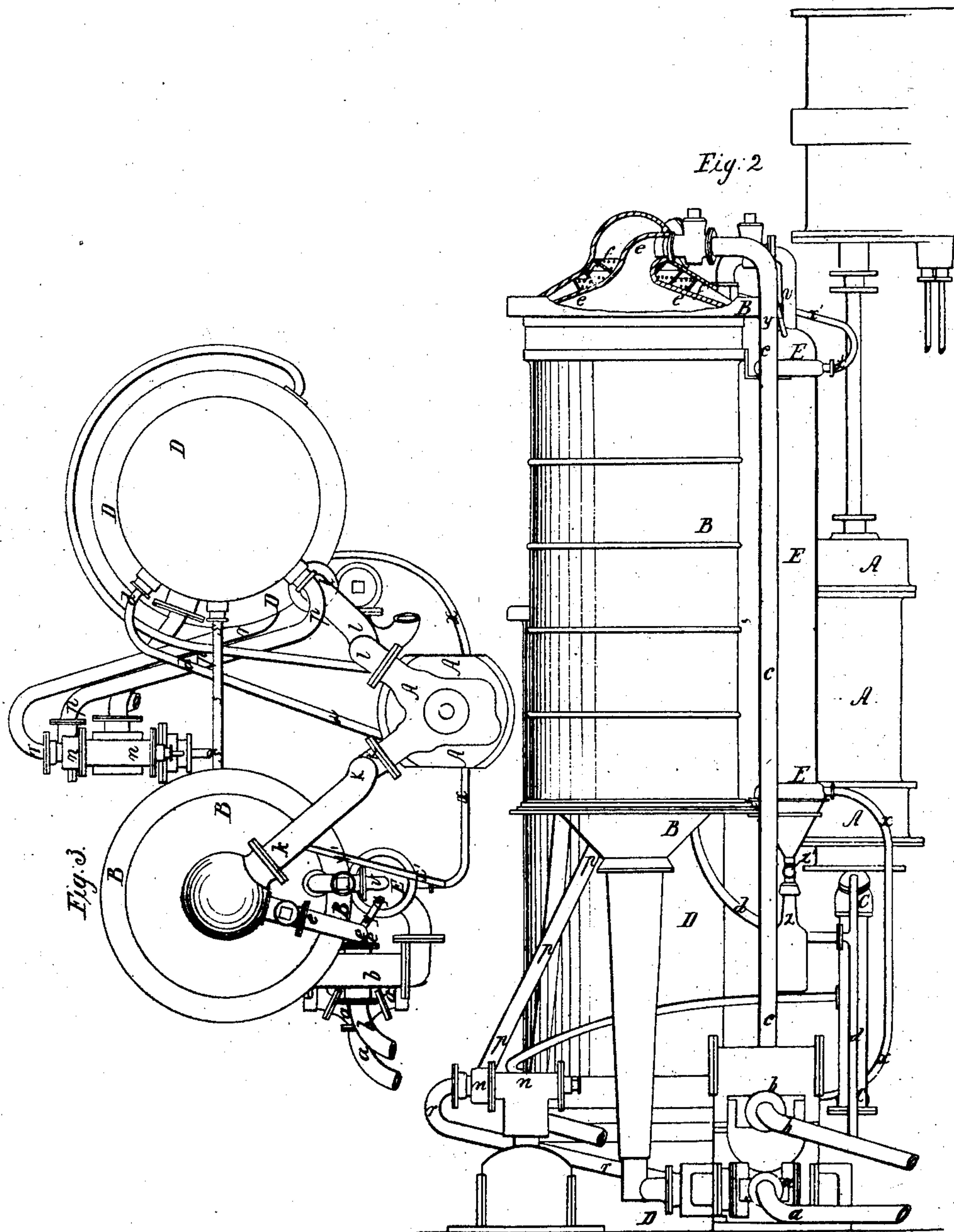
Inventor.
A. C. Twining

Sheet 2-2 Sheets.

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Witnesses
Allen L. Smith,
L. Thwait

Inventor
A. C. Twining.

UNITED STATES PATENT OFFICE.

ALEXANDER C. TWINING, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN APPARATUS FOR COOLING AND FREEZING.

Specification forming part of Letters Patent No. 35,051, dated April 22, 1862.

To all whom it may concern:

Be it known that I, ALEXANDER C. TWINING, of the city of New Haven, county of New Haven, and State of Connecticut, have invented a new and useful Improvement in Fixtures, &c., for Refrigeration and Congelation; and I declare that the following is a full description of my invention, of which—

Figure I of the accompanying drawings shows a front view; Fig. II, a side view; Fig. III, a plan or ground view, and Fig. IV an elevation and side view of certain details and modifications.

In a former patent I have described the general process which is employed.

In the drawings, A A A is the exhaust-pump for evaporation of a volatile liquid, and B B B is the exhaust or vacuum vessel, in which the above pump keeps up a partial vacuum, and into which ether (making that the type of any volatile liquid) is introduced to be evaporated in part, and consequently cooled. In this present construction the cooled ether is drawn out of the vessel by the lower circulating-pump, *a a a*, and is forced by the same into the freezing-cisterns or refrigerating-vessels (not shown in drawings) through the circulating-pipe *a a* and back through *b b*. The temperature of the cold ether is raised in the act or process of freezing the water, &c., exposed to its action, and it is returned (by the aid of a second circulating-pump, if desired) through the upper circulating-pipe, *c c c*, into the top of the vacuum-vessel. This last pipe expands into the funnel-shaped distributing-cavity *e e e*, which has its bottom pierced with holes to discharge the ether in a shower upon the grating F F. For more complete distribution of the ether upon the grating an auxiliary plate, *g g*, is interposed and is pierced with holes more numerous and of smaller size than in the funnel-plate above mentioned. The ether now falls in drops upon the middle of the upper grate-bars, around which there pass cloths *i i i* down to and around the bars of a lower grating, which is suspended by them. Straining-screws pass through the vacuum-vessel's under side into lugs cast upon the ring of the grating *h h*, by which the cloths are strained taut. These cloths offer a very extended surface for the ether to run down upon and so be exposed to evaporation in the vacuum. Metallic plates without the grat-

ings and other thin diaphragm would constitute an equivalent arrangement, although less advantageous. Moreover, the metallic plates might be placed horizontally with rims around and holes pierced through them, forming colanders one below another in a series, showering the ether through successively, as shown in Fig. IV of the drawings. The ether or other vapor passes between the funnel *e e e* and upper head of the vacuum-vessel, and is drawn to the exhaust-pump through the discharge-pipe *k k k* and its controlling-cock; but this passing vapor strikes open diaphragms *f f*, &c., of metal, cloth, or other suitable material, arranged between the funnel and the upper head to catch small drops or mist of liquid which the vapor may bear along in its current, and discharge them in drops or vesicles down the diaphragms. The vapor, however, turns into the spaces or slits left in or between the diaphragms, and meets other diaphragms overlapping these spaces, but with a distance between, all as in the drawings. This may be susceptible of still other application. The vapor pumped out of the vacuum-vessel is thrown by the ether-pump A A A at its return-strokes into the restorer D D D, through the pipe *l l l* and its controlling-cock. Here it is reconverted into liquid, according to the operation described in my patent dating from July, 1850; but during the process a little air becomes mixed with the vapor, and this air would accumulate in the restorer and impede or destroy continuous condensation if not removed. To remove this air without serious loss of vapor is the object of my condensation-pump *c c* and condenser *m m m*, also of the gas-pump *n n* and precipitating-vessel *o o o o*. The condensing-pump may be worked, as in the drawing, by the piston-rod of the ether or exhaust pump continued through, or by a separate rod. It draws mixed vapor and air from the upper part of the restorer D D D through the pipe *d d d* and its controlling-cock, and it throws the mixture into the condenser, where most of its vapor is condensed under the augmented pressure on the outside of the pipes, which have water running through them, just as in the restorer. The gas-pump now draws the air, with a little vapor still in it, from the condenser through the pipe *p p p* and its controlling-cock, and throws it through *r r r* with

as high compression as practicable into the precipitating-vessel *o o o*, which acts by its pipes like the condenser and restorer; but the precipitating-vessel embraces, by means of the connecting-pipe *s s s s* and its controlling-cock, the narrow cavity *t t t* around the lower part of the vacuum-vessel, which lower part I call the "cold-ether reservoir." This reservoir is of sheet-copper, and by the important assistance of its low temperature precipitates from the compressed air nearly all its small residue of vapor. The air may then escape through the small orifice or cock and escape-pipe *u u*. This escape-pipe may be enlarged and partially filled with water, alcohol, sponge, cotton, or other absorbents to catch any remaining ether, small as its quantity will be. This operation will be aided by making the escaping air expand in a small working-pump on its way to the escape. The absorbed or liquid ether may be returned through a pipe leading from its containing substance and vessel to the vacuum-vessel, taking care to close the escape-pipe from air for the time being. It is obvious that I may employ any part of either the vacuum-vessel's surface or of the circulating or the vapor pipes for precipitation, just as I have described for the cold-ether reservoir.

Again, if any part of the apparatus is liable to concealed leakage, it may be inclosed by a casing, as the vacuum-vessel in Fig. IV, or by a chamber, as the stuffing-box of the main piston-rod at I, and the cavity or chamber may be kept filled with water, or the escape-pipe *u u* may be introduced into those cavities. By these means the leakage will carry back the ether vapor which the escape air would otherwise waste, or will itself be avoided. Thus, also, gas leaking out from one part may leak in at another by embracing both in the same cavity or inclosure.

It will be understood that pipes, cocks, and channels are provided to conduct the respective precipitations of ether back to the main body or current, and, again, that non-conducting wrappers or coverings are provided for the vacuum-vessel and for all pipes or parts exposed to injurious radiation.

The returned liquid from the restorer will hold oils and other impurities derived from the ether-pump or leakage of water, &c. These I propose to work out by the clarifier *E E E*. This is a hollow cylinder with tight heads, which are capped both above and below by cavities of convenient shape, *w w w w*. Pipes run through both heads tightly. The pipes open by a very contracted bore in each into the upper cavity, and by their full bore they open into the under cavity. This last opens into the vacuum-vessel through a large central pipe, *v v*, and its controlling-cock, which, like some of the other cocks, is closed at bottom and has a

stuffing for its stem. The discharge-pipe *x x* of the restorer opens into the hollow cylinder and fills it around the pipes with warm restored ether, which discharges into the vacuum-vessel through the pipe *x' x'* and its controlling-cock, or, if preferred, a self-acting valve which opens and shuts or contracts by flotation in the liquid itself. The upper cavity opens upward by the pipe and cock *y y* into the return ether-pipe *c c c*.

The operation is as follows: The pipe and cock *y y* allow a regulated stream of the return ether to run from the circulating current into *w w* and into the small upper orifices of the pipes, which terminate in a horizontal plane. The ether spreads along the inner surfaces and is evaporated by the warm liquid around the pipes, cooling the latter. The vapor flies down the pipes and up through the central pipe into the vacuum, while impurities run down and may be drawn off into a bottle screwed upon *z'* by first opening and then closing the cock at *z'*.

What I claim in the above, and desire to secure by Letters Patent, is embodied in the following:

1. The condensing-pump and condenser, in combination with the restorer, whether with or without the gas-pump and precipitating-vessel between them and the escape-pipe, the gas-pump and precipitating-vessel, in combination with the restorer, whether with or without the condensing-pump and condenser intervening, and the employment of any cold surface of the vacuum-vessel or of the circulating-pipes or the vapor-pipe as part of a precipitating-vessel, or of a condenser in any way substantially the same as above.

2. The use of cloths as above, or other plates equivalent thereto, in combination with a distributing-funnel or any distributing plate or arrangement for the liquid, also the use of the colanders in a series, all substantially as above and in combination with a restorer.

3. The above diaphragm arrangement for arresting mist or vesicles from vapor, in combination with an evaporating apparatus.

4. The clarifier, in combination either with the circulating cold current or the reconducted liquid from the restorer.

5. The combination of a vacuum-vessel and a liquid cooled therein with a pump or pumps to draw out from the vacuum-vessel and throw back in a continuous circulation that freezing or refrigerating liquid.

6. The connection of the escape-pipe *u u*, or of any escape or leak outward, with a cavity surrounding any part leaking inward, to obviate loss of ether, as above.

ALEXR. C. TWINING.

Witnesses:

EDWARD C. HERRICK,
CHAUNCEY A. DICKERMAN.