(No Model.)

2 Sheets—Sheet 1.

O. L. F. BROWNE.

DEVICE FOR UTILIZING THE HEAT AND PRODUCTS OF EVAPORATION.

No. 250,707. Patented Dec. 13, 1881.

FIG-1-

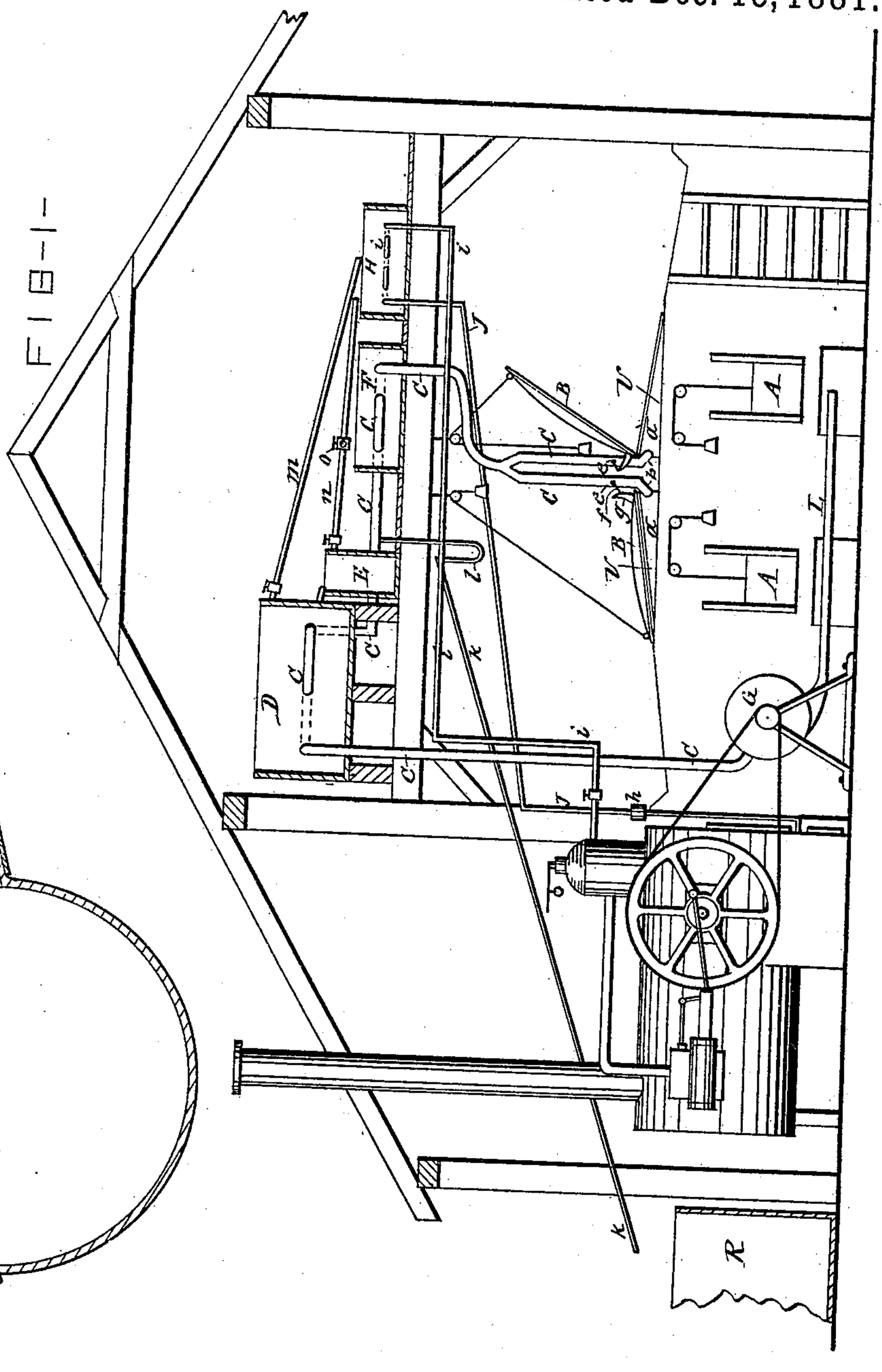

FIG-2-

WITNESSES=

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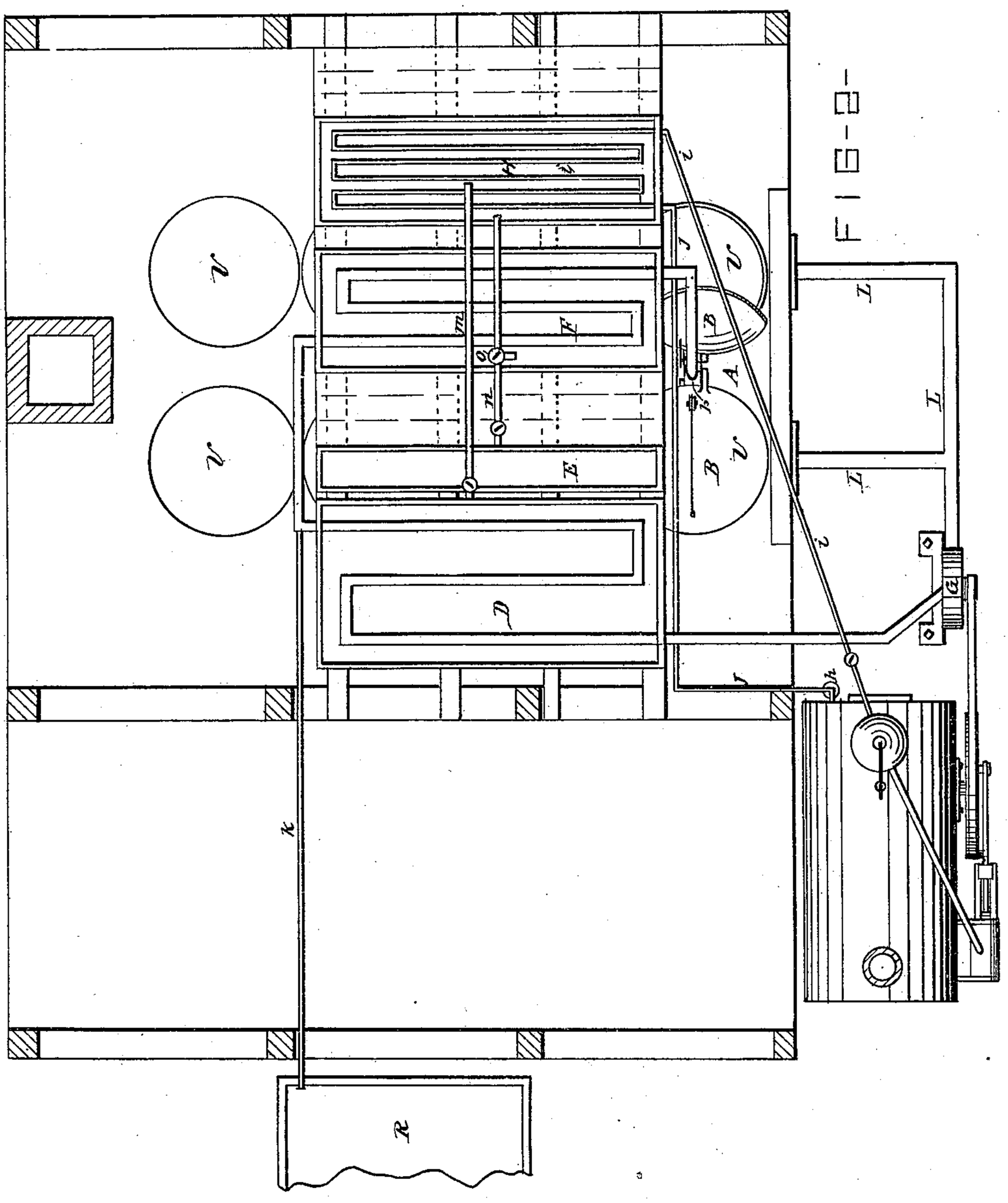

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UNITED STATES PATENT OFFICE.

OLIVER L. F. BROWNE, OF SYRACUSE, NEW YORK.

DEVICE FOR UTILIZING THE HEAT AND PRODUCTS OF EVAPORATION.

SPECIFICATION forming part of Letters Patent No. 250,707, dated December 13, 1881.

Application filed November 4, 1881. (No model.)

To all whom it may concern:

Be it known that I, OLIVER L. F. BROWNE, of Syracuse, in the county of Onondaga in the State of New York, have invented new and useful Improvements in Devices for Utilizing the Heat and Products of Evaporation, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

The chief object of this invention is to utilize the heat and products of steam or vapor generated in the process of evaporating liquids.

The invention consists, essentially, in the combination, with an evaporating-vessel or series of such vessels, of a receptacle adapted to collect the vapor arising from said evaporating vessel or vessels, a vapor-duct extended from said receptacle, a pump or suction-fan connected to the vapor-duct to assist the passage of vapor, and various other devices connected with said duct to absorb therefrom the heat and to utilize said heat and also the products of condensation in the vapor-duct.

It also consists in the combination, with the aforesaid apparatus, of auxiliary evaporating appliances, arranged to receive that portion of the liquid which is in excess of the capacity of the before set forth evaporating apparatus; and it furthermore consists in a novel construction of a removable cover or receptacle and means of applying the same and a ventiduct to the evaporating-vessel; and it also consists in a novel arrangement for closing the valve of the ventiduct automatically with the opening of the lid or cover of the evaporating-vessel, all as hereinafter more fully explained, and set forth in the claims.

In the annexed drawings, Figure 1 is an end view of an evaporating apparatus embodying my improvements, a portion of the evaporating-vessels or condensers being shown in section to better illustrate the means of utilizing the heat and products of vapor passing through the ventiduct of the primarily-heated evaporating-vessel. Fig. 2 is a plan view of the aforesaid apparatus, and Fig. 3 is an enlarged detail view of the construction of the cover and means of applying the same and the ventiduct to the evaporating-vessel.

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

V V represent a series of kettles or evaporating-vessels set in a prolonged fire-arch, A, in any ordinary manner. The top of said kettles is provided with a vertical extension, *a*, which may be either cast on the kettles or formed separately and fitted to the kettle. The said extension *a* is provided with a thimble, *b*, for the attachment of the ventiduct or vapor-duct hereinafter described.

To the top of the extension *a* is hinged a lid or cover, B, which serves to confine the steam or vapor underneath said cover and within the vapor-receptacle formed by the extension *a*.

To the under side of the cover B, I apply a diaphragm, *c*, with a space between them. This diaphragm is perforated so as to produce around the perforations *d* an upward-projecting burr or flange, which forms a barrier to the passage of the water of condensation from between the diaphragm and cover down through the aforesaid perforations and back to the evaporating-vessel. The cover and its diaphragm are made crowning and sloping to one side, so as to cause the aforesaid water of condensation to run off from the diaphragm and to be conducted over the edge of the evaporating-vessel by the overlapping edge of the diaphragm.

C represents the vapor-duct connected to the thimble *b* of the evaporating-vessel V. Said duct is provided with a valve, *e*, which is weighted so as to normally stand in an open position. By means of an arm, *f*, on the outer end of the axis of the valve, engaging with a cam, *g*, on the cover or lid B, the valve is swung into a closed position automatically with the opening of the lid B. The vapor-duct C is extended to and passes in a tortuous or sinuous course through vats or evaporating-vessels D and F, situated in any convenient position; and to the end of the aforesaid duct is connected either a pump or a suction-fan, G, as shown in the annexed drawings, said suction-fan aiding the passage of the vapor through the duct C, and also preventing the escape of vapor through loose joints in the vapor receptacle or duct connected therewith, and thus obviating the necessity of carefully and expensively constructed steam-tight joints. The arrangement illustrated in the annexed drawings is especially designed for the manufacture of salt from natural brine. The vessel

D, which is the most remote from the source of heat, and which is heated by the already partially cooled vapor pipe, receives the crude brine, and is designed to reduce the same to saturation, or about 100° salinometer. The brine passes from the vessel D to a tank, E, in which it deposits its impurities, and thence by a pipe, *n*, to another evaporating-vessel, F, which first receives the vapor-duct C, and is subjected to greater heat than the vessel D. In the vessel F the saturated brine is reduced to salt.

H represents an evaporating-vessel or vat, designed as an auxiliary means for completing the process of evaporating the brine and crystallizing and graining the salt, said vessel being employed whenever the vapor-duct in the vessel F is found incapable of furnishing sufficient heat to evaporate the purified and saturated brine as rapidly as it is furnished by the vessel D. The brine can be drawn into the vessel H either direct from the vessel D, by a pipe, *m*, or from the tank E by the before-described pipe *n*, which has a two-way cock, *o*, which allows the brine to be shut off from the vessel F and turned into the vessel H. The auxiliary evaporating-vessel H is heated either by live steam or by exhaust-steam derived from the boiler of the engine usually employed about salt-works, said steam being conducted to the vessel H by a pipe, *i*, which is extended in a serpentine or tortuous course through said vessel. A pipe, *j*, extended from the end of the tortuous pipe *i* to the water-space of the boiler and provided with a check-valve or injector, *h*, returns the condensed steam to the boiler.

It will be observed that the vats or vessels act as condensers on the vapor-duct C. The products of condensation of the vapor in the duct C are utilized by means of a pipe, *k*, which taps the vapor-duct C at one or more of its lowest points and leads to a suitable receptacle, R, in which to collect the products of condensation for further uses. By suitable traps, *l*, on the pipe *k* the ingress of air through said pipe and to the duct C is prevented.

In order to make the fan G serve the double purpose of producing a draft in the vapor-duct C and a blast on the fire of the furnace A, I connect to the discharge end of the fan a duct, L, and extend the said duct to the furnace and direct its discharge to the most effective part thereof.

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

1. An evaporating apparatus comprising two or more evaporating-vessels or sets of such vessels, the primary heating agent being applied to the first vessel or set of vessels, and the succeeding vessels being heated by the vapor generated in the preceding vessel and conducted to the said succeeding vessels by suitable ducts or passages, aided by the draft introduced by a pump or suction-fan, substantially as set forth.

2. The within-described means of utilizing the heat and products of condensation, consisting in the combination, with an evaporating-vessel or series of such vessels, of a receptacle adapted to collect the vapor arising from said evaporating vessel or vessels, a vapor-duct connected with said receptacle, a condenser or condensers applied to the vapor-duct, a trap to prevent the ingress of air through said duct, a receptacle to collect the products of condensation, and a suction-fan or pump connected to the vapor-duct, all as and for the purpose set forth.

3. The combination, with an evaporating-vessel or series of such vessels, of a receptacle adapted to collect the vapor from said vessels, a vapor-duct connected with said receptacle, a condenser applied to said duct, and a pump or suction-fan connected with the vapor-duct and having its discharge directed to a furnace to apply thereto a blast, substantially as set forth.

4. In combination with the evaporating-vessel D, heated by the vapor-duct C, and the purifying-tank E, the auxiliary evaporating-vessel H, heated by the auxiliary steam-pipe *i*, as shown and set forth.

5. The evaporating-vessel V, having the extension *a*, provided with the thimble *b*, and the lid B, hinged to said extension, as shown and set forth.

6. In combination with an evaporating-vessel, the cover B, having the diaphragm *c*, with steam-passages through it, and with a barrier around said passages to prevent the return of condensed steam to the evaporating-vessel, substantially as specified.

7. The combination, with the evaporating-vessel V and ventiduct C, the valve *e*, closed automatically by the opening of the lid B, as set forth.

In testimony whereof I have hereunto signed my name and affixed my seal, in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 29th day of October, 1881.

OLIVER L. F. BROWNE. [L. S.]

Witnesses:
WM. C. RAYMOND,
C. H. DUELL.