

No. 662,399.

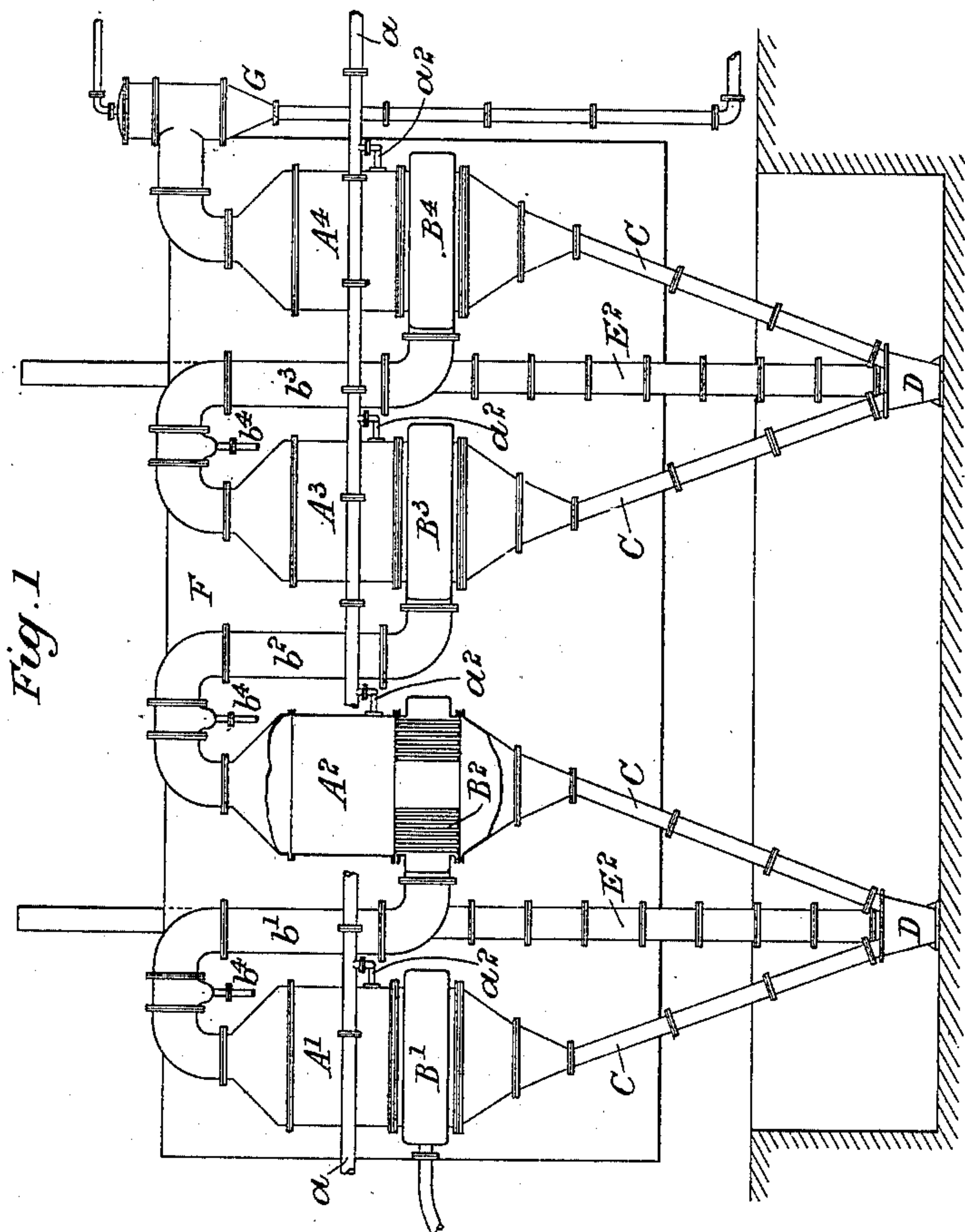
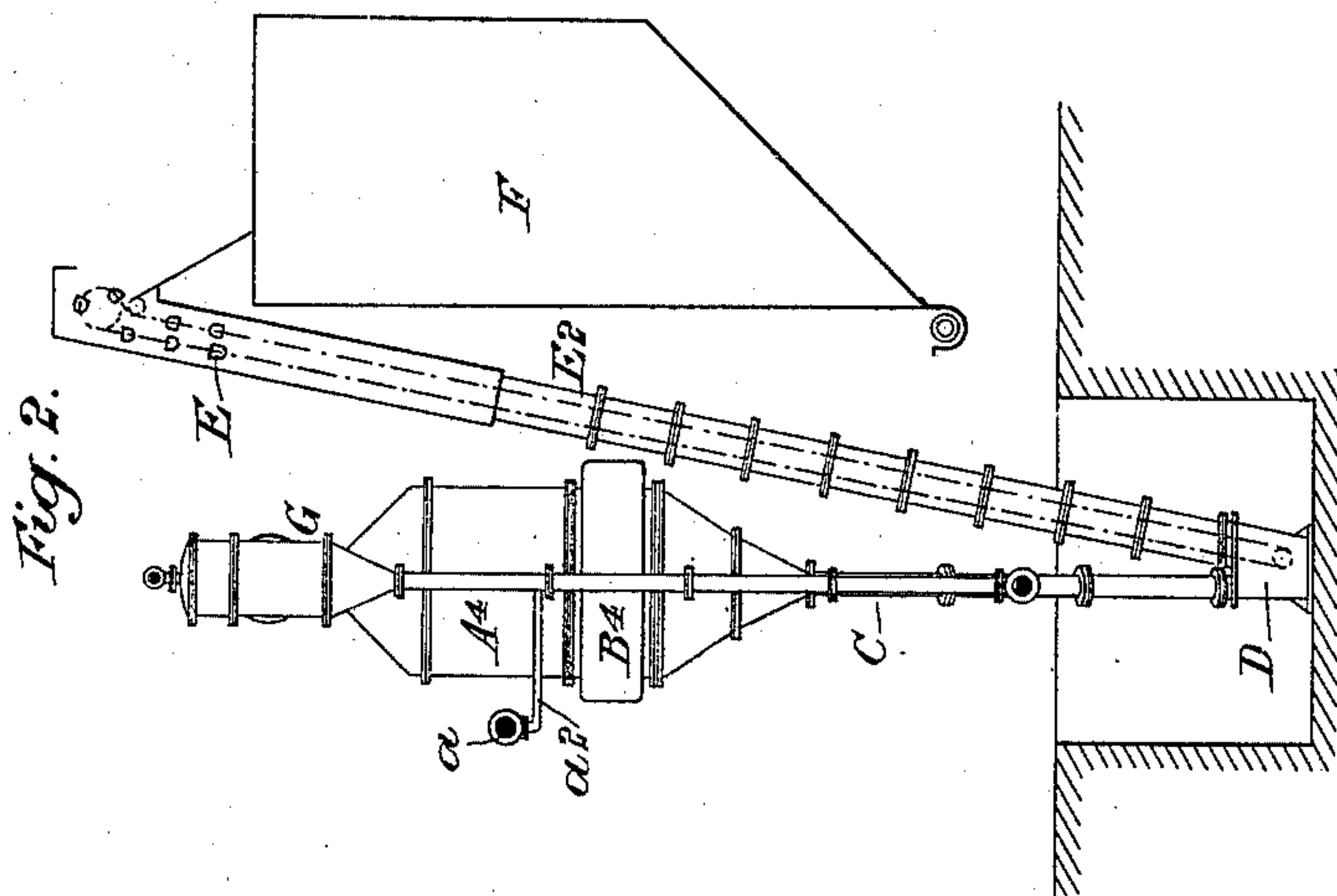
Patented Nov. 27, 1900.

E. J. DUFF.

MULTIPLE EFFECT EVAPORATING APPARATUS.

(Application filed Feb. 13, 1900.)

(No Model.)



Witnesses.
James F. Fure
W. R. Edelen.

Inventor
Edward James Duff,
by *Philip H. Haines*
his attorney.

UNITED STATES PATENT OFFICE.

EDWARD JAMES DUFF, OF LIVERPOOL, ENGLAND, ASSIGNOR OF ONE-HALF
TO THE UNITED ALKALI COMPANY, LIMITED, OF SAME PLACE.

MULTIPLE-EFFECT EVAPORATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 662,399, dated November 27, 1900.

Application filed February 13, 1900. Serial No. 5,116. (No model.)

To all whom it may concern:

Be it known that I, EDWARD JAMES DUFF, engineer, a subject of the Queen of Great Britain and Ireland, residing at 30 James street, Liverpool, in the county of Lancaster, England, have invented certain new and useful Improvements in Multiple-Effect Apparatus for Use in Evaporating Brine; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to multiple-effect apparatus, and has for its object to effect economy in the production of salt thereby. The evaporating-chambers may be of any suitable construction, but I prefer to use chambers in which steam or other heated gases or vapors is or are used as a source of heat. The evaporating-chambers are or may be arranged at or about the same level. Steam (or the other heating agent employed) is admitted to the heating-chamber of the first evaporating-chamber, and the steam generated by the evaporation of the brine in this chamber is conducted to the heating-chamber of the second evaporating-chamber of the series, and so on throughout the series, the last evaporating-chamber being connected with any suitable means of producing a vacuum.

The accompanying drawings illustrate in Figures 1 and 2, in elevations at right angles to each other, an arrangement of four evaporating-chambers, (marked $A^1 A^2 A^3 A^4$), the heating-chambers thereof being marked $B^1 B^2 B^3 B^4$ respectively, and the connections between the heating and evaporating chambers being marked $b^1 b^2 b^3$. The dips at b^4 are for collecting and discharging water. The brine is fed by the pipe a and branch pipes a^2 into each of the evaporating-chambers separately, and the brine does not flow from chamber to chamber, as hitherto. As evaporation proceeds salt is deposited in each of the chambers and falls through a leg C into a boot D, through which an elevator E works to carry the salt up a tube or casing E^2 and deliver it into a receptacle F. The evaporating-chambers are arranged in groups of two or more, the legs C from the evaporating-chambers of each group meeting in the one boot D of an elevator $E E^2$, common to both or all of the said legs C, and from this boot

the salt from both or all of the evaporating-chambers of a group is removed by means of the elevator.

In the drawings the evaporating-chambers $A^1 A^2$ are shown in one group, their legs C C opening into one boot D, provided with an elevator $E E^2$, and the chambers $A^3 A^4$ are shown in another group, their legs C C opening into the boot D of another elevator $E E^2$; but, as before stated, the chambers may be arranged in a group, or in groups of other number than two.

In Fig. 1 the vessel A^2 is shown in section to illustrate the arrangement of tubes through which the brine circulates while being evaporated, the said tubes being surrounded by a belt into which the heating agent is passed, as described in the specification of an application for United States Letters Patent, Serial No. 5,114, of even date herewith. This present invention is, however, not limited to the employment of this particular arrangement of heating-chamber.

G is the arrangement in connection with the last chamber of the series, consisting of a descending outlet pipe, into the upper part of which condensing water is passed and falls, producing the necessary vacuum.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is—

In multiple-effect apparatus for evaporating brine; the combination of evaporating-chambers arranged side by side in groups of two, or more, legs, for the deposit of salt, from each group meeting in one boot of an elevator common to both, or all, of the said legs, tubes for the circulation of brine, a belt surrounding the tubes into which the heating agent passes, pipes or passages one leading from the top of each evaporating-chamber into the belt of the next succeeding evaporating-chamber, and means for feeding the evaporating-chambers separately with brine, substantially as hereinbefore described.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD JAMES DUFF.

Witnesses:

ALFRED PATCHETT,
THOMAS SPROAT.