

No. 686,740.

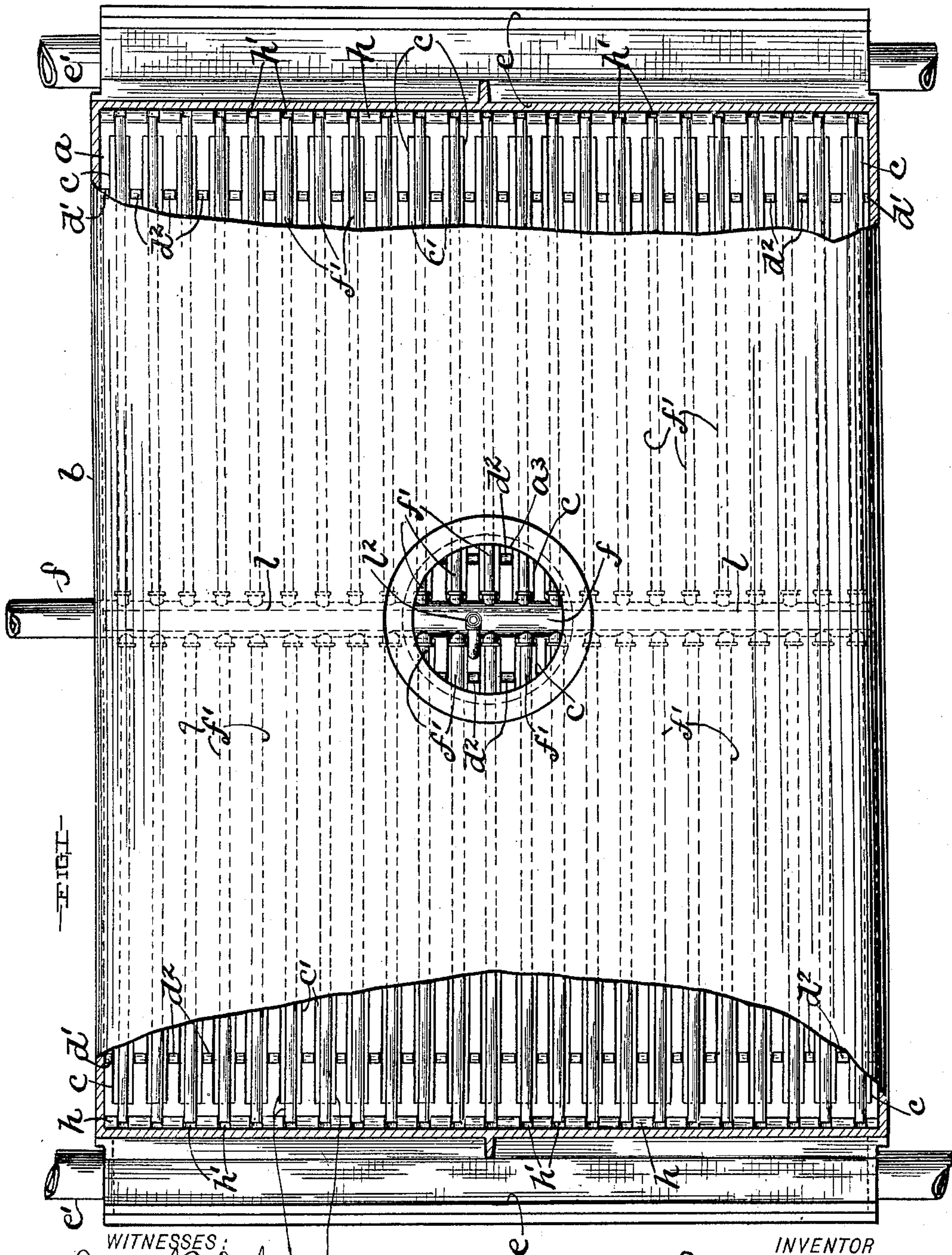
Patented Nov. 19, 1901.

J. E. KOHN.
EVAPORATOR.

(Application filed Dec. 17, 1900.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES

Daniel E. Daly.
Victor C. Lynch.

INVENTOR

INVENTOR
Joseph E. Kohn
BY
Lynch & Worcester
his ATTORNEYS

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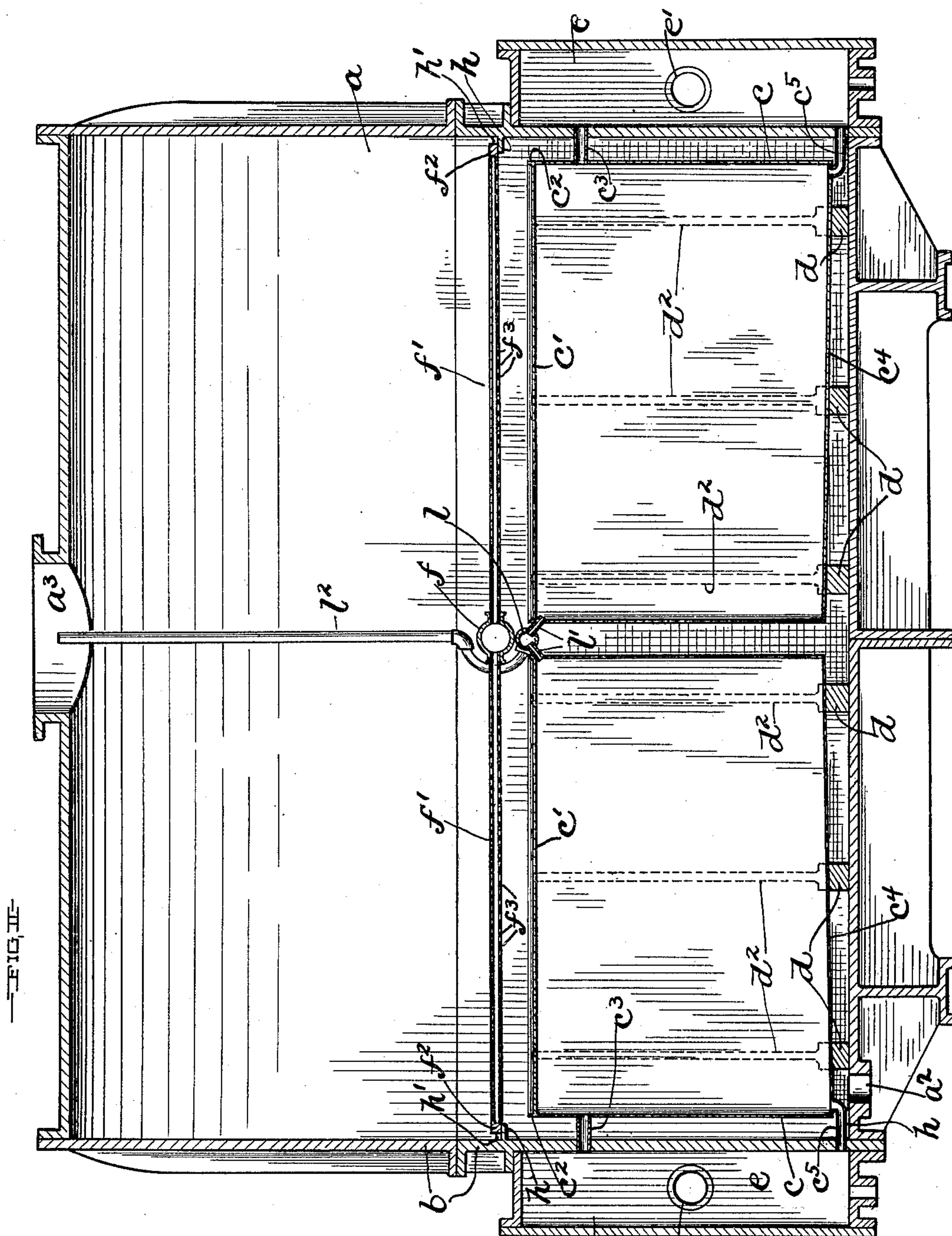
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Victor C. Lynch.

INVENTOR
Joseph E. Kohn
BY
Lynch & Kohn
ATTORNEYS

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3 Sheets—Sheet 3.

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UNITED STATES PATENT OFFICE.

JOSEPH E. KOHN, OF CLEVELAND, OHIO.

EVAPORATOR.

SPECIFICATION forming part of Letters Patent No. 686,740, dated November 19, 1901.

Application filed December 17, 1900. Serial No. 40,203. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH E. KOHN, a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Evaporators; 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 pertains to make and use the same.

My invention relates to improvements in evaporators suitable for use in evaporating juices or liquids—such, for instance, as sugar-juices.

The primary object of this invention is to provide an evaporator of the character indicated that has an exceedingly large evaporating capacity, that is simple and durable in construction, and that is readily repaired when any portion of its evaporating-surface becomes worn without materially interfering with the operation of the evaporator.

With this object in view and to the end of realizing other advantages hereinafter appearing my invention consists in certain features of construction and combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure I is a top plan, partly in section, of an evaporator embodying my invention. Figs. II and III are elevations taken at right angles to each other, largely in section. Fig. IV is a section taken vertically and longitudinally of two branch pipes that extend from opposite sides, respectively, of the main pipe for supplying the liquid that is to undergo evaporation. Portions are shown broken away to reduce the size of the drawing. Fig. V is a vertical section of the upper portion of several evaporating-chests and adjacent pipes.

Referring to the drawings, *a* designates a room or chamber wherein the process of evaporation takes place. The chamber *a* is formed within a comparatively large casing *b*, that is constructed in any approved manner.

The evaporating-surface of the evaporator is formed by numerous narrow vertical boxes or chests *c*, suitably arranged within the chamber *a* and made of copper or other metal or material that is a good conductor of heat. The evaporator illustrated is provided with

two parallel rows of evaporating steam-heated vertically-arranged copper chests *c*, that are preferably about three inches wide, a few feet in height, and several feet in length. The chests *c* of each row of chests are arranged a short distance apart laterally and parallel. The chests *c* of each row of chests are mounted in several frames *d*, that are arranged a suitable distance apart widthwise of the respective row of chests, and each of the said frames rests upon the bottom of the chamber *a* and extends transversely of the said bottom below and longitudinally of the row of chests partially supported by the said frame. Each chest-supporting frame *d* has its opposite ends comprising two upright arms *d'* and *d'*, between which the row of chests partially supported by the said frame is arranged, and the said frame between adjacent chests of the said row of chests comprises upright arms *d''*, that brace apart the chests.

Steam is supplied to the chambers of the chests *c*, as will hereinafter appear, and the top of each chest *c* is trough-shaped widthwise of the chest. The liquid that is to be evaporated is supplied to the trough-forming top of the chests *c*, as will hereinafter appear, and the trough *c'*, formed upon each chest *c*, extends from end to end of chest and is closed at its ends, as at *c''*, so that the liquid supplied to the said trough will, first, fill the said trough and then simultaneously overflow at the sides and ends of the trough and adown the external surfaces of the side walls and end walls of the chest. It is almost superfluous to remark that the external surfaces of the side walls of the chests *c* are the main evaporating-surfaces of the evaporator and that by the formation of the evaporating-surfaces by narrow upright chests arranged in the manner hereinbefore described an exceedingly large evaporating capacity is obtained.

The construction illustrated, wherein the sides and bottom of the troughs *c'* are formed by depressions made in and extending longitudinally of the tops of the chests *c*, is especially valuable on account of its simplicity and durability.

In a very large evaporator, as illustrated, the evaporating-surface is formed, preferably, by two rows of chests *c*, arranged side by

side, with the chests of each row of chests in line with a chest of the other row of chests and with all the chests of both rows of chests uniform in height. In the evaporator illustrated the two rows of chests are arranged side by side between two steam-supply chambers e and e , which are formed externally of the chamber a in any approved manner and extend, respectively, longitudinally of the adjacent row of chests. Each steam-supply chamber e is of course provided with a steam-inlet e' . Open relation between each steam-supply chamber and the chambers of all the chests of the adjacent row of chests is provided, and any water resulting from condensation of steam in any chest c is drained into the connected steam-supply chamber. Preferably the steam connection between the chamber of each chest c and the adjacent steam-supply chamber e is formed by a short pipe c^3 , which extends from the upper portion of the said steam-supply chamber to and discharges into the upper portion of the said chest, as shown in Fig. II. Each chest c has the bottom c^4 of its chamber declining toward the connected steam-supply chamber, as shown in Fig. II, and preferably a short pipe c^5 leads from the said chamber at the lower end of the bottom of the chamber to and discharges into the lower portion of the steam-supply chamber. Hence any water resulting from condensation of steam in the chests c is drained by the pipes c^5 into the steam-supply chambers, whence the water is removed in any approved manner.

The means for supplying the liquid that is to be evaporated comprise, preferably, a main liquid-supply pipe f , that extends longitudinally of and between and somewhat above the rows of chests and is supported from the casing b in any approved manner. The supply-pipe f is provided with as many branch pipes f' as there are evaporating-chests c , and the said branch pipes extend longitudinally of and a short distance directly above the different chests c , respectively. Each branch pipe f' of the main pipe f extends, therefore, from the said pipe f horizontally to and over and longitudinally of the trough of an evaporating-chest c and is closed at its outer end, as at f^2 , and is provided at its lower side with a row of orifices f^3 , arranged at short intervals longitudinally of the pipe. Obviously by the liquid-supply apparatus hereinbefore described the liquid is capable of being run simultaneously into and at short intervals longitudinally of all of the troughs formed upon the many evaporating-chests. The branch pipe f' for each row of evaporating-chests are preferably removably mounted at their outer ends in recesses h' , formed in a shelf h , that is rigid with the casing b and extends longitudinally of the said row of chests.

The bottom a' of the chamber a declines, preferably, from the ends of the rows of evaporating-chests toward the central portion of the chamber, as shown in Fig. III, and the

said chamber at the lower and central portion of its bottom is provided with a discharge-opening a^2 , (see Fig. II,) at which the concentrated liquid is run from the said chamber. To facilitate the movement of the concentrated liquid from all portions of the bottom of the chamber a to the said opening, each frame d is provided with numerous duct-forming lateral slots or recesses d^3 , that are formed in the lower portion of the frame and extend from the lower edge of the frame upwardly.

Any approved means for accommodating the escape of ammonia or other non-condensable gases from within the chambers of the evaporating-chests are provided, and comprise, preferably, a pipe l , that is arranged horizontally between and somewhat above the two rows of evaporating-chests, and short pipe-sections l' establish communication between the chambers of the said chests next below the troughs upon the chests and the said pipe l . The pipe l is provided at any suitable point with an upright pipe l^2 , that extends into the outlet a^3 , with which the top of the chamber a is provided, and the ammonia-gas and other non-condensable gases conducted from the chambers of the evaporating-chests by the pipe system l , l' , and l^2 and the vapors arising from the liquid that is undergoing concentration within the evaporator escape at the said outlet a^3 .

By the construction hereinbefore described it will be observed that my improved evaporator has an exceedingly large evaporating capacity. The chests c are smaller in construction and have their side walls vertical, so that the liquid which is to be evaporated, overflowing from the troughs, trickles or flows down the outer surfaces of the said walls and will not drop from the walls above the lower ends of the chests. The formation of a single chamber within each chest, the means employed for supplying the chest with the heating agent, and the simple and efficient pipe system for conveying the juice or liquid that is to be evaporated to the troughs upon the chests constitute no unimportant features of the evaporator.

What I claim is—

1. In an evaporator of the character indicated, comparatively narrow chests arranged a short distance apart laterally and having troughs thereon with the ends of the troughs closed and with the sides and bottoms of the troughs formed by depressions made in and extending longitudinally of the tops of the chests; means for supplying the heating agent to the chambers of the chests, and means for supplying the liquid which is to undergo evaporation to the aforesaid troughs.

2. An evaporator of the character indicated, comprising vertical chests provided each with a trough which is formed thereon and extends longitudinally of the respective chest and has closed ends, means for supplying a heating agent to the chambers of the chests,

a pipe for supplying the liquid that is to undergo evaporation, and branch pipes arranged above and extending longitudinally of the troughs of the chests, which branch pipes are connected, at one end, to the aforesaid liquid-supply pipe, are closed at their other end, and are provided, at their under side, with orifices arranged at suitable intervals longitudinally, substantially as and for the purpose set forth.

3. An evaporator of the character indicated, comprising a chamber a having a vapor-outlet a^3 at the top, means for draining the said chamber, a row of vertical and comparatively narrow chests arranged a suitable distance apart laterally and provided each with a trough arranged on the top and extending longitudinally of the respective chest and having closed ends, a system of pipes for conducting the liquid that is to undergo evaporation to the troughs, a steam-supply chamber arranged at one side and extending longitudinally of the row of chests and connected with the chambers of the chests, means for draining the chambers of the chests of water resulting from condensation of steam therein, a pipe l arranged longitudinally of the top of the row of chests and having an upwardly-extending outlet-pipe l^2 and connected and in open relation with the upper ends of the chambers of the chests, substantially as and for the purpose set forth.

4. An evaporator of the character indicated, comprising a chamber a having a vapor-outlet at the top, means for draining the chamber, a plurality of vertical and comparatively narrow chests provided each with a trough arranged on top and extending longitudinally of the respective chest and having closed ends, a pipe for supplying the liquid which is to undergo evaporation, which pipe has branch pipes leading to and over the troughs upon the aforesaid chests, which branch pipes are provided at the bottom with orifices arranged to discharge into the aforesaid troughs, means for supplying steam to the chambers of the chests, means for draining the chambers of the chests, and a system of pipes for conducting ammonia-gas and other non-condensable gases from the upper portions of the chambers of the chests to the aforesaid vapor-outlet.

5. An evaporator of the character indicated, comprising a chamber a having a vapor-outlet a^3 at the top, means for draining the said chamber, a row of vertical and comparatively narrow chests c arranged a short distance apart laterally and provided each with a trough c' which is formed on top and extends longitudinally of the respective chest and has closed ends, a pipe for supplying the liquid that is to undergo evaporation, which pipe is arranged above and longitudinally of the row of chests, branch pipes leading from and connected with

the said liquid-supply pipe to and over and longitudinally of the troughs upon the chests, which branch pipes are closed at their outer ends and are provided at the bottom with orifices formed at short intervals longitudinally of the pipes, a steam-supply chamber arranged at one side and extending longitudinally of the row of chests, steam-pipes establishing open relation between the steam-supply chamber and the chambers of the chests, pipes arranged to drain the chambers of the chests into the steam-supply chamber, and a system of pipes for conducting ammonia and non-condensable gases from the upper portions of the chambers of the chests to the aforesaid vapor-outlet a^3 .

6. In an evaporator of the character indicated, the combination, with a row of comparatively narrow evaporating-chests arranged a short distance apart laterally, of a plurality of frames d arranged a suitable distance apart laterally and supporting the chests, which frames d extend, respectively, in under and from end to end of the row of chests, and have upright arms extending between and bracing the chests laterally.

7. An evaporator of the character indicated, comprising a chamber a whose bottom is provided with an outlet a^2 , a row of evaporating-chests arranged a short distance apart laterally and above the aforesaid bottom, means for supplying a heating agent to the chambers of the chests, means for conducting the liquid which is to undergo evaporation to and upon the chests and causing the same to flow adown the external surfaces of the side walls of the chambers of the chests, and frames d resting upon the aforesaid bottom and instrumental in supporting the chests, and provided with the duct-forming recesses d^3 , substantially as and for the purpose set forth.

8. An evaporator of the character indicated, comprising a chamber a whose bottom is provided with an outlet a^2 , a row of narrow evaporating-chests arranged a short distance apart laterally and above the aforesaid bottom, means for supplying a heating agent to the chambers of the chests, means for conducting the liquid that is to undergo evaporation to and upon the chests and causing the same to flow adown the external surfaces of the side walls of the chambers of the chests, and the chest-supporting frames d resting upon the aforesaid bottom and having the arms d' and d^2 and the duct-forming recesses d^3 , substantially as shown, for the purpose specified.

Signed by me at Cleveland, Ohio, this 26th day of November, 1900.

JOSEPH E. KOHN.

Witnesses:

C. H. DORER,
A. H. PARRATT.