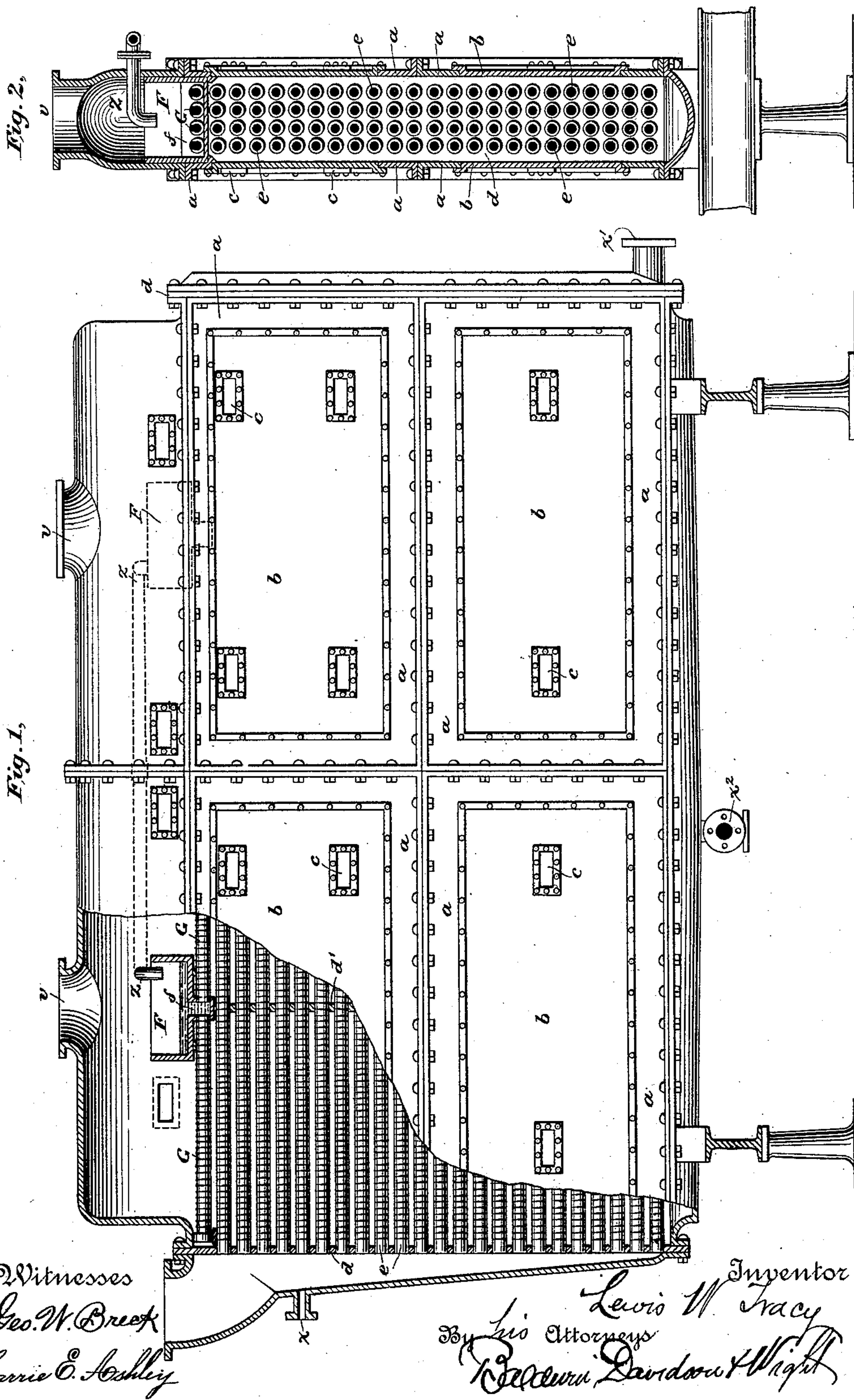


2 Sheets—Sheet 1.

No. 420,749.

Patented Feb. 4, 1890.



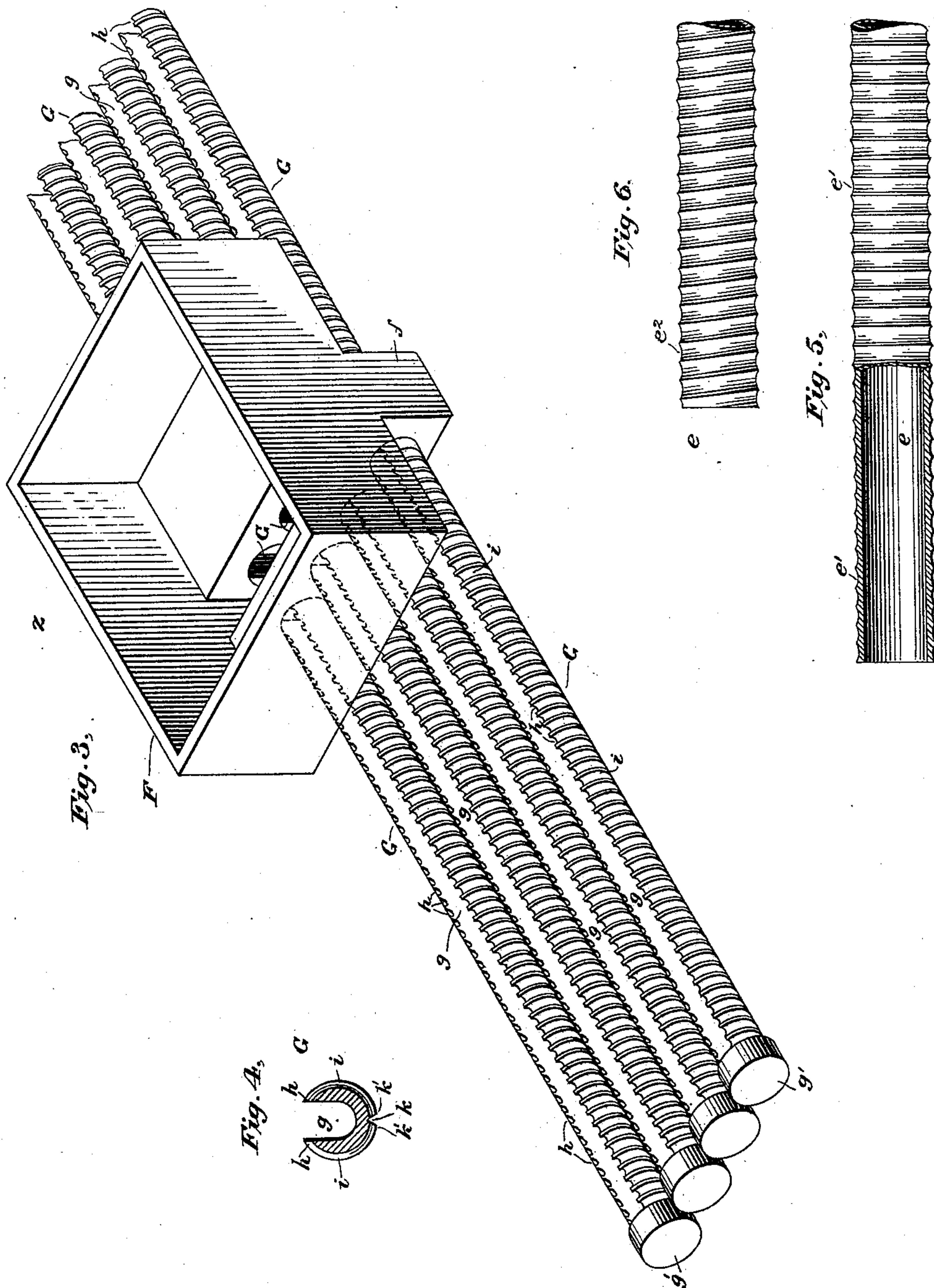
(No Model.)

2 Sheets—Sheet 2.

L. W. TRACY.
EVAPORATING APPARATUS.

No. 420,749.

Patented Feb. 4, 1890.



Witnesses
Geo. W. Drexel
Carrie E. Ashley

Inventor
Lewis W. Tracy
By his Attorneys
Baldwin, Davidson & Wright

UNITED STATES PATENT OFFICE.

LEWIS W. TRACY, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF TWO-THIRDS TO JAMES E. GRANNISS, OF SAME PLACE.

EVAPORATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 420,749, dated February 4, 1890.

Application filed February 21, 1889. Serial No. 300,670. (No model.)

To all whom it may concern:

Be it known that I, LEWIS W. TRACY, of New York, in the State of New York, have invented certain new and useful Improvements in Evaporating Apparatus, of which the following is a specification.

My invention more especially relates to that class of apparatus in which the cane-juice or other liquid to be concentrated is distributed or fed over a bank of heating tubes or pipes, the liquid being passed from the bottom of one evaporator to the feed devices of the next and the vapor of evaporation from one evaporator serving as the heating medium in the next. Such a system is fully disclosed in an application filed by me jointly with James J. Adams on August 31, 1888.

The present invention consists in certain improvements, first, in the feed devices, and, second, in the heating tubes or pipes.

In the accompanying drawings, Figure 1 is a side elevation, partly broken away, of one evaporator or "effect;" Fig. 2, a vertical transverse section of the same; Fig. 3, a perspective view of the feed device; Fig. 4, a transverse section of one of the feed or liquid-distributing pipes; Fig. 5, a detail view of a section of one of the heating-tubes, and Fig. 6 a similar view of a portion of a heating-tube having a slightly-different character of surface.

The casing or shell of the evaporator is made up, as shown, of top, bottom, and end sections bolted together, and each side thereof is composed of four like flanged sections *a a a a*, bolted together and to the top, end, and bottom sections, as shown. Each side section *a* has a panel *b* removably bolted in it, and each panel *b* has one or more glass-covered peep-holes *c*. By unbolting and removing the panels *b* the heating-pipes and interior of the evaporator are readily accessible for cleaning without disturbing the main framing or sections *a* of the shell.

At each end of the evaporator, and bolted between the end sections and the side, top, and bottom sections of the shell, is a tube-plate *d*. The horizontal heating-tubes *e* are carried in these plates, and may, if desired, be supported between their ends by one or

more partitions *d'*. Steam or heating vapor is to be admitted at *x* at one end, and in the first evaporator of the multiple effect or apparatus may pass out at *x'*. Each tube *e*, through which the heating medium passes, has its exterior surface irregularly shaped in such manner as to cause the liquor which is fed or distributed on the tubes to drop from them evenly without running to one or more separate points on the surface of a tube and there running off in a stream. To carry out this part of my invention in what I deem the most practical way, I form the tubes *e* with annular depressions *e'* arranged one alongside of another over the entire surface of the tube. These annular channels prevent the lateral running of the liquor, even if the tubes are out of a horizontal plane, and compel it to fall evenly upon the tubes below in little streams or drops which fall from the annular ridges; or I may form the tubes with a close spiral channel *e²*, as shown in Fig. 6, and whatever may be the form of the exterior of the tube that I may adopt the purpose is to provide obstructions to the lateral running of the liquid and compel it to fall in a finely-divided state upon the heating-tubes below.

The liquor from the bottom of one evaporator is taken through a pipe *x²* and delivered to the feed devices *z* of the next evaporator, while the heated vapors of evaporation which pass off at *v v* are used to heat the next effect, being admitted thereto at *x*, a suitable vacuum-pump being employed, as is well understood, to draw the vapors from one evaporator to another.

The feeding devices are constructed as follows: In the top of each evaporator are one or more liquor-receiving tanks *F*, each having in the bottom a transverse well or depression *f*, from the side walls of which extend channel feed or distributing pipes or troughs *G*—that is, these pipes or troughs are open at the top and the liquor overflows and falls upon the evaporating-surfaces below. Generally this construction is shown in the joint application above referred to.

The present invention consists, first, in making the troughs *G* of solid metal chan-

neled or cut, as shown at *g*, or casting them in such solid shape, as illustrated, for I have found that ordinary piping or tubing, even when very heavy, is liable to warp and discharge the liquor unevenly; second, I notch or scallop the edges of the trough, as shown at *h*, to compel the liquor to overflow in a large number of small streams; third, I form depressions or channels *i* in the sides of the troughs extending from the notches *h* to the under sides of the troughs; fourth, instead of having the channels *i* run around the trough from the notches *h* on one side to those on the other, I prefer to cut a longitudinal channel *k* on the under side of the trough. A large number of points *k'* are thus provided, from which the liquor will run in fine streams.

In practice I should prefer to have the channels *i* quite shallow. I should also make the troughs of larger diameter than the evaporating-tubes, and such tubes, instead of being as close together as shown, would be separated by spaces amply sufficient to afford free access to the tubes for cleaning and provide ample space for the expansion of the vapors—that is, they might be from one to two inches apart, and the tubes might be of relatively larger diameter than shown.

Where the feed-troughs are cast, the caps *g'* may be cast with them, or they may be screwed on.

Both in the case of the feed-troughs and of the evaporating-tubes, the transverse channels for preventing the lateral running of the liquor may of course be much smaller than indicated, and it should be understood that any transverse channeling or roughening which will accomplish that result is within the terms of my invention.

I claim as my invention—

1. In an evaporating apparatus, the combination, with suitable feeding devices, of a gang of evaporating-tubes over which the liquor is distributed, said tubes being formed upon their exterior faces with transverse

channels for preventing the lateral running of the liquor, substantially as set forth.

2. The combination, with the liquor-feed tank or receptacle, of the horizontal feed-trough having its overflow edges notched for the purpose set forth, and the horizontal evaporating-tubes upon which the liquor from the feed-trough falls, substantially as set forth.

3. In an evaporating apparatus, the combination, with the evaporating tubes or surfaces over which the liquor is to be distributed, of a feed-trough having transverse depressions or channels upon its exterior, substantially as set forth.

4. In an evaporating apparatus, the combination, with the evaporating tubes or surfaces over which the liquor is to be distributed, of the feed-trough having transverse channels on its exterior and a longitudinal groove along its under side, substantially as set forth.

5. In an evaporating apparatus, the combination, with tubes or evaporating-surfaces over which the liquor is to be distributed, of the feed-trough having its overflow edges notched, transverse channels upon its exterior face running from said notches downwardly, and the longitudinal groove on its under side, substantially as set forth.

6. In an evaporating apparatus, the combination, with the evaporating tubes or surfaces over which the liquor is to be distributed, of the feed-trough, whether cast or formed by channeling a bar of metal, the channel of the trough having vertical side walls *g* and its overflow edges being notched and its exterior formed with transverse channels, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

LEWIS W. TRACY.

Witnesses:

WM. A. ROSENBAUM,
EDWARD C. DAVIDSON.