

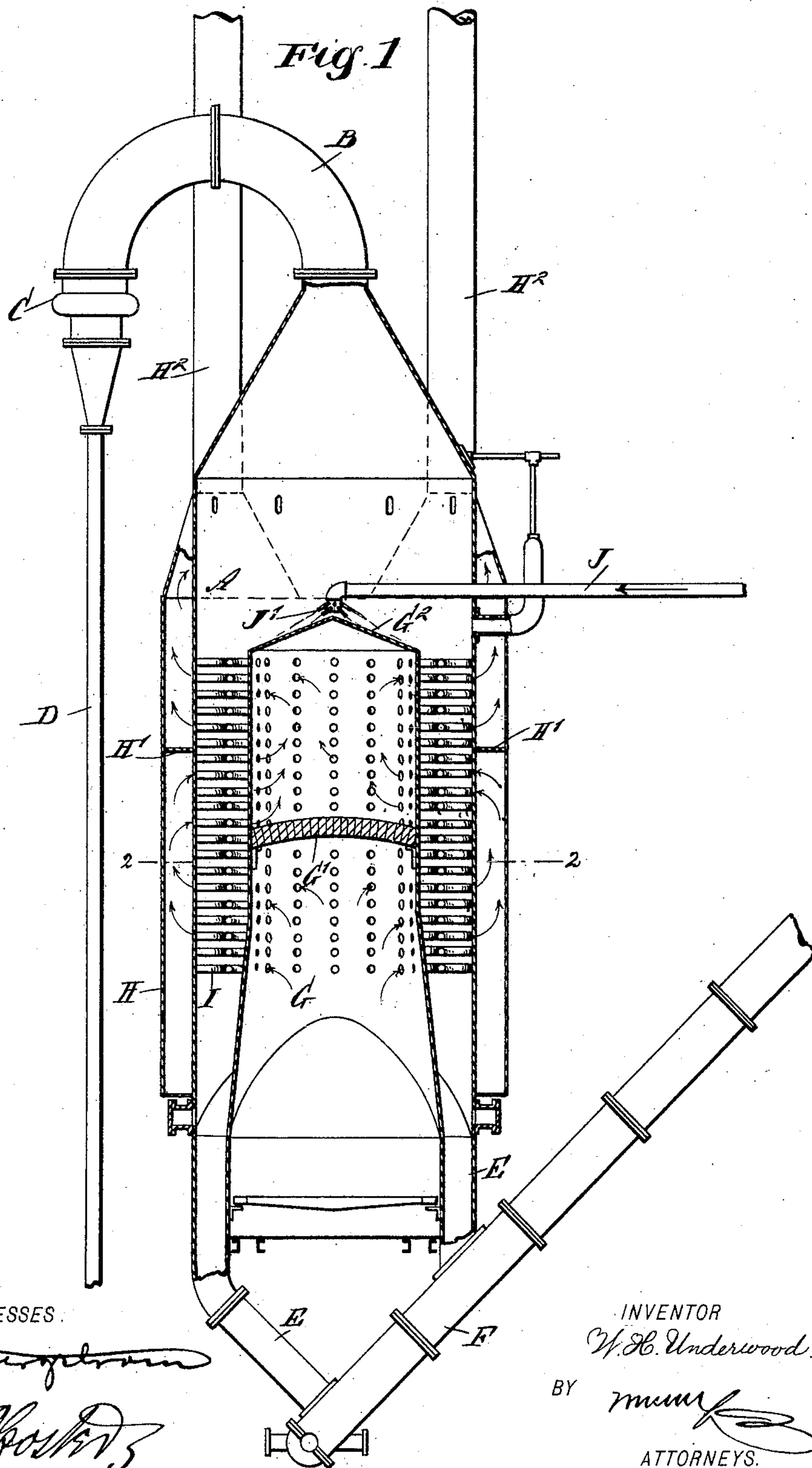
(No Model.)

2 Sheets—Sheet 1.

W. H. UNDERWOOD.  
EVAPORATING APPARATUS.

No. 603,543.

Patented May 3, 1898.



WITNESSES.

*John S. Underwood*  
*Geo. G. Underwood*

INVENTOR

*W. H. Underwood*

BY

*Wm. H. Underwood*

ATTORNEYS.

(No Model.)

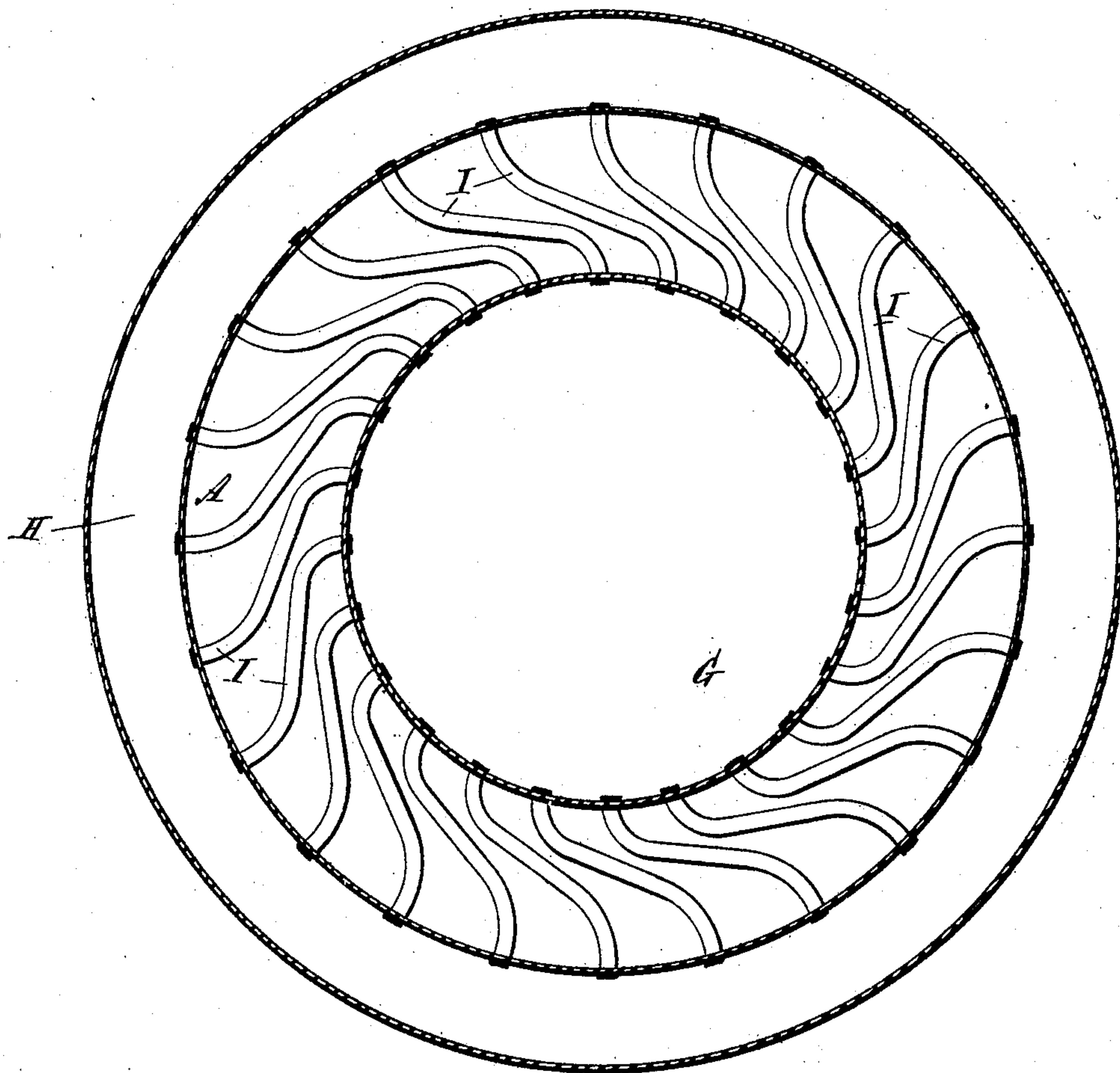
2 Sheets—Sheet 2.

W. H. UNDERWOOD.  
EVAPORATING APPARATUS.

No. 603,543.

Patented May 3, 1898.

*Fig. 2*



WITNESSES:

*John A. Berghman*  
*Rev. G. Foster*

INVENTOR

*W. H. Underwood*

BY

*mmu*

ATTORNEYS.



# UNITED STATES PATENT OFFICE.

WALTER H. UNDERWOOD, OF HUTCHINSON, KANSAS.

## EVAPORATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 603,543, dated May 3, 1898.

Application filed July 9, 1897. Serial No. 644,006. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER H. UNDERWOOD, of Hutchinson, in the county of Reno and State of Kansas, have invented a new and Improved Evaporating Apparatus, of which the following is a full, clear, and exact description.

The invention relates to evaporating apparatus used in the manufacture of salt and the like; and the object of the invention is to provide a new and improved evaporating apparatus in which the salt is prevented from accumulating on the dome of the fire-box and becoming incrustated and burned thereon, with a consequent burning out of the sheets, as is so frequently the case in evaporating apparatus as heretofore constructed.

A further object of the invention is to increase the heating-surface of the flues in the pan and to prevent the said flues from pulling out of the sheets.

The invention consists principally of a feed-pipe provided with a distributor extending over the dome of the fire-box, so that the discharged brine washes the salt off as it falls on the dome and before it has a chance to burn thereon.

The invention further consists of a fire-box, an evaporating-chamber around the fire-box, a heating-chamber around the evaporating-chamber, and curved flues in the said evaporating-chamber and connecting the fire-box with the heating-chamber to increase the heating-surface of the flues, and thus permit expansion and contraction of the same without danger of pulling out the flues from the sheets, and also to crack the salt accumulating on the exterior surface of the flues.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in both the figures.

Figure 1 is a sectional side elevation of the apparatus, and Fig. 2 is an enlarged sectional plan view of the same.

The improved evaporating apparatus is provided with an evaporating-pan A, from the

upper end of which leads a vapor-exhaust pipe B, provided with a condenser C of any approved construction and connected with the pipe D, through which passes the water from the condenser C to form the necessary vacuum in the evaporating-chamber of the pan A. The pan A is provided at its bottom with settling-legs E, opening into an elevator F, for carrying the crystals as they form to any desired point above the level of the brine contained in the evaporating-pan A.

Within the evaporating-pan A is arranged a fire-box G, and around the said pan is a heating-chamber H, connected by flues I with the said fire-box, so that the flues extend horizontally through the evaporating-pan A and through the brine contained therein. A suitable distance above the grate of the fire-box is arranged an arched partition G' for causing the heat and gases from the burning fuel in the fire-box to pass through the lowermost flues I into the chamber H, and to then pass from the latter below a partition H' through another set of flues I back into the fire-box above the partition G', and to finally pass from the upper end of the fire-box through the uppermost flues I back into the chamber H above the partition H', to finally pass up the smoke-stacks H<sup>2</sup> to the outside. The flues I are curved or S shape in form, as is plainly indicated in Fig. 2, so as to produce a large heating-surface in the evaporating-pan A and at the same time allow proper expansion and contraction of the flues and sheets without danger of the flues pulling out of their fastenings in the sheets forming the fire-box and chambers.

Now it will be seen that when the flues expand and contract the walls of the flues cause a cracking of the salt and scale that has accumulated on the flues, and consequently the said flues are kept comparatively free from salt, and in cleaning up any particles of salt adhering to the flues may be readily knocked off.

By having the partitions G' and H' in the fire-box G and heating-chamber H, respectively, the heat and gases arising from the burning fuel in the fire-box are caused to travel a long distance to give off their heat before finally passing into the chimneys H<sup>2</sup>



and escaping to the outside. Thus a great saving of fuel is obtained in running the apparatus.

By the arrangement described the heat  
5 passes through three sets of comparatively long flues before passing to the chimney to obtain the full benefit of the fuel.

The feed-pipe J for carrying the brine to the evaporating-pan A terminates over the apex of  
10 the dome G<sup>2</sup> of the fire-box, and on the inner end of this feed-pipe is arranged a distributor J', formed by tapping a series of short pipes into the feed-pipe J, to cause the brine to  
15 pass over the dome G<sup>2</sup>, so as to wash off any salt that falls on the dome and before the salt has a chance to burn on the metal forming the dome.

Having thus fully described my invention, I claim as new and desire to secure by Letters  
20 Patent—

1. An evaporator for brine and the like, comprising three concentric chambers, the inner chamber constituting a fire-box and being closed at the top by a conical dome and  
25 having a partition across the same central its ends, the intermediate chamber constituting the evaporating or brine-containing chamber and extending above the fire-box, and the outer chamber constituting a smoke-flue  
30 or breeching and having a partition located above the partition in the fire-box and dividing the same into two parts, the fire-box and smoke-flue being connected above and below

both partitions by horizontal flues curved in an S shape and extending through the evaporating-chamber, and a brine-supply pipe discharging upon the apex of the fire-box dome whereby the same is kept free of salt deposits, substantially as described. 35

2. An evaporator for brine and the like, comprising three concentric chambers, the inner chamber constituting a fire-box and being closed at the top, the central chamber constituting an evaporating or brine-containing chamber and extending above the fire-  
45 box, and the outer chamber constituting a smoke-flue or breeching, the fire-box and smoke-flue being connected by horizontal flues curved in an S shape and extending through the evaporating-chamber, substantially as described. 50

3. An evaporator for liquids containing salts in solution, comprising an evaporating or liquid-containing chamber having a fire-box within the same, the upper end of the  
55 fire-box being sloping, and a liquid-supply pipe having nozzles discharging the fresh brine upon and arranged to entirely cover the upper surface of the fire-box whereby the fire-box top is covered with fresh brine under circulation and the formation of salt deposits thereon is prevented. 60

WALTER H. UNDERWOOD.

Witnesses:

EDWIN S. MOORE,  
W. H. SMITH.