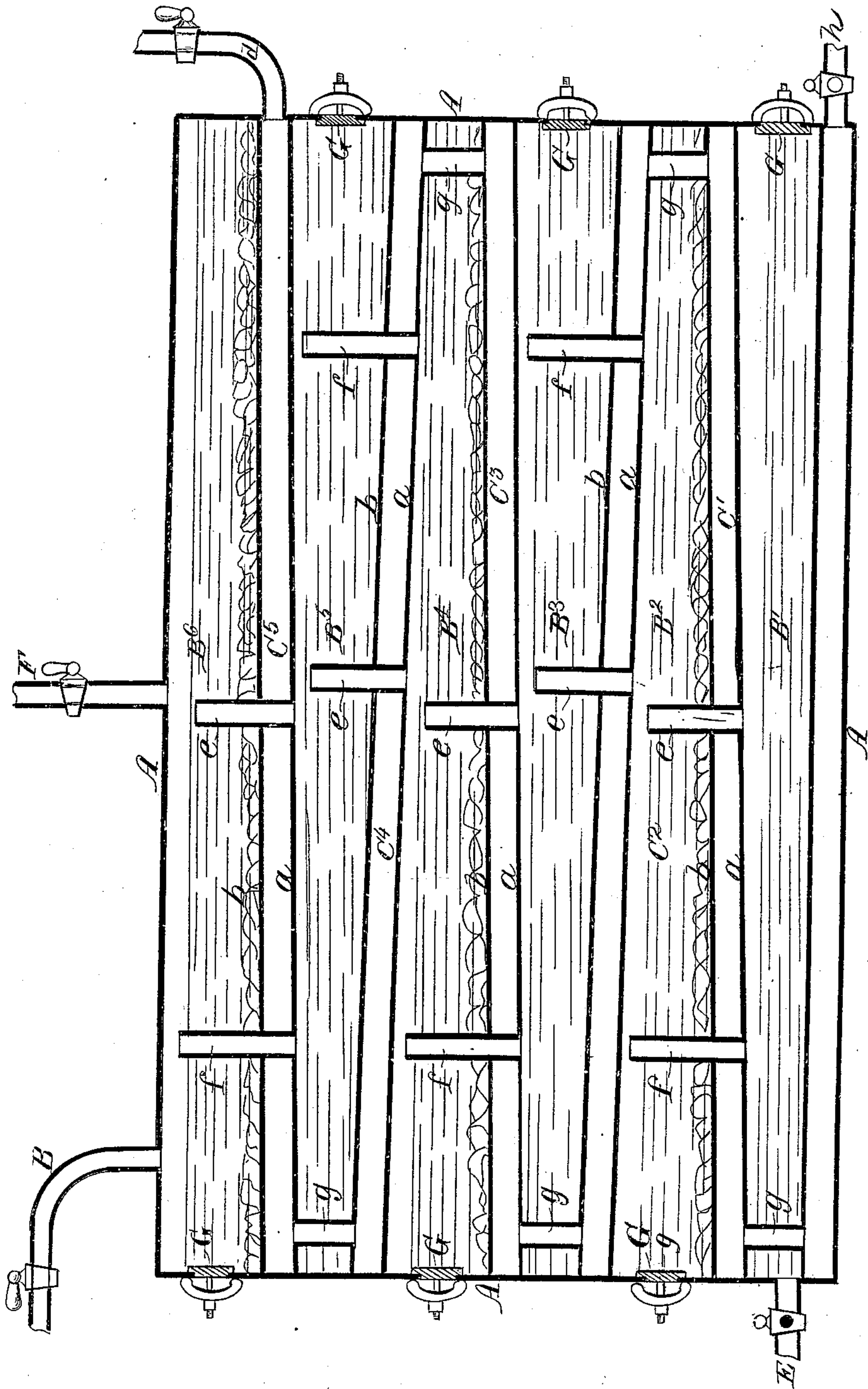


L. S. Fales,

Evaporating Pan.

No. 93,072.

Patented July 27, 1869.



Witnesses.
Fred. Haynes

Lev. S. Fales

United States Patent Office.

LEVI S. FALES, OF NEW YORK, N. Y.

Letters Patent No. 93,072, dated July 27, 1869.

IMPROVED APPARATUS FOR EVAPORATING AMMONIACAL AND OTHER LIQUIDS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern :

Be it known that I, LEVI S. FALES, of the city, county, and State of New York, have invented a new and useful Improvement in "Apparatus for Evaporating the Ammoniacal Liquor of Gas-Works or other Liquids;" and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, which represents a vertical section of an apparatus constructed according to my invention.

This invention, though applicable to the evaporation of other liquids, and to some distilling-purposes, is more especially designed for the evaporation of the ammoniacal liquors obtained from gas-works, for the manufacture of sulphate of ammonia.

It consists in a novel arrangement of superposed and intercommunicating evaporating-chambers, for the reception of the liquid to be evaporated, and interposed steam-passages, whereby the heating of the liquid is effected in thin sheets, and a very effective evaporation is obtained.

To enable others to make and use my invention, I will proceed to describe it with reference to the drawings.

A is a shell of oblong parallelopipedal or other suitable shape, of boiler-iron, or other suitable metal, forming the side walls of the apparatus. This shell may be braced internally in any suitable manner, and may be encased with any suitable poor-conducting material, to prevent loss of heat by radiation.

The said shell is divided by horizontal or slightly inclined partitions *a b*, arranged in pairs, and extending from end to end, and from side to side, into a series of superposed evaporating-chambers, B¹ B² B³ B⁴ B⁵ B⁶, and interposed shallow steam-passages C¹ C² C³ C⁴ C⁵.

When inclined, the several pairs of partitions *a b* are inclined alternately in opposite directions, as represented in the drawing.

The several steam-passages above mentioned are connected at opposite ends alternately by a number of upright pipes *g*, for the purpose of permitting a circulation of steam through the whole series, one after the other in succession, the steam being admitted into the uppermost passage C⁵, from a boiler or superheating-apparatus, through a pipe, and the water of condensation escaping from the lowest chamber by a pipe, *h*.

The several evaporating-chambers are connected each, with the one above and below it, by two sets of pipes *e* and *f*, the lower ends of the said pipes terminating each in the upper plate *b* of one evaporating-chamber, and extending some distance above the lower plate *a* of the evaporating-chamber above, the

upper ends of the pipes *f*, reaching higher up than the pipes *e* within their respective chambers.

Each evaporating-chamber is furnished at one end with a man-hole, the cover G of which is removable, for the purpose of cleaning out the chamber when necessary.

D is a pipe, connecting with the uppermost evaporating-chamber, for the ingress of the liquid to be evaporated.

E is a pipe, connecting with the lowest evaporating-chamber, for drawing off the spent liquid after evaporation.

F is a pipe attached to the uppermost evaporating-chamber, for the egress of the vapors eliminated from the liquids.

The operation of the apparatus, when employed for the evaporation of ammoniacal liquor, is as follows:

The partition-plates *b*, forming the bottoms of the several evaporating-chambers, have spread over them a stratum of lime, to facilitate the elimination of the vapors (carbonate of ammonia) from the liquor, and the liquor is admitted through the pipe D to the uppermost evaporating-chamber B⁶, from whence, on rising above the level of the tops of the pipes *e*, it overflows to the next chamber B⁵ below. After filling the last-mentioned chamber to the level of the top of its pipes *e*, it overflows into B⁴, and so on, overflowing from each to the next one below through the whole series of chambers, until it reaches the lowest, B¹, whence its escape is properly regulated by a stop-cock in the pipe E.

While the liquor is thus circulating through the whole series of chambers, superheated steam, at a temperature of about 400° Fahrenheit, is admitted by the pipe *d* to the uppermost steam-passage C⁵, and allowed to circulate, thence through the pipes *g*, into the next passage C⁴ below, and so on, downward through the whole series of passages in succession, the water of condensation and spent steam passing off at *h*.

The liquor in the several evaporating-chambers is thus heated to a suitable degree, to produce evaporation, and the vapors pass off upward therefrom, from one into the next above, through the conducting-pipes *f*, finally passing off from the uppermost chamber through the pipe F, by which it is conveyed to a vessel or chamber containing sulphuric acid, to be converted into sulphate of ammonia.

The liquor, as it overflows from one evaporating-chamber to another, is weaker and weaker, until, on its escape from the lowest chamber, its strength is so much reduced that there would be no economy in its further evaporation.

The evaporation of other liquids may be conducted in this apparatus in the same manner as above de-

scribed, except that for other purposes the use of lime or other material on the bottoms of the evaporating-chambers may be dispensed with.

What I claim as my invention, and desire to secure by Letters Patent, is—

The evaporating-apparatus, composed of the superposed intercommunicating evaporating-chambers $B^1 B^2 B^3 B^4 B^5 B^6$, interposed steam-passages $C^1 C^2 C^3 C^4 C^5$,

steam-pipes g , everflow-pipes e , and vapor-conducting pipes f , the whole combined to operate substantially as herein described.

LEVI S. FALES.

Witnesses:

FRED. HAYNES,
J. W. COOMBS.