2 Sheets—Sheet 1.

FARQUHAR & DOAN.

Evaporating Pan.

No. 67,742. Patented Aug. 13, 1867.

Fig. 2.

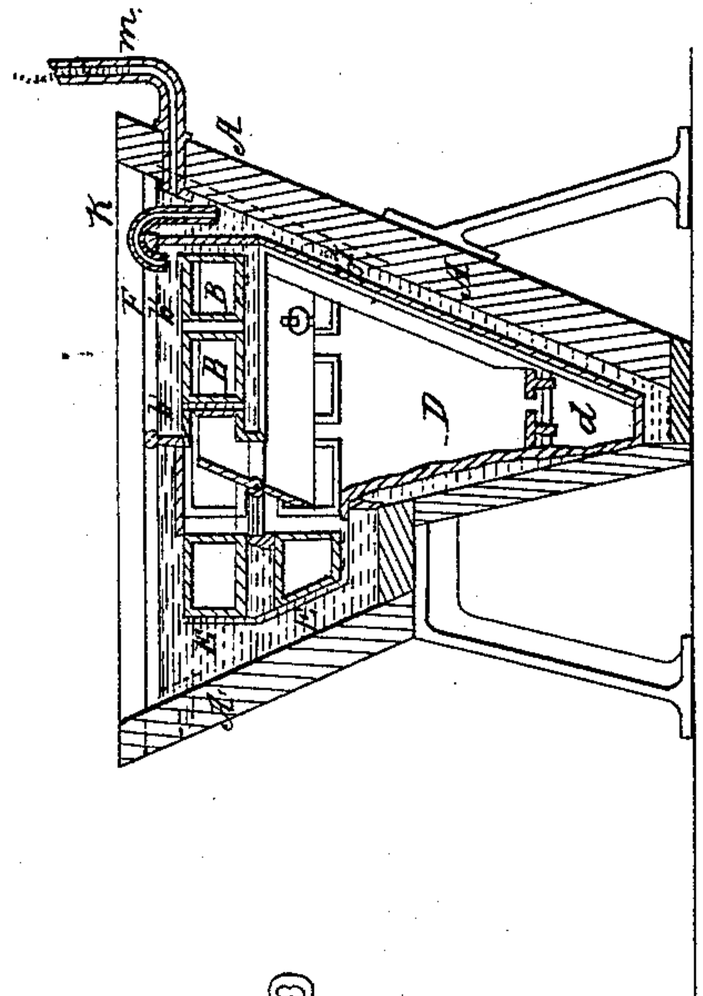
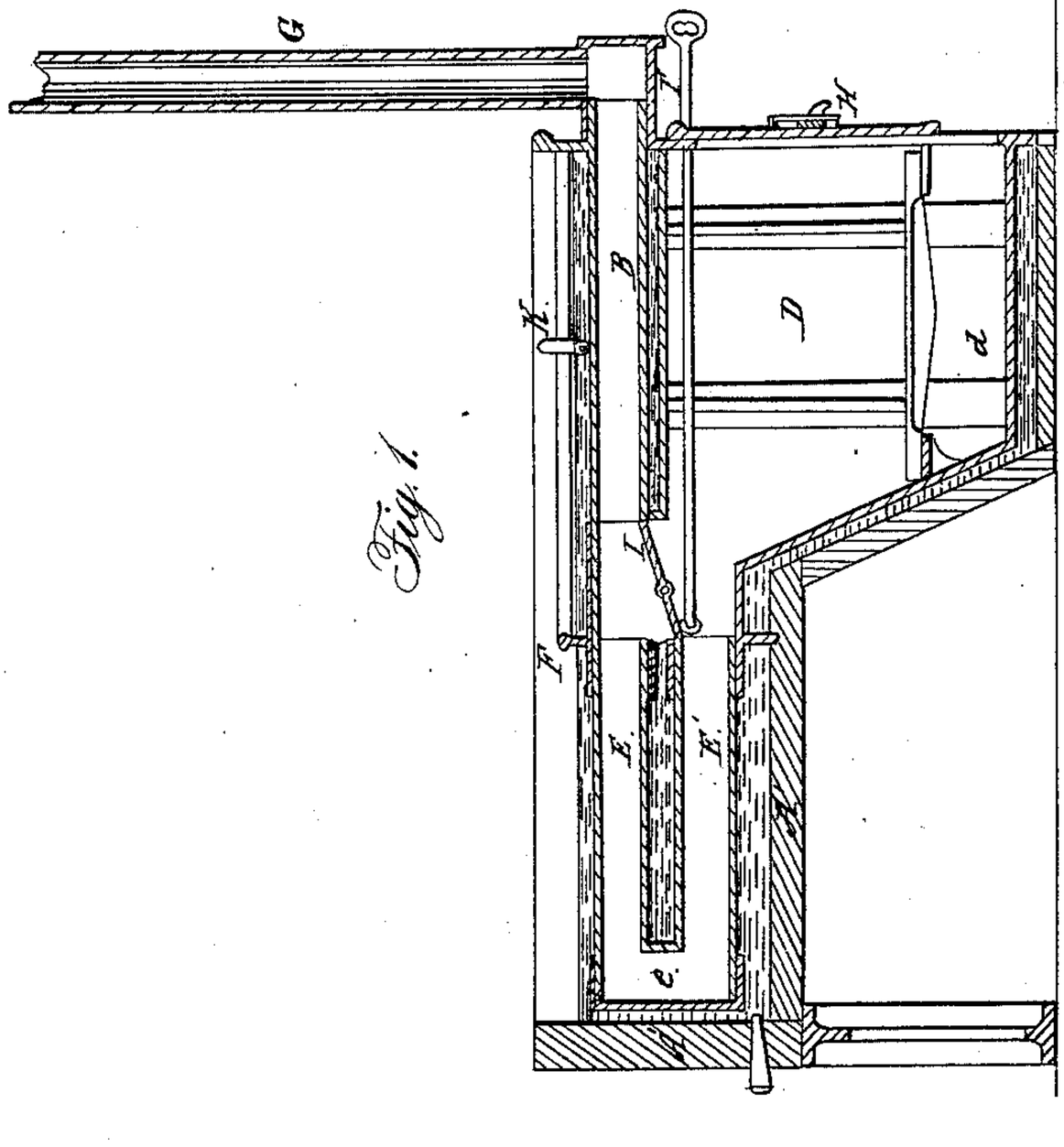


Fig. 1.



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2 Sheets—Sheet 2.

FARQUHAR & DOAN.

Evaporating Pan.

No. 67,742. Patented Aug. 13, 1867.

Fig. 3.

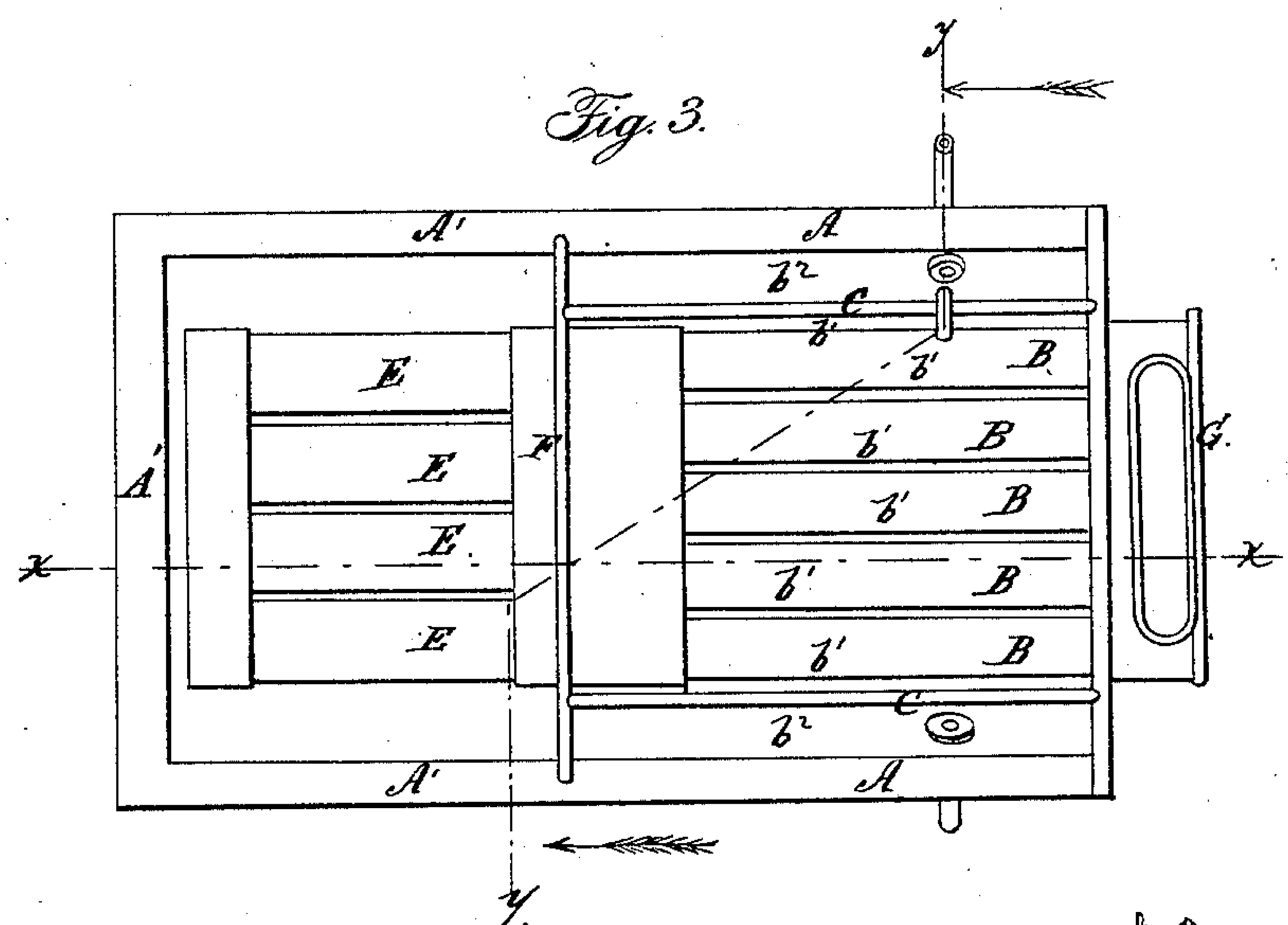
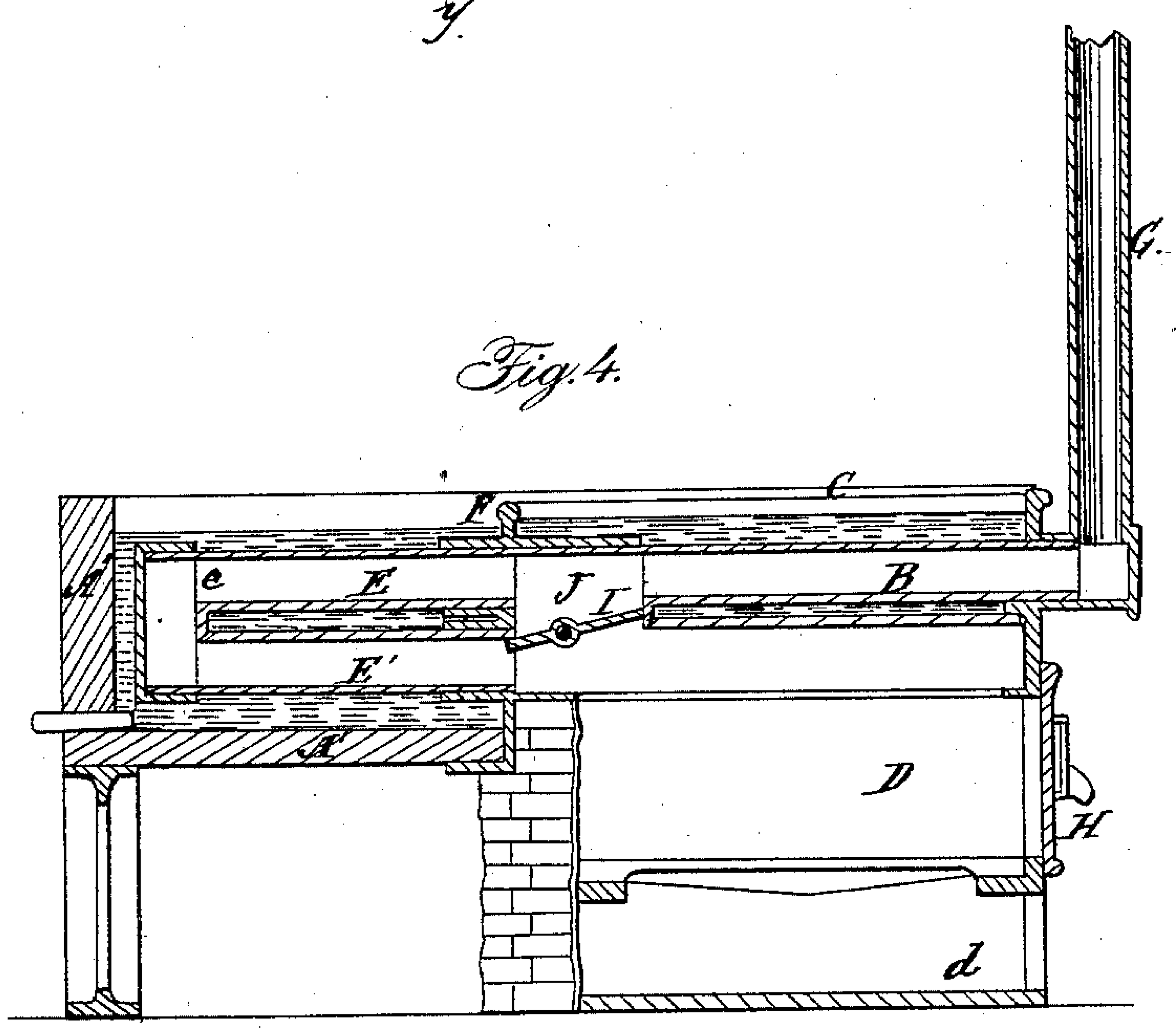


Fig. 4.



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FRANCIS FARQUHAR AND ROBERT E. DOAN, OF WILMINGTON, OHIO.

Letters Patent No. 67,742, *dated August* 13, 1867.

IMPROVED APPARATUS FOR HEATING AND EVAPORATING.

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

TO ALL WHOM IT MAY CONCERN:

Be it known that we, FRANCIS FARQUHAR and ROBERT E. DOAN, of Wilmington, in the county of Clinton, and State of Ohio, have invented a new and useful Improvement in Evaporating and Heating Apparatus; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, which form part of this specification.

In our improvements in the construction of evaporators we have sought to remedy the following disadvantages, one or more of which are found to exist in most apparatus in use previously to the date of our invention:

First, the heat is not applied and utilized in the most economical and thorough manner, and much waste of fuel consequently results.

Second, adequate means are not provided for defecating the juice in accordance with natural laws, without checking the boiling operation by irregularity either in the application of heat or in the introduction of cold juice.

Third, the finishing operation usually involves loss of heat, retarding of the boiling operation, or danger of injuring the sirup by imperfect control of heat.

The objects of our invention are to attain a more complete utilization of heat, and to provide improved facilities for performing the several processes of defecation, evaporation, and finishing in the same apparatus.

The first part of our invention consists in extending the flues over the fire-box, the latter being in the illustrated type of our invention surmounted by a defecating-pan, and partially surrounded by the evaporating-spaces in which the liquid is boiled.

Another feature of our invention consists in constructing the evaporator with a finishing-pan projecting beyond the fire-box, so as to be removed from the direct influence of the fire, and traversed by flues through which a regulated amount of heat may be supplied, or from which the heat may be entirely excluded, as hereinafter explained.

The invention also has reference to means for regulating the heat in the different flues, and for diverting it from one set to the other.

Figure 1 is a longitudinal section of an evaporator illustrating our invention, the line *x x*, fig. 3, indicating the plane of section.

Figure 2 is a vertical section of the same on the several planes indicated by the line *y y*, fig. 3.

Figure 3 is a plan of the same.

Figure 4 is a longitudinal section illustrating a modification.

The apparatus which forms the subject of this application resembles that described in our patent of September 26, 1866, in so far as relates to the surrounding of the fire-box and flues with the evaporating or liquid-containing spaces; and also as relates to the uniformity in the bulk of the liquid in said spaces to secure the equal and most effective action of the heat.

In the accompanying drawings, A may represent a wooden box enclosing the sheet-iron flues B B B, pan C, and fire-box D, together with its ash-pit and draught-chambers *d*. The flues B are situated directly over the fire-box D, and are arranged in parallel positions within the pan C, but are supported so as to leave a space, *b*, between their bottoms and the bottom of the pan C, which latter constitutes the top of the fire-box, and is subject to the direct action of the heat. There are also spaces, b^1, between the adjacent flues B and between the sides of the pan C and the adjacent flues; also spaces, b^2, between the sides of the pan C and those of A, the latter spaces, b^2, extending down alongside of as well as beneath and behind the fire-box D. A′ is a box or pan joined to the pan A, but projecting therefrom in such a way as to avoid the direct influence of the fire in the furnace D. The box or pan A′ contains flues E E′, having surrounding and intervening spaces the same as B B B. A partition, F, closes communication between A and A′, and also between A′ and C. The fuel is supplied to the furnace through the door H at the front, and the escaping products of combustion are carried off by the pipe G. I represents a damper, which, by means of the rod I′, may be made to assume either a vertical position or the nearly horizontal position in which it is represented. In the position in which it is represented the damper I serves to direct the products of combustion from the fire-box into the flues E′, after passing to the rear of which they ascend through the connecting passage *e*, pass forward through flues E, thence through flues B, and

out at the discharge pipe G. This is the course of the heated products of combustion when the process of finishing is being conducted in the projecting-pan A′. The finishing process requires moderation and regulation of heat in order to prevent burning. In this apparatus the first of these requisites is met by having the pan A′ removed from the immediate vicinity of the fire, and the second, by the provision of the damper I, which enables any desired variation in the amount of heated products of combustion allowed to traverse the interior of the flues E E′. By turning the damper I into its vertical position the heat will be entirely excluded from the flues E E′, and in this case it passes directly through the space J into the flues B.

The defecating and first boiling or evaporating process is as follows: The crude juice is let into the pan C near its rear end, which end may be made to flare, and as the operation proceeds, the cold or newly received juice, being heavier than the heated juice, first descends and flows forward in contact with the flues B and with the bottom of pan C, which, being intensely heated, cooks or coagulates the glutinous matter in the juice. This coagulated matter rising to the surface with the impurities then floats backward on the top of the liqui the rear end of the pan C, where it becomes quiescent, and does not again mix with the liquid, and where it may be skimmed off at leisure. A siphon, K, or any suitable means, may be employed to transfer the clarified juice from the pan C to the space b^2, in which it may be allowed to boil and evaporate to any desired extent. From the boiling-space or apartment b^2 it is transferred to the projecting-pan A′, where the heat is controlled and regulated by means of the damper I, as may be found necessary in the finishing operation. Of the liquid in the pan C, only that portion in contact with its bottom, namely, the heavier portion containing glutinous matter, is subjected to intense heat, and hence the pure juice is not liable to burn. The damper I being situated in front of the partition F enables the heat to be completely excluded from the front as well as from the other parts of the pan A′, thus completely precluding the possibility of burning the liquid contents of the finishing-pan.

It will be observed that so far as the placing of the flues above the fire-box is concerned the arrangement may be varied in different ways without departing from the essential principle of our invention. Thus, instead of extending from front to rear, the flues B may extend from side to side, and in order to increase the flue capacity two or more tiers may be employed. Where very great capacity is required we may dispense with the space around the lower part of the fire-box, and mount a pan similar to C, together with the projecting-pan and flues, (all controlled by a damper, as before,) on a brick or stone arch, as shown in fig. 4. In this case we prefer to make one or more partitions in the projecting or finishing-pan to enable us to finish a small quantity at a time, and when the finishing-pan is thus divided a plurality of dampers should be employed to enable each division to be controlled independently of the others. The pipes *m m′* are for introducing and withdrawing water which it may be desirable to heat in this apparatus for slaughtering, washing, bathing, or general domestic purposes, or cooking.

In connection with the above-described apparatus may be employed a perforated metallic or other pan for containing grain or vegetables to be cooked as food for stock. When the apparatus is filled with water a pan of this kind, (having ribs upon its under side to keep it out of contact with the heated surfaces,) may be set upon the flues so as to allow the hot water to circulate through and cook its contents.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. We claim an evaporating or heating apparatus, having one or more flues mounted directly over the fire-box, substantially as described.

2. We claim the projecting-pan A′ to be heated by one or more flues, substantially in the manner and for the purpose specified.

3. We claim the combination with the flues B E E′ of the damper I, substantially as and for the purpose set forth.

4. We claim the defecating-pan C, in combination with the boiling or evaporating-space b^2, and fire-box D, substantially as and for the purpose set forth.

To the above specification of our improved evaporating and heating apparatus we have signed our hands.

FRANCIS FARQUHAR,
ROBERT E. DOAN.

Witnesses:

OCTAVIUS KNIGHT,
GEO. A. MORRISON, } as to FRANCIS FARQUHAR.

LEVI MILES,
JOHN A. SMITH, } as to ROBERT E. DOAN.