

Leffert R Cornell.
 Evaporating Apparatus.

PATENTED JUL 18 1871

117052

Fig. 1.

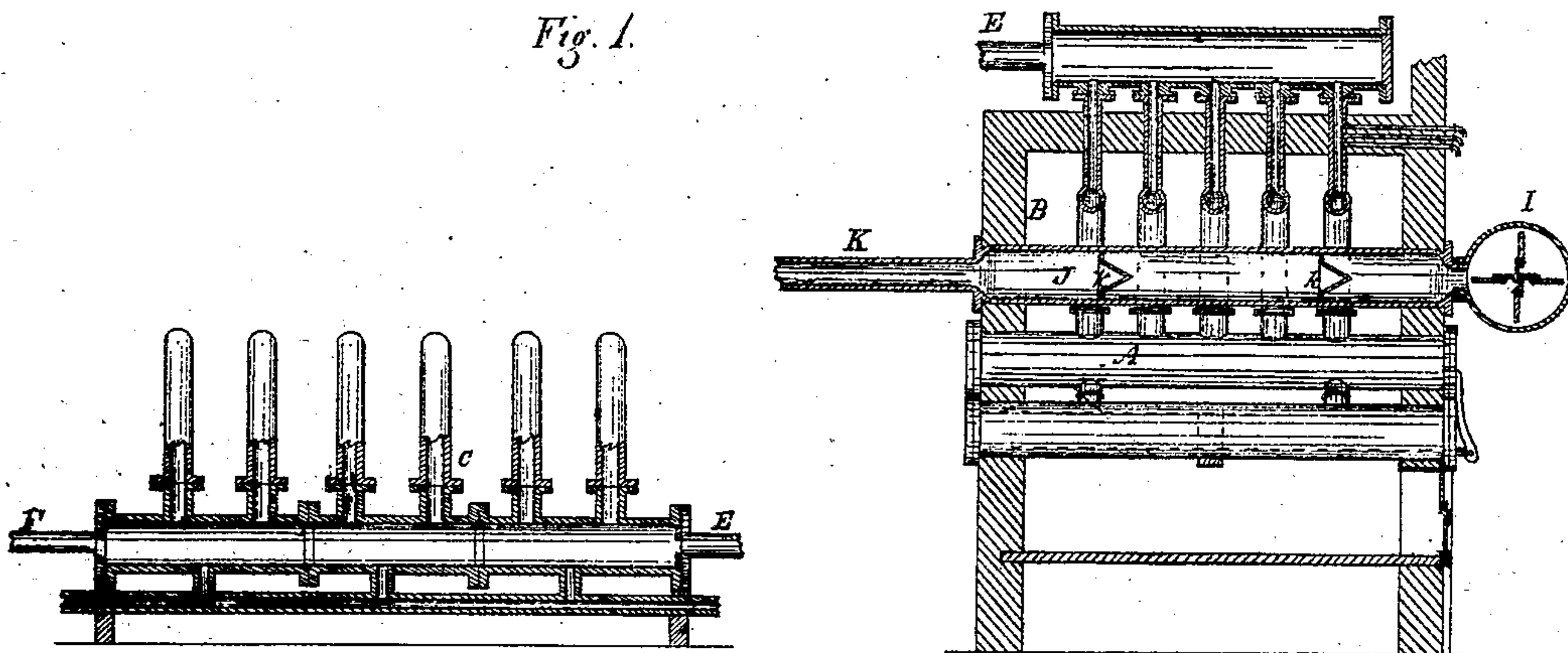


Fig. 2.

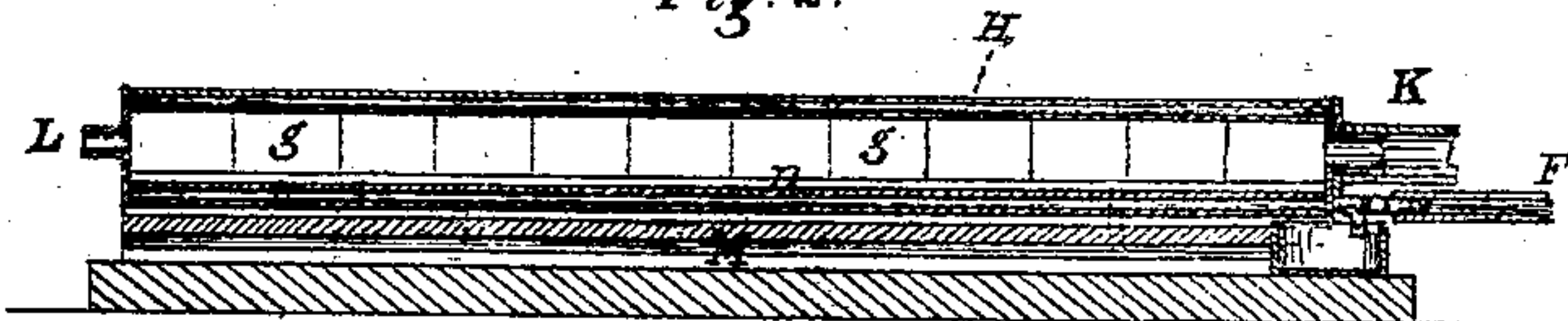


Fig. 3.

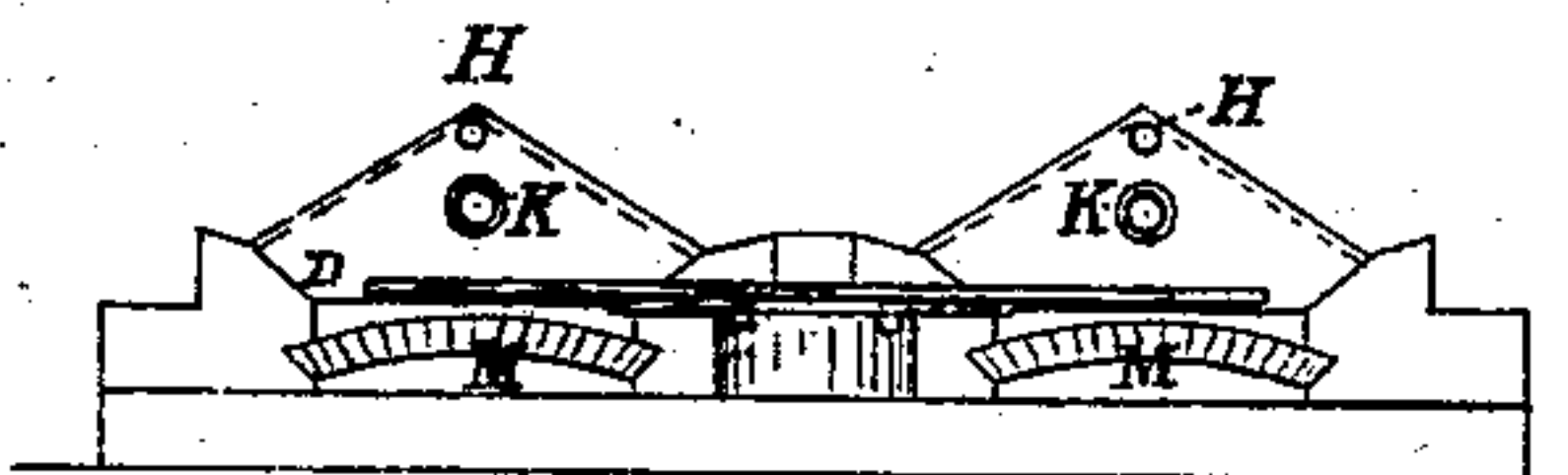


Fig. 4.

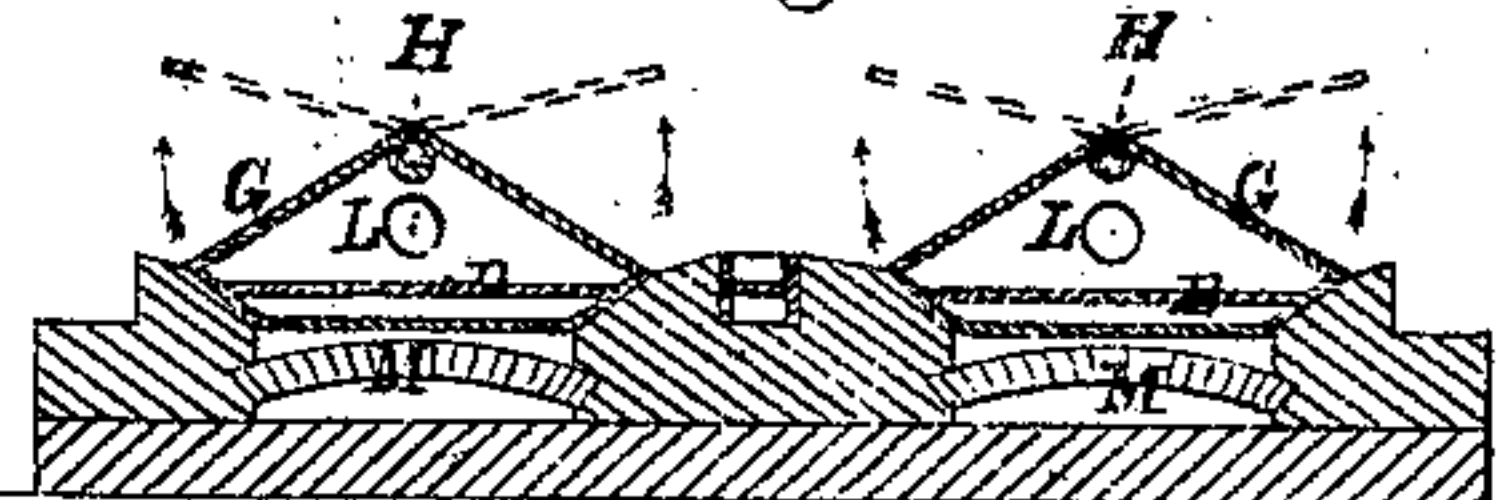
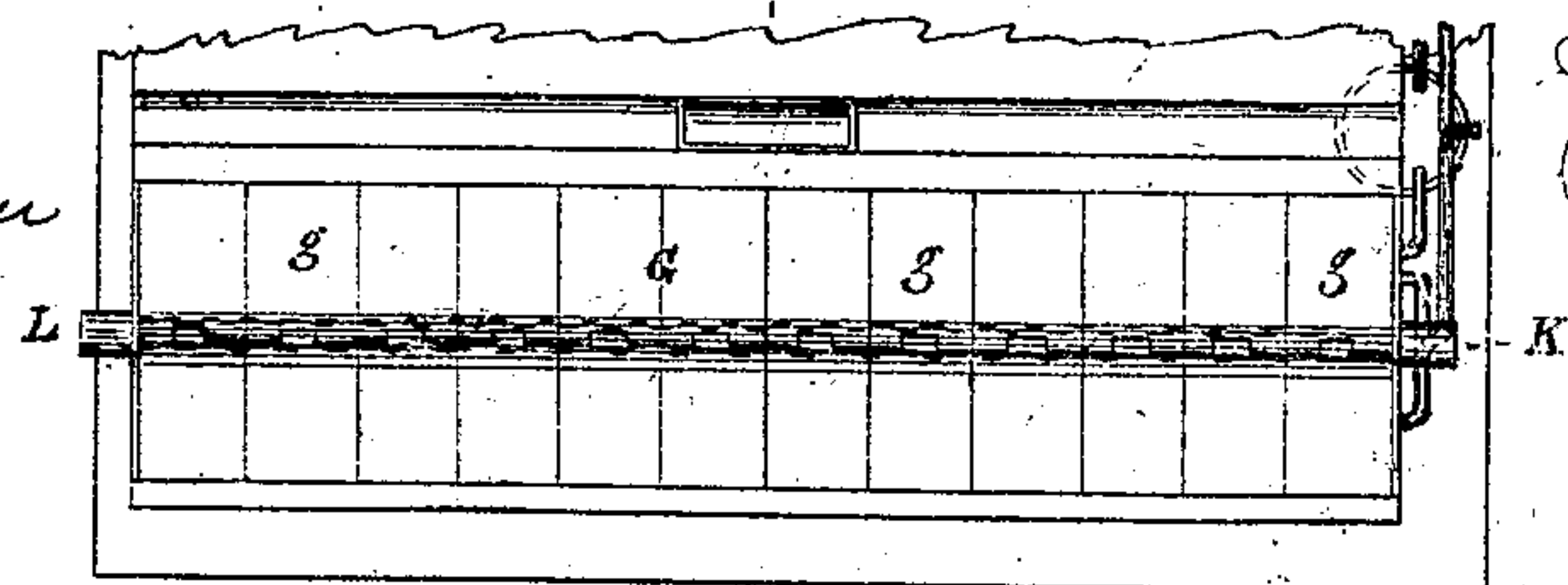


Fig. 5.



Witnesses-
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UNITED STATES PATENT OFFICE.

LEFFERT R. CORNELL, OF SYRACUSE, NEW YORK.

IMPROVEMENT IN APPARATUS FOR EVAPORATING BRINE AND OTHER LIQUIDS.

Specification forming part of Letters Patent No. 117,052, dated July 18, 1871.

To all whom it may concern:

Be it known that I, LEFFERT R. CORNELL, of Syracuse, in the county of Onondaga and State of New York, have invented certain Improvements in Evaporating Apparatus.

This apparatus is intended chiefly for evaporating salt-brine, and is adapted to that purpose, though it may be used for others. It is intended to obviate the difficulties which are now experienced in the use of the ordinary apparatus, in which either fire or ordinary natural steam is used, and to furnish an economical means of imparting a controllable and perfectly-regulated heat to the brine in the process of evaporation. The first part of my invention consists in the combination of a steam-generator, a superheater, and a double-bottomed evaporating-pan, substantially as hereinafter more fully set forth. The second part of my invention consists in the combination of a blower or its equivalent, an apparatus for heating air, and a covered evaporating-pan, substantially as hereinafter more fully set forth. The third part of my invention consists in the combination of a double-bottomed evaporating-pan and an arch or its equivalent, placed below said evaporating-pan and between it and the ground, so as to leave a chamber or open space between the evaporating-pan and the arch or its equivalent, and also between said arch or its equivalent and the ground, as hereinafter more fully set forth.

Figure 1 is a vertical longitudinal section of the boiler, superheater, blower, and air-heating device which form parts of my apparatus. Fig. 2 is a similar section of that portion of my apparatus which is not shown in Fig. 1. Fig. 3 is a front-end view of my evaporating-pan and its appurtenances. Fig. 4 is a transverse section of the same. Fig. 5 is a plan of the same.

A is a boiler or steam-generator, which I prefer to construct in accordance with Letters Patent of the United States granted to me December 6, 1870, though any other similar boiler will answer. The furnace B, in which the boiler is placed, is also shown in Fig. 1. C is a superheater, constructed according to Letters Patent of the United States granted to me October 1, 1867. This superheater, as well as the boiler A, I prefer to place in an arch or reverberatory furnace. D is a double-bottomed evaporating-pan of the ordinary construction, generally used in

the manufacture of sugar. E is a pipe which connects the boiler to the superheater and conducts the steam from one to the other. F is a pipe which connects the superheater to the steam-chamber, formed in the double bottom of the evaporating-pan D, and conducts superheated steam from the said superheater to the said steam-chamber. This steam-chamber may also be provided with a faucet to draw off any water which may be formed by the condensation of the steam in said chamber when the fires are allowed to go down, or at any other time.

This combination of parts enables me to more perfectly regulate the heat applied to the evaporating-pan, as the heat thus supplied is always under control, being regulated by the supply of superheated steam to the said pan. As the superheated steam is drier than ordinary steam this regulation of temperature is not liable to be interfered with by rapid condensation of the steam in this chamber. I am also enabled to regulate the temperature more evenly upon different parts of the pan, for the reason that the superheated steam, being more rarefied than ordinary steam, it passes more readily to all parts of the chamber, and also for the reason that it is not liable, like ordinary steam, to become condensed, and thereby made inert for heating purposes before it has time to pass to all parts of the steam-chamber in the bottom of the evaporating-pan. The operation of this combination is also more economical, enabling me to accomplish a larger amount of work with the same amount of fuel.

For the manufacture of salt I make my evaporating-pan very large in proportion to the amount of heating-surface of the steam-generator and superheater, so as to run the evaporating-pan at a heat below the boiling-point, which, saturated in salt-brine, is 226° Fahrenheit. I propose to so regulate the heat to the evaporating-pan as not to raise the temperature of the brine higher than 200°, at which temperature the salt crystallizes in beautiful thin scales, which form is preferred by dealers and consumers.

In the manufacture of salt by the ordinary modes of evaporation by artificial heat the salt crystallizes upon the top of the brine and remains there for a considerable time if not removed, in which position it very seriously interferes with the process of evaporation by preventing the steam from escaping from the surface of

the brine, and to partially avoid this difficulty frequent stirring of the brine to precipitate this salt rising on the top of the brine has been resorted to. The steam discharged from the brine is also very dense and heavy and lingers over the brine, thereby retarding the evaporation.

To obviate these difficulties I provide the combination of parts hereinafter described, by which a current of heated air is made to pass over and in contact with the surface of the brine, which not only carries off the condensed vapor or steam which is formed from it and which hovers over it, but also so agitates the brine as to precipitate the salt which may be crystallized upon its surface, and frees the steam from it and hastens evaporation.

To carry this purpose into effect I provide an evaporating-pan with a cover, G, and, for convenience in raking the salt out of the pan, or attending otherwise to the salt or brine during the operation of boiling, I make this cover in sections *g*, hinged at the middle upon a round rod, H, or support, which extends the whole length of the pan, and is so supported that the cover G may be removed altogether, if desired, either to clean out the evaporating-pan or to dispense with the hot-air current when the weather is warm, or for other purposes. These sections *g* may be made of sheet-iron or other suitable material, and the joints lapped so as to make them nearly tight. Each of these sections may also be covered with some non-conducting material to prevent loss of heat. I is a fan-blower, which I employ for the production of a current of air for the purposes above stated. I prefer what is known in the market as a McKenzie blower, as being the most efficient and serviceable for this purpose. This blower I attach to a tube or flue, J, which extends through the furnace B to heat the air from the blower, and which is provided with conical-shaped diaphragms or partial partitions *k*, which prevent the air from passing directly through the center of this flue from end to end, and drive it in contact with its sides, so as to cause it to be more thoroughly heated. A pipe, K, extends from this flue into one end of the air-chamber formed under the cover G of the evaporating-pan, to conduct the current of heated air from the flue J into the space between the cover G and the brine. L is an exit-tube at the other end of the evaporating-pan from which heated air is introduced, and to allow said heated air, and any steam or vapors with which it may be charged, to escape into the surrounding atmosphere.

By this combination of parts I secure the transmission of a current of heated air over the top of the brine and in contact with it, which current so agitates the surface of the brine as to precipitate the salt which may have crystallized on its surface, and removes the steam and other vapors from the surface of the brine, so as to allow and facilitate further evaporation.

Though I have herein described the forms of construction which I prefer for the different parts of the apparatus, it is still obvious that other forms of construction may be adapted without changing the essential character of the invention—as, for example, a different form of boiler may be used, or the air may be heated in a differently-formed receiver or in a separate furnace.

It has been found, in practice, that a double-bottomed salt-pan placed above the surface of the earth, even if at some distance from it when used, will, by its heat, draw the moisture from the earth under it and even to some distance from it, which moisture must evidently have a cooling effect upon the pan. It is obvious that the heat thus lost might, if economized, be advantageously used in the evaporation of the brine, and to effect this result I construct a horizontal partition or arch, M, between the bottom of the evaporating-pan and the surface of the earth, so as to leave an air-space or chamber between the partition and the pan, and also an air-space or chamber between the said partition or arch and the surface of the ground. I prefer to make this partition M of brick laid in mortar or cement, and covered above and below with a coating of plaster of Paris or suitable non-conducting material.

I claim as my invention—

1. The combination of a steam-generator, a superheater, and a double-bottomed evaporating-pan, substantially as hereinbefore set forth.
2. The combination of a blower or equivalent means of producing a current of air, an air-heating chamber or flue, and a covered evaporating-pan, substantially as hereinbefore set forth.
3. The combination, with a double-bottomed evaporating-pan, of an arch or horizontal partition so arranged below it as to leave air-space between said partition and the said pan, and also air-space below said partition, substantially as hereinbefore set forth.

LEFFERT R. CORNELL.

Witnesses:

THOS. P. HOW,
WM. DOMELLY.