(No Model.)

J. FOSTER.

VACUUM PAN.

No. 594,783. Patented Nov. 30, 1897.

FIG. 1.

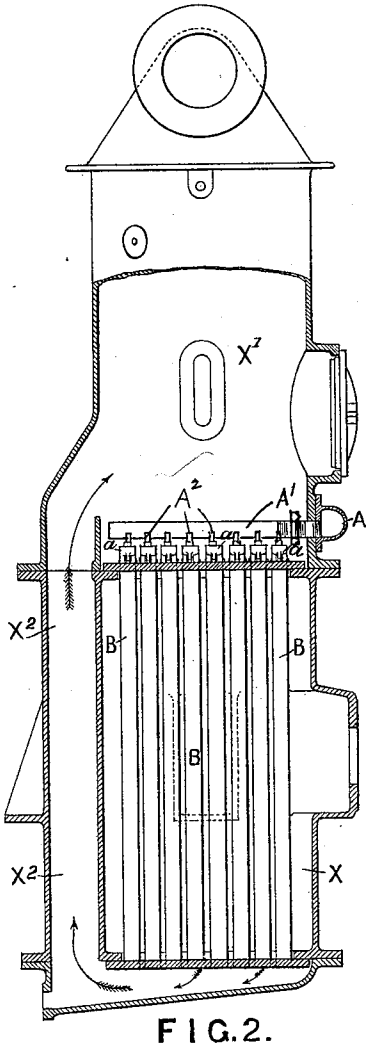


FIG. 2.

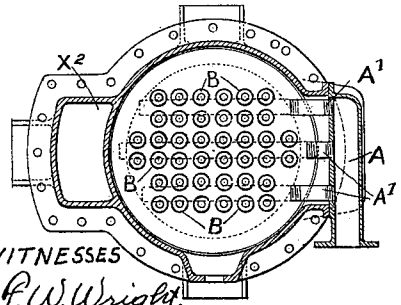


FIG. 3.

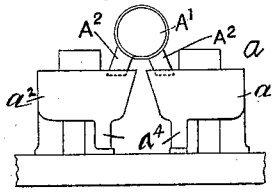


FIG. 4.

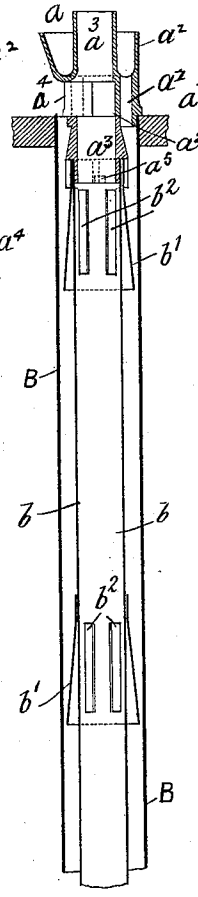


FIG. 5.

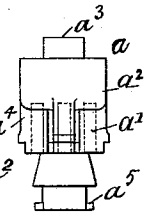
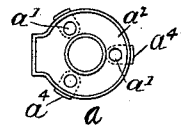


FIG. 6.



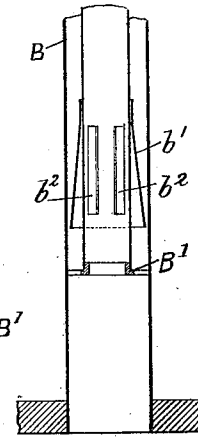
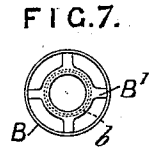


FIG. 7.



WITNESSES

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UNITED STATES PATENT OFFICE.

JAMES FOSTER, OF GLASGOW, SCOTLAND.

VACUUM-PAN.

SPECIFICATION forming part of Letters Patent No. 594,783, dated November 30, 1897.

Application filed March 2, 1897. Serial No. 625,754. (No model.) Patented in England February 13, 1895, No. 3,118.

To all whom it may concern:

Be it known that I, JAMES FOSTER, a subject of the Queen of Great Britain and Ireland, residing at Glasgow, Scotland, have invented certain new and useful Improvements in Evaporating Apparatus, (for which I have obtained a patent in Great Britain, No. 3,118, bearing date February 13, 1895,) of which the following is a specification.

This invention has reference to improvements in and relating to the film-evaporating tubes of evaporating apparatus, and particularly applicable to multiple-effect apparatus of the vertical class for evaporating sugar-juice and like liquors *in vacuo*.

The improvements essentially comprise improved apparatus for distributing the liquid to be evaporated within the tubes and permitting of the upward escape of vapor; and in order that others skilled in the art to which my invention relates may understand how same may be carried into practice I have hereunto appended an explanatory sheet of drawings, in which—

Figures 1 and 2 represent a sectional elevation and sectional plan view, respectively, of an evaporating apparatus as fitted with my improvements. Fig. 3 is an end elevation showing the arrangement for leading the liquid to be evaporated to two rows of tubes. Fig. 4 is a sectional elevation of a tube, to an enlarged scale, showing my improved fittings applied thereto. Fig. 5 is a detached elevation showing the upper liquid-distributing and vapor-escaping shield at right angles to that shown in Fig. 4. Fig. 6 is a top plan view of Fig. 4, and Fig. 7 is a plan view looking from the under side of Fig. 4.

Referring to the drawings, according to my improvements the liquid to be evaporated is fed from a chest A to horizontal pipes A′, one of which distributes the liquid to two rows of tubes B, this being effected by branches A^2, leading from the pipe A′ to each liquid-distributing and vapor shield *a*, these shields being provided with legs a^4, which fit into the top of each tube B. The shield *a* is formed with an annular trough a^2 at the top to receive the liquid, and has a central tubular neck a^3, the bottom of which is formed with a bayonet-joint a^5 or other simple detachable catch which fits onto a central tube *b*, hereinafter referred to. The liquid passes down from the trough a^2 through the opening *a*′, while the vapor from the tube *b* escapes up through the central opening a^3.

An inner tube *b*, of zinc or other suitable metal, is attached or connected to the bottom of the top shield *a* by the bayonet-catch a^5 in each of the tubes B, and kept central at its lower end by a guide-ring B′, fitting by a central hollow boss within the tube *b*.

A series of tapering shields *b*′ are secured to the central tube *b* at spaced distances apart, so as to redirect the juice from the surface of the central tube *b* to the inner surface of the outer or heating tube B, while any impurities in the liquid will adhere to the surface of the inner tube *b*. Openings b^2 are formed in the inner tube *b*, under each of the conoidal shields *b*′, to permit of the inlet and escape of vapor from the outer tube B into the central tube *b*, from whence it would pass upward and escape through the central outlet a^3 in the top shield *a*. By means of these duplex-arranged tubes B *b* a double evaporating effect takes place at the same time—first, by the vapor in heating-chamber X, surrounding the outer tubes B, and, second, by the vapor from the liquid being evaporated passing through the openings b^2 in and ascending up the inner tube *b*—and the liquid becomes completely evaporated before it reaches the bottom of these tubes, so that upward return circulation is obviated.

In order that the liquid may have a free flow from the top to the bottom of the tubes B, the side channel X^2 is provided, so that the steam or vapor which is taken down by the liquid may escape through or be drawn up by the vacuum through this channel X^2. If this channel was not provided, all the steam or vapor would have to pass to the top vapor-chamber up through the central tube *b*, which would increase the temperature of the liquid and reduce the evaporating capacity of the tubes or apparatus. By this arrangement an equal vacuum is maintained at the top and bottom of the apparatus.

What I claim is—

1. In evaporating apparatus, the combination of outer and inner tubes, with an annular trough for feeding the liquid between the two tubes, the inner tube carrying shields *b*′, extending nearly to the outer tube, so as to

direct the liquid from the outer surface of the central tube onto the inner surface of the outer tube, the said inner tube being also provided with openings below the shields to provide for the escape of vapor, substantially as set forth.

2. In evaporating apparatus, the combination comprising outer and inner tubes, and an annular trough fitted at the upper end of said tubes for receiving and directing the flow of the liquid between the tubes and providing for the escape of vapor, and means for redirecting the liquid onto the inner surface of the outer tube, substantially as set forth.

3. In evaporating apparatus, the combination of two rows of vertical duplex evaporating-tubes, annular troughs fitted at the upper end of the duplex tubes for receiving and directing the flow of liquid, with a horizontal feeding-pipe provided with branches on each side thereof, leading to the said annular troughs, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES FOSTER.

Witnesses:
JOHN SIME,
JAMES B. PAUL.