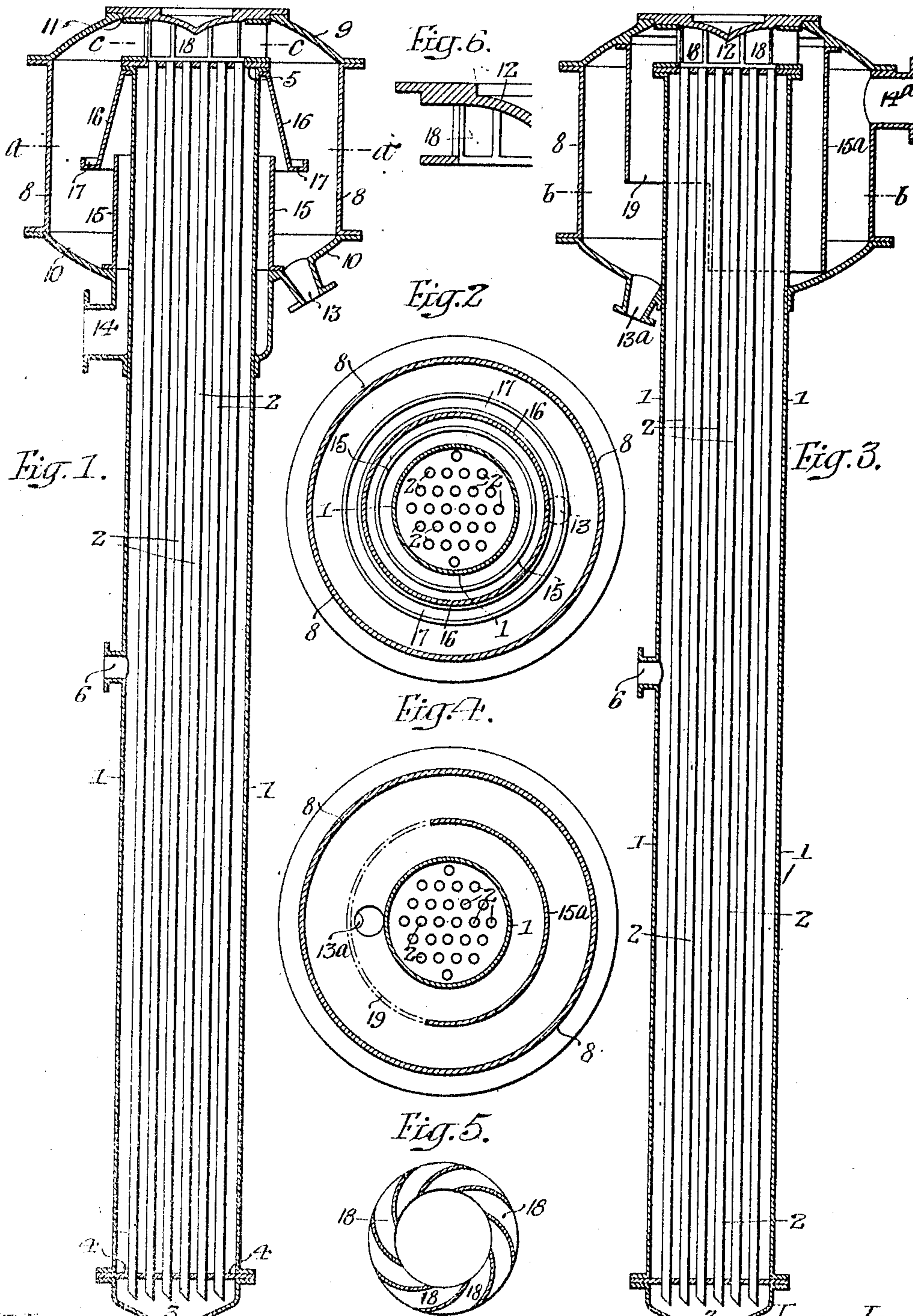


P. KESTNER.
EVAPORATOR.
APPLICATION FILED JUNE 20, 1910.

989,982.

Patented Apr. 18, 1911.



Witnesses—
William H. Pinner.
Chas. A. Burrows

Inventor
Paul Kestner
by His Attorneys
Howson & Howson

UNITED STATES PATENT OFFICE.

PAUL KESTNER, OF LILLE, FRANCE.

EVAPORATOR.

989,982.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Application filed June 20, 1910. Serial No. 567,957.

To all whom it may concern:

Be it known that I, PAUL KESTNER, a citizen of the Republic of France, and a resident of Lille, Department of the Nord, France, have invented certain Improvements in Evaporators, of which the following is a specification.

My invention relates to evaporating apparatus, and the object of my invention is to provide apparatus of the long vertical tube or "climbing film" type with means at the upper end of the shell carrying the tubes and into which such tubes discharge for effectually separating vapor or steam from the liquid under treatment.

An important feature of my improvement consists in disposing the separator so as to surround the upper portion of the tubes instead of having the same entirely above the tube sheet. Such arrangement presents valuable advantages, since I am enabled to reduce the total height of the apparatus on the one hand, and on the other hand render access to the tubes easier. These and other features of my invention, more fully set forth hereinafter, are substantially shown in the accompanying drawings, in which:

Figure 1, is a sectional elevation of one form of apparatus embodying my invention; Fig. 2, is a sectional plan view on the line *a-a*, Fig. 1; Fig. 3, is a view similar to Fig. 1, of another form of apparatus embodying my invention; Fig. 4, is a sectional plan view on the line *b-b*, Fig. 3; Fig. 5, is a sectional plan view on the line *c-c*, Fig. 1, and Fig. 6, is a sectional view illustrating a modified detail of my invention.

In Figs. 1 and 2 of the drawings, 1 represents a shell or casing inclosing a series of long tubes 2, which extend from an inlet 3 at the bottom of the structure through a lower tube plate 4, and may be suitably secured in an upper tube plate 5. Steam or other heating medium is admitted to the shell or casing 1 at the point 6 and the water of condensation may be drawn off in any suitable manner. 7 represents a separating chamber disposed at the upper part of the apparatus and which may be formed by a shell or wall 8 having top and bottom plates 9 and 10; and the top plate may have a central aperture 11 directly over the tubes, which may be normally closed by a cover plate 12. In some instances the structure

forming the separating chamber may be an integral element. The lower or bottom plate 10 is suitably secured to the shell 1, and carries an outlet 13 for the concentrated liquid and an outlet 14 for the vapor separated from said liquid. Disposed within the separating chamber and surrounding the shell 1, is a wall 15 which may rise to a point approximately midway between the upper and lower plates of the separating chamber, and depending from the top of the shell 1 is a wall 16 which may be inclined and have its lower edge turned to form a gutter 17; such wall 16 extending over the annular wall 15. Between the upper tube sheet and the top of the separating chamber, I may provide a series of tangential openings 18 through which the liquid coming from the tubes is discharged and given a centrifugal or whirling motion within the separating chamber, effecting the breaking up of the liquid and liberation of the vapor, the liquid falling to the bottom of the separating chamber where it is discharged through the opening 13, while the vapor passes under the overhanging inclined wall 16 and enters the space between the wall 15 and the shell 1, finally discharging through the outlet 14. The passages for the tangential discharge of liquid passing from the tubes may be formed in a suitable casting disposed between the cover plate 12 and the upper tube sheet, and in some instances such casting may be secured to the cover plate, and in others formed integral therewith so as to be bodily removable with said cover plate if desired; such removal of the cover plate being necessary when the tubes are to be examined.

In the structure shown in Figs. 3 and 4, the vapor outlet 14^a is disposed in the upper portion of the separator chamber, and a wall 15^a within the chamber, which may be annular and is cut away at its lower side at a point opposite the vapor outlet, as at 19, may be provided. In this form of the structure, the liquid discharged through the tangential openings strikes the inner surface of this annular wall and falls to the bottom of the separating chamber, being discharged through a suitable liquid aperture 13^a, while the vapor separated therefrom rises from said liquid and passes from the opening 19 in said wall to the discharge outlet 14^a of the separating chamber. The

liquid outlet 13^a is shown as disposed below the cutaway portion of the wall 15^a, and while this is preferred, such arrangement is not essential to the proper operation of the apparatus.

In the structure shown in Figs. 1 and 2, the wall 15 forms a chamber or passage surrounding the upper portion of the tube sheet into which the vapor must pass before it is discharged. Entrained liquid is prevented from entering with the vapor by reason of the overhanging portion of the inclined wall 16. The gutter carried by this inclined wall may be perforated for the escape of the liquid caught thereby, if desired, and in some instances such gutter may be omitted.

I claim:

1. In an evaporator of the climbing film type provided with vertical tubes, a casing inclosing said tubes to which a heating medium is introduced, a vapor casing encircling the top of the evaporator and having a liquid exit at its lowest point, a vapor exit conduit opening into the chamber casing at a higher point, and a depending wall within the vapor casing encircling the tube casing and interposed in the pathway between the upper ends of said tubes and the entrance to said vapor conduit.

2. In an evaporator of the climbing film type, a steam heated tube, a vapor casing encircling the top of said tube, means for tangentially discharging the liquid and vapor emerging from said tube into the casing, liquid exit means at the lowermost point of said casing, vapor exit means communicating with a higher point, and a depending wall within the vapor casing interposed in

the pathway between said tangential discharge and said vapor exit means.

3. In an evaporator of the climbing film type provided with vertical heated tubes, a vapor separating head comprising a casing encircling the top of the apparatus, said casing being provided with vapor and liquid discharge outlets, conduit forming means within the casing comprising an annular wall forming a passage leading to the vapor outlet and having an inlet at a higher level than the level of the liquid outlet, and a vertically depending shield surrounding the tube casing and protecting such inlet.

4. In an evaporator of the climbing film type provided with vertical heated tubes, a heating shell containing said tubes, a vapor separating head comprising a casing encircling the top of the apparatus, said casing being provided with vapor and liquid discharge outlets, a supplemental shell surrounding the heating shell and forming a conduit within the casing leading to the vapor outlet and having an inlet intermediate the top and bottom of the separating chamber, and a vertically depending shield surrounding said heating shell below the tube outlets and protecting such inlet, said vapor outlet being below the liquid outlet.

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

PAUL KESTNER.

Witnesses:

HENRI CHARRIER,
LÉON PECKEL.