June 1, 1926. 1,586,814

A. P. LEONARD

CALANDRIA FOR EVAPORATORS OF SUGAR MILLS

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Fig. 1.

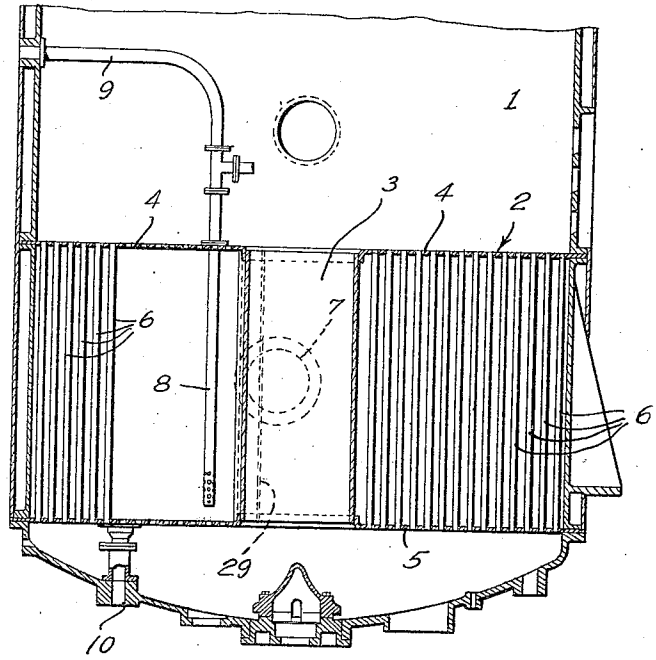
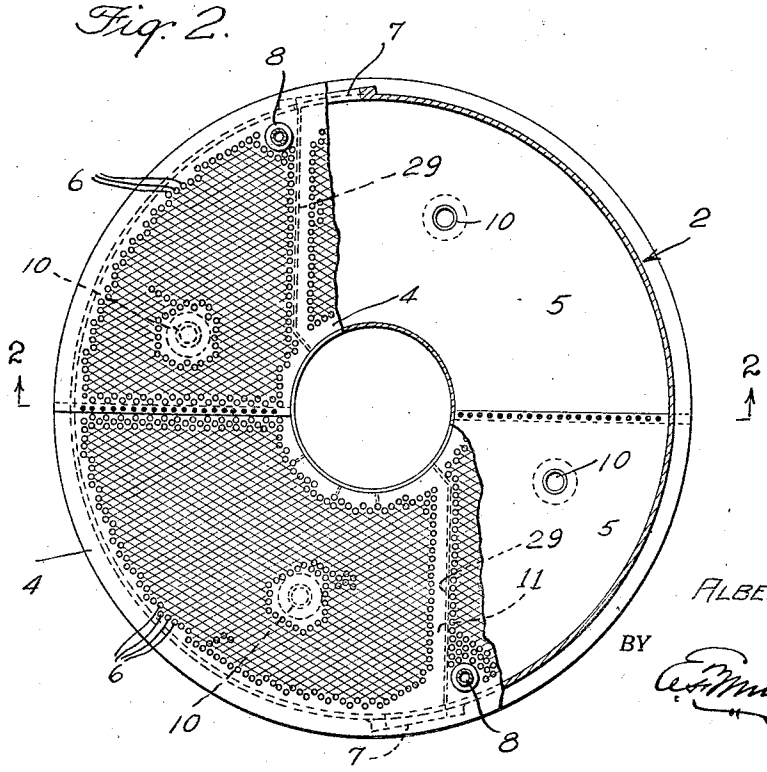



Fig. 2.




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Fig. 3

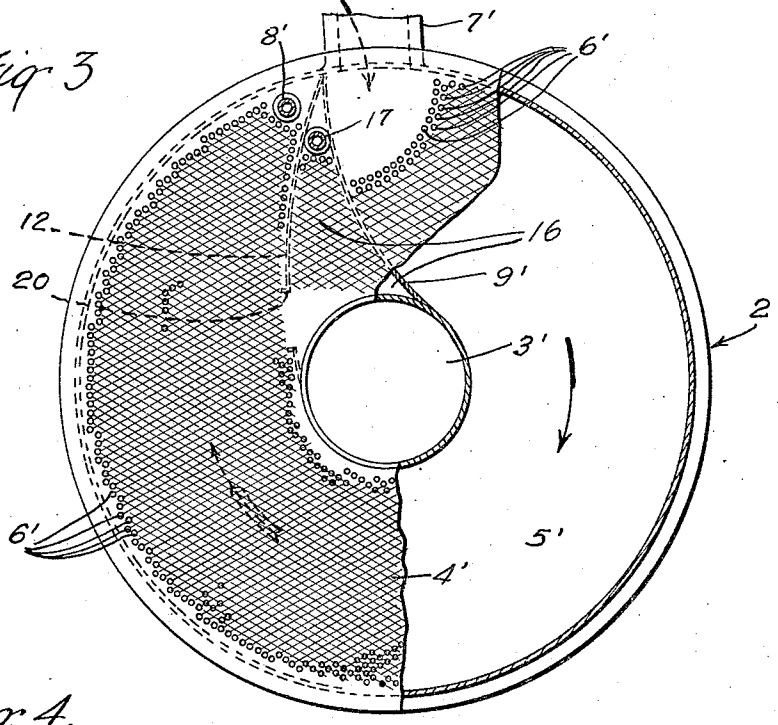
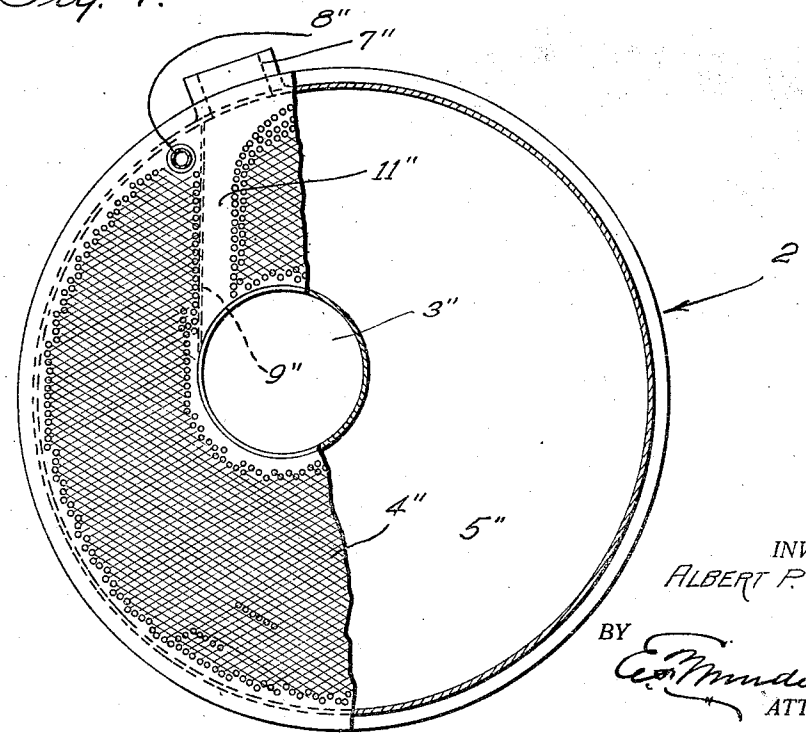



Fig. 4.




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Patented June 1, 1926. 1,586,814

# UNITED STATES PATENT OFFICE.

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## CALANDRIA FOR EVAPORATORS OF SUGAR MILLS.

Application filed March 17, 1924. Serial No. 699,792.

Among the principal objects which the present invention has in view are: to obtain a high velocity of the heating medium when passing over the surface of the heating tubes; to maintain the speed of the heating medium in passing through the calandria; to remove the waters of condensation with the least possible interference with the flow of the heating medium; and to facilitate the removal of the non-condensible gases.

With the above objects in view, the invention consists principally in providing steam passages within the calandria extending from a steam inlet to an outlet, said passage being constructed to diminish gradually from the inlet to the outlet, avoiding pockets or eddy-producing obstructions in the path of the heating medium or steam; and more particularly in arranging the heating tubes of the calandria in such manner as to obtain the maximum area for the introduction of the steam therebetween at the receiving end of the passage or passages referred to.

*Drawings.*

Figure 1 is a vertical section through an evaporator with a calandria positioned therein;

Figure 2, a horizontal section therethrough above the calandria;

Figure 3, a similar section of a modified form; and

Figure 4, a similar section of a further modified form.

The preferred embodiment of the invention is illustrated in Figures 1 and 2, in which an evaporator tank 1 is equipped with a calandria 2 provided with the usual central downtake passage 3, top plate 4, and bottom plate 5 between which extend the usual circulation pipes 6. Steam inlets 7 are provided at opposed points in the calandria. Steam is the preferred heating medium. The non-condensible gases are expelled through outlet pipes 8 leading to the outside by means of conduits 9.

The present invention resides in the particular disposition of the steam inlets and baffles within the calandria whereby steam will be evenly distributed throughout the entire portion of the calandria and have a uniform temperature from its point of entry to its outlet. In accordance with this purpose, I provide baffle plates 29 adjacent each inlet 7 and extending upon a slight angle from each inlet to the downtake 3, as best illustrated in Figure 2. By this construction, using two steam inlets and two baffle plates, the calandria is divided into two chambers of similar dimensions and configurations from which the products of condensation within the calandria are drained through outlets 10 disposed at suitable points.

As is of usual construction in these devices, the interior of the calandria is taken up by the circulation tubes 6 which are disposed in spaced relation to permit of the passage of steam therebetween and occupy the entire space within the calandria with the exception that adjacent each baffle plate 29, the pipes 6 are spaced therefrom to provide a steam passage 11 extending from the steam inlets 7 across the calandria to the walls of the downtake 3. By this construction, it will be seen that when steam is admitted through the intakes 7 it will before entering between the circulation tubes have an unrestricted travel through the passages 11 across the entire calandria, before it begins its passage through the respective chambers therein. This construction provides for a uniform distribution of the steam directly adjacent the inlet.

Each outlet pipe 8 is disposed at the end of its respective chamber farthest removed from the inlet and is disposed in the apex formed by the junction of the outer wall of the calandria with the baffle plate 9. By reason of the location and disposition of the baffle plates, each chamber of the calandria will have its widest area directly adjacent to steam inlets, from which point the cross sectional area of each chamber decreases continuously toward the delivery end and outlet pipe 8. This construction insures a uniform distribution of steam throughout every point of the calandria and by reason of the continuous reduction of the cross sectional area of the chamber maintains a uniform pressure and density of the steam.

With calandrias hitherto in use, in this particular art, it has been found that the steam employed as a heating medium is most effective directly adjacent the inlet points, and that the circulation pipes located adjacent the downtake pipe of the calandria receive little, if any, of the steam passing therethrough. By the provision of my baffle plates and the arrangement of the circulation pipes so as to provide the passageways 11 extending across the calandria the steam

is permitted before entering the chambers, to extend entirely across the calandria and enter between the circulation tubes with a uniform pressure from all points, which pressures will continue throughout the passage of the steam to the outlet conduits 8 and 9.

In Figures 3 and 4 I have illustrated modified forms which the invention may take, in which the details of construction are practically the same as those of the preferred form, with the exception that in the modification shown in Figure 3 the baffle 9′ is arcuately arranged, and only one steam inlet is employed, as at 7′. In this form the chamber within the calandria is uninterrupted and continues from its inlet to the outlet pipe 8′ located in the apex between the outer wall of the calandria and a supplementary baffle 12, arcuately arranged and disposed from one side of the inlet 7′ and the wall of the down take 3′ forming substantially a triangular chamber 16 within the calandria. The chamber 16 is provided at its apex with an outlet pipe 17 and the entry of steam thereto is permitted through an inlet passage 20 located in the baffle 12 directly adjacent its connection with the wall of the downtake 3′. In this form of the invention the circulation tubes 6′ are crowded adjacent the intake 7′ in arcuate formation to provide a clearance space within the calandria adjacent the inlet so as to permit full volume of steam to enter the calandria in an even distribution.

In the modification shown in Figure 4, the downtake pipe 3″ is eccentrically disposed within the calandria, and only one steam inlet 7″ is provided. A baffle 9″ is arranged across the interior of the calandria in the same manner as that illustrated in the preferred form and the circulation pipes are similarly disposed to provide the passageway 11″. The extreme end of the chamber is provided with an inlet pipe 8″ in the apex formed by the outer wall of the calandria and the baffle 9″. This construction provides for a relatively wide cross sectional area of the chamber directly adjacent the steam inlet, constantly decreasing towards the outlet end, and providing for an even distribution of steam throughout its passage with a constant temperature and density.

While in the form illustrated, I have described certain details entering into the construction, arrangement and operation of the invention, I desire it to be understood that I do not intend these as limitations, but that any changes and modifications may be made therein that will fall within the scope of the invention as claimed.

I claim:—

1. A calandria having a closed heating chamber therein, a downtake extending through said chamber, a steam inlet in the outer wall of said chamber, a baffle extending across said chamber at an angle from said inlet, an outlet for said chamber, a plurality of circulation pipes in said chamber between said inlet and outlet, and a passageway along said baffle and entirely across said chamber formed by disposition of the circulation pipes in spaced relation from said baffle adjacent the inlet.

2. A calandria having a closed heating chamber, a down-take passing therethrough, a steam inlet in the outer wall of said chamber, a baffle extending on an angle across said chamber from one side of said inlet to the wall of said downtake, an outlet for said chamber adjacent said inlet and on the opposite side of said baffle, a plurality of circulation pipes disposed through said chamber between said inlet and outlet and arranged to provide a steam passage entirely across said chamber from the inlet to the wall of the downtake along said baffle.

3. A calandria having a closed heating chamber therein, a downtake passing therethrough, a stem inlet in the outer wall of said chamber, outlets in said chamber, a plurality of circulation pipes through said chamber between said inlet and outlets, and a baffle in said chamber extending from said inlet to the walls of said downtake and between said outlets for forming a plurality of steam passages through said chamber.

4. A calandria having an inner and outer side wall and tube plates disposed in spaced relation, a plurality of heating tubes connecting said tube plates and opening therethrough, said tubes being arranged to provide substantially open passageways each extending from the outer side wall to the inner side wall, said passageways being in open communication with heating medium inlets; a baffle plate forming one side of said passageways for diverting the heating medium into heat transferring passages; and means disposed adjacent the outer side wall of the calandria and at the end of the heating passage furthest removed from the heating medium inlet supplying said passage, for conducting non-condensible gases from said passage.

5. A calandria having an inner and an outer side wall and tube plates disposed in spaced relation, a plurality of heating tubes connecting said tube plates and opening therethrough, said tubes being arranged to provide substantially open passageways each extending from the outer side wall to the inner side wall, said passageways being in open communication with heating medium inlets; a plurality of baffle plates each forming one side of said passageways for diverting the heating medium into vapor conducting passages; and a plurality of means each disposed adjacent the outer side wall of the calandria and at the end of each heating

passage furthest removed from the heating medium inlet supplying said passage, said means providing an outlet duct for non-condensible gases pocketed there by the steam in said passage.

6. A calandria having a closed heating chamber therein, a downtake extending through said chamber, a steam inlet in the outer wall of said chamber, a baffle in said chamber at one side of said inlet and extending to the wall of said downtake, an outlet for said chamber, a plurality of circulation pipes in said chamber between said inlet and said outlet, said pipes being arranged to provide an unobstructed passageway along said baffle from said inlet to the wall of said downtake.

7. A calandria having a closed heating chamber therein, a downtake extending through said chamber, a steam inlet in the wall of said chamber, a baffle in said chamber at one side of said inlet and extending to the wall of said downtake, an outlet for said chamber, and a plurality of circulation pipes in said chamber between said inlet and outlet, said pipes being arranged to provide an unobstructed passageway adjacent to said inlet and baffle.

8. A calandria having a closed heating chamber therein, a downtake extending through said chamber, a steam inlet in the wall of said chamber, a baffle in said chamber forming a steam passage leading from said inlet, an outlet for said passage at the end thereof, and a plurality of circulation pipes in said chamber between said inlet and outlet, said pipes being arranged to provide an unobstructed passageway from said inlet entirely across said passage.

9. A calandria having a closed heating chamber therein, a downtake extending through said chamber, a steam inlet in the wall of said chamber, a baffle in said chamber at one side of said inlet, extending to the wall of said downtake and forming a steam passage leading from said inlet, an outlet for said passage at the end thereof opposite said inlet, and a plurality of circulation pipes in said chamber between said inlet and outlet, said pipes being arranged to provide an unobstructed passageway from said inlet.

10. A calandria having a closed heating chamber therein, a downtake extending through said chamber, a steam inlet in the wall of said chamber, a baffle in said chamber forming a steam passage leading from said inlet, an outlet for said passage at the end thereof opposite said inlet, and a plurality of circulation pipes in said chamber between said inlet and outlet, said pipes being arranged to provide an unobstructed passageway from said inlet along said baffle.

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