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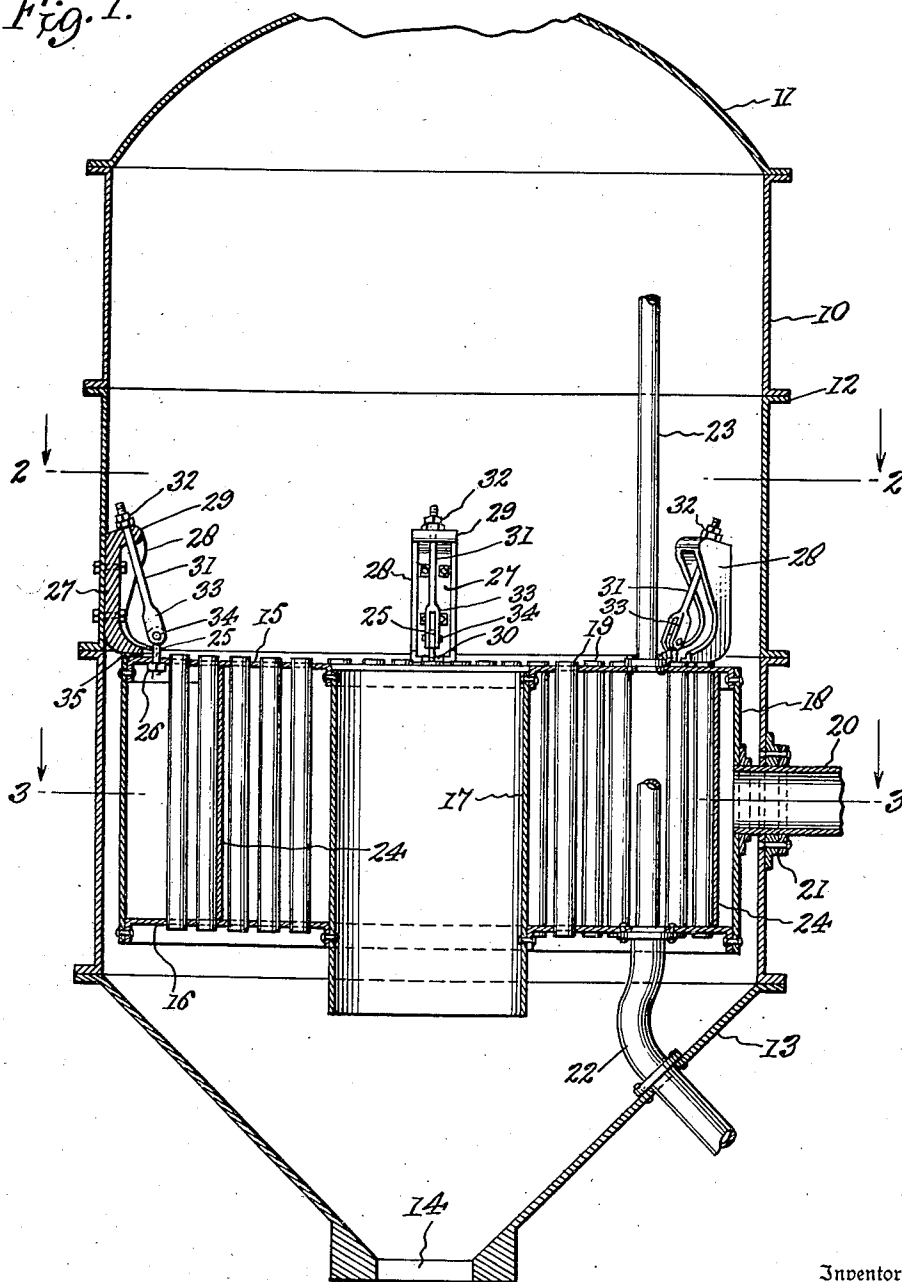
2,065,147

FLOATING CALANDRIA

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Fig. 1.



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Fig. 2.

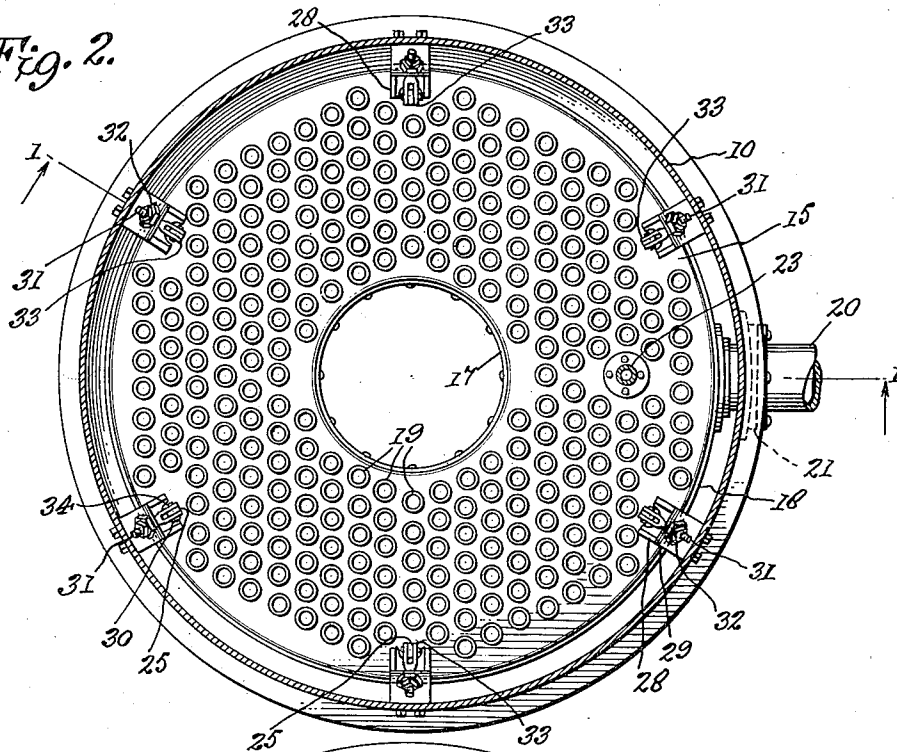
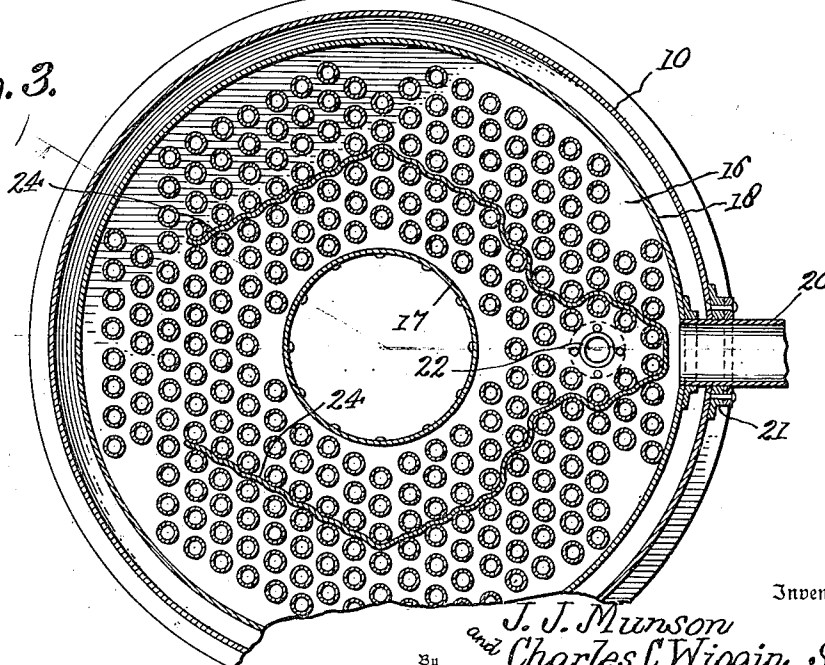


Fig. 3.



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UNITED STATES PATENT OFFICE

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FLOATING CALANDRIA

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11 Claims. (Cl. 257—219)

The present invention relates to improvements in a floating calandria such as may be used in a vacuum pan in sugar refining and has for an object to do away with the use of expansion joints at the steam inlet.

Another object is to direct the thrust caused by expansion of the calandria when steam is first admitted against a fixed steam connection and to permit sliding movement of the calandria on bearing surfaces within the pan.

A further object is to provide a top suspension which holds down the calandria against the buoying effect of the boil mass in the pan.

Another object is to provide a suspension in which the calandria is free to move in all directions except against the steam feed pipe.

In the prior art it has been customary in a device of this kind to attach the calandria to the walls of the vacuum pan throughout its circumference and great difficulty has been experienced because of the expansion and contraction with respect to the pan when steam is admitted. Another difficulty that has been very pronounced is the tendency of the calandria to rise to the top of the pan under the buoying effect of the rather dense boil mass which is being heated and concentrated. The result of this tendency to rise has been to loosen the joints of the calandria at its points of attachment eventually resulting in impairment of the efficiency of the concentrating unit and great loss of sugar liquor. As a result of the various movements of the calandria under the forces of expansion and buoyancy it was necessary to introduce the steam through an expansion joint. The expansion joint required packing and was generally productive of trouble in that it always permitted a certain amount of leakage and was a weak point in the system.

The present invention as illustrated in the embodiment here disclosed will be seen to provide means for overcoming each of these defects.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views,

Figure 1 is a central vertical section taken on the line 1—1 of Figure 2 through a vacuum pan with the improved floating calandria installed.

Figure 2 is a section taken on the line 2—2 of Figure 1, and

Figure 3 is a section taken on the line 3—3 of Figure 1.

Figure 1 shows a vacuum pan 10 of conventional type having the dome 11 which communicates with another unit in a multiple effect concentrator or the like. The pan 10 is cylindrical throughout its body and is made up of a number of circular sections which are bolted or otherwise secured together by means of end flanges 12. Below the cylindrical body a tapered section 13 is attached which section terminates in the restricted mouth 14 from which liquid may be drawn off. The lowermost section of the pan 10 holds the calandria. As will be seen from an inspection of the drawings the calandria consists in a top head 15 and a bottom head 16 both of which are provided with central openings. At these central openings the heads are attached to downtake tube 17 which is flush with the top head 15 but extends below the lower head 16 down into the tapered section 13 of the vacuum pan 10. At their outer edges the heads are attached to the short cylindrical shell 18. This forms in effect a drum having a central opening extending from top to bottom. Also between the heads are placed a plurality of tubes 19 which are open from top to bottom providing passages entirely through the drum for circulation of the liquid in the pan. A steam inlet 20 passes through the shell 18 and communicates with the space inside the drum and around the tubes 19. The steam inlet 20 is made fast to the wall of the pan 10 by means of a series of washer plates 21 which are bolted or riveted to the wall of the pan. The drum is provided with a drain 22 for condensate accumulating therein. The drain is fixed to the lower head 16 and also to the wall of the tapered section 13 of the pan. The drain is preferably of a resilient material so that it may follow movement of the calandria. A steam vent 23 is connected to the upper head 15 for the purpose of removing uncondensed steam and gases which may be in the calandria when the steam is admitted. This vent communicates with any suitable flue to remove these gases from the pan. As will be seen in Figure 3 a baffle plate 24 is provided around the inside of the drum to insure even circulation of the steam admitted through the inlet 20. It will be noted that the exhaust 22 and gas vent 23 are placed directly in front of the steam inlet 20 and by means of this baffle 24 steam entering through the inlet is forced to travel to the opposite side of the drum and back before it can escape. This insures that the greatest heating

effect will be obtained from the steam and also assists in securing equal expansion when steam is first admitted. For the purpose of suspending the calandria within the pan the upper head 15 is provided at spaced points about its circumference with a plurality of eye bolts 25 secured in the top head by means of the nuts 26. At corresponding points around the inside of the center section of the pan 10 is placed a like number of brackets each formed of a base plate 27, spaced side webs 28, a top plate 29 and a bottom bearing plate 30. The top plate 29 serves to hold a hanger bolt 31 which is provided at its top with an adjusting nut 32 and at its lower end with the fork 33. The fork 33 is placed over the head of the eye bolt 25 and a pin 34 passed through the eye of said bolt. The bearing plate 30 at the lower end of the bracket is cut away to pass around the eye bolt 25 when the calandria is drawn up into position. The hanger bolt and suspension permits movement of the calandria in any direction and when drawn up against the bearing plates 30 a certain amount of wear occurs in the course of the movement. To overcome the effects of the wear a strip 35 of copper or other soft material is interposed between the top head and the bracket. This strip 35 serves to take up any wear which may occur. It is advisable to make the brackets and bolts and all connections of the calandria of non-corrosive material as in the presence of the liquid at an elevated temperature corrosion of some metals occurs very rapidly.

As the calandria is anchored fast by the steam inlet 20 at one point in the vacuum pan any expansion and consequent movement must take place against this point. The yieldable nature of the suspension employed here permits this movement to take place freely in any other direction and with a minimum of strain on the fastening of the steam inlet. Also when the liquid is placed in the concentrator the hollow calandria will have a strong tendency to rise but the downwardly directed surfaces of the bearing plates 30 afford the ideal resistance to this type of movement. It will be observed by reference to Figure 1 that the bearing plates 30 extend over the top edge of the shell 18 as well as part way onto the top head 15. It, therefore, exerts pressure directly on the shell 18 in some measure and the stress is not carried entirely through the joint between the top head and the plate 18.

It is of great importance to note that the expansion away from the anchored steam inlet 20 is wholly limited to the expansion of the large inlet pipe while the calandria itself will expand in every direction proportionately at the same rate so that compensation will be required only for the expansion away from the anchor point. In other words the movement of the calandria caused by expansion must take place away from the fixed steam inlet 20. The pressure tending to cause the calandria to move on its mounting is exerted at the point of attachment to the inlet 20 but as movement is relatively free the stress is not great enough to damage the joint with the inlet.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

What is claimed is:

1. In a heating pan, a calandria having a steam inlet pipe fixed to the side of the pan, a plurality of spaced brackets fixed on the inner wall of the pan, and means for holding the calandria to said brackets permitting movement under the force of expansion.

2. In combination with a calandria and a heating pan, means for suspending the calandria in the pan, and means for engagement with the top of the calandria for holding against the tendency to rise in the liquid being heated.

3. In a steam calandria for use in a heating pan, a single fixed connection between said calandria and pan consisting in the steam supply pipe, and means for suspending the calandria including brackets fixed to the pan and movable connectors between said brackets and the calandria.

4. Suspension means for use with a calandria in a heating pan having spaced brackets fixed to the pan above the calandria and provided with downwardly directed surfaces for engagement with the top of the calandria to prevent rising under the buoyant effect of liquid in the pan.

5. Suspension means for use with a calandria in a heating pan having spaced brackets fixed to the pan above the calandria and provided with downwardly directed surfaces for engagement with the top of the calandria to prevent rising under the buoyant effect of liquid in the pan, and having means for movably suspending the calandria from said brackets.

6. In suspension means for a calandria, in a heating pan, an eye bolt fixed to the top of the calandria, a bracket fixed to the side of the pan above the calandria and having a bearing plate for engagement with the top thereof, and a hanger bolt fastened at its upper end to said bracket and at its lower end pivotally secured to the calandria through the eye bolt whereby movement of the calandria against the bearing plate is permitted to compensate for expansion.

7. A suspension means for use with a calandria in a heating pan having, a fixed connection between the calandria and pan at one point, spaced brackets fixed to the pan above the calandria with downwardly directed shoulders adapted to engage the top of the calandria to prevent rising under the buoying effect of liquid in the pan, and means for movably suspending the calandria from said brackets.

8. A floating connection for a calandria in a heating pan comprising a steam inlet fixed to the calandria and to the pan, a plurality of circumferentially spaced brackets fixed in the pan above the calandria and having at the lower ends thereof downwardly directed bearing plates, and a corresponding plurality of hanger bolts secured to the brackets and movably secured to the calandria.

9. In a device of the character described, a fixed attachment between calandria and pan at one point, a plurality of spaced brackets in the pan above the calandria provided with downwardly directed bearing plates, movable suspending means between said bracket and the calandria for holding the calandria against said bearing plates, and soft metal inserts between said calandria and said bearing plates to take up wear incident to relative movement thereof.

10. In a heating pan, a calandria having a steam inlet pipe fixed to the side of the pan, and a plurality of movable connectors each secured at one end to the pan and at the opposite end to

the calandria, whereby the calandria is maintained in the pan and permitted to move under the force of expansion.

5 11. In a heating pan, a plurality of circumferentially spaced rods secured to the inside of the pan, a calandria in the pan and having a steam inlet pipe, and means for movably securing

the calandria to the ends of said spaced rods, whereby a floating suspension is obtained for the calandria to permit movement under the force of expansion.

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