No. 881,990. PATENTED MAR. 17, 1908.

E. ZAREMBA.

EVAPORATOR.

APPLICATION FILED FEB. 12, 1907.

Fig. 1

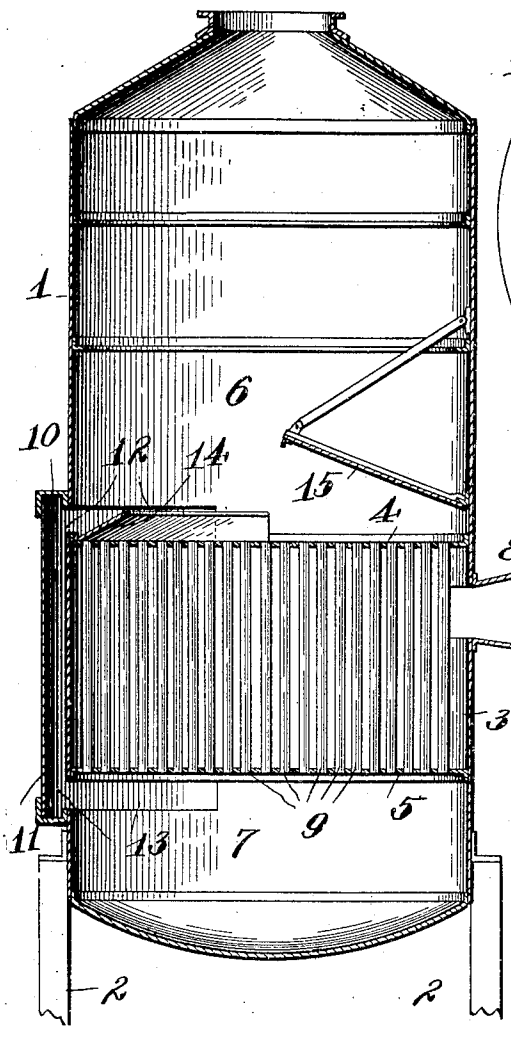


Fig. 2

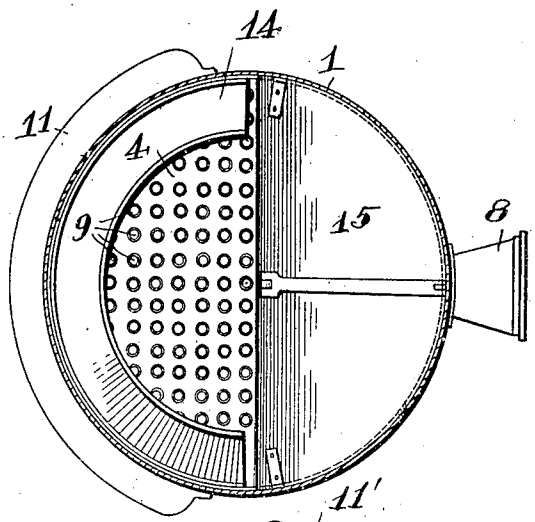
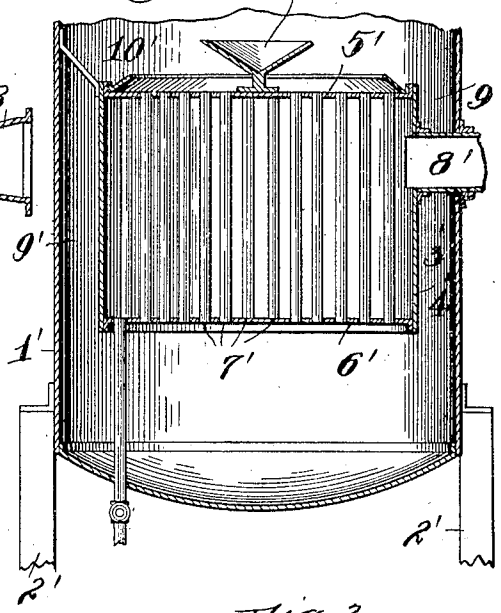


Fig. 3



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EVAPORATOR.

No. 881,990. Specification of Letters Patent. Patented March 17, 1908.

Application filed February 12, 1907. Serial No. 357,079.

To all whom it may concern:

Be it known that I, EDWARD ZAREMBA, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Evaporators, of which the following is a specification.

This invention relates to evaporators and relates particularly to evaporators of the type comprising a suitable shell or casing, a steam drum within said casing, upright tubes which extend through said steam drum and connect the interior of the evaporator above and below said steam drum and a passageway for the downward circulation of the liquor being treated from the space above said steam drum to the space below the same. Said tubes are ordinarily distributed uniformly over the entire area of the steam drum.

In operation, the course of the liquor undergoing treatment is upwardly through the tubes which extend through the steam drum and downwardly through the passageway connecting the interior of the evaporator above and below said steam drum.

It is found in practice, that the liquor passing upwardly through the tubes of the evaporator is discharged therefrom with such great velocity that the jets or streams from the tubes adjacent to the open upper end of the downward passage obstruct said opening and prevent to a very large extent the liquor above the steam drum from entering said passageway, thus materially impairing the circulation of the liquor within the evaporator and correspondingly decreasing the efficiency of said evaporator.

The primary object of the invention is to overcome this objectionable feature, permitting the liquor to circulate freely within the evaporator and securing the highest possible efficiency.

I attain the object of my invention by providing means to maintain the open upper end of the downward passageway free and unobstructed, thus permitting the liquor to enter the same freely. Preferably, also, I combine said means with means for creating a current of liquor above the steam drum in the direction of the opening into the downward passage, thereby increasing instead of retarding the circulation of the liquor and correspondingly increasing the capacity or efficiency of the evaporator.

Specifically, my improvements consist of a shield which extends over the tubes located adjacent to the opening into the downward passage, said shield being preferably inclined upwardly away from said opening. Said shield is preferably used in connection with a deflector above the tubes of the evaporator adapted to direct the current of liquor discharged from said tubes towards the opening to said downward passage.

The invention also consists of the various other features, combinations of features and details of construction hereinafter described and claimed.

In the accompanying drawings, in which my improvements are fully illustrated,— Figure 1 is a vertical sectional view of an evaporator embodying my invention. Fig. 2 is a plan section thereof on line 2—2 of Fig. 1; and Fig. 3 is a partial vertical sectional view of a modified form of evaporator of this general type showing the adaptation of my improvements thereto.

Referring now particularly to Figs. 1 and 2 of the drawings, 1 designates the shell of the evaporator, consisting, as shown, of a vertically disposed cylinder supported upon posts or pillars 2; 3 the steam drum of the evaporator formed by heads 4 and 5 secured to the shell 1 and which form spaces 6 and 7 above and below said steam drum; 8 the steam admission opening to said steam drum; 9 tubes which extend through said steam drum, the ends of which are secured in the heads 4 and 5 of said steam drum and which are in open communication with the spaces 6 and 7 of the evaporator above and below the steam drum; and 10 a passageway connecting the interior of the evaporator shell 1 above and below the steam drum 3 and through which the liquor is adapted to flow from the upper space 6 into the lower space 7. As shown, the passageway 10 extends substantially half way around the evaporator and is formed by means of an outer shell 11 secured to the exterior of the evaporator shell 1, suitable openings 12 and 13 being formed in the shell 1 which respectively communicate with the spaces 6 and 7 above and below the steam drum 3.

In operation the circulation of the liquor undergoing treatment is upwardly through the tubes 9 into the space 6 above the steam drum 3 and downwardly through the passageway 10 back into the space 7 below the steam drum. As previously stated, it is found in practice that, owing to the volume of vapor generated from the liquor in its pas-

sage through the tubes 9, it is discharged from said tubes into the space 6 with great velocity and that the jets or streams from the tubes 9 adjacent to the opening 12 into the passageway 10 obstruct said opening 12, preventing the contents of the space 6 from passing into the passageway 10, thereby greatly interfering with the circulation of the liquor within the evaporator and correspondingly reducing its capacity or efficiency. To overcome this defect, I secure a shield 14 within the evaporator adjacent to the lower edge of the opening 12, which extends outwardly over the tubes 9 adjacent to said opening. Said shield 14 is of the same length as the opening 12. In the preferable construction shown, also, the shield 14 is inclined upwardly from its point of attachment to the shell 1, so that the jets from the tubes 9 covered thereby will be deflected away from said opening 12. In connection with the shield 14, I also preferably employ a deflector 15 which consists of a sheet of suitable metal secured to the inside of the shell 1 in such position that the liquor projected against the same, either from the shield 14 or from the tubes 9 beneath the same, will be deflected and thrown across the evaporator above the shield 14, so that it will be free to settle and pass into the opening 12 of the passageway 10 without obstruction.

The angle at which the deflector 15 is set will depend largely upon the velocity of the liquor discharged from the tubes 9, which, in turn, will depend upon the length of said tubes and the temperature of the steam admitted to the steam drum. The proper angle at which to set said deflector in a given case is largely a matter of experiment or experience. In the drawings, I have indicated the two extremes, the deflector indicated in full lines corresponding to the maximum inclination where the jets form a relatively low velocity, and the deflector shown in dotted lines corresponding to the inclination where the liquor has a relatively high velocity.

With the construction shown, it is found that an unimpaired circulation will be secured and the highest possible efficiency obtained.

In Fig. 3 of the drawings I have shown a somewhat different form of evaporator of this general type embodying my invention, though of the same general type. Referring to said Fig. 3, 1^1 designates the shell of the evaporator and 2^1 the posts or pillars on which said shell is supported. Supported in the shell 1^1 of the evaporator is a steam drum 3^1. As shown, in said Fig. 3, however, the steam drum 3^1 is of less diameter than the shell 1^1 and comprises a separate cylindrical casing 4^1 secured to the ends of which are heads 5^1 and 6^1. As in the other form of the device, heating tubes 7^1 extend through the steam drum 3^1. Steam is supplied to the steam drum 3^1 through a steam pipe 8^1 connected thereto and which passes outwardly through the shell 1^1 of the evaporator. The steam drum 3^1 is located substantially concentric with the shell 1^1, thus leaving a circular space 9^1 between the shell 1^1 and the steam drum 3^1 on all sides, which forms the passage for the down flow or return of the liquor to the space below the steam drum 3^1.

Secured to the upper end of the steam drum 3^1 is a shield 10^1, which extends inwardly over the outer sets of tubes 7^1 and is preferably upwardly and inwardly inclined and supported above said steam drum is a deflector 11^1, said deflector being made in the form of an inverted cone with its axis substantially concentric with the axis of the steam drum 3^1.

With the described construction, it is obvious that the liquor discharged from the tubes 7^1 will be directed inwardly by the shield 10^1 against the deflector 11^1, which will in turn operate to throw it outwardly beyond the shield 10^1, allowing it to descend freely and without obstruction through the space or passage 9^1 between the steam drum 3^1 and the casing 1^1 of the evaporator.

With the form of device shown in Fig. 3, it is found that good results may be obtained by the use of the deflector 11^1 alone, and that if desired the shield 10^1 may be dispensed with and my invention therefore contemplates this modification.

While I have herein shown two different forms of evaporator embodying my invention, these are merely illustrative and my invention contemplates the application of my improved shield and deflector, either separately or in combination with other well known forms of evaporators of this general type or which will suggest themselves to persons skilled in this art.

I claim:—

1. An evaporator comprising a casing, a steam drum therein, said evaporator being provided with a passageway which connects the interior of said casing above and below said drum, vertical circulating tubes which extend through said drum, comprising tubes the discharge ends of which are located closely adjacent to the opening to the upper end of said passageway, and a shield which extends from the upper head of said drum over a portion of said tubes located adjacent to said admission opening to the upper end of said passageway.

2. An evaporator comprising a casing, a steam drum therein, said evaporator being provided with a passageway which connects the interior of said casing above and below said drum, vertical circulating tubes which extend through said steam drum, comprising tubes the discharge ends of which are located closely adjacent to the opening to the upper

end of said passageway and an upwardly inclined shield which extends from the upper head of said drum over a portion of said tubes located adjacent to said admission opening to the upper end of said passageway.

3. An evaporator comprising a casing, a steam drum therein, said evaporator being provided with a passageway which connects the interior of said casing above and below said drum, vertical circulating tubes which extend through said drum, comprising tubes the discharge ends of which are located closely adjacent to the opening to the upper end of said passageway, a shield which extends from the upper head of said drum over a portion of said tubes located adjacent to said admission opening to the upper end of said passageway, and a deflector located above said steam drum and adapted to direct the current of liquor towards the open upper end of said passageway connecting the interior of the evaporator casing above and below said steam drum.

In testimony, that I claim the foregoing as my invention, I affix my signature in presence of two subscribing witnesses, this 6th day of February, A. D. 1907.

EDW. ZAREMBA.

Witnesses:
K. A. COSTELLO,
E. M. KLATCHER.