

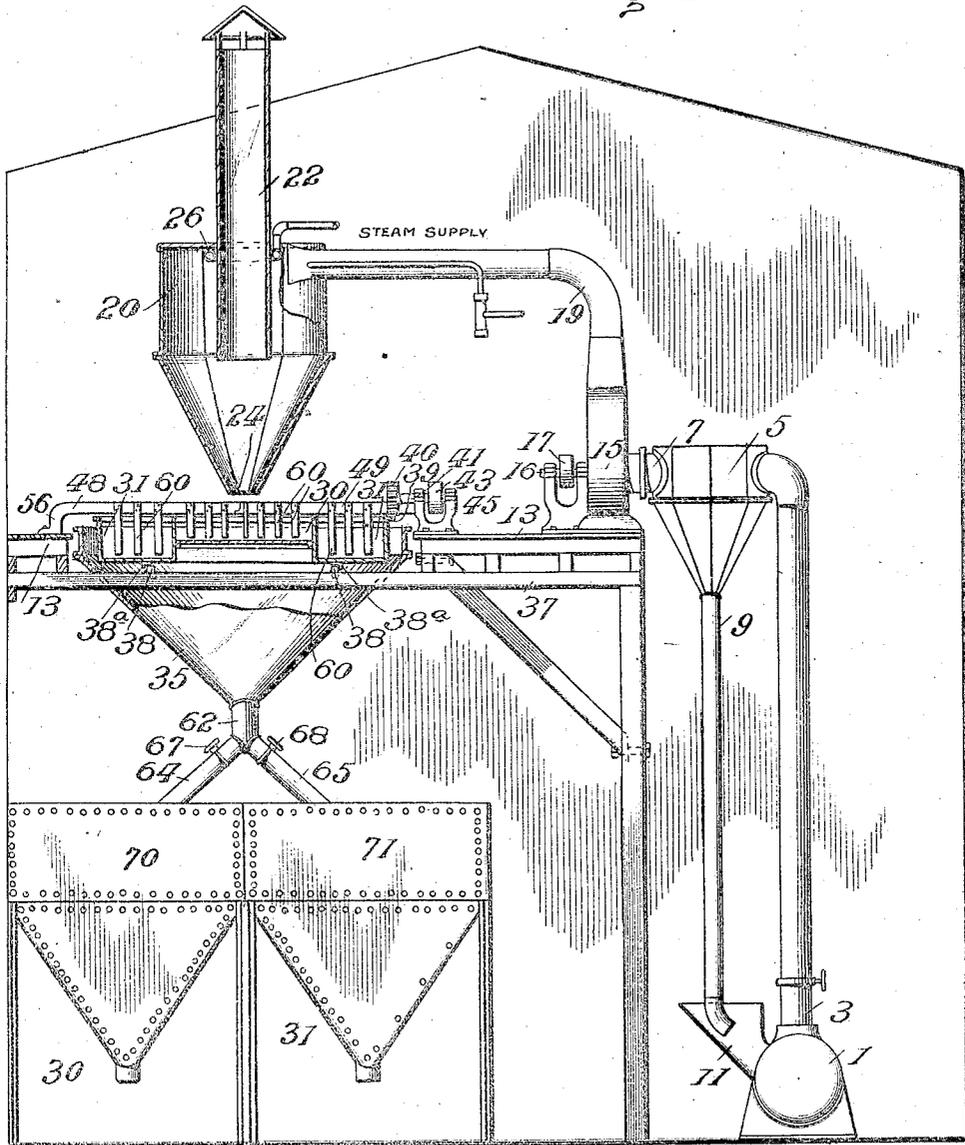
No. 845,189.

PATENTED FEB. 26, 1907.

W. S. OSBORNE.
APPARATUS FOR HYDRATING LIME.
APPLICATION FILED MAR. 2, 1905.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

FIG. 2.

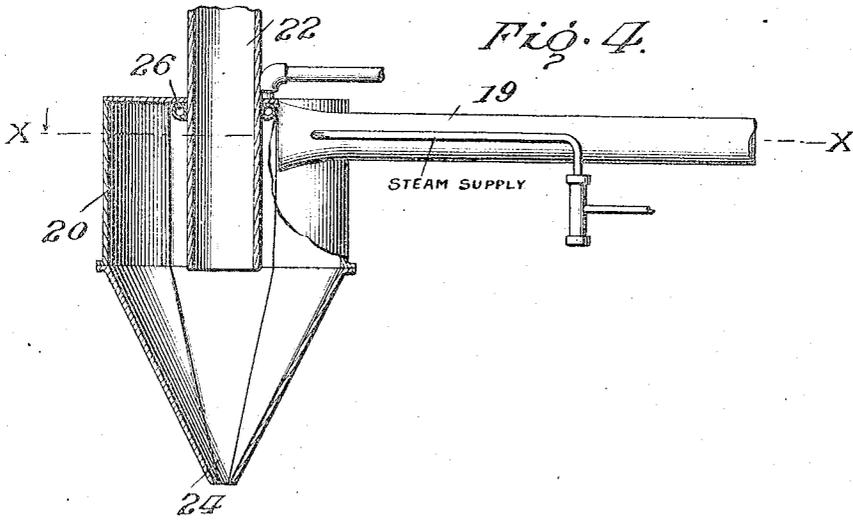
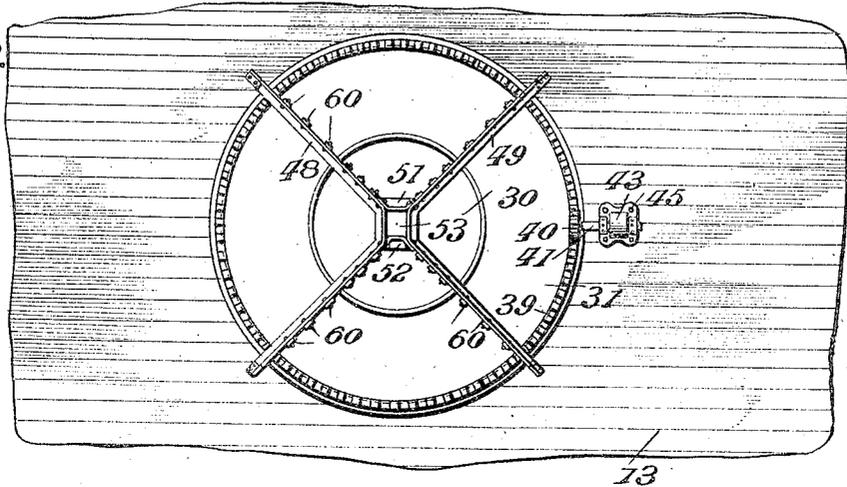


FIG. 4.

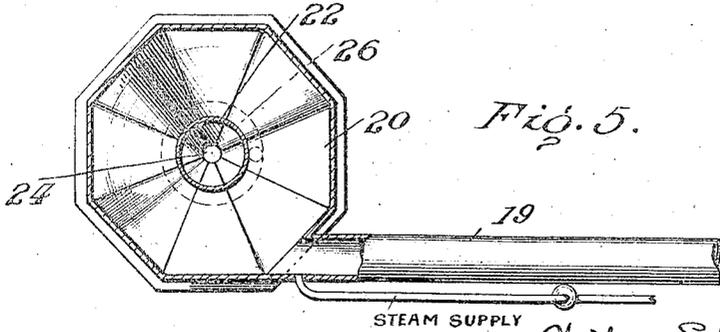


FIG. 5.

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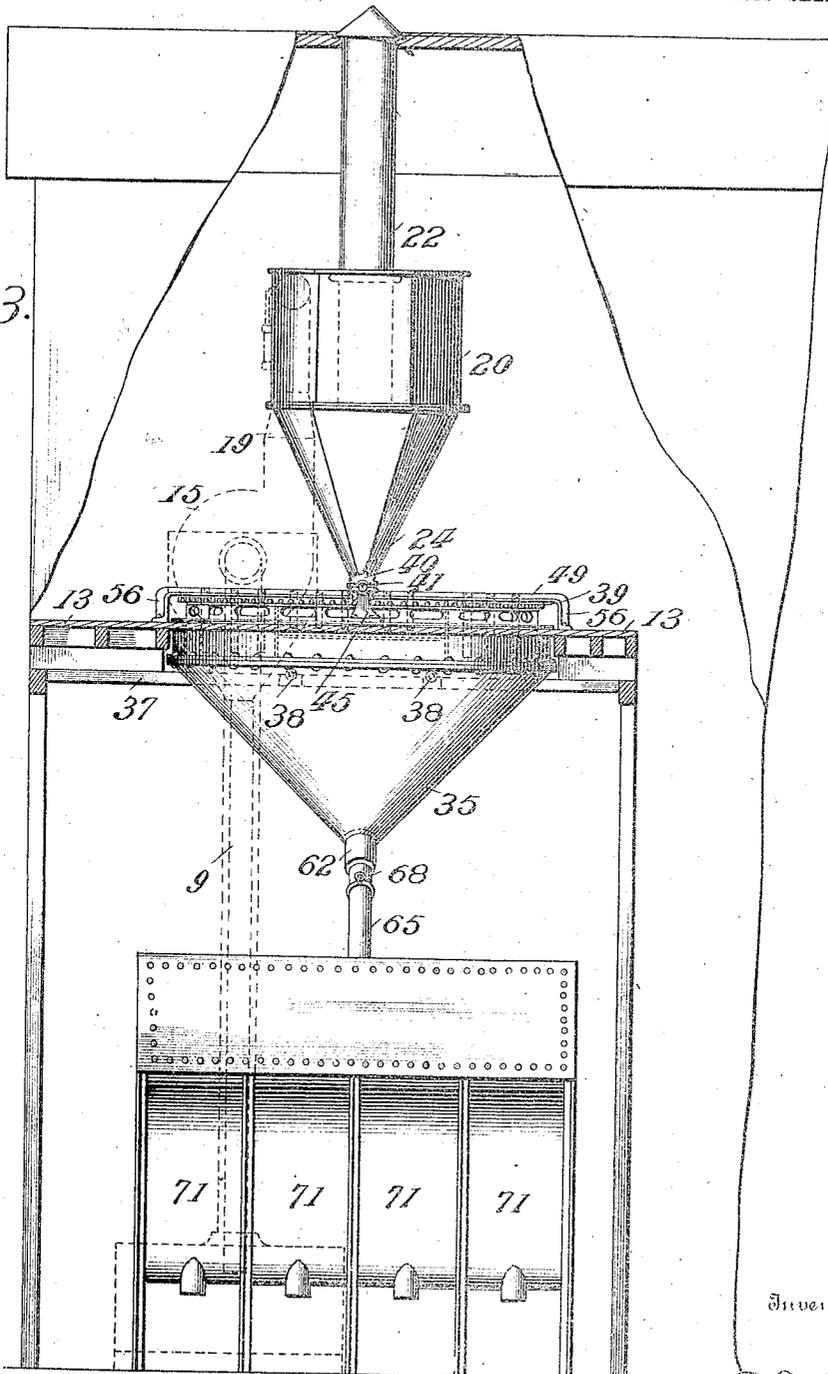
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3 SHEETS—SHEET 3.

FIG. 3.



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APPARATUS FOR HYDRATING LIME.

No. 845,189.

Specification of Letters Patent.

Patented Feb. 26, 1907.

Application filed March 2, 1905. Serial No. 248,086.

To all whom it may concern:

Be it known that I, WILLIAM S. OSBORNE, a citizen of the United States of America, and a resident of Marietta, in the county of Lancaster, State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Hydrating Lime, of which the following is a specification.

This invention relates to improvements in apparatus for hydrating lime; and the object of my invention is to provide an effective apparatus for economically carrying out the process of hydration.

In its preferable embodiment the lime is finely pulverized and after having the tailings separated the pulverized material is led into a suspension-chamber together with a jet of steam and while in suspension the lime receives moisture for hydration and settles by gravity into mixing-vats while the air is withdrawn in any suitable manner.

With this general statement my invention consists in the apparatus, as illustrated, in what I now consider its preferable embodiment in the accompanying drawings and as will now be hereinafter described and definitely claimed.

In the drawings, which accompany and form part of this application, and which, as I have before stated, illustrate the preferable though not necessary embodiment of my invention, Figure 1 is a sectional view of my apparatus. Fig. 2 is a top plan view of the mixing-vats and their plows. Fig. 3 is an end view of the apparatus, and Figs. 4 and 5 are details of the suspension-chamber and the pipes leading thereto.

Referring now to the details of the drawings by numerals, 1 designates a crushing or pulverizing mill, which may be of any desired or approved form, from the outlet of which leads a conducting-pipe 3, which leads to a separator 5 and is arranged when the material is drawn through it by the suction of a fan, as hereinafter described, to separate the material, so as to deliver the pulverized particles to the outlet 7, while the tailings or heavier or larger particles descend by gravity through a tailings-spout 9, leading into the inlet 11 of the mill 1. The separator 5 may be of any desired construction; but I prefer to use one similar to those shown in my Patents Nos. 710,603, 710,604, and 710,605. In fact, all of these parts may be of any ordinary construction, and my present invention does not reside specifically in any one of them, but

they are each shown in conventional form in order that my complete apparatus may be fully described.

Secured on a suitable platform 13 at an appropriate height from the main floor is a suction-fan 15 with its driving-shaft 16 and pulley 17, to which power is applied from any desired or convenient source. The fan 15 is connected to the outlet 7 of the separator 5 and owing to the suction caused by it the finely-pulverized lime is drawn from the separator and propelled through the conduit or conductor 19, which leads the particles of lime into a settling or suspension chamber or receptacle 20 of suitable and appropriate size. This settling-chamber is provided with a closed top having a ventilating-stack 22, leading through the roof of the structure in which the plant is located, and the lower end of the said chamber is formed into a conical delivery-spout 24 of relatively small size.

The delivery end of the conduit or conductor 19 leads into the settling-chamber 20 at a tangent, so that the finely-pulverized material is caused to travel around the said chamber and is thus held in a state of suspension before it falls by gravity through the delivery-spout 24.

In order to perfectly moisten the lime while it is thus in suspension, a source of steam (exhaust-steam may readily and economically be employed) is led into the conducting-pipe just where it enters the settling-chamber, and the pulverized lime is therefore driven into the chamber 20 with exhaust-steam, and as the lime and steam pass around the suspension-chamber the lime absorbs the steam and is thus moistened. The moistened material then descends by gravity, and the air entering the chamber with the lime escapes through the stack 22.

In order that there may be sufficient moisture for complete hydration, I also employ a water-spray 26, supplied from any suitable source, and when the steam does not contain sufficient moisture the water-spray may be used to supply the deficiency, so as to completely and effectually moisten the lime for hydration. As the moistened material descends in the settling-chamber it passes out through its spout 24 into mixing-vats, in which it is thoroughly mixed while hydrating, and as soon as the lime is completely hydrated it overflows into the storage-vats, from whence it may be placed in suitable packages—such as bags, &c.—ready for ship-

ment. These mixing-vats are designated 30 and 31 and are located in a large aperture formed in the platform 13, hereinbefore mentioned, and the central vat 30 is of course directly under the outlet of the settling-chamber. Both of these vats 30 and 31 are located within a large receiving-hopper 35 and are supported on beams, of which one is indicated at 37 as passing through the hopper. The beams are provided with suitable journaled rollers 38, and the outer mixing-vat 31 is provided with a flanged circular track 38^a, which runs on these rollers. The outer vat 31 is also provided with a toothed rim 39, with which meshes a gear-wheel 40 on a shaft 41, supported in a suitable bearing 45, resting on the platform 13, the shaft being provided with a pulley 43, to which power may be applied. It will be manifest that when the shaft is rotated the gear-wheel 40, meshing with the circular rack 39, rotates both of the vats, which rotation is permitted, owing to the fact that the circular track of the vats rests on the rollers 38, as described.

In order that the moistened material dropping into the vats may be properly mixed and hydrated, it is of course necessary to agitate the material, and this is accomplished as follows: A suitable frame is made of two pieces of angle-iron 48 and 49 of substantially V shape and these are connected together by means of two strips 51 and 52, also of angle-iron, and the whole is firmly riveted together, as shown in Fig. 2, forming a frame substantially X shape, with a rectangular opening 53 in the center. This opening coincides with the lower end of the delivery-spout 24, and hence the moistened material is delivered from said spout through said opening 53 into the center vat. The outer ends of the X-shaped frame are each bent downwardly, as seen best at 56 in Fig. 1, and are thus supported on the platform 13.

From the foregoing it will be evident that while the vats rotate, as before described, this frame is stationary, and in order to agitate the material vertical plows 60 are secured to each arm of the X-shaped frame and project downward into the vats, so that as the vats are rotated the material is thoroughly mixed.

The large receiving-hopper 35, which has been described as underneath the vats and as receiving the material from vats, is provided with a contracted lower discharge 62, which conducts the material to the divided chutes 64 and 65, which are provided with the valves or gates 67 and 68, and these chutes lead the material into the lower cooling-vats or storage-bins 70 and 71, from which it may be withdrawn into suitable sacks or barrels, as the case may require.

The detailed description has been given so fully that it is believed that those familiar with this art will understand my invention.

It will therefore be sufficient to concisely state the operation as follows: Fresh-burnt lime is delivered to the mill through the inlet-hopper 11 and is finely pulverized by the mill. It is then drawn by the suction of the fan 15 up through the conductor or pipe 3 into the separator, where the material is separated, and the finely-pulverized material passes through the fan, while the tailings pass through the tailings-spout 9 back to the mill. The pulverized material after leaving the fan 15 is blown into the suspension-chamber 20 with exhaust-steam, the material and steam entering said chamber at a tangent, and said material absorbs the moisture of the steam while the former is in suspension, and if the steam does not contain sufficient moisture the deficiency is supplied from the water-spray. The material passes around the chamber in suspension until ready to descend by gravity, the air in the meantime passing out of the suspension-chamber through the stack 22. The material passes from the suspension-chamber, and dropping through the rectangular opening 53 in the X-shaped frame supporting the plows 60, falls into rotary vat No. 30. As this vat rotates the plows agitate the material, and as the material slakes and expands it overflows the walls of vat 30 into the surrounding vat 31, and as this vat also rotates the material is likewise agitated there, and finally overflows the outside walls of vat 31 and falls into the receiving-hopper 35. From the lower end of this hopper the material passes through either of the chutes 65 or 66, as the attendant desires, and from thence into the cooling-vats or storage-bins, from which it is withdrawn as desired into sacks or barrels. The divided chutes 64 and 65, with their valves or gates, make it possible to first load one of the cooling-vats or storage-bins, and while the material is cooling there the material may be directed into the other bin in a manner well understood. As these cooling-bins are covered, the only communication at the top being through the divided chutes, the lime is delivered to the storage-bins without the chance of air getting to it, and thus the lime is prevented from absorbing carbonic-acid gas before being packed into the barrels or sacks.

I am aware that it has heretofore been proposed to treat lime by applying water and stirring it and do not claim this, broadly; yet it is obvious that modifications and changes may be made in my apparatus without departing from the spirit of my invention, the scope of which is set forth by the following claims,

What I claim as new is—

1. In apparatus of the character described, the combination of means for moistening lime, a rotatable vat into which the moistening means discharge, and plows or agitators

for mixing the material in the vat while it is hydrated, substantially as described.

2. Apparatus of the character described, having, in combination, a plurality of vats arranged to overflow one into another at a point above the bottom thereof, and means for stirring the material in the vats, substantially as described.

3. Apparatus of the character described, having, in combination, a plurality of vats, one of which is arranged to overflow into another at a point above the bottom thereof, means for delivering moistened lime in a constant stream to the first of said vats, and means for mixing the material in the vats, substantially as described.

4. Apparatus of the character described, having, in combination, two adjacent vats separated by an intervening partition so that one overflows into the other, means for delivering lime into the first vat, and means for stirring the lime in the vats, whereby the pits and unhydrated particles settle to the bottom while the powdery hydrated matter overflows one of said vats into the other, substantially as described.

5. Apparatus of the character described, having, in combination, two concentric rotating vats, of which the inner vat is arranged to overflow into the outer vat at a point above its bottom, means for delivering lime to the inner vat, and fixed means for stirring the lime in the vats, substantially as described.

6. Apparatus of the character described, having, in combination, a mixing-vat, means for delivering lime to the vat, means for stirring the lime in the vat, whereby the pits and unhydrated matter settle while the powdery hydrated lime overflows the sides of said vat, and a receiving-hopper located beneath the vat so as to receive the hydrated lime overflowing the sides of the vat, substantially as described.

7. In apparatus of the character described; the combination of a vat, means for mixing material therein and for causing it to over-

flow said vat, a receiving-hopper arranged to receive the discharge from said vats, cooling-vats arranged to receive the material from said receiving-hopper, and means for controlling the discharge from the receiving-hopper into the cooling-vat, substantially as described.

8. In apparatus of the character described; the combination of a vat, means for mixing material therein and for causing it to overflow said vat, a receiving-hopper arranged to receive the discharge from said vat, cooling-vats closed from the atmosphere arranged to receive the material from said receiving-hopper, and means for controlling the discharge from the receiving-hopper into the cooling-vats, substantially as described.

9. In apparatus of the character described; the combination of a mixing device, means for causing the material therein to overflow, a receiving-hopper receiving the material from said device, cooling-vats arranged to receive the material from said receiving-hopper, and divided chutes with valves controlling the delivery of material from the receiving-hopper to the cooling-vats, whereby the material may be fed into one of the cooling-vats while the material is cooling in the other, substantially as described.

10. In apparatus of the character described, a settling-chamber having a discharge-spout, a mixing-vat located under said spout, a frame suitably supported and interposed between said spout and said vat, said frame being formed of two V-shaped angle-irons connected together and forming an X-shaped frame with an opening through which the material passes, plows projecting from said X-shaped frame into the vat, and means for rotating said vat whereby the material is mixed, substantially as described.

Signed by me at Marietta, Pennsylvania, this 3d day of October, 1904.

WILLIAM S. OSBORNE.

Witnesses:

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