Sept. 2, 1941. W. J. KUNTZ 2,254,688

CONTINUOUS HYDRATOR

Filed Sept. 6, 1939 2 Sheets-Sheet 1

Fig. 2.

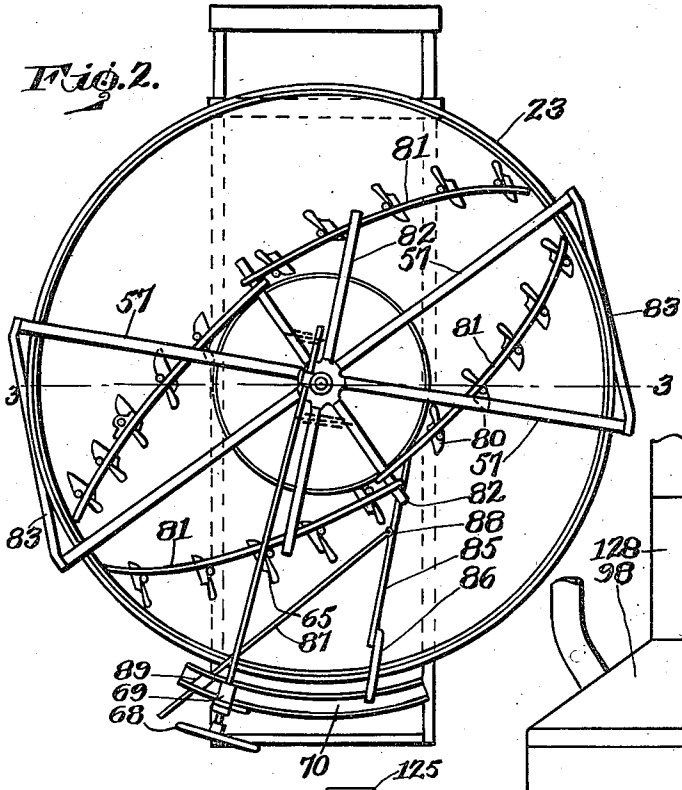


Fig. 1.

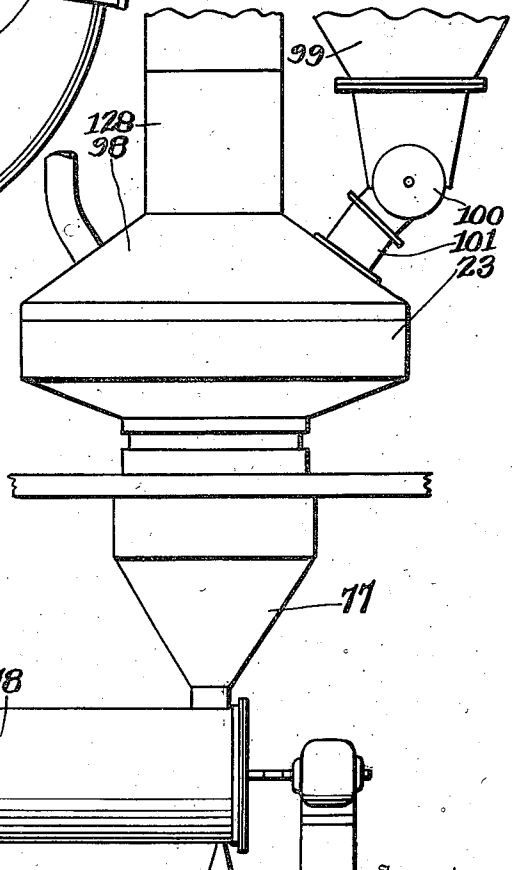
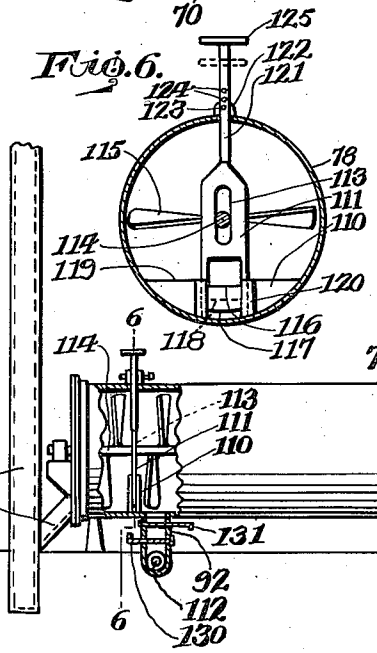


Fig. 6.



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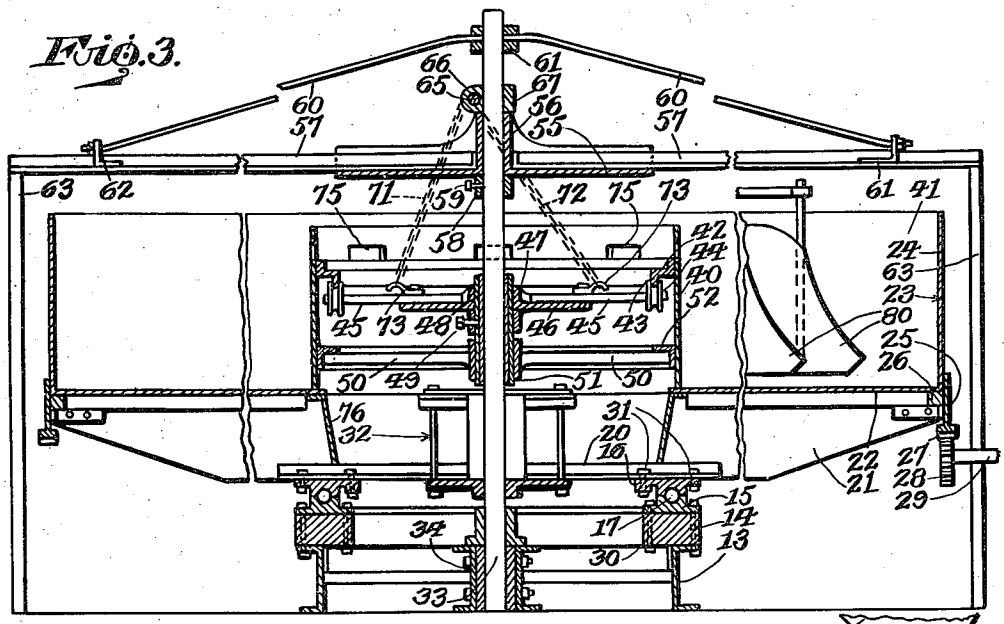
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Filed Sept. 6, 1939 2 Sheets-Sheet 2

Fig. 3.



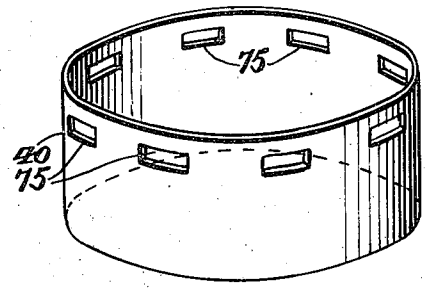


Fig. 4.

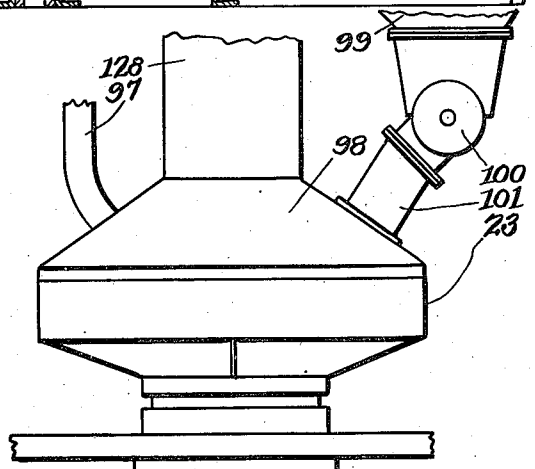
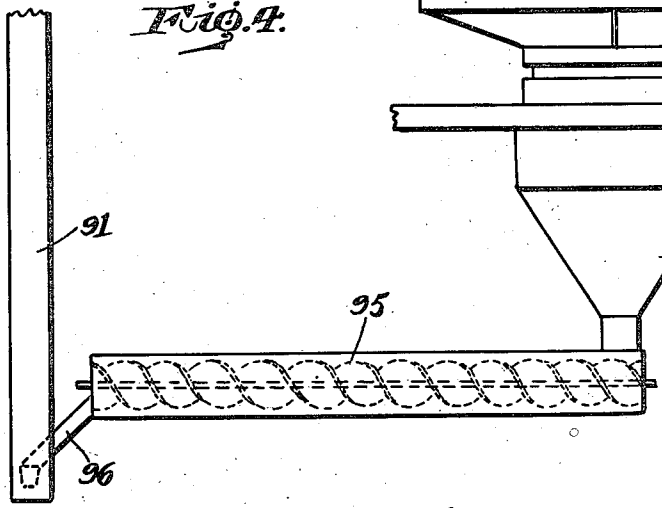


Fig. 5.



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UNITED STATES PATENT OFFICE

2,254,688

CONTINUOUS HYDRATOR

William Jacob Kuntz, York, Pa.

Application September 6, 1939, Serial No. 293,647

4 Claims. (Cl. 23—287)

This invention relates to improvements in batch hydrators.

It has been found in practice that the hydration of lime by batches does not provide uniform hydration because the method of burning limestone as well as the different types of limestones in any quarry when burned and introduced into a hydrator do not give a uniform quality of lime for each successive batch where a fixed amount of water is introduced to a fixed amount of lime. Under this established plan of batch hydration there results incomplete hydration caused by overburned and underburned lime introduced into the batch with properly burned lime.

It is an object of the present invention to adapt a batch hydrator to a continuous operation in which a continuous quantity of lime and water are fed into the hydrator operating on a continuous plan whereby when the lime is perfectly hydrated it is allowed to flow or proceed by its own resultant contact in a control space so that foreign matter, the overburned and unburned lime will remain in the chamber in which it is introduced from the caustic lime feeder until such time as the overburned and unburned lime has had intimate contact with the water and the lime is in such condition that it will flow from the hydrator until the separation between the refined and inert matter is completed, the foreign matter and residue from the overburned and unburned lime remaining in the original chamber for disposal as desired.

A further object of the invention is the improvement in a batch hydrator in which continuous quantities of water and lime are discharged into a hydrator with a continuous flow of the fines from the hydrator at a point centrally or otherwise located.

This invention will be best understood from a consideration of the following detailed description, in view of the accompanying drawings forming a part of the specification; nevertheless, it is to be understood that the invention is not confined to the disclosure, being susceptible of such changes and modifications as define no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a view in elevation partly in section of a converted batch hydrator in combination with a second hydrator, a cooler, screw conveyor, or other apparatus,

Figure 2 is a plan view of the same,

Figure 3 is a vertical section taken along the line 3—3 of Figure 2,

Figure 4 is a view in perspective of an inner cylinder for converting the batch hydrator into a continuous hydrator,

Figure 5 is a modified form of the hydrator shown in Figure 1, and

Figure 6 is a cross section taken on the line 6—6 of Figure 1 showing the gate partially raised.

Referring more particularly to Figures 1 to 4, inclusive, 13 designates a base member upon which is mounted a circular support 14 having a lower ball bearing race way 15 connected thereto. An upper ball bearing race way 16 is located upon the race way 15 and a plurality of steel balls 17 are housed by the race ways. Both of the race ways are circular.

A web, generally designated by the numeral 20, is secured to the upper face of the race way 16 as are supporting plates 21. The arms of the web 20 extend beyond the race way 16, while the supporting plates 21 extend beyond the arms of the web 20 and are connected to a ring shaped bottom 22 of a revolving container 23 which has its circular side wall 24 upstanding at the ends of the supports 21.

A ring gear 25 is secured to the lower end of the side wall 24 and to the ring 26 which is secured to the bottom 22 at the outer periphery thereof. The bottom face of the ring gear 25 is provided with teeth 27 which mesh with the teeth of a driving gear 28 operated by a shaft 29. The shaft is driven in any approved manner by a motor not shown.

It will be noted that the race way 15 is secured by bolts 30 to the support 14 while bolts 31 secure the upper race way to the arms of the web 20 which is supported by a member generally designated by the numeral 32 which is received by a shaft 33 which in turn is supported at its lower end by a box 34.

An inner cylindrical member 40 forms the inner wall of an annular chamber 41 and this chamber is defined by the concentric walls 24 and 40 and the bottom 22. It will be noted that the wall 40 merely rests on the bottom 22 of the container 23 and is not connected to said bottom so that the member 40 may be raised for a purpose which will be presently described.

A ring 42 is secured to the inner face of the cylindrical member 40 and has a depending annular flange 43 which is received by a plurality of rollers 44 rotatably mounted on the ends of arms 45 carried by channel arms 46 which are radially disposed and have their inner ends connected to a hub portion 47 received by a sleeve

48 slidably mounted on the shaft 33. A set screw 49 secures the hub 47 to the sleeve 48.

A plurality of radially disposed arms 50 have their ends secured to a hub 51 which is received by the sleeve 48. A ring 52 is secured to the inner wall of the cylindrical member 40 and the outer ends of the arms 50 are welded or secured in any approved manner to the ring 52.

A plurality of U-shaped arms 55 have their inner ends secured to a hub 56 mounted on the shaft 33. These arms are radially disposed and receive the inner ends of bars 57 which extend outwardly beyond the outer wall of the container 23. The inner ends of the bars 57 are secured in any approved manner within the channel arms 55. A collar 58 is secured by a set screw 59 below the hub 56 and is adapted to maintain the hub in a predetermined horizontal position.

Brace rods 60 are secured to a collar 61 mounted on the upper end of the shaft 33 while the outer ends are held in place by means of brackets 62 secured to the outer end of the bars 57 which are in the shape of angle irons. Bars 63 are secured to the outer ends of the bars 57 and depend therefrom and terminate at the lower end in a horizontal plane passing through the bottom of the member 13.

A shaft 65 has its inner end mounted in a bearing 66 carried by a collar 67 which rests on the hub 56 and is received by the shaft 33. This shaft extends outwardly and terminates in an operating wheel 68. A bearing 69 carried by an arcuately shaped support 70 receives the outer end of the shaft 65 (Fig. 2).

A pair of chains 71 and 72 (Fig. 3) have their lower ends received by hooks 73 carried by the arms 45 while their upper ends are connected to the shaft 65. Rotation of the shaft will cause the chains to be coiled on the shaft and thus raise the arms 45, the rollers 44 and likewise the cylindrical member 40 above the bottom 22 of the container 23.

The upper end of the cylindrical member is provided with a plurality of elongated slots 75 through which the fines may be discharged from the chamber 41 continuously during the process of hydration of the lime. The fines which are satisfied with water will pass through these openings and then downwardly through the central portion of the hydrator and through the hopper 76 and thence through a hopper 77 into a second hydrator 78.

A plurality of mold boards 80 are suspended from rods 81 from the bars 57 and these rods are also supported by radial arms 82 which project radially from the shaft 33. These mold boards which are held stationary while the member 23 is revolved will agitate the water and the lime continuously during the process.

Brace bars 83 are secured to the outer ends of the radial bars 57 for maintaining the angular relation between the bars 57.

A scraper 85 depends into the chamber 41 and terminates adjacent the bottom. This scraper is pivotally mounted on an arm 86 carried by an arm pivotally mounted on the support 70. A rod 87 is pivotally connected at 88 to the scraper 85 and the outer end of said rod as shown at 89 is slidably mounted in a guide on the support 80. The free end of the rod is located adjacent the wheel 68.

The hydrated lime which continually passes through the openings 75 and thence into the hopper 77 is discharged into an auxiliary hydrator 78 where the further process of hydration is carried on so that when the materials leave this hydrator and are discharged through a conduit 90 into an elevator 91 the lime will be thoroughly hydrated. Any unburned lime passing over into the hydrator 78 or any foreign matter will be collected in a sump 92 adjacent the discharge end of the hydrator 78. This sump and hydrator is described and claimed in my co-pending application S. N. 339,382, filed June 7, 1940 and this hydrator is an improvement on the hydrator described and claimed in my Patent No. 1,954,211.

Figure 5 discloses a hydrator in which a screw conveyor 95 receives the hydrated lime from the hopper 77 and conveys it to a conduit 96 where the lime is deposited in an elevator 91 where it is carried to separators.

Crushed lime is fed through a hopper 99 and this lime is then fed in regulated amounts by a metering device 100 located at the upper end of a pipe 101 which enters the cover 98.

Since the water and lime are fed continuously into the chamber 41 and since the container 23 is revolving the stationary mold boards 80 will keep the water and lime agitating so that the lime will be hydrated and the fines by the continued flow of the lime and water will reach the openings 75 and flow through these openings through the hopper 76 and the hopper 77 to the hydrator 78 where the materials will be further hydrated if necessary. This, however, depends upon the type of lime employed.

On the other hand the hydrated lime may be passed directly through the screw conveyor 95 and thence to the elevator 91 where it will be deposited in separator tanks of the type described and claimed in my Patent No. 1,954,211, dated April 10, 1934.

It will be seen by this construction that the well known type of Clyde hydrator will be converted from the batch method to the continuous method.

At predetermined times the cylinder 40 may be elevated by the rotation of the shaft 66 whence the unburned and overburned lime and other foreign matter may be removed from the chamber 41 as desired.

A tower 128 is connected with the upper end of the cover 98 and is adapted to contain water sprays for preventing the lime from passing out of the hydrator. This tower is described and claimed in my Patent No. 1,954,211, dated April 10, 1934.

A dam 110 is located adjacent the discharge end of the hydrator 78 and beyond the sump 92 to maintain a level of the hydrate in the hydrator and to retain overburned and underburned lime in the hydrator until such time as the lime will receive proper treatment.

The completed hydrate will flow over the dam 110 continuously when the gate valve 111 is in its lowermost position while the foreign matter will be discharged from the sump 92 on to a conveyor 112 and will be carried away from time to time. The adjustable gate 111 controls the level of the aggregate by raising said gate.

The gate valve 111 is provided with an elongated opening 113 to receive the shaft 114 that operates the vanes or stirrers 115 of the hydrator 78. The opening permits the raising or lowering of the gate so that the upper end 116 of the gate proper, designated by the numeral 117, may be raised above the level of the reduced portion 118 of the dam 110. The upper end of the main body may be elevated until it aligns with the upper edge 119 of the dam so that the hydrated lime

will flow over the entire upper edge of the dam. The lower end of the gate is slidably mounted in guides 120 mounted on the dam 110.

An operating rod 121 projects through a bushing 122 on the upper portion of the housing of the hydrator 78 and is adapted to be maintained in various elevated positions by means of a pin 123 which is adapted to be received by any one of a number of perforations 124 in the stem 121. An operating handle 125 is secured to the outer end of the rod.

As the hydrated lime is moved through the hydrator 78 to the dam 110 it will flow over the upper edge 116 of the gate proper 117 whence it will enter the conduit 90 to the elevator 91. Foreign matter and unburned lime rock will be collected in the sump 92 and when a valve 130 is opened it will be discharged upon the conveyor 112 whence it will be carried away.

If no hydrator 78 follows the Clyde or other batch hydrator, a sump 92 is placed in the screw or conveyor for carrying away the rejects to another hydrator to further the process of hydration of the rejects when necessary. This sump 92 in every case has two valves, one 131 directly under the hydrator or screw or other device, the other 130 at a distance below, which is found in practice to be proper for the particular lime being hydrated. The object of the two valves in the sump is to provide for operation as follows: When hydration is being carried on, the refuse or foreign materials will settle in the sump, the top valve being open, the operator will soon learn when the sump is full of rejects or foreign material in which case he will close the upper valve and open the bottom valve to empty the rejects or foreign material into whatever receptacle or conveyance is provided.

I claim:

1. A batch hydrator converted into a continuous hydrating machine comprising a cylinder having a bottom provided with a central opening, a movable auxiliary cylinder resting on the bottom and embracing the central opening cooperating with the first mentioned cylinder and bottom to form an annular chamber for the hydration of lime, the upper end of the auxiliary cylinder adjacent the top of the first cylinder being provided with openings for the continuous discharge of hydrated lime, means for supplying the chamber continuously with regulated amounts of water and unslacked lime, means for collecting the lime being discharged through the opening, and means for agitating the water and lime in the chamber.

2. A batch hydrator converted into a continuous hydrating machine comprising a cylinder having a bottom provided with a central opening, a movable auxiliary cylinder resting on the bottom and embracing the central opening cooperating with the first mentioned cylinder and bottom to form an annular chamber for the hydration of lime, the upper end of the auxiliary cylinder adjacent the top of the first cylinder being provided with openings for the continuous discharge of hydrated lime, means for supplying the chamber continuously with regulated amounts of water and unslacked lime, means for collecting the lime being discharged through the opening, means for agitating the water and lime in the chamber, and means for raising the auxiliary cylinder to permit the discharge of unburned, overburned lime and foreign matter from the chamber through the central opening.

3. A batch hydrator converted into a continuous hydrating machine comprising an outer cylinder having a bottom provided with a central opening, an inner cylinder resting on the bottom, embracing the central opening and cooperating with the first mentioned cylinder and bottom to form an annular chamber for the hydration of lime, and means located near the top of the inner cylinder for continuously conducting hydrated lime from the chamber, means for supplying the chamber continuously with regulated amounts of water and unslacked lime, means for collecting the lime being discharged through the opening, and means for agitating the water and lime in the chamber.

4. A batch hydrator converted into a continuous hydrating machine comprising a cylinder having a bottom provided with a central opening, a movable auxiliary cylinder resting on the bottom and embracing the central opening cooperating with the first-mentioned cylinder and bottom to form an annular chamber for the hydration of lime, the upper end of the auxiliary cylinder adjacent the top of the first cylinder being provided with openings for the continuous discharge of hydrated lime, means for supplying the chamber continuously with regulated amounts of water and unslacked lime, means for collecting the lime being discharged through the opening, means for revolving the first mentioned cylinder, and means in the chamber for agitating the lime and water in the chamber and below the openings in the auxiliary cylinder.

WILLIAM JACOB KUNTZ.