Oct. 21, 1952 W. KELSEY 2,614,828

SINTERING MACHINE

Filed March 2, 1950 2 SHEETS—SHEET 1

Fig. 1.

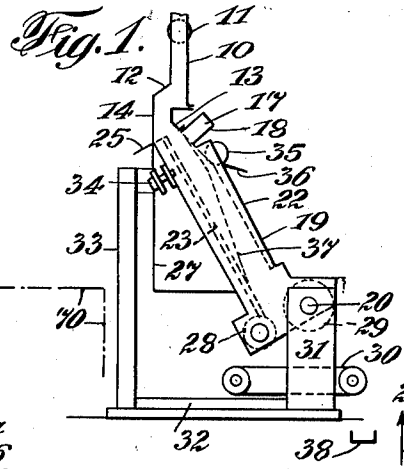

Fig. 3.

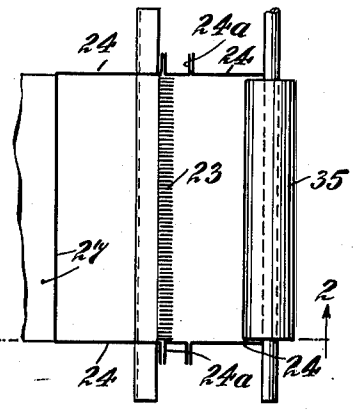

Fig. 2.

Fig. 4.

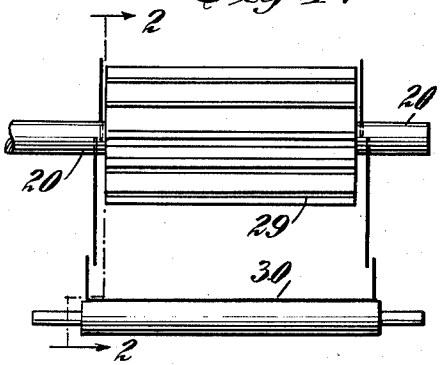

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Fig. 5.

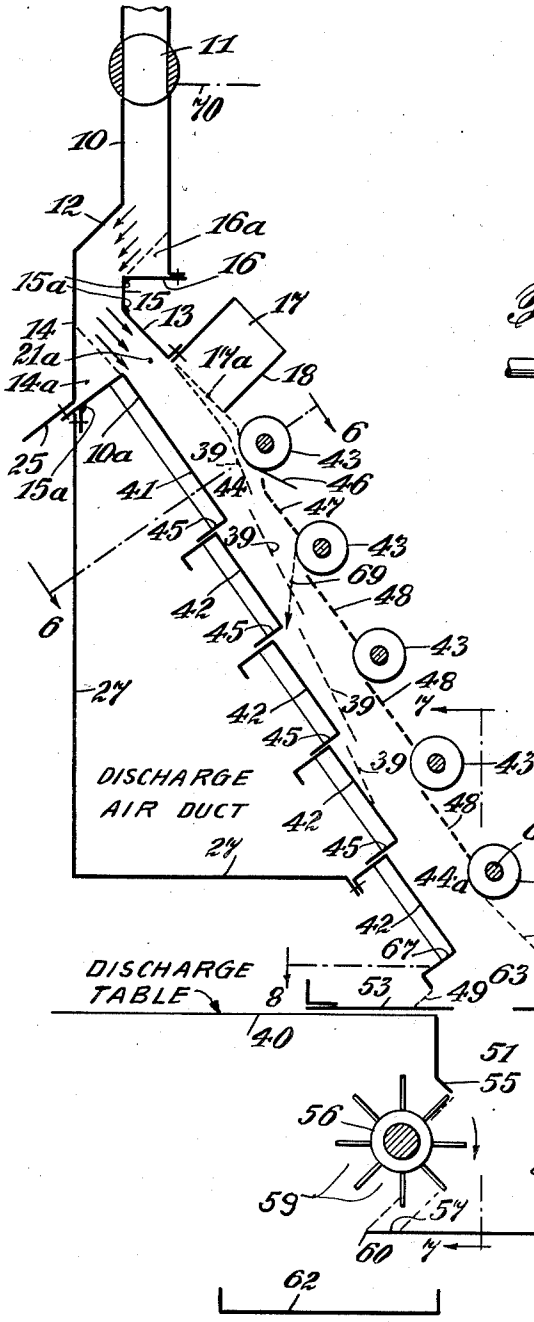


Fig. 6.

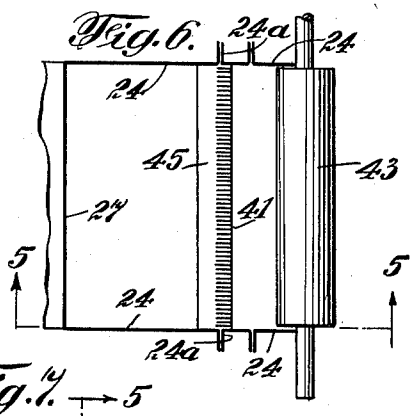


Fig. 7.

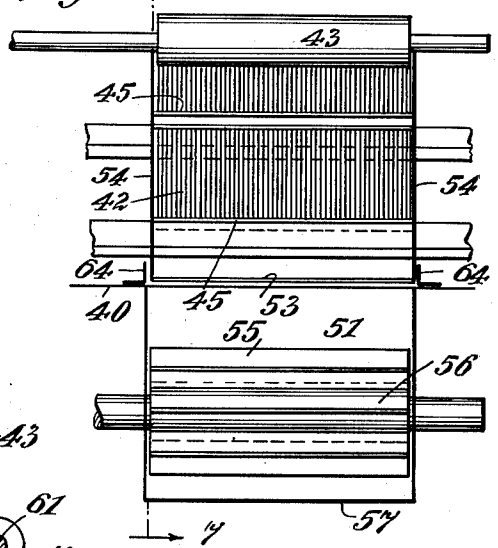
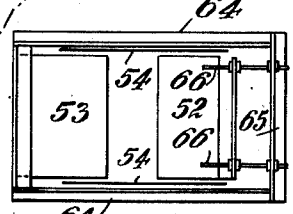


Fig. 8.



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Patented Oct. 21, 1952 2,614,828

UNITED STATES PATENT OFFICE

2,614,828

SINTERING MACHINE

Walter Kelsey, New York, N. Y.

Application March 2, 1950, Serial No. 147,317

8 Claims. (Cl. 266—21)

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This invention relates to sintering machines and more particularly to improvements in the inclined gravity acting type described in my copending application Serial No. 736,487, filed March 22, 1947, for "Gravity Flow Sintering Machines," U. S. Letters Patent No. 2,527,309 of October 24, 1950.

The object of this invention is to provide such improvements and this invention consists essentially of a sinter pass inclined to the vertical, having an open top in communication with the discharge outlet of a feed chute to receive and carry the stock in a line continuing in the direction of the feed chute discharge. The invention consists further in providing means to tilt the sinter pass to change its inclination to the vertical within the range of registration of the receiving opening of the sinter pass and the discharge conduit of the feed chute.

As a further alternative improvement, the invention includes a gravity flow inclined sinter pass with the lower surface of the sinter pass stepped at intervals for the breaking or shearing of the stock and sinter as it flows off each step. This continual stepping and shearing during the formation of the sinter, breaks the sinter into pieces which are readily handled by a constant discharge device below the bottom end of the sinter pass, by which the speed of the flow of sinter may be controlled, the controlling means operating in consonance with the speed of flow of the stock desired in the sinter pass.

The invention also contemplates an adjustable gate opening below the sinter pass and below this a controlled paddle wheel sinter discharge. The invention also contemplates means to change the depth of the flow of the stock and the sinter in the machine.

The sinter pass being variable in slope, the flow of sinter stock and sinter is regulated in consonance with the sintering action, the top surface or side of the flowing sinter stock passing under an ignition device, to ignite the adjacent surface of the stock, and the flow of the stock with its ignited surface continues without change of direction or reversal of slope through the sinter pass, forced by gravity, down the sinter pass. The operation of the machine is continuous. The flow of sinter stock and sinter from the sinter stock supply downward through the machine is energized by gravity. The slope of the sinter pass is such as to produce flow of the particular type of stock being utilized regardless of resistances, the slope of the sinter pass being capable of being varied to accelerate

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or retard the flow. The machine is made so that the slope as a whole can be readily changed to meet any changed condition, within the controlling rule that the inclination of the stock supporting wall of the sinter pass must not be too steep but should retard but not prevent the flow of stock under the action of gravity.

The function of this machine is to sinter ores, fly ash and to agglomerate any materials that can be so treated and put into condition for further use.

The sintering machines at present in use are elaborate and costly to build and limited on that account in their scope of use. The present invention is simple in design and construction, far less costly and consequently has a wider scope of use.

The invention will be further described, embodiments thereof shown in the drawings, and the invention will be finally pointed out in the claims.

In the accompanying drawings,

Fig. 1 is a side view outline drawing showing provisions made for changing the slope of the sinter pass and showing supports for the sinter pass and frame shown in greater detail in Fig. 2;

Fig. 2 is a vertical section of a single sloping surface sinter pass taken on line 2—2 of Figs. 3 and 4;

Fig. 3 is an inclined section on line 3—3 of Fig. 2;

Fig. 4 is a vertical section on line 4—4 of Fig. 2;

Fig. 5 is a vertical section of a stepped sloping surface sinter pass taken on line 5—5 of Figs. 6 and 7;

Fig. 6 is an inclined section taken on line 6—6 of Fig. 5;

Fig. 7 is a vertical section on line 7—7 of Fig. 5;

Fig. 8 is a plan of the equalizing gate, in reduced scale, taken on line 8—8 of Fig. 5.

Similar characters of reference indicate corresponding parts throughout the various views.

Referring generally to the drawings, both embodiments show a straight line flow of the stock from the discharge end of the feeding chute to the upper open receiving end of the sinter pass, flow continuing without reversal of the slope of the stock, which sinter pass is sloped to permit gravity action to force the flow of stock, but not retard the stock against such gravity action.

The tilting action of the sinter pass around the pivot 20 is clearly seen in Fig. 1, and is embodied in both Figs. 2 and 5. The preferable

slope of the sinter pass with respect to the horizontal is also shown in this Fig. 1.

The shearing steps 42 are shown in Fig. 5.

The shiftable opening for controlling the sinter flow in the sinter pass is shown in Figs. 5 and 8.

More particularly, the inclosed stock feeding chute 10, (Figs. 2 and 5) and the offset inclosed stock feeding chute 14 have such a combined length between the gate 11 and the ignition chamber 17 that there is no appreciable loss of air suction or pressure through the stock held in the two air tight continuous connecting chutes. The stock fills the chutes throughout their cross-section area and forms an air choke. The top of the offset 12 is so sloped that the top of the flowing stock is restrained, thus preventing the separation of large pieces in the stock during this part of the stock flow. The idea in these offset chutes with their stock pockets 16*a* and 14*a* is to take the vertical stock load above each pocket and break up the compact condition of the stock as it flows out of each pressure relieving pocket. Pocket 16*a* has a horizontal bottom but on account of the slope changing provision of the sinter pass the pocket 14*a* has a sloping bottom formed by the end of the sinter pass, which end has an extension which may be joined to a part of the flange connection 25 extending from the feed chute. The top surface of stock in this variable size pocket 14*a* has the same natural retarding slope as in pocket 16*a*. As the flow at each pocket is created by the withdrawal of stock from below, the compact condition is thus greatly reduced making the stock condition more open for the passage of air. Two stock pockets are shown in the drawings; it may be advisable to have more pockets to break up more completely the compact condition of stock and permit a freer flow of air through the stock. The stock receiving part 21*a* of the sinter pass has a top 13, not perforated, extending from a wall 15 to the ignition chamber 17, sloped at the natural free slope of the top of the stock, and a bottom or grate 19*a* extending from the pocket 14*a* beyond the ignition chamber 17, in advance of the sinter pass proper 21 sloped at the same slope of the sinter pass. In the embodiment, this part 19*a* which is a grate, and the grate of the sinter pass 21 are continuous (Fig. 2).

The stock feed chute has for its object to prevent compacting of the stock, since this would prevent proper airing of it, for the subsequent sintering operation. At least, two steps are provided in reverse direction to each other, to divert the stock flow angularly to the vertical and angularly to itself, and vertically spaced from each to allow for the continued stock flow. By providing pockets for the stock, the stock flows are guided by the surfaces of the stock in the pockets, whereby intermingling of stock at these guiding surfaces take place. While the embodiments shown, present the pocket walls 16 at right angles to the vertical wall adjacent thereto, this is not essential, since acute or obtuse angular relationships will operate to carry out the principle, provided the guiding surface has an angle to the vertical which enables the stock to flow by gravity action, and be retarded, but not prevented from flowing. The flow of the stock, first in one direction (angular in respect to the vertical) and then in the other, with a turning point between said directions, assures a fluffiness to the stock, thus, preventing compacting of the same. Throughout the feed chute the stock extends from wall to wall, filling the horizontal cross-sectional areas from the receiving end of the chute to its discharge end. In the embodiments shown in Figs. 2 and 5, the feeding chute may be said to extend from its feed inlet valve 11 to about at the lower end of wall 13 forming a chute 21*a* with the part 19*a* of the grate 23.

The sinter pass is made of a parallel top perforated surface wall 22 and bottom surface wall or grate 23 (Figs. 1 and 2), and inclosing side walls 24 (Fig. 3), held together in a frame 19, pivoted on a shaft 20 (Figs. 1 and 2). The grate 23 has a portion 19*a* which acts as the bottom of chute 21*a*. The top open end of the sinter pass 21 receives ignited stock from the lower side of the ignition chamber from chute 21*a*. The top end of the sinter pass chute 21*a* forms with the feed chute 14 a pocket 14*a* which varies in size depending on the slope position of the sinter pass. Thus, the uppermost end 19*a* of the grate 23 acts as the chute bottom and with the top 13 establishes the direction of the consequent stock flow with the sinter pass tilted to provide a flow for that particular stock. The arrows 14*c* point out the direction of the flow of stock at that point. The next adjacent part of the grate 23 is opposite the ignition chamber wall 18, where the sinter pass proper 21 begins.

The ignition chamber 17 (Figs. 2 and 5), is so made as to burn the fuel used to a flame. The flame is impinged upon the exposed surface 17*a* of the sinter stock descending in the chute 21*a* throughout its width so as to properly ignite the stock while it passes below the chamber 17. Any suitable ignition device may be used. Air suction or pressure at 19*a* aids to draw the flame to the surface of the stock. The intensity of the flame, the width of the ignition chamber, the amount and rate of flow of stock, and the intensity of the air action, are individually adjusted to give proper ignition to the surface of the stock passing the ignition device. The lower edge of side 18 of the ignition chamber is made to clear the flowing ignited surface of the stock.

The angle of flow of sinter stock of any particular type by gravity is hard to predict. The friction on the sinter pass surface varies with the weight, compactness and moisture content of the stock with air pressure used and other variables. The angle of repose of the top surface is also variable due to conditions mentioned and to the amount of formed sinter in the stock. A gravity flow sintering machine to meet commercial conditions should be made with a range of slope for the sinter pass, and changes should be able to be easily made from slope to slope. For general use of the gravity flow sintering machine the depth of stock flow must be made readily variable. This is provided for by changing the channel 24*a* to a channel of different depth used in building up the enclosing sides 24 (Figs. 3 and 6), and adjustment in the chute closure pieces 13 and 15 (Fig. 2). For a sintering machine used constantly for the same stock, the parts can be welded at 15*a*; or suitable adjustable devices may be used for different stocks. Air duct 27 and ignition chamber 17 are connected to and move with a frame 19 and the piping and duct connections to same (not shown) are made flexible or adjustable. Breaker roller 28 moves with the frame 19 and roller 29 is on the fixed pivot and drive shaft 20 (drive not shown). At the lower end of the sinter pass 21 connections are made through flanges at 26. Feeding chutes 10 and 14 and discharge conveyor 30 are not moved with the change of slope, but

the walls 13 and 15 are adjustable as explained. The sinter pass frame 19 (Fig. 1) is supported by shaft 20 or other means on the fixed base having parts 31, 32, and 33 (Fig. 1), and by the adjusting screw or other means at 34 at the top of the base piece 33. Substantially the same means is used for supporting and changing the slope of the stepped sinter pass shown in Fig. 5.

The sinter pass 21 (Fig. 2), has a perforated bottom or grate 23 which extends from the upper end 10a to the bottom breaker roller 28. The perforated top 22 for air passages is preferably parallel to the bottom 23 and extends from the top guide roller 35 down to a space above the bottom breaker roller 29. These top 22 and bottom 23 surfaces and the guide roller 35, which may or may not be power driven (drive not shown) are supported from the inclosing sides 24 (Fig. 3) and the main supporting frame 19 (Fig. 1) shown in outline only. Roller 35 is driven from shaft 20. This roller 35 has applied to its bottom side, a doctor or scraper 36 to remove adhering burning sinter allowing it to pass under the top 22 with the rest of the ignited sinter stock. The air for burning the sinter passes through the top 22, through the sinter stock in the pass 21 and through the grate 10a and grate 23 to the air duct 27 and to chimney duct connections not shown. During the air passage through the ignited stock in the pass 21, the ignited fire line 37 is drawn through the flowing stock burning out against the grate 23 near the lower part of the air duct 27.

The sinter pass 21 is at an angle to the vertical and the fire line is at an angle to grate 23, with constantly decreasing spaces from the grate 23. The angle of the grate 23 to the vertical, is such as to retard the flow of the stock, but permit its flow under gravity action.

At the lower point of the sinter pass 21, all the stock has been converted to sinter and continues to flow down into the controlling sinter breaker rollers 28 and 29. These rollers control the stock flow as in operation the stock gate 11 at the top of the feed chute is open. The length of the sinter pass from the bottom of the air duct 27 to the breaker rollers 28 and 29 may be lengthened relatively beyond what is shown to give space for the sinter to cool. This cooling may be aided by a cross flow of cooling air. Sinter is discharged from the rollers on the conveyor 30 and to the conveyor 38 and to such processing as required discharging in the direction of the arrows 30a. The final discharge of sinter or stock from the single sloping sinter pass is controlled by the conveyor 30 as the free flowing stock is stopped on this conveyor, and when removed facilitates the sinter flow from the sinter pass.

In Fig. 2 the sinter pass is also shown as moved to a position at a lower slope which is shown dotted. The top 22 is moved to position 22a, the guide roller 35 to position 35a, the ignition surface 17a to position 17b, the grate 10a to position 10b, side of air duct 27 to position 27a, top of chute 13 to position 13a, and breaker roller 28 to position 28a. Other features of the sinter pass and frame not named are moved with the frame to a position corresponding to the lower slope. A collecting conveyor 38 is shown to receive the sinter from conveyor 30.

The section Fig. 3 shows top guide roller 35 with relation to the grate 23 and air duct 27 and the construction of the inclosing sides 24 with

provision for changing height of same by changing depth of channels 24a.

The section Fig. 4 shows the crushing roller 29 and shaft 20 (power connections not shown) in relation to the pan conveyor 30.

In another embodiment, a series of stepped grates are shown (Fig. 5). The sinter pass has a stepped perforated bottom surface or grate which extends from the stock inlet chute 21a (Fig. 5), to a space above the discharge table or floor 40 (Fig. 5). The wall or step 41 is below the wall 13, and the ignition device (Fig. 5). Steps 42 follow downwardly in sequence. This succession of steps 41 and 42 are sloped to overcome resistance and produce sinter stock flow by gravity action. About above the riser 45 of each step is placed a deflecting or pressure roller 43 and 43a (power connection not shown), bearing on the surface of the stock in the sinter pass 44 and 44a forcing the new plastic sinter down and by pressure along line 69, for example, shearing the flow of sinter and stock at each riser 45, this repeated shearing action on the stock and sinter in all stages of formation resulting in producing separate pieces of sinter. The upper end of the fire line 39 starts at the ignition device and is pulled by the air flow toward the lower side 42 and extinguished against the lower side 42 near the bottom of the air duct 27. This fire line or ignited surface 39 is broken at each shear point but continues in the flow of stock to the succeeding shear point. The shearing breaks up the stock altering or freeing the air flow through the stock, this freer flow is counteracted by the pressure wheel or roller on the top of the stock, cutting off part of the air flow at each shear point. To overcome a possible restriction of air flow under the pressure wheels, the wheels can be shaped to permit air to flow around the wheel into the sinter by grooving the surface of the wheel. This pressure wheel or roller is subject to many variations to gain the working combination of pressure action and air flow. With a heavy sinter stock the weight of the stock may be sufficient to produce the shearing action without such wheels. A scraper 46 (Fig. 5), is applied as may be required to the pressure rollers 43 to keep ignited sinter stock from building up on the rollers, only one scraper 46 being shown. The top surface of the flowing sinter is restrained by the perforated plates 47 and 48. The step surfaces 41 and 42 (Fig. 5) are built up of grate bars but regardless of the step construction, the face of the riser 45 should be made of a bar for strength and to stop off any air passage at the risers to assure a good air flow control through the grates. Air and gases should be permitted to leave the sinter pass only through the openings in the step surfaces of steps 41 and 42. The length of the bottom part 44a of the sinter pass from the bottom of the air duct 27 to the discharge table 40 may be longer relatively than is shown on the drawing. The step and shearing feature will then extend downwardly to beyond the point where the hot sinter cements together into a cake, below which point the steps can be omitted. This lengthening is to give the flowing sinter time to cool, which can be aided by a cross flow of cooling air.

The lower end of the sinter pass 44a (Fig. 5), discharges the broken sinter from under the lowermost roller 43a and lowermost riser bar 67 between the sinter pass sides 54 (Fig. 8), into a free surface 49 flowing pile 63 resting on the discharge equalizing gate with leaves 52 and 53 which are

on the discharge table 40. These two equalizing gate leaves are joined together by side pieces 64 and header piece 65 (Fig. 8), with an opening between the leaves and screws 66 for adjusting the gate opening. This really forms a gate valve with an adjustable opening at the center. This equalizing gate valve opening is placed above the opening between the sinter pass sides in the top of table 40 and adjusted for the desired flow of sinter from the pile 63 to the discharge pocket 51, and moved so that the opening is in such a position in the pile 63 as to direct the flow of sinter from the pile and from the sinter pass 44a to give a uniform mass flow through the whole cross-sectional area of the sinter pass 44a. The discharge pocket 51 extending between the extended sinter pass sides (Fig. 5), is air tight and deep enough so that the contained sinter will make an air seal pocket between the table 40 and the cut off plate 55 at the top of the sinter discharge control wheel 56. This control paddle wheel 56 (Fig. 5) is set in what would be a free discharge from the pocket 51, between the flow cut off plate 55 and the end 60 of the bottom 57. This wheel held rigid intercepts and stops by its paddles the flow from the pocket 51. This controlled wheel power rotated at a constant speed (power connection not shown), discharges a constant fixed quantity of sinter. Each cell 59 between paddles fills with sinter at the cut off 55, and is rotated down through the bottom of the pocket and discharged over the edge 60 of the pocket bottom 57. The paddle wheel can handle material varying greatly in size as the paddles revolve in the sinter and clears by a space the retaining back wall 58 and the bottom 57 of the pocket. This paddle wheel 56 is the final controlling part of the stepped sinter machine having a discharge pocket 51 or similar pocketing means. The discharge by this wheel withdraws and controls the flow of sinter and stock all the way through the machine to the supply above the gate 11. A discharge conveyor is shown at 62. This control device below the table 40 may be applied to the embodiment shown in Fig. 2, on the removal of the continuous apron 30 and its operating parts.

The stepped sinter pass (Fig. 5), like the constant slope sinter pass (Fig. 2) is built into a frame as 19 (Fig. 1), which is supported in the same manner and provides means for the change of slope of the sinter pass. The pivot support of the stepped pass would then be the shaft 61 of the pressure roller 43a (Fig. 5), and the top of this stepped pass would be supported by the screw 34 or other similar device (Fig. 1), and chute connections 13, 15, 16, and 25 (Figs. 2 and 5) would be provided. Chute connecting pieces 13, 13a, 15 and 16 can be fitted for adjustment, or can be fitted and welded for each position of the sinter pass.

The screw 34 and pivot 20 (or 61) connect to the fixed base having parts 31, 32 and 33 (Fig. 1). All connections (not shown) to the several parts of this stepped pass are made flexible or easily adjusted.

The section (Fig. 6) shows the top pressure and guide roller 43 with relation to the grate 41, the air duct 27 and the sides 24 and shows the channel 24a which can be changed in depth to meet changed depth of flow of stock in the sinter pass.

The section (Fig. 7) shows a top pressure roller 43 in relation to a riser 45 and grate 42, and shows the equalizing gate part 53, side pieces 64 and discharge table 40 with the sinter pocket 51, and the discharge paddle wheel 56 above the bottom wall 57.

The plan at reduced scale of equalizing gate (Fig. 8) shows the construction of the gate and its location at the bottom of the sinter pass 44a with reference to the sinter pass sides 54.

The air seal provision at the air tight feeding chute 10 and 14 (Fig. 5) and the discharge pocket 51 provides an opportunity to use a forced draft through the sinter stock in the sinter pass instead of an air suction through the air duct 27. This can be done by making a plenum chamber with walls 70 in the room in which the sinter machine is located.

This plenum chamber can be applied to the embodiment of Fig. 2, as shown by the lines 70.

To put the gravity flow sintering machine into operation, fill the machine with sinter stock by opening the stock gate 11 at the top, start the ignition flame and connect the air and power lines. Any stock going through the machine without being converted to sinter is separated from the sinter and returned to the stock processing line. Partial loss of fire or ignition does not stop the process as the stock and sinter both pass through the machine at the same velocity, thus allowing a pick up in ignition. However, the controlling machinery must run and the ignition flame and air pressure must be maintained to produce a continuous output of sinter.

Many of the sintering plants are very dusty in their operation and require elaborate dust collecting equipment. This gravity flow sintering machine produces relatively very little dust to be collected as the free flow of the dusty sinter is very limited.

Divisional applications have been filed for matter disclosed herein but not claimed herein, as follows: Serial No. 191,050, Serial No. 191,051, both filed on October 19, 1950.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

I claim:

1. In a sintering machine, the combination of a sinter pass chute having parallel front and rear walls and inclosing side walls, said front walls consisting of a series of perforated steps being inclined to the vertical, each step in line with the sinter pass chute and lower than its preceding step, said inclination being such as to retard but not prevent the flow through the sinter pass chute of the stock and sinter under gravity action, said rear wall consisting of a series of perforated stepped plates, and powered pressure rollers between said perforated stepped plates, whereby said combination of front wall steps, rear wall stepped plates and powered pressure rollers, shears and breaks into pieces the sinter and sinter stock as it flows off each step downwardly in the sinter pass chute.

2. In a sintering machine, the combination of a sinter pass chute having parallel front and rear walls and enclosing side walls and an open upper receiving end and an open lower discharging end, said front wall being inclined to the vertical, said inclination being such as to retard but not prevent the flow of the stock under gravity action, said sinter pass chute having means incorporated with said chute for breaking the sinter, an equalizing gate valve having an opening below the sinter pass chute for receiving the broken sinter, and means horizontally shifting said gate valve to bring its opening in

a position in relation to the sinter pass chute to determine the direction of flow of the broken sinter from the sinter pass through the said gate valve opening and thereby the descent in uniform cross-sectional mass flow of the stock and sinter in the sinter pass chute providing a uniform mass flow through the whole cross-sectional area of the sinter pass.

3. In a sintering machine, the combination of a sinter pass chute having parallel front and rear walls and enclosing side walls and an open upper receiving end and an open lower discharging end, said front wall being inclined to the vertical, said inclination being such as to retard but not prevent the flow of the stock under gravity action, said chute having sinter breaking means within the sinter pass chute, an equalizing controlled gate valve having an opening below the sinter pass chute discharge for receiving the broken sinter, means horizontally shifting said gate valve to bring its opening to a position in relation to the sinter pass to determine the direction of flow of the broken sinter through the said gate opening, a sinter pocket, below said opening, and a controlled discharge paddle wheel having paddles below the said sinter pocket, providing a uniform flow through the whole cross-section of said sinter pass.

4. In a sintering machine, the combination of a sinter pass chute having parallel front and rear walls and enclosing sidewalls and an open upper receiving end and an open lower discharging end, said front wall being inclined to the vertical, said inclination being such as to retard but not prevent the flow of the stock under gravity action, sinter breaking means within the sinter pass chute, and a controlled paddle wheel below the lower end of said sinter pass chute intercepting the broken sinter with its paddles, to determine the rate of flow of the broken sinter through the said discharge opening, and thereby the rate of descent of the stock and sinter in the sinter pass chute.

5. In a sintering machine, the combination of a sinter pass chute having parallel front and rear walls and enclosing sidewalls and an open upper receiving end and an open lower discharging end, said front wall being inclined to the vertical, said inclination being such as to retard but not prevent the flow of the stock under gravity action, the lower end of said chute having a discharge, means within said chute for breaking the sinter, a horizontal discharge floor, below said discharge of said chute, said floor having an opening, and an adjustable horizontal equalizing gate above said opening in the discharge floor, whereby the discharge flow of sinter through the gate opening is so positioned as to give the discharging sinter in the sinter pass chute a uniform flow across its cross-section from its front wall to the rear wall.

6. In a sintering machine, the combination of a sinter pass chute having parallel front and rear walls and enclosing side walls and an open upper receiving end and an open lower discharging end, said front wall being inclined to vertical, said inclination being such as to retard but not prevent the flow of the stock under gravity action, the lower end of said chute having a discharge opening, means within said chute for breaking the sinter, an adjustable horizontal shifting discharge gate having an opening below said chute discharge opening, a horizontal gate supporting discharge floor with a sinter flow opening in said floor below the gate said gate opening and said sinter flow floor opening substantially coinciding, a sinter pocket below the coinciding openings in the said gate and the said floor, and a controlled rotating sinter flow controlling paddle wheel in said sinter pocket, whereby the flow of sinter through the gate is at the same rate as the machine produces sinter.

7. In a sintering machine, the combination of a sinter pass chute having sidewalls, with an upper stock receiving end and a lower sinter discharge end, and having sinter breaking means within the sinter pass for breaking the sinter within the sinter pass, for discharge at the lower end of said chute, a discharge floor having a discharge opening extending from sidewall to sidewall of the sinter pass chute, said floor supporting said sidewalls, an equalizing gate consisting of a rectangular frame formed of two end pieces placed on the floor adjacent to said sidewalls and outside of same, and of two side pieces connecting the two end pieces located without the discharge opening on said discharge floor, a first gate leaf connected to one side piece extending between the two sinter pass chute sidewalls and extending toward the opposite side piece, a second opposite gate leaf connected to the opposite side piece, said second gate leaf extending between the two sinter pass chute sidewalls and extending toward the opposite first gate leaf and spaced therefrom, said space between gate leaves being adjustable by screw connection between said second gate leaf and adjacent side piece of said frame; said equalizing gate with all of said frame and leaf parts resting on the discharge floor.

8. In a sintering machine, the combination of a sinter pass chute having parallel front and rear walls and enclosing sidewalls and an open upper receiving end and an open lower discharging end, said front wall being inclined to the vertical, said inclination being such as to retard but not prevent the flow of the stock under gravity action, with a series of steps in the front wall of the sinter pass chute, having risers between adjacent steps, a series of sinter pressure rollers in the rear wall of the sinter pass chute, said steps in the front wall of the sinter pass chute being so connected at each riser to form a continuous wall, a series of stepped plates, in the rear wall of said sinter pass chute said plates in the rear wall being separated by said pressure rollers, the rear plates being parallel to the steps in the front wall and at substantially the same spacing from steps in the front wall, with the inclination of the front and rear wall such that the force of gravity acting on the stock and sinter will exceed the combined resistance forces due to action on the front and rear walls, and that of the rollers.

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