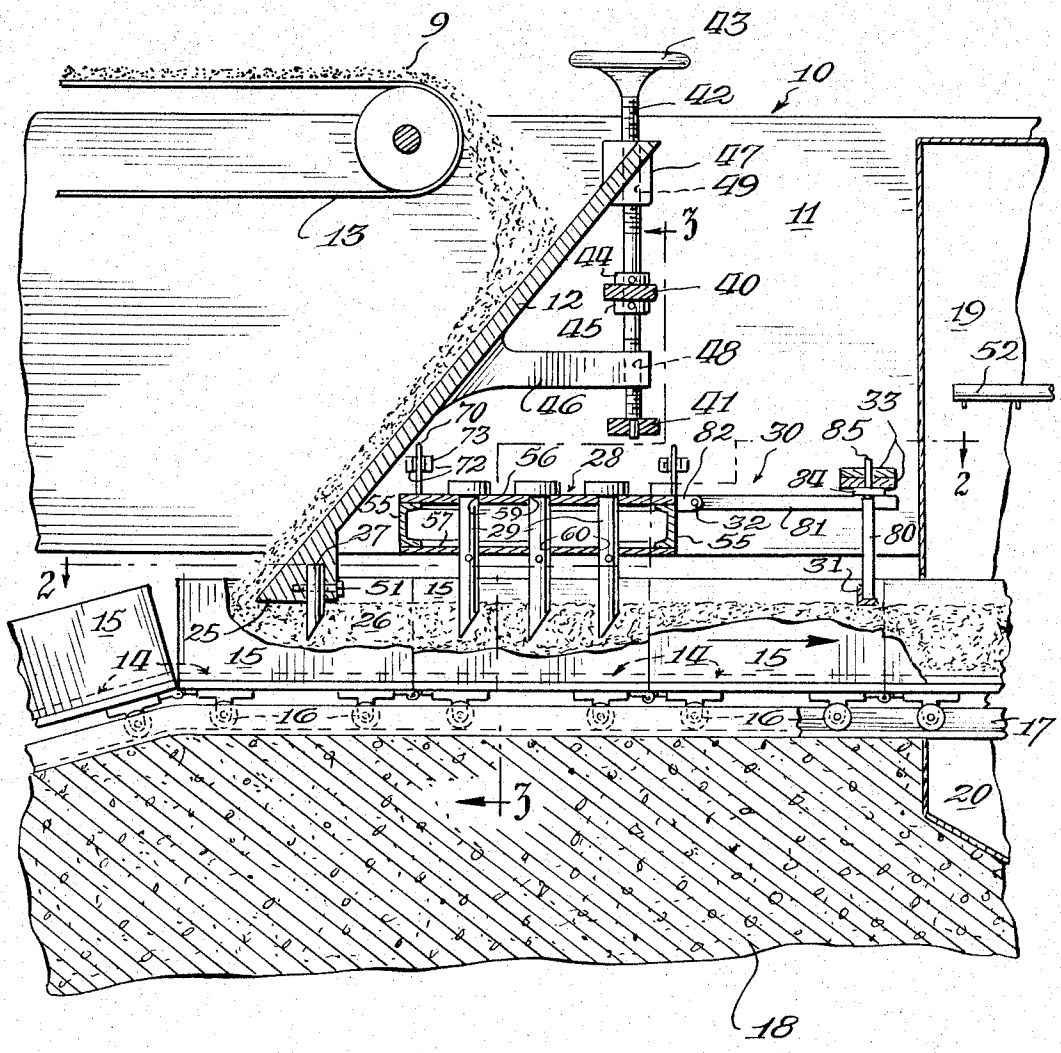
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SINTERING APPARATUS

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Fig. 1



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Fig. 2

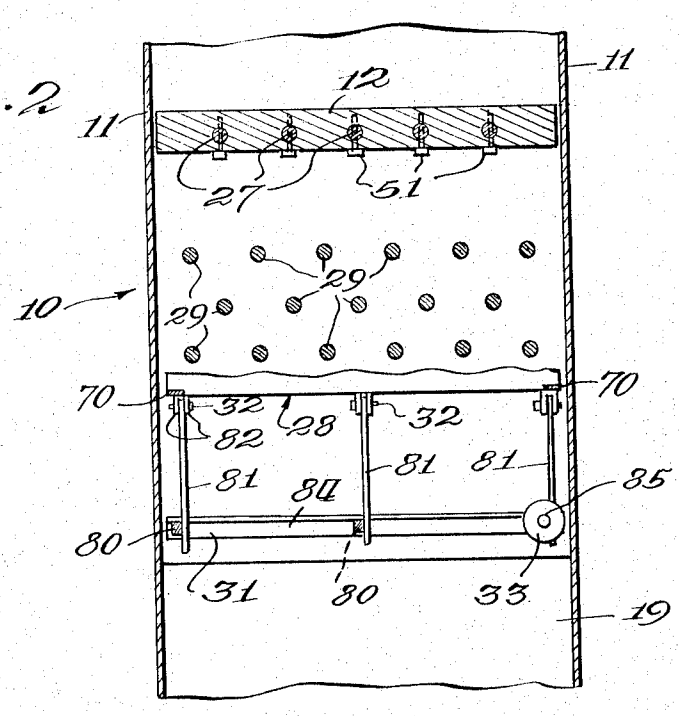
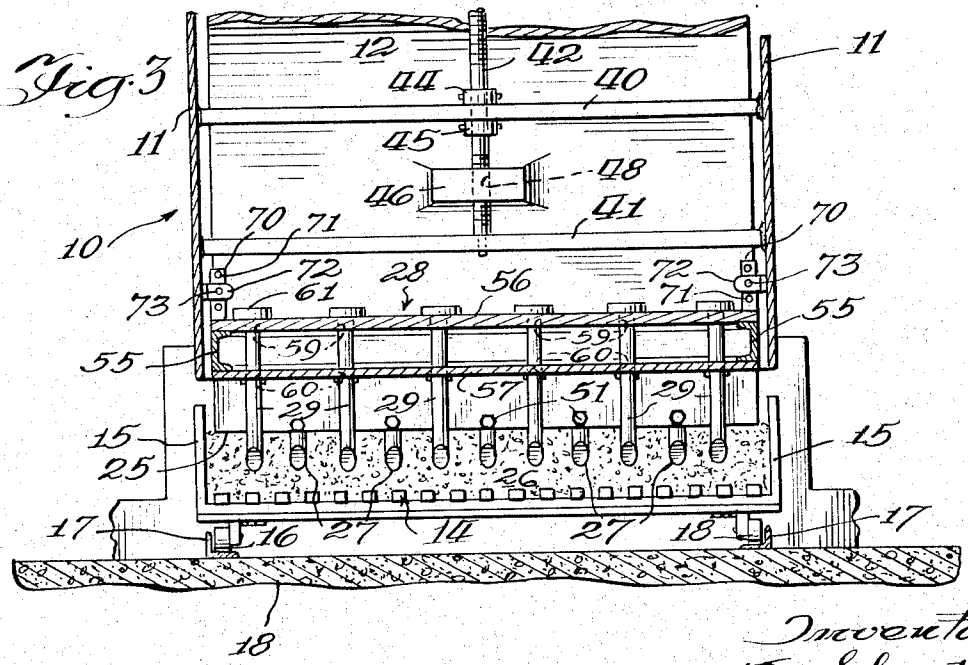


Fig. 3



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SINTERING APPARATUS

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The present invention relates generally to sintering machines, of the down-draft type, in which a bed of material to be sintered is moved continuously longitudinally through the sintering machine; and more particularly to a sintering machine including means for providing a relatively fluffy, low-density bed of material to be sintered while at the same time maintaining the top of the sinter bed level across the entire width of the bed as it moves through the sintering machine.

A sintering machine of the type described above is used, typically, in steel mills to form iron ore into a porous clinker for smelting. Very fine iron ore is delivered from a crusher to grate means mounted for movement longitudinally through the sintering machine. The moving grate carries the bed of very fine ore under an igniting furnace where a draft of air is sucked downwardly through the material on the grate to burn out unwanted constituents from the material and form a clinker.

In order to produce a uniformly sintered product it is desirable that all portions of a bed of material, across the width of the bed, be subjected to the same amount of sintering. To decrease the time necessary for a given amount of sintering, it is desirable that the material be in a relatively fluffy or low-density state when the material is ignited. The denser the bed, the longer it takes to burn out a given amount of unwanted constituents.

In sintering machines to which the present invention relates generally, very fine ore material is directed onto the moving grate by deflecting means extending downwardly toward the moving grate and including a lowermost edge, extending laterally across the sintering machine, which edge serves the function of initially determining the level or height of the bed of material to be sintered. This edge and the grate respectively define the upper and lower ends of an entrance for material to be sintered. Although this lowermost edge imparts a uniform level to the bed of material across the width thereof, it also causes unwanted packing or increased density of the bed of material.

To overcome this packing, there is provided, in accordance with the present invention, a plurality of laterally spaced finger means, extending downwardly toward the grate means, substantially below the lowermost edge. These finger means restrict the amount of material which can pass through the entrance and decrease the density of the material as it moves past the finger means in a downstream direction.

The fingers form laterally spaced longitudinally extending ridges and furrows in the bed of material. These ridges and furrows are undesirable because, during the burning of the material, they cause non-uniform sintering of the bed across the width thereof. This is because the depth of the bed is greater along the ridges and less along the furrows, rather than being uniform across the width of the bed. Accordingly, means are provided, in accordance with the present invention, to uniformly level the ridges and uniformly fill in the furrows without substantially increasing the density of the bed of material. Therefore, when a bed treated in accordance with the present invention is subsequently ignited and subjected to a downdraft, sintering of the bed of material is uniform across the width thereof.

Other features and advantages are inherent in the structure claimed and disclosed or will become apparent to those skilled in the art from the following deailed description in conjunction with the accompanying diagrammatic drawings wherein:

FIGURE 1 is a fragmentary sectional view of a sintering machine in accordance with the present invention;

FIGURE 2 is a sectional view taken along line 2—2 in FIGURE 1; and

FIGURE 3 is a sectional view taken along line 3—3 in FIGURE 1.

Referring to the figures, there is illustrated an embodiment 10 of a sintering machine constructed in accordance with the present invention. Sintering machine 10 includes side plates 11 between which is mounted a plate or deflecting means 12 for directing material to be sintered 9 from a conveyor 13 downwardly toward grate means 14 having sides 15 and wheels 16 mounted on rails 17 supported by foundation 18, for movement longitudinally through an ignition zone or chamber 19 located downstream of deflecting means 12 and having burner means 52. Located below grate means 14, downstream of deflecting means 12 is a suction box 20 for drawing air downwardly through grate means 14. As described up to this point, the sintering machine is essentially of conventional construction.

Deflecting means 12 terminates at a lowermost edge 25 which determines the upper level or depth of the bed 26 of material to be sintered. Lower edge 25 and grate means 14 respectively define essentially the upper and lower ends of an entrance for material to be sintered (FIG. 3). However, lower edge 25, in addition to determining the depth of the bed also causes packing of the material in bed 26. This packing is undesirable because it increases the length of time required to burn out a given amount of unwanted constituents from the bed of material.

To loosen the density of the bed and to render it fluffier, a first set of fingers 27 are attached to the deflecting means 12, downstream of lowermost edge 25. Fingers 27 extend downwardly from lower edge 25 across the entrance for the material to be sintered and restrict the amount of material which can pass through the entrance during movement of the grate means. Upon passing finger means 27, the material has room to spread out to fill in the spaces previously occupied by the finger means 27; and this decreases the density of the bed and increases its porosity. Also provided to increase porosity or the fluffiness of the bed of material are additional finger means 28, located downstream of the first set of fingers 27. Additional finger means 28 includes a plurality of fingers 29 arranged in a plurality of rows each having a plurality of laterally spaced fingers 29, each of which is offset relative to a finger 29 in an adjacent row (FIG. 2); and the first row of fingers 29 is offset relative to fingers 27 (FIGS. 2 and 3), thus urging the material to spread out and fill that part of a space, previously occupied by finger 27, and which has not already been filled before the material reaches the first row of fingers 29.

After the bed of material 26 has moved downstream of the row of fingers 29 furthest downstream, the bed has a plurality of longitudinally extending, laterally spaced, alternating furrows and ridges. These furrows and ridges are undesirable because they interfere with uniform sintering of the bed of material. Accordingly, leveling means 30 are provided, downstream of additional finger means 28, for filling in the furrows and leveling off the ridges without substantially increasing the density of the bed of material.

Leveling means 30 includes a bar 31 extending laterally relative to the sintering machine, and means mounting bar 31 for movement about the axis of pins 32 also extending laterally relative to the sintering machine but located upstream of bar 31. Leveling means 30 also includes removable weights 33 for urging bar 31 downwardly and about the axis of pins 32 toward grate means 14. The

amount of removable weights 33 required depends upon the size and consistency of the material in bed 26. At any rate, weights 33 should not be so great as to cause packing of bed 26 while it undergoes leveling by bar 31.

Describing sintering machine 10 now in greater detail, referring to FIGURES 1 and 3, extending between side plates 11 are a pair of vertically spaced horizontal cross members 40, 41. Mounted on cross member 41 and extending through cross member 40 is a threaded shaft 42 having a top handle 43. Fixedly mounted on shaft 42, on respective upper and lower sides of cross member 40 are a pair of collars 44, 45 each having a surface bearing against a respective upper and lower surface of cross member 40. Shaft 42 also extends through a threaded opening 48 in an arm 46 attached to deflecting means 12 and through threaded opening 49 in a collar 47 also attached to deflecting means 12. By virtue of the construction described in the preceding paragraph, deflecting means 12 together with lower edge 25 and fingers 27 may be raised or lowered by turning handle 43 of shaft 42. In this manner the upper level or depth of bed 26 may be controlled by the vertical adjustment of lower edge 25.

Fingers 27 are removably mounted on deflecting means 12, downstream of lower edge 25, by pins 51. Fingers 29 are removably mounted on additional finger means 28 by means now to be described.

Additional finger means 28 includes a box-like frame 55 composed of channel-shaped members, and upper and lower plates 56, 57 respectively, each having vertically aligned openings 59, 60 respectively. Fingers 29 extend through openings 59, 60 and include heads 61 for maintaining fingers 29 in place. By removably mounting fingers 29 in the manner just described, maintenance and repair of the fingers are facilitated, as well as replacement by fingers of varying length should a different length of finger be needed. The length and size of a finger 29 is dependent upon the type of material in bed 26.

The additional finger means 28 is mounted for vertical adjustment by means now to be described. Located at both the upstream and downstream ends of additional finger means 28 are a pair of vertically extending clips 70 each having a plurality of openings 71. Clip 70 extends between a pair of brackets 72 cooperatively, removably mounting a pin 73 normally received in one of the openings 71 in clip 70. Raising or lowering additional finger means 28 changes the opening 71 in clip 70 which will receive the pin 73 mounted on brackets 72. In this manner additional finger means 28 may be vertically adjusted.

Describing the construction of leveling means 30 now in greater detail, bar 31 is suspended by vertical members 80 from longitudinal, substantially horizontally extending members 81, each in turn pivotally mounted on a pin 32 extending between a pair of brackets 82 attached to the downstream end of box-frame 55 of additional finger means 28. Vertical adjustment of finger means 28 also effects a vertical adjustment of the axis of pins 32.

Mounted atop longitudinal extending members 81 is a plate 84 and extending upwardly from plate 84 are rods 85 which extend through openings in weights 33 to removably mount weights 33 atop plate 84.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

What is claimed is:

1. In a sintering machine:
grate means;
means mounting said grate means for movement longitudinally through the sintering machine;
means for introducing material to be sintered onto said grate means;
means for controlling the depth of material introduced onto the grate means;
said depth-controlling means including means defining an edge extending laterally relative to the sintering machine and spaced above the grate means;
said edge and said grate means respectively defining the upper and lower ends of an entrance for material to be sintered;
means, extending across said entrance, for restricting the amount of material which can pass through said entrance during movement of the grate means;
and means, located upstream of the place where the sintering operation occurs, for causing material which has moved past said restricting means to spread out and occupy the space previously occupied by said restricting means.

2. In a sintering machine as recited in claim 1 wherein said restricting means comprises:
a plurality of laterally spaced finger means extending downwardly from the upper end of said entrance.

3. In a sintering machine as recited in claim 1:
a leveling bar, extending laterally relative to the sintering machine and located downstream of said restricting means;
means mounting said bar for pivotal movement about an axis extending laterally relative to the sintering machine and located upstream of the bar;
and means mounting said axis for vertical adjustment.

4. In a sintering machine as recited in claim 1 and comprising:
means mounting the upper end of said entrance and said restricting means for vertical movement together as a unit.

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