July 2, 1935. W. R. ZEHNER 2,006,936

METHOD AND MEANS FOR PRODUCING FINE SINTER RETURNS

Filed April 18, 1934 3 Sheets-Sheet 1

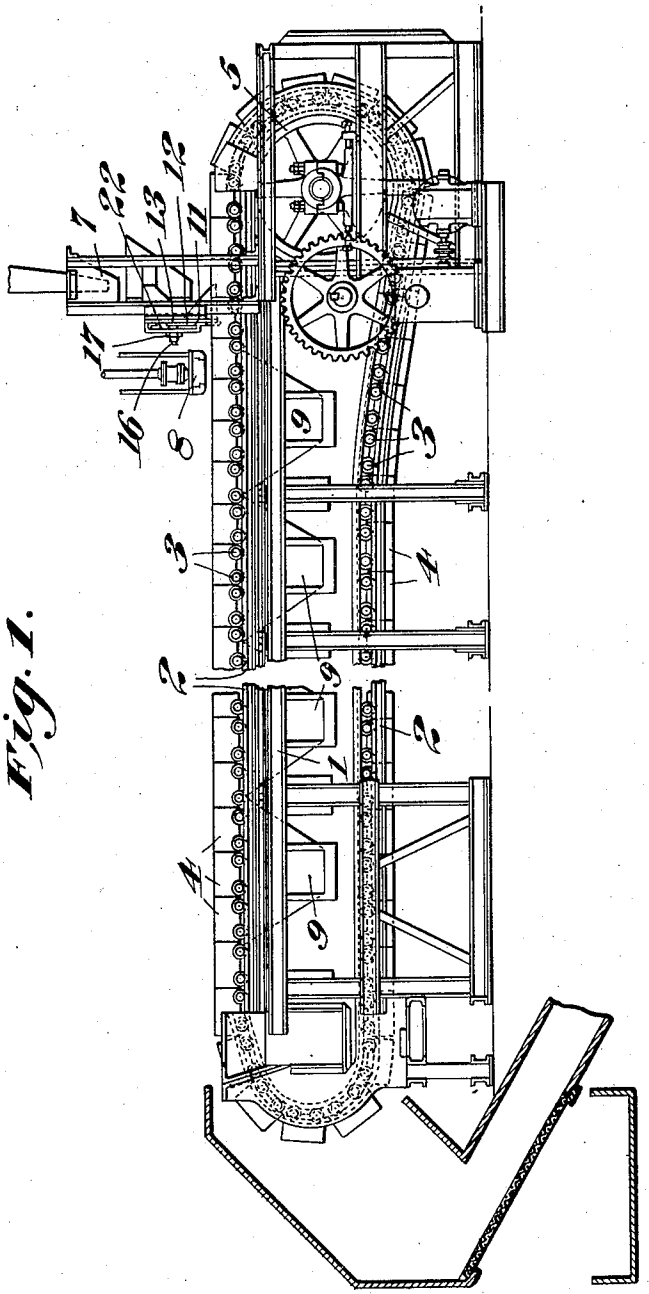


Fig. 1.

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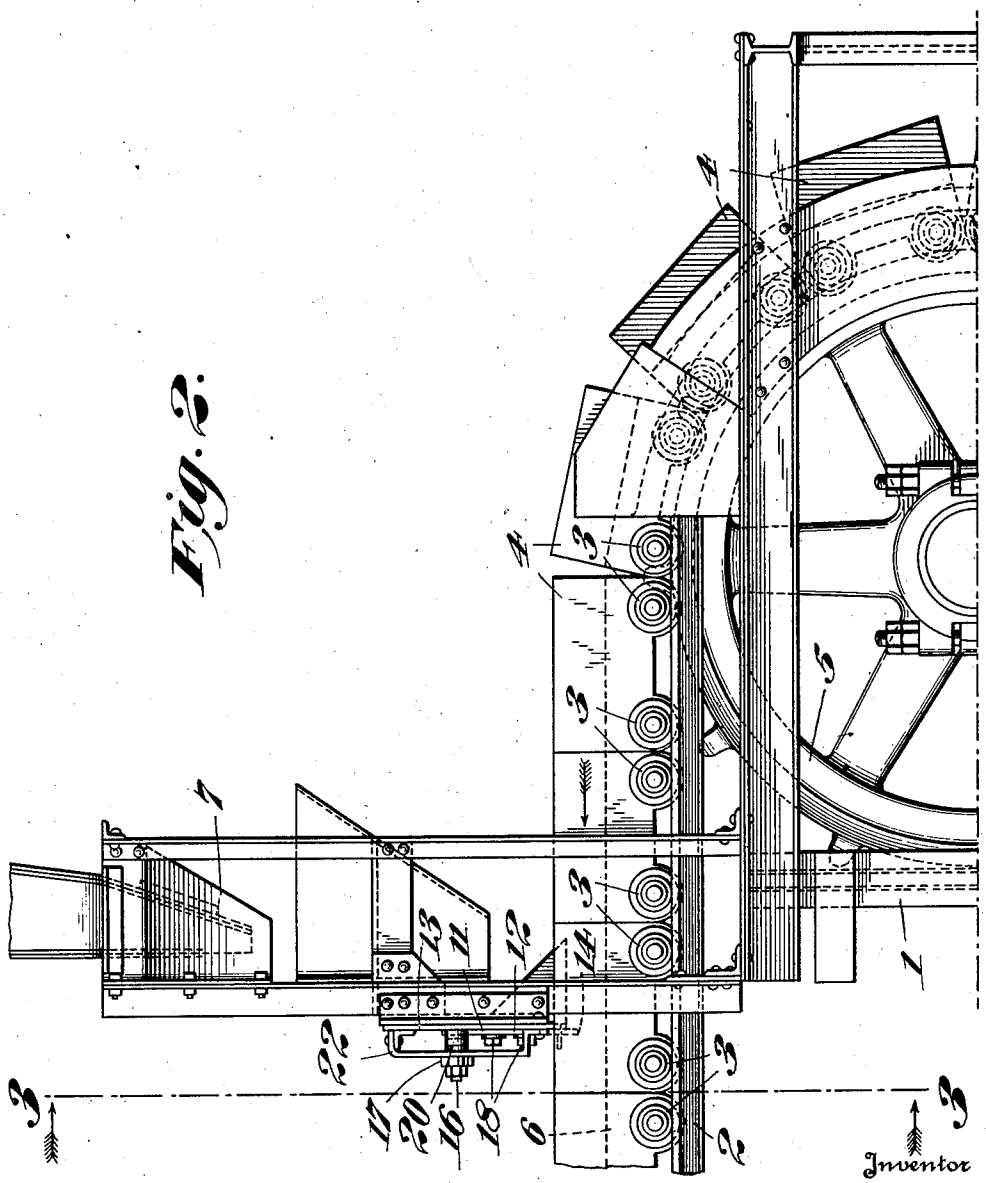
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Fig. 2.



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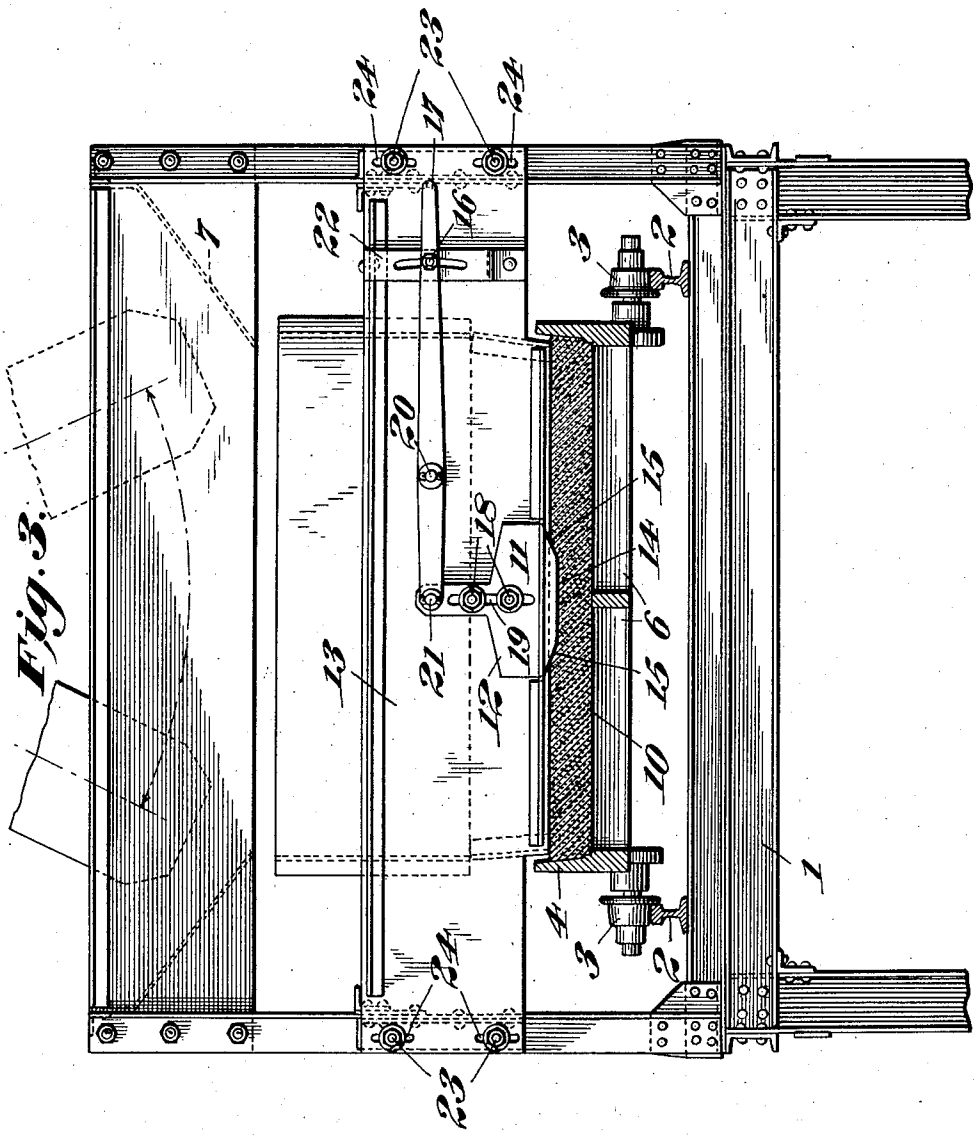


Fig. 3.

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Patented July 2, 1935 2,006,936

UNITED STATES PATENT OFFICE

2,006,936

METHOD AND MEANS FOR PRODUCING FINE SINTER RETURNS

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Application April 18, 1934, Serial No. 721,105

14 Claims. (Cl. 266—21)

The present invention relates to sintering machines for sintering finely divided flue dust and other materials containing combustible ingredients, and has to do with a method for producing more fine sinter returns than is normally produced by ordinary practice.

In the Dwight and Lloyd type of sintering machine, to which my invention is particularly adapted, a train of separate pallets carrying the material to be sintered, are moved along an endless track, the pallets on the upper run of the track traveling beneath a feed hopper from which the material is discharged onto the grate sections of the pallets. The pallets then pass beneath an ignition device which serves to ignite the material. During the continued travel of the pallets along the upper run of the track, they pass above a succession of wind boxes by means of which a down draft is produced through the material so that combustion is propagated downwardly through the burning mass.

In general, the material to be sintered consists of fine particles commonly designated as fines, and relatively large or coarse particles called aggregates, these materials being moistened, intermixed and deposited upon the grates of the pallets. The purpose of the return fines is to increase the porosity of the mass to be sintered so that free passage of air may be had throughout the mass and in sufficient quantity to assure quick and proper sintering during the travel of the grates to the discharge end of the machine.

In normal operation the amount of sinter returns is less than the amount needed to make the best quality of sinter when operating at a maximum sintering rate.

The present or usual method of making additional returns—that is more than will normally come back for any given mixture—is to slow the machine down so that the sinter is more completely chilled as it approaches the discharge end. This additional chilling, by giving the suction fans more time to sinter and chill the bed, produces a large number of contraction cracks throughout the mass which makes the sinter cake more friable and causes it to break up more during the discharge and subsequent screening operations. However, this method is only temporary and it is not possible or desirable to adjust the operation to do this intermittently. A much better method is one which produces the desired sinter fine returns at a regular or maximum rate, so that the amount of returns is always constant for any given mixture.

It is not desirable to put any apparatus on the sinter bed to crush the chilled or score the hot sinter and so make the desired returns, as either of these methods impose too great a mechanical strain on the pallets and driving mechanism.

I have discovered that by grooving the top surface of the moistened bed of material prior to its ignition, and downwardly aspirating air through the ignited bed to promote combustion, that the grooved portions sinter through before the adjacent sections in the same cross section of the bed. Furthermore, the grooved sections being of reduced thickness will be quenched by the action of the air passing therethrough to a greater extent than the adjacent thicker portions, which makes the thin section friable and more easily broken up when discharged, thus making more fine sinter returns available.

An object of my invention is to provide a simple and efficient means for producing extra sinter return fines to be mixed with the raw material to be sintered.

Another object of my invention is to provide means for grooving the surface of the bed prior to ignition, and which can be applied to present machines of the character described with but little cost.

A further object of my invention is to provide means for increasing the depth and width of the groove in the bed of material without interfering with the operation of the machine.

A still further object is to provide means so positioned upon the machine that it will produce a thin section of bedded material without imposing severe mechanical strains upon the pallets and without perceptible additional load upon the driving mechanism.

Further objects and advantages of the invention will appear from the following description and claims when taken in connection with the accompanying drawings, in which:

Figure 1 is a side view of a sintering machine illustrating my invention as applied thereto.

Figure 2 is a fragmentary side view of the hopper end of the machine illustrated in Fig. 1 on an enlarged scale.

Figure 3 is a section taken on line 3—3 of Figure 2.

While I have illustrated my invention as applied, by way of example, to a Dwight and Lloyd type of sintering machine, it is to be understood that in its broader aspects it may be used with other types of machines well known in the art.

The sintering machine comprises a main frame 1 to which are secured rails 2 forming tracks for the reception of rollers 3, of pallets 4 of known

type. This machine has an endless track, comprising an upper run and a lower run, the pallets being elevated from the lower run to the upper run by any suitable means, such as sprockets 5. The pallets are propelled along the upper run by said sprocket wheels and are each provided with a grate 6 of any suitable or preferred type, the pallets on the upper run being in contact so as to form a continuous traveling grate structure. As the pallets travel along the upper run of the track they first pass beneath a feed hopper 7, by means of which the material to be sintered is delivered to the pallets, after which the pallets pass beneath a suitable device 8 for igniting the material. The pallets in their continued travel then pass over wind boxes 9 which are connected to suitable suction means for creating a down draft at atmospheric temperature through the mass or layer of material 10 on the pallets, whereby combustion is propagated downwardly therethrough.

In the embodiment of the invention illustrated in Figs. 1 to 3, inclusive, the means for producing additional sinter returns is indicated in its entirety at 11, and comprises a flat metal plate or plow 12 which extends transversely of the sinter bed and projects downwardly into the top surface thereof as shown more clearly in Fig. 3. This plow is positioned against the outside face of the leveling plate 13 and is arranged for vertical sliding movement relative to pallets 4 and material 10. The plow has a straight bottom edge 14 which tapers outwardly and upwardly as indicated at 15, this taper being sufficiently flat so as to form a groove in the surface of the bedded material of such inclination that the material will not tend to roll back into the groove after it has once been formed. In other words the groove in the material is formed with inclined sides of slightly less angle than the angle of repose of the material. In this manner a groove of definite shape can be produced and the resulting effect of the groove maintained constant for any particular mixture of material. It will further be noted that as the plow is lowered relative to plate 13, the width of the groove will also be increased, and conversely when the plow is raised. The extent of the groove is determined by trial for different mixtures, after which the position of the plow is secured by means of the locking bolt 16 on the adjusting lever 17. The plow may be slidably mounted against the leveling plate by means of loose fiting bolts 18 passing through the slot 19 of the plow and secured to plate 13. The adjusting lever is pivotally secured to the leveling plate at 20 and its end is likewise hingedly attached to the plow at 21. The guide bracket 22 is secured to the leveling plate and moves therewith. The leveling plate is adjustably mounted by means of bolts 23 which pass through the slots 24 of the plate. Obviously, the leveling plate may be adjusted without disturbing the setting of the plow relative to the plate because the whole plow assembly is carried by the leveling plate.

While I have shown a plow for making but a single groove in the surface of the moistened material, it will be understood that this is subject to modification, whereby more than one groove may be formed, or that means other than that shown may be used for forming the groove as will be apparent to those skilled in the art. The mechanical details of the plow may be changed to suit conditions when applied to a machine now in use.

The material to be sintered, comprising fine and coarse material including finely prepared fuel, is deposited upon the grate structure from hopper 7 where it is carried forward until it reaches the leveling plate 13 which is set to produce a bed of definite thickness. This plate levels the entire top surface of the material on both sides of the plow 12. As the material moves past the plow, a groove or series of grooves is formed extending longitudinally of the bed. The material thus leveled and grooved, then passes beneath the ignition device 8 where it is ignited, the grooved or thinner section of the bed sintering through before the balance of the sinter cake is completely sintered at the discharge end of the machine. This thinner section is therefore exposed to additional chilling due to the quenching action of the cool air being drawn downwardly through the cake by the action of the wind boxes, thus producing a large number of contraction cracks throughout the mass, making the cake more friable, and which breaks up more during the discharge and screening operations so as to produce extra returns for subsequent mixing with the material to be sintered. Thus by controlling the depth of the thin sections of the bedded material, I am enabled to produce the quantity of sinter returns desired, without strain or additional power consumption in the machine. This has a tendency to lengthen the life of the pallet grate bars over former methods of sintering.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In the sintering of finely divided material having fuel uniformly mixed therewith and bedded on a sintering machine, a method of controlling the proportion of sinter returns produced, which comprises first grooving the surface of the bed to a predetermined depth, then igniting consecutive surfaces of the bed, downwardly aspirating air through the ignited bed to promote combustion of its fuel throughout its depth, the grooved portions thereby burning through before the adjacent sections in the same cross section of the bed, and air quenching said grooved portions by continuing the downward aspiration of air therethrough until the adjacent portions have burned through, the air quenched portions of the bed determining the proportion of sinter returns produced.

2. In the sintering of finely divided material having fuel uniformly mixed therewith and bedded on a sintering machine, a method of controlling the proportion of sinter returns produced, which comprises reducing the thickness of the bedded material at certain portions of its cross section, prior to its ignition and consequent sintering under the downward suction of air therethrough, the degree of said reduction being proportioned to the quantity of sinter returns desired.

3. In the sintering of finely divided material having fuel uniformly mixed therewith, a method of controlling the proportion of sinter returns produced, which comprises bedding the material on a sintering machine so as to present an undulating top surface having thick and thin bed portions transversely of the bed prior to its ignition, said thin sections being proportioned to the quantity of returnable fines desired, then igniting said undulating surface and sintering the material by the downward suction of air therethrough.

4. The method of producing fine sinter returns, which comprises bedding finely divided material having fuel uniformly mixed therewith on a sintering machine, then leveling and grooving the upper surface of said material to definite thick-

nesses, and then igniting and sintering the material.

5. The method of producing fine sinter returns, which comprises feeding moistened material to be sintered on a sintering machine, then forming a bed of the material having thick and thin sections of definite depths, and then igniting the surface of the material and passing air through the ignited material in the direction of burning to embrittle and fracture the thin section of the bed to a greater extent than the thick section, whereby extra returns are obtained from the thin section when breaking the material.

6. The method of producing fine sinter returns, which comprises first feeding moistened material to be sintered to the grates of a sintering machine so as to present an undulating top surface forming thick and thin sections of material, the depth of said thick and thin portions being uniformly constant throughout the bed, then igniting consecutive surface portions of the bed, downwardly aspirating air through the ignited bed to promote combustion throughout its depth and to quench the thin section of the bed until the thick sections have burned through.

7. The method of producing fine sinter returns, which comprises feeding finely divided and coarse material including fuel on a sintering machine, then leveling the upper surface of the material to form a bed and reducing the thickness of the bedded material at certain portions of its cross section to definite thickness prior to its ignition, then igniting and sintering the material under the downward action of air at atmospheric temperature, the thin portion of the bed being proportioned to the quantity of returnable fines desired.

8. The method of producing fine sinter returns, which comprises bedding moistened material having fuel uniformly mixed therewith on the traveling grate of a sintering machine, then forming a bed of the material of different but definite thicknesses prior to ignition, then igniting the surface of the material thus formed, passing air at atmospheric temperature downwardly through the ignited material to promote combustion of its fuel throughout its depth and to quench the thinner portions of the material to a greater extent than the thicker portions, and then breaking up the sintered material.

9. In combination in a sintering machine comprising a traveling grate structure, means for depositing upon the grate a bed of material to be sintered, means for leveling the upper surface of the bedded material, means for igniting the upper surface of the material, and means disposed rearwardly of the igniting means adapted to groove the upper portion of the bed to definite shape and held against movement in the direction of travel of the grate structure.

10. In combination in a sintering machine comprising a traveling grate structure, means for depositing upon the grate a bed of material to be sintered, means for igniting the upper surface of the bedded material, means positioned to the rear of said igniting means for leveling the upper surface of the material prior to ignition, means for drawing air downwardly through the ignited material, and means carried by the leveling means for grooving the upper surface of the material to predetermined depth and width prior to ignition.

11. In combination in a sintering machine comprising a travlling grate structure, means for depositing upon the grate a bed of material to be sintered, means for leveling the upper surface of the material, a plow member projecting below and mounted in cooperative relationship with said leveler for forming a longitudinal groove of definite shape in the upper surface of the material upon movement of the grate structure, and means for igniting and sintering the grooved material said plow being positioned rearwardly of the igniting means.

12. In combination in a sintering machine comprising a grate structure, means for depositing upon the grate a bed of material to be sintered, means for leveling the upper surface of the material, and a plow member adjustably mounted on said leveler for grooving the upper surface of the leveled material, means positioned ahead of said leveler and said plow for igniting the upper surface of the grooved material, and means for drawing air downwardly through the ignited material.

13. In combination in a sintering machine comprising a traveling grate structure, means for depositing upon the grate a bed of material to be sintered, means for leveling the upper surface of the material, a plow member mounted in cooperative relationship with said leveler for forming a longitudinal groove of definite shape in the upper surface of the material upon movement of the grate structure, said plow projecting below said leveling means, said projecting portion being of greater width than depth, means for igniting the grooved material, and means positioned ahead of said plow for downwardly aspirating air through the ignited material.

14. In the sintering of finely divided material having fuel and coarse particles mixed therewith to produce a porous mixture and bedded on a sintering machine, a method of controlling the proportion of fine sinter returns, which comprises first leveling and grooving the surface of the bedded material without packing effect to form thick and thin sections transversely of its cross section, said thin sections governing the quantity of returnable fines desired, then successively igniting the surface of the material and aspirating air downwardly therethrough to continue combustion, completely burning through the thinned sections of the bed before the thicker sections are fully burned, continuing the downward aspiration of air through the bed after the thinned sections are fully sintered to complete the burning of the thicker sections and to chill and render friable the thinned sections to a greater extent than the thicker sections, and finally breaking up the sintered material and separating the extra amount of fine returns thus produced from the coarse.

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