July 3, 1945. M. L. COVER 2,379,418

SINTERING MACHINE

Filed Nov. 9, 1943 2 Sheets-Sheet 1

Fig. 1.

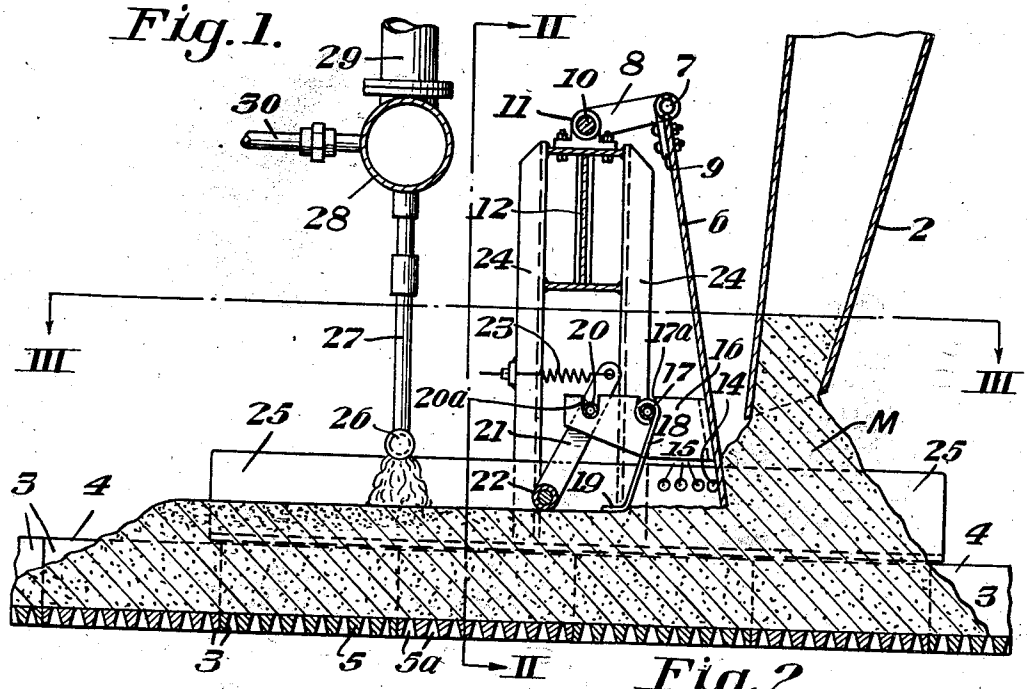
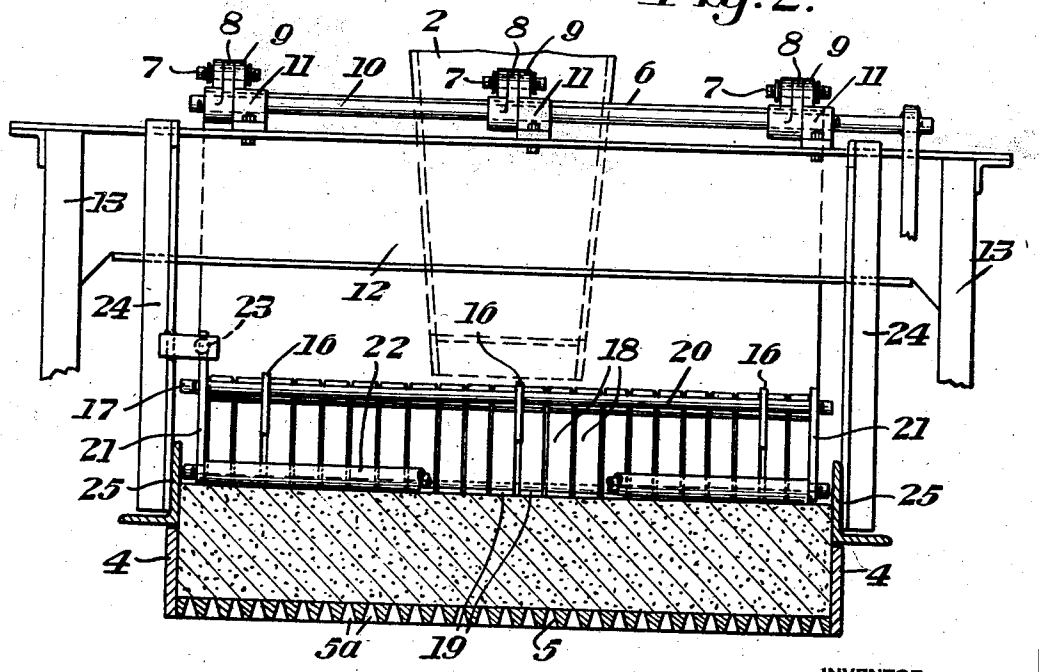


Fig. 2.



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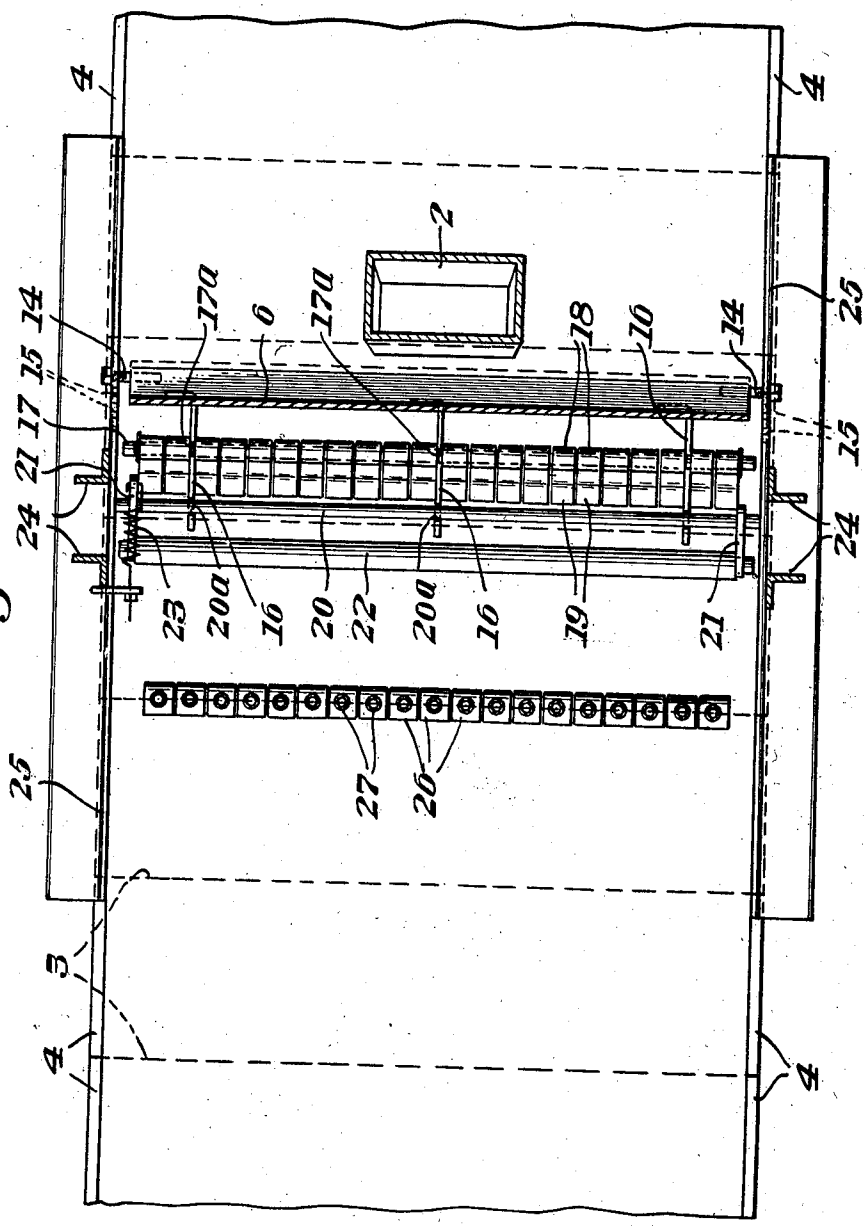


Fig. 3.

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UNITED STATES PATENT OFFICE

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SINTERING MACHINE

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14 Claims. (Cl. 266—21)

The present invention relates to sintering machines for sintering finely divided ore, flue dust and materials containing combustible ingredients. More particularly, it relates to improvements in such machines which materially increase the capacity thereof and at the same time provide a suitable bed of material to be sintered without the necessity of increasing the size of the machine or in any way interfering with the operation thereof.

In sintering machines the material to be sintered is deposited upon a grate and is ignited, after which combustion is propagated through the mass by causing the passage of an air current therethrough. In the well-known Dwight and Lloyd type of sintering machine, to which the present invention is particularly adapted, a train of separate pallets carrying the material to be sintered is 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 burners which serve 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 mass. At the discharge or delivery end of the machine, the sintered material is discharged from the pallets.

In general, the material to be sintered consists of fine particles, commonly designated as "fines," and relatively large particles, usually designated as "aggregates," these materials being intermixed and deposited upon the grate of the pallet. Each pallet has side walls to retain the fines and aggregates on the grate portion thereof. These side walls ordinarily extend slightly above the bed of material to be sintered so that the bed of material will be of substantially uniform thickness from one side to the other. Where a thicker bed of material is desired, the side walls of the pallets may extend to a greater height above the grates thereof, but there are limits beyond which it is impracticable to go in this respect. If an attempt is made to increase the height of the side walls of the pallets, operating problems are created and the cost of the machine and the cost of operation thereof are materially increased. Consequently, it has heretofore been deemed necessary to utilize rather shallow pallets and, as a consequence, the bed of material to be sintered is necessarily thin.

By the present invention I provide a sintering machine which will permit the sintering of a relatively thick bed of material without any corresponding increase in the height of the side walls of the pallets. Where the present invention is employed, a bed of material may be sintered which extends a substantial distance above the top of the sides of the pallets, and this is accomplished without any material increase in the cost of the machine and without materially increasing the production costs over those which would prevail when sintering a thin bed of material which does not extend above the top of the side walls of the pallets. Moreover, where the present invention is employed it may be possible to even dispense with pallets having side walls and to utilize instead a flat grate structure without any side walls, the side guards of my invention being adequate to prevent the material from flowing over the sides of the grate structure during the time it remains in a non-adherent condition.

Considerable difficulty has been encountered heretofore in providing a bed of material of such character that uniform sintering throughout the bed will be obtained. The material is not deposited uniformly on the grates of the pallets by the spout leading from the bin containing the material to be sintered. Consequently, it is necessary to provide means for leveling the deposited material and for breaking up any lumps thereof and particularly those adjacent the surface. I have found that even where such leveling means is provided there is a marked tendency for the flame to enter the bed non-uniformly with the result that a channeling action takes place and the particles do not cohere properly. I have overcome this difficulty by the provision of means located between the feeding spout and the burners for compacting the surface of the material. As a consequence, in my machine a uniformly level bed of material which is compacted somewhat at the surface is provided before the material reaches the igniting burners. The resulting blocks of sintered material are, therefore, uniform in thickness and the combustion therein has been carried out uniformly.

In the accompanying drawings I have shown a preferred embodiment of my invention. It will be understood, however, that my invention may be otherwise embodied and that various types of side guards, leveling plates and other leveling means may be utilized and the advantages of my invention obtained.

In the accompanying drawings,

Figure 1 is a longitudinal sectional view through the charging end of a sintering machine embodying my invention, the mechanism for

moving the grate structure being omitted;

Figure 2 is a transverse section taken along the line II—II of Figure 1; and

Figure 3 is a horizontal section taken along the line III—III of Figure 1.

In the embodiment shown in the drawings, the material M to be sintered, which comprises finely divided ore, flue dust and other material containing combustible ingredients, is discharged from the feed spout 2 onto pallets 3 which form a traveling grate structure. The apparatus for moving the pallets continuously beneath the spout is not shown in the drawings as it does not constitute any part of the present invention. A traveling grate structure and mechanism for moving it are disclosed in Shallock patents, Nos. 1,764,696 and 1,856,270, and reference is hereby made to said patents for a full description of apparatus of this character. The pallets 3 have upwardly extending side walls 4 which extend above the bottom or grate 5. The bottom 5 of each pallet is provided with a plurality of holes 5*a* through which air is drawn by means of wind boxes (not shown) which are positioned beyond the igniting burners.

After the material M has been deposited upon the pallets it is carried forwardly beneath a leveling plate 6 which serves to level the top surface thereof so as to present a body of material for sintering which is of substantially uniform thickness. The leveling plate 6 is pivotally supported on pins 7, each of which is carried by an arm 8 of a clevis 9. Each clevis is carried by a rod 10 which is mounted in bearings 11 supported by a transversely extending beam 12. The transversely extending beam 12 is supported by means of upwardly extending plates 13 which are carried on the supporting structure.

The leveling plate 6 may be moved to any suitable position depending upon the desired depth of the material to be sintered. Pins 14, which are mounted in holes 15 in side plates or angles 25, hold the leveling plate in any desired position. A plurality of spaced holes 15 are provided in each of the side plates or angles 25 so that the plate may be adjusted to a variety of positions.

Leveling members or scrapers are also provided for leveling the body of material to be sintered. These scrapers also serve to break up any large pieces of material at the surface of the body of material to be sintered. Spaced brackets 16 are welded to the leveling plate and extend forwardly thereof. These spaced brackets carry a shaft 17 in notches 17*a*. The leveling members or scrapers 18 are pivotally carried by this shaft 17 and extend downwardly into engagement with the top surface of the body of material. Each leveling member is provided with a forwardly extending foot portion 19 which bears against the top surface of the material.

A roller 22 is also provided for leveling and slightly compacting the surface of the material to be sintered. A shaft 20 is carried by notches 20*a* in the spaced brackets 16, and this shaft carries downwardly extending, pivotally mounted arms 21 on which the roller 22 is mounted. Ordinarily the weight of the roller is adequate to sufficiently level and compact the material, but, in order to hold the roller in position on the material and press it downwardly, a spring 23 may be utilized. By virtue of the fact that the roller effects a compacting of the material at and adjacent the surface of the bed, the flame takes hold of the material uniformly and a uniformly sintered, coherent product results.

A longitudinally extending side guard or angle 25 is mounted at each side of the traveling pallets and these side guards extend vertically above the top of the side walls of the pallets. They extend longitudinally from a position just behind the spout 2 to a position a short distance beyond the burners for sintering the material. These side guards are stationary and do not move with the pallets. They are supported from downwardly extending angles 24 which are carried by the transverse beam 12. These side guards permit the supplying to the pallets of a greater amount of material than could be otherwise supplied to them because the material extending upwardly above the side walls of the pallets will be held in position on the pallets by these guards.

A plurality of burners 26 are spaced above the material on the pallets at a point beyond the leveling means. These burners are used for igniting the material to be sintered. The burners are mounted at the lower ends of vertically extending pipes 27 which communicate with a header 28 to which gas and air are supplied by pipes 29 and 30.

It is necessary to have the side guards extend a short distance behind the outlet of the spout to prevent any of the material supplied to the grate structure by the spout from flowing laterally over the sides of the pallets. It is also desirable that these side guards extend slightly beyond the burners 26 so that by the time the pallets pass beyond the ends of these guards the material thereon will have become sufficiently coherent that it will not flow laterally over the sides of the pallets even though extending above those sides to an appreciable extent. Of course, the leveling plate, the leveling members or scrapers, and the roller compact the material to some extent and provide a uniform layer of material on the pallets so that even though the side guards do not extend forwardly of the burners to any appreciable extent, the material will tend to adhere together and, to some extent, prevent it from flowing outwardly over the sides of the pallets.

While, in the preferred embodiment shown in the drawings and described above, the stationary side guards are employed as complementary to the usual side walls of the usual pallets, it will be seen that my invention may be employed in connection with a traveling grate structure having no side walls, the stationary guards serving to hold the material on the grate structure until the sintering has proceeded to a sufficient extent to cause the material to cohere sufficiently to prevent it from flowing over the sides of the grate structure. Where the usual side walls of the grate structure are dispensed with, it may be desirable to extend the stationary side guards further along the grate structure beyond the igniting means, but this can be done without materially increasing the cost of such guards.

It will be readily appreciated that the capacity of the ordinary sintering machine is greatly increased by the use of stationary side guards due to the fact that the material can be built up above the side walls to an appreciable extent. It will also be appreciated that this increase in capacity is achieved without the necessity of greatly increasing the cost of the sintering machine or production costs. Moreover, the side walls of the pallets may be dispensed with entirely and, thus, the cost of the machine and operating costs materially reduced.

While I have shown and described a preferred

embodiment of my invention, it will be understood that it may be otherwise embodied within the scope of the appended claims.

I claim:

1. A sintering machine comprising a plurality of pallets forming a traveling grate structure, each of said pallets having a bottom and side walls extending above the bottom, means for feeding material to be sintered to the pallets, and stationary side guards complementing and extending above the side walls of said pallets adjacent the material-feeding means.

2. A sintering machine comprising a plurality of pallets forming a traveling grate structure, each of said pallets having a bottom and side walls extending above the bottom, means for feeding material to be sintered to said pallets, means for igniting the material to be sintered, and longitudinally extending stationary side guards complementing and extending above the side walls of the pallets, said side guards extending from the material-feeding means to a point adjacent the igniting means.

3. A sintering machine comprising a plurality of pallets forming a traveling grate structure, each of said pallets having a bottom and side walls extending above the bottom, means for feeding material to be sintered to said pallets, leveling means extending transversely of the grate structure adjacent the feeding means for leveling the material fed thereto, means for igniting the material to be sintered, side guards complementing and extending above the side walls of the pallets, and means for supporting the side guards adjacent the material-feeding and leveling means.

4. A sintering machine comprising a plurality of pallets forming a traveling grate structure, each of said pallets having a bottom and side walls extending above the bottom, means for feeding material to be sintered to said pallets, leveling means including a leveling plate extending transversely of the grate structure adjacent the feeding means for leveling the material fed thereto, means for igniting the material to be sintered, and longitudinally extending side guards extending above the side walls of the pallets and extending from a point adjacent the material-feeding and leveling means to a point beyond the igniting means.

5. A sintering machine comprising a plurality of pallets forming a traveling grate structure, means for feeding material to be sintered to said pallets, stationary side guards extending vertically above the pallets adjacent the sides thereof, and means for supporting the stationary side guards adjacent the material-feeding means.

6. A sintering machine comprising a plurality of pallets forming a traveling grate structure, means for feeding material to be sintered to said pallets, means for igniting the material to be sintered, stationary side guards extending vertically above the pallets adjacent the sides thereof, and means for supporting the side guards, said side guards extending substantially from the material-feeding means to a point beyond the igniting means.

7. A sintering machine comprising a plurality of pallets forming a traveling grate structure, means for feeding material to be sintered to the pallets, a leveling plate adjacent the feeding means for leveling material fed to the pallets, means for igniting the material on the pallets, stationary side guards extending vertically above said pallets adjacent the sides thereof, and means for supporting said side guards, the guards extending from a point adjacent the material-feeding means to a point beyond the igniting means.

8. A sintering machine comprising a traveling grate structure, means for feeding material to be sintered to said traveling grate structure, igniting means extending transversely of the grate structure for igniting the material thereon, longitudinally extending stationary side guards adjacent the edges of said traveling grate structure and extending vertically above it, and means for supporting said stationary side guards, said guards extending from a point adjacent the material-feeding means to a point on the opposite side of said igniting means, whereby the guards will retain material to be sintered on the grate structure until after it has been ignited and the particles thereof caused to adhere to a sufficient extent to prevent substantial flow thereof from the grate structure.

9. A sintering machine comprising a plurality of pallets forming a traveling grate structure, means for feeding material to be sintered to said pallets, surface compacting means extending transversely of the grate structure, and means for supporting the surface compacting means in contact with the material on said grate structure so that the weight thereof exerts a compacting pressure on material on the pallets.

10. A sintering machine comprising a plurality of pallets forming a traveling grate structure, means for feeding material to be sintered to said pallets, a roller extending transversely of the grate structure, and means for supporting the roller in contact with the material carried by the grate structure so that the weight thereof exerts a compacting pressure on material on the pallets.

11. A sintering machine comprising a traveling grate structure, means for feeding material to be sintered to said traveling grate structure, means extending transversely of the grate structure for igniting the material thereon, longitudinally extending stationary side guards adjacent the edges of said traveling grate structure and extending vertically above it, means for supporting said stationary side guards, said guards extending from a point adjacent the material-feeding means to a point beyond said igniting means, whereby the guards will retain material to be sintered on the grate structure until after it has been ignited and the particles thereof caused to adhere to a sufficient extent to prevent substantial flow thereof from the grate structure, surface compacting means extending transversely of the grate structure, and means for supporting the surface compacting means in contact with material on said grate structure between said side guards and between the material-feeding means and the igniting means.

12. A sintering machine comprising a traveling grate structure, means for feeding material to be sintered to said traveling grate structure, means extending transversely of the grate structure for igniting the material thereon, longitudinally extending stationary side guards adjacent the edges of said traveling grate structure and extending vertically above it, means for supporting said stationary side guards, a roller for compacting material on the traveling grate structure, and means for supporting the roller between said stationary side guards and between the material-feeding means and the igniting means.

13. A sintering machine comprising a traveling grate structure, means for feeding material

to be sintered to said traveling grate structure, means extending transversely of the grate structure for igniting the material thereon, longitudinally extending stationary side guards adjacent the edges of said traveling grate structure and extending vertically above it, means for supporting said stationary side guards, said guards extending from a point adjacent the material-feeding means to a point on the opposite side of said igniting means, whereby the guards retain material to be sintered on the grate structure until after it has been ignited and the particles thereof caused to adhere to a sufficient extent to prevent substantial flow thereof from the grate structure, leveling means including a leveling plate and scraping means extending transversely of the grate structure, and means for supporting the leveling plate and the scrapers with their bottom ends above the grate structure and between said side guards between the feeding means and the igniting means.

14. A sintering machine comprising a traveling grate structure, means for feeding material to be sintered to said traveling grate structure, means extending transversely of the grate structure for igniting the material thereon, longitudinally extending stationary side guards adjacent the edges of the traveling grate structure and extending vertically above, means for supporting said stationary side guards, said guards extending from a point adjacent the material-feeding means to a point on the opposite side of said igniting means, leveling means extending transversely of the grate structure, means for supporting the leveling means with the bottom end thereof above the grate structure and between the side guards adjacent the material-feeding means, and material-compacting means between the leveling means and the igniting means and extending transversely of the grate structure between said side guards.

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