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SINTERING MACHINE

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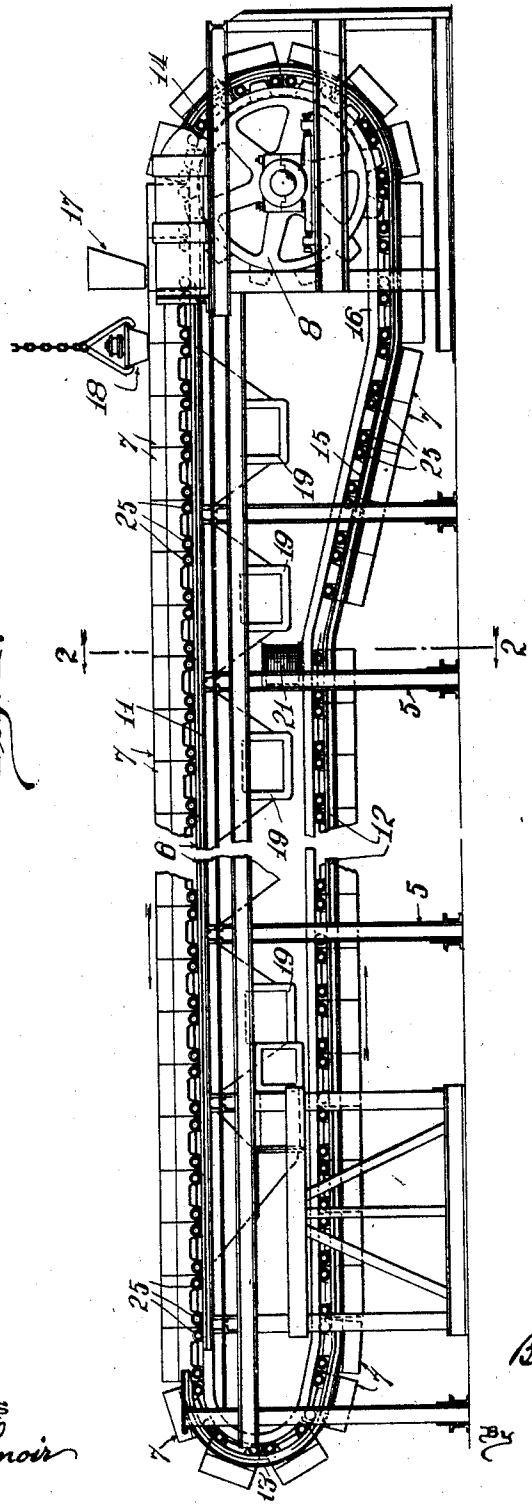


Fig. 1.

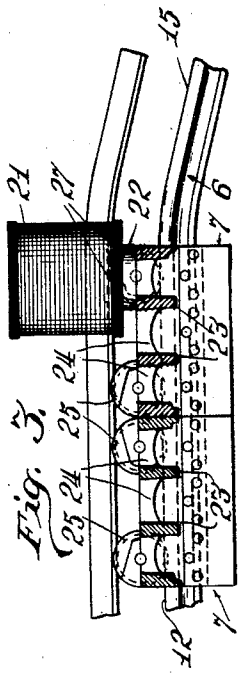


Fig. 3.

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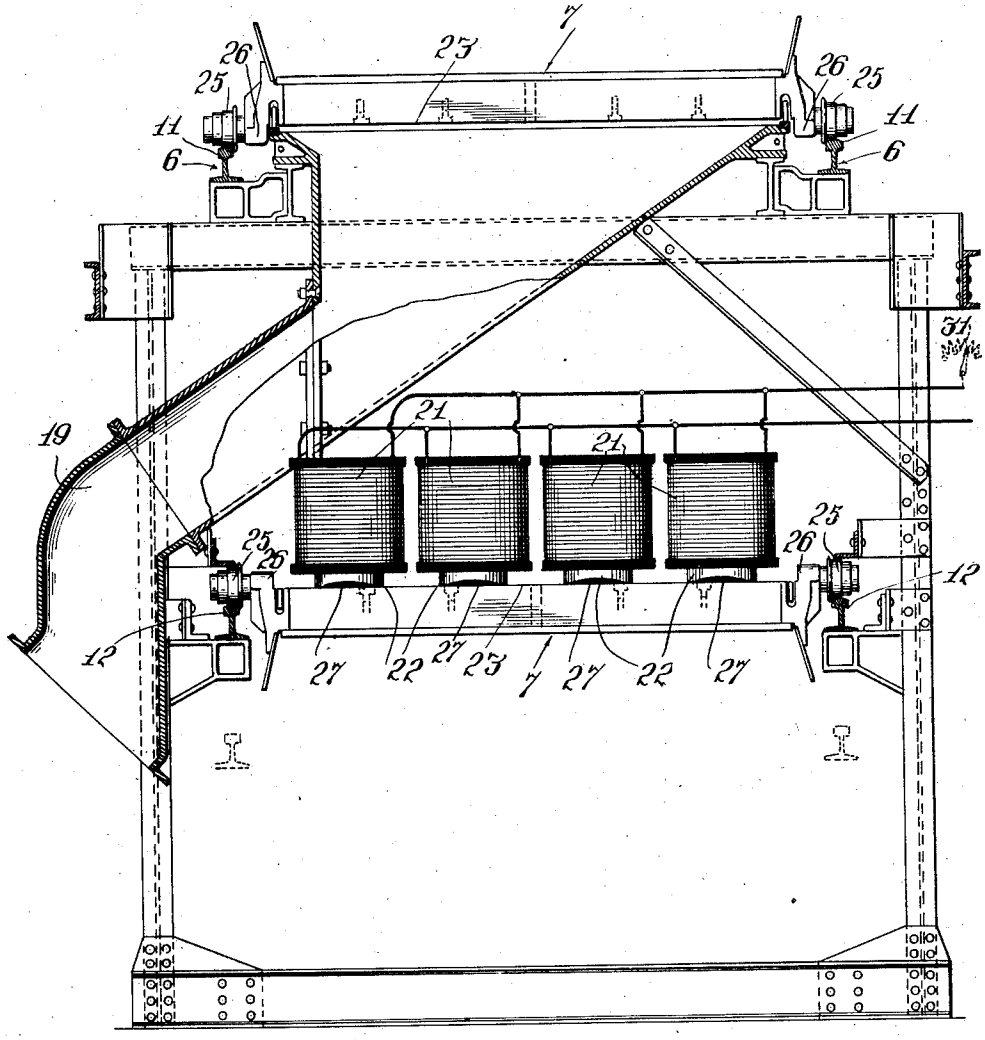
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Fig. 2.



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UNITED STATES PATENT OFFICE.

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SINTERING MACHINE.

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The present invention relates to sintering machines of the Dwight and Lloyd type, wherein a plurality of grates or pallets are arranged to travel continuously around a closed track, to form, in one part of their travel, a continuous moving grate on which the ore or other material is sintered. More specifically, the invention pertains to improved means for governing the travel of these pallets so as to maintain an expansion space in the train of pallets at a particular point in the track, as will hereinafter appear.

The ore is generally fed to the continuous grate surface defined by these pallets at one end of the machine, where it is ignited, and from this point the burning ore is slowly conveyed during the sintering thereof to the opposite end of the machine where the completely sintered ore is discharged. The closed track on which these pallets travel generally consists of an upper track section and a lower track section, joined at the ends by curved track sections. The pallets moving along the upper track section form the moving grate surface on which the ore is sintered. The pallets are slowly propelled around the closed track by a sprocket wheel located at one end of the machine, generally the feeding end.

Because of the variable expansion and contraction of the train of pallets, resulting from the heat changes arising in the operation of the machine, it is necessary that an expansion space or gap be left in the train to accommodate these expansions and contractions. The point where the expansion space is maintained is of decided importance in the successful operation of the machine, and the essence of the present invention pertains to improved means for constantly maintaining this expansion space at a particular point in the closed track. For example, this expansion space should not be permitted to occur between the pallets forming the continuous grate surface on the upper stretch of the track, as this grate surface is passing over suction flues which stimulate the combustion of the ore, and if the pallets were allowed to separate at this point, it would result in a considerable loss of suction between the spaced pallets. Any space between the pallets on this upper track section would also permit the ore to drop down between the pallets as the pallets pass under the ore feeding hopper. Furthermore, this expansion space should not be permitted to occur at the discharge end of the machine, where the pallets swing down around the curved end of the track in discharging the sintered ore, as it has been found that if this does occur, there is the likelihood that some of the sintered ore will lodge between the pallets, destroying their accurately spaced relation, and hence rendering the machine liable to serious injury through inaccurate meshing of the pallets with the sprocket wheel.

It is the fundamental object of the present invention to overcome the difficulties heretofore encountered in the proper maintenance of this expansion space by providing simplified and improved means which will effectively hold all of the pallets in bunched, contacting relation along the upper track section and around the discharge end thereof, and which will maintain the expansion space at a point in the lower track section. The improved construction herein disclosed is also so arranged that the pallets will feed in contacting relation from this expansion point to the sprocket wheel, so that accurate registration between the teeth of the sprocket wheel and the pallets is assured.

Referring now to the accompanying drawings, wherein I have illustrated a preferred embodiment of my invention:

Figure 1 is a side elevational view of a sintering machine embodying the invention, an intermediate portion of the machine being broken away so as to bring the ends of the machine within the limited dimensions of the drawing.

Fig. 2 is a transverse sectional view on a larger scale, taken on the plane of the line 2—2 of Figure 1, and

Fig. 3 is a fragmentary sectional view taken longitudinally through the machine adjacent the electromagnets.

The machine comprises any suitable frame work 5 on which is supported a closed or endless track 6. The pallets 7 are propelled continuously around this track, in the direction indicated, by the sprocket wheel 8 at the feeding end of the track. If desired, this driving mechanism may consist of two sprocket wheels, one for engaging with each lateral edge of the track, these sprocket wheels having teeth thereon adapted to effect driving engagement with the pallets, as is well understood by those skilled in the art.

The track comprises an upper horizontal

portion 11, a lower horizontal portion 12, and two curved end portions 13 and 14, the former constituting the discharge end of the machine and the latter guiding the pallets around the sprocket wheel. From the lower horizontal portion 12, an inclined portion 15 leads downwardly to a short horizontal portion 16 connecting with the curved end portion 14. The total length of this track is greater than the combined lengths of all of the pallets in the train so that an expansion space is left in the train of pallets to permit of the variable expansions and contractions referred to above.

The ore to be sintered is discharged into the pallets, after they pass up around the sprocket wheel, through a hopper 17. Immediately after this charging operation, the pallets pass under an igniting device 18 where the surface of the ore is ignited. From this point the pallets proceed slowly along the upper track section where they pass over the suction flues 19, which draw air down through the pallets, the bottoms of which are foraminous, these currents of air resulting in a rapid combustion of the ore downwardly through the bed in each pallet. It will be obvious that during this travel of the pallets, they should be maintained in close abutting contact to prevent the ore from falling between the pallets and also to prevent loss of suction as they pass over the suction flues 19. The ends of the pallets have substantially sealed contact with guide surfaces along this portion of the track to prevent loss of suction, as will be understood by those acquainted with this type of machine.

As the pallets move down around the curved section 13 of the track, they drop their sintered masses of ore into any suitable hopper or receptacle at this end. Here again, it is desirable to maintain the pallets in contacting relation; first, to prevent separation of the pallets along the upper track section 11, and, second, to prevent the sinter from lodging between adjacent pallets during the discharge of the sinter while the pallets pass around this curved track section.

The means which I employ to prevent the separation of the pallets at these points, comprises one or more electromagnets 21 which are located at the end of the lower horizontal track section 12, and which act magnetically and frictionally to yieldingly retard the travel of the pallets. As shown in Fig. 2, there are preferably a number of these electromagnets, four being shown, disposed transversely of the machine and directly above the pallets on this lower track section. The cores 22 of these electromagnets extend downwardly therefrom in close proximity to the adjacent surfaces of the pallets, which surfaces are the undersides thereof, inasmuch as the pallets are inverted at this time. These pallets may be of any suitable construction, consisting, however, of a frame or other portion constructed of iron or steel which will be attracted by the electromagnets. As exemplary of a preferred construction of pallet, Fig. 3 illustrates the frame thereof as comprising a plurality of parallel bars 23 extending between the ends of the pallets and joined by transversely extending ribs 24. Pairs of wheels 25 are supported at each side of the pallet in brackets 26. The pallet frame defined by the bars 23 and cross ribs 24 has a flat bottom surface which, in the travel of the pallet along the lower track section, is presented in close proximity to the ends of the magnetic cores 22. The edges of these cores are chamfered as indicated at 27 so as to prevent the edges of any of these bottom surfaces from striking the edges of the cores.

As each pallet comes under the attracting influence of the electromagnets 21, it is lifted bodily off the track rails 12 and is pulled up against the ends of the cores 22. Where upper guide rails or bars 28 are employed, they are raised sufficiently from the rails 12 at this point so that the pallets will be free to move up against the ends of the cores 22.

Here the pallet will be subjected to the magnetic attraction of the electromagnets tending to hold the pallet against moving beyond this magnetic field; and the pallet will also be subjected to a relatively heavy friction in its movement across the faces of the cores under the pressure with which the pallet is held to the cores. The result will be that each pallet in passing the electromagnets 21 will be subjected to a relatively heavy retarding force which will yield only against the feeding pressure transmitted through the train of pallets from the sprocket wheel 8. Thus the series of pallets passing along the upper track section 11 and around the curved track section 13 will be maintained in contacting relation, as desired.

Referring to Figure 1, as each pallet is forced past and beyond the restraining influence of the electromagnets 21, it will roll down the lower inclined track section 15. Thus the expansion space will be maintained between the pallet which is under the retarding influence of the electromagnets and the preceding pallet which has just previously rolled down the inclined track 15. The weight of the pallets rolling down the inclined track section 15 will maintain these pallets in contacting relation and will also maintain the pallets along the horizontal track section 16 in a connected train so that they will mesh properly with the teeth on the sprocket wheel 8.

The electromagnets 21, shown more or less diagrammatically in Fig. 2, can be supported in any suitable manner between the upper and lower track sections, and will be energized from any suitable source of electric current. By properly graduating the current flow

through the coils, as by a rheostat or the like, indicated in dotted lines at 31 in Fig. 2, the retarding force exerted on the pallets can be increased or diminished, as desired. While the use of electromagnets is preferable, because of their greater magnetic pull, nevertheless, permanent magnets might be employed. If desired, adjacent cores 22 may be connected across their upper ends so that when a pallet frame is engaging with the cores, a closed magnetic circuit or circuits will be established.

While I have shown what I consider a preferred adaptation of my invention, it will, of course, be understood that the essence of the invention is not limited to this particular means or arrangement, but that the invention is capable of embodiment in numerous other forms and with other means all to the end of exerting a yielding retarding force on the pallets.

What I claim as my invention and desire to secure by Letters Patent, is—

1. In a sintering machine, a train of separate pallets or grates, an endless track for the same including a loading and combustion portion, a discharge portion, a return portion located below the loading and combustion portion, means for elevating the pallets or grates from the return portion to the loading portion of the track, said track being longer than the train of separate pallets or grates to provide expansion space for the same, and magnetic means associated with the return portion of the track to prevent separation between the pallets or grates at and around the said delivery portion.

2. In a sintering machine, a train of separate pallets or grates, and an endless track of a length providing expansion space for said train, means located at the feed end of the machine for positively elevating the pallets or grates and propelling the train of pallets or grates toward and around the delivery end of the machine, and magnetic means associated with the return portion of the track between the delivery end and the feed end of the machine for controlling the travel of said pallets or grates, whereby to permit separation of the pallets or grates only at a point distant from the delivery end of the machine and to restore contact between them before moving into engagement with the said elevating and propelling means.

3. In a sintering machine, an endless track, a plurality of pallets traveling about said track and magnetic means for controlling the travel of said pallets around said track to retain said pallets in contacting relation along a particular portion of said track.

4. In a sintering machine, a train of pallets, an endless track of a length providing expansion space for said train, means for propelling said pallets around said track, and magnetic means cooperating with said pallets to maintain said expansion space at a particular point in said track.

5. In a sintering machine, a train of pallets, an endless track of a length providing expansion space for said train, said track comprising an upper sintering portion and a lower return portion, means for propelling said pallets around said track, and an electromagnet disposed adjacent the return portion of said track and acting attractively on said pallets to maintain said expansion space in the return portion of said track.

6. In a sintering machine, an endless track, a plurality of pallets travelling about said track, and magnetic means exerting a frictional retarding force on said pallets to maintain the pallets in predetermined relation in a certain point in said track.

7. In a sintering machine, an endless track, a plurality of pallets travelling about said track, and magnetic means comprising a frictional surface with which said pallets are adapted to contact to maintain said pallets in predetermined relation at a certain point in said track.

8. In combination, a train of separate traveling members, an endless track for said train, and mechanism for governing the travel of said members on said track comprising a friction surface and cooperating magnetic means for causing frictional engagement between said traveling members and said friction surface.

9. In combination, a track, a traveling member moving along said track, and magnetic means acting magnetically on said member for governing its travel along said track.

10. In combination, a closed track, a train of travelling members moving around said track, and magnetic means acting attractively on said members for governing the travel thereof around said track.

11. In a sintering machine, a train of pallets, an endless track around which said pallets are arranged to travel, means exerting a yielding retarding force on said pallets at one point in said train to maintain said pallets in predetermined relation at another point in the train, and means for varying the intensity of said retarding force.

12. In a sintering machine, a train of pallets, an endless track of a length providing expansion space for said train, means for propelling said pallets around said track, and magnetic means cooperating with said pallets to maintain said expansion space at a particular point in said track, said magnetic means comprising a magnet and a cooperating frictional surface against which each pallet is drawn by said magnet.

13. In a sintering machine, a train of pallets, an endless track of a length providing expansion space for said train, means for propelling said pallets around said track, and

means cooperating with said pallets to maintain said expansion space at a particular point in said track, said latter means comprising an electromagnet having a pole shoe under which each pallet is adapted to travel, said magnet operating to lift the pallet from said track into frictional engagement with said pole shoe.

14. In a sintering machine, a train of pallets, an endless track of a length providing expansion space for said train, said track comprising a sintering portion and return portion, means for propelling said pallets around said track, and a plurality of electromagnets associated with the return portion of said track and operative to lift each pallet from the return portion of the track into engagement with frictional surfaces associated with said electromagnets.

15. In a sintering machine, an endless track, a plurality of pallets travelling about said track, magnetic means for controlling the travel of said pallets around said track to retain said pallets in contacting relation along a particular portion of said track, and means for varying the intensity of action of said magnetic means.

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