March 17, 1959 W. M. BAILEY ET AL 2,878,009

SINTER COOLING MACHINES

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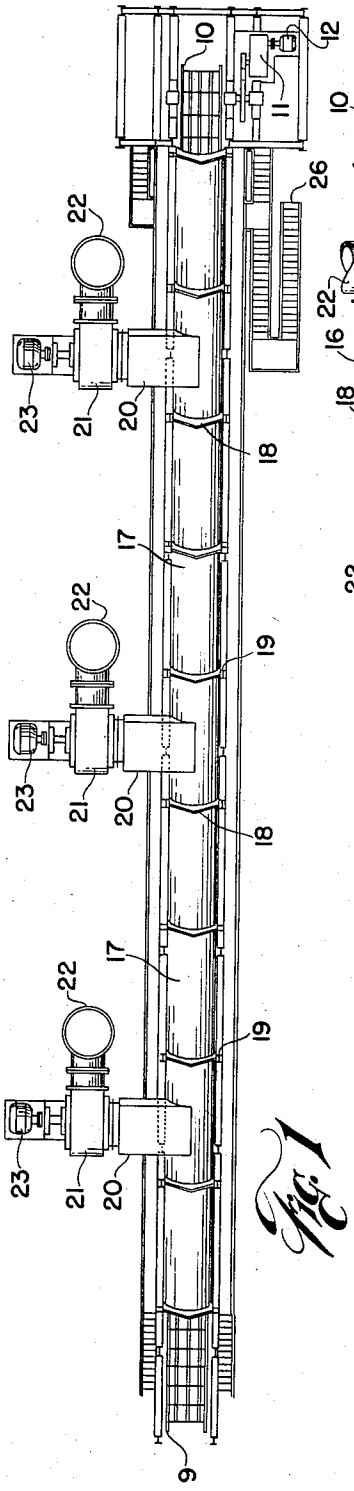


Fig. 1

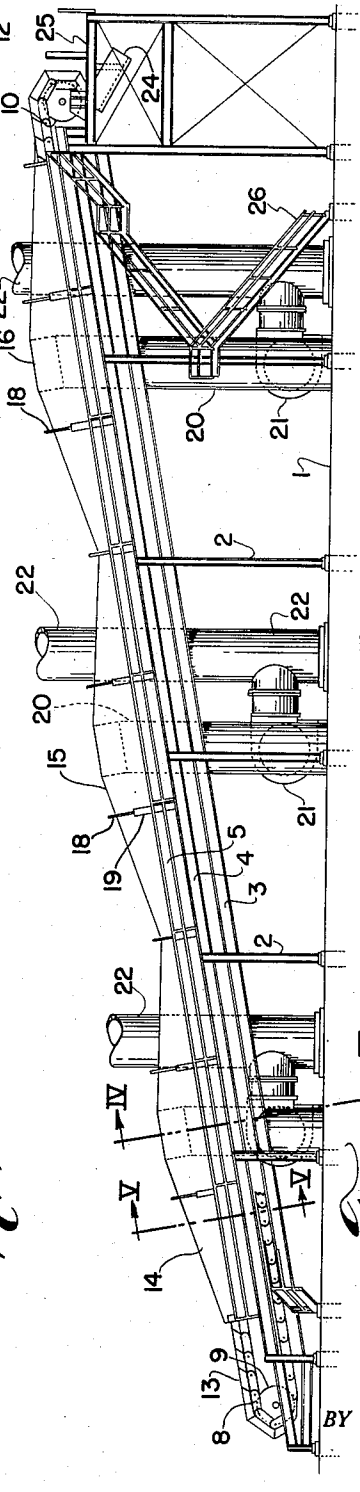


Fig. 2

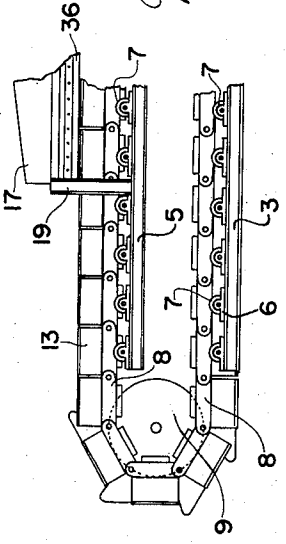


Fig. 3

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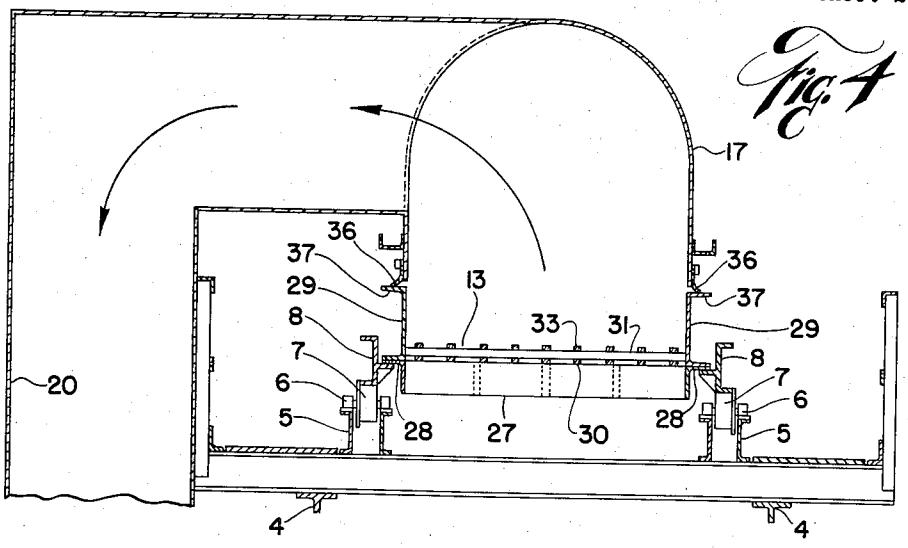
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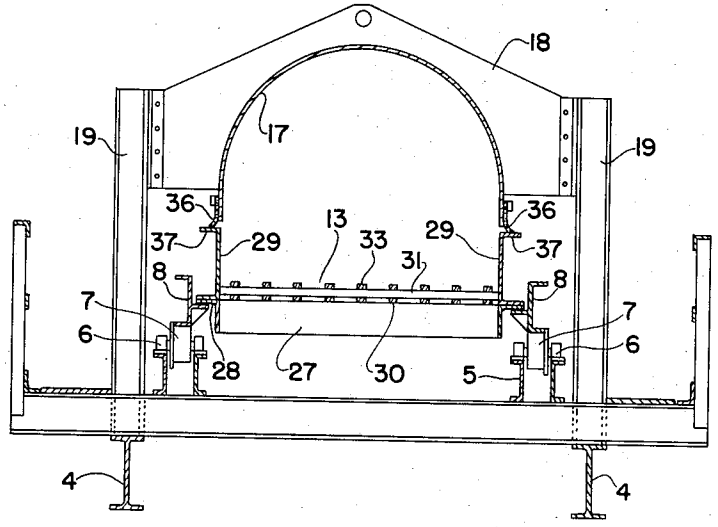
SINTER COOLING MACHINES

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Fig. 4





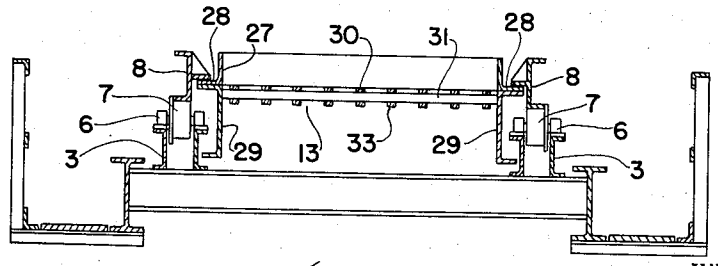


Fig. 5

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Fig. 6

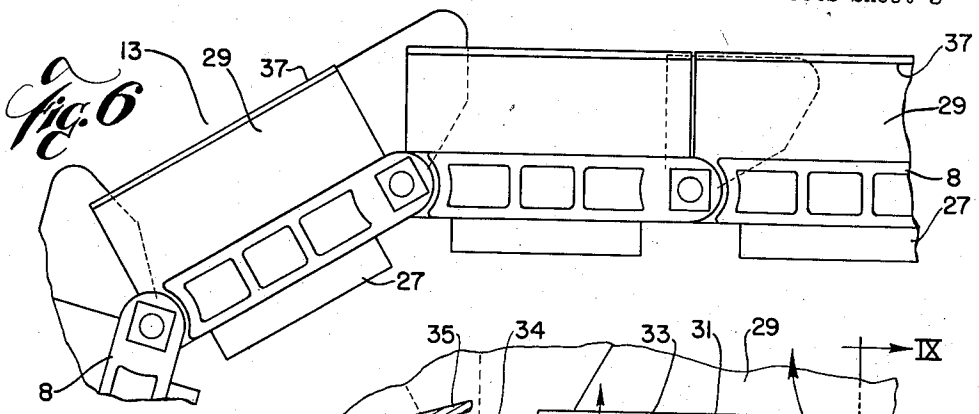


Fig. 7

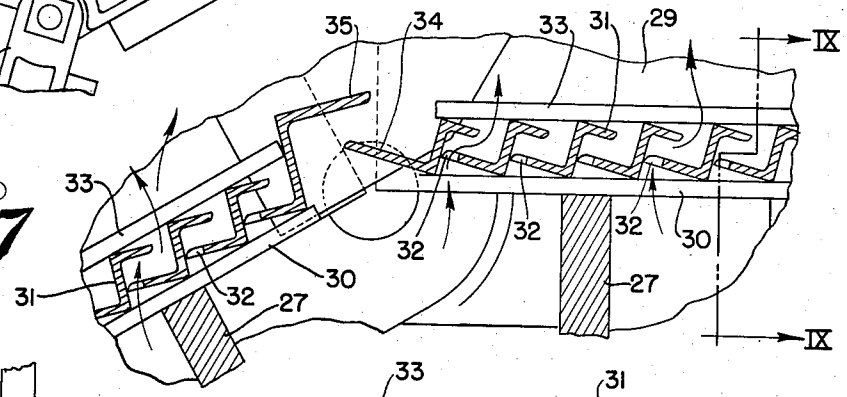


Fig. 8

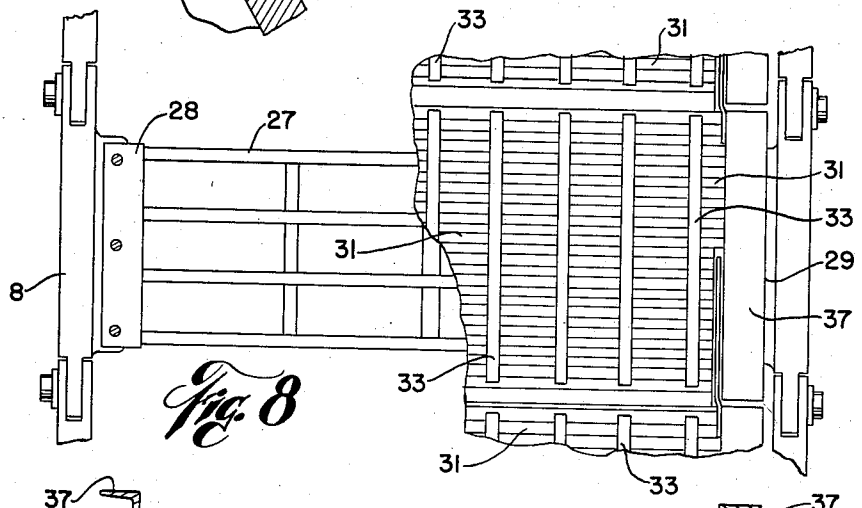
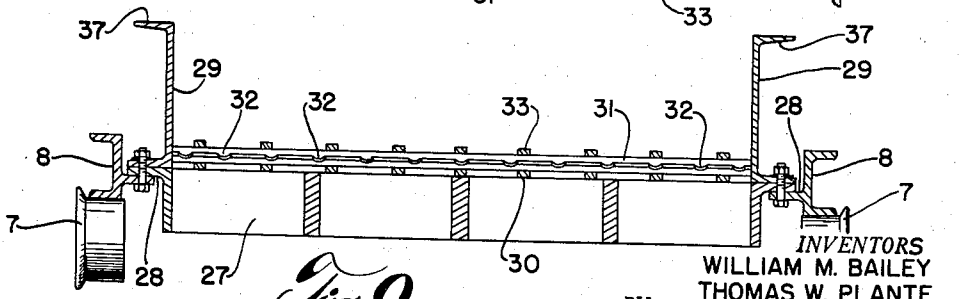


Fig. 9



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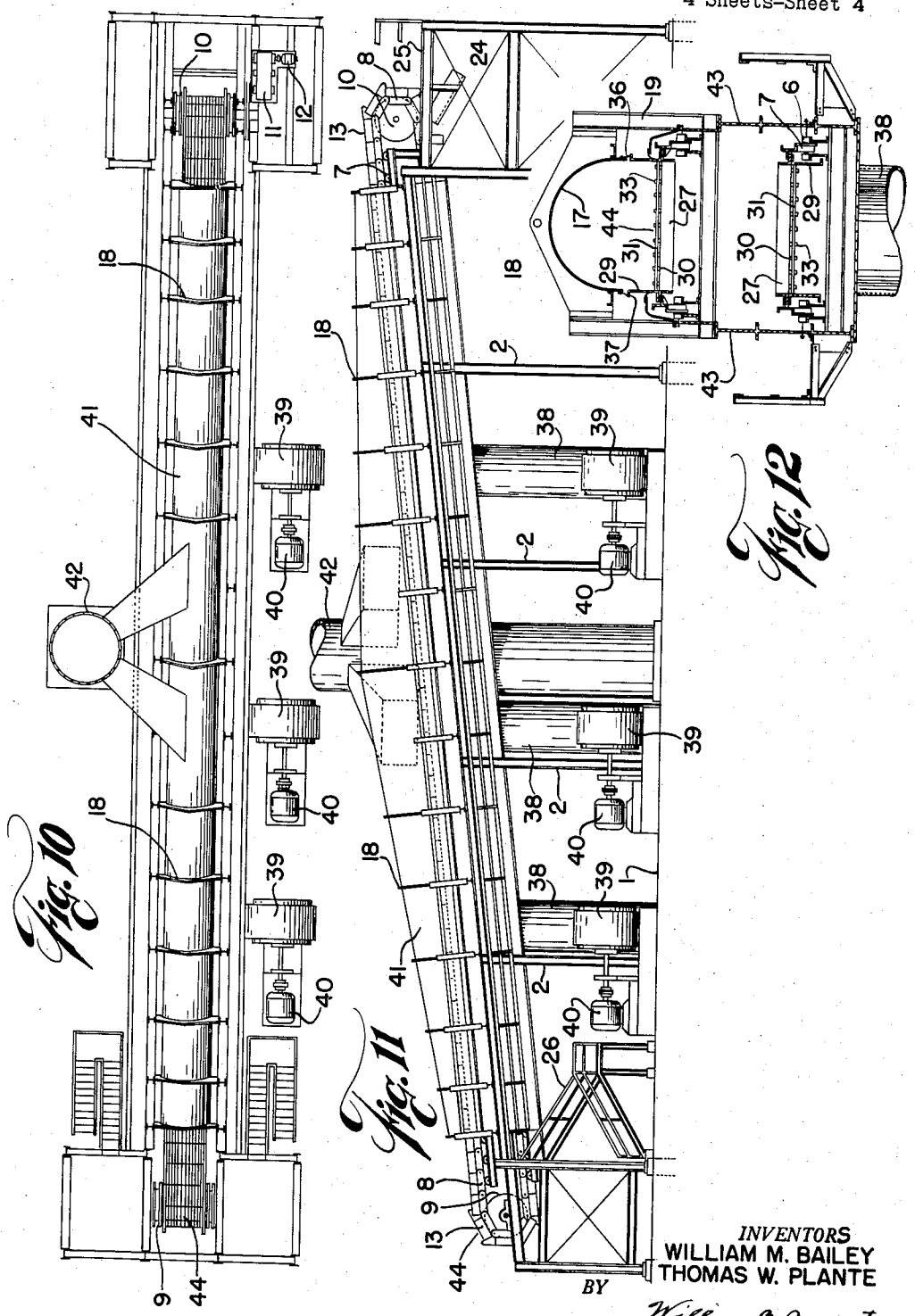


Fig. 10

Fig. 11

Fig. 12

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SINTER COOLING MACHINES

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Application June 25, 1954, Serial No. 439,382

2 Claims. (Cl. 266—21)

This invention relates to new and useful improvements in sinter cooling machines and is among the objects thereof to provide apparatus for cooling sinters in which the sinters are charged direct from the sintering pans and conveyed through a cooling atmosphere supplied by passing cooling air through the sinter bed, and it is a further object of the invention to provide an endless conveyor of a grate bar construction designed to facilitate the passage of cooling air uniformly through the sinters supported thereon.

The trend of blast furnace practice is to more and more charge sinters composed of fine ore, flue dust and other materials not considered suitable for direct use, and sometimes lime or lime bearing materials, and the handling of the hot sinters after they are delivered by the sintering machine in which the material is processed at relatively high temperatures, is a major problem. The sinter is formed on pans or pallets and is dumped into bins, stockyard piles or railway cars at undesirable high temperatures. The common practice is to cool the sinter by water sprays, which has certain disadvantages—among them being that the sinter is fractured into very small pieces due to the thermal shock, or the water cooled sinter may be too wet to handle on conveyor belts and may freeze in winter. Also, with the tendency to produce lime bearing sinter in the process, there is marked tendency toward size deterioration if water be used in cooling.

In accordance with the present invention, these difficulties are overcome by cooling the sinter with air through the critical range to bring it to a temperature of from 150 to 200° where it will not injure conveyor belts or railway equipment. The invention will become more apparent from a consideration of the accompanying drawings constituting a part hereof in which like reference characters designate like parts and in which:

Figure 1 is a top plan view of a sinter cooling machine embodying the principles of this invention;

Figure 2 is a side elevational view thereof;

Figure 3 a similar view of the end portion of the machine illustrating the relation of the conveyor mechanism to the cooling chamber;

Figure 4 is a vertical cross sectional view taken along the line 4—4, Figure 2;

Figure 5 a similar view taken along the line 5—5, Figure 2, showing the load bearing and return strands of an endless conveyor;

Figure 6 a side elevational view of a link conveyor for supporting the sinter material in passing through the screen;

Figure 7 a vertical cross sectional view of a conveyor constructed of inverted Z-shaped bars arranged to constitute the sinter supports;

Figure 8 a top planned view partially cut away of the conveyor links and sinter supporting bars;

Figure 9 a vertical cross sectional view taken along the line 9—9, Figure 7;

Figure 10 a top plan view of a modified form of sinter cooling machine employing a sealed tunnel in which air is forced under pressure through the sinter bed from below the bed;

Figure 11 a side elevational view of the device shown in Figure 10; and,

Figure 12 a vertical cross sectional view through the tunnel and conveyor mechanism illustrating the closed wall construction.

With reference to Figures 1 and 2 of the drawings, the numeral 1 constitutes the floor or foundation of the sinter cooling machine on which are erected vertical columns 2 that support rails 3, 4 and 5. Rails 3 and 5 support pedestal bearings 6 having rollers 7 for supporting the conveyor links 8. This is more clearly shown in Figures 4 and 5 of the drawings. The rollers 7 are flanged to form a track for the conveyor links 8 whereby the conveyor is entirely supported by rollers having fixed bearings.

The supporting columns 2 are of graduated lengths to dispose the conveyor on an incline with the lower end of the conveyor passing around a drum 9 and the upper end of the conveyor passing around a drum 10 which is driven through a gear reduction 11 by a motor 12. As shown in Figures 2 and 3, links 8 carry pallets or pans 13 on which the sinter is supported in its travel through cooling chambers, generally designated by the numerals 14, 15 and 16, these chambers being provided with hoods 17 and are supported by cross bracing 18 and foot supporting columns 19 that rest on the channels or I sections 4. The hooded chambers may be shaped to form a continuous air tunnel of varying cross section with the high portions thereof connected by ducts 20 to a blower 21 having an exhaust stack 22, the blowers being individually driven by motors 23, Figure 1. In this manner the exhaust, or negative pressure, is uniformly applied to the sinter bed throughout the hooded section, that is served by a particular exhaust fan, there being three such sections shown in Figure 2 of the drawing.

As shown in Figures 1 and 2, the cool sinter is dumped on a chute 24 below a platform 25 which is accessible by stairs 26, and the material is charged at the rear end of the cooling machine by a chute, or in any other suitable manner not shown, the sinter being preferably of uniform size and is evenly distributed on the pallets or pans 13 to a uniform depth to subject the material to uniform cooling treatment as it passes through the cooling tunnels.

So that the air may be uniformly drawn through the sinter material, the supporting pan or pallet is perforated and instead of the link construction herein shown, may consist of an endless mesh conveyor belt. One form of pallet construction which is suitable for the purpose is shown in Figures 6 to 9 inclusive of the drawings, and consists of a cross frame 27 having flanges 28 that are secured to the flanges of channels 29 that constitute the side walls of the pallets as shown in Fig. 9. Cross frames 27 and channels 29 are bolted to the flanges of links 8. Support bars 30 are placed on cross frames 27 and grate bars 31 of inverted Z-shape having air passages 32 therein are mounted on bars 30. The inverted Z-shaped bars overlap in the manner shown in Figure 7 and are held in position by the top bars 33. As shown in Figure 7, a leg 34 of the end bar 31 of one pallet overlaps the leg 35 of the bar 31 of the adjacent pallet so that the material will not drop into the joints of adjacent links. As shown in Figure 9, the air vents 32 of the bars 31 are spaced the length of the bars to provide a series of passages for drawing air through the pallets and the supported sinters into the vent hoods 14, 15 and 16.

As shown in Figures 4 and 5, the hood 17 is provided with a flexible flanged material 36 made of asbestos or other non-combustible substance to effect a seal with the

flanged 37 of the sinter pallets. Consequently, when the hooded sections 14, 15 and 16 are exhausted by means of the blowers 21, the air is drawn through the inverted Z-shaped pallet bars 31 and the sintering material, except for minor leaks that may occur at the joints of the conveyor links. As shown in Figure 7, this would be minor.

The operation of the sinter cooling machine shown in Figs. 1 to 9 of the drawings is briefly as follows: The sinter is charged on the endless conveyor at the rear end of the incline and distributed over the inverted Z-bar grating to a uniform thickness. As hereinbefore noted, the sinters are dumped direct from the sintering machine and are at temperatures of from 400° F. upward. As they enter the tunnels 14, 15 and 16, the exhaust fans 21 will tend to evacuate the tunnel or hooded portions and cause a draft of air to pass through the air vents 32 of the inclined Z-bars upward through the bed of sintered material. Because of the close spacing of the air vents 32 and the inclined Z-bars 31, the cooling air would be distributed throughout the sintered mass, resulting in rapid and uniform cooling. By regulating the exhaust fans 21, the cooling of the sinters may be controlled to be effected more slowly in the initial portion of the cooling tunnel, as in the section 14, and more rapidly cooled in the successive sections 15 and 16.

Also, the system is adapted to effect cooling by blowing air into the hooded sections 14, 15 and 16 and exhausting it beneath the inverted Z-bars.

The Z-bar construction of the pallets assures that the sinter material will be channeled and not pack on its support and renders the conveyor self-cleaning as it passes over the drive drum 10, so that no sinter particles will be retained on the conveyor. Also, the Z-bar construction lends itself to the replacement of bars which may be injured or burnt, it being an object of the invention to provide a practical and suitable sinter cooling machine with minimum maintenance cost in its operation. Instead of passing the coolant through the sinter bed by exhausting the tunnel above the sinter bed to draw the air therethrough, the coolant may be forced through the sinter bed by pressure below the bed, this being accomplished by means of the construction shown in Figures 10, 11 and 12 as follows:

As shown in Figure 12, the tunnel, instead of employing the open wall construction as shown in Figure 5, is provided with side walls 43 to include both the load bearing and return strands of the conveyor 44. The closure beneath the load bearing strands of the conveyor may be termed a wind tunnel if continuous throughout the length of the sinter cooling machine, or wind boxes if the closures occur at intervals throughout the longitudinal extent of the tunnel. These wind tunnels, or wind boxes, are provided with conduit 38 connected to blowers 39 driven by motors 40 to supply air under pressure which is directed through the sinter bed on the conveyor into the hooded portion 41 having a common exhaust stack 42.

As in the construction shown in Figures 1 to 9, the blower stations may be regulated to vary the amount of air supplied to the sinter bed at different portions of the tunnel in the travel of the material through the tunnel, and the passage of the cooling air through the Z-bars is the same as when the air is drawn therethrough by exhausting the tunnel above the sinter bed, as heretofore explained. Also, it is evident that by supplying a coolant under pressure beneath the sinter bed, refrigerated air or other cooling media may be employed.

Although several embodiments of the invention have been herein illustrated and described, it will be evident to those skilled in the art that various modifications may be made in the details of construction without departing from the principles herein set forth.

We claim:

1. In a sinter cooling machine, a cooling tunnel, an endless conveyor having a load bearing strand passing through said tunnel, said conveyor comprising side links and pallet cross frames supported by each pair of links, grate bars mounted on said cross frames to form a pallet bed for the sinter, said bars being of inclined Z-shape with the legs overlapping and tilted for channeling the sintering material supported thereon, with the bottom leg of one pallet touching the web of the next adjacent pallet with the first Z-bar element in the link extending over the lower leg of the last Z-bar element in the preceding link to prevent the sinter material on the bed from falling through and vent holes in the bottom legs of said bars for admitting air to the sintered material.

2. An endless conyeyor for sinter colling machines having pallet cross frames supported by pairs of side links of said conveyor, said pallet cross frames having cross bars of inclined Z-shape with the bottom leg of one Z-bar touching the web of the next adjacent Z-bar and the first Z-bar in each link being constructed so that its upper leg extends over the lower leg of the last Z-bar on the next adjacent link to prevent the sinter material on the bed from getting through, said Z-bars having vent holes for admitting air to the sintered material.

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