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TUBULAR END SEAL FOR FURNACE CARS

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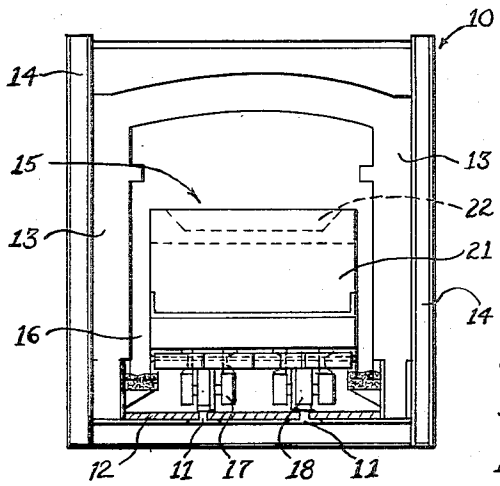


FIG. 1

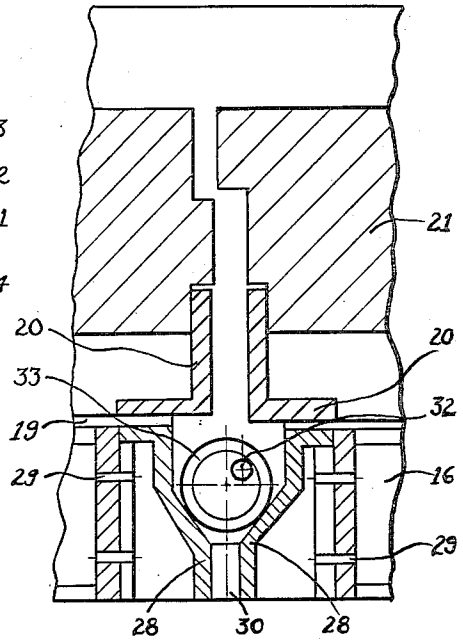


FIG. 2

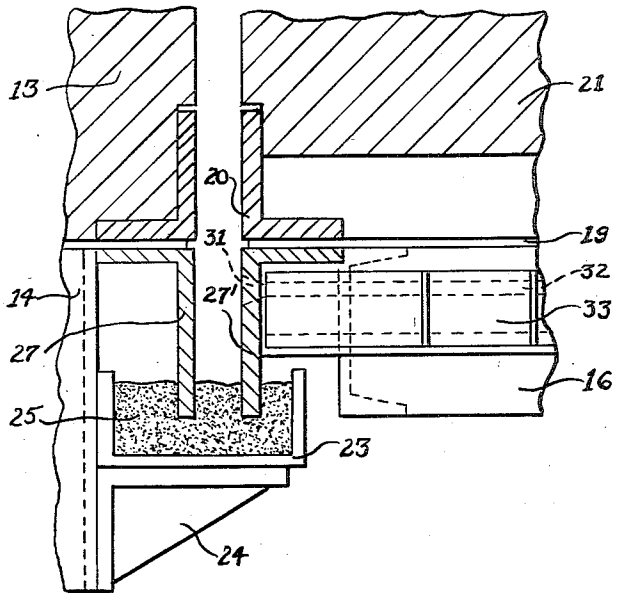


FIG. 3

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TUBULAR END SEAL FOR FURNACE CARS

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1 Claim. (Cl. 263—28)

The present invention relates generally to the heating furnace art and more particularly to a novel seal for effecting a mechanical seal between abutting ends of successive cars being pushed or drawn through a heating chamber.

It is common practice to provide an elongated furnace built over tracks or rails and to push bogie carts through the heating chamber carying the metal objects to be heated. Since the temperatures involved are relatively high, one of the foremost problems encountered is the provision of effective seals between the ends and sides of carts to prevent the escape of heat. This heat also has another undesirable feature in that it scores and warps the structural steel members of the bogie carts after continued exposure and in many instances requires their replacement or repair.

It is therefore an object of the invention to provide an improved seal for use between the ends of successive cars being pushed through a furnace which substantially reduces the heat lost by connection to the cooler air surrounding the furnace.

Yet another object of the invention is the provision of a seal which protects the structural portions of the load-bearing cars from the excessive heat generated in the furnace chamber. The protection thus afforded insures a longer operating life for the cars used in a pusher type furnace.

Another object of the invention described herein is to provide an end seal that when used with cooperating side seals reduces the amount of insulating material and fire brick required to construct the heating chamber. With a good seal the furnace proper need only be constructed from the seals to the desired height instead of from the floor on which the buckstays and other supporting members of the furnace rest. This construction results in large savings of expensive material and time in building the furnace.

A more specific object of the invention is to provide end seals for carts used in pusher type furnaces that require none of the complicated attachment of coupling procedures usually encountered in using previous like equipment. The arrangement disclosed is completely operative without operator attention or supervision as the carts are abutted against each other and the seal is complete.

A particular object of the invention is to provide a sealing means for furnace carts when they are aligned in end-to-end relation although the cooperating end thereof need not be completely abutted but may be separated by a small distance. This is especially important when a cart entering the furnace is given an extra strong push resulting in the separation of one or more carts due to differences in friction, inertia, etc.

Yet a more specific object of the invention is to provide end seals for furnace cars that are of the utmost simplicity and may be easily constructed and manufactured from standard metal pieces, such as pipes and rods, without the use of special machines. The tubular end seal disclosed herein is also adaptable for attachment to bogie

cars already in use in heating furnaces with a minimum of time and cost. In the furtherance of this and the other objects of the invention the end seal is constructed from a tubular member supported by a rod extending the length thereof attached to one end of a cart and adapted to cooperate with the end of the following car to form a seal. It is further noted that only one tubular seal apparatus is provided for each cart but when successive carts are aligned in end-to-end relation a seal is formed on both ends of the cars.

These and other objects and advantages of the invention will become more fully apparent upon consideration of the following detailed specification and accompanying drawing wherein is found an illustrated embodiment of my invention.

In the drawing:

Figure 1 of the drawing is an end view of a bogie type cart having a tubular end seal according to the teaching of my invention;

Figure 2 is a side sectional view showing two furnace cars in abutting relation with the tubular end seal therebetween; and

Figure 3 is an enlarged end sectional view of part of the arrangement depicted in Figure 1.

Referring now to the drawing and initially to Figure 1 thereof, the numeral 10 refers to a heating chamber structure built over a pair of longitudinally extending rails 11 embedded in the floor 12 of the factory or place where the heating installation is installed. The heating chamber is constructed of top and side walls 13 consisting of insulating material and fire brick and supported above the floor 12 by the structural members or buckstays 14. A bogie furnace cart 15 is adapted to be pushed through the furnace by suitable means and carries metal objects, such as billets, through the furnace. It is understood that the furnace structure 10 is usually of considerable length so that a plurality of bogie carts 15 are aligned in end-to-end relation while being pushed through the furnace.

The bogie cart 15 itself is a four wheeled vehicle having a main rectangular structural frame 16 constructed from a number of angles and plates supported by the axle and wheel assemblies 17 and 18 in the usual manner. The wheel assemblies 18 are properly spaced under the frame 16 so that they rest on the parallel tracks 11 and thereby the bogie cart is adapted for movement through the furnace upon the application of suitable pushing force.

The structural frame is covered by a plate 19 to form a flat bed to which are welded the angles 20 along the edges thereof to form a boxed shaped container. Built on the bed 19 and supported by the angles 20 is an insulating top 21 usually constructed out of fire brick or other suitable material. As noted in the drawing the top 21 is of considerable thickness, making up approximately half the height of the bogie cart 15. The top 21 is also dished on the upward surface thereof to receive a chrome ore or other ceramic hearth 22 which serves as the actual supporting surface for workpieces being carried through the furnace. A chrome ore hearth is used because, when properly prepared, it provides a high quality refractory surface of the density required to support heavy metal objects. The proper preparation of the hearth requires burning-in of the chrome ore and this procedure is accomplished by apparatus described in my co-pending patent application Serial No. 571,823, entitled Burn-In Furnace for Chrome Ore Hearths.

The apparatus so far described is more or less of construction well known in the furnace art to be an expedient method of constructing a pusher type furnace and a bogie cart for use therewith. Since the temperatures in the furnace are of considerable magnitude it has been found desirable to provide mechanical seals of

various types to limit the heat to the top 21 and the chrome ore or other ceramic hearth 22 thus protecting the steel structural undercarriage of the bogie carts 15 and of the furnace proper while keeping heat loss to a minimum.

In Figure 3 of the drawing is shown in arrangement for effecting the side seal between the side of the furnace walls and the side edges of the bogie carts. In this construction I have provided an upturned channel 23 resting on brackets 24 which is filled with sand 25 and extends the length of the furnace. Brackets 24 are suitably secured to the buckstays 14. A downwardly directed angle 27 is supported on one side by the buckstays 14 and the insulating side walls 23 in any normal manner while the other end extends into the sand 25 in the channel 23 to effect a seal prohibiting the escape of heat through spaces that might exist between the channel 23 and the buckstays 14. The angle 27 also extends the length of the furnace thus affording a continuous seal.

To complete the side seal a like downwardly orientated angle 27' is welded or attached by some other means to the bottom of the bed plate 19 of the bogie cart and one end extends into the sand 25 located in the channel 23 forming a sand trough. The angle 27' is longer than the bogie cart 15 as will be hereinafter more fully described. It should be understood that each bogie cart 15 is provided with this member 27' along both side edges as well as the sand carrying channel 23 being situated along both sides of the furnace as shown in Figure 1. The result of this construction is that when the bogie carts are aligned in end-to-end relation a seal along the side of the carts results. As the cars are pushed through the heating furnace the angles 27' drag in the sand completing the seal.

The structure thus far recited provides for a bogie cart construction having side sand seals for keeping the heat confined to the heating chamber of the furnace proper. It is obvious that if some type of seal is not provided between ends of successive carts in the furnace much heat may be lost in the resulting openings. In carrying out the objects of the invention I have provided an effective end seal which is specifically shown in Figures 2 and 3 of the drawing.

Rigidly secured to the end pieces of the structural frame 16 of the bogie cart 15 are the transversely extending pieces 28 attached by means of the bolt and nut assemblies 29. The most forwardly disposed face of the piece 28 is fitted with a hard steel contact plate 30 by any expedient means which also extends transversely across the end of the cart 15. The arrangement is such that when two cars are pushed together the main contact for pushing is formed along the contact plates 30.

With two carts thus in abutting relation the cooperating pieces 28 on each cart are of such nature to provide an opening generally increasing in cross-sectional area toward the bed plate 19 and the insulating top 21. This opening is provided for the tubular seal to be hereinafter more fully described.

The pieces 28 may not extend transversely completely across the end of the cart but may be secured against the edges of the angles 27' so that the top part of the piece 28 is tightly held against the bed plate 19. As indicated in the previous discussion the side angles protrude beyond the length of the cart on at least one end so that the ends thereof are aligned approximately with the pieces 28. Journaled in the side faces of the angles 27' at a distance above the contact plates 30 shown as 31 is the transversely extending rod 32. Slidably mounted on the rod 32 is a tubular member 33, preferably a section of pipe, which is of greater inner diameter than the rod 32 and is of such length to reach from one angle 27 to the other disposed on the opposite side of the bogie cart.

When the carts are separated the rod 32 supports the pipe length 33 from undue movement in the downward direction and holds the same in proper position for effecting the seal. As a cart is moved into abutting relation with another cart carrying a tubular end seal the pipe length is wedged between the angled faces of the pieces 28 but due to the rounded shape of the tubular member 33 does not interfere with the contact plates 30 meeting each other. In this manner the pipe 33 is caused to rest on the angled portion of the pieces 28 to complete the end seal between the bogie carts 15. It is contemplated that the rear ends of the carts will be equipped with the tubular end seal in order that when the front end of the following car is moved into position an immediate seal is formed against the escape of heat from the furnace and that the construction of alternate ends of the insulating material 21 may be offset to provide a further barrier to the escape of heat.

The seals thus effected provide an excellent means for keeping the heat within the heating chamber and in this manner the side walls 13 of the furnace do not need to be built from insulating material from the ground to the roof but only from the plane of the seal which may be a considerable distance from the floor and level of the tracks 11. The advantages are numerous from this construction as much insulating material is saved and the size or number of the buckstays and other supporting members may be reduced. The savings are of considerable magnitude as the furnaces are usually of great length.

It is also important that the tracks and structural undercarriage of the bogie carts be protected from the heat and the tubular end seals provided in this application substantially reduces the amount of heat reaching these parts. In this manner the operating life of the bogie cart is considerably increased as very little of the structural support of the cart is above the end and side seal.

Since the seals are effective in reducing the heat conducted to the cooler air surrounding the furnace the amount of fuel needed to heat the furnace and maintain it at proper temperatures is considerably reduced.

It may be further observed that the tubular end seal I have provided is of the utmost simplicity in construction, being made from standard metal pieces and parts so as to be readily adapted for use with bogie carts in a pusher type furnace. The seal is equally applicable to cars already in use by providing the end piece, a rod journaled in the sides of the sand seal angles, and the tubular member carried thereby in the arrangement detailed herein.

Attention is also directed to the fact that the trailing and leading ends of successive bogie carts do not have to be completely contacting each other in order for the seal to be operative. The contact plates may be separated by a small distance but the pipe will still be supported by the angled sides of the end pieces and this is especially important since it is often the case that such a small separation exists as is readily understood.

Although it is apparent that I have accomplished the objects initially set forth, it should be understood that many changes may be made in the illustrated embodiment and therefore reference should be had to the following appended claim in determining the full and complete scope of the invention.

I claim:

In a bogie type pusher furnace of the kind having an elongated tunnel-like heating chamber and a plurality of bogie carts adapted to be moved through the lower portion of said chamber in end-to-end relation thereby forming the bottom wall of said chamber, the improvement which consists of forming each of said bogie carts with a horizontally disposed structural steel frame for supporting a load-bearing hearth thereon and being in turn supported on the bogie wheels, each end of said frame having an end surface with a protruding transverse-

ly disposed lower portion and a contiguous transversely disposed upper portion inclined upwardly and inwardly toward the center of the cart, the arrangement being such that upon two of said carts being assembled in end-to-end relation said lower transverse portions of the adjacent end surfaces of the two carts are in pushing contact while there is provided above said contact a generally enlarged interstice which is generally V-shape in cross section as viewed in a plane longitudinal of the carts, a transversely disposed cylindrical member lying loosely in said interstice and contacting the inclined walls thereof to provide a fluid seal between the contacting ends of the carts, means for securing said member to one of said carts, said frame on each of said carts being formed with a pair of spaced side rails longitudinally coextensive with said lower transverse portions of said end surfaces, the end portions of said side rails extending above said lower transverse portions of said end surface on each end of said carts being thus operative to provide end stops for said cylindrical member, said securing means comprising a relatively small diametered rod extending longitudinally and loosely passing through said cylindrical

member and having its ends secured in one of said end portions of said side rails, said longitudinally extending side rails having depending leg portions, troughs attached to the opposite longitudinally extending wall of said heating chamber and being filled with loose granular material, and said depending leg portions adapted to extend into said troughs whereby a continuous fluid seal is provided about the periphery of each of said carts when said carts are in end-to-end relation in said heating chamber and the structural frame and bogie wheels of said carts are protected from the heat of said chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

822,380	Miller et al.	June 5, 1906
1,132,681	Parsons	Mar. 23, 1915
1,598,176	Tharadsen	Aug. 31, 1926
1,777,856	Pearson	Oct. 7, 1930

FOREIGN PATENTS

991,462	France	Oct. 5, 1951