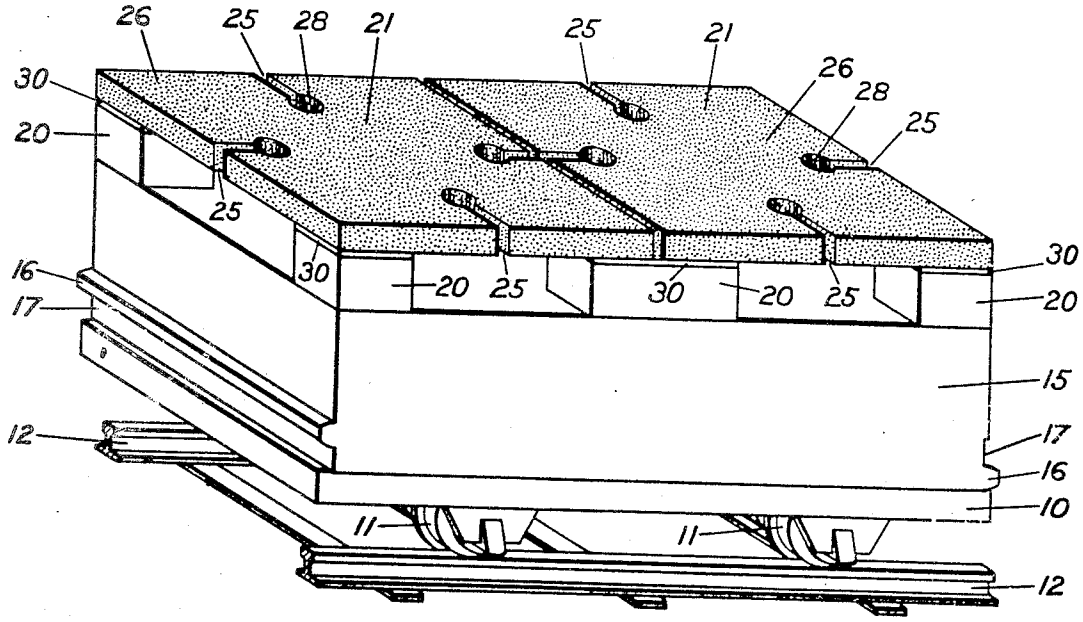
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TUNNEL KILN CAR

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WITNESSES

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TUNNEL KILN CAR

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My invention relates to tunnel kiln cars and more particularly to a refractory block and to a car structure including the same adapted for transporting ceramic ware through the heating chambers of a tunnel kiln.

Kiln cars for this purpose are ordinarily constructed of an iron framework supported on wheels and carrying a superstructure of refractory blocks, upon which the goods to be fired are supported, which will withstand the high temperature of the firing zone and protect the metallic portions of the car from the intense heat within the kiln. This superstructure is usually made in separate blocks, which expand under the influence of heat and then contract when cooled, the blocks being provided with passages therethrough for circulation of the heated air and the products of combustion. Since these cars are periodically removed from the kiln and so subjected to repeated heating and cooling treatments, the car tops tend to warp, crack and otherwise become defective and so render it difficult to properly set thereon the batts and saggers heretofore employed to support the green ware during firing. Moreover, it is found that these defects are more likely to occur during the treatment of ware of small size, since large portions of the refractory blocks on which the ware is set are wholly uncovered and exposed to the firing heat. These cracks develop due to the stresses set up during the contraction and shrinkage of the blocks when cooled; then mortar or other material becomes lodged in the cracks to cause rupture across the entire section of the block, so that the car must be rebuilt to avoid danger of an accident within the kiln. Furthermore, these refractory portions have usually been made of ordinary fire clay or other highly refractory material in special shapes which are expensive and involve a heavy cost of replacement.

It is accordingly one object of my invention to overcome such difficulties and to provide a car construction which is easily manufactured and will have a long life of usefulness.

A further object is to so construct the refractory parts of a kiln car that expansion and contraction thereof will not cause detrimental cracking of the ware supporting refractory blocks and so decrease the utility of the car.

A further object is to so construct the ware supporting refractory plates that they may expand and contract when subjected to the severe temperature conditions of the kiln and so provide a more uniform distribution of the expansion and contraction strains induced by the severe heating and cooling conditions of the kiln.

The accompanying drawing illustrates one embodiment of my invention in which the figure is an isometric view of a conventional form of kiln car equipped with several of the improved type of ware supporting plates, the slots in which are exaggerated to better show the invention.

Referring to the drawing, I have there illustrated a tunnel kiln car, comprising an iron framework 10 supported in the usual manner on wheels 11 arranged to run on tracks 12 laid on the floor of a tunnel kiln and within the lower portion of the kiln which is kept sufficiently cool therefor. The upper portion of the car, however, may be subjected to a temperature of 1300° C. or higher and must be made of highly refractory material. Mounted on the framework 10 is a base layer of refractory material 15 such as a number of refractory blocks, which may be of refractory fire clay or other suitable material and need not be of high refractoriness. The cars are ordinarily arranged to push one against another in the kiln and are so constructed that this pushing takes place against the base of the iron frame 10. The base layer of each car is provided with a projecting lug 16 and a corresponding depression 17 in the opposite ends thereof to form an interfitting joint and so provide a circuitous path between the cars which serves to prevent the hot kiln gases, as well as loose material which may drop from the cars, from entering the unheated passage for the kiln cars below the heating zone.

Mounted on this base layer 15 are the small refractory supporting blocks or plugs 20

made preferably of a refractory material, such as silicon carbide, bonded by a highly refractory vitrified ceramic bond. These plugs, which are of proper dimensions, are spaced apart on the top of the base layer to support the refractory car top 21, on which the green ware is to be carried, and to provide cross passages to permit the circulation of gas therebetween.

This refractory car top 21 may be made in accordance with my invention, and as illustrated in the drawing, of one or more pieces of highly refractory material which are provided with openings or slots 25 extending therethrough to compensate for expansion and contraction of the material due to thermal changes thereof. These pieces preferably comprise a single layer of plates or flat slabs 26 made of granular refractory material of high heat conductivity, such as silicon carbide or crystalline alumina bonded by vitrified ceramic bonds, as is well known in the art. The slots 25 in the blocks are preferably made as shown in the drawing, in which a series of narrow elongated slots perforate the slab and extend therethrough and inwardly from its edges to permit expansion and contraction of the material due to thermal changes in volume, although a plurality of slots may be formed in each edge if desired.

In the from illustrated, a single slot 25 extends inwardly from the central portion of each side edge of the plate for a sufficient distance towards the center portion of the plate so that strains set up in the edge portions of the plate are materially relieved by the ability of the plate to expand inwardly as well as outwardly. In order that the stress distribution may be gradual, the inner corners of these slots are well rounded, as shown by the cylindrical cavities 28, so as to minimize the effects of contraction and shrinkage and thus prevent rupture from starting across the entire section. However, the cavities 28 should be of such size as to reduce the plate strength as little as possible. If desired, a layer of refractory cement 30 may be placed between the plugs and the portions of the plate which are supported thereby. This car top may also be made of one piece, yet to avoid the expense of manufacturing such a large article it is preferably made in a plurality of pieces, as illustrated. Also, I prefer that these pieces be provided with a substantially plane top surface on which the kiln ware may be laid.

It will now be seen that in accordance with this invention I have provided a simple car construction in which the car top comprises a ceramic body made of a refractory granular material, such as ceramic bonded silicon carbide or crystalline alumina, and on which the ware may be directly set without necessitating the use of saggers. The various blocks or slabs which tend to crack under the strain induced by expansion and contraction are now suitably formed so as to permit such thermal change in volume without the production of detrimental warping or permanent cracking tendencies of the parts. Such modifications or changes of my invention as may be obvious to one skilled in the art are, however, to be considered embodied in the above specification and the following claims.

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

1. A ware supporting plate for tunnel kiln cars comprising a slab of refractory material having an opening therethrough which extends inwardly from the edges to compensate for expansion and contraction of the material due to thermal changes thereof.

2. A ware supporting plate for tunnel kiln cars comprising a slab of refractory material having a series of openings therethrough which extend inwardly from the edges to compensate for expansion and contraction of the slab due to thermal changes thereof.

3. A ware supporting plate for tunnel kiln cars comprising a slab of refractory material having a series of narrow elongated slots extending therethrough and inwardly from its edges to compensate for expansion and contraction of the material due to thermal changes thereof.

4. A car for tunnel kilns comprising a wheeled support, a refractory structure of low heat conductivity thereon, refractory supporting blocks spaced on the top of said structure, and a flat top slab of refractory material supported by said blocks, the edge portions of said slab having inwardly extending slots, which permit expansion and contraction of the material thereof.

5. A support for ceramic articles in a kiln comprising a slab of vitrified ceramic bonded granular refractory material of high heat conductivity, the central portion of which consists of a solid dense mass of bonded refractory grains and the heat exposed sides have a plurality of narrow elongated slots formed therein and extending inwardly for sufficient distance to compensate for expansion and contraction of the material due to thermal changes thereof.

Signed at Worcester, Massachusetts, this 12th day of February 1931.

HUGO W. H. BETH.