

June 1, 1926.

M. F. BEECHER ET AL

1,587,210

TUNNEL KILN CAR

Filed June 4, 1924

3 Sheets-Sheet 1

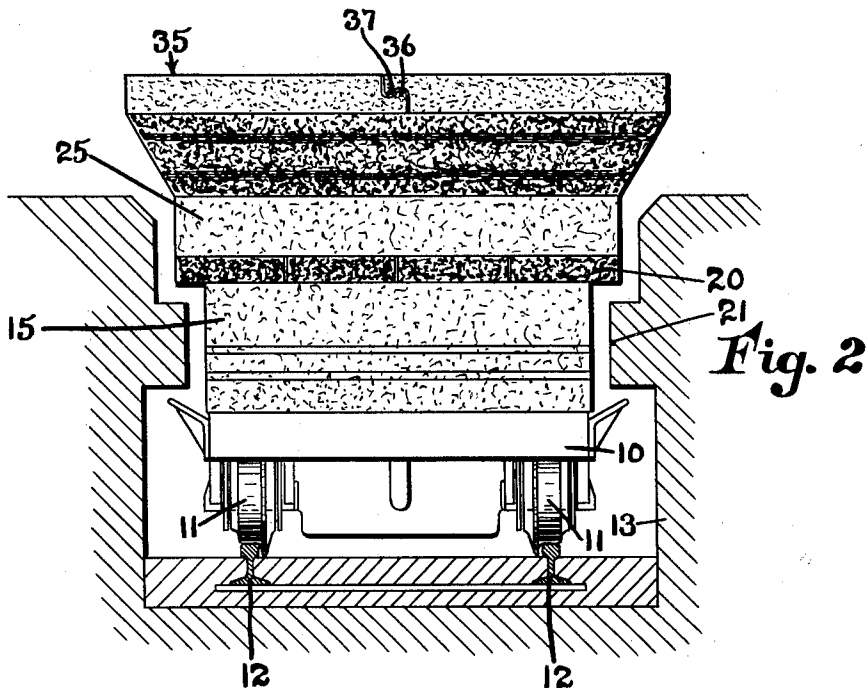


Fig. 2

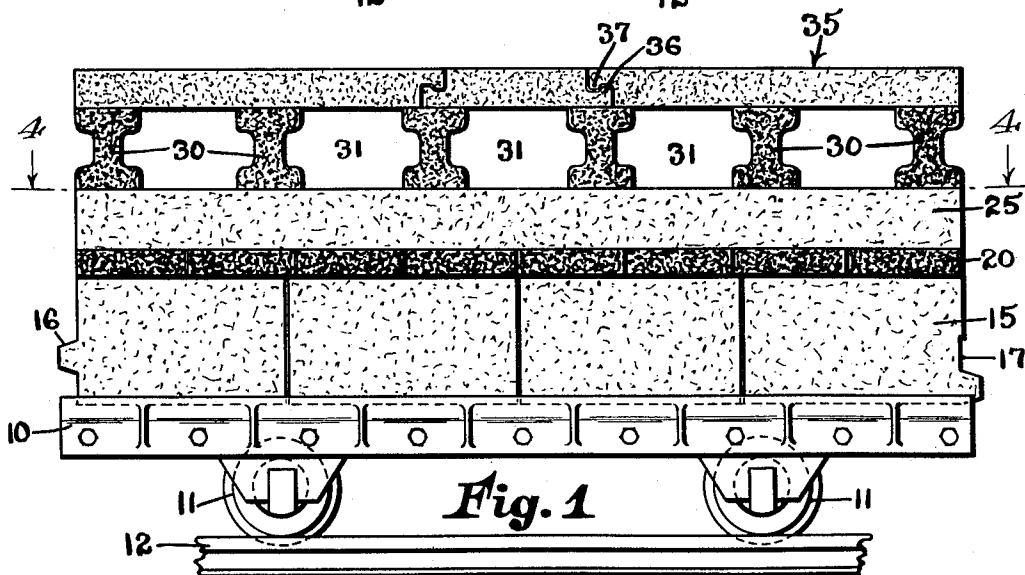


Fig. 1

Witnesses
Harold W. Eaton
Leah A. Sessions

Inventors
Milton F. Beecher
Anton E. Olson
By
Clayton F. Jenkins
Attorneys

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3 Sheets-Sheet 2

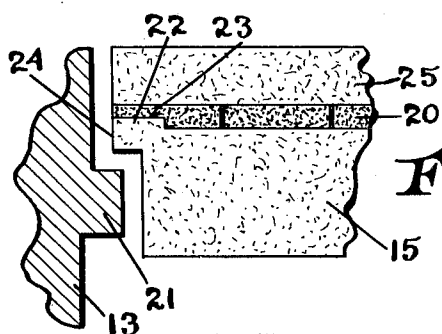
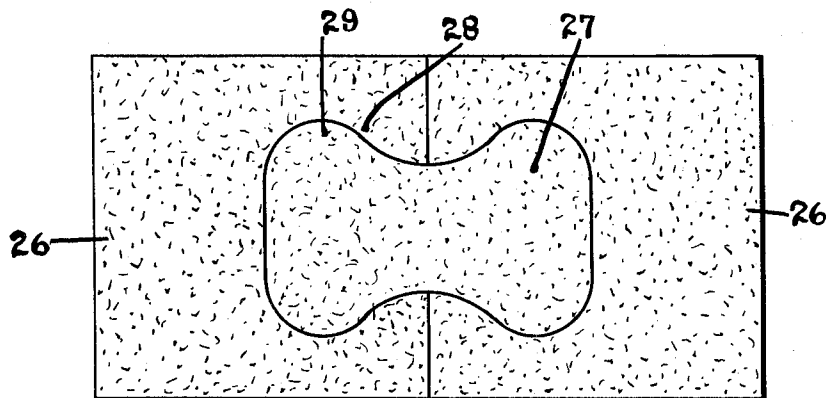


Fig. 4

Fig. 5

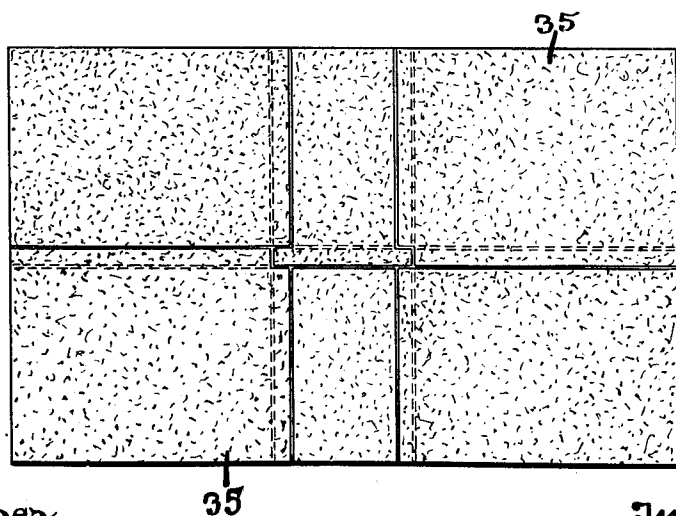


Fig. 3

Witnesses

Harold W. Eaton
Leah A. Sessions

Inventors

Milton F. Beecher
Anton E. Olson

By

Clayton H. Jenkins
Attorney

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M. F. BEECHER ET AL

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3 Sheets-Sheet 3

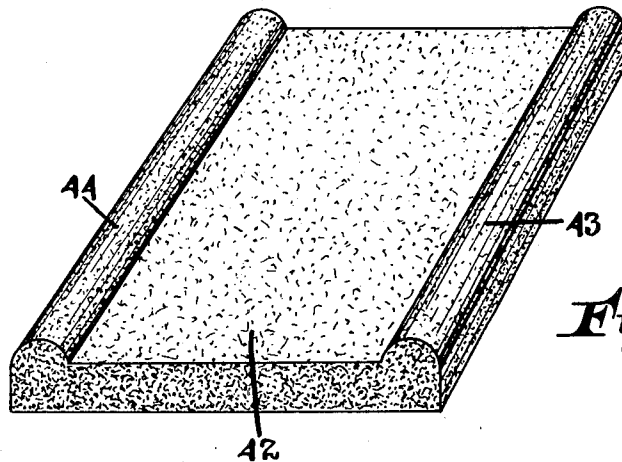


Fig. 7

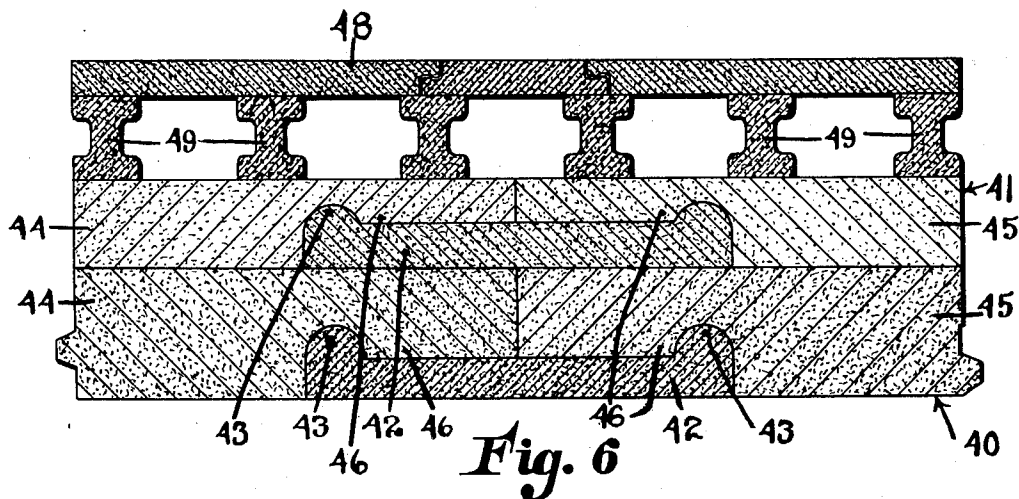


Fig. 6

Witnesses

Harold W. Eaton

Evelyn M. Bancroft

Inventors

Milton F. Beecher

Anton E. Olson

By Clayton Jenks
Attorney

UNITED STATES PATENT OFFICE.

MILTON F. BEECHER AND ANTON E. OLSON, OF WORCESTER, MASSACHUSETTS, ASSIGNORS TO NORTON COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

TUNNEL-KILN CAR.

Application filed June 4, 1924. Serial No. 717,864.

Our invention relates to tunnel kilns and more particularly to a car adapted for transporting ceramic ware through a high temperature kiln.

5 Kiln cars for this purpose are ordinarily constructed of an iron frame-work supported on wheels and carrying a super-structure of refractory blocks which will withstand the high temperature of the firing
10 zone. Cars which are particularly adapted for use in a Dressler type of tunnel kiln have cross-passages communicating with holes in the top of the car to provide for circulation of the heated air. These cars
15 as formerly constructed have necessitated the use of saggars for supporting the green ware to be fired. Moreover, the refractory portions of such cars have been made in separate blocks which expand under the influence of heat and then contract when
20 cooled. Cracks develop between these cooled blocks, and mortar or other material falls into these cracks and prevents their closing when again heated. As a result the large
25 blocks are forced apart so that the car must ultimately be re-built to avoid danger of an accident within the kiln.

It is accordingly one object of our invention to overcome such difficulties and to provide a car construction which is easily manufactured and will have a long life of usefulness and which will permit an economical, compact and safe piling of the ware thereon.

30 A further object of our invention is to so construct the refractory parts of a kiln car that expansion and contraction thereof will not cause detrimental displacement of the blocks and so decrease the utility of the car.

40 A further object is to provide such shapes and arrangement of refractory blocks and to so interlock them that they may expand under the influence of heat and upon cooling serve to pull each other back to their original positions.

45 With these and other objects in view as will be readily apparent in the following disclosure, our invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings in which like numerals indicate like parts:

Fig. 1 is a side elevation of a car constructed in accordance with our invention; 55

Fig. 2 is an end elevation thereof, including a diagrammatic showing of the adjacent kiln wall;

Fig. 3 is a plan view of the top of the car; 60

Fig. 4 is a plan view of the top of the upper layer of fire clay refractory blocks taken on the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary detail showing a modification of the arrangement of parts shown in Fig. 2; 65

Fig. 6 is a longitudinal sectional view of a modified arrangement of blocks; and

Fig. 7 is an isometric view of one of the interlocking blocks. 70

In accordance with our invention we provide a kiln car of the type described which has a highly refractory top portion provided with a substantially plane and imperforate surface on which the green ware may be supported. The main portion of the car body supporting this refractory top is made up of blocks of fire clay or other suitable refractory material which are interlocked sufficiently to prevent detrimental deformation of the car body. 80

Referring to the drawings which illustrate one embodiment of our invention, we have there illustrated a tunnel kiln car, comprising an iron framework 10 supported in the usual manner on wheels 11 arranged to run on a track 12 within the lower portion of a kiln 13, 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 are a number of large blocks 15 of refractory fire clay or other suitable material. These blocks are not subjected to a high temperature but we may nevertheless provide such a construction as to take care of expansion and contraction. The cars are ordinarily arranged to push one against another in the kiln and we so construct them that this pushing takes place against the lower layer of blocks. To this end, the pro- 100

jecting lugs 16 and the corresponding depression 17 in the opposite ends of each car are provided to form an interfitting joint through which force is transmitted to move the cars. This pushing action, therefore, tends to hold the block in proper position on the car longitudinally thereof, and if desired they may be made of a single piece crossways so as to prevent any expansion and opening of cracks in that direction.

In our preferred construction, we place a layer of material above these blocks 15 which is a very poor conductor of heat, and to this end we may employ bricks made of diatomaceous earth, or we may employ other desirable low heat conducting material. These bricks 20 may be positioned as shown in Fig. 2 of the drawings as a single layer closely contiguous to one another, and forming a layer throughout the entire extent of the car. This layer may overlap the blocks 15 as shown in Fig. 2, as is common in kiln car construction, in which the upper portion of the cars are made wider than the bottom to provide a part overlapping a corresponding ledge 21 on the kiln walls, so that material falling off the car will not fall directly into the lower portion of the kiln, but may be caught on the ledges of the kiln or on the projecting flanges placed on the car. This arrangement also prevents the radiation of heat directly from the hot car part into the lower zone of the kiln in which the iron structure of the car is located.

These bricks 20 may be held in position on the car and prevented from expanding either transversely or longitudinally thereof by providing a construction, such as shown in Fig. 5, in which the lower blocks 15 are provided with an upwardly projecting shoulder 22 which interfits with a cut-away portion 23 in the outer row of bricks. The outer part 24 of the block 15 also projects to the extreme edge of the upper layer of bricks so as to support them completely throughout the entire extent, and prevent the super-structure from shearing off the bricks or crushing them, thereby permitting the entire weight of the car load to be transmitted directly to the strong blocks 15 below this layer of bricks 20.

Above this layer of bricks 20 is a layer of highly refractory material, made up as shown in Fig. 4, of large blocks which are preferably interfitted or so constructed that expansion will not move the blocks away from each other. The interfitting joints may be of sufficient looseness to prevent such expansion and contraction, but if desired I may make this layer 25 of a single block of refractory material. One simple construction involving interfitting blocks is illustrated in Fig. 4, in which the two end blocks 26 are dovetailed with a central block 27 as illustrated, the parts having interlocking

lugs 28 and 29 which prevent the parts from separating.

Mounted upon this layer 25 are cross beams 30 made preferably of a super-refractory material, such as silicon carbide, bonded by highly refractory vitrified ceramic bond. These rails serve to provide cross-passages 31 through which heated gases may be transmitted from the muffles which extend longitudinally at the side of the kiln and they also serve to support the refractory car top 35 on which the green ware is to be carried.

This refractory car top 35 may be made as illustrated in Fig. 3 of various pieces which have interfitting lugs or members suitably shaped and arranged to prevent separation of the blocks upon expansion and contraction. These blocks are preferably made of granular refractory material, such as silicon carbide or crystalline alumina bonded by vitrified ceramic bonds, as is well known in this art. The interlocking joints between the blocks are preferably made as shown in Figs. 1 and 3, in which an upwardly and outwardly projecting lug 36 on one block interfits with an outwardly and downwardly extending lug 37 on the adjacent block, the joint therebetween being substantially of an S-shape. If desired, a refractory cement, or one capable of softening under the heat of the firing operation, may be placed in the cracks between the blocks 35 to prevent foreign bodies getting into the joints. This car top may 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 we prefer that these pieces be imperforate and form a substantially plane surface on which kiln ware may be laid.

The lowest layer of blocks may also be locked together if desired, and to show this as well as another manner of arranging the refractory portion of a car, we have illustrated a simplified construction in Figs. 6 and 7, in which the two layers 40 and 41, corresponding with blocks 15 and 25 above described, are made in sets of three blocks dove-tailed or hooked together. A key stone 42 used in each layer is shaped as shown so as to provide two locking ridges 43 which cooperate with correspondingly shaped grooves cut in the stones 44 and 45. These stones may be arranged either side up but preferably as shown with the two outside blocks on top. As will be apparent, any tendency for the blocks to separate longitudinally will be resisted by the depending lugs or ridges 46 of the two upper blocks which hook against the shoulders of the ridges 43 of the key block. These blocks may be made as wide as the car, so that lateral expansion will not affect their arrangement. In this modification the top

slabs 48 may be shaped as in Figs. 1 and 2 and likewise supported on the rails 49 mounted on the upper block layer 41.

It will now be seen that we have provided a simple car construction in which the car top is an imperforate body made of a super-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 saggars. The various blocks which tend to separate under expansion and contraction are suitably locked together so as to permit such change in volume without detrimental and permanent separation of the parts. It will be apparent that such interlocking need be provided to take care only of the transverse expansion since longitudinal expansion may be overcome by having the cars push directly against each other on this layer 25, thereby tending to hold the blocks of this layer closely together both when cold and when hot during the operation of the kiln, but if desired the blocks may be locked in both directions. Various other changes in construction will be apparent to one skilled in the art in view of the above disclosure and it is intended that such equivalent forms lie within the scope of the following claims.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. A car for tunnel kilns comprising a supporting framework mounted on wheels and a super-structure thereon having a layer of refractory blocks so constructed and arranged that they may expand under the influence of heat and upon cooling will pull each other back to their original positions.

2. A car for tunnel kilns comprising a supporting framework mounted on wheels, a layer of refractory blocks thereon, and a car top of super-refractory blocks interlocked together to prevent permanent separation by expansion and contraction thereof.

3. A car for tunnel kilns comprising a wheeled support, a refractory structure thereon and an imperforate car top constructed of refractory blocks which have interlocking joints arranged to permit expansion and contraction but prevent permanent separation thereof.

4. A car for tunnel kilns comprising a framework mounted on wheels, a lower layer of refractory material thereon, a layer of refractory blocks superimposed thereover and having interlocking joints connecting them together, and a car top supported thereon made up of refractory blocks interlocked together, said blocks being arranged to permit expansion and contraction but prevent permanent separation thereof.

5. A car for tunnel kilns comprising a framework mounted on wheels, layers of refractory blocks supported thereon, spaced cross rails on the top layer and a top of refractory blocks on said rails forming the car top, the blocks in each layer being provided with interlocking members which are hooked together to permit expansion and contraction but prevent permanent separation thereof.

6. A car for tunnel kilns comprising a wheeled support, a refractory structure thereon made of blocks interlocked together, spaced cross rails carried on the blocks and a top of refractory blocks interlocked together and supported on said rails, said blocks being arranged to permit expansion and contraction but prevent permanent separation thereof.

7. A block for tunnel kiln cars comprising a body of refractory material having a locking ridge on one side arranged to interfit with and hook over a portion of a second block to hold the two together, and a top portion for setting ware thereon.

8. A block for tunnel kiln cars comprising a slab of refractory material having a plane top and locking lugs on edges thereof arranged to interlock with lugs on other blocks to hold them together.

9. A block for a tunnel kiln car comprising a slab of refractory granular material bonded by a vitrified ceramic bond, said slab having an imperforate plane top, and a locking lug on an edge constructed and arranged to interlock with a corresponding portion of another block and permit expansion and contraction of the blocks without permanent separation thereof.

Signed at Worcester, Massachusetts, this 3rd day of June 1924.

ANTON E. OLSON.
MILTON F. BEECHER.