Dec. 10, 1929. G. D. MORRIS ET AL 1,739,176

KILN CAR

Filed Aug. 27, 1928

Fig. 1,

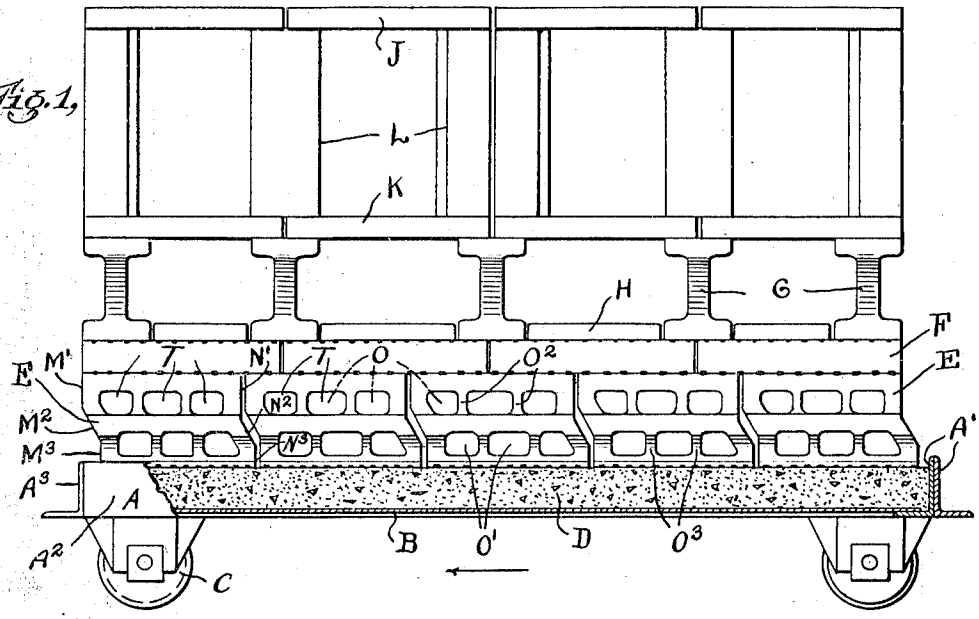


Fig. 2,

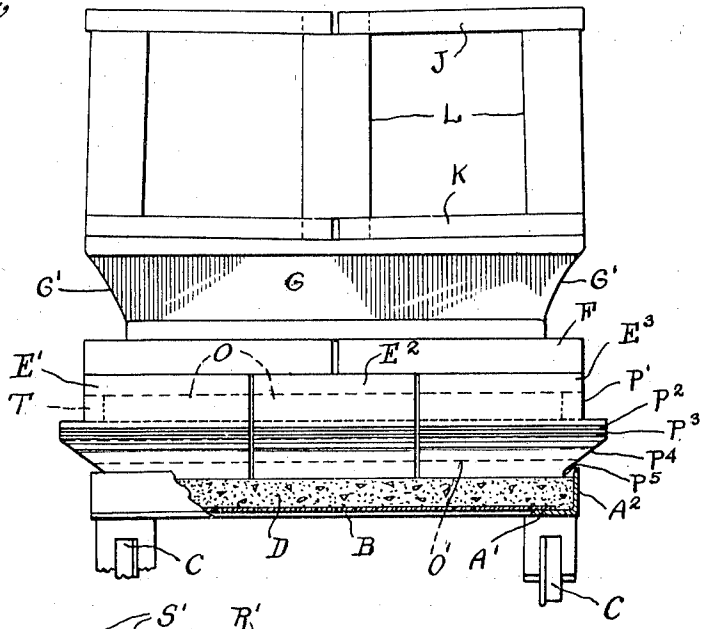
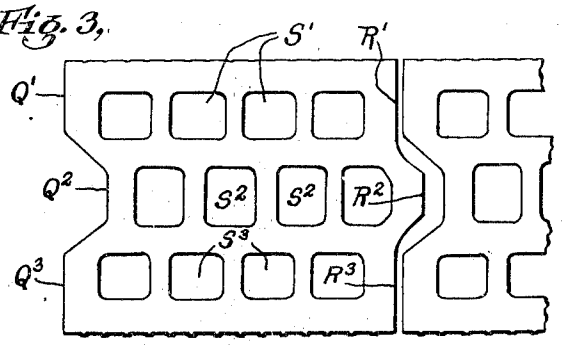


Fig. 3,



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UNITED STATES PATENT OFFICE

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KILN CAR

Application filed August 27, 1928. Serial No. 302,231.

The object of the present invention is to provide an improved construction of the refractory body portion of the cars employed in transporting goods through tunnel kilns, which will be relatively simple in construction and durable under the severe temperature conditions and particularly under the contraction and expansion of the parts to which said cars are subjected in regular operation.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, and the advantages possessed by it reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

Of the drawings:

Fig. 1 is a side elevation partly broken away to expose the concrete filling material;

Fig. 2 is a rear end elevation with portions broken away; and

Fig. 3 is a modified form of refractory block.

In the drawings and referring first to the construction shown in Figs. 1 and 2, I have illustrated a preferred embodiment in which a kiln car having a direction of travel through the kiln as indicated by the arrow in Fig. 1, comprises a metallic frame A at the bottom of the car body and preferably made of angular cross-section. The frame is provided at its front and rear sides with a strengthening metallic angle beam A′. A steel sheet B is supported on the horizontal flange A^2 of the frame A and forms the bottom of the car body. The usual wheels C are journalled on the frame member A adjacent each end thereof. The shallow receptacle formed by the frame A and sheet B is filled with a concrete and refractory mixture D which tends to a level slightly below the top of the vertical flange A^3 of the bottom frame. Seated on the concrete layer D and forming the major portion of the car body are a plurality of massive refractory blocks E. In the construction shown three rows of blocks E′, E^2 and E^3 with five blocks in each row are shown extending longitudinally of the car.

A platform consisting of a plurality of flat slabs F of refractory material is positioned on the upper surface of the refractory blocks and the slabs are arranged to cover the vertical joints between the individual blocks. The ware supporting means are mounted on the refractory slabs F and comprise a series of transversely extending refractory girders G spaced apart longitudinally of the car by small slabs H of refractory material. Each of the girders G has its ends G′ cut away along a curved line to maintain a proper clearance with the kiln chamber sides. A plurality of top and bottom slabs J and K, respectively, separated by vertical posts L are mounted on the girders G. The bottom slabs K form a cover for the open ended channels between the girders and through which the kiln chamber atmosphere circulates.

The refractory blocks E forming the major portion of the car superstructure are of the overlapping type and of relatively light weight. All of the blocks shown in Figs. 1 and 2 have the same longitudinal cross section, but the blocks in the side rows differ from those in the center row in that the side row blocks have the face adjacent the chamber side walls specially formed to minimize the amount of high temperature gases passing from the upper portion of the kiln chamber downwardly into contact with the car running gear Such provisions are necessary as the metallic portions of the car rapidly deteriorate when subjected to the action of the kiln atmosphere.

As shown in Fig. 1, each of the blocks E has its front end formed with an upper vertical portion M′, a middle portion M^2 extending downwardly and rearwardly at an angle to the upper portion, and a lower vertical portion M^3. The rear face of the block is formed with substantially the same shape as the front face and comprises an upper vertical portion N′ slightly longer than the corresponding portion M′, a middle portion N^2 extending downwardly and rearwardly, and a lower vertical portion N^3 slightly shorter

than the corresponding portion M^3. When the blocks are arranged in rows extending longitudinally of the car with the front face of one block slightly spaced from the rear face of another, the portions M′ and M^2 of the former will overlap the portions N^2 and N^3 of the latter. This arrangement of the blocks prevents direct radiant heat from passing downwardly between the blocks of each car and also between the adjacent end blocks of adjacent cars. Furthermore, the blocks may be substituted for one another at any point along the length of the car without necessitating any change in the block structure.

In the ordinary use of refractory blocks of this type, the blocks are subjected to expansion and contraction strains due to the various heating and cooling operations necessary in heat treating the ware. Such operations have a destructive effect on kiln car refractory blocks heretofore in use and these blocks must be replaced in a relatively short time. To equalize the contraction and expansion strains and at the same time materially decrease the amount of material in and the weight of the block, each block is formed with a plurality of transverse cores or passages, which are arranged in such a manner that the distance from any face of the block to an adjacent core is substantially the same. In carrying out this plan in a block of the type described, we have arranged upper and lower rows of cores, O and O′ respectively, with the cores in the upper row staggered with respect to the cores in the lower row. In this arrangement the cores are preferably made the same size in each row to reduce the number of cores required and to eliminate a large number of odd-sized cores. It is apparent that the walls O^2 between the upper cores are not in alignment with the walls O^3 between the cores in the lower row.

The face on the outer side of each of the blocks in the side rows E′ and E^3 is formed with an upper vertical portion P′, an intermediate projecting shoulder portion P^2 having an outer vertical side P^3 and a lower inwardly sloping portion P^4 extending from the lower end of the section P^3 inwardly over the top of the side vertical flange of the frame, and a short vertical section P^5 at the end of the section P^4. The projecting portion of the block cooperates with a correspondingly shaped portion of the kiln chamber (not shown) to form an abrupt curve in the space between the side of the car and wall. Such an arrangement minimizes the downward flow of heating gases into contact with the metallic parts of the car.

The top and bottom surfaces of the blocks E and slabs H are preferably scored or corrugated to oppose any tendency of the parts to move in any direction on the concrete material.

It will be apparent with the arrangement shown that the upper portions of the blocks will be subjected to considerably higher temperatures than the lower portions. In order to avoid any circulation of high temperature gases through the upper row of cores, plugs T of refractory material may be inserted in the ends of the cores in the side rows of blocks.

The modified form of refractory block illustrated in Fig. 3 is substantially rectangular in cross-section and formed with a recessed front portion Q^2 between top and bottom vertical portions Q′ and Q^3 respectively, and a projecting rear portion R^2 between upper and lower vertical portions R′ and R^3, respectively. The vertical portions at each end are in vertical alignment and the intermediate projecting portion is preferably smaller in every dimension than the recessed portion into which it extends. In a block of this type, three rows of cores are provided with the cores in the top and bottom rows S′ and S^3 respectively, in alignment and the cores in the middle row S^2 staggered with respect to the cores in the other rows.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

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

1. A tunnel kiln car comprising a metallic bottom frame and a refractory body portion mounted thereon and formed of a plurality of large blocks of refractory material arranged in overlapping relation, each of said blocks having a plurality of rows of transverse cores arranged in staggered formation.

2. A tunnel kiln car comprising a metallic bottom frame, a mass of concrete in said frame, and a refractory body portion mounted on said concrete mass and comprising a plurality of refractory blocks, said blocks being arranged longitudinally of the car and overlapping one another and each of said blocks having a plurality of rows of transverse cores arranged in staggered formation.

3. A tunnel kiln car comprising a metallic bottom frame, and a refractory body portion mounted thereon and comprising a plurality of rows of refractory blocks extending longitudinally of the car, the blocks in each row being arranged in overlapping relation and the outer side of each block in the rows adjacent the kiln chamber walls having a laterally projecting portion adapted to cooperate with

the kiln wall in preventing the passage of gases between said blocks and wall.

4. A block adapted for use in tunnel kiln cars consisting of a mass of refractory material having a projecting portion at one end and an indented portion at the opposite end, and transverse cores arranged in a plurality of horizontal rows, the cores in one of said rows being staggered with respect to the cores in another of said rows.

5. A block adapted for use in tunnel kiln cars consisting of a mass of refractory material having a projecting portion at one end and an indented portion at the opposite end, and transverse cores arranged in a plurality of horizontal rows, the cores in one of said rows, being staggered with respect to the cores in another of said rows, and the bottom surface of said mass being roughened to prevent movement of said mass relative to its support.

6. A block adapted for use in tunnel kiln cars consisting of a mass of refractory material having a projecting portion at one end and an indented portion at the opposite end, and transverse cores arranged in a plurality of horizontal rows, the cores in one of said rows being staggered with respect to the cores in another of said rows, all of said cores being substantially equi-distant from the outer surface of said mass.

7. A block adapted for use in kiln cars consisting of a mass of refractory material having the lower portion of one end and the upper portion of the opposite end projecting and a plurality of rows of transverse cores therein, the passages in the upper row being staggered relative to the passages in said lower row.

8. A block adapted for use in kiln cars consisting of a mass of refractory material having the lower portion of one end and the upper portion of the opposite end projecting and a plurality of rows of transverse passages therein, the passages in the upper row being staggered relative to the passages in said lower row, all of said passages being approximately equi-distant from the adjacent outer surface of the mass.

Signed at New Castle, in the county of Lawrence and State of Pennsylvania, this 30th day of June, A. D. 1928.

GEORGE D. MORRIS.
GORDON KLEIN.