June 25, 1963 H. R. HERRON 3,094,759

TUNNEL KILN CAR TOP

Filed April 5, 1962 2 Sheets-Sheet 1

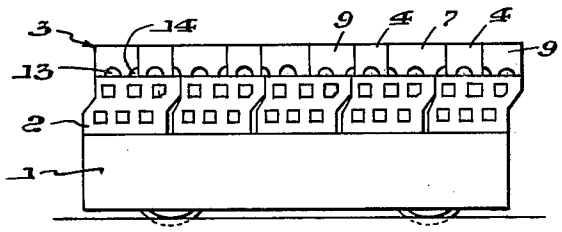


Fig. 1.

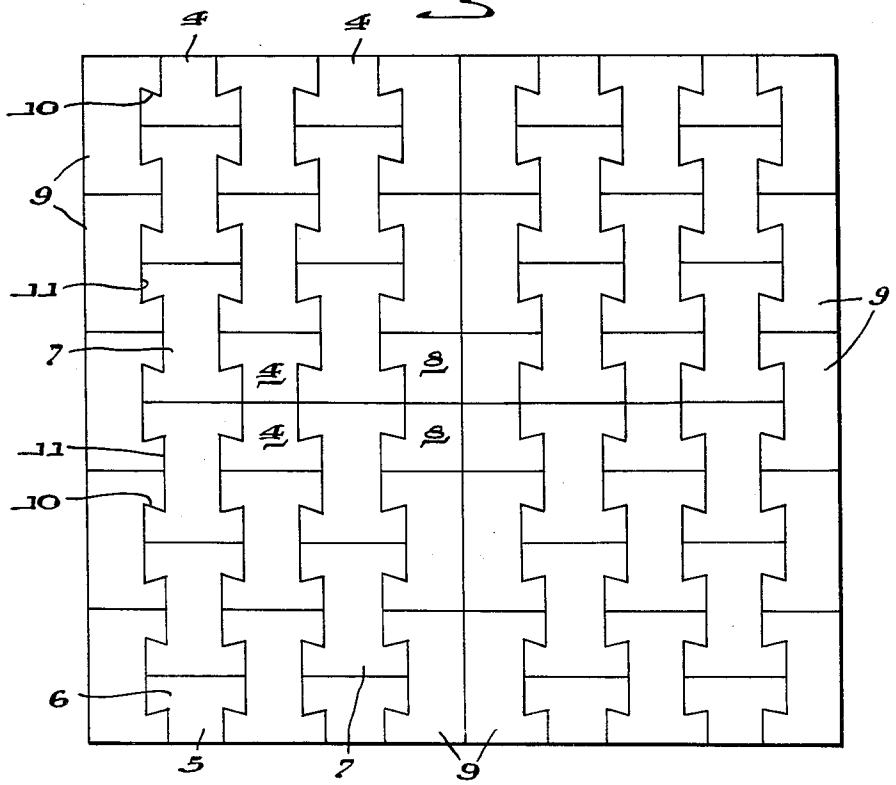


Fig. 2.

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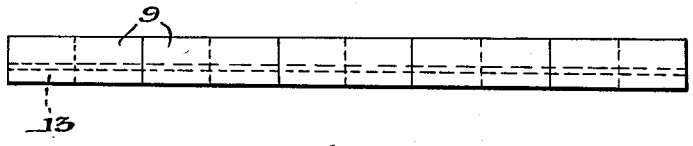


Fig. 3.

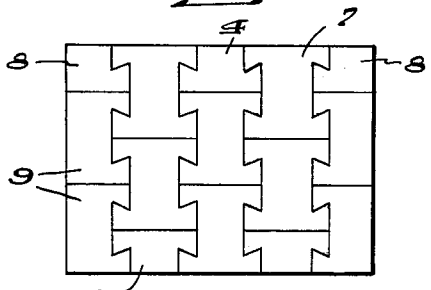


Fig. 4.

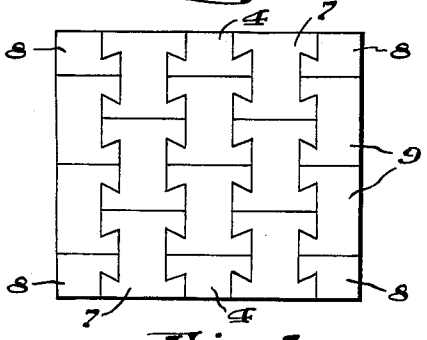


Fig. 5.

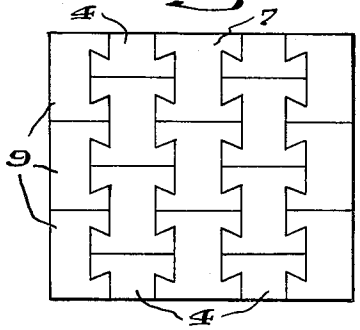


Fig. 6.

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TUNNEL KILN CAR TOP

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6 Claims. (Cl. 25—142)

This invention relates to tunnel kiln cars, and more particularly to the refractory tops with which they are provided.

This application is a continuation-in-part of my copending application, Serial No. 12,706, filed March 4, 1960, for "Tunnel Kiln Car Top," which has been abandoned in favor of the present application.

It is customary to provide a tunnel kiln car with a flat refractory top that supports a layer of sand, on which the articles that are to be fired are set. Although a monolithic top would be ideal in some respects, it is not practical in most cases for several reasons. It is therefore customary to form the top from a number of tiles. Tiles are cheaper and easier to handle, and if any of them break, it is a simple matter to replace them. However, when a top is formed from a large number of tiles, there necessarily is a large number of joints between them. It is conventional to place silica sand or quartz over the upper surface of the car top to prevent sticking between items being fired in the kiln and the car top; and this sand has had a tendency to sift down the joints between tiles. The sand deposits tended to build up and the joints became packed, so that when the cars were passed through the kiln, because of differences in thermal expansion between the quartz or sand and the refractory tiles, there was buckling of the tiles, car top failure, and in some instances spreading of the top sufficient to cause contact with internal kiln walls resulting in wrecks inside the kiln. Also, since the top also becomes uneven in the process, breakage of ware supported by it may occur. The mechanical handling of cars and the ware on them are other causes of car top destruction. Any severe bumping of the cars together or ramming by lift trucks will usually knock the car top out of alignment and soon require it to be rebuilt.

The monolithic type tops above referred to seemed an answer to the problem of sand build up in joints. But monolithic tops have not been successful, because the temperatures involved in tunnel kiln used for firing refractories is much greater than presently available, castable or monolithic material can successfully withstand without failure due to cracking.

It is among the objects of this invention to provide a tunnel kiln car top which is made from a large number of small tiles, but in which the tiles are interlocked together; and interlocked in such a manner as to prevent silica sand build up in joints.

The invention is illustrated in the accompnaying drawings, in which:

FIG. 1 is a side view of a kiln car provided with my top;

FIG. 2 is an enlarged plan view of the top;

FIG. 3 is an end view of the top alone; and

FIGS. 4, 5 and 6 are plan views of other patterns in which the same tile shapes as shown in FIG. 2 can be arranged.

Referring to FIG. 1 of the drawings, a conventional kiln car 1 supports suitable cored refractory blocks 2, on which a flat top 3 is mounted. The top consists of a number of interlocking tiles. As shown in FIG. 2, the tiles are made in several different shapes, a maximum of four shapes being required, with tiles of one shape made as both rights and lefts. For the purpose of this description, tiles 4 will be called the first shape, which is like

a horizontal T that has a stem 5 crossed at one end by a bar 6 that projects from opposite sides of the stem. The second shape forming tiles 7, is produced by integrally joining two tiles 4 of the first shape stem-to-stem so that their cross bars are at opposite ends of the tile. In actual practice, tile 7 would be considered the basic shape, because the other shapes can be cut from it. Tiles 8 have the third shape, which is the same as the first shape, except that one end of the cross bar has been omitted. These tiles are made in rights and lefts. The fourth or last shape, for tiles 9, is like two tiles 8 (right and left) of the third shape joined stem to stem with their cross bars at opposite ends of the tile where they project from only one and the same side of the stem. The stem side 10 of each end of all cross bars forms an acute angle with the adjoining stem. Therefore, the space between the cross bars of each tile 7 and 9 forms at the side of the tile a dovetail notch 11.

The tiles are arranged in parallel rows, preferably extending crosswise of the car. The two outer rows, which are at the front and back of the car, are formed entirely of tiles 9 because they have flat sides extending from end to end and can therefore form flat ends for the top. Their notched sides face inwardly. The row of tiles engaging each outer row is composed mainly of tiles 7 arranged bar to bar, with their stems in alignment. These tiles are staggered relative to those in the outer rows, so that the joints between tiles 7 are opposite the centers of tiles 9. Since the width of each notch 11 is about a sixteenth of an inch greater than twice the width of a tile cross bar, each notch in tiles 9 can receive and retain the ends of a pair of cross bars on two adjoining tiles 7 beside it. This sixteenth inch difference in wdith is repeated across the top in all the notches 11 and is maintained during all temperature variations because all the tiles are fabricated of the same material and thus have an identical coefficient of thermal expansion. Likewise, the cross bars on tiles 9 are retained in the notches in the sides of tiles 7 beside them. Since tiles 7 extend only half way across the two end tiles 9 in each outer row, the space remaining is filled by two tiles 4 of the first shape, which therefore form the ends of the second row and make it the same length as the outer row. It will be seen that all of the tiles in the two rows at each end of the car are interlocked by the cross bar ends and the notches in two directions, lengthwise and crosswise of the car.

The rest of the rows of tiles could be formed solely of tiles 4 and 7 interlocking in the same way as those just described. In that case, every other row would be composed entirely of tiles 7. However, in order to permit the car top to be removed from the car mechanically, it is desirable to make the top divisible into sections small enough to be handled. For that purpose, the top may be divided into completely separate front and back half sections. To do that, the top is made from an even number of rows of tiles, and the two center rows may be formed of tiles 9 placed back to back. Since half of the top may still be too large to remove as a unit, it is desirable to divide the top into quarters before it is removed. This can be done by first removing the middle tile 9 from each outer row, but as it would be difficult to lift out the middle tile 7 in the center row of each half section of the top, it is preferred to use two tiles 4 in place of that middle tile 7. The two tiles 4 are placed stem to stem as shown. For the same reason, two tiles 8 are used instead of the center tile in each center row of tiles 9.

Therefore, the car top not only has a joint extending straight across the car between the two center rows, but also another straight joint extending lengthwise of the car across the centers of the two half sections of the top from the front to the rear row. In use, the two outer rows of tiles hold the halves of the half sections of the top to-

gether, and the pressure of the ends of the tops against one another as a line of cars is pushed through a kiln will hold the half sections together. By merely removing the middle tile 9 from each outer row, a top is divided into four quarter sections.

The bottom of each tile preferably is provided centerly of its stem with a downwardly opening recess 13 that extends throughout the length of the tile as illustrated in FIGS. 1 and 3. When the tiles are laid in rows, these recesses form a continuous passage from one end of the row to the other. Because of the one sixteenth inch difference in width between the notches 11 and a pair of tile cross bars, the joints between tiles are in open communication with these continuous passages, and sand is thus free to sift downwardly into them. The passages serve three functions. They help to cool the tiles, they provide openings for receiving vacuum lances to clean out sand that sifts down between the tiles, thereby preventing sand buildup and related difficulties, and they also provide openings for receiving long parallel fingers on a device for lifting a quarter section of the top as a unit. The tiles may likewise be provided with similar recesses 14 in the lower outer corners of each cross bar.

In the modifications shown in FIGS. 4, 5 and 6, three different patterns or arrangements of tiles in a kiln car top are shown. The tiles have the same shapes as those shown in FIG. 2. It will be understood that as many tiles as desired can be connected together to form a car top of any desired size.

In the embodiment shown in FIG. 4, the arrangement is such that each outer row of tiles contains a tile 8 at one end in addition to the tiles 9 that make up the rest of those rows. As a result, it is necessary that one end of each intermediate row of tiles 7 contain a tile 4 to make all of the rows the same length. Because the rows are staggered, tiles 4 will fall at opposite ends of adjoining rows. This pattern can be used where a kiln car is not wide enough to support a top in which the outer rows are made up entirely of tiles 9.

In FIG. 5, tiles 8 are located at all four corners of the car top, with the result that the rows immediately adjoining the outer rows are composed entirely of tiles 7. The center row has tiles 4 at both ends to make it come out the same length as the other rows.

In the modification shown in FIG. 6, the outer rows are composed entirely of tiles 9, the center row is formed only of tiles 7, and the remaining two rows are each composed of tiles 7 with tiles 4 at both ends. This arrangement is similar to a half-section of the top shown in FIG. 2, but it does not contain any tiles 8 of the third shape, and the middle tile in the center row is not formed from two tiles 4 as it is in FIG. 2.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A tunnel kiln car top comprising a plurality of interlocking tiles disposed in parallel rows, all said tiles fabricated of the same refractory material, said tiles including three different shapes, the first shape being like a horizontal T having a stem and a cross bar, the second shape being like two of said first shape joined stem to stem to locate the cross bars at opposite ends of the tile, the last shape being like the second shape but with the ends of both cross bars omitted at one side of the stem, the stem side of each end of the cross bars forming an acute angle with the adjoining stem, the tiles in each row being arranged bar to bar with their stems in alignment, tiles of said last shape being in the two outer rows, tiles of said first and second shapes being in only the intermediate rows with said first shape only at row ends, and the space between the cross bars of each tile of the second and last shapes forming at the side of the tile a dovetail notch receiving and retaining the ends of a pair of cross bars of two tiles in an adjoining row, said dovetail notch being wider than a said pair of cross bars, whereby the tiles are interlocked in two directions horizontally at right angles to each other, the bottom of each tile being provided centrally of its stem with a downwardly opening recess extending throughout the length of the tile, all of said recesses in each row being in alignment with one another and in open communication with some of the joints between tiles.

2. A tunnel kiln car top comprising a plurality of interlocking tiles disposed in parallel rows, all said tiles fabricated of the same refractory material, said tiles including three different shapes, the first shape being like a horizontal T having a stem and a cross bar, the second shape being like two of said first shape join stem to stem to locate the cross bars at opposite ends of the tile, the last shape being like the second shape but with the ends of both cross bars omitted at one side of the stem, the stem side of each end of the cross bars forming an acute angle with the adjoining stem, the tiles in each row being arranged bar to bar with their stems in alignment, the two outer rows consisting of only tiles of said last shape, said top including a plurality of alternate intermediate rows consisting of only tiles of said second shape with tiles of said first shape at the opposite ends of the same rows, and the space between the cross bars of each tile of the second and last shapes forming at the side of the tile a dovetail notch receiving and retaining the ends of a pair of cross bars of two tiles in an adjoining row, said dovetail notch being wider than a said pair of cross bars, whereby the tiles are interlocked in two directions horizontally at right angles to each other, the bottom of each tile being provided centrally of its stem with a downwardly opening recess extending throughout the length of the tile, all of said recesses in each row being in alignment with one another and in open communication with some of the joints between tiles.

3. A tunnel kiln car top comprising a plurality of interlocking tiles disposed in parallel rows, all said tiles fabricated of the same refractory material, said tiles consisting of four different shapes, the first shape being like a horizontal T having a stem and a cross bar, the second shape being like two of said first shape being joined stem to stem to locate the cross bars at opposite ends of the tile, the third shape being like the first shape but with one end of the cross bar omitted, the last shape being like two of said third shape joined stem to stem to locate the cross bars at opposite ends of the tile and projecting from the same side of the stem, the stem side of each end of the cross bars forming an acute angle with the adjoining stem, the tiles in each row being arranged bar to bar with their stems in alignment, tiles of said third and last shape being in the two outer rows with said third shape only at row ends, tiles of said first and second shapes being in only the intermediate rows with said first shape only at row ends, and the space between the cross bars of each tile of the second and last shapes forming at the side of the tile a dovetail notch receiving and retaining the ends of a pair of cross bars of two tiles in an adjoining row, said dovetail notch being wider than a said pair of cross bars, whereby the tiles are interlocked in two directions horizontally at right angles to each other, the bottom of each tile being provided centrally of its stem with a downwardly opening recess extending throughout the length of the tile, all of said recesses in each row being in alignment with one another and in open communication with some of the joints between tiles.

4. A tunnel kiln car top comprising a plurality of interlocking tiles disposed in parallel rows, all said tiles fabricated of the same refractory material, said tiles consisting of four different shapes, the first shape being like a

horizontal T having a stem and a cross bar, the second shape being like two of said first shape joined stem to stem to locate the cross bars at opposite ends of the tile, the third shape being like the first shape but with one end of the cross bar omitted, the last shape being like two of said third shape joined stem to stem to locate the cross bars at opposite ends of the tile and projecting from the same side of the stem, the stem side of each end of the cross bars forming an acute angle with the adjoining stem, the tiles in each row being arranged bar to bar with their stems in alignment, the two outer rows consisting of only tiles of said last shape with tiles of said third shape at the opposite ends of the same rows, said top including a plurality of alternate intermediate rows consisting of only tiles of said second shape, and the space between the cross bars of each tile of the second and last shapes forming at the side of the tile a dovetail notch receiving and retaining the ends of a pair of cross bars of two tiles in an adjoining row, said dovetail notch being wider than a said pair of cross bars, whereby the tiles are interlocked in two directions horizontally at right angles to each other, the bottom of each tile being provided centrally of its stem with a downwardly opening recess extending throughout the length of the tile, all of said recesses in each row being in alignment with one another and in open communication with some of the joints between tiles.

5. A tunnel kiln car top comprising a plurality of interlocking tiles disposed in an even number of parallel rows, all said tiles fabricated of the same refractory material, said tiles consisting of four different shapes, the first shape being like a horizontal T having a stem and a cross bar, the second shape being like two of said first shape joined stem to stem to locate the cross bars at opposite ends of the tile, the third shape being like the first shape but with one end of the cross bar omitted, the last shape being like two of said third shape joined stem to stem to locate the cross bars at opposite ends of the tile and projecting from the same side of the stem, the stem side of each end of the cross bars forming an acute angle with the adjoining stem, the tiles in each row being arranged bar to bar with their stems in alignment, the two outer rows consisting of only tiles of said last shape, each of the two center rows consisting of only tiles of said last shape with a pair of tiles of said third shape disposed stem to stem at the middle of the row, each of alternate intermediate rows between the outer rows and the center rows consisting of only tiles of said second shape with tiles of said first shape at their opposite ends, each of the rows between said alternate rows consisting of tiles of said

second shape with two tiles of said first shape disposed stem to stem at its middle and the space between the cross bars of each tile of the second and last shapes forming at the side of the tile a dovetail notch receiving and retaining the ends of a pair of cross bars of two tiles in an adjoining row, said dovetail notch being wider than a said pair of cross bars, whereby the tiles are interlocked in two directions horizontally at right angles to each other, the bottom of each tile being provided centrally of its stem with a downwardly opening recess extending throughout the length of the tile, all of said recesses in each row being in alignment with one another and in open communication with some of the joints between tiles.

6. A tunnel kiln car top comprising a plurality of interlocking tiles disposed in parallel rows, all said tiles fabricated of refractory materials having similar coefficients of thermal expansion, said tiles including three different shapes, the first shape being like a horizontal T having a stem and a cross bar, the second shape being like two of said first shape joined stem to stem to locate the cross bars at opposite ends of the tile, the last shape being like the second shape but with the ends of both cross bars omitted at one side of the stem, the stem side of each end of the cross bars forming an acute angle with the adjoining stem, the tiles in each row being arranged bar to bar with their stems in alignment, tiles of said last shape being in the two outer rows, tiles of said first and second shapes being in only the intermediate rows with said first shape only at row ends, and the space between the cross bars of each tile of the second and last shapes forming at the side of the tile a dovetail notch receiving and retaining the ends of a pair of cross bars of two tiles in an adjoining row, said dovetail notch being wider than a said pair of cross bars, whereby the tiles are interlocked in two directions horizontally at right angles to each other, the bottom of each tile being provided centrally of its stem with a downwardly opening recess extending throughout the length of the tile, all of said recesses in each row being in alignment with one another and in open communication with some of the joints between tiles.

References Cited in the file of this patent

UNITED STATES PATENTS

1,306,160	Zwermann	June 10, 1919
1,485,109	Beth et al.	Feb. 26, 1924
1,587,210	Beecher et al.	June 1, 1926
2,099,149	Turnquist	Nov. 16, 1937
2,104,307	Miller	Jan. 4, 1938