June 5, 1962 R. SNELLMAN 3,037,468

ROTARY KILN LINING BLOCK

Filed Oct. 21, 1960

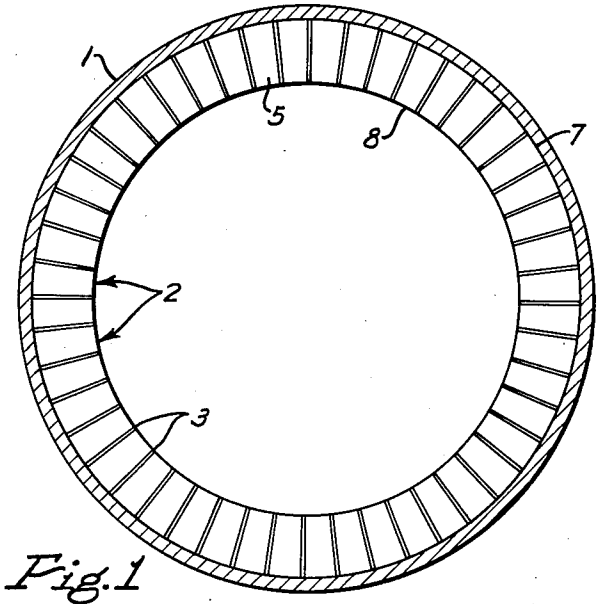


Fig. 1

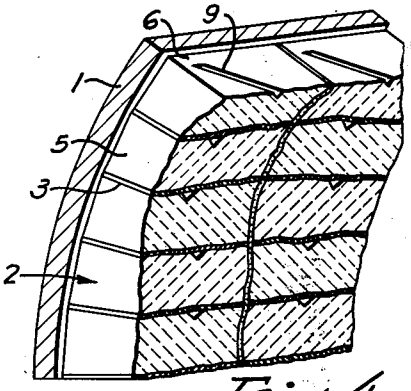


Fig. 4

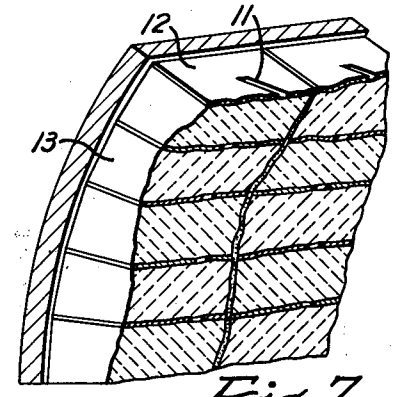


Fig. 7

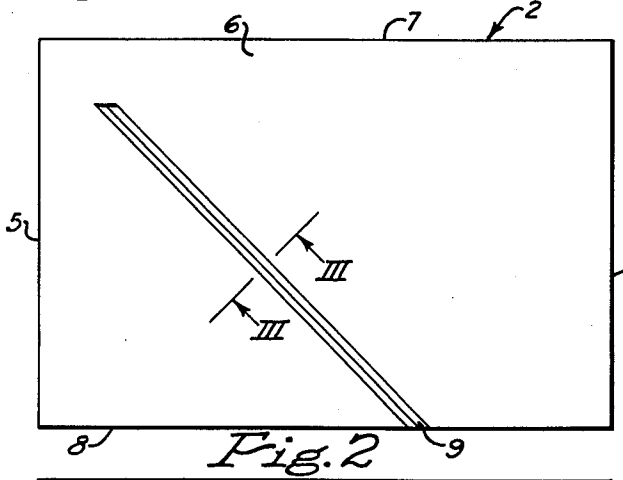


Fig. 2

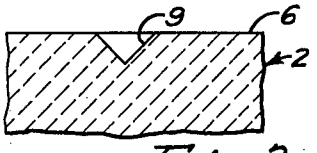


Fig. 3

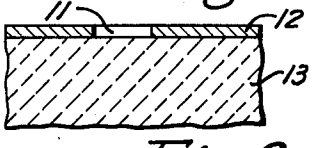


Fig. 6

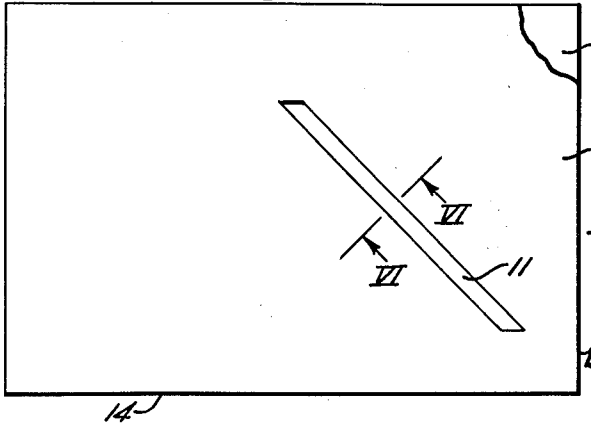


Fig. 5

INVENTOR.
ROGER SNELLMAN
BY
Brown, Critchlow, Flick & Peckham
ATTORNEYS

United States Patent Office 3,037,468 Patented June 5, 1962

3,037,468

ROTARY KILN LINING BLOCK

Roger Snellman, Detroit, Mich., assignor to Harbison-Walker Refractories Company, a corporation of Pennsylvania

Filed Oct. 21, 1960, Ser. No. 64,183
2 Claims. (Cl. 110—99)

This invention relates to rotary kiln linings, and more particularly to the individual blocks from which they are made.

The cylindrical metal shells of rotary kilns generally are lined with wedge-shaped blocks laid in annular courses. Each block may consist entirely of a refractory brick, but usually the block also includes a metal plate that spaces it from an adjoining block in the same ring of blocks. As the kiln is used, the lining wears or spalls, and sometimes slag pulls away chunks of the lining during cooling. It is necessary to know when any part of the lining has become so thin that it should be replaced. The usual way of determining lining wear is to measure its internal diameter and then compare it with the internal diameter that the lining had when it was first put in use. It will be seen that such a method does not take into consideration the fact that portions of the lining may have worn more than others. Therefore, although the change in diameter might indicate a moderate amount of wear, in reality the lining at one side of the kiln may have worn but very little while the diametrically opposite portion wore dangerously thin.

It is among the objects of this invention to provide a rotary kiln lining, in which the amount of wear at any point can be determined quite accurately, and in which the individual lining blocks are provided with a built-in gauge of their wear that can be observed by a man walking through the kiln.

In accordance with this invention a rectangular side face of each lining block is provided with a channel that extends across it at a predetermined oblique angle to its inner or hot face. Preferably, the channel is straight. By knowing what the angle of the channel is and its location in the block, the thickness of the block can readily be determined by observing or measuring the distance from the exposed inner end of the channel to one end of the block. This is easiest to do if the channel bisects the angle at a corner of the block.

The invention is illustrated in the accompanying drawings, in which—

FIG. 1 is a transverse section through a rotary kiln showing a ring of the lining blocks;

FIG. 2 is an enlarged side view of one of the blocks provided with a gauging channel;

FIG. 3 is an enlarged fragmentary section taken on the line III—III of FIG. 2;

FIG. 4 is a fragmentary perspective view of the kiln showing a worn lining;

FIG. 5 is a view, similar to FIG. 2, of a modification;

FIG. 6 is a fragmentary section taken on the line VI—VI of FIG. 5; and

FIG. 7 is a view similar to FIG. 4, showing a worn lining made from the modified blocks.

Referring to FIGS. 1, 2, 3 and 4 of the drawings, a rotatable cylindrical metal shell 1 is provided with a refractory lining that is formed from wedge-shape blocks laid in annular courses or rings. Each block is formed principally or entirely from a refractory brick 2. In many cases the block will also include a metal plate 3 secured to one side of it so that all of the bricks in each ring of the lining will be spaced apart by metal plates for a well known reason. Each brick has tapered end faces 4 and 5 and rectangular side faces 6. It also has an

outer face 7 adjoining the metal shell and an inner face 8 exposed to the heat within the kiln and therefore referred to as the hot face of the brick. As the kiln is used, the lining wears away until it becomes so thin throughout or in some places that it must be replaced or the metal shell will be damaged.

It is a feature of this invention that the thickness of the lining at any point can readily be determined at any time. Accordingly, each lining block is provided with a channel extending part way or entirely across one of its rectangular side faces at a predetermined oblique angle to its hot face. In FIGS. 2, 3 and 4 the channel is in the form of a groove 9 shown molded into the refractory brick. By knowing the original position of the groove along a side face 6 of a brick and also knowing the direction that it extends outward across the brick, a workman can determine how thick the lining is at the location of that brick by observing or measuring the distance from one end of the worn brick to the exposed inner end of the groove. Preferably, the groove extends outward from the hot face 8 as shown in FIG. 2, so that from the beginning the inner end of the groove is exposed inside the kiln. However, it is not necessary that the groove start at the hot face, because some wear can take place before it is necessary to check up on the amount of wear, so as long as the inner end of the groove is not visible there is no need for becoming concerned about the amount of wear that has taken place.

The workman may be furnished with a chart or pattern showing the thickness of the brick for every position of the exposed inner end of the groove along the worn face. In such a case, the groove can be located anywhere along the side of the brick and can even be curved. However, it is better, as shown in FIG. 2, if the groove is straight and extends along a line intersecting a corner of side face 6 at a predetermined angle which is known to the operator. The distance from the inner end of the groove to an end of the brick will then always bear the same relation to the remaining thickness of the brick, so the thickness of the brick or, conversely, the amount of wear, can readily be determined. Moreover, if the angle just mentioned is a 45° angle, the workman will be able to calculate the wear or thickness of the brick still more readily. By simply measuring the distance from the exposed inner end of the groove to the end 5 of the brick toward which the outer end of the groove is inclined, the figure that is obtained will be the same as the remaining thickness of the brick. Thus, if he finds that the distance from the inner end of the groove to the end 5 of the brick is four inches, he will know that the brick remains only four inches thick. When, as shown in FIG. 2, the groove originally extends a material distance from both sides of a line half way between the opposite ends of the brick, the workman must know in which direction the groove extends from the hot face in order to know whether he should measure from the inner end of the groove to end 4 or end 5 of the brick. He can determine the direction of the groove by merely inserting a short stiff wire into it.

With this invention, the thickness of every worn brick can be determined at any time in a simple manner independently of the other bricks. The presence of any thin spots in the lining can therefore be detected in time to prevent injury to the kiln shell.

When metal plates are secured to the refractory bricks before installation in a kiln, it may be desirable to form the gauging channels in the plates instead of in the bricks. Thus, as shown in FIGS. 5, 6 and 7, a slot 11 is formed in a metal plate 12 cemented or otherwise secured to one side face of a wedge-shape brick 13 having an inner hot face 14. The slot may take the same shape and location and direction as any of the channels mentioned

above, but preferably it bisects a corner of the plate to facilitate calculating wear of the block.

Measurement or gauging is still further simplified if the entire slot is located between one end of the brick and a line half way between the opposite ends of the brick, as shown in FIG. 5. In such a case, as the brick wears away after the inner end of the slot has been reached, the workman should always measure from the slot to the closer end of the brick. When the bisected corner of the plate is an inner corner, as shown in FIG. 5, rather than an outer corner as in FIG. 2, the distance from the inner end of the slot to the nearest end of the block will be the same as the amount that the brick has worn away. It also is an advantage not to have the slot extend originally to any edge of the metal plate, because that would separate most of the plate into two parts and weaken it.

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 rotary kiln lining block comprising a refractory brick having an inner hot face and laterally spaced rectangular side faces, and a metal plate covering one of said side faces, said plate being provided with a straight slot extending across it at a predetermined oblique angle to said hot face to permit gauging of the wear of the block outward from its hot face.

2. A rotary kiln lining comprising a plurality of blocks disposed in rings side by side, the blocks in each ring having adjacent rectangular side faces and exposed inner hot faces, and a side face of each block being provided with a channel extending across it at a predetermined oblique angle to its hot face to permit gauging of the thickness of said lining as it wears away.

References Cited in the file of this patent

UNITED STATES PATENTS

129,512	Baker	July 16, 1872
1,529,183	Howren	Mar. 10, 1925
2,462,289	Rochow	Feb. 22, 1949
2,470,498	Lankford	May 17, 1949
2,829,877	Davis	Apr. 8, 1958

FOREIGN PATENTS

284,809	Germany	June 9, 1915