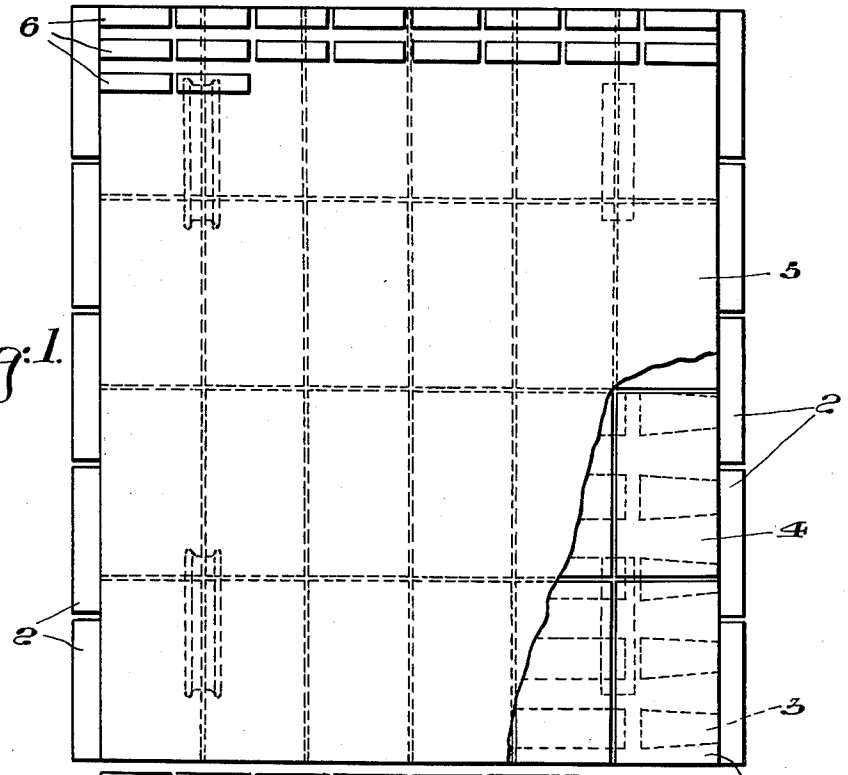
March 14, 1961 C. A. TATE 2,974,374

METHOD OF FORMING A REFRACTORY SETTING

Filed June 29, 1954

Fig. 1.



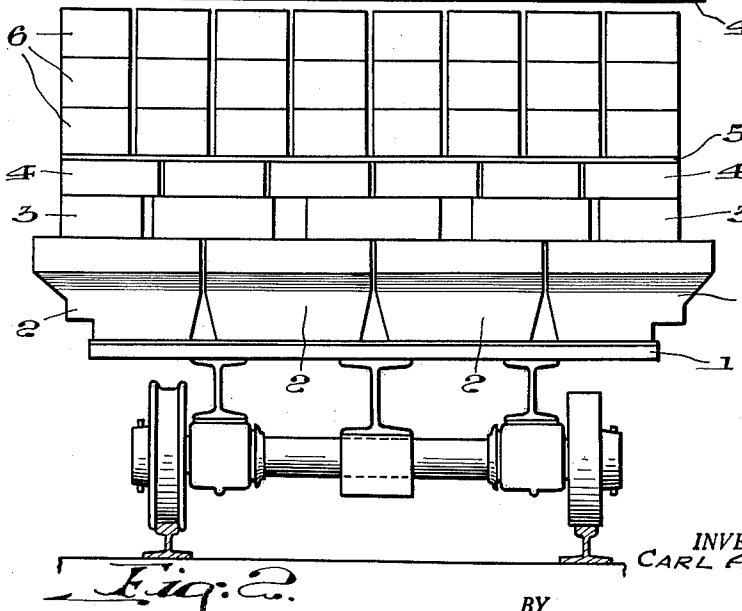


Fig. 2.

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METHOD OF FORMING A REFRACTORY SETTING

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1 Claim. (Cl. 18—60)

This invention relates to material on which ceramic ware rests while it is being fired in a kiln, and to a method of forming a flat setting for such ware.

When ceramic ware, such as refractory brick or dinnerware, is fired it has to be supported by a level bed or setting to minimize deformation of the ware when it develops the incipient fusion which accompanies the burning or maturing process. For example, the necessity for faultless bedding of silica brick is great because there is an extended period in the heating-up cycle when they are extremely weak. If the setting surface is faulty, the bottom courses of brick will break under the load of the higher courses and deformation or complete rupture is possible. Periodic levelling of the setting is a necessity because of unevenness in the hearth, due to inequalities of construction or the shifting of masonry units during heating and cooling.

The commonest levelling practice has been to lay down a layer of sand and then strike it off smooth with a straight-edge. Sand bedding of this character has become inadequate in modern firing processes, because they impose conditions unsuitable to it. Foremost among these is the use of fans which induce active movement of fuel, air, and products of combustion throughout the kiln and which disturb the sand setting so that the ware ceases to be properly supported. Thus, it is common to find the sand has been blown away from the edges of the ware so that areas of the product are left unsupported. The result is complete loss of at least the lower courses due to their deformation or cracking at high temperatures.

When the ware is carried on tunnel kiln cars in continuous kilns, it is supported by refractory masonry tops or hearths which protect the wheels and other undercarriage parts from the high temperatures of the firing zones. The ware is set on these cars either immediately following forming or after preliminary drying. While the problems of obtaining proper bedding on the hearth are common to both periodic and continuous kilns, they are more serious with the latter since the movement and vibration of the cars as they are moved in and out of the drier and through the kiln cause movement of the setting sand. The car tops are made up of multiple-masonry units, and no matter how tightly they are set together and bonded, the joints will open up after one or more passes through a kiln. The result is that the loose sand, previously used for setting, filters into the joints where it expands during firing and forces the car top refractories farther apart. This is the principal factor in determining the life of refractory car tops. The expanding sand forces the car top tiles outward, causing them to heave up and break and to rub against the sides of the kiln so that a partial destruction of the kiln occurs, particularly in those extreme cases where contact with the kiln wall leads to car wrecks.

It is among the objects of this invention to provide a bedding layer which can be quickly and easily applied to a hearth before each firing and removed before the next

firing, which will not affect the ware, which will stay in place during the firing operation, and which will not settle between the tiles of the kiln cars.

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

Fig. 1 is a plan view of a kiln car, to which my ware setting has been applied; and

Fig. 2 is an end view thereof showing bricks resting on the setting.

Referring to the drawings, mounted on the bed 1 of a tunnel kiln car are a number of large refractory blocks 2, that support rows of spaced bricks 3, on which rectangular tiles 4 are laid. The bricks are bonded to the blocks and tiles in a well-known manner to form a unitary refractory top for the car. The tiles form the hearth of the car, on which is set the ceramic ware that is to be fired when the car moves through a tunnel kiln. The ware is not set directly on the tiles; but on a setting 5 that covers them. The setting is a bedding layer that is applied to the hearth to level it and form a flat surface for supporting the ware without deformation. Such a setting also is used for the hearth of a periodic kiln for the same reason.

In accordance with this invention, the bedding layer is formed by the cold setting or dry setting of a moistened layer consisting of a mixture of finely ground refractory material and a bonding agent. The refractory material and the bond may be mixed with water and then spread over the hearth and levelled with a straight-edge or the like. This is a good way to overcome sand infiltration into the joints between the top tiles of a kiln car. The ware, such as bricks 6, can be placed on the bedding layer at once as it will soon set and become hard and rigid.

An easier way of applying a bedding layer is to mix the refractory material and the bond and spread the mixture out dry on the kiln hearth or car hearth to form a bed of approximately the desired thickness. The material is struck off level with a straight-edge as before, and then a fine spray of water is applied to it until the mixture is moist throughout. The bedding layer is then ready for use immediately or after brief standing. The small amount of bedding material which will fall into the joints between the car top blocks when it is applied dry, will cause no appreciable harm compared to that encountered by the old method of using unbonded loose sand which continued to flow during the subsequent shifting of the kiln cars. Plaster of Paris is an example of a cold setting bond which assumes a hydraulic set throughout to harden the setting layer within a few minutes. Sulphite pitch also becomes hardened, at least on the surface, upon very brief standing, possibly due to the evaporation of moisture. It is of little moment if the layer does not completely harden before ware is set on it, since there is no disadvantage if the ware slightly imbeds itself in the setting layer.

The refractory grains of the bedding layer should either be similar in composition to the ware being burned or non-fluxing with the ware. The term "non-fluxing" signifies that there shall not be sufficient fluxing or reaction between the bedding layer and the ware to damage the latter commercially. A very successful bedding for silica brick is a mixture of silica sand and plaster of Paris. This is an example of the refractory grains having a composition similar to the ware. The layer formed from silica sand and plaster of Paris is one of the most ideal settings because it does not fuse strongly together, which might make it difficult to remove the layer from either the hearth or the ware after firing. Such layers must be freely removable so that they can be replaced with an uncracked or smooth layer after each firing. Other bonds which bear a similar non-fluxing relationship with

silica sand are eyrite and bentonite, if the latter is used in small quantities. The clay mineral, eyrite, also known as hectorite, is basically a hydrous magnesium silicate having gelling properties similar to bentonite. These are weaker bonds than plaster of Paris, but do result in consolidation or setting upon drying.

An unlike but also non-fluxing mixture would be chrome ore sand and a bond of sulphite pitch for use in the process of burning magnesite brick. Other examples of suitable bedding layers are those formed from chrome ore with magnesium oxychloride cement, dead-burned magnesite with starch, or alumina with carboxymethyl cellulose or other organic bond well known in the ceramic industry. In setting fireclay or high alumina bricks, it may be desirable to form the bedding layer from calcined bauxite or calcined diaspore with aluminum sulphate. Calcined refractory clay could be substituted in this mix. Also, olivine sand, using such a bond as magnesium sulphate, would make a suitable setting layer for several kinds of refractories.

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 claim, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

The method of forming on a refractory hearth a rigid flat monolithic setting for ceramic ware to be fired, comprising mixing granular refractory material with a cold-setting bond, applying a layer of the mixture to the entire hearth, levelling off the layer, and then sprinkling the layer with water, whereby the layer will set and become hard.

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