Feb. 16, 1926. 1,573,543

F. A. J. FITZ GERALD

TUNNEL KILN

Filed June 1, 1925

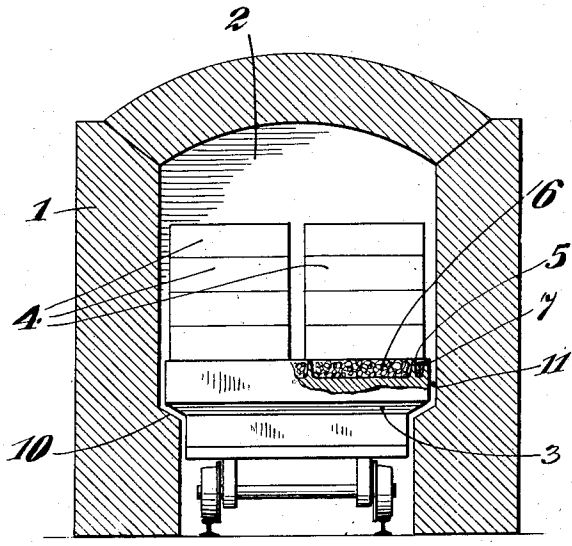


Fig. 1.

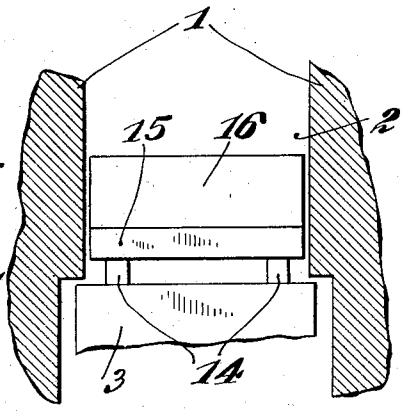


Fig. 2.

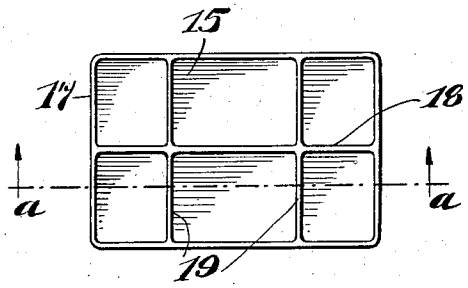


Fig. 3.

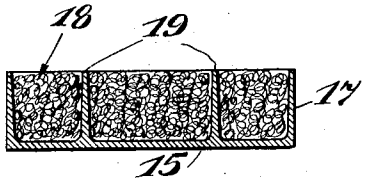


Fig. 4.

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UNITED STATES PATENT OFFICE.

FRANCIS A. J. FITZ GERALD, OF NIAGARA FALLS, NEW YORK, ASSIGNOR TO HARPER ELECTRIC FURNACE CORPORATION, A CORPORATION OF NEW YORK.

TUNNEL KILN.

Application filed June 1, 1925. Serial No. 33,923.

To all whom it may concern:

Be it known that I, FRANCIS A. J. FITZ GERALD, a citizen of the United States, residing at Niagara Falls, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Tunnel Kilns, of which the following is a specification.

This invention relates to tunnel kilns and particularly to an improved kiln wherein the heat wasted is reduced to a minimum.

In the operation of tunnel kilns it is the practice to convey the material or articles to be heat-treated through the kiln on trucks or other carriers, the articles, in general, being supported in saggers mounted on refractory supports carried by trucks. Any heat conveyed to the refractories supporting the saggers or to the body of the truck diminishes the thermal efficiency of the heat-treating process, as this heat serves no useful purpose and is ultimately lost. The higher the temperature required for the heat-treatment, the greater is the loss, for where this temperature is very high a considerable thickness of refractories must be interposed between the bottom of the lowest sagger and the top of the truck, and these refractories absorb a large quantity of heat which is wasted. The principal object of the present invention is to provide an improved means for supporting the material to be heat-treated, or the saggers containing such material, from the truck, which means has high heat-insulating properties and is sufficiently refractory to be unaffected by the highest temperature to which it is subjected.

Other objects of my invention will appear from the following description, taken in connection with the accompanying drawing, wherein

Fig. 1 shows diagrammatically in transverse section a tunnel kiln, and shows in elevation, partly broken away, a truck and sagger support embodying one form of my invention.

Fig. 2 is a detail view similar to Fig. 1 but showing a modification.

Fig. 3 is a top plan view of the sagger supporting tray shown in Fig. 2.

Fig. 4 is a section taken on the line *a*—*a* of Fig. 3.

Referring to Fig. 1 of the drawing, 1 represents a kiln of heat-insulating material which forms a heating chamber 2, through which trucks 3 carrying the saggers 4 are adapted to be moved. Means, not shown, is provided for supplying heat to the upper portion of the chamber 2 to heat the articles contained in the saggers 4. To reduce the heating of the lower portion of the chamber 2 and the lower portion of the trucks 3, the walls of the kiln are thickened at their lower portion, thereby forming shoulders 10, and the upper portions of the trucks are formed wider than the lower portions so that the narrow clearance spaces 11 between the trucks and the walls of the kiln are angular in vertical section and prevent any direct radiation of heat from the upper to the lower portion of the chamber 2. In practice, a series of trucks are passed through the chamber 2, these trucks abutting one another at their ends so as, in effect, to close the upper portion of the chamber 2 from the lower portion and so minimize any transfer of the heat from the upper to the lower portion. The body of the truck is formed of metal having at its top upwardly projecting ribs or knobs 5 cast integrally therewith. Cast integrally with the truck body is also a peripheral flange 7 which surrounds the knobs 5 and forms in effect a tray which is filled with refractory material 6 of high heat-insulating properties. The material 6 may consist of any suitable refractory of sufficiently high heat-insulating properties and will vary with the working temperature of the kiln and other special conditions. Thus, if the maximum temperature of the bottom sagger in the kiln were not more than 900° C. infusorial earth may be employed. At very high temperatures, where the atmosphere of the kiln is strictly reducing, powdered charcoal may be employed. If, however, at this high temperature an oxidizing atmosphere exists, some such material as silico-carbide may be used. When silico-carbide is employed, that variety known as fibrox (described in Transactions A, E, S, Vol. 27, 1915, pp. 267 et seq.) may be employed to advantage. In certain cases the receptacle at the top of the truck may be filled with a mixture of highly refractory material and sawdust or the like, and the mixture then burned at a temperature where the refractory material is sintered so as to

form a porous, highly refractory material which on account of its porosity will have very low heat-conductivity.

The material 6 being of low heat-conductivity, forms a heat-insulating medium between the saggers and the body of the truck. The supporting knobs 5 as well as the flange 7 are made as thin as possible, consistent with strength, so as to reduce the heat conducted through them to the body of the truck. In the form shown, both knobs 5 and flange 7 are tapered upwardly and their upper exposed area is very small.

While I have shown the holding tray at the top of the truck as formed integrally with the truck body, it is obvious that this tray may be formed as a separate receptacle placed on or suitably secured to the top of the truck body. In Fig. 2 I have shown a modification of my invention in which the saggers 16 are supported on a tray 15 which, in turn, is supported and spaced from the top of the truck 3 by uprights 14. The tray 15 may be formed of any suitable refractory material and comprises thin and rather deep side walls 17 and upwardly extending thin ribs 18 and 19.

I claim:

1. A sagger carrier for use in tunnnel kilns consisting of a metal body the top of which is formed as a receptacle, divided refractory heat-insulating material contained in said receptacle, and sagger-supporting members in said material.

2. A sagger carrier for use in tunnel kilns having a receptacle at its top, charcoal in said receptacle, and thin sagger-supporting members in said charcoal.

3. A sagger carrier for use in tunnel kilns having a receptacle at its top, silico-carbide in said receptacle, and thin sagger-supporting members in said silico carbide.

4. A sagger carrier for use in tunnel kilns having a receptacle at its top, fibrox in said receptacle, and thin sagger-supporting members in said fibrox.

5. A sagger carrier for use in tunnel kilns having a metal body, means at the top of said body for supporting saggers and for holding divided material, and divided refractory heat-insulating material held by said means and so arranged as to form a heat-insulating medium between the saggers on said carrier and the body of said carrier.

6. A tunnel kiln having a chamber, a series of abutting carriers in said chamber, said carriers having body portions whose sides lie closely adjacent to the side walls of said chamber, whereby said chamber is divided into an upper and lower portion, the tops of said carriers being formed to hold divided material and being formed with thin upwardly-extending sagger-holding projections, divided refractory heat-insulating material surrounding said projections, and means for heating the upper portion of said chamber.

7. A sagger carrier for use in tunnnel kilns, a tray mounted on said carrier in spaced relation thereto, said tray being formed with thin interior sagger-supporting ribs, and divided refractory heat-insulating material contained in said tray.

8. A carrier having at its top a sagger-supporting member and means carried by said member for forming a heat-insulating medium between the carrier and the saggers supported thereby, said means consisting of a material formed by heating a mixture of sawdust and refractory material until the refractory material is sintered.

FRANCIS A. J. FITZ GERALD.