R. T. KYLE.

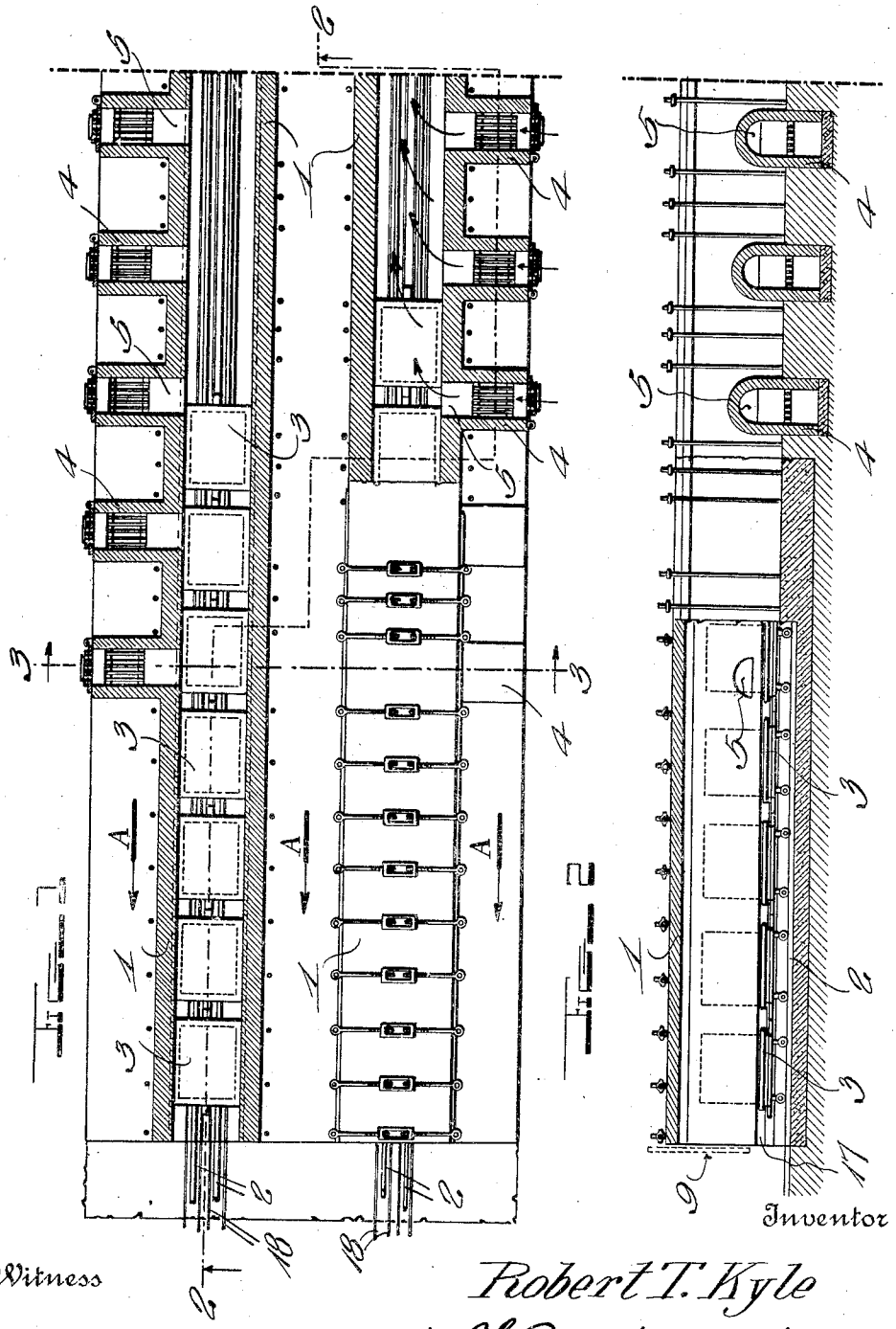
KILN.

APPLICATION FILED MAR. 10, 1921.

1,426,655.

Patented Aug. 22, 1922.

4 SHEETS—SHEET 1.



Witness

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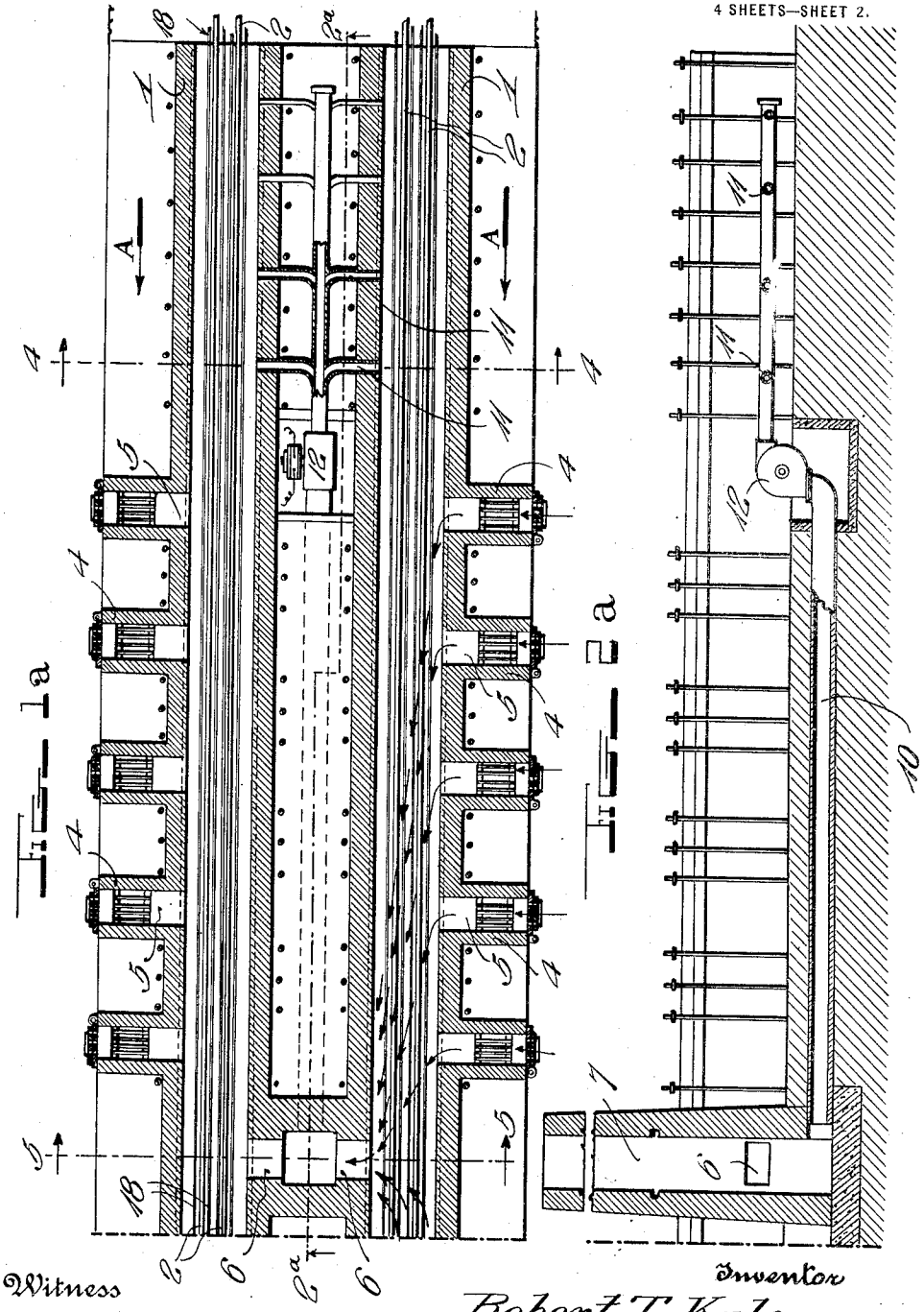
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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

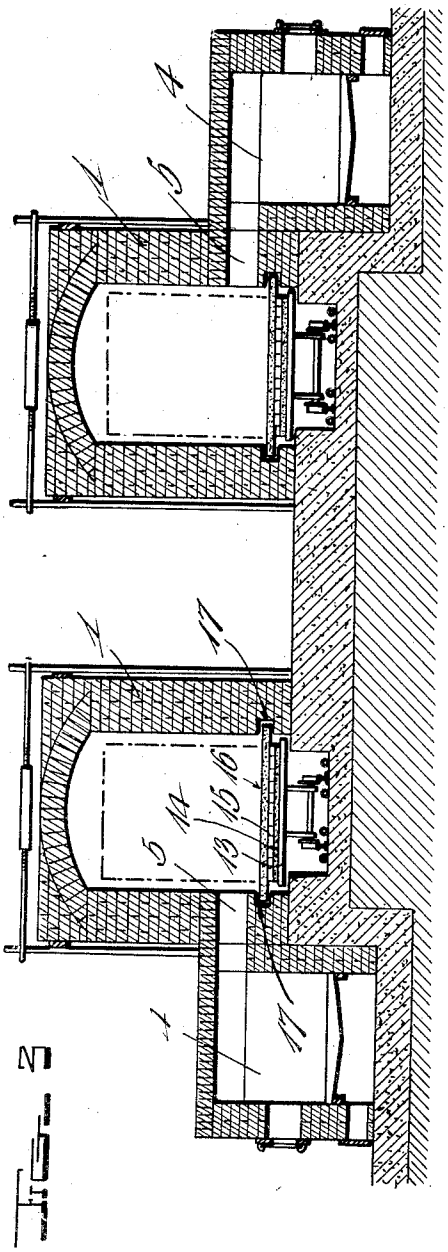


FIG. 3.

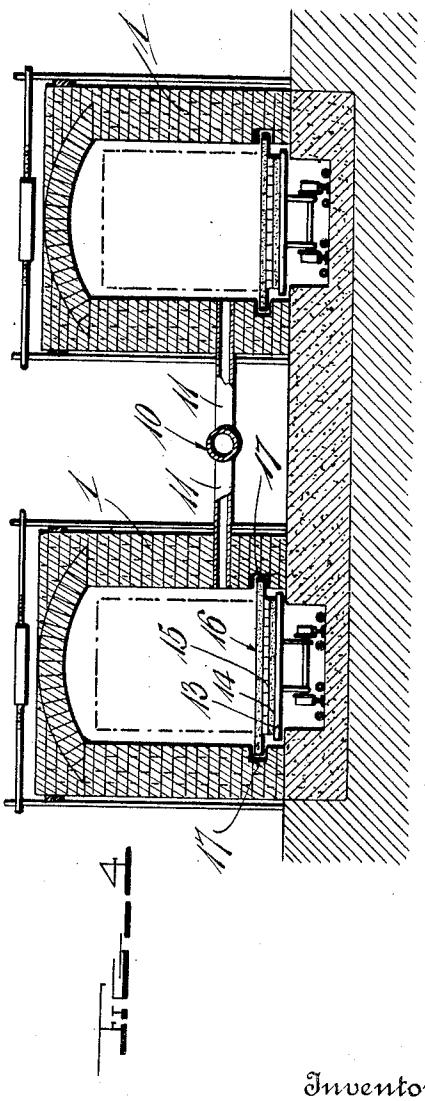


FIG. 4.

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4 SHEETS—SHEET 4.

FIG. 5

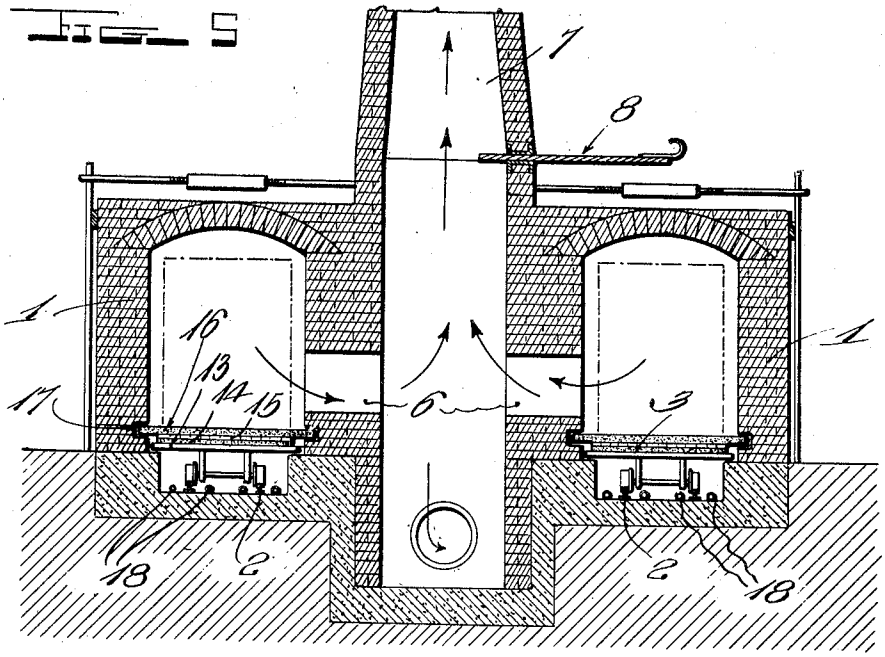
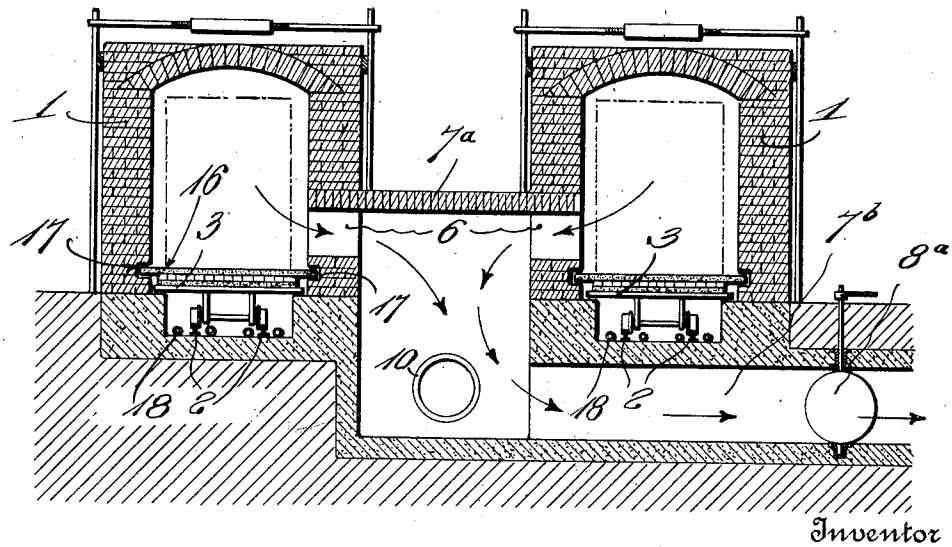


FIG. 6



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UNITED STATES PATENT OFFICE.

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KILN.

1,426,655. Specification of Letters Patent. Patented Aug. 22, 1922.

Application filed March 10, 1921. Serial No. 451,080.

To all whom it may concern:

Be it known that I, ROBERT T. KYLE, a citizen of the United States, residing at Huntington, in the county of Cabell and State of West Virginia, have invented certain new and useful Improvements in Kilns; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to kilns of the type in which the bricks or other ware are continously conveyed through a tunnel provided with a plurality of furnaces. Numerous kilns of this general character have been heretofore devised, but all of them have proven unsatisfactory in view of the fact that they will not drive the heat entirely through the stacks of brick or the like on the cars, with the result that the outside brick is over-burned while that at the inner portion of the stack is not burned to the required extent. The principal object of my invention is to provide an improved form of kiln which is so constructed that the hot air must necessarily pass diagonally across the tunnel and hence travel through the stacks of ware, in order to reach the stack or other hot-air outlet which may be provided.

A further object is to locate the stack or other hot-air outlet between the ends of the series of furnaces and at the side of the tunnel opposite said furnaces, thereby forcing the heat to travel diagonally with the ware throughout the first stage of burning and to then travel against the ware during the finishing stage of the burning process. By this arrangement, the bricks are more uniformly baked and the so-called water-smoke from the brick is forced to pass out through the stack or the like before the ware reaches the hottest part of the kiln and the heat from the cooling ware will flow back to the stack through the ware burning in the hottest part of the kiln. This eliminates any possibility of the brick "scumming" or "white-washing" while being burned.

Yet another object is to provide for gradually raising the temperature of the bricks or the like from the time they enter the tunnel until the first furnace is reached, whereby their temperature will not be suddenly changed with any danger of injury.

With the foregoing in view, the invention resides in the novel construction, combination and arrangement of parts hereinafter described and claimed, the descriptive matter being supplemented by the accompanying drawings.

Figures 1 and 1ª illustrate a horizontal sectional view, partly in plan, of a twin tunnel kiln constructed in accordance with my invention.

Figures 2 and 2ª illustrate a longitudinal sectional view as indicated by line 2—2 of Fig. 1 and 2ª—2ª of Fig. 1ª.

Figures 3, 4 and 5 are vertical transverse sectional views as indicated by the lines 3—3, 4—4 and 5—5 (see Figs. 1 and 1ª).

Figure 6 is a duplicate of Fig. 5 with the exception that it shows an underground outlet for the hot-air instead of a stack such as that shown in the other views.

In the drawings above briefly described, the numerals 1 designate a pair of parallel tunnels having tracks 2 for a plurality of cars 3 upon which the bricks or other ware to be fired, are conveyed from one end of the tunnels to the other.

One vertical side of each of the tunnels 1 is provided with a series of spaced furnaces 4 which communicate with said tunnels near their lower portions, by means of passages 5. The other vertical side however of each tunnel is provided with a heat outlet 6 and in order to pass from the furnaces 4 to this outlet, the heat must travel entirely across the tunnels and consequently through the stacks of brick or the like on the cars, as indicated by the arrows in Figs. 1 and 1ª. In most figures of the drawings, I have shown the outlets 6 discharging into a stack 7 which may well have a suitable damper 8 as disclosed in Fig. 5. If the heat discharged from the kiln is to be used to operate a drier for initially drying the ware before burning the same, an arch 7ª may be substituted for the stack 7 and an underground passage 7ᵇ controlled by a suitable damper 8ª may lead from the arch as disclosed in Fig. 6. In either case, the operation of the kiln and the paths on which the heat travels from the furnaces, is the same.

Attention is directed to the fact that the heat outlet 6 of each tunnel is located between the ends of the series of furnaces 4. By this arrangement, when the cars of brick or the like are fed slowly through the tunnels in the direction indicated by the arrows A in Figs. 1 and 1ª, the heat from the first

half of the series of flues will travel with the ware as indicated in Fig. 1ª, while the heat from the remaining furnaces will travel against the ware. This not only dries the bricks or the like more effectively than when the currents of air move always in the same direction, but all dampness is carried from both ends of the tunnel to the stack or other outlet, which is of great importance, particularly in view of the fact that the outlet end of the tunnel which is at maximum heat, is absolutely free of "water-smoke" so that there is no danger of "scumming" the ware or otherwise producing an inferior product. The "water-smoke" comes from the incoming ware and leaves at the stack or the like. If desired, the outlet end of each tunnel may be provided with a door as indicated by the dotted lines 9 in Fig. 2. By raising this door to the required extent, sufficient air may be allowed to enter the tunnel to form a strong draft toward the stack or the like, so that all dampness is removed.

By reference more particularly to Fig. 1ª, it will be seen that the series of furnaces 4, start a considerable distance from the inlet end of each tunnel 1. This is done in order that provision may be made for gradually raising the temperature of the ware from the time it enters until the heat of the first furnaces is encountered, thus insuring that its temperature shall not be abruptly changed, which would have a tendency to injure the product. While any suitable means could be employed for increasing the temperature of the bricks or the like in the manner set forth, I prefer to employ the construction shown most clearly in Figs. 1ª and 2ª. A hot-air discharge pipe or other passage 10 leads from the stack 7 or the arch 7ª as the case may be, and is provided with a plurality of spaced lateral branches 11 which discharge into the tunnels 1 at different points along the length thereof. These branches increase in size from the inlet ends of the tunnels toward the first furnaces 4 as clearly shown in Fig. 1ª and an appropriate fan 12 is incorporated in the pipe 10 so as to draw hot-air from the stack or the like and force it through the branches 11 into the tunnels. Due to the varying sizes of these branches, the amount of hot-air supplied to the inlet portions of the tunnels will increase gradually toward the furnaces 4, with the result that although very little heating of the ware is accomplished as it enters the tunnels, the temperature is gradually increased so that when it encounters the heat from the furnaces 4, there will be no abrupt change in temperature.

In the preferred form of construction, as shown most clearly by the transverse sectional views, the platform 13 of each car 3 is provided first with a layer 14 of heat insulating material, a layer of brick 15 is placed on this insulating material, and a slab 16 of fire clay or the like is supported on the bricks, with its edges projecting beyond the sides of the car and received in longitudinal grooves 17 with which the inner opposed sides of the tunnels are provided below the passages 5 and 6. With this arrangement, there is no possibility of any great amount of heat escaping under the cars and thus traveling to the outlet 7 or 7ª without first performing work.

It is desirable to have the portions of the tunnels, below the platforms of the cars 3, at a relatively low temperature and to obtain this result, I provide water circulating pipes 18 alongside of the tracks or rails 2. These pipes and water therein absorb a great deal of heat from the tunnels and hence lower the temperature of their lower portions. At the same time, the water heated may be used in connection with tempering clay or for any other purposes desired.

From the foregoing, taken in connection with the accompanying drawings, it will be seen that I have produced a kiln which will possess the advantages of a continuous feed through a tunnel, yet one which will not be subject to the disadvantages heretofore existing, namely overburning of the outside brick and insufficient firing of the remainder, abrupt changing in temperature of the ware as it encounters the heat from the furnaces, and the prevalence of "water-smoke." The improved results are obtainable in an expeditious manner by employing the general construction and arrangement set forth and I therefore prefer this construction, but it is to be understood that within the scope of the invention as claimed, it may be embodied in numerous forms other than that shown. Furthermore, while I have illustrated a twin tunnel kiln, it will be understood that my improvements are equally adaptable to kilns having a single tunnel or any number of tunnels, the operation in all cases being the same.

I claim:

1. A kiln comprising a tunnel, a series of heat inlets opening into said tunnel at horizontally spaced points along one vertical side thereof only, and a single heat outlet from said tunnel, said outlet being located at the opposite side of the tunnel from said heat inlets and being longitudinally spaced from all of said heat inlets and in substantially the same horizontal plane therewith, whereby to force the heat from said inlets to travel diagonally across the tunnel and through the ware before escaping through said outlet.

2. A kiln comprising a tunnel through which the ware is conveyed, a series of furnaces at one vertical side of said tunnel

communicating with the latter at longitudinally spaced points, and a heat outlet from the opposite side of said tunnel, and located between the ends of said series of furnaces whereby to force the heat to travel diagonally in opposite directions across the tunnel and through the ware.

3. A kiln comprising a tunnel through which the ware is conveyed, a plurality of furnaces along one side of said tunnel, and hot air supply means between the inlet end of said tunnel and the first furnace for gradually raising the temperature of the ware preparatory to encountering the direct heat from the furnaces; together with a hot air outlet from the side of the tunnel opposite said one side thereof and diagonally opposed to said furnaces to force the heat from said furnaces to travel diagonally across the kiln and through the ware.

4. A kiln comprising a tunnel through which the ware is conveyed, a plurality of furnaces spaced along one side of said tunnel, and hot air supply passages spaced along said tunnel between the inlet end thereof and the first furnace, said passages increasing in size toward the first furnace to gradually raise the temperature of the ware preparatory to encountering the direct heat from the furnaces; together with a hot air outlet from the side of the tunnel opposite said one side thereof and diagonally opposed to the furnaces to force the heat from said furnaces to travel diagonally across the kiln and through the ware.

5. A kiln comprising a tunnel through which the ware is conveyed, a series of furnaces spaced along one side of said tunnel, said series of furnaces being spaced from the inlet end of said tunnel, a hot air outlet from the other side of the tunnel, a passage leading from said hot air outlet toward the inlet end of the tunnel and having branches discharging through said other side of the tunnel at longitudinally spaced points between said inlet end of the tunnel and the first furnace, and means for forcing travel of hot air from said outlet through said passage and branches to initially heat the ware preparatory to encountering the direct heat from the furnaces.

6. A structure as specified in claim 5, said branches increasing in size toward the furnaces for the purpose specified.

7. A kiln comprising a tunnel through which the ware is conveyed, a plurality of furnaces along one side of said tunnel, and hot air supply means between the inlet end of said tunnel and the first furnace for gradually raising the temperature of the ware preparatory to encountering the direct heat from the furnaces.

8. A kiln comprising a tunnel through which the ware is conveyed, a plurality of furnaces spaced along one side of said tunnel, and hot air supply passages spaced along said tunnel between the inlet end thereof and the first furnace, said passages increasing in size toward the first furnace to gradually raise the temperature of the ware preparatory to encountering the direct heat from the furnaces.

9. A kiln comprising a tunnel through which the ware is conveyed, said tunnel having an inlet at one end and an outlet at the other, and means for setting up hot air currents in said tunnel from both ends thereof toward approximately its center, whereby the hot air travels with the ware for a part of the tunnel's length and against said ware throughout the other portion of the tunnel's length.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ROBERT T. KYLE.

Witnesses:
WM. MARTIN,
A. E. SALMON.