J. B. OWENS.

KILN.

APPLICATION FILED APR. 7, 1916.

1,289,530.

Patented Dec. 31, 1918.

3 SHEETS—SHEET 1.

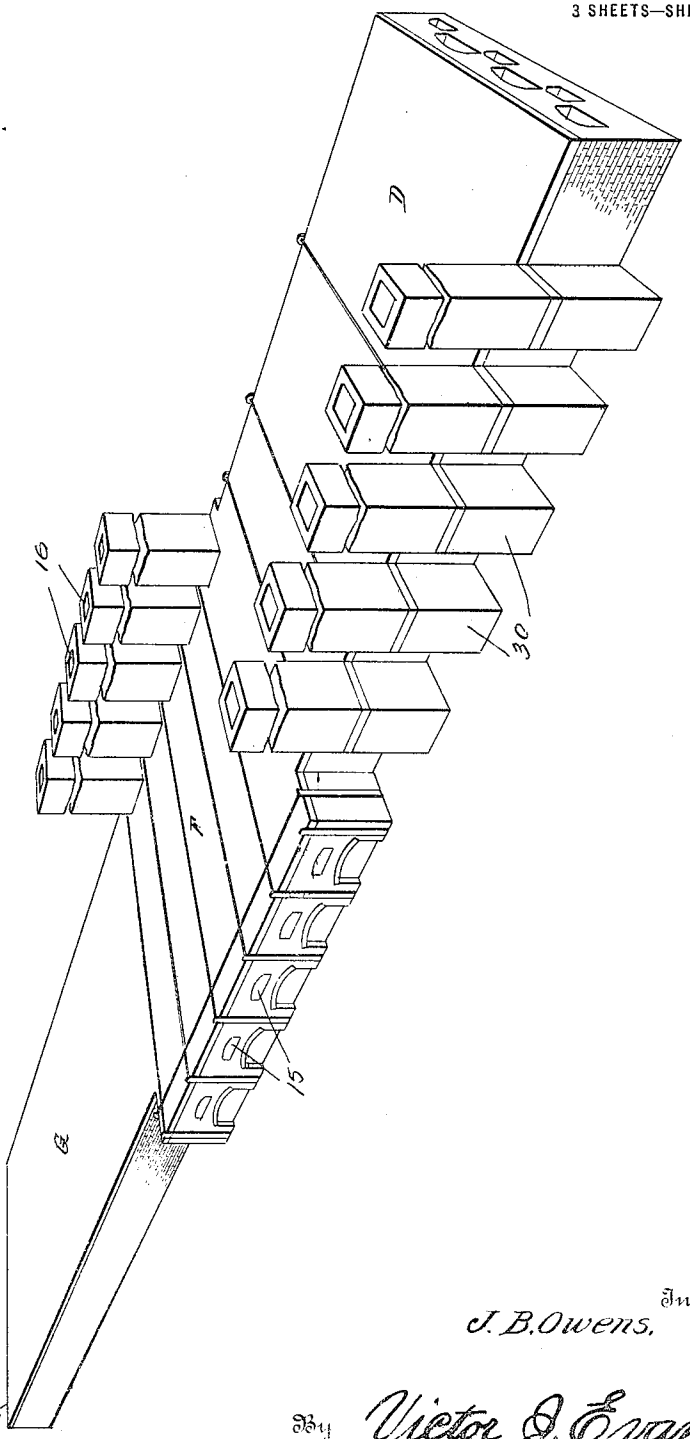


Fig. 1.

Witnesses

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3 SHEETS—SHEET 2.

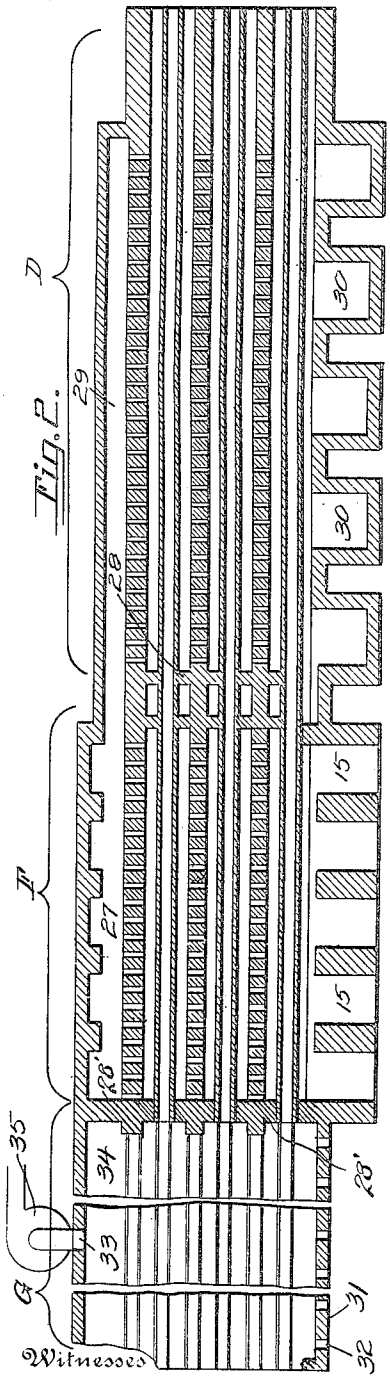


Fig. 2.

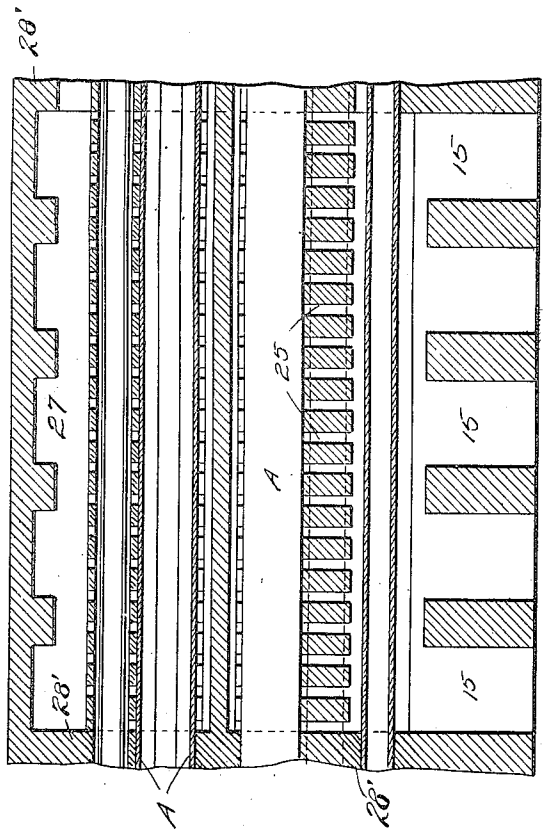


Fig. 3.

Witnesses

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3 SHEETS—SHEET 3.

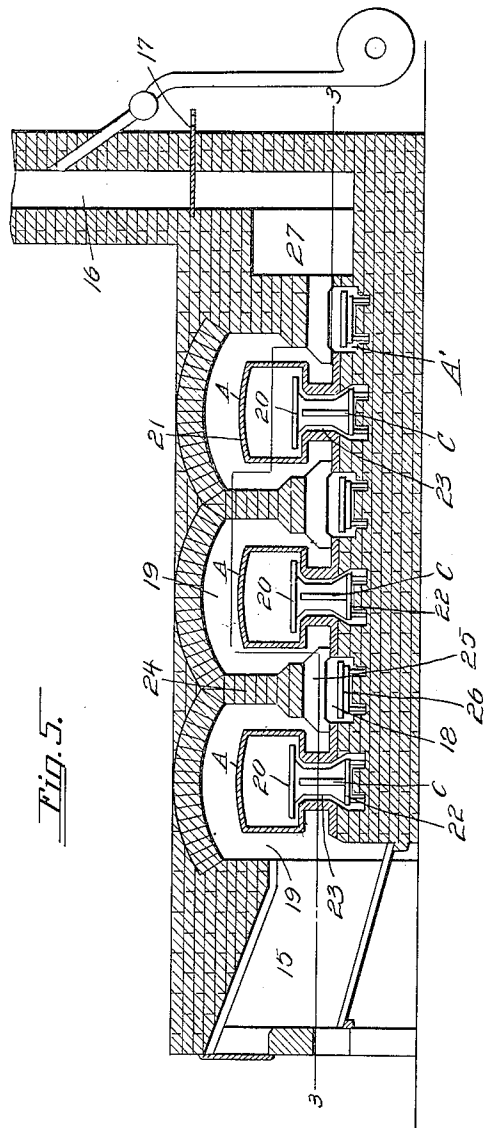


Fig. 5.

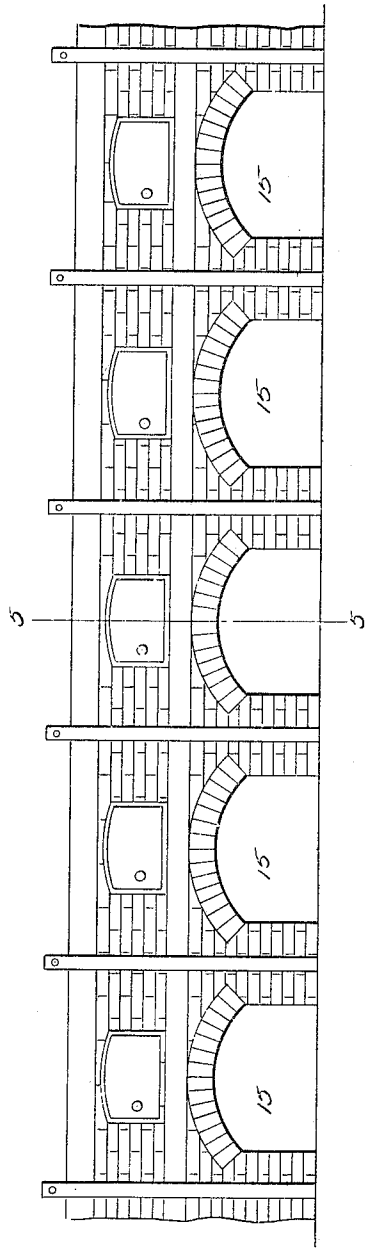


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN B. OWENS, OF METUCHEN, NEW JERSEY.

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Application filed April 7, 1916. Serial No. 89,679.

To all whom it may concern:

Be it known that I, JOHN B. OWENS, a citizen of the United States, residing at Metuchen, in the county of Middlesex and State of New Jersey, have invented new and useful Improvements in Kilns, of which the following is a specification.

This invention relates to kilns, and it has for its primary object to produce a kiln of simple and improved construction wherein clay and other products requiring varying degrees of heat may be fired at one and the same time.

A further object of the invention is to construct a kiln of the continuous tunnel type including one or more muffle tunnels and one or more open-fire tunnels, all of said tunnels being arranged in substantially parallel relation, and all of said tunnels being heated from the same source.

A further object of the invention is to produce a continuous tunnel kiln of the type described wherein each tunnel is provided with a burning zone that receives the products of combustion direct from the source of heat, a preheating zone wherein the products of combustion are subsequently utilized for the purpose of drying and preheating the products and a cooling zone wherein the products are cooled prior to their delivery at the discharge end of the kiln.

A further object of the invention is to produce a kiln construction that will enable the heat to be conserved and utilized with little or no waste.

With these and other ends in view which will readily appear as the nature of the invention is better understood, the same consists in the improved construction and novel arrangement and combination of parts which will be hereinafter fully described and particularly pointed out in the claims.

In the accompanying drawings has been illustrated a simple and preferred form of the invention, it being, however, understood that no limitation is necessarily made to the precise structural details therein exhibited, but that changes, alterations and modifications within the scope of the claims may be resorted to when desired.

In the drawings,—

Figure 1 is a perspective view of a kiln constructed in accordance with the invention.

Fig. 2 is a sectional plan view of the same.

Fig. 3 is a sectional plan view on a larger scale of the burning zone of the kiln.

Fig. 4 is a side elevation of that portion of the kiln which includes the furnaces.

Fig. 5 is a transverse sectional view taken on the line 5—5 in Fig. 4.

Corresponding parts in the several figures are denoted by like characters of reference.

The improved kiln is provided at one side thereof with a row of furnaces 15 of which any desired number may be used, said furnaces being adapted for the consumption of any kind of fuel, such as gas, liquid fuel, coal or any desired solid fuel. At the other side of the kiln structure are the primary stacks 16, the number of which may correspond with the number of furnaces, although this is by no means necessary. The stack 16 in Fig. 5 has been shown as being equipped with a damper 17. When additional stacks are employed each stack will usually be provided with a damper. It may here be stated that wherever stacks have been referred to in connection with the present device, it is to be understood that any well known draft inducing device, such as a fan, may be substituted.

Extending longitudinally through the kiln structure are the tunnels through which the ware that is to be fired is conveyed in any convenient manner; usually on cars that may be propelled in any well known way. The open tunnels 18, so-called, because the ware passing therethrough is exposed to the direct action of the products of combustion, alternate with the muffle tunnels 19 in which the muffles A are constructed, said muffles being tubular casings of refractory material having heads or crown portions 21 of large cross sectional area to accommodate the decks 20 of the cars C, the trucks of which, 22, travel in the lower portions of the muffles which are connected with the upper crown portions by constricted neck portions 23. The tunnels 19 in which the muffles are constructed are separated from each other by massive longitudinal walls 24, the lower portions of which have transverse flues 25, to accommodate the loads on the cars 26 that travel in

the open tunnels 18, and also to establish communication between the tunnels 19 for the passage of the products of combustion transversely through the kiln. One of the tunnels 19 at one side of the kiln has been shown as communicating directly with the fire boxes of the furnaces, and one of the tunnels 18 at the other side of the kiln has been shown as communicating directly with a longitudinal flue 27 that communicates with the bases of the smoke stacks; this arrangement might, however, be altered or reversed without departing from the principles of the invention.

As will be best seen in Fig. 5 of the drawings, the products of combustion from a furnace 15 will pass, assuming that the damper or dampers 17 are open, transversely through the kiln structure and through the passages formed by the flues 19 and 18, alternately, the muffles, and especially the top or crown portions thereof, being enveloped by the products of combustion, thereby firing the ware that is passing through the muffles and also exposing the ware that is passing through the open tunnels 18 to the direct action of the heat. The tunnels that are relatively near the furnaces will obviously be exposed to the highest temperature, while tunnels relatively near the smoke or draft exit will be subjected to a lower degree of temperature. It follows that by increasing the number of tunnels a considerable variation of heat may be obtained, thus enabling many different kinds of ware to be treated in the same kiln and by the same fires. Fine and fragile ware that requires protection from the direct action of the fire will be treated in the muffles, while coarser ware may at the same time be treated in the open fire tunnels. It is further evident that by varying the speed at which the ware is passed through the tunnels, different results may be obtained and different kinds of ware may be successfully treated.

The front or entrance end of the kiln contains a preheating zone, indicated by D in Fig. 2, said preheating zone being separated from the burning zone, indicated by F, by partition walls 28, and said preheating zone having at one side thereof a flue 29 communicating with the flue 27 of the burning zone. At the other side of the preheating zone are stacks 30 which receive the products of combustion from the flue 29 when the damper or dampers 17 are closed, the products of combustion passing transversely through the kiln structure in a direction opposite to the course taken by said products in passing from the furnaces to the stacks 16. The products of combustion may thus be utilized for the purpose of preliminarily heating and drying the ware that is to be fired, thereby avoiding the use of special heating arrangements for this purpose. The ware may be so stacked in the open tunnels as to prevent any appreciable leakage of the heated gases from section F to section D. It is also to be particularly noted that by this arrangement the crude ware may be passed directly to the kiln where it will be dried and preheated without cost of fuel and with a highly important economy in the drying space usually required in factories for the purpose of eliminating moisture from the ware before firing the same.

At the rear end of the kiln structure is a cooling space or zone G separated from the burning zone by partition walls 28′, and one of the side walls of which, 31, is provided with air inlets 32, permitting the passage of air transversely through the kiln structure, the air being permitted to escape through an opening 33 in the opposite side wall, said opening communicating with a duct 34. It is obvious that the temperature of the air will be materially raised during its passage through the cooling space and as contained in the duct 34 it contains heat that would otherwise have been wasted, This hot air may be disposed of through the medium of a fan conventionally indicated by 35 and whereby it may be carried to any place where it may be utilized in any well known manner.

From the foregoing description, taken in connection with the drawings hereto annexed, the operation and advantages of this invention will be readily understood. When the improved kiln is constructed of proper dimensions with a plurality of open fire tunnels and muffles, it may be continuously operated for the purpose of firing different kinds of ware requiring different heat and varying degrees of care, and great economy will be derived from its use, not only with respect to the amount of fuel required, but also with respect to the time required for firing the ware, the avoidance of damage to the ware, the labor that may be saved by its use and the amount of factory space required.

Having thus described the invention, what is claimed as new, is:—

1. A kiln combining in one structure a furnace, a smoke exit, a muffle tunnel, an open fire tunnel, and means for conveying the products of combustion transversely of the tunnels from the furnace to the exit in one direction only, producing varying degrees of heat in the several tunnels according to whether they be close or remote from the furnace.

2. A kiln combining in a single structure a furnace, a smoke exit, a plurality of tunnels some of which have muffles extending therethrough, and means for conveying the products of combustion transversely of the tunnels from the furnace to the exit in one direction only, producing varying degrees of heat in the several tunnels according to

whether they be close or remote from the furnace.

3. A kiln combining in a single structure a furnace, a smoke exit having a damper, a plurality of tunnels some of which have muffles extending therethrough, and flues arranged for the passage of products of combustion transversely of the tunnels from the furnace to the exit in one direction only, producing varying degrees of heat in the several tunnels according to whether they be close or remote from the furnace.

4. A kiln combining in a single structure, a furnace, a smoke exit, and a plurality of muffle tunnels and open fire tunnels disposed longitudinally in alternate order between said furnace and smoke exit, means for transferring ware to be burned through the tunnels, and means for conveying products of combustion transversely of the tunnels from the furnace to the smoke exit, the muffle tunnels and the open fire tunnels being transversely in communication with each other, and the muffle tunnels being equipped with muffle structures having enlarged crowns or head portions below which the ducts establishing communication between the tunnels are located.

5. A kiln structure having a plurality of open fire tunnels and muffle tunnels extending longitudinally therethrough and arranged in alternate order, said tunnels being transversely in communication with each other for the passage of products of combustion, partition walls whereby the kiln is divided into a burning zone located intermediate the ends, a preheating zone at the front end and a cooling zone at the rear end of the structure, furnaces at one side of the burning zone, and smoke exits at the other side of the burning zone.

6. A kiln structure having a plurality of open fire tunnels and muffle tunnels extending longitudinally therethrough and arranged in alternate order, said tunnels being transversely in communication with each other for the passage of products of combustion, partition walls whereby the kiln is divided into a burning zone located intermediate the ends, a preheating zone at the front end and a cooling zone at the rear end of the structure, furnaces at one side of the burning zone, and smoke exits at the other side of the burning zone, the preheating zone and the burning zone being provided with communicating flues adjacent to the side wall at which the smoke exits are located, and auxiliary smoke exits or stacks being provided adjacent to the opposite side of the preheating zone, and the smoke exits being equipped with means for controlling the direction and outlet of the products of combustion.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN B. OWENS.

Witnesses:
J. G. BECK,
GEORGE PYATT.