May 10, 1927. 1,627,720

W. E. WILSON ET AL

SINGLE FIREBOX KILN

Filed Feb. 25, 1921 3 Sheets-Sheet 1

Fig. 1.

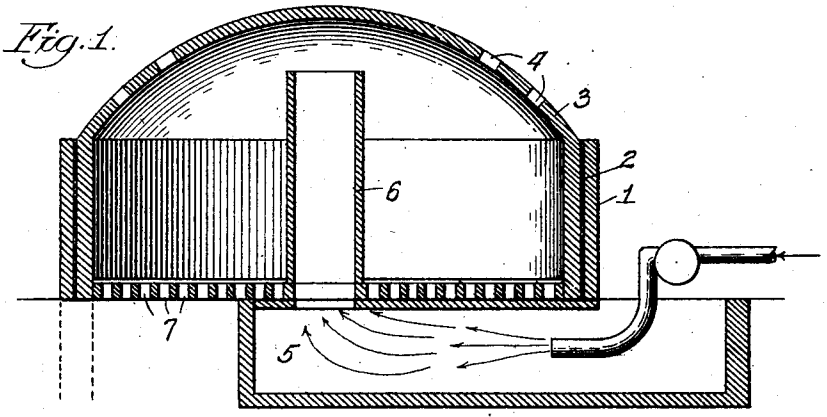


Fig. 2.

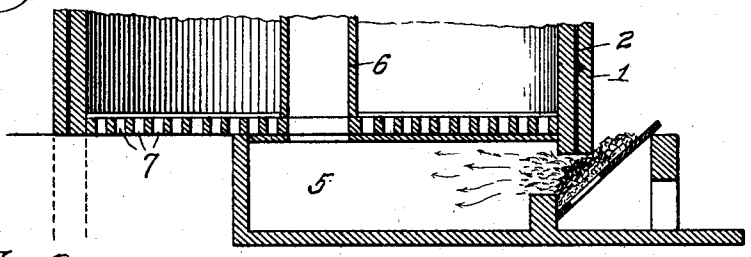


Fig. 3.

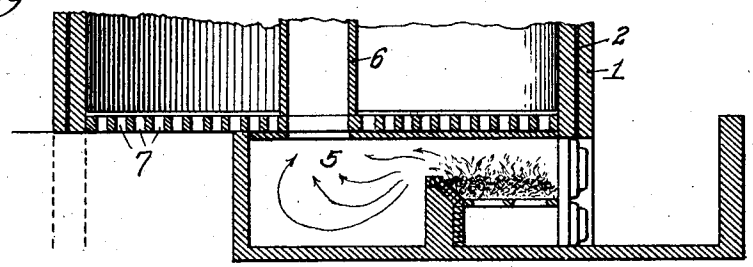
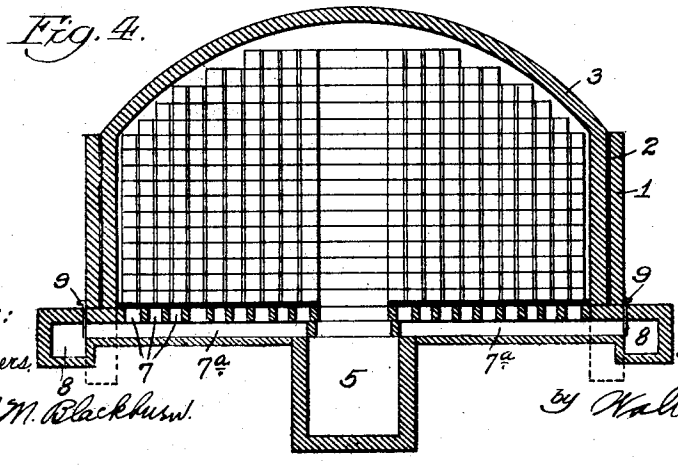


Fig. 4.



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SINGLE FIREBOX KILN

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Fig. 5.

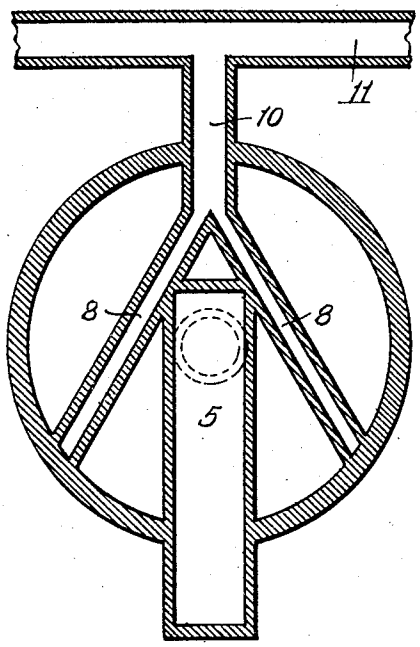


Fig. 6.

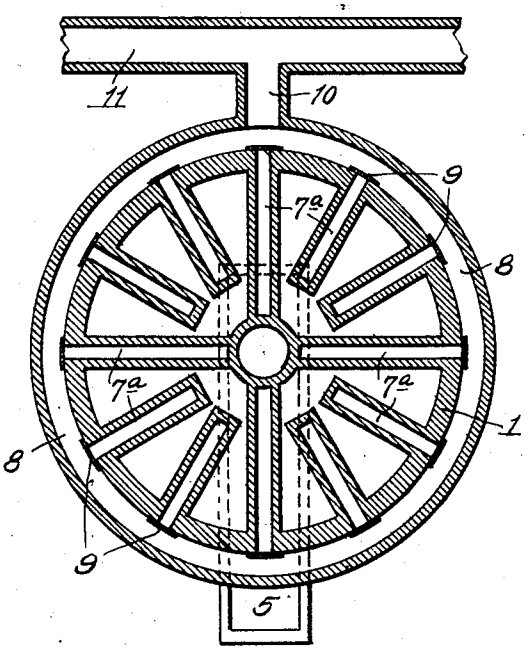
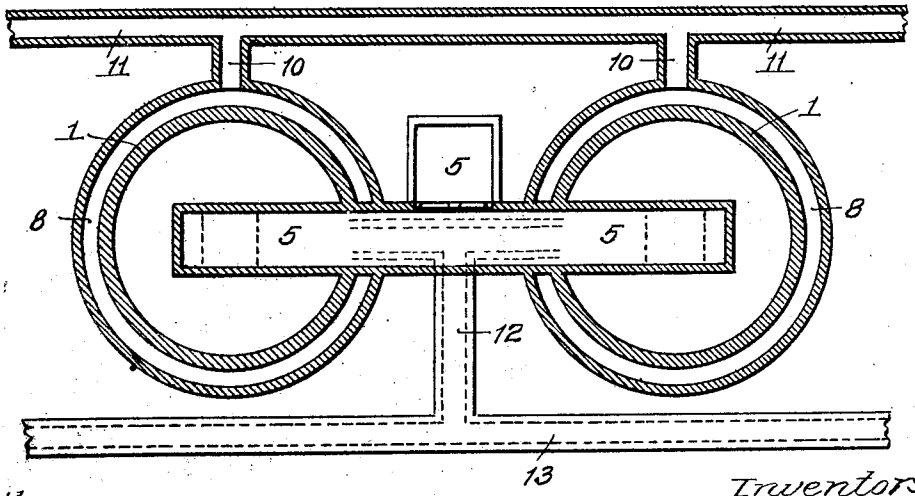


Fig. 7.



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SINGLE FIREBOX KILN

Filed Feb. 25, 1921 3 Sheets-Sheet 3

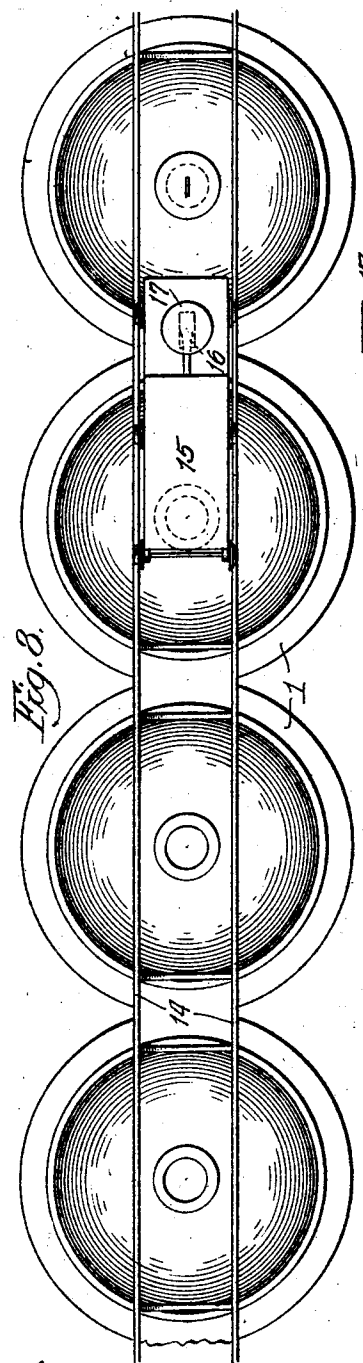

Fig. 8.

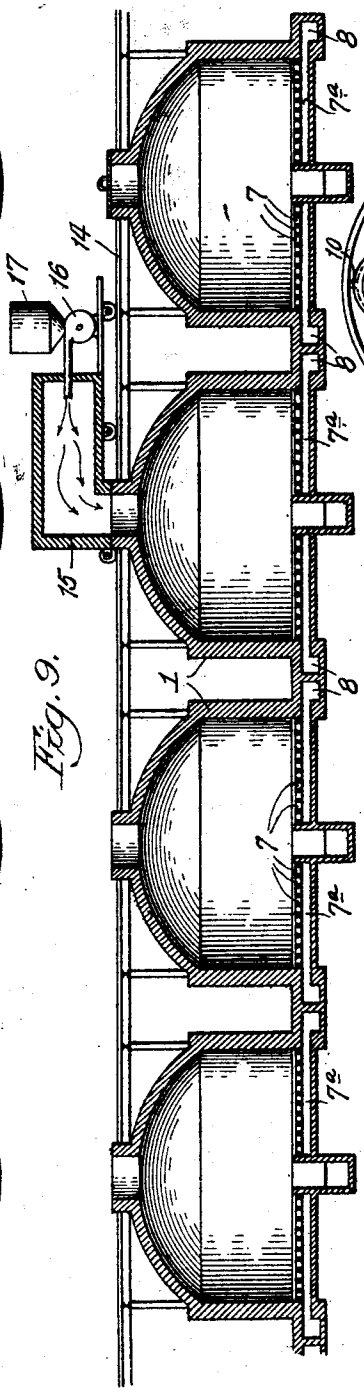

Fig. 9.

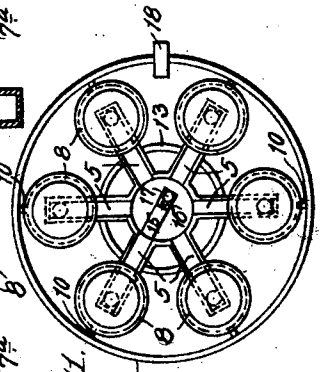

Fig. 11.

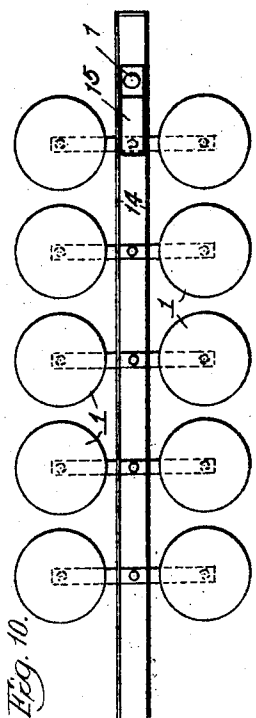

Fig. 10.

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UNITED STATES PATENT OFFICE.

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SINGLE-FIRE-BOX KILN.

Application filed February 25, 1921. Serial No. 447,661.

Our invention relates primarily to improvements in kiln construction adapted for the use of various kinds of fuel and to reduce the amount of fuel consumption. Among the objects of our invention are: to so construct a kiln for the burning of brick, tile, pottery etc. as to effect a maximum reduction in the amount of fuel consumed; to construct a kiln adapted for the use of various fuels such as fuel oil, fuel gas and powdered fuel; to so construct a kiln as to secure regulated heat distribution throughout the ware being fired; to regulate the heat distribution; and such further objects, advantages and capabilities as will later more fully appear.

Our invention further resides in the combination, construction and arrangement of parts illustrated in the accompanying drawings, and while we have shown therein preferred embodiments, we desire the same to be understood as illustrative only and not as limiting our invention.

In the present method of firing, there is a large heat loss due to the great amount of excess air carried in thru and over the multiplicity of grates and fires. This loss of heat energy thru the heating of excess air to the high temperatures at which the ware is fired is the largest loss in firing prior types of kilns and there is no practical means of keeping such losses down to a reasonable minimum. By the use of one fire or at the most two or three fires in a larger kiln these losses can be reduced in proportion to the reduction of the number of fires, particularly as it is possible, as in this invention, to utilize a better type of fire box in which it is possible to regulate more accurately the proportion of air used in firing.

A second large loss in the firing of the prior types of kiln is the fact that they have a limited combustion space. The burning of any fuel requires not only a correct proportion of air supply, but an intimate mixture of the air supply with the gases distilled off from the burning fuel together with a large enough combustion space, giving time for such mixing and time to burn. A large combustion chamber is not only desirable but necessary for the economical burning of all fuels, coal and other combustibles burned on a grate, as well as oil, gas and powdered fuels. This invention provides such a combustion chamber which can be made of any required dimensions.

In the burning of gases, oil and powdered fuel an intensely hot flame is produced which necessitates a large combustion chamber for complete combustion, in order that the gases may expand to obviate the erosive effect of the high velocity gases of the flame itself, which would be destructive if impinged on the refractory of the kiln or the ware to be burned. In this invention such a combustion chamber is provided which can be made of any suitable dimensions, which would obviously be impossible with eight or more circumferential fires used with the present kiln.

By taking the products of combustion and gases direct from the combustion chamber, when they are at their hottest, up thru the center of the ware in the kiln, distributing it radially outward and downward, a better distribution of heat is obtained as the ware body heats from the inside radially outwards while the descending gases may be deflected and pulled down along the circumferential walls.

It is also obvious that in this construction an increased capacity of the kiln is obtained in that the ascending central flue or opening left in the mass of the ware to be burned occupies less of the volume of the kiln than the multiplicity of fire bags required in the prior forms of kiln. This kiln also permits of a less expensive wall construction, which may be reduced considerably in thickness if properly insulated. It reduces tremendously the amount of high refractory material required, in that the impinging flame and radial heat is confined in the one combustion chamber and strikes the kiln proper only at the apex of the dome eliminating any necessity of high refractory in the wall construction of the kiln proper.

In the drawings annexed hereto and forming a part hereof, Figs. 1, 2 and 3 are vertical sections showing the application of various modes of heating a kiln in accordance with our invention; Fig. 4 is a vertical transverse section of a kiln such as that shown in Fig. 6; Fig. 5 is a horizontal section of a kiln embracing our invention; Fig. 6 is a similar section of another form of draft control means, comprised in our invention; Fig. 7 is a still further modification showing an arrangement for firing two

kilns from one fire box; Figs. 8 and 9 show respectively a plan view and a vertical longitudinal section of another form of our invention, in which the fire box runs on a track over the kilns and the fire is directed downwardly through the top thereof; Fig. 10 is a somewhat similar modification in which the fire box runs on a track at or near ground level and may fire either a kiln at the right or at the left as desired; and Fig. 11 is a further modification in which a fire box is located centrally of a ring of kilns and directs the heat and products of combustion laterally into any one of the kilns as desired.

Referring more in detail to the annexed drawings numeral 1 indicates the kiln wall, provided with heat insulating material 2, to reduce the amount of heat radiated laterally through the kiln walls. 3 denotes the kiln top or dome and 4 side openings in the dome, through which the interior of the kiln may be inspected. 5 represents a single large fire box provided with means for the utilizing of any desired fuel such as fuel oil, powdered coal, or lump fuel such as coal and the like. This fire box may open into the kiln centrally as is shown in Figs. 1, 2 and 3, or at one side of the kiln, through a structure similar to a bag fire box.

In Figures 1, 2 and 3 the flue or stack 6 is shown as a permanent part of the structure, while in Fig. 4 this is omitted, the ware to be burned being stacked so as to form a central flue for the upward passage of the heat and gases resulting from the combustion of the fuel. The heat passing upwardly through the flue, whether this be centrally arranged or arranged at one side of the kiln, strikes the dome 3 and then passes downwardly through the ware and out through the floor through the outlet openings 7, from which escape is by way of ducts 7^a. Only so much of the dome is lined with refractory material as is necessary to resist the action of the directly impinging heat, entering thru the flue 6, thus reducing to a minimum the amount of refractory material required. Surrounding the wall 1 and communicating with ducts 7^a is a duct 8, which may be shut off from one or more of the ducts 7^a by dampers 9. It should be noted that the duct 8 may be located inside of the wall 1, if desired or considered necessary, and may communicate with the ducts 7^a. It is, however, considered preferable to have the duct 8 outside of the wall 1. There are some instances in which it is practically impossible to arrange the draft ducts 7^a as shown in Fig. 6, owing to the fact that in a kiln already built it would be hard to cut so many openings through the kiln walls. In such a case the ducts or flues may be arranged as shown in Fig. 5, in which case only a single opening, 10, has to be cut through the wall. This duct 10 leads to the main conveyor duct 11, which communicates with the stack or fan by means of which the products of combustion are finally disposed of. Pipe 11 is provided with a damper whereby communication with the fan or stack may be cut off when desired.

In the form shown in Fig. 7, a single fire box 5 serves to fire either of two kilns, or, if desired, both of them simultaneously. Connected with the fire box is a duct or exhaust pipe 12 which leads into a main exhaust pipe 13, connected with the stack or exhaust fan, so that, when desired, the direction of the air through the kiln can be reversed.

Figs. 8 and 9 show the application of a single fire box traveling on a track above the top of a row of kilns, so that the fire can be applied to the top of a kiln and the heat and products of combustion drawn out through the bottom thereof. In this instance a track 14 is erected above the row of kilns and carries a fire box 15, which is preferably fired with oil, powdered coal, or the like, for the production of the heat. In Fig. 9 is shown a force feed means 16 drawing fuel from a tank 17, and blowing the same into the fire box 15 where it is burned. In this construction the exhaust pipes are not shown.

In Fig. 10 the ducts leading from the fire box 15 to the middle of the kilns are placed below the level of the ground and the heat passes from the fire box 15 to the right or left as desired, or may be used to fire two kilns at once if so desired. Here also the exhaust ducts are omitted for the sake of clearness.

In Fig. 11 a plurality of kilns are set in a circle around a central pit in which is located a pivotally mounted blower, which may be turned to direct the fire into any one of the fire boxes 5, from which the heat will rise through the center opening of the kiln as in Fig. 1, will strike the dome of the kiln, and then be deflected downwardly to and through the ware, traveling outwardly through ducts 8, 10 and 11 to the stack or fan 18.

It is of course understood that the specific description of structure and method set forth above may be departed from without departing from the spirit of our invention as set forth in this specification and the appended claims.

Having now described our invention, we claim:

1. In a kiln having a roof and a floor, a single fire box beneath the floor, said floor having an aperture connecting the fire box with the interior of the kiln and a plurality of apertures surrounding the first named aperture and communicating with the interior of the kiln, a plurality of passage-

ways beneath the floor of the kiln with which the apertures in said floor communicate, and a common duct communicating with all of said passageways and connected with an exhaust duct so that the waste products of combustion may be withdrawn through the floor of the kiln.

2. That step in the method of burning plastic ware which comprises stacking a portion of the ware around an opening through the floor of the kiln so as to form a flue for the passage of heat and products of combustion upwardly in the kiln toward the top thereof.

In witness whereof, we hereunto subscribe our names to this specification.

WM. E. WILSON.
HENRY G. LYKKEN.