

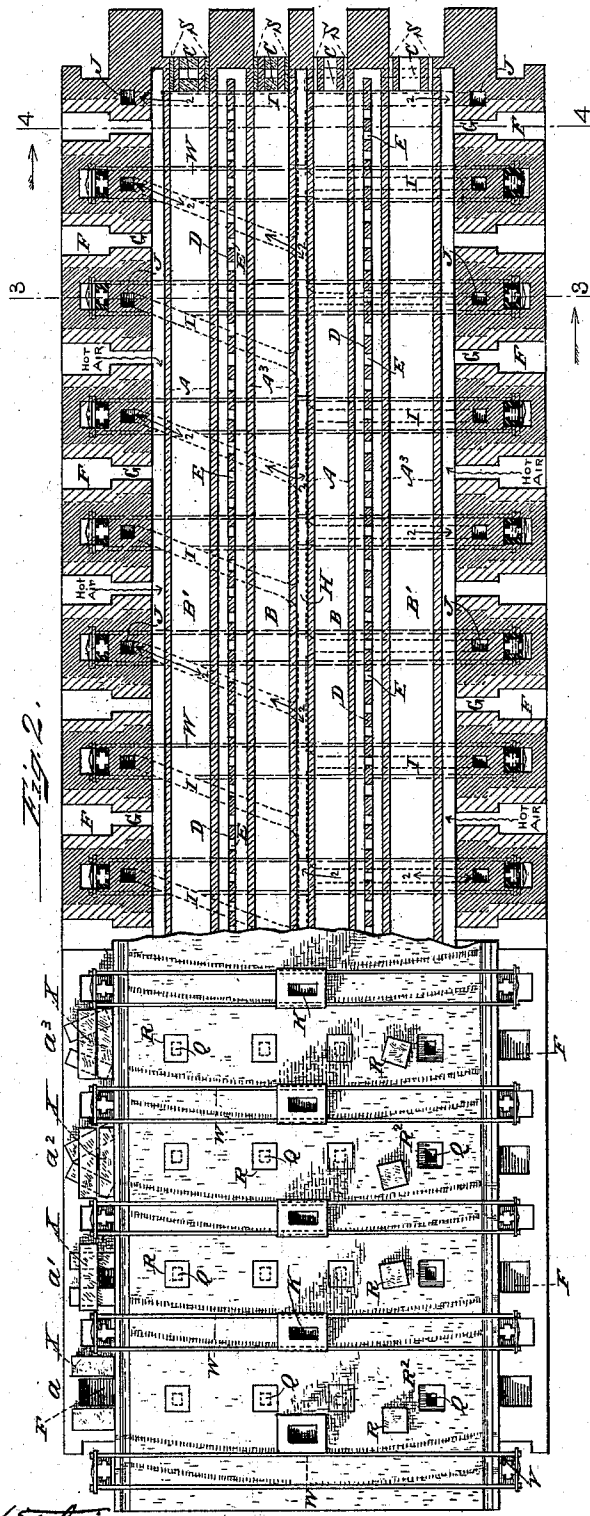
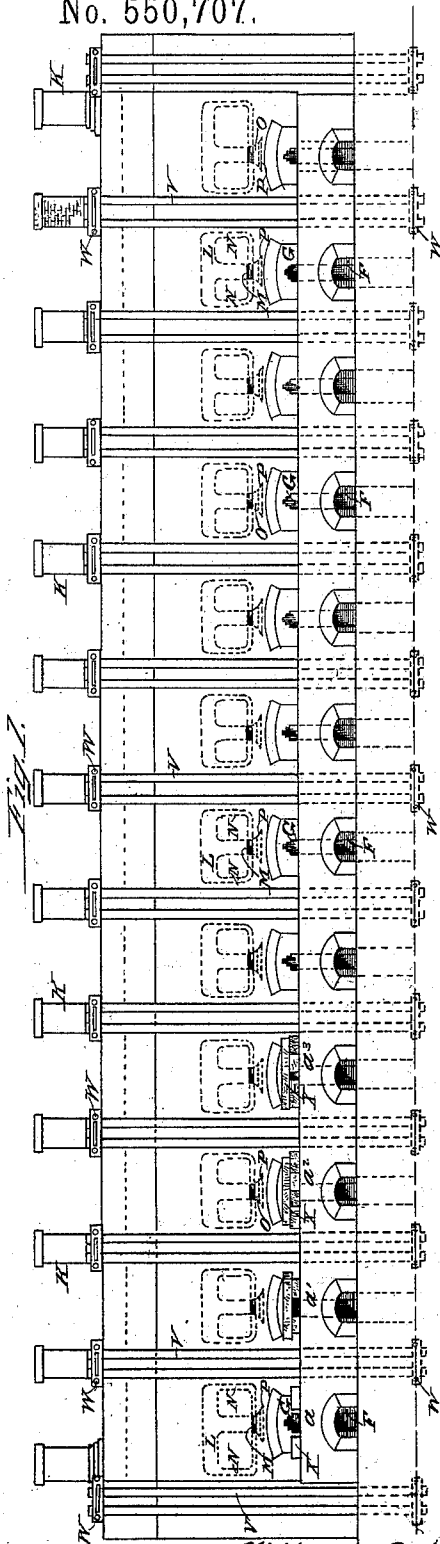
(No Model.)

2 Sheets—Sheet 1.

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KILN FOR BURNING CLAY WARES.

No. 550,707.

Patented Dec. 3, 1895.



Witnesses: *William S. Hutchins* Inventor. *Alfred Yates.*  
*H. E. Bennick & Co.* For *W. E. Remick, H. A. H.*

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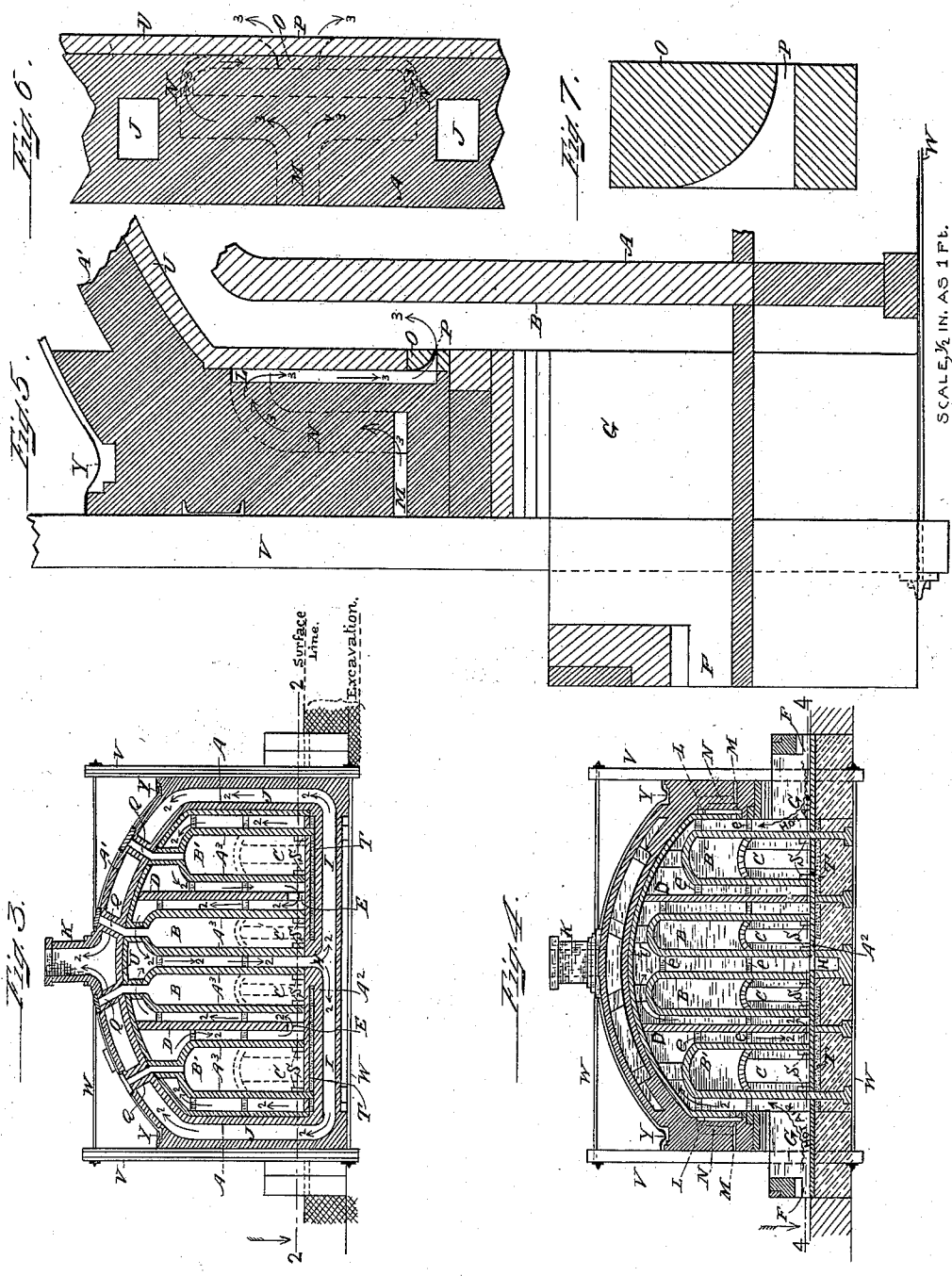
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J. H. B. Remick  
His atty.

# UNITED STATES PATENT OFFICE.

ALFRED YATES, OF ARLINGTON, ASSIGNOR OF ONE-HALF TO WILLIAM N. PIKE, OF MALDEN, MASSACHUSETTS.

## KILN FOR BURNING CLAY-WARES.

SPECIFICATION forming part of Letters Patent No. 550,707, dated December 3, 1895.

Application filed June 9, 1892. Serial No. 436,124. (No model.)

*To all whom it may concern:*

Be it known that I, ALFRED YATES, a subject of Victoria, Queen of the United Kingdom of Great Britain and Ireland, and a resident of Arlington, in the county of Middlesex and State of Massachusetts, have invented a certain new and useful Improvement in Kilns for Burning Clay-Wares, of which the following, taken in connection with the accompanying drawings, is a specification.

My present invention particularly appertains to and is an improvement on my Patent No. 264,118, dated September 12, 1882, embracing certain novel and useful features not existing therein, said improvements mainly comprising the following: the combustion-chambers in side walls, air-lets therein communicating with said chambers, diffusing-blocks with divergent air-outlets, muffles within the kiln for reception of wares to be burned, air-inlets to said muffles, passages therefrom to permit the escape of moisture eliminated from the green wares, and also to hasten the cooling of the kiln after burning, the object of my invention being to burn brick, flooring-tile, terra-cotta, ceramics, and other wares adapted to be burned in a kiln in a uniform manner as regards quality, density, and color, using coal or hydrocarbons as a fuel. A specific description of these features with their functions will be ascertained through reference to the drawings, forming a part of this specification, wherein—

Figure 1 is a side elevation of my improved kiln for burning all classes of clay goods. Fig. 2 combines a top and bottom plan to exhibit the exterior and interior arrangement of the same, Fig. 3 being a transverse vertical section on line 3 3 of Fig. 2, exhibiting the interior subdivisions with muffle-entrances closed. Fig. 4 designates a similar view on line 4 4 of Fig. 2, showing the construction of the fire-holes, combustion-chambers, and air-ducts leading thereto and therefrom with muffle-entrances open. Fig. 5 represents an enlarged detail of fire-hole and combustion-chamber from Fig. 2. Fig. 6 is a longitudinal horizontal section of said wall, showing the combustion-chamber and diffusing-block in dotted lines. Fig. 7 illustrates

the diffusing-block in cross-section, forming the outlets of the combustion-chambers.

Similar characters designate the same features in the several views, referring to which—

A A indicate the side walls, A' the arch or dome, and A<sup>2</sup> the bottom, of the kiln, said walls forming the exterior thereof. The vertical flash-walls within the interior of the kiln are designated as A<sup>3</sup>, inclosing and forming the muffles B B', wherein are placed the goods which are to be burned by radiated heat. Said muffles extend the length of the kiln and are provided with entrance-ways C C at one or both ends to admit wares. Before burning these entrances are temporarily, yet tightly, sealed with coarse masonry technically known as "clammings," which allow removal after burning without detriment to the kiln. Said muffles are separated from each other by partition-walls D D, having a series of draft-passages E E contiguous to the bottom A<sup>2</sup>. These muffles I prefer to construct of different capacities for reasons hereinafter apparent in my description of the heated-air circulation.

Returning now to the walls A A, along these exteriorly are erected at predetermined distances the fire-holes F, which receive the fuel and may be supplied with grates, though I do not deem it advisable, the heat therefrom passing to the interior of the kiln through the fire-slits G, following the direction of the arrows 2, thereby completely enveloping the outer muffles B, thence through the series of draft-passages E in the walls D D, surrounding in a similar manner the inner muffles B. Thence the heated air passes downward into the lower central longitudinal flue H, whence it diverges into the lateral flues I (see Fig. 2) beneath the floor A<sup>3</sup>, passing into the uptake-flues J, Fig. 3, converging over the arch or crown A', from thence making its exit through the chimneys K. I thus secure an economic and most effective circulation of intensely-hot air, while preserving my goods from direct contact with the flame and consequent deterioration from the gases therein.

To control the draft feeding the flame in the fire-holes F, I provide turn-bricks X, arranged to cover the fire-slits G in the several

ways shown in Fig. 2 at  $a a' a^2 a^3$ , wherein said slits may be observed open, partially closed, and closed, as the exigencies of the burning may require.

5 In the varying construction of the muffles previously alluded to those of an increased width  $B'$  are adjacent to the fire-holes  $F$ , which obviously receive a greater degree of heat. I therefore consider it advisable to sub-  
10 ject the broader mass of goods to this increase of temperature, while the thinner mass receives the somewhat diminished heat, thereby securing a greater uniformity in the general burning.

15 It is highly important to thoroughly consume the gases which are set free by imperfect combustion in the fire-holes. To this end fresh air is introduced into the flame by means of chambers  $L$ , supplied through pas-  
20 sages  $N$  by air-inlets  $M$ , corresponding in number to the fire-holes, above which they are respectively situated. These chambers are in the inner part of the walls  $A A$  and present a broad surface to the action of the  
25 flames and heated air in the contiguous space immediately about the muffles. As the said chambers are thin, the air in them becomes thoroughly heated before passing out of them into the flames, and is therefore much more  
30 efficacious in consuming the obnoxious gases than if it came by a direct unimpeded passage from the atmosphere to the interior of the furnace. The outlet  $P$  of the said chamber is at its bottom about equidistant from its  
35 two sides and in the same vertical plane with the inlet  $M$ , though slightly below it. The said outlet is adapted to diffuse the air escaping from the said chamber, being formed in a diffusing-block  $O$ . Said block is constructed  
40 with a convexity (shown in Figs. 5 and 7) on the upper side of the said opening, which tends to divide the fresh heated air passing out of the chamber  $L$  and to cause it, as indicated in Fig. 6, to flow in diverging fan-like  
45 streams or currents into the flame, whereby it is perfectly mixed therewith and performs its office to the best advantage.

The preliminary manipulations of tempering, molding, &c., I have not described, as  
50 they do not come within the province of this invention, being well known to those skilled in the art. Assuming, then, these goods to be dried, they are stacked and arranged in suitable courses to insure a uniform heated  
55 circulation within the muffles  $B B'$ . In the practical operation of burning these green products there is more or less latent moisture which condenses under the pressure of heat and if not allowed to escape deters the burn-  
60 ing to a very considerable extent and affects the density of the clay and consequently the strength of the wares. To obviate this difficulty, I provide cooling-holes  $Q$  at suitable distances along the arch  $A'$ , as in Fig. 2,  
65 communicating with and above the muffles  $B B'$ . Said openings  $Q$  are arranged to be

temporarily closed by hatches  $R$ , of brick, while the goods are burning, or to be opened for the dispersion of the moisture and to facilitate the cooling of the kiln after burning,  
70 as at  $R^2$ , in conjunction with the cold-air inlets  $M$  previously described. To further hasten the escape of the condensed moisture, outer air-passages  $S$  are formed in the end  
75 walls of the kiln, directly communicating with and close to the floors of the muffles  $B B'$ . These are adapted to be opened and closed temporarily, as necessity requires, after the manner of the cooling-holes  $Q$  previously  
80 described. I would add here that said muffles permit by my improved construction the as-  
semblage of various classes of wares together to be burned by radiation and to be ventilated during the process of firing, as previously de-  
85 scribed—a vast and important improvement over the use of “saggers,” wherein the wares are hermetically sealed, which prevents the escape of the latent moisture, retards burn-  
90 ing, and affects the density and quality of said wares to an appreciable extent.

An important factor in the building of my improved kiln is stability of construction and imperviousness to leakage, to avoid which I create beds of cement concrete, as at  $T$ , in  
95 the floors and foundation and within the kiln a lining of fire-brick  $U$  at such points as would be exposed to greatest heat and of which the flash-walls might also be composed, the whole suitably bonded, as at  $e$ , to impart  
100 additional strength.

$V$  designates the channel-iron vertical beams set against the outer walls where necessary and united at top and bottom by metal  
105 tie-rods  $W$ , clamped in the ordinary manner to insure stability.

$Y$  is the gutter draining the dome.

Having thus described my invention, I desire to secure by Letters Patent of the United States and I claim—

1. A kiln for burning clay ware provided  
110 with a fresh air-inlet  $M$ , a diffusing block  $O$  constructed to leave an opening  $P$  for discharging the air in proximity to one of the muffles and communications between the  
115 said inlet and opening, the said block being provided with a convex lower face for causing the air that passes through the said opening to be distributed in opposite directions substantially as shown.

2. A kiln for burning clay ware constructed  
120 with a central passage or flue  $H$ , two or more rows of muffles arranged on each side of the same, partitions dividing the rows of muffles on each side from each other and provided  
125 with openings  $E$ , means for supplying hot air to the said passage through the said openings around the muffles, and outlet passages from the said central passage substantially as set forth.

3. A kiln constructed to burn clay-products  
130 provided with the chambers  $L$  each having an air diffusing block and opening arranged to

supply the air in a fan-form stream to the flame  
opposite each muffle, the said kiln being also  
supplied with an air inlet M for each one of  
the said chambers and a pair of diverging  
5 air passages N connecting each inlet with the  
corresponding chamber substantially as set  
forth.

4. In combination with one or more muffles,  
the exterior kiln walls inclosing the same, pro-  
10 vided with flues conveying hot air to the exit,  
the chambers L, inlets M, passages N, diffus-  
ing blocks O and openings P and the exterior

fire holes for reception of fuel, all of the said  
parts being constructed within the said wall  
substantially as set forth. 15

In testimony whereof I have signed my  
name to this specification, in the presence of  
two subscribing witnesses, on this 6th day of  
June, A. D. 1892.

ALFRED YATES.

Witnesses:

WILLIAM E. HUTCHINS,  
CHARLES E. ALLEN.