

944,304.

A. H. YODER.
KILN.
APPLICATION FILED DEC. 7, 1908.

Patented Dec. 28, 1909.
2 SHEETS—SHEET 1.

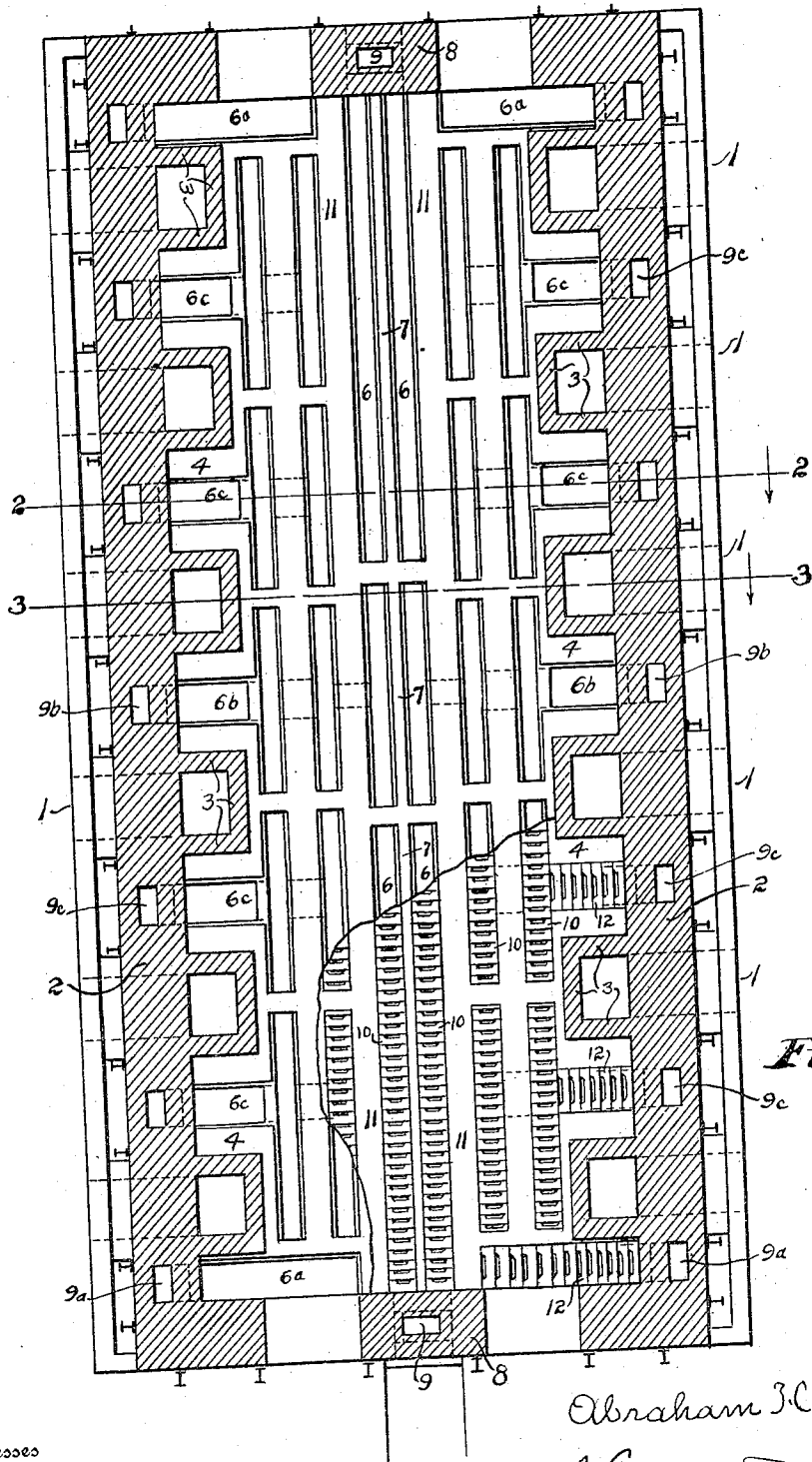


Fig. 1.

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2 SHEETS—SHEET 2.

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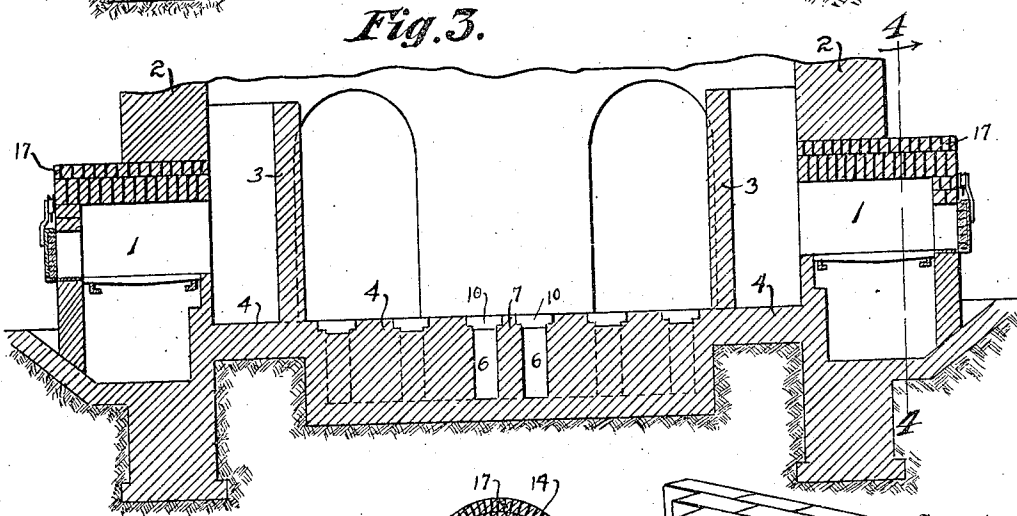
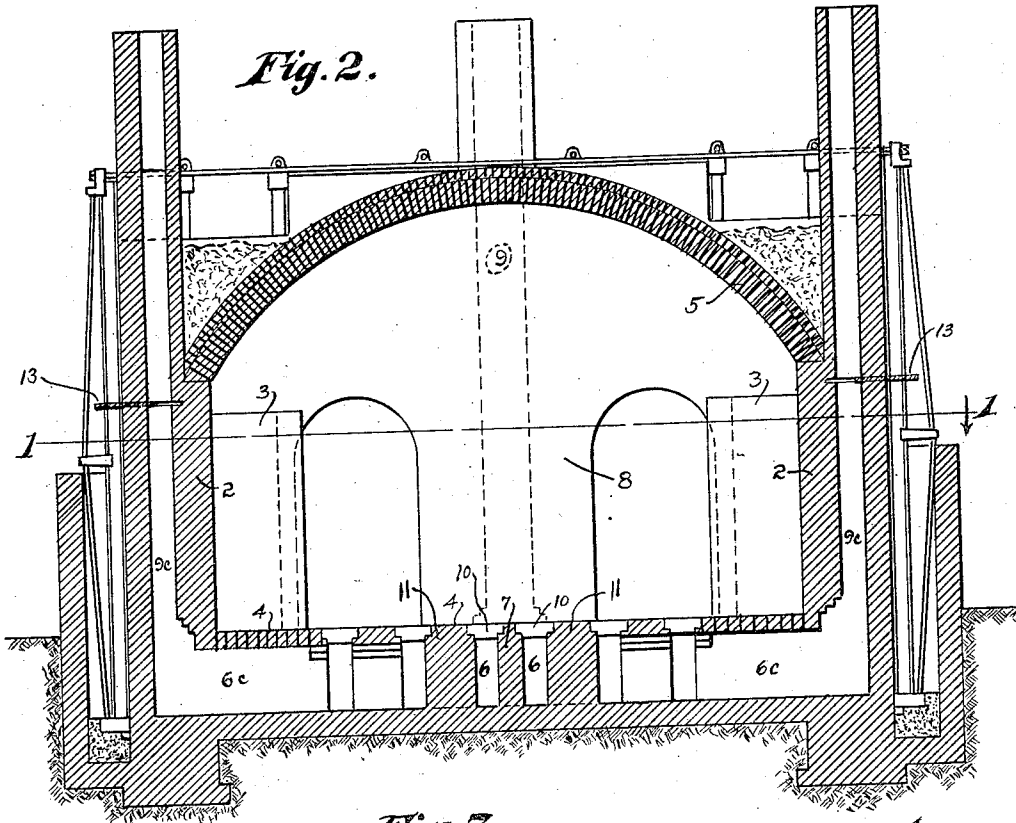


Fig. 4.

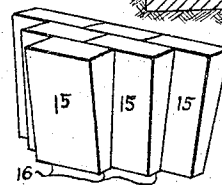
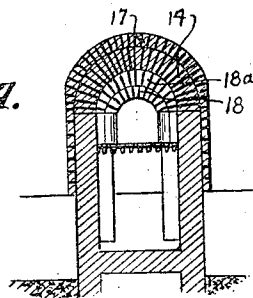


Fig. 5.

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KILN.

944,304.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ABRAHAM H. YODER, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented a new and useful Improvement in Kilns, of which the following is a specification.

The invention relates to kilns for burning bricks, tile, sewer pipe, terra cotta or other clay products, and in the embodiment of the improvement herein set forth, the same is shown and described more particularly with reference to a down draft kiln for burning paving bricks.

A general type of such a kiln includes a series of furnaces or fire boxes extending through the walls of the kiln, at or near the floor thereof, a series of shields or "bags" inside the kiln around the openings of the fire boxes and extending upward to or near the arched or crowned roof or cover of the kiln, and a series of intercommunicating flues underneath the floor and leading either to a large central flue and single stack, or to numerous smaller stacks located in the walls of the kiln, the floor over the flues being apertured to complete the down-draft circuit through the kiln.

The bricks to be burned are set or stacked at suitable intervals apart within the kiln, and the heat from the fire boxes is directed upward by the bags and thence deflected downward by the roof through the intervals between the bricks and through the floor apertures, and thence by way of the flues to the stack or stacks. In such kilns, great difficulty has been experienced in obtaining a uniform burn throughout the kiln, for it is practically impossible to draw the heat to the sides and particularly to the ends of the kiln, which are furthermore the most exposed to the cooling effects of radiation; and therefore the greatest amount of heat is drawn to and retained in the middle portions of the kiln. On the other hand, when it is sought to draw the heat away from the middle portions of the kiln by providing series of flues in each side, with intervening longitudinal flues extending continuously from one end of the kiln to the other and leading to stacks in each end of the kiln, too much heat is drawn to the end portions of the kiln and the middle portion is left unburned. These difficulties are overcome by providing longitudinal flues in the median line underneath the floor of the kiln divided by cross parti-

tions into end sections and one or more intermediate sections, and a series of flues on each side thereof likewise divided by cross partitions and also separated from the median-line flues by longitudinal partitions, the intermediate median-line flues being connected with the adjacent side flues and forming separate sections therewith; and by providing separate stacks in the walls of the kiln leading from each separate flue section, whereby each section and particularly each middle section, has an independent draft; so that by the use of suitable dampers in the stacks, the heat currents can be controlled in and distributed to the different regions or zones of the floor corresponding to the separate and independent flue sections therein. A further difficulty pertains to the construction of the fire boxes which are usually extended outward some distance from the outer face of the wall of the kiln, and by reason of the varying expansion and contraction to which they are subject under the varying degrees of heat, the separate bricks of the arch have a great tendency to bend or warp, and the arch as a whole has a further tendency to crack or rupture, especially at or near the plane of the outer face of the kiln wall. This general difficulty is overcome and other minor advantages of construction and durability are attained by making the top of the fire box as a continuous arch composed exclusively of end wedge bricks all laid as headers and bonded or interlocked one with another.

The more important features of the invention, thus set forth in general terms, are illustrated in the accompanying drawings, forming part hereof, in which—

Figure 1 is a sectional plan view showing the walls of the kiln on line 1—1 of Fig. 2, and showing the floor bricks removed from the greater portion of the floor; Fig. 2, a vertical cross section of the kiln on line 2—2, Fig. 1; Fig. 3, a similar section of the lower portion of the kiln on line 3—3, Fig. 1; Fig. 4, a vertical cross section of one fire box on line 4—4, Fig. 3; and Fig. 5, a fragmentary perspective view showing the arrangement of the fire box arch bricks.

Similar numerals refer to similar parts throughout the drawings.

The fire boxes 1 are built in and through the side walls 2 of the kiln and around the inner ends of the fire boxes are provided the bag walls 3 which extend from the floor 4

upward to a point preferably just below the spring of the arched roof 5 of the kiln.

In the arrangement of the floor flues illustrated herein, two parallel flues 6 are located, one on each side of the longitudinal median partition 7, and are extended from each end wall 8 of the kiln to a transverse partition preferably located opposite the third set of fire boxes. These longitudinal end flues open into and have an outlet through the stacks 9 formed in and extended upward from the end walls of the kiln, and it is evident that they will draw through the apertured floor bricks 10 which cover them, from that particular region or zone of the kiln which corresponds to the location of the flues, but will not draw from any other portion of the kiln.

In the arrangement illustrated, a single transverse flue 6^a is located at each corner of the kiln and is extended from the partition 11 forming the side of the parallel flues, laterally outward to the side wall 2, wherein these flues communicate with and have an outlet upward through the stacks 9^a formed in and extended upward from the side walls. It is evident that these flues will draw through the apertured floor bricks 12 which cover them, only from the corresponding regions or zones of the floor in the respective corners of the kilns.

In the middle portion of the kiln, one or more transverse flues 6^b are provided on each side of the longitudinal median partition 7 and are extended each way to the side walls, wherein they communicate with and have an outlet through the stacks 9^b formed in and extended upward from the side walls. These flues are preferably provided with a number of longitudinal branches which extend each way to transverse partitions at or near the middle lines of the adjacent pairs of fire boxes, and it is evident that these flues will each draw through the apertured floor bricks 10 and 12 which cover them, only from the corresponding regions or zones of the floor, and that such flues can be duplicated at will to draw from the middle side zones of kilns of varying lengths.

In each side portion of the kiln between the corner and middle zones is provided a series of transverse flues 6^c which extend from the outer walls 11 of the longitudinal flues, outward to the side walls of the kiln, wherein they communicate with and have an outlet in the stacks 9^c formed in and extended upward from the side walls. These flues are preferably provided with a number of longitudinal branches which extend each way to transverse partitions at or near the middle lines of the adjacent pairs of fire boxes, and it is evident that these flues will each draw through the apertured floor bricks 10 and 12 which cover them, only from the corresponding regions or zones of

the floor, and that such flues can be duplicated at will to draw from the intermediate side zones of kilns of varying lengths.

The corner flues are preferably proportioned to draw from a smaller region or zone of the kiln floor than any of the other flues, but are provided with stacks of equal cross area as compared with the other stacks, whereby the draft from these flues will be proportionately greater because of the relatively smaller zone of the floor from which they draw, which greater draft is desirable at the corners of the kiln for the reason that the corners are naturally the coolest portions thereof. And likewise, each and all of the other flues can be proportioned to draw from varying regions or zones of the kiln according to the location thereof and their proximity to the side walls of the kiln, so that the draft of each flue can be proportioned to its particular stack and to the requirement of the particular zone from which it draws, to equalize or vary, as may be desired, the downward draft throughout the kiln. And as the flues underlie the whole area of the floor it is evident that by use of the dampers 13 in the respective stacks, the draft of any particular flue or separate series of flues can be regulated and controlled at will, whereby the draft at any and all portions of the kiln can be positively regulated and controlled.

The arches 14 of the fire boxes are made of a series of end-wedge arch bricks 15, which are all laid as headers in continuous series from one end to the other of the fire box, the joints of the bricks of one series being broken with respect to the joints of the bricks of the adjoining series, whereby a perfect bond is made between all the bricks of the arch from one end of the fire box to the other. Furthermore, by this form of construction, the small end face only of each arch brick is presented to the heat of the furnace, thereby greatly lessening the expanding and contracting action of the varying degrees of heat, thus practically preventing any bending or warping of the brick and any resulting cracking or rupture of the wall of the kiln, and permitting a greater proportion of the thickness of the arch to be burned out by the action of the fire without materially affecting the integrity or strength of the arch.

In the construction of the kiln, a supplemental arch 17 made of bricks laid preferably on edge, is provided, on which the wall of the kiln is built, so that in event the fire box arch is required to be replaced, the same can be drawn out from underneath the supplemental arch and rebuilt thereunder without affecting or disturbing the walls proper of the kiln. Likewise, the size of the door opening can be reduced by one or more face arches 18 and 18^a being built therein, which

same can be removed and replaced without affecting the arch proper of the fire box.

What I claim as my invention, and desire to secure by Letters Patent, is—

- 5 1. A down-draft kiln having a series of flues including one or more longitudinal flues in the median line with a series of flues on each side thereof, all together underlying the whole area of the floor, partitions separating the flue or flues pertaining to the different zones of the floor including transverse partitions dividing the median-line flues into end sections and one or more intermediate sections, the intermediate sections of the median-line flues being connected with the adjacent side flues, and separate stacks leading from the flue or flues pertaining to each zone, with means for controlling the draft in the respective stacks.
- 10 2. A down-draft kiln having a series of flues including one or more longitudinal flues in the median line with a series of flues on each side thereof, all together underlying the whole area of the floor, partitions separating the flue or flues pertaining to the different zones of the floor including transverse partitions dividing the median-line flues into end sections and one or more intermediate sections, the intermediate sections of the median-line flues being connected with the adjacent side flues, and separate stacks leading from the flue or flues pertaining to each zone.
- 15 3. In a kiln, a fire-box extending through and beyond the kiln wall, and having an arch composed entirely of end-wedge bricks all laid as headers in series extending the whole length of the arch, the joints of each series being broken with the joints of adjoining series, a supplemental arch in the wall over the through arch and one or more face arches in the mouth of the box inside the through arch.
- 20 4. In a kiln, a fire-box extending through

and beyond the kiln wall, and having an arch composed entirely of end-wedge bricks all laid as headers in series extending the whole length of the arch, the joints of each series being broken with the joints of adjoining series, and one or more face arches in the mouth of the box inside the through arch.

5. In a kiln, a fire-box extending through and beyond the kiln wall, and having an arch composed entirely of end-wedge bricks all laid as headers in series extending the whole length of the arch, the joints of each series being broken with the joints of adjoining series, and a supplemental arch in the wall over the through arch.

6. In a kiln, a fire-box extending through and beyond the kiln wall, and including an arch composed entirely of end-wedge bricks all laid as headers in series extending the whole length of the arch, the joints of each series being broken with the joints of adjoining series.

7. In a kiln, a fire-box extending through and beyond the kiln wall and having an arch composed of wedge bricks laid in series extending the whole length of the arch, the joints of each series being broken with the joints of adjoining series, a supplemental arch in the wall over the through arch, and one or more face arches in the mouth of the box inside the through arch.

8. In a kiln, a fire-box extending through and beyond the kiln wall and having an arch composed of wedge bricks laid in series extending the whole length of the arch, the joints of each series being broken with the joints of adjoining series, and one or more face arches in the mouth of the box inside the through arch.

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