

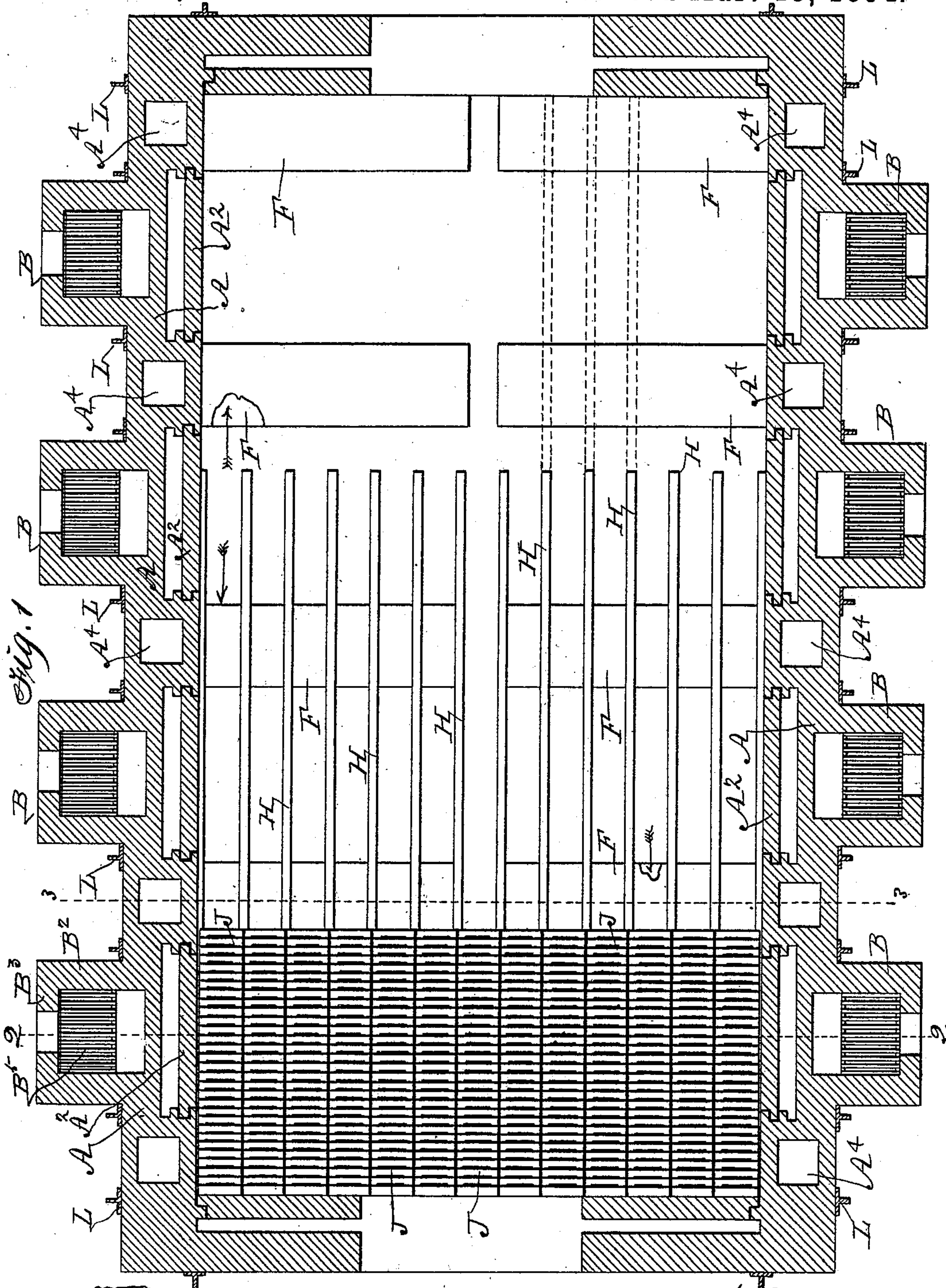
(No Model.)

3 Sheets—Sheet 1.

J. M. SHUCK & T. E. MARTIN.
BRICK KILN.

No. 516,615.

Patented Mar. 13, 1894.



Witnesses:
W. J. Tanky.
R. H. Brigg.

Inventors: John M. Shuck
(and) Thomas E. Martin,
By Thomas G. Orwig, Attorney.

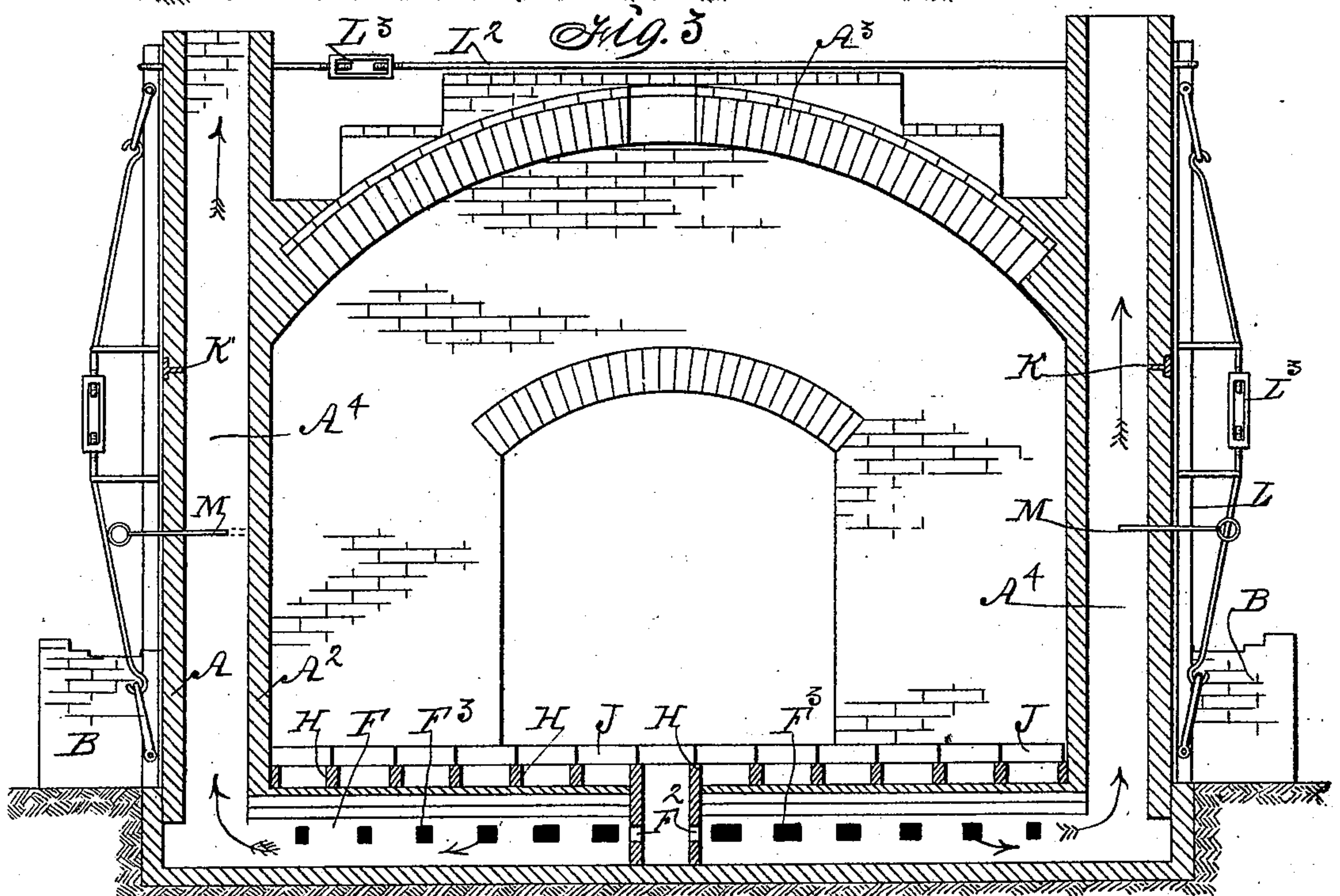
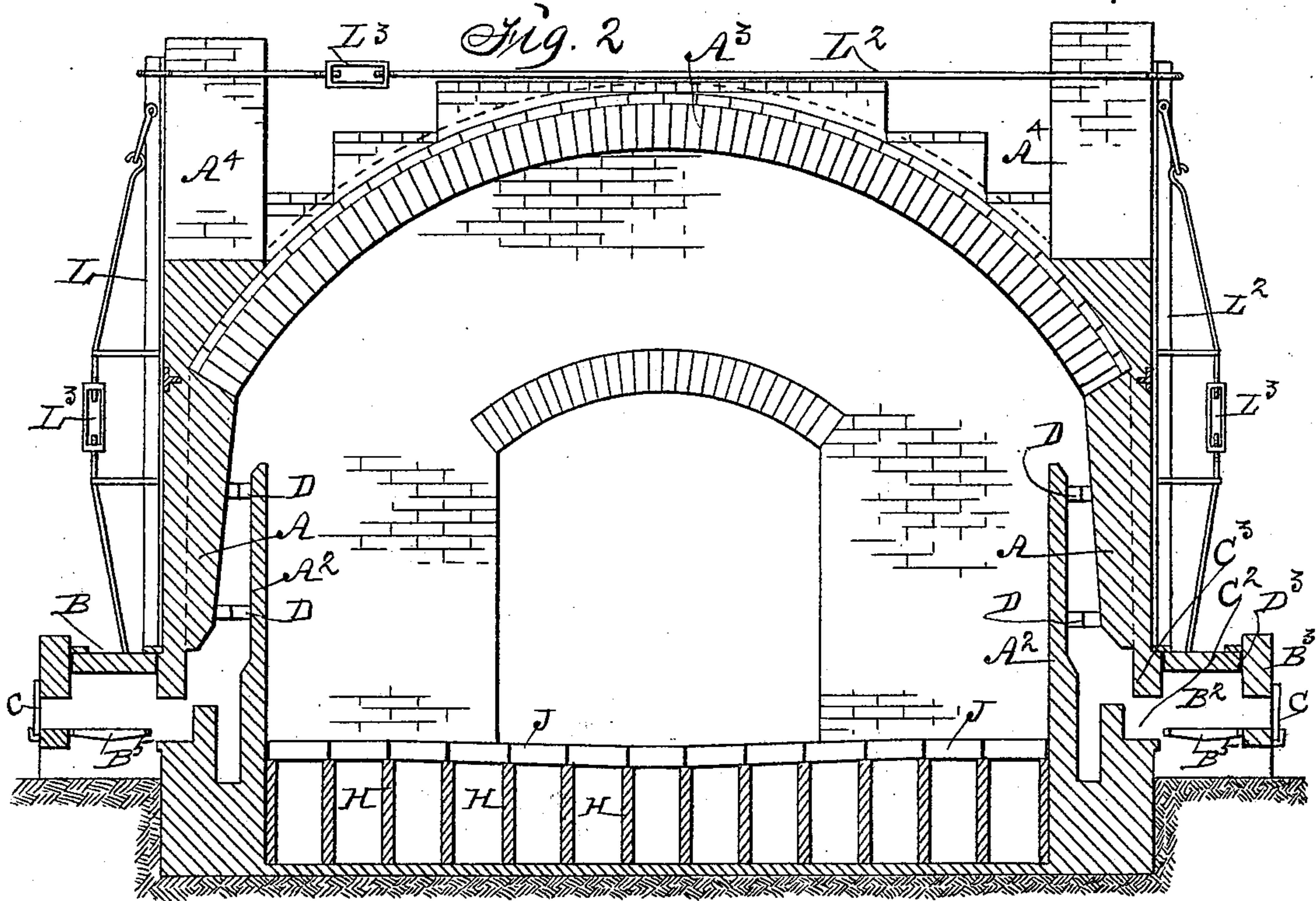
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W. J. Dankey.
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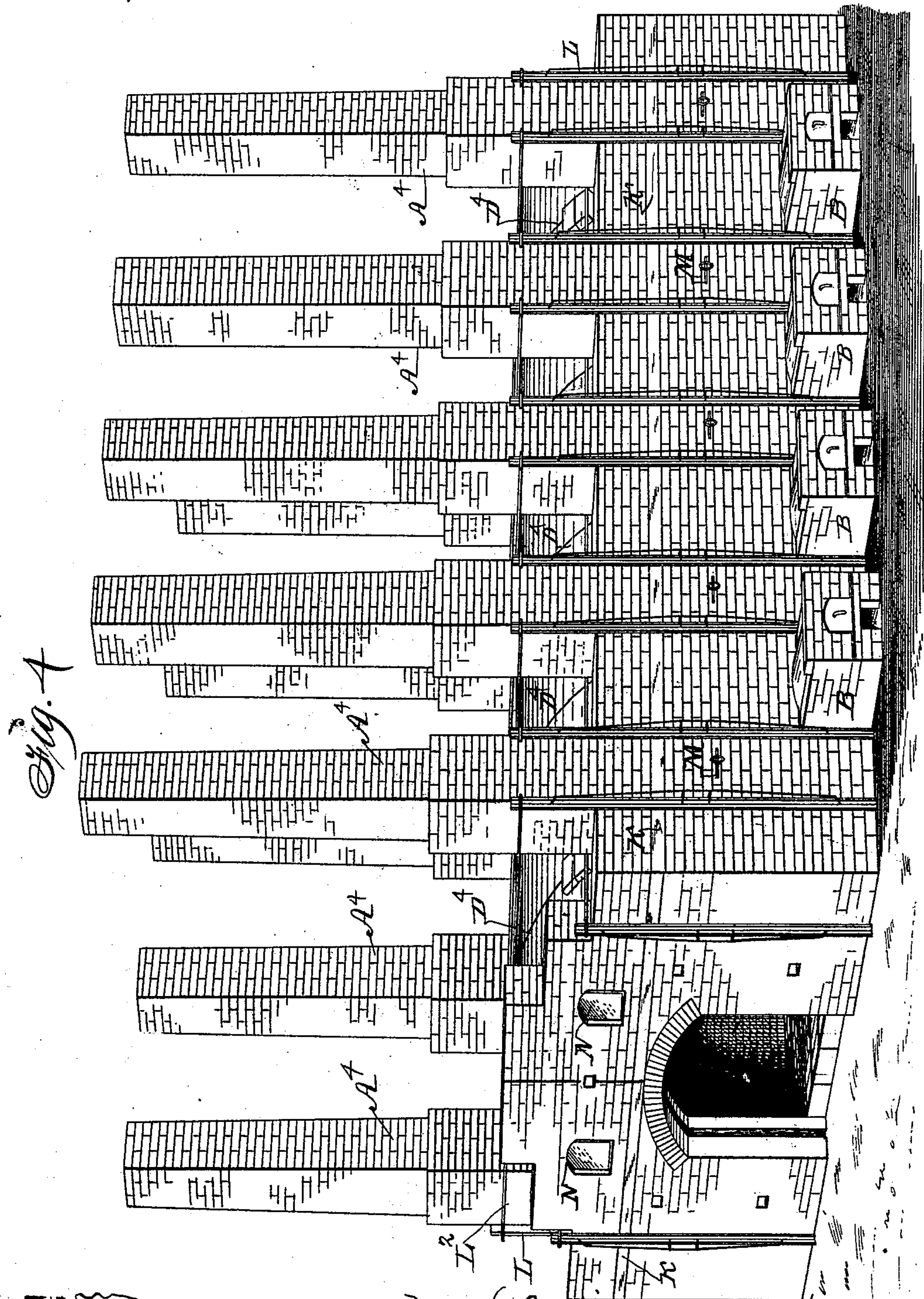
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W. J. Tanker.

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Inventors:

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UNITED STATES PATENT OFFICE.

JOHN M. SHUCK AND THOMAS E. MARTIN, OF DES MOINES, IOWA.

BRICK-KILN.

SPECIFICATION forming part of Letters Patent No. 516,615, dated March 13, 1894.

Application filed August 29, 1892. Serial No. 444,381. (No model.)

To all whom it may concern:

Be it known that we, JOHN M. SHUCK and THOMAS E. MARTIN, citizens of the United States of America, residing at Des Moines, in the county of Polk and State of Iowa, have invented certain new and useful Improvements in Brick-Kilns, of which the following is a specification.

Our object is to facilitate the burning of brick, tile, and other earthen-ware articles uniformly hard in all parts of a kiln, by directing, equalizing and distributing heat downward through the stack or stacks of articles placed in a kiln.

Our invention is a permanent structure and down draft kiln in which furnaces and flues and chimneys are formed, arranged and combined as hereinafter set forth, pointed out in our claims, and illustrated in the accompanying drawings in which—

Figure 1 is a plan view in which the positions of the furnaces and flues and chimneys relative to the walls are shown. Fig. 2 is a transverse vertical sectional view looking toward the end of the kiln from the point indicated by the dotted line 2—2 in Fig. 1 and Fig. 3 is a corresponding view through the line 3—3 in Fig. 1. Fig. 4 is a perspective view of the complete kiln.

The walls are practically double and the inner parts made of fire brick and the outer parts connected by means of an arched roof. The kiln shown is quadrangular in shape but the form and size may vary.

A represents the outside portion of the wall made of common burned brick.

A² represents the inner wall made of fire brick and adapted in material and construction to be subjected to the high degree of heat required to dry and burn green brick stacked in the kiln.

A³ is the arched roof connected with and supported by the vertical walls A and chimneys A⁴ that are integral portions of the complete wall and kiln.

B are furnaces integral with the walls and at points intermediate between the chimneys and extending outward from the parallel parts A and A² of the double portions of the complete wall immediately above the surface of the ground. These furnaces are uniform in construction and may vary in dimensions

and numbers to suit kilns of different sizes. Each furnace is composed of parallel side walls B², a front wall B³ and an arched roof B⁴ and a grate B⁵.

C is a sliding door upon a support extending under an opening in the front wall B².

C² represents a fire pot in rear of the grate adapted to retain fuel. It has a closed bottom and an opening between the front of its bottom and the rear end of the grate, through which opening ashes may be scraped into the ash pit under the grate and also serves as a means to protect the rear end of the grate from burning out by allowing air to surround the grate. These fire pots are produced by simply forming vacant spaces in the wall A that extend horizontally between the side walls B² and vertically from a plane below the grate B⁴ to a plane that is central relative to the grate and the arched roof B⁴ of the furnace. The portion C³ of the wall A thus produced over the fire pot serves as a deflector in directing the products of combustion rising to the roof of the furnace downward and immediately over the fuel in the fire pot in its passage rearward to the vacant space between the outer wall A and the inner wall A². Air admitted to the fuel on the grate through the doorway in the front wall above the grate and from the ash pit under the grate is mingled with the products of combustion rising from the fuel on the grate and aids combustion and the oxygenated gas thus produced and drawn over the fuel in the fire pot produces perfect combustion and a white heat and prevents black smoke and soot from escaping rearward from the fire pot while all particles of carbon liberated from the fuel are consumed and utilized in producing heat that ascends through the vacant spaces between the walls A and A². To aid in supporting the top portions of the inner walls A² fire bricks D are fixed in the parallel walls A and A² so as to project toward each other as required to let their free ends engage each other. These supports may vary in number and are located at different points of elevation as shown in Fig. 2.

D², shown in Fig. 1, represents crevices that extend transversely through the inner wall A² from its lower portion to its top. These crevices are produced by laying the fire brick in the wall in such a manner that in their nor-

mal condition they will not come together but leave an open vacant space between their parallel surfaces that will allow the brick and wall to expand when heated without crack-
 5 ing and producing irregular fissures. Corresponding crevices D^3 are produced in the same manner between the side walls and roof of the furnaces B and their front and rear walls as shown in Fig. 2, and also through the
 10 side walls and arched roof of the kiln as indicated by dotted lines in Fig. 2 and solid lines D^4 on the outside of the arched roof A^3 as shown in Fig. 4. To prevent the escape of heat through these crevices D^3 and D^4 that
 15 extend from the interior to the exterior of the walls brick are placed over them to close them without binding the parts of the walls on opposite sides of the crevices together and
 20 and so as not to interfere with the contraction and expansion to which the walls are subjected in burning brick within the kiln.

F are flues in the bottom of the kiln, preferably below the surface of the ground upon which the kiln is located, extended inward
 25 from the chimneys A^4 with which they communicate. They have openings F^2 at their inner ends and a plurality of openings F^3 in their sides, as shown in Fig. 3. These openings F^3 vary in size and are graduated
 30 from the center of the kiln toward the sides in such a manner that the largest openings are most distant from the chimneys but will, on account of their size, cause as strong a
 35 draft upon the products of combustion coming from the furnaces as do the smaller openings nearer the chimneys and thus aid in the uniform distribution of heat throughout the
 40 kiln as required to burn all the brick within the kiln uniformly hard. Flues extend at right angles to and over the flues F. These flues are
 45 produced by permanent partitions, H, made of fire brick and adapted to serve as supports for a permanent floor J consisting of fire brick placed on top of the partitions, as shown in
 50 Figs. 1 and 3, in such a manner as to allow green brick to be stacked thereon. Interstices between the bricks that compose the floor J allow the products of combustion that circulate
 55 downward through the stacks of brick placed thereon to pass down through the floor into the flues H and from thence into the flues F through the openings F^2 and F^3 and then into the chimneys. The floor J is preferably
 60 inclined slightly from the side walls toward the center, as shown in Fig. 2, in such a manner that when a stack of green brick is placed thereon it will not spread outward but the tendency of the pressure will be inward toward the center as required to keep the stack
 65 from collapsing or any portions thereof pressing against the inner walls A^2 of the kiln.

K are T-irons, partly embedded in the outer portion of the wall A, when the wall is built, to aid in bracing and strengthening the complete structure.

To further reinforce the walls, as required

to prevent the kiln from spreading and breaking when subjected to intense heat, trusses L are placed in vertical positions against the
 70 outsides of the walls and connected at their top ends, by means of rods L^2 , in such a manner that they can be adjusted and drawn firmly against the walls by means of turn
 75 buckles L^3 . Their lower ends extend in the ground. Each end of the kiln has a passage way through which a person can pass in and
 80 out of the kiln as required to stack green brick therein and remove them therefrom, when burned, while the kiln remains permanent and intact.

In each chimney a sliding damper N is placed, as shown in Fig. 3, by means of which the drafts of the furnaces aid in the complete
 85 kiln, in connection with the doors in the front walls of the furnaces, can be readily regulated as required to maintain a uniform heat within the kiln.

Openings N in the end walls are provided for ventilating the kiln when persons are
 90 working within the kiln and to facilitate cooling the brick when burned.

In the practical operation of our invention green brick, or other earthenware articles, are stacked upon the floor J in such a manner
 95 that there will be interstices in every direction through the stack to allow the circulation of air and heat throughout the entire stack so that each particular brick or article will be subjected to heat when fires are maintained in the furnaces.

When the kiln is filled the open passage ways at the ends are closed by means of temporary walls, and fires are started and maintained in all the furnaces. The line of draft
 105 of each furnace will be first upward over the inner wall A^2 and into the top portion of the kiln and then downwardly through the interstices of the stack of articles that are to be dried and burned and from thence through
 110 the floor J and into the flues that extend longitudinally under the floor and from said flues into the flues thereunder that extend at right angles thereto and have direct communication with the chimneys.

The chimneys A^4 being located at equal distances apart and midway between the furnaces B and each chimney connected with the longitudinal central flue, by means of the horizontal flues F and openings F^2 in their ends,
 115 so that the heat descending through the kiln will be equally divided on the opposite sides of the continuous longitudinal central flue by the draft created by means of the said central flue, the horizontal flues F and the chimneys A^4 . To subdivide the two equal quantities of heat thus produced and distribute
 120 them uniformly on the opposite sides of the said central flue, the series of parallel walls H are extended parallel with the central longitudinal flue and over the horizontal flues F for the purpose of supporting floor brick J
 125 and also for the purpose of producing con-

tinuous flues extending parallel with the central or dividing flue. To establish communication with the horizontal transverse flues F the graduated series of openings F³ are made in each side of each flue F and the largest openings nearest the central flue that extends at right angles to the inner ends of the flues F. A uniform draft is thus produced throughout the entire kiln to distribute the descending heat equally throughout the stack of brick placed in the kiln, as required to dry and burn all the brick uniformly hard.

It is obvious that in this circuitous pathway of the products of combustion rising from all of the furnaces and united underneath the roof of the kiln the heat is diffused throughout the stack of articles to be dried and burned, in the downward draft thereof created by the relative positions of the furnaces outside of the parallel walls A and A², and the longitudinal and communicating flues under the permanent floor of the kiln and the chimneys connected therewith at their bottoms, and that the main portion of the heat generated in the furnaces will be absorbed by the articles to be burned direct, as it comes from the furnaces, and that the minor portion of heat absorbed by the interior of the walls and roof and floor will be stored therein during the operation to aid in maintaining a high degree of uniform heat in and around the stack of brick or other articles that are to be burned uniformly hard.

To remove the burned brick the temporary walls closing the passage ways in the ends of the kiln are taken away and all the other parts retained in permanent position and ready for another stack of green articles to be dried and burned.

We claim as our invention—

1. In a brick kiln having vertical flues to discharge heat into the top of a kiln, a horizontal flue in the bottom of the kiln having closed ends, a series of parallel horizontal flues extending at right angles to said central flue and communicating therewith at their inner ends and provided with series of graduated openings the largest of said openings nearest the center of the kiln, walls extending between and abutting with the said parallel flues and close enough to each other to support floor brick and the spaces between them brought into communication with the said parallel flues by means of said graduated openings, and chimneys at the outer ends of the parallel flues, all arranged and combined to oper-

ate in the manner set forth for the purposes stated.

2. In a brick kiln provided with furnaces and flues adapted to discharge heat into the top of the kiln, two series of horizontal flues in the bottom of the kiln extending from the center in opposite directions to the walls of the kiln, chimneys at the outer ends of said flues, parallel walls extending between and at right angles to the flues and close enough to support floor brick on their tops and the spaces between them brought into communication with the flues by means of graduated openings in the flues and said openings largest near the center of the kiln, all arranged and combined to operate in the manner set forth for the purposes stated.

3. In a down draft brick kiln of rectangular form adapted to admit heat at the top portions of two parallel walls, a flue midway between said walls composed of two parallel walls adapted to support floor brick on their tops and closed at their ends, horizontal flues closed on their tops and extended at right angles in opposite directions from the sides of said central flue and provided with openings in their ends to communicate with said central flue and openings in their sides graduated in size and the largest openings nearest the central flue, and chimneys at the outer open ends of said transverse horizontal flues, to operate in the manner set forth for the purposes stated.

4. In a down draft brick kiln, parallel walls having furnaces on their outsides and flues connected therewith to discharge the products of combustion into the top portion of the kiln, chimneys midway between the furnaces, flues in the bottom extending inward from the chimneys and provided with openings in their ends and also with graduated series of openings in their sides, the largest opening being nearest their inner ends, and their tops closed, a series of parallel walls adapted to support floor brick extended at right angles to said flues and the spaces between said walls adapted to serve as flues communicating with the said horizontal flues having openings in their ends and sides, all arranged and combined to operate in the manner set forth for the purposes stated.

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