

(No Model.)

3 Sheets—Sheet 1.

J. GAFFNEY.  
BRICK KILN.

No. 510,967.

Patented Dec. 19, 1893.

Fig. 1.

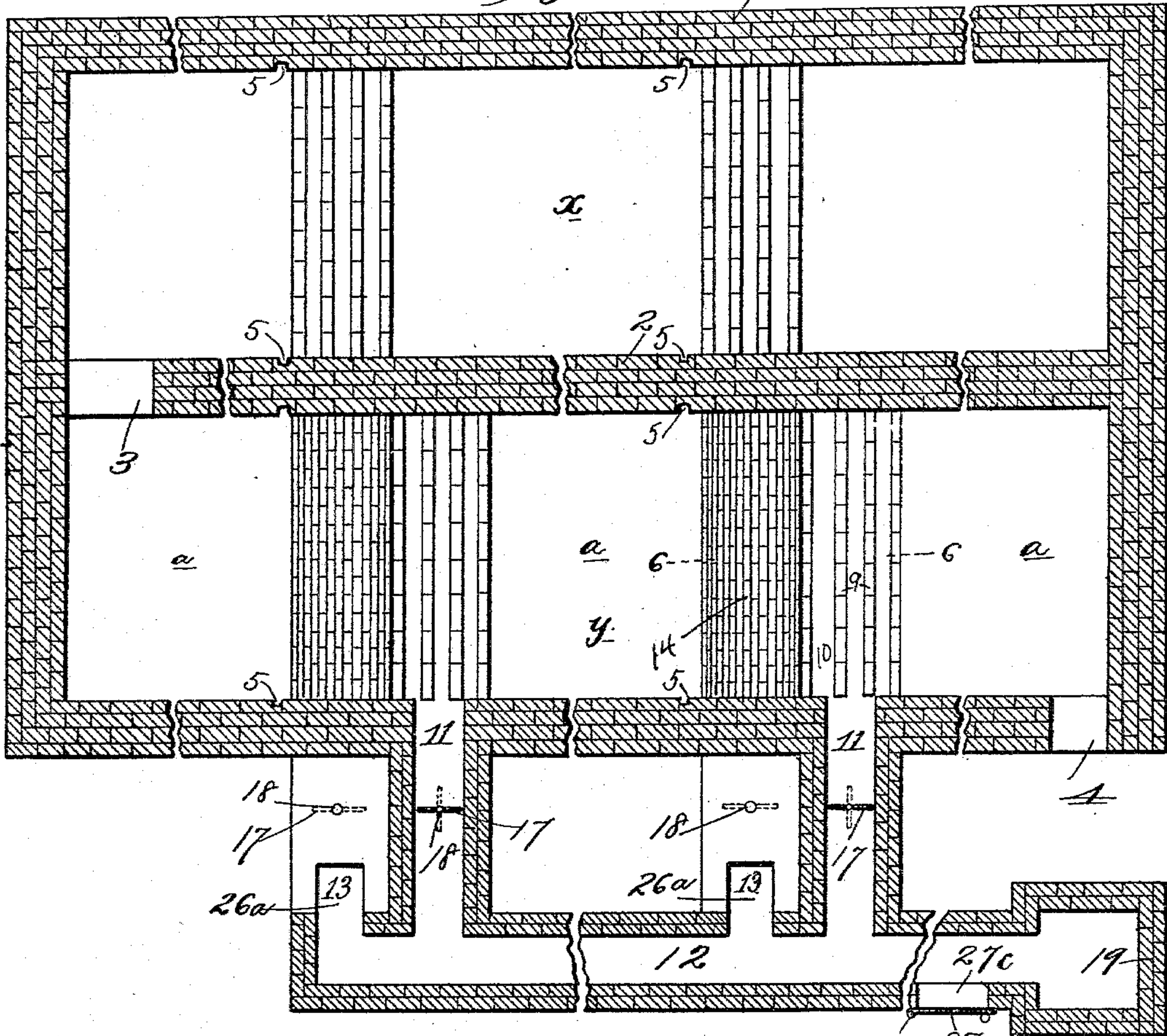
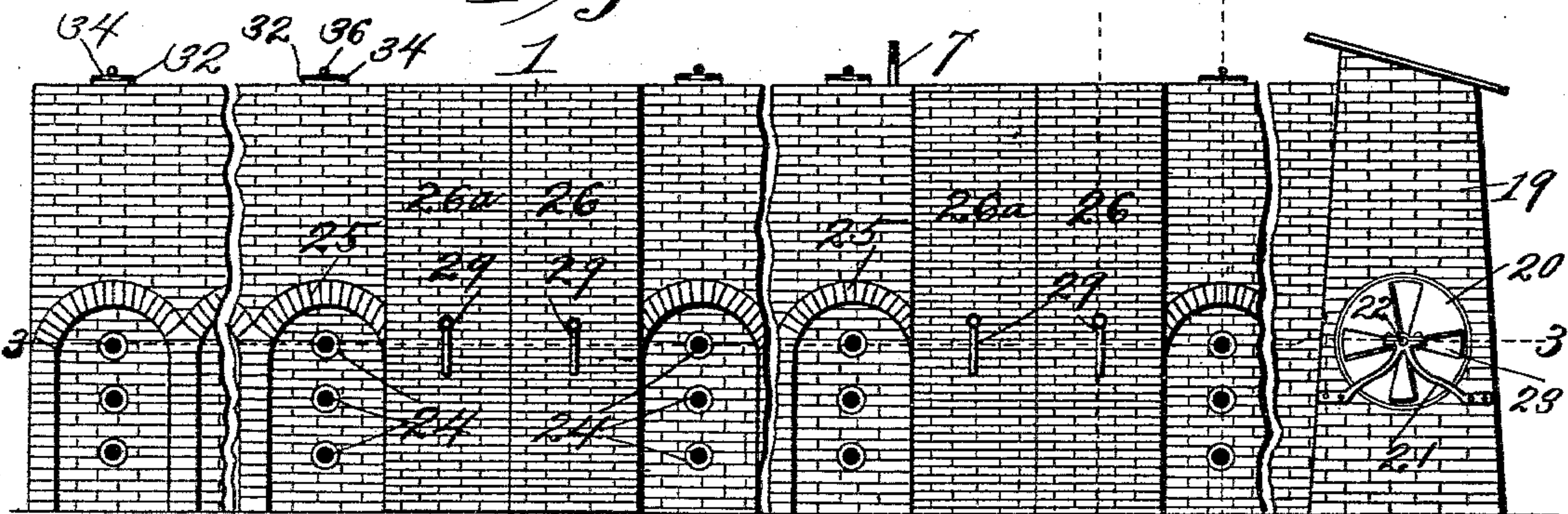


Fig. 2.



Witnesses  
W. B. Smith  
G. P. Phelps

Inventor:  
John Gaffney.

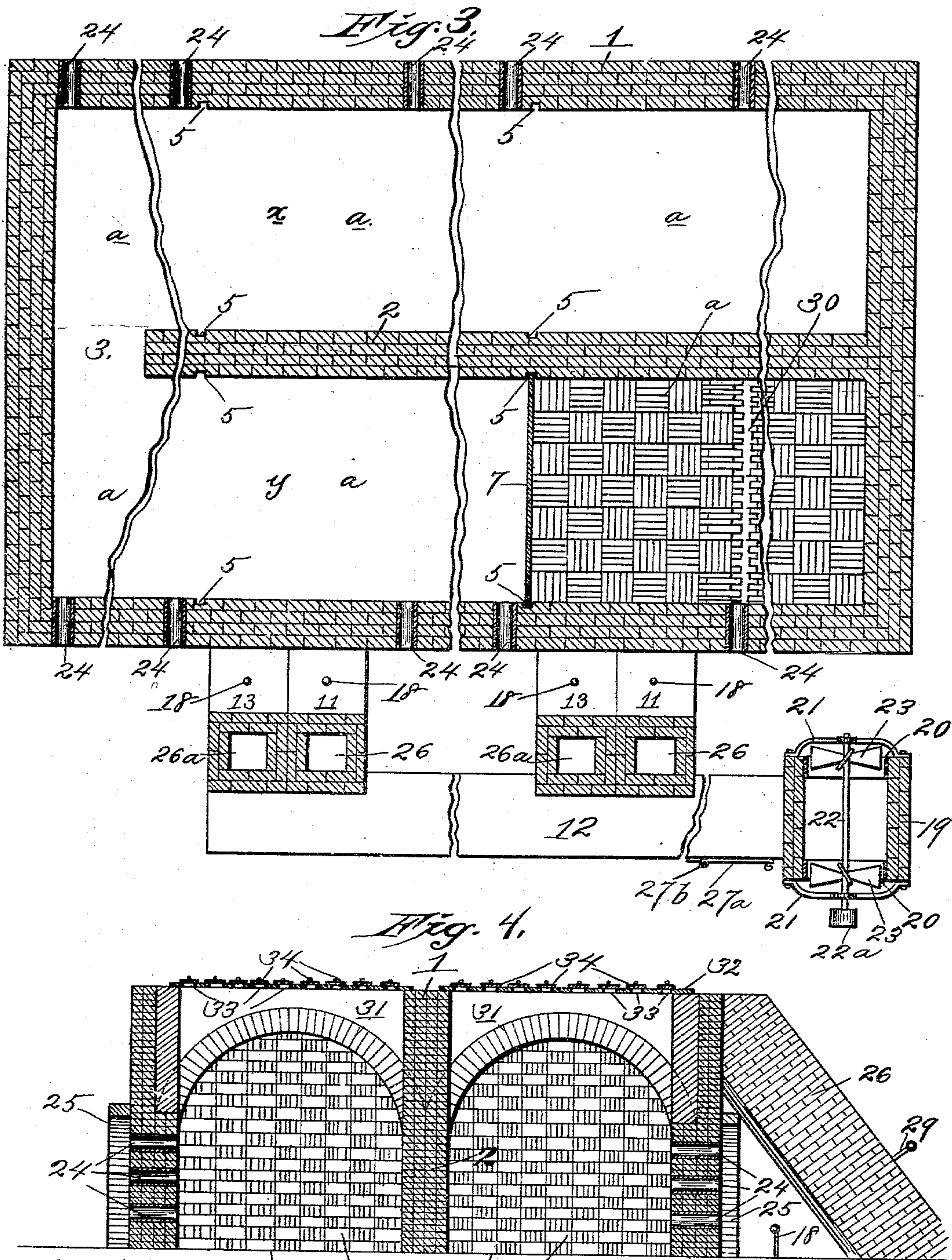
By Hydon & Hydon  
Att'ys



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Witnesses: x a

M. P. Smith.

G. P. Thorpe.

Inventor: John Gaffney.

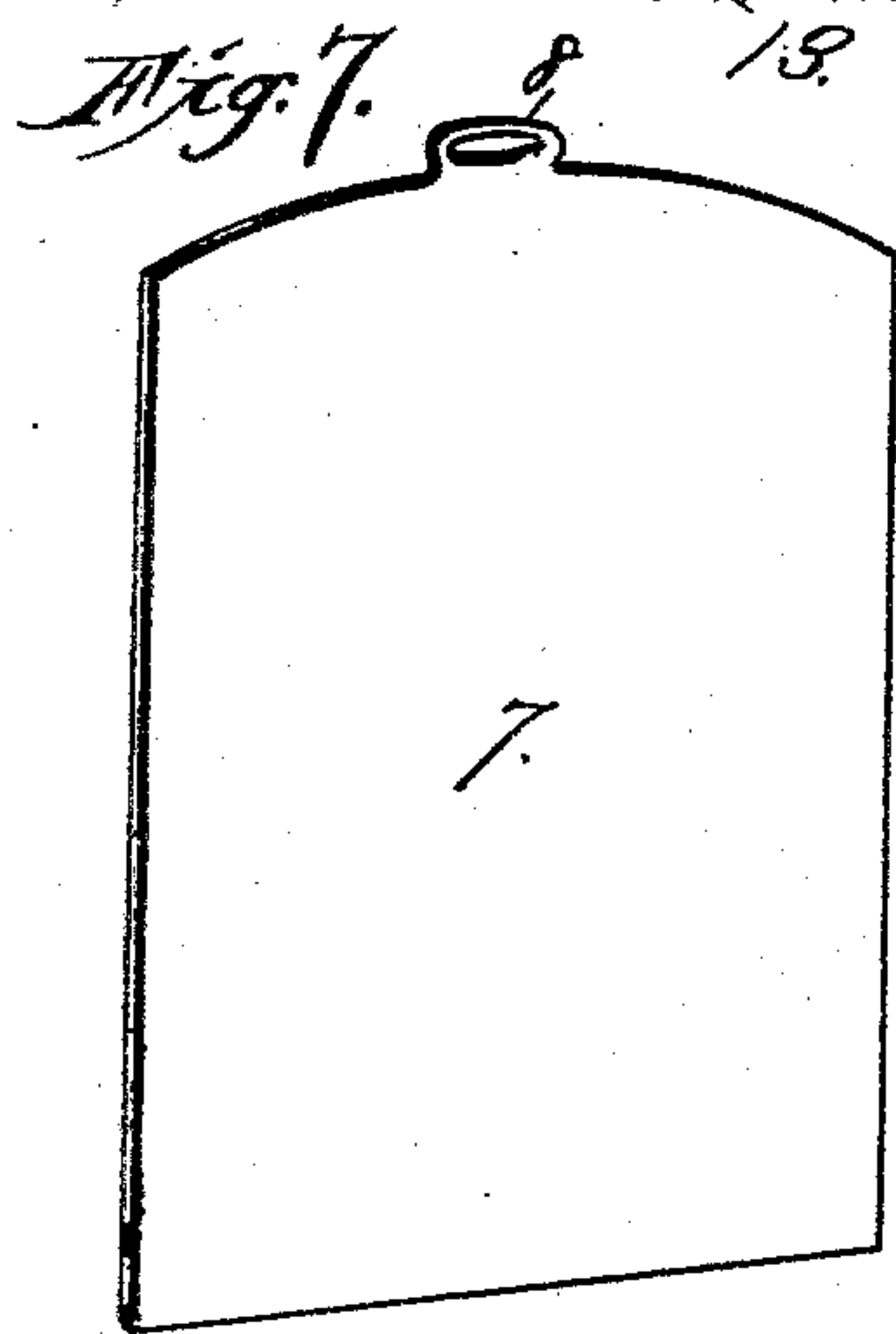
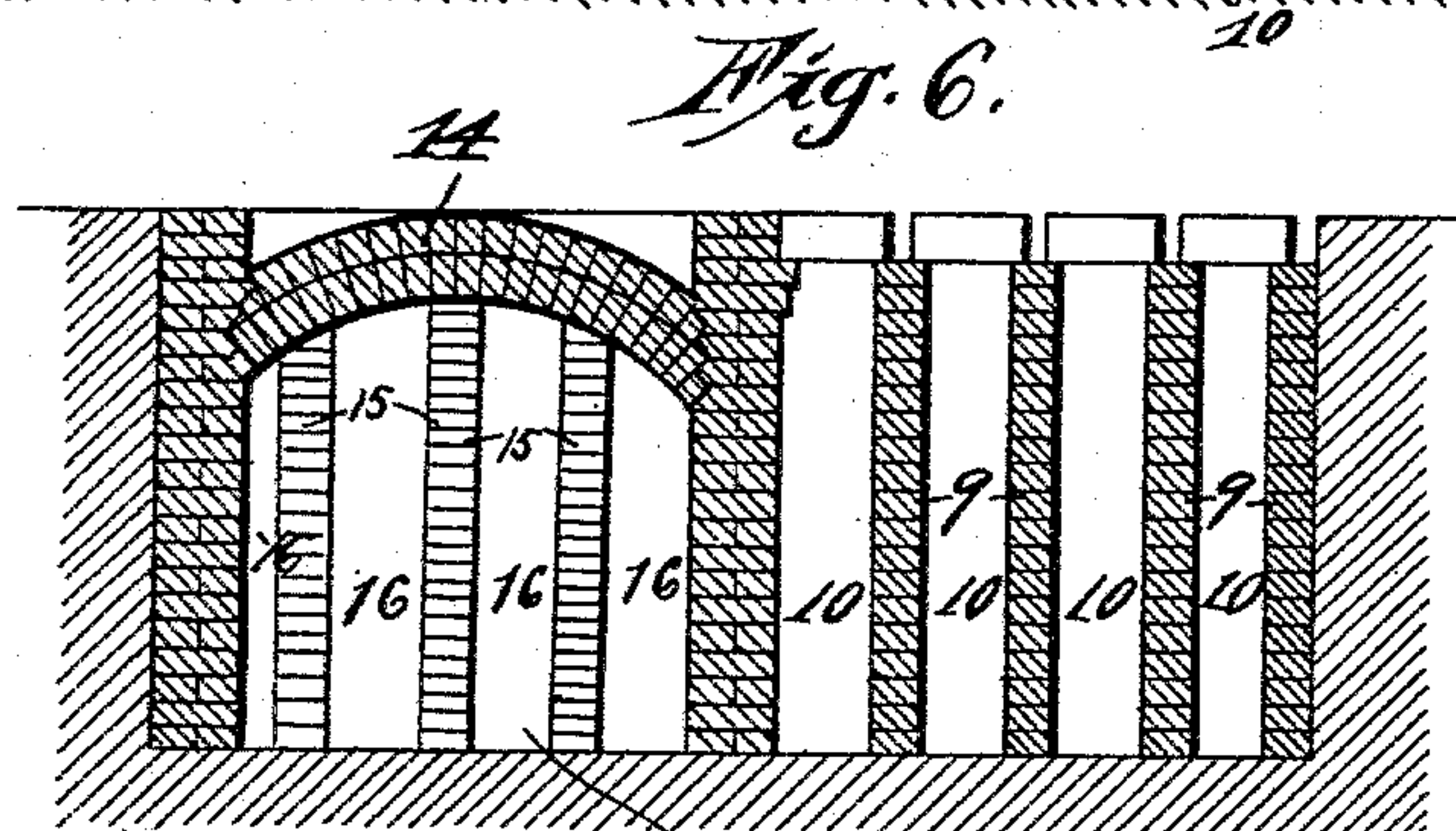
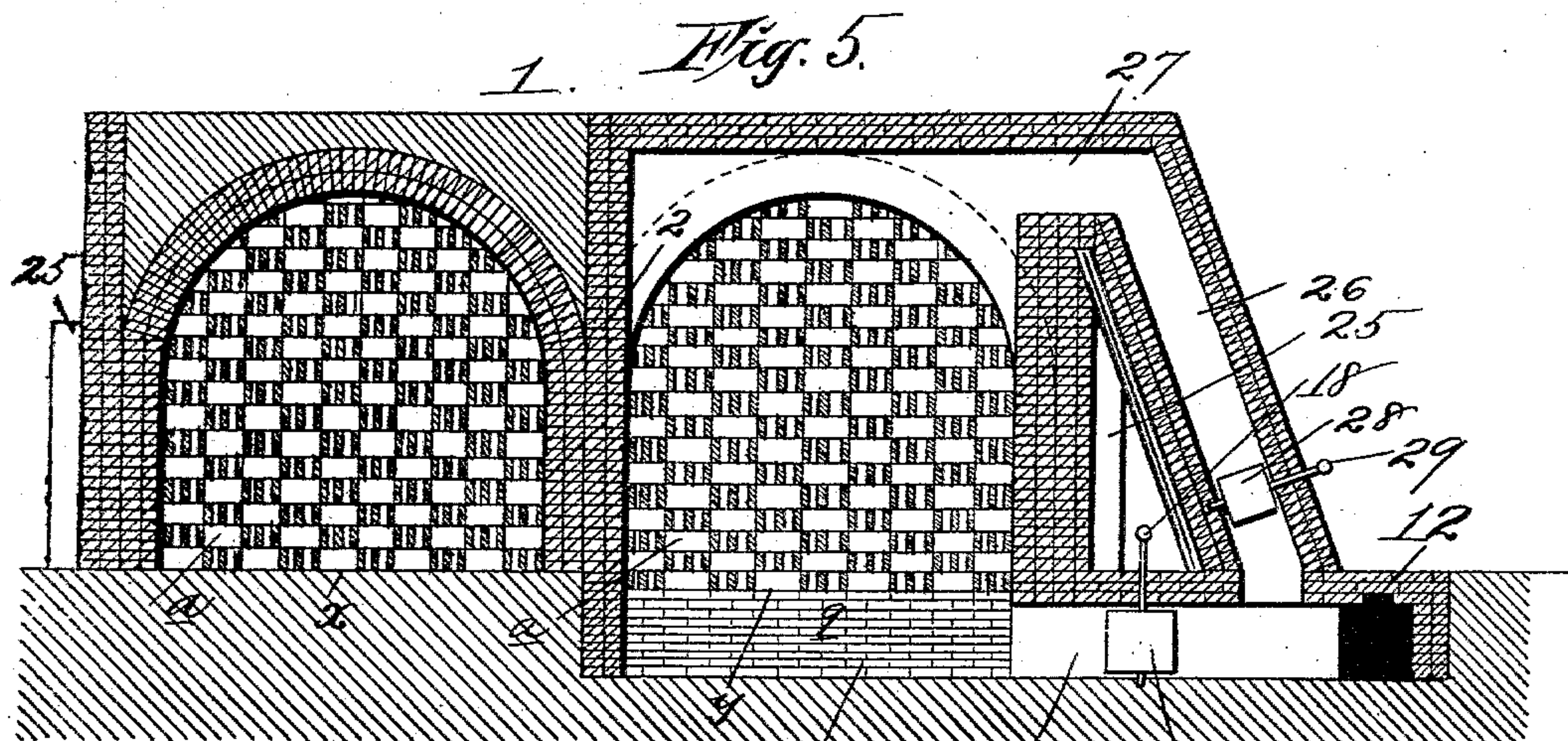
By Higdon & Higdon Att'ys



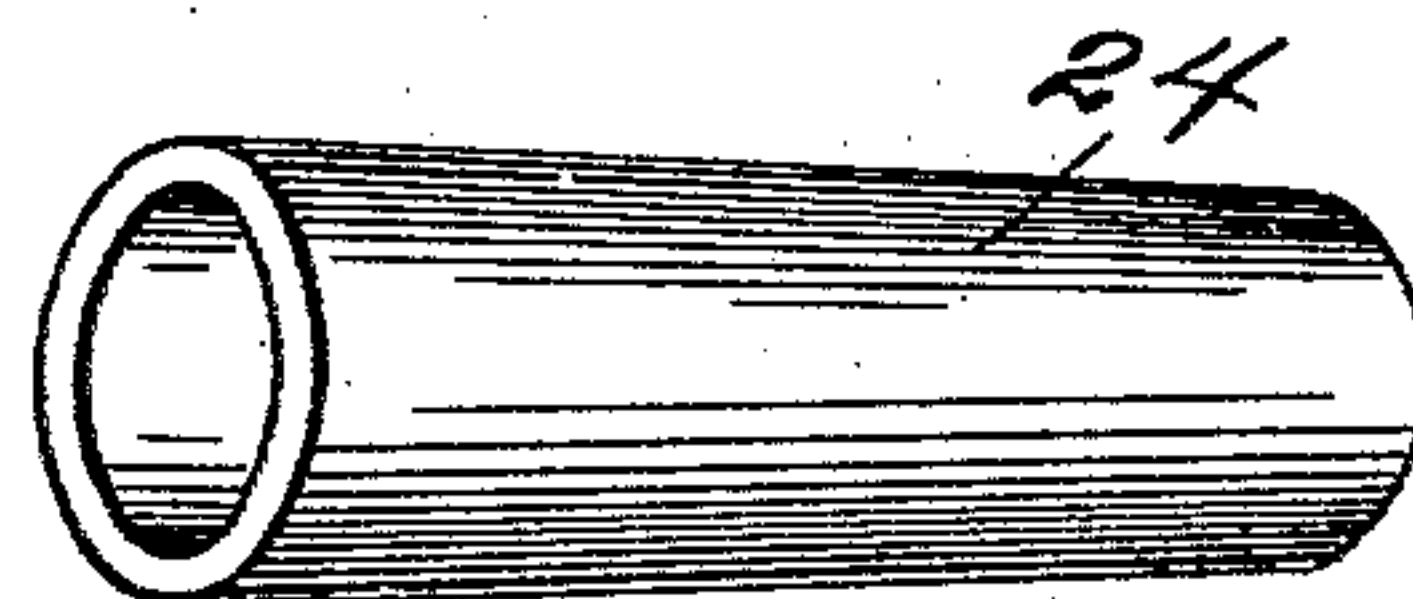
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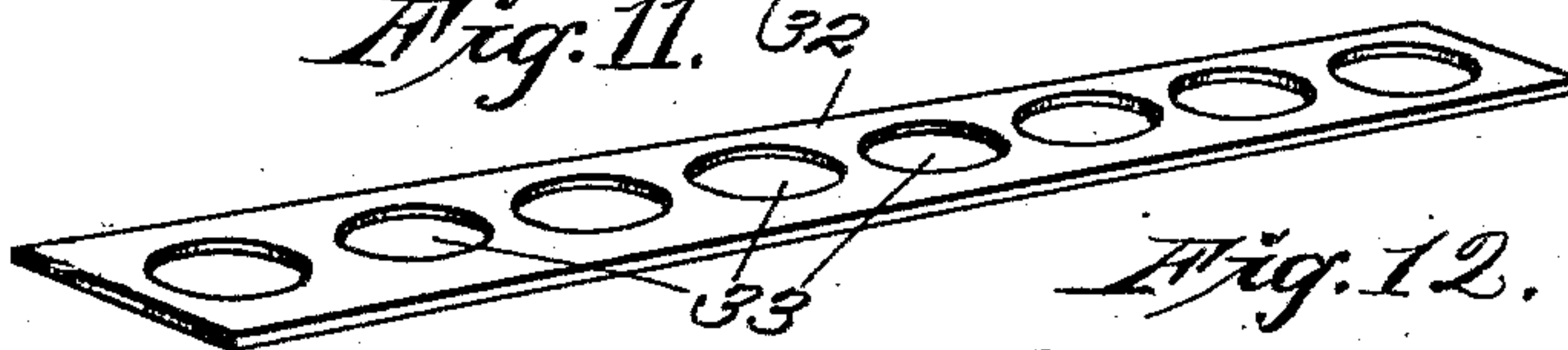
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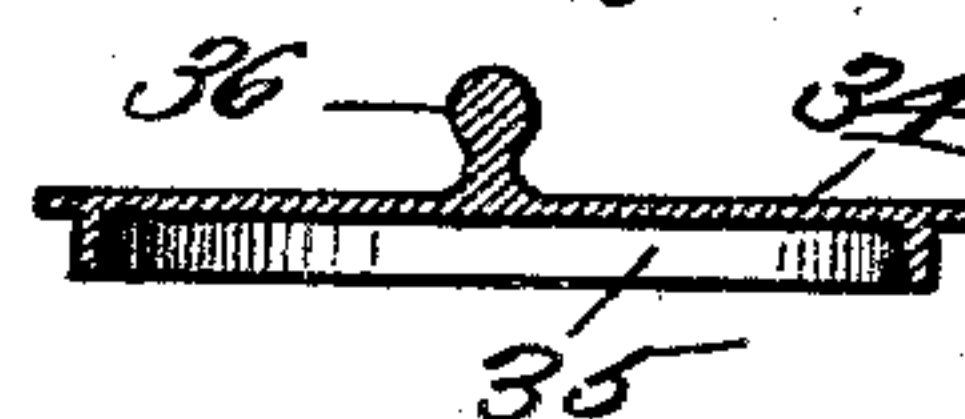
*Fig. 8.*



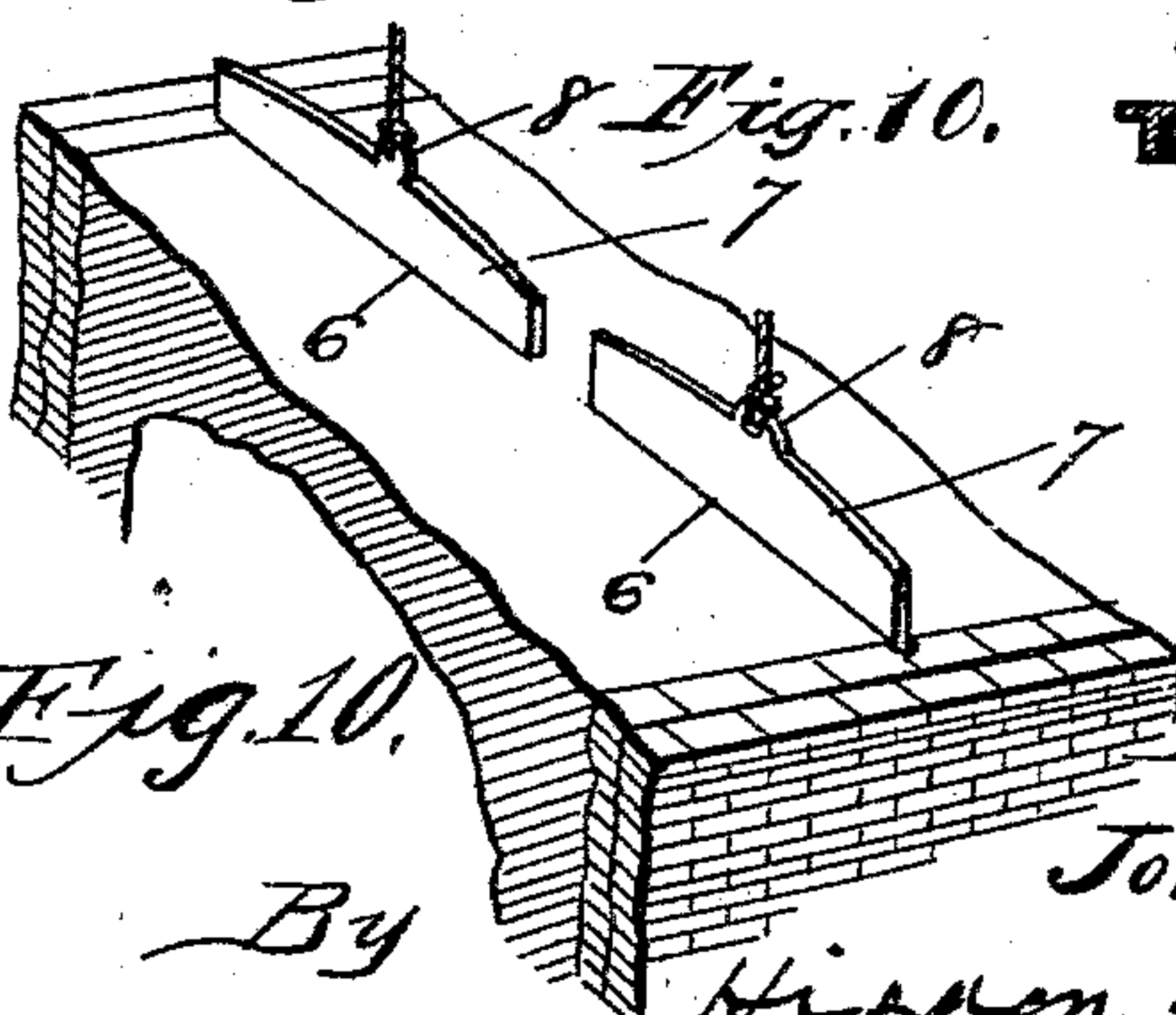
*Fig. 11.*



*Fig. 12.*



*Fig. 10.*



Witnesses:

M. P. Smith.

*[Signature]*

*Fig. 10.*

By

Inventor:

John Gaffney.

Hipson & Hipson

Attys.



# UNITED STATES PATENT OFFICE.

JOHN GAFFNEY, OF ATCHISON, KANSAS.

## BRICK-KILN.

SPECIFICATION forming part of Letters Patent No. 510,967, dated December 19, 1893.

Application filed April 14, 1893. Serial No. 470 279. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN GAFFNEY, of Atchison, Atchison county, Kansas, have invented certain new and useful Improvements in Brick-Kilns, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to improvements in the manufacture of brick, clay-ware, cement, lime, &c., and has for its object the more perfect utilization of the heat, in drying, water-smoking and burning the brick, clay ware and such like articles.

With this object in view the invention consists in certain peculiar and novel features of construction and arrangement of parts, as will be hereinafter described and pointed out in the claims.

In order that my invention may be fully understood, I will proceed to describe it with reference to the accompanying drawings, in which—

Figure 1, is a horizontal sectional view of a brick-kiln, constructed in accordance with my invention and taken on the ground line of the body of the kiln, and through the main or stack-flue. Fig. 2, is a side elevation of my improved brick-kiln. Fig. 3, is a horizontal sectional view, taken on the line 3—3 of Fig. 2. Fig. 4, is a vertical transverse section, taken on the line 4—4 of Fig. 2. Fig. 5, is a vertical transverse sectional view, taken on the line 5—5 of Fig. 2. Fig. 6, is a vertical sectional view, taken on the line 6—6 of Fig. 1, and showing the compartment flues enlarged. Fig. 7, is a detail perspective view of one of the removable partitions. Fig. 8, is a detail perspective view of one of the air-inlet tubes. Fig. 9, is a detail perspective view of one of the flue-dampers. Fig. 10, is a perspective view of the upper portion of the kiln broken away. Fig. 11, is a detail perspective view of the apertured plates, through which coal is fed into the furnace, and Fig. 12, is a detail sectional view of one of the removable plugs, adapted to close the apertures of said plate.

In order that wet brick, clayware, &c., may be dried, water-smoked and burned efficiently and in a short time, I provide a continuous kiln, and the process consists in first

placing the wet-brick or clay ware in the kiln, and subjecting the same to a suction blast of air which effectually dries them; the dried bricks are then hacked or built up in the usual "checker-work" manner, and the kiln is divided into compartments by removable partitions each compartment containing a quantity of brick; each of these compartments is also provided with inlet-openings for air and draft flues controlled by dampers; said draft flues communicating with a main-draft tunnel having a stack provided with suction fans. When prepared for burning, the dampers of the flues of all except the first compartment are closed; the fire is started in the first compartment, and the suction draft supports perfect combustion therein. Coal is fed to heat the brick to a high degree of temperature and the air-inlet openings and the furnace opening and the flues of said compartment are closed. The partition interposed between the first and second compartments is now removed, and the dampers operated to open the flues of the second compartment; thus utilizing the heat of the brick in the first compartment to prepare the brick in the second compartment for the final burning. After the brick in the second compartment become heated sufficiently, coal is introduced to heat the brick to a high degree of temperature, and the partition is again interposed between the first and second compartments, so that the burned brick in the first compartment will rapidly cool that they may be removed from the kiln. After the brick in the second compartment are heated to the required degree, the air-inlet openings and the flues are closed. The partition interposed between the second and third compartments is now removed, and the process described with relation to the second compartment gone through. This operation is repeated until the brick in all the compartments are burned. It will thus be seen that a continuous use of heat is obtained, that is, the heat from one compartment of brick is utilized to heat the next succeeding compartment, until all the brick have been burned.

In the drawings, 1 designates a continuous brick-kiln of oblong rectangular form; said kiln being divided into two compartments  $x$  and  $y$ , by a longitudinal and vertical parti-



tion wall 2. These compartments are adapted to be converted into a number of sub-compartments as will be hereinafter described, where the brick are burned. At the rear end of the kiln, the partition is formed with a passage 3; said passage connecting the two compartments. At the front end of one of these compartments, an opening 4, is formed through the side wall of the kiln; the object of this opening will be hereinafter explained. Formed at suitable intervals apart throughout the entire length of the kiln and in the inner side walls of each compartment, are the vertical and oppositely disposed grooves 5; these grooves 5 communicating at their upper ends with the transverse slots 6, formed through the roof of the kiln. A number of partitions 7 of suitable material divide the compartments into a number of sub-compartments *a*, and are of suitable width, and have their side margins engaging the oppositely disposed grooves, and have their lower ends resting upon the bottom of the kiln and their upper ends engaging the transverse slots 6 of the roof. These partitions 7, are also formed with an opening 8 in their upper ends, by which the said partitions may be engaged when about to be removed from the kiln. A flue is formed in the bottom of each sub-compartment *a* of the compartment *y*, of the kiln, and extends transversely thereof, and a number of vertical partitions 9, divide each of said flues, into a number of said sub-flues 10; all of said sub-flues 10, communicating at their outer ends with a common flue 11, there being one flue 11 for each sub-compartment *a*. A similar flue 13 Fig. 6 extends transversely of each sub-compartment *a*, of compartment *y*, but is arched over at 14, so as not to communicate therewith, and each of said flues communicates at its inner end with a flue extending transversely of and formed in the sub-compartment *a* of the compartment *x*. These flues are also formed with vertical walls 15, dividing them into sub-flues 16 which communicate with the flues 13. The outer ends of the flues 11 and 13, communicate with a main flue 12, which extends the full length of the kiln. A damper is provided to control the passage of air, as hereinafter referred to, through each flue 11 and 13, and consists of a pivot-rod 18, extending vertically through said flue, and a damper-plate 17, mounted upon said rod; by operating this rod in the proper direction, the damper opens or closes the flue to the passage of air there through. One end of the main-flue or air-duct is closed, and the opposite end communicates with a stack 19; said stack, being formed with the oppositely disposed openings 20 Fig. 3. A bracket 21, is secured to the stack and adjacent to each opening, and extending transversely of the stack, and centrally of the openings 20 is a shaft 22 the opposite ends of said shaft resting in bearings formed in said brackets 21. A suction fan 23 is mounted upon the shaft near each end, and a belt-pul-

ley 22<sup>a</sup> secured upon the outer end thereof, is adapted to be connected by a belt to a suitable motive power. (Not shown.) A number of openings, are formed in the side wall of the kiln, opposite each compartment *a*, and tubular tiles or pipes 24, are fitted therein, to form inlet air passages for each sub-compartment.

It will be understood from the foregoing description, that the dampers controlling the flues 11 and 13 being opened, the operation of the suction fans will cause a down-draft, that is, the air entering through the tubular tiles 24, will pass down into the sub-flues 10 and 16, thence into the flues 11 and 13 respectively, and into the main-flue 12, thence to the stack, whence it will be discharged by the revolving fans. In order to produce also, an "up-draft" through the kiln, when desired, I provide the inclined flues 26 and 26<sup>a</sup>, communicating at their upper ends through flues 27 with the interior of the sub-compartments *a*; the flues 26<sup>a</sup> communicating with the upper portion of the sub-compartments, with which the sub-flues 16, communicate, and the flue 24, communicating with the upper portion of the sub-compartments with which the sub-flues 10 communicate; the lower ends of flues 26 and 26<sup>a</sup>, communicate respectively, with the flues 11 and 13, adjacent to their point of juncture with the main-flue or air-duct 12. Dampers or valves 28, provided with handle 29, control the passage of air through the flues 26 and 26<sup>a</sup>, and a door 27<sup>a</sup>, Fig. 3, is hinged at 27<sup>b</sup>, to the main flue 12 adjacent to the fan-stack 19, and is adapted to close the opening 27<sup>c</sup> Fig. 1 formed through said flue. When it is desired to cause only a moderate suction of air through the kiln, the door 27<sup>a</sup>, is opened, and allows air to pass through the opening 27<sup>c</sup> to the fan-stack, from which it is discharged. A vertical and transverse slot 31, communicates through the roof of the kiln, with each sub-compartment *a*, and fitted over each of said slots, is a plate 32; each plate being formed with a number of vertical apertures 33. Removable caps or plugs 34, are formed with a handle 36, and a depending annular flange 35, of diameter to fit within and close said apertures 33.

In operation, the wet-brick are first spread out in the kiln, the dampers opened, and the suction-fans caused to revolve; this causes a suction blast to envelop and dry said brick, which are then "stacked" or "hacked" up in the usual "checker-work" manner, in the sub-compartments *a*. The vertical partitions 9 and 15 form a rest so that the bricks may be stacked thereon, as shown in Fig. 6. The draft flues of all but the first compartment are now closed, and a fire is built across the entire first sub-compartment *a*, the fuel being introduced through the opening 4. If desired, the fire may only be built a portion of the way across the kiln, that being of course according to the manner it is desired to burn



the brick. The dried brick, when stacked in the first compartment, are arranged of course to form a transverse passage into which the fuel, introduced through the opening 4, is placed. After the brick are sufficiently heated, the damper of flue 11 is closed, and the air-inlet openings 24 are closed, and also the fire opening 4. The caps or plugs 34 are now removed, and fine coal is dropped through the apertures 33 and slots 31 and into the vertical passage 30, formed through the stacked brick. This coal burns and forms a wall of fire in said passage, and heats the brick to a high degree. Before the brick are subjected to this intense heat, and while subject only to the heat of the original fire, by closing one or more of the air-inlet openings 24 the heat upon the brick may be regulated, so as not, by exposing them to a sudden heat, to inflate or crack them, and also by regulating the supply of air, perfect combustion is assured, and accumulation of surplus gases prevented; these gases being the principal actor, in causing non-combustion or waste of fuel. The partition 7, interposed between the first and second sub-compartments, is now removed, and the dampers of the second sub-compartment are opened. The suction draft carries the heat through the unburned but dried brick of the second sub-compartment, water-smokes the same, and prepares them for the final burning, by means of introducing fine coal therein as described. This operation is continued throughout the length of the kiln, and then passing through the opening 3 the bricks in the second compartment are subjected to the same process until all the bricks of the kiln have been burned. If desired, an opening similar to 3, may be made in the front end of the wall 2, and the first compartment being again supplied with brick the burning may continue as before.

It will be observed that by having the pull or suction from the fan direct upon the fire, it forms a partial vacuum where the fire is; and by admitting the air at a point beyond the fire but where the brick are already at a high degree of temperature, any accumulation of gases will be consumed. It will also be observed that by having a number of air-inlets,

the air current can be increased so gradually, that practically no chemical water forms, as is the result when intense heat impinges suddenly upon the brick.

From this description, it will be seen, that there is no waste of fuel or heat, and that I obtain a continuous use of heat, that is, the heat from one sub-compartment is utilized to heat the next, and so successively, until all of the brick have been burned.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A brick-kiln, partitions dividing said kiln into a number of said sub-compartments, a stack having fans, a flue leading to said stack, a valve controlled flue leading from the upper portion of each sub-compartment to said stack-flue, and a valve controlled flue leading from the stack-flue to the lower portion of each sub-compartment, and a number of open sub-flues or channels in each sub-compartment communicating with the flues leading to the lower portion of the sub-compartment, substantially as set forth.

2. In a brick-kiln, the combination with a stack having fans, and a flue leading to said stack, and a door-closing an opening in said flue, of a compartment, a valve controlled top or up-draft flue, and a valve-controlled bottom or down-draft flue connecting the compartment with the stack flue, and openings communicating with the said compartment for the ingress of air, any number of said openings being adapted to be closed at times, substantially as set forth.

3. In a brick-kiln, removable partitions dividing said kiln into sub-compartments, a transverse slot or opening formed through the roof of each compartment, a plate having openings, and engaging each slot or opening of the kiln, and removable plugs for closing said openings, substantially as set forth.

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

JOHN GAFFNEY.

Witnesses:

G. Y. THORPE,  
M. P. SMITH.