

(No Model.)

3 Sheets—Sheet 1.

N. S. CLARK.
BRICK AND POTTERY KILN.

No. 432,601.

Patented July 22, 1890.

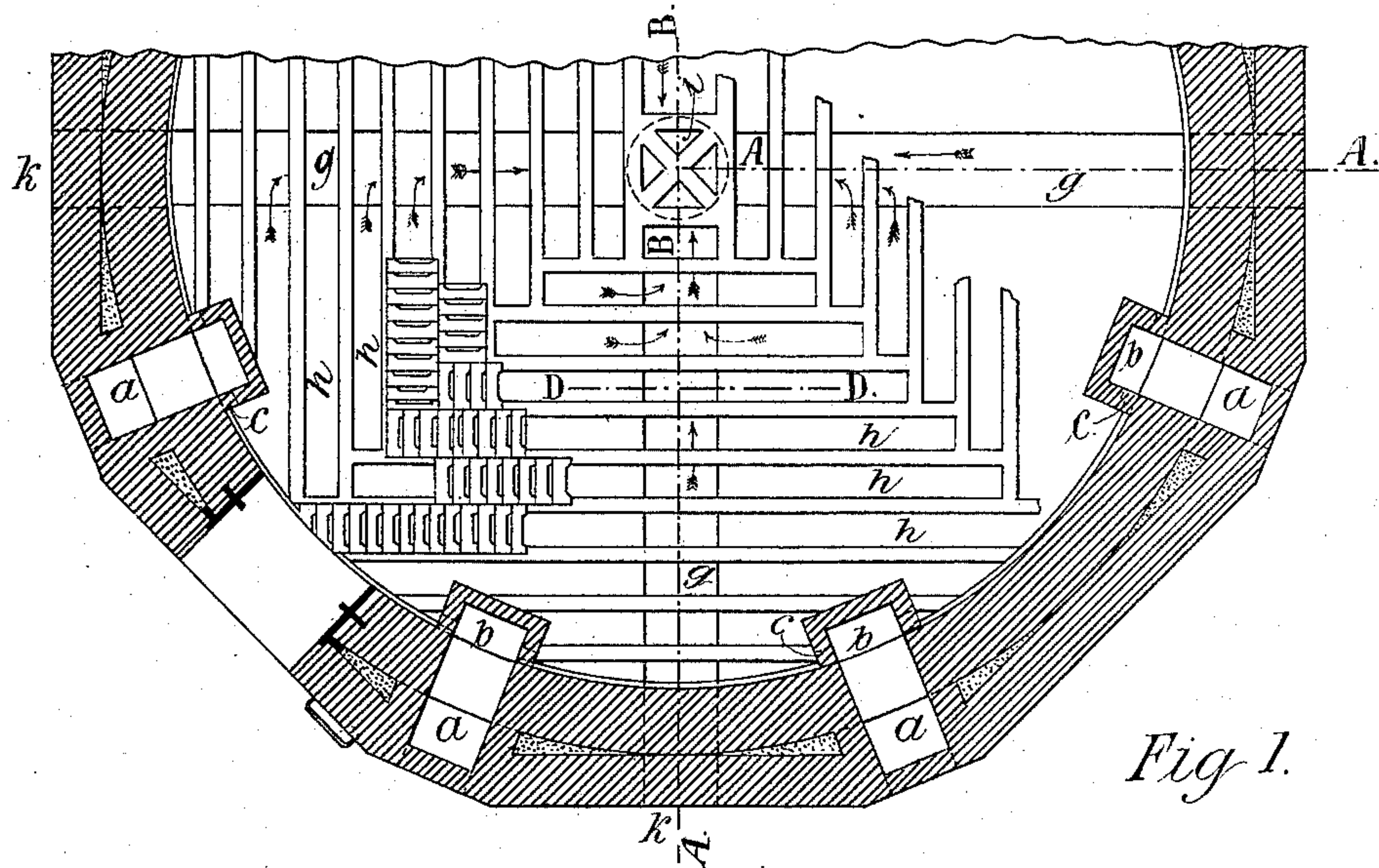


Fig. 1.

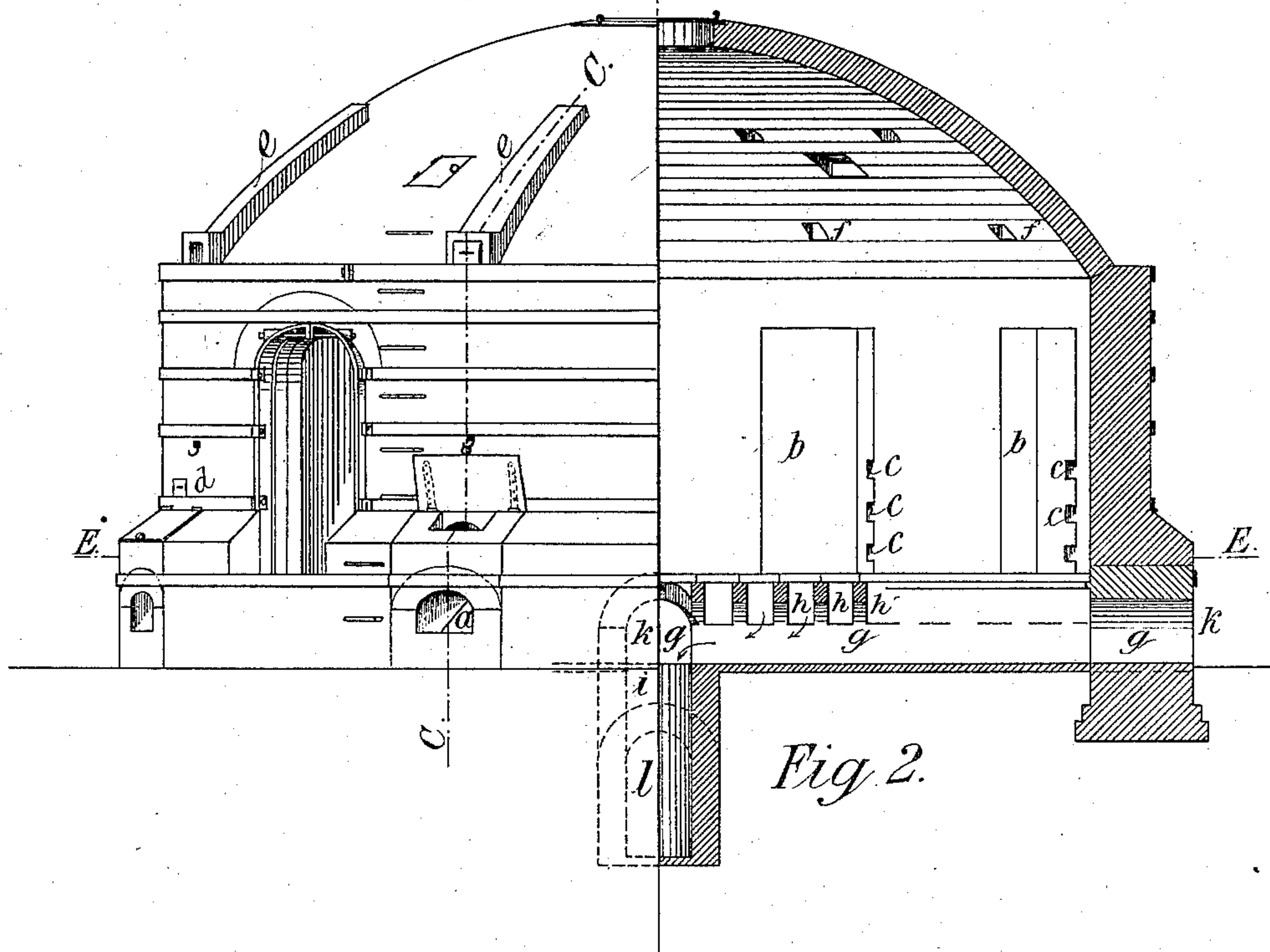


Fig. 2.

Witnesses:
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(No Model.)

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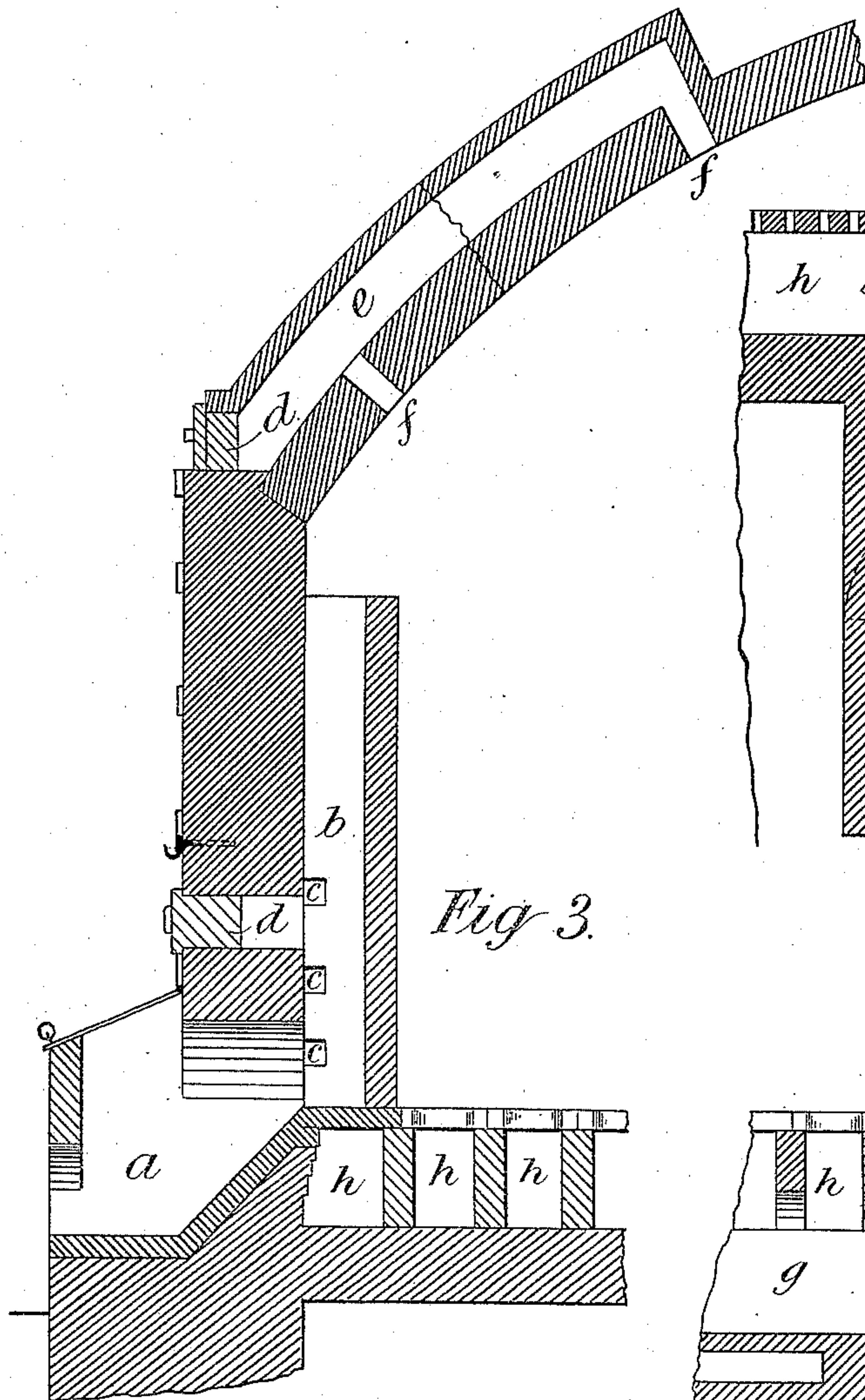


Fig. 3.

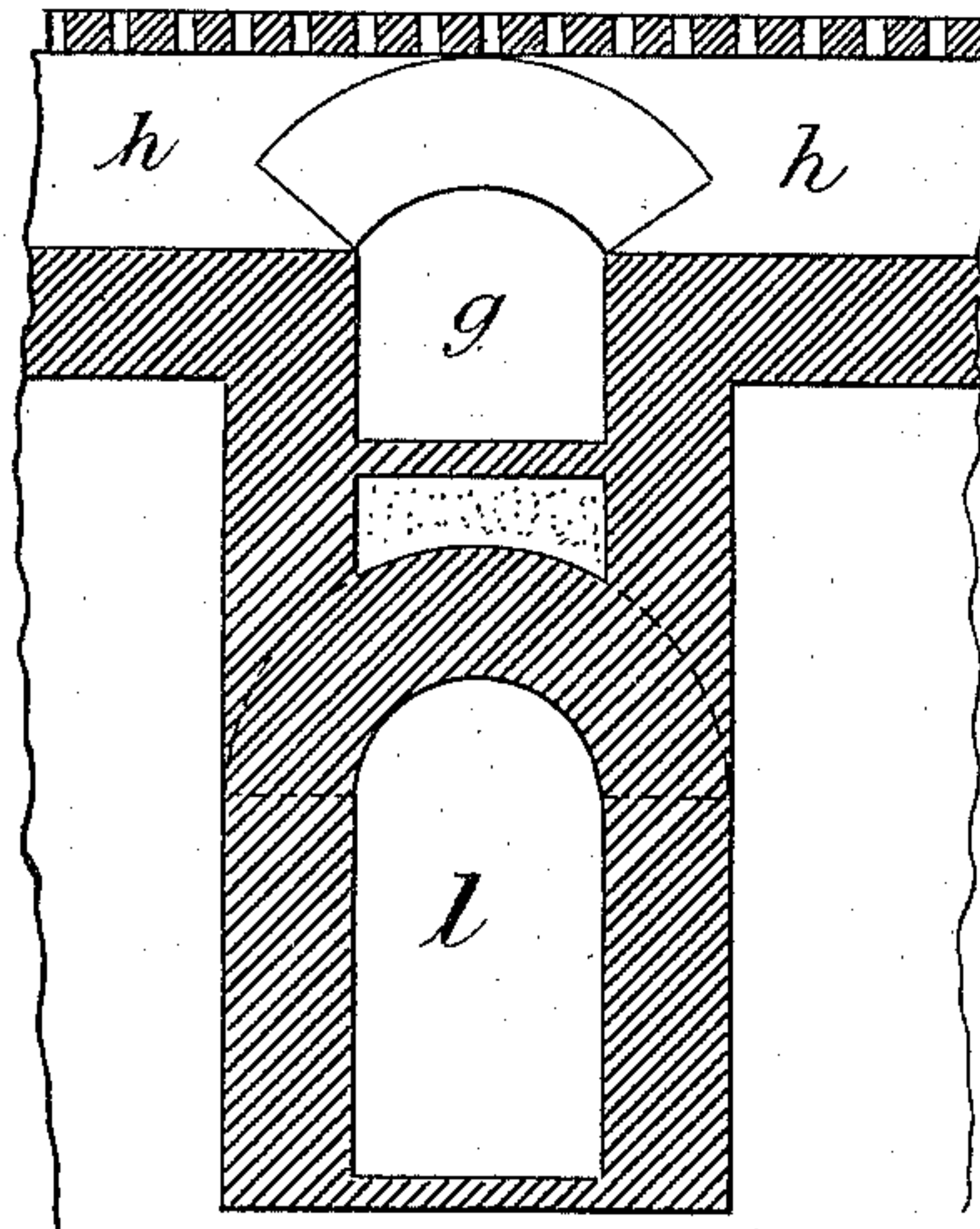


Fig. 4.

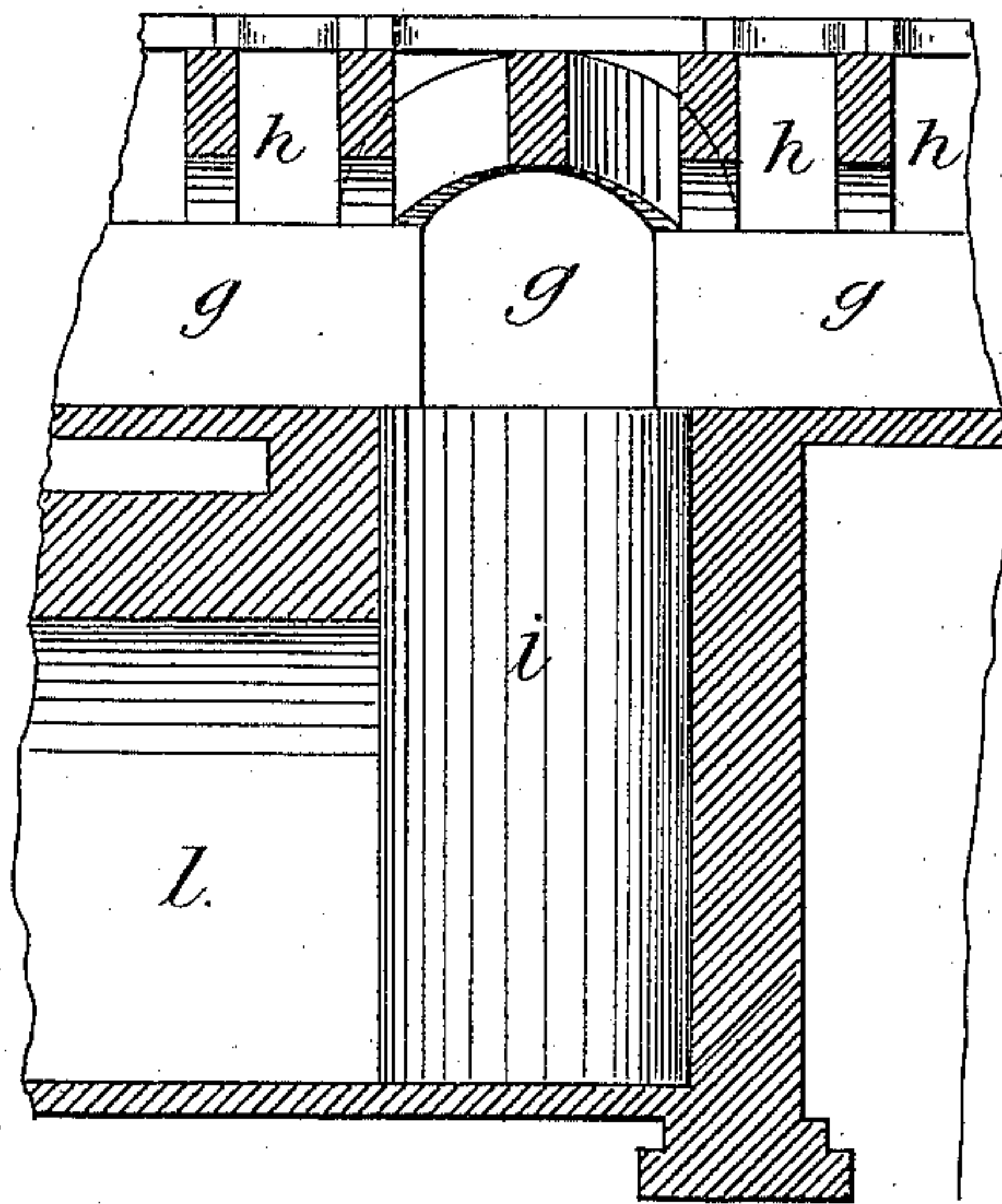


Fig. 5.

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Inventor:
Newman S Clark

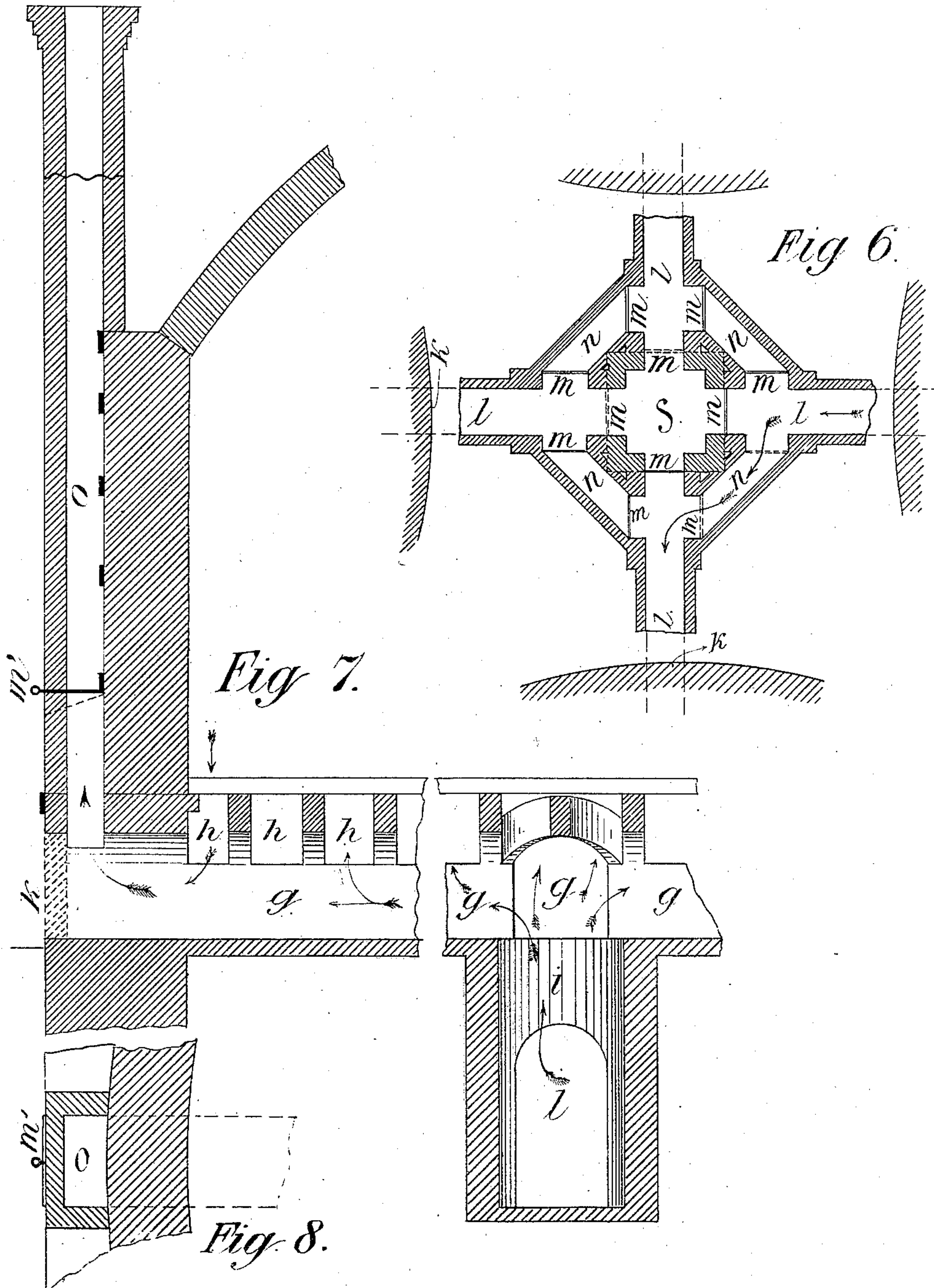
(No Model.)

3 Sheets—Sheet 3

N. S. CLARK.
BRICK AND POTTERY KILN.

No. 432,601.

Patented July 22, 1890.



Witnesses:
Joseph E. Dietrich
Joseph P. Smith

Inventor
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UNITED STATES PATENT OFFICE.

NEWMAN S. CLARK OF OMAHA, NEBRASKA, ASSIGNOR OF ONE-HALF TO
GEORGE HIGGINS, OF SAME PLACE.

BRICK AND POTTERY KILN.

SPECIFICATION forming part of Letters Patent No. 432,601, dated July 22, 1890.

Application filed September 2, 1889. Serial No. 322,786. (No model.)

To all whom it may concern:

Be it known that I, NEWMAN S. CLARK, a citizen of the United States, residing at Omaha, in the county of Douglas and State of Nebraska, have invented new and useful Improvements in Brick, Tile, and Pottery Kilns, of which the following is a specification.

The objects of my invention are, first, the saving of fuel by the peculiar construction of fire-boxes and perfect control of the heat; second, to provide self-feeding fire-boxes; third, to evenly distribute and regulate the heat throughout the kiln by means of properly-constructed draft-flues and air-ducts; fourth, to provide for cleaning out of hot-air flues under brick floor without taking up floor-brick; fifth, to provide cold-air ducts and openings for cooling off a kiln and means by which the heat of a cooling-off kiln can be used for drying and heating material in another kiln. These objects I attain by the arrangements illustrated in the accompanying drawings, in which—

Figure 1 is a horizontal section through kiln on line E E. Fig. 2 is a half-elevation and half-section of kiln-section on line A A. Fig. 3 is a section on line C C through fire-box *a*, inside fire-bag *b*, regulator *d*, cold-air duct *e*, and hot-air flues *h h* under floor. Fig. 4 is a section on line D D, showing hot-air flues *h h* under floor, cooling and clean-out channels *g*, and smoke-tunnel *l*. Fig. 5 is a section on line B B, showing hot-air flues *h h* under floor, cooling-off and clean-out channels *g*, vertical smoke-shaft *i*, and smoke-tunnel *l*. Fig. 6 is a horizontal section of the main smoke-stack (below ground-line) and connection-channels *n* between tunnels *l* of four kilns *k*. Fig. 7 is a section of cooling-off and clean-out channels *g* and hot-air chimney *o*, outlet for waste heat drawn from cooling-off kiln. Fig. 8 is a horizontal section of waste hot-air chimney.

Similar letters refer to similar parts throughout the several views.

In the above-named views, *a* are fire-boxes, in which the fire is started in openings in front and continued for several hours. Then said openings are closed, except a small opening for draft. The fire-box is then filled with fuel at upper opening, thus converting them

into self-feeding fire-boxes. These fire-boxes, especially the hearth and inclined back of same are so constructed that the fuel is kept to the front of fire-box and below inside floor-line, thereby creating a more direct draft and causing perfect combustion, and therefore a saving of fuel.

Each fire-box is constructed with a short horizontal hearth or bottom and a considerably larger part or area at the back or rear wall, which is inclined at an angle from the hearth, starting at a point on the line of the outside main wall of the kiln and running upward and backward to the line of the floor, thus making the fire-box "hopper-shaped." When filled with fuel, the draft is admitted at the front and bottom of the fire-box and the fuel is consumed slowly, equally, and perfectly from the under side, and fresh supply is gradually fed from above by the gravity of the fuel, the fire being easily controlled by regulating the opening through which air is admitted. The heat passing through the fire-bags *b*, a part will be drawn through *c*, (the side openings in *b*), thereby assisting and more perfectly heating the lower part of contents of kiln between fire-bags *b*, that portion of the material in a kiln heretofore imperfectly burned.

i is a vertical shaft in the center of kiln connected with the smoke-tunnel *l* and the cooling-off and clean-out channels *g* and *n*. The hot-air flues *h h* under the floor are connected with *g*. The four main or clean-out flues *g* extend entirely across the kiln at right angles to each other and intersect at the center of the kiln and connect at that point with a common vertical smoke-shaft *i*, which leads through an intermediate smoke-tunnel *l* to the detached stack *S* of the series of kilns. The small heat-flues *h* are arranged at right angles to the main flues *g*, as shown in Fig. 1, and the outside flues *h*, or those nearest to the fire-boxes, are made longer than those nearer the center of the kiln, these flues gradually decreasing in length from the outside to the center of the kiln. By this arrangement of parts the kiln is practically divided into a series of eight equal parts or sections having one fire-box to each section, so that the heat can be increased or diminished

at will and the sections can be made to work or heat in unison perfectly.

The advantage arising from the particular arrangement of flues herein shown and described is that the whole interior of the kiln is uniformly heated, because the heat is drawn downward from the upper part of the kiln entirely through the contents thereof, through the perforated floor into the flues *h*, and thence into the main flues *g* and along the latter to the vertical smoke-shaft and the smoke-tunnel. As the fire-boxes are equally distributed around the kiln to supply the heat to the top thereof and the draft is downward from the top toward the bottom, the heat will follow or seek the most direct outlet to the stack, which in the present case is through the floor near the fire-box. To equalize the heat and draw the same downwardly and uniformly over the area or surface of the entire kiln, I build the outside flues *h*, or those nearest to the fire-boxes, longer than the inside flues, which retards the draft at the outside flues. The flues, as stated, gradually decrease in length from the fire-boxes toward the center of the kiln, and the short inner flues have the most direct communication with the outlet, so that the heat will be carried from the outside flues toward the central smoke-shaft, thus burning the goods evenly and uniformly.

The cleaning out of flues *h h* beneath the floor can be accomplished by scraping refuse from *h h* into *g*, and from there in four directions, through *h*, outside, (see Figs. 1 and 2,) the openings *g* being made large enough to admit a person for the purpose, thus doing away with the necessity of removing the floor-brick.

e designates a cold-air duct or flue, which is arranged exteriorly of the roof of the kiln in the vertical plane of one of the fire-bags and the hearth, one of these flues being arranged over each fire-bag, as shown.

It is a well-established fact that in the ordinary downdraft-kiln the contents on or toward the top thereof are burned the hardest and often injured by excess of heat in the top of the kiln. To overcome this objection, cold air must be admitted to the top of the kiln in order to drive or deflect the hot air downward. Kilns as ordinarily constructed have openings in the crown or roof thereof; but it is impossible to supply cold air through these openings because of the excess of heat in the top of the kiln, which heat rushes out of the kiln immediately upon uncovering the openings, and thus prevents the admission of cold air to the interior of the kiln. To overcome this objection, I have provided means whereby the escape of the heat is prevented and cold air can be supplied in regulated quantities to the interior of the kiln to overcome an excess of heat in the top thereof and secure uniform burning of the goods. The cold-air ducts or hoods *e* extend in a vertically-in-

clined position from the outside of the kiln toward the center thereof; but the inner end of each flue *e* terminates at a point some distance from the center of the kiln. The inner end of the cold-air flue is closed; but the lower outer end thereof is adapted to be closed by a removable cover or regulator *d*, each flue communicating with the kiln at two or more points of its length through the openings *f*, formed in the roof of the kiln. The hood or cold-air flue is heated to the same temperature as the crown of the kiln on which it is built, and the hot air ascends to the highest point within the kiln and to the closed upper end of the flue, which is due to the fact that the flue is built at an angle, as shown. Now, if the regulator or cover *d* is removed from the lower end of the vertically-inclined air-duct, cold air will enter and thence pass into the kiln through the openings *ff*; but no heat will escape from the kiln through the openings *ff* and the flue, which is due to the inclined position of the latter and the closed upper end thereof. I have furthermore observed that by opening the lower regulator, which is located immediately above the fire-box, and which opens into the fire-bag *b*, near the base of the latter, the air will rush up through the fire-bag, and as it strikes the crown of the kiln it will be deflected downward, which downward current is assisted by the downdraft of the kiln, and operates to draw in the cold air through the openings *ff*, and thus take in the required volume of cold air to prevent the upper part of the kiln from being overheated.

The means by which the heat of a cooling-off kiln can be used for drying purposes in another kiln and gradually heating same are illustrated in Figs. 6, 7, and 8. The smoke-tunnels *l* in Fig. 6 of two or more kilns are connected with channels *n* and regulated by dampers *m*, so that the escaping or waste heat of cooling-off kiln can be drawn into a kiln filled with material and the heat used for drying purposes. The waste heat thus leaving one kiln through *l* is drawn into the other kiln instead of going to the stack *S* by opening and regulating the dampers *m* in channels *n*, and also at *m'* in chimney *o*, the waste-heat chimney, Fig. 7. (See dotted dampers *m* in Fig. 6, which are open.) The heat thus drawn into another kiln rises through *i* in the center and through contents in kiln to the top, and from there is drawn downward by opening or regulating *m'* in chimney *o*, Fig. 7.

I attach importance to the connecting-channels intermediate of the common smoke-stack and two or more kilns, each kiln having a chimney at the outer terminal of each of its main flues, said chimneys drawing the heat from a cooling-kiln into one filled with green goods. Each channel around the common smoke-stack has two dampers, whereby the heat may be permitted to pass into the smoke-stack or from one kiln to the other, so that

the heat of one kiln when it is cooling can be drawn into another kiln containing green goods, thus utilizing the waste heat.

I am aware that prior to my invention down-draft brick, tile, and pottery kilns have been constructed on a similar general plan. I therefore do not claim the invention of the downdraft principle of this kiln, broadly; but

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

1. In a kiln, substantially as described, a vertically-inclined cold-air flue which communicates with the kiln at the top thereof and has its lower end open for the admission of cold air, substantially as set forth.

2. In a kiln, the combination of a fire-box, a vertical fire-bag communicating therewith, and a cold-air flue *e*, located on the roof of the kiln in the vertical plane of the fire box and bag and having the inlet-openings *f* in the roof, for the purpose described, substantially as set forth.

3. A kiln having an exterior cold-air flue extending from the edge toward the center of the roof thereof, said flue opening into the kiln at points intermediate of the length of the flue, the inner end of said flue being closed and the outer end provided with a movable cover *d*, for the purpose described, substantially as set forth.

4. In a downdraft-kiln, substantially as described, the combination of the central smoke-shaft, the series of radial clean-out channels *g*, extending from the central smoke-shaft to the outside walls of the kiln, said channels *g* having means for closing the outer ends of the same and of such cross-sectional area as to permit ready access to the interior of the kiln,

and the hot-air flues *h*, situated below the floor of the kiln and opening into said channels *g*, for the purpose described, substantially as set forth.

5. In a downdraft-kiln, substantially as described, the combination of a vertical smoke-shaft located centrally within the kiln, the series of diametric or radial clean-out channels *g*, extending from the central smoke-shaft to the exterior walls of the kiln and having means which close the outer ends of said channels and permit ready access to the same, and the series of hot-air flues *h*, one series for each clean-out channel, which flues are arranged at right angles to and communicate with said channel, said hot-air flues being situated beneath the floor of the kiln and gradually decreasing in length from the outer wall of the kiln toward the center thereof, for the purpose described, substantially as set forth.

6. In a kiln, a fire-box, the perforated vertical fire-bag communicating with the same at a point immediately above the fire-box, and the inclined cold-air flue arranged exteriorly on the roof of the kiln in the vertical plane of the fire-bag and communicating with the kiln through one or more openings, whereby the air escaping from the vertical fire-bag into the interior of the kiln is commingled with the cold air admitted to the kiln through the cold-air flue, substantially as described.

NEWMAN S. CLARK.

Witnesses:

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BYRON REED.