

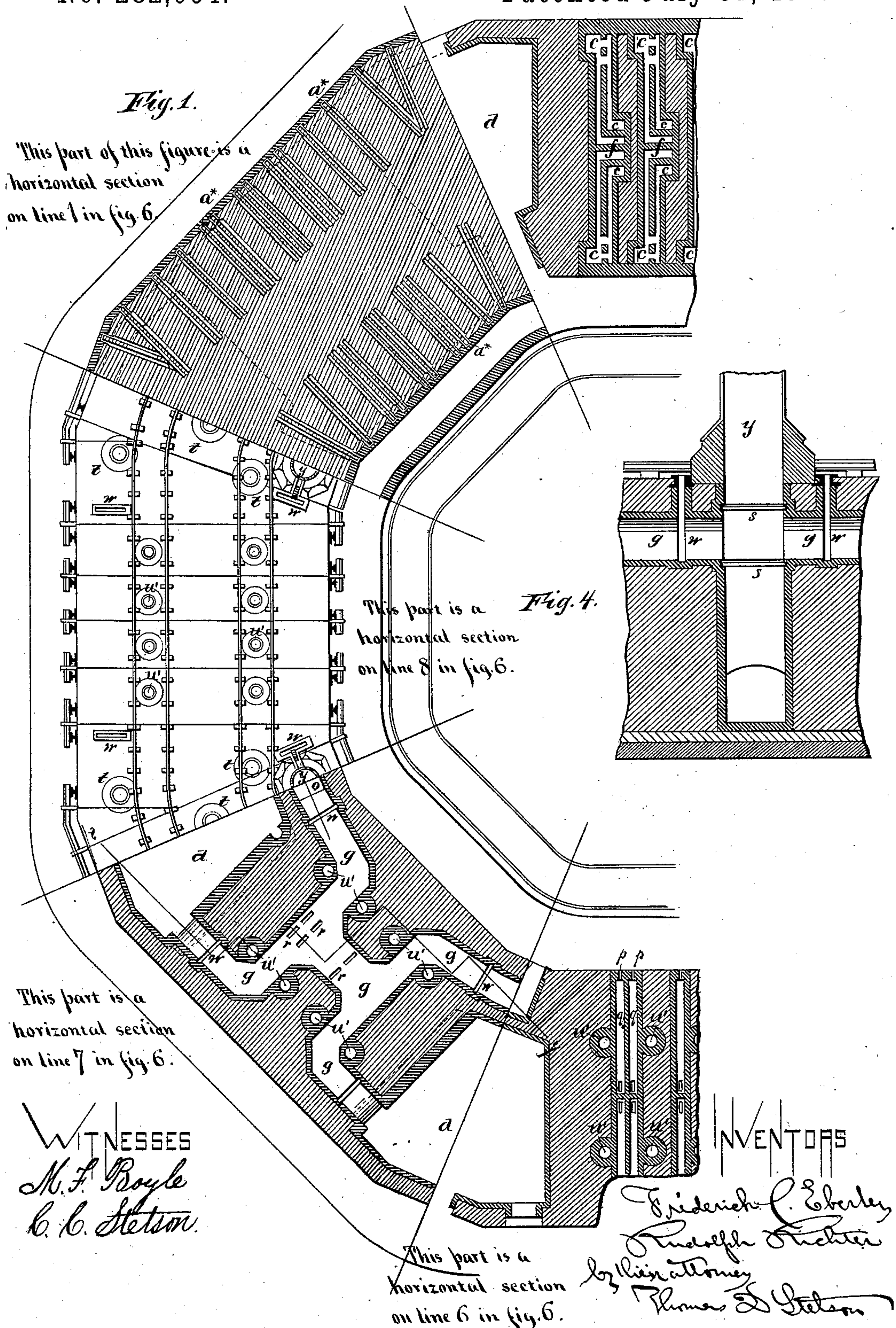
(No Model.)

3 Sheets—Sheet 1.

F. C. EBERLEY & R. RICHTER.
COKE OVEN AND KILN.

No. 282,064.

Patented July 31, 1883.



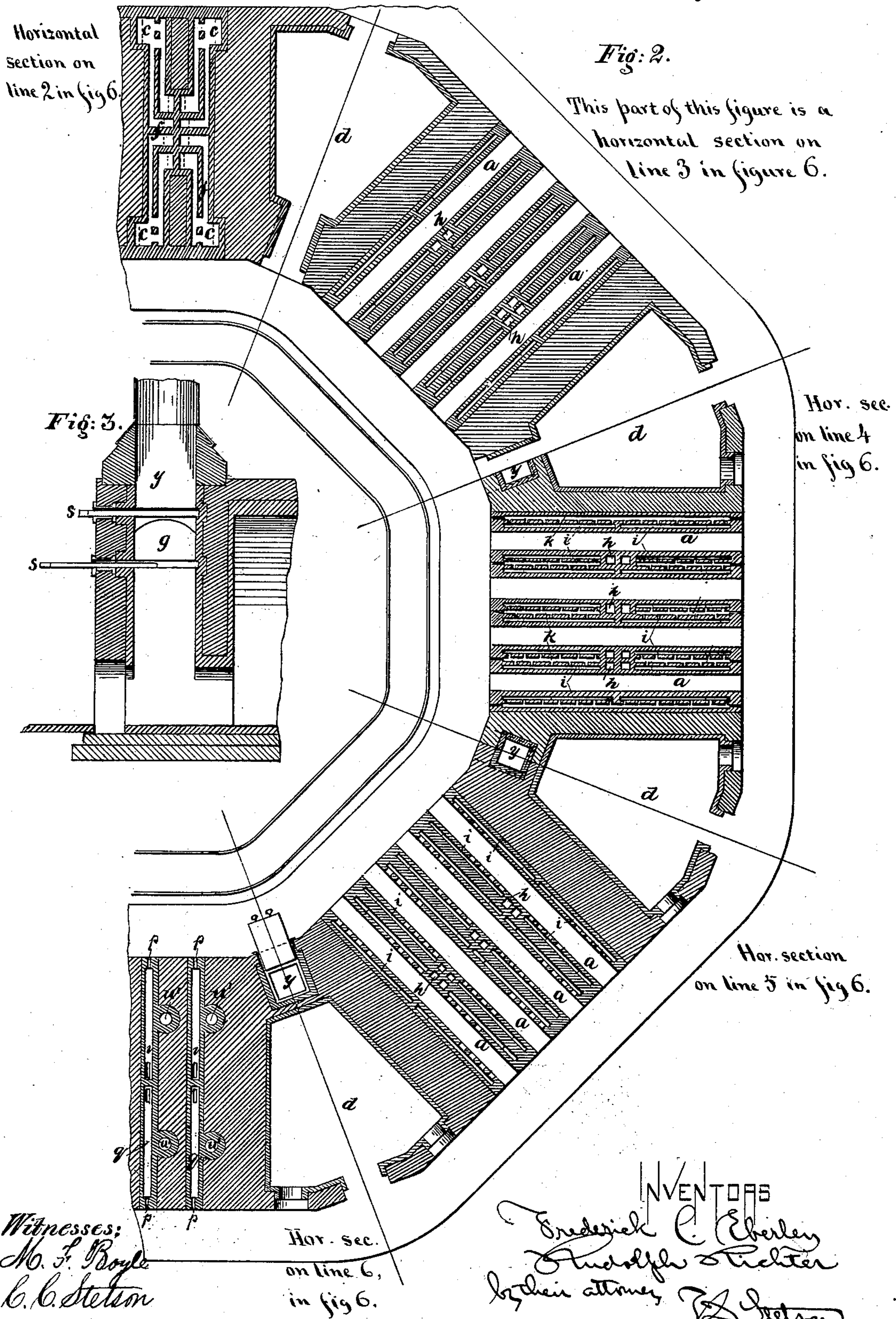
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3 Sheets—Sheet 2.

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Witnesses:
M. F. Boyle
C. C. Stetson

Hor. sec.
on line 6,
in fig 6.

INVENTORS
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Rudolph Richter
by their attorney J. S. Sisson

(No Model.)

3 Sheets—Sheet 3.

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Fig: 5.

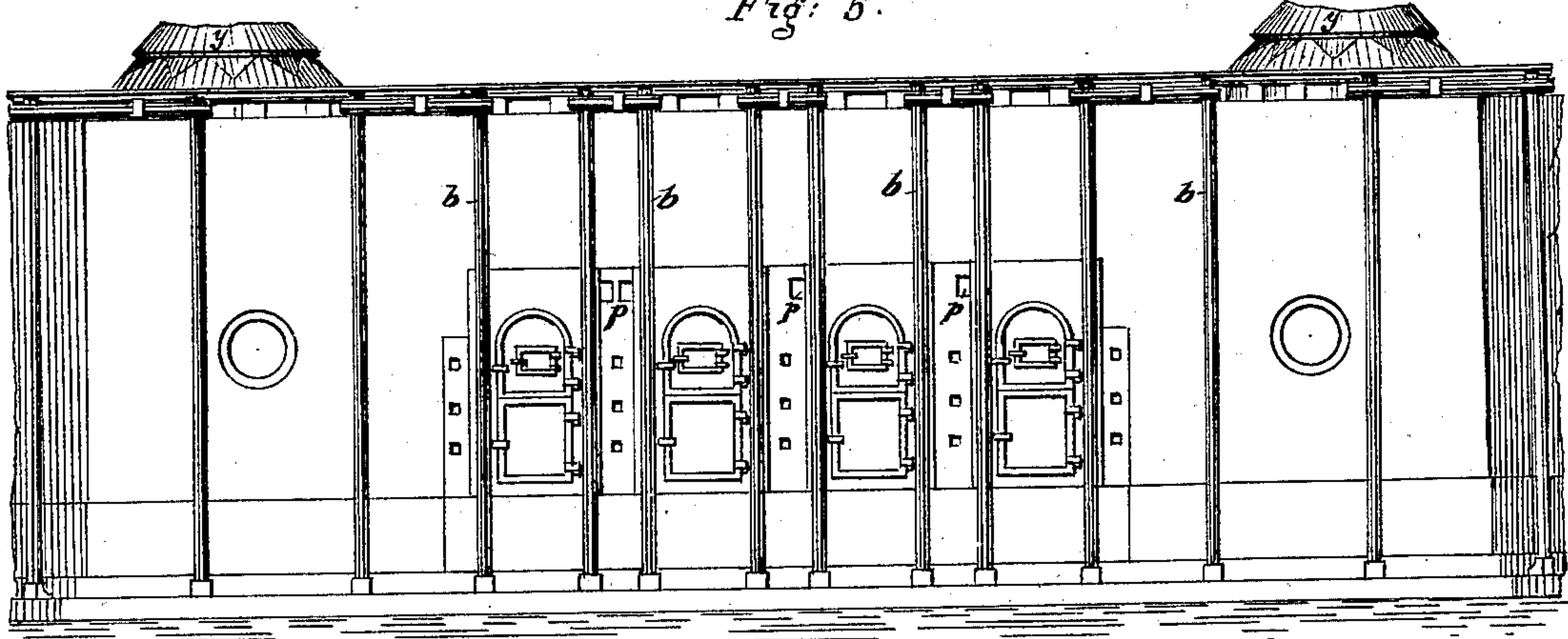


Fig: 6.

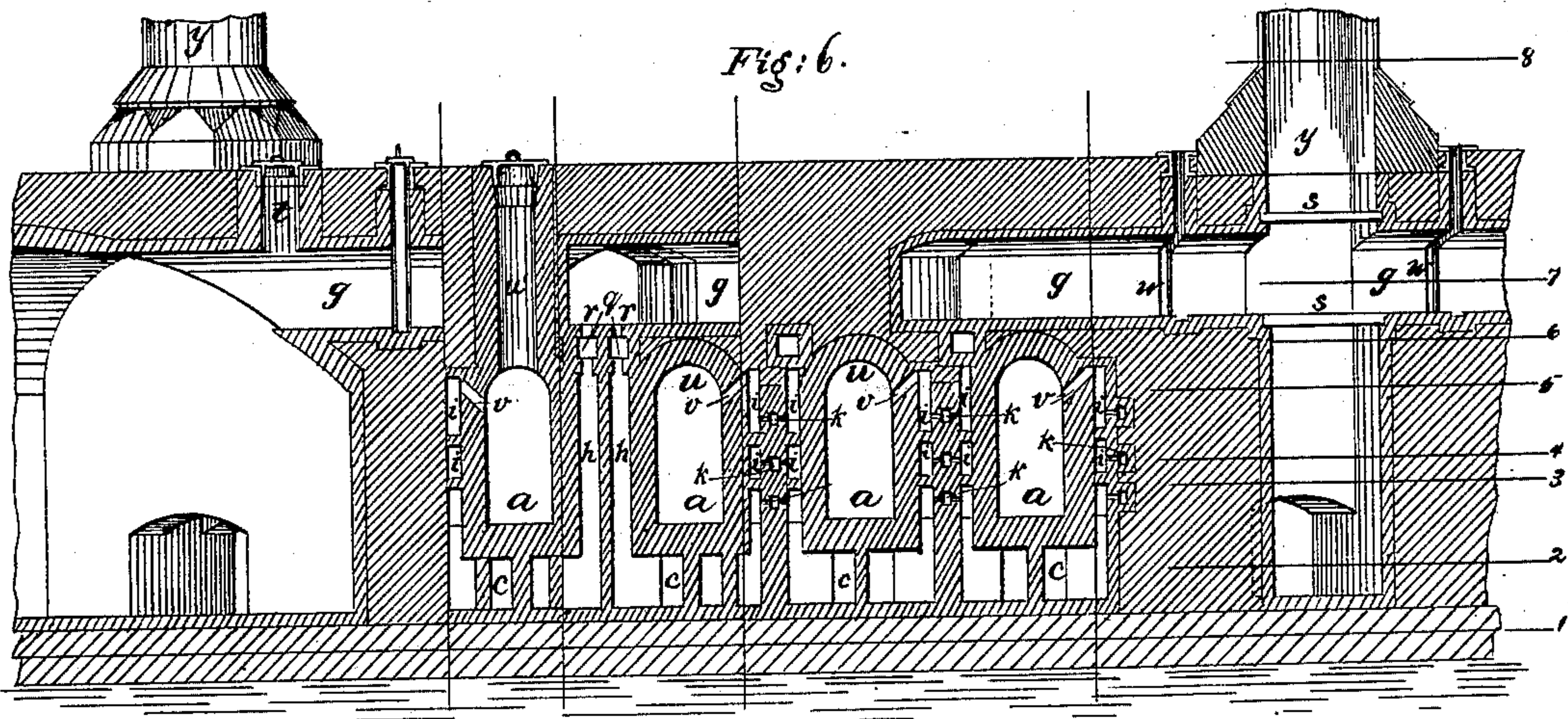
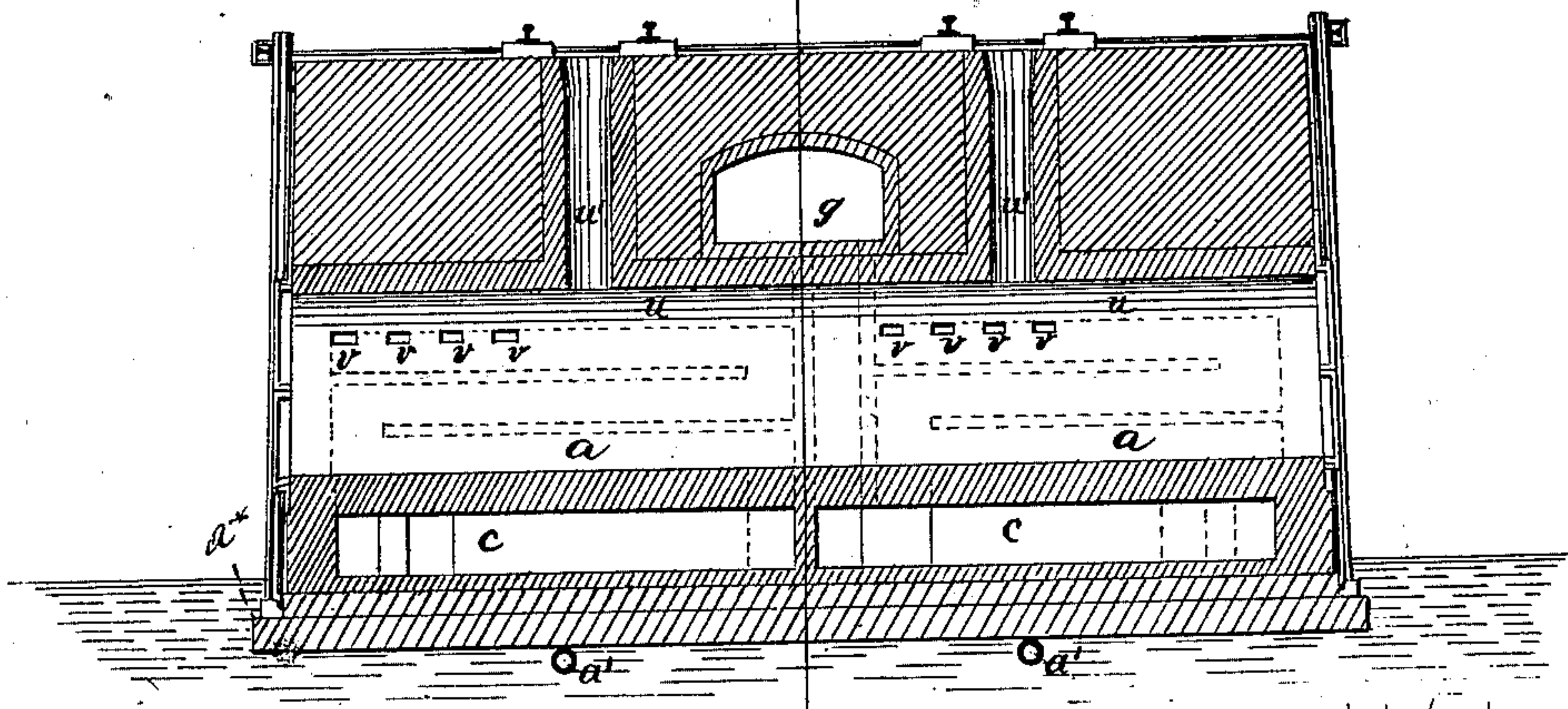


Fig: 7.



WITNESSES

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UNITED STATES PATENT OFFICE.

FRIDERICH C. EBERLEY AND RUDOLPH RICHTER, OF DENVER, COLORADO.

COKE OVEN AND KILN.

SPECIFICATION forming part of Letters Patent No. 282,064, dated July 31, 1883.

Application filed April 29, 1882. (No model.)

To all whom it may concern:

Be it known that we, FRIDERICH C. EBERLEY and RUDOLPH RICHTER, of Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements relating to Coke-Ovens, of which the following is a specification.

Our invention relates to an improved oven in which coal is reduced to coke and the heat utilized, as will be hereinafter explained. After the first ignition, and when the ovens and inclosing masonry have become heated up, the coal in the ovens is fired by the heat of the masonry. The smoke arising finds an outlet through apertures made in the arch of the ovens into channels suitably located. The gas arising and passing out through side apertures comes in contact with air from the exterior introduced through suitable channels, and is ignited, thereby thoroughly heating the masonry of the ovens. The products of combustion thus produced ascend through vertical flues into a main channel or flue, which conveys them to the kilns in which the burning is to be done. These kilns are suitably located between the series of coke-ovens, so that the heat given off by the surrounding masonry of the coke-ovens, as well as the products of combustion above described, is thus utilized. The arrangement of the flues conveying the ignited gases to the kilns is such that they may be taken to one kiln and then discharged into the smoke-stack, or, if they are not spent, may be carried on to another kiln, as hereinafter set forth.

The accompanying drawings form a part of this specification, and illustrate what we consider the best means of carrying out the invention.

Figure 1 represents a series of horizontal sections of the ovens, taken on the planes 1, 6, 7, and 8 in Fig. 6. Fig. 2 represents horizontal sections on the planes 2, 3, 4, 5, and 6 in Fig. 6. Fig. 3 is a transverse vertical section taken through the smoke-flue. Fig. 4 is a longitudinal vertical section of the same. Fig. 5 is an exterior elevation of a portion of the structure with the parts complete. Fig. 6 is a longitudinal section on the zigzag line *x y*, Fig. 1. Fig. 7 is a vertical transverse section of an oven.

Similar letters of reference indicate corresponding parts in all the figures.

a are the coke-ovens. *b* are the brick or terra-cotta burning ovens or kilns. We have shown the structure as built about a polygon or portion thereof. The coke-ovens *a* are grouped, and the kilns *d* lie between the groups at the angles of the octagon or other polygonal shape. Channels and flues convey the ignited gases and heat from the coke-ovens to the kilns, where it is utilized in burning any desired article.

In erecting the structure the foundation is built up of some material that will endure the heat, such as common hard bricks or some varieties of stone. When it is leveled off, the wall-anchors *a* a** are placed thereon, which are to receive the upright exterior bars, *b b*. (See Figs. 1 and 5.) Another course of similar material is then laid, and upon this bed the fire-bricks forming the bottom of the channels *c c* are placed, as also the floor of the kilns *d*, which are laid in fire-clay. The covers of the channels *c c* form the floors of the ovens *a*, and are of fire-clay. Partitions *f* separate the several channels *c*. The sides of the ovens *a*, built of fire-brick also, are punctured by several channels or flues. The central upright flues, *h h*, (see Fig. 6,) extend from the bottom channels, *c*, to the upper horizontal flues, *g*. Near the top they are narrowed, and open into transverse passages *q*, which have exits *r* into the main flues *g*. A loose brick or other suitable slide is placed in the passage *q* and moved by a poker or tool from the exterior opening, *p*, (see Fig. 2,) to open or close the passage or exit *r*, thus controlling the draft through the upright channel *h*. The products of combustion, after circulating through the channels *c*, pass up through the flues *h h*.

The ovens are arched, as shown at *u*, and near the top they have orifices *v*, which communicate with a series of channels, *i i*, running horizontally near the sides of the ovens. These channels *i i* are formed on either side of the ovens, and the connecting-orifices *V* also enter from either side, so that the exit of gases will be equal on each side. Lying between these channels *i i*, in the partition between the ovens, are air-ducts *k*, (see Figs. 2 and 6,) which have communication directly with the

outside air. The bricks between the channels *i i* and air-ducts *k* are laid loose and without cement or mortar, so that the air will flow into the gas-channels *i i* and mingle with the gas.

5 This causes combustion, and the ignited gases flow down, circulate through the bottom channels, *c*, and then rise through the upright flues *h*. It will thus be seen that the entire surrounding masonry of the ovens is exposed to the action of the burning gases, except a small portion at the top. A fervent heat is thus maintained in the ovens without a very active fire being maintained therein. The heat will be evenly distributed over the oven. The ducts *k* are provided on the outside with brick plugs or other means for shutting off the ingress of air or regulating the flow thereof.

Above the ovens are provided the horizontal flues *g g*, which convey the products of combustion from the various upright flues *h* to the kilns *d*, where the said products are utilized for burning bricks, pottery, terracotta, &c. The communication through these flues may be had to the kilns or to the smoke-stack, as desired, by means of suitable gates or valves, to be hereinafter described; and the burning gases and other products of combustion may be received into these flues from only one of the ovens or from several, as may be desirable, by means of the shut-off slides or bricks in the passages *q*, operated as above described. To facilitate the conveyance of the products of combustion to the kilns or to the smoke-stack, the flues *g* are branched, as shown in Fig. 1 in the section taken on line 7 of Fig. 6, one branch entering near the front of the kiln *d* and the other entering the smoke-stack *y* at the rear of the kiln.

Across the smoke-stack, above and below the junction with the flue *g*, slides or gates *s s* are provided. When the upper one of these gates is closed, the gases, &c., may enter the kiln or continue their traverse in the next set of flues *g*. When the lower slide, *s*, is closed and the upper one open, the products of combustion will travel out the smoke-stack. When both the gates are closed, the products continue to circulate through the flues *g*, passing along to the next stack. The flues *g* are provided with vertical sliding gates *w w*, which direct the passage of the products of combustion. These gates are operated from the top of the structure. They are formed of cast-iron, and are coated over with fire-clay on both sides for the purpose of protecting them from the action of fire. They work in grooves formed in the fire-brick walls of the flues *g*. They are hung on chains running over pulleys, and the free end of the chains is provided with counter-weights. Those vertical slides *w* which are near to the smoke-stacks *y* may have their pulleys attached thereto, while those at a distance must be provided with a frame-work to support them. By means of these gates *w* the products of combustion may be directed either to the front of the kiln or to the back of it

through the lower portion of the smoke-stack. By means of the counter-weights attached to the chains running over the pulleys, the ready action of the gates is insured and greatly facilitated.

The kiln-chambers *d*, when formed, as shown in the drawings, at the corners of a polygonal structure, are triangular in general form; but they may have any form, according to the form of the structure in which they are located and the situation which they occupy. An opening large enough for the admission of a wheelbarrow is formed in the front on the exterior of the structure. Smaller openings are formed alongside of this for the purpose of cooling. At the rear of the kilns an opening is provided under the smoke-stack *y*, about opposite the main door, in order to secure a draft, when such is needed, to cool off the chamber in a short time. When the burning is going on, these openings are to be closed by being walled up air-tight.

The tops of the kiln-chambers *d* are provided with a number of holes, *t t*, to provide for ventilation and regulation of the temperature in the kilns. Caps are provided for these holes, as shown.

The iron frames for the doors to the ovens are placed in position and fitted tightly to the brick-work at the proper time during the erection of the structure.

The top is leveled off and finished with flags, on which are laid tracks or ways, upon which carts or trucks run to convey the coal to the ovens. The ovens are charged through the channels *u'* from the top, as shown. These channels or feed-pipes *u'* are provided with caps or stoppers, as shown. (See Fig. 6.)

When all the parts are in place, the upright bars *b* are reared and tied across the top by the swivel-rods, as shown, in order to hold the iron door-plates securely in position. These bars *b* rest upon the wall-anchors *a'* heretofore described.

If moisture from the ground should interfere with the successful working of the apparatus, we overcome this by placing a series of draining-tiles *a'* under the masonry to carry off the water.

The apertures *v* are set obliquely in the base of the arches *u*, and are inclined upward, so as to prevent the coal, &c., from getting into and choking them.

Structures possessing some of the features of ours have been made having the coking-chambers partially surrounded with flues, and others having a boiler or calcining-kiln arranged between two coking-ovens to receive the products of combustion from them, and have a valve or gate in the passages from the ovens to the kiln or boiler; but we are not aware of any having the arrangement and construction herein claimed.

Nothing in this application is to be considered broadly for the utilization of the waste heat from coke-ovens, as that has heretofore

been accomplished in various ways. The features of novelty in this invention are specifically pointed out in the claims.

Modifications may be made in the forms and proportions without departing from the principle or sacrificing the advantages of the invention.

The drawings show an octagonal form of the structure; but this shape is by no means necessary. It may be erected in a straight line or with as many corners as circumstances may dictate, having also a convenient number of ovens—say from two to sixteen, more or less—placed between the kiln-chambers in each case.

Having thus described our invention, what we desire to claim and secure by Letters Patent is—

1. In a series of coking-ovens and baking-kilns in which the series of ovens and kilns are arranged alternately and in octagonal or polygonal form, the channels *c*, formed beneath the floor of the ovens *a*, the upright flues *h h*, leading from the channels *c* to the upper horizontal flues, *g*, having passages *q*, with sliding dampers, the ovens having passages *v*, com-

municating with channels *i i*, the ducts *k*, leading from the outer air into the channels, and means for deflecting the combined gases into the kilns at will, all combined and operating substantially as set forth.

2. In a coking-oven substantially as described, the ovens *a*, having outlets *v*, channels *i*, and ducts *k*, communicating with the outer air, the channels *c*, arranged beneath the floors of the ovens and having partitions *f*, the vertical passages *h*, passages *q*, having sliding dampers, the upper horizontal passages, *g*, and deflecting-valves *w w* and *s s*, and the kilns *d*, all combined and operating as and for the purposes set forth.

In testimony whereof we have hereunto set our hands, at the city of Denver, Colorado, this 15th day of March, 1882, in the presence of two subscribing witnesses.

FRIDERICH C. EBERLEY.
RUDOLPH RICHTER.

Witnesses:

CARL BRUEHNE,
FRED. HIELMEYER.