

No. 609,150.

Patented Aug. 16, 1898.

J. T. KEY.

PROCESS OF AND APPARATUS FOR MANUFACTURING COKE.

(Application filed Apr. 25, 1896.)

(No Model.)

4 Sheets—Sheet 1.

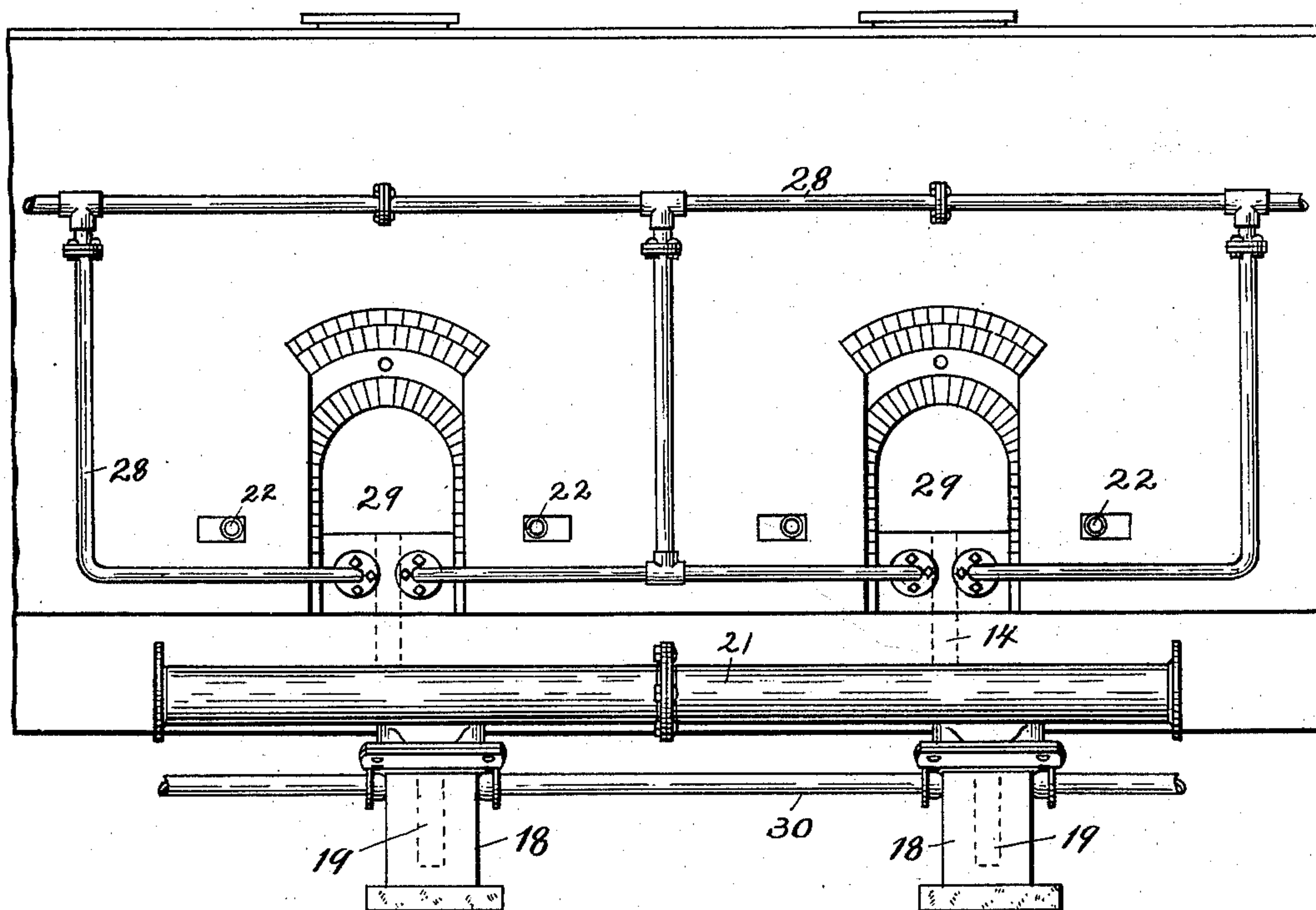


Fig. 1.

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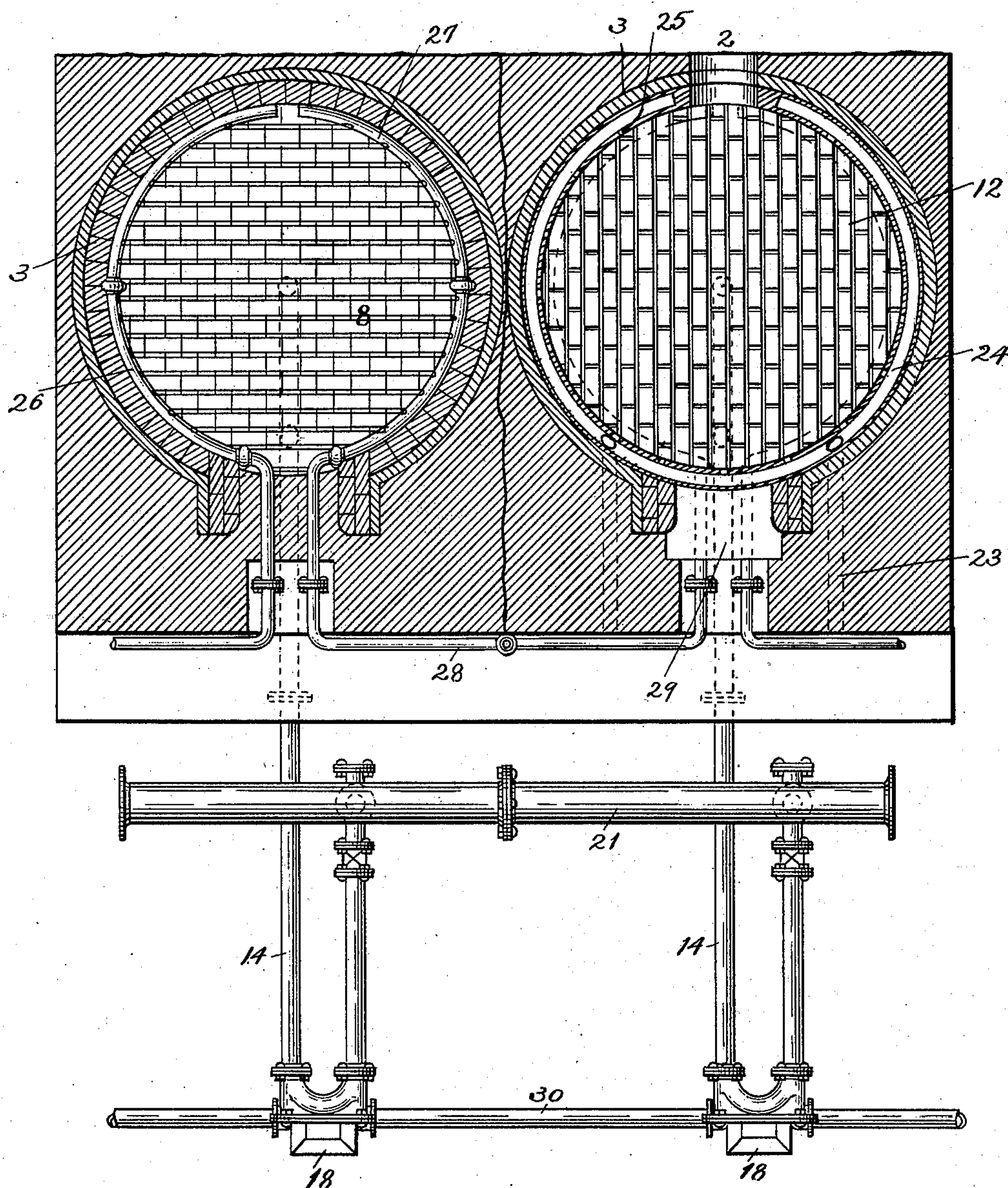


FIG. 2.

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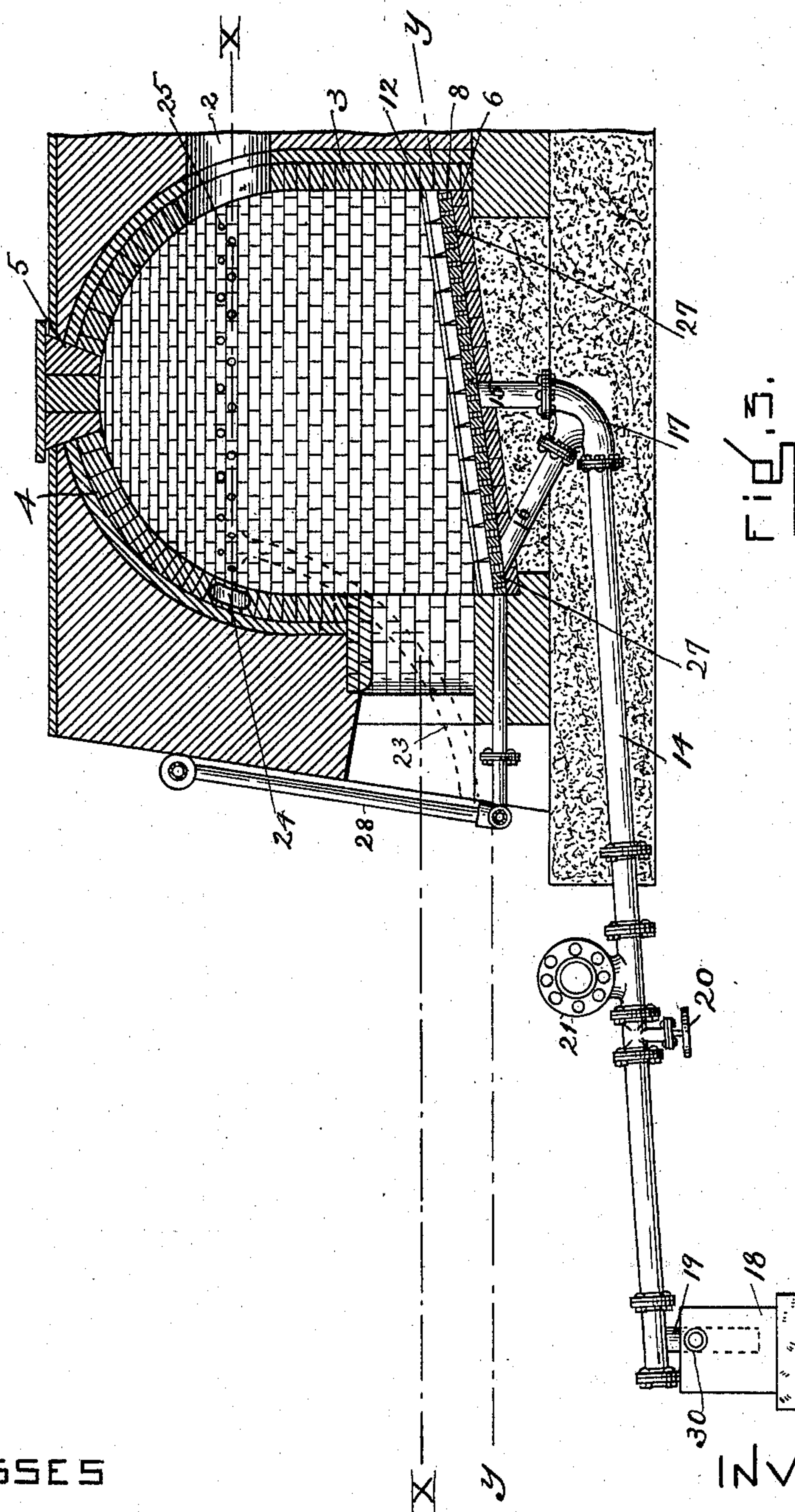
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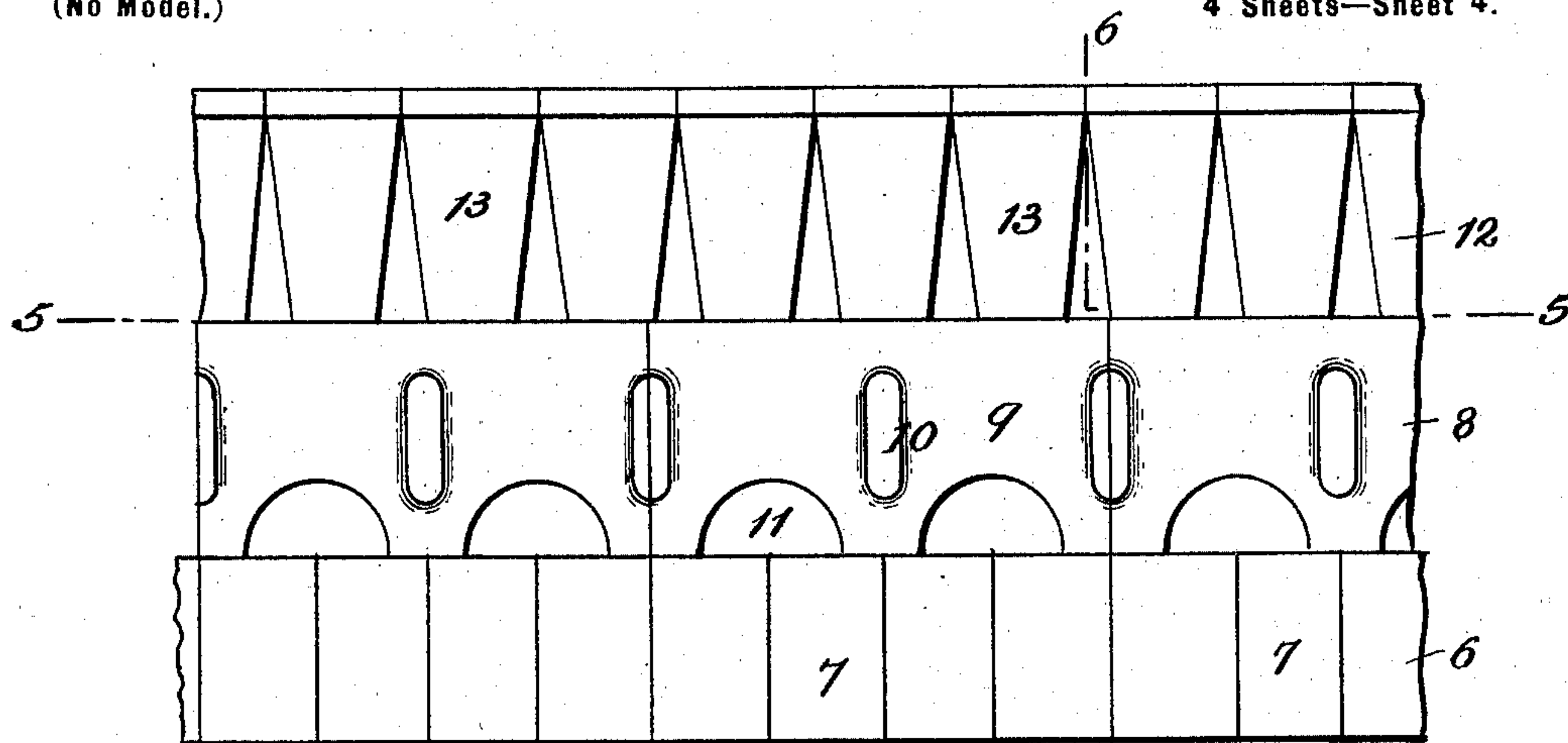


Fig. 4.

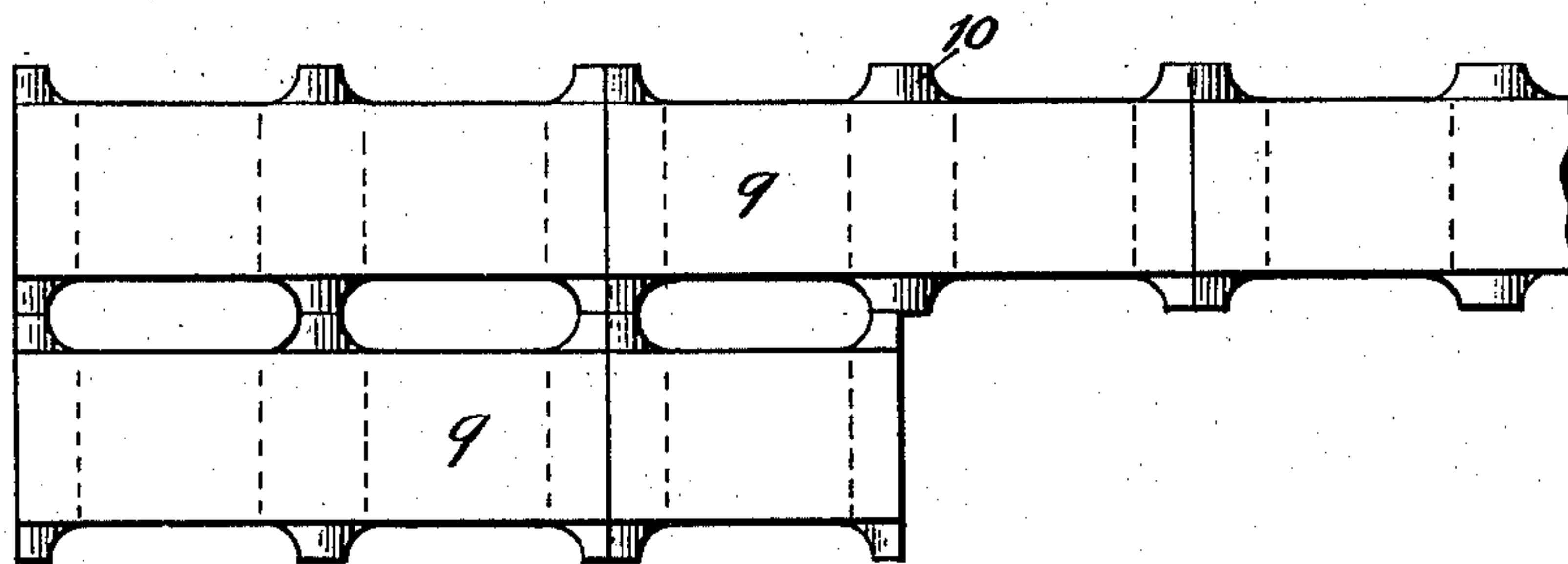
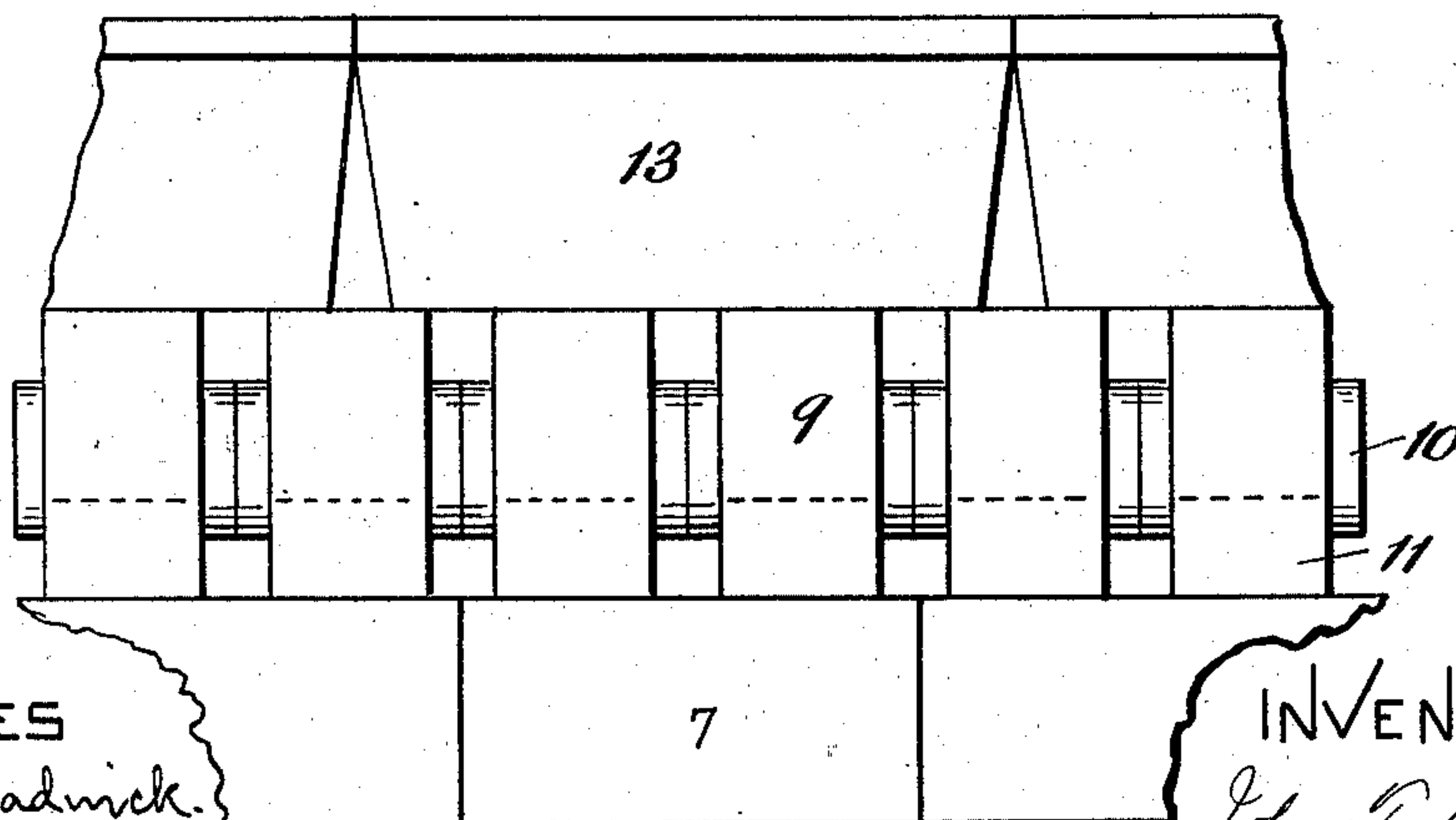


Fig. 5.



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Fig. 6.

UNITED STATES PATENT OFFICE.

JOHN THOMAS KEY, OF SANDAL MAGNA, ENGLAND.

PROCESS OF AND APPARATUS FOR MANUFACTURING COKE.

SPECIFICATION forming part of Letters Patent No. 609,150, dated August 16, 1898.

Application filed April 25, 1896. Serial No. 589,039. (No model.) Patented in England May 27, 1895, No. 10,356.

To all whom it may concern:

Be it known that I, JOHN THOMAS KEY, a subject of the Queen of Great Britain, residing at Sandal Magna, in the county of York, England, have invented a certain new and useful Process of and Apparatus for Manufacturing Coke, (for which I have obtained Letters Patent in Great Britain, No. 10,356, dated May 27, 1895,) of which the following is a specification.

My invention relates to the production of coke; and its object is to provide a process and apparatus therefor by means of which a product of very high quality may be manufactured, an especial object being to get rid of the sulfur, which is the worst enemy of good coke and which it has been found very difficult to expel therefrom.

To the above ends I employ a process comprising the following steps, viz: charging the oven with a suitable quantity of fine coal or smudge, igniting it at its top surface and drawing the products of combustion downward for a time sufficient to drive off the volatile by-products from the coal, and then reversing the direction of the draft by forcing steam in beneath the coke and up through the same, thereby quenching it and driving off the remaining waste gaseous products.

For the purpose of practically carrying out my process as above described I have also devised certain improvements in the structure of the coke-oven, as will be more fully explained below.

In the accompanying drawings, Figure 1 represents a front elevation of two ovens and their accessories constructed in accordance with my invention. Fig. 2 shows the same in horizontal section, the right-hand half of the figure being a section taken on the line *xx* of Fig. 3 and the left-hand half being a section taken on the line *yy* of Fig. 3. Fig. 3 is a vertical centrally-transverse section of one of my ovens. Fig. 4 shows in side elevation three courses of bricks constituting a preferred form of the bottom of my oven. Fig. 5 is a plan view of the middle course, looking downward, on the lines 5 5 of Fig. 4. Fig. 6 is a section on the line 6 6 of Fig. 4.

Coke-ovens are usually arranged in two rows, placed back to back and provided with a central flue. I have shown in Figs. 1 and 2

two such ovens on one side of a double row and communicating with the central flue by means of a flue 2; but my improvements may be equally well applied to any of the well-known forms and arrangements of coke-ovens. My oven, as shown, is of the beehive type, having circular vertical walls 3 and an arching top 4, provided with a central aperture 5, which is capable of being tightly closed, as shown. My oven is further provided with a false bottom laid on a suitable foundation and preferably inclined from the rear to the front of the oven, as shown in Fig. 3. This bottom may be of any desired construction suitable for supporting the coal and allowing the volatile products of combustion to be drawn downward through itself. My preferred form consists of three courses of bricks, the lower course 6 being made of rectangular bricks 7, of the usual form, laid solid. On this course is laid the course 8, which consists of bricks 9, provided with means, such as lateral projections 10, for keeping the bricks slightly separated and with transverse recesses 11 in their under edges, thus forming when the course is laid a series of channels running along on top of the course 6 and opening upward between the bricks 9 to apertures left by the abutting projections 10, as clearly shown in Figs. 4, 5, and 6. The top course 12 is formed of bricks 13, beveled on their lateral faces, as shown in Fig. 4. These bricks are laid dry—that is, without mortar—with their upper edges in contact. Obviously they will fit together with sufficient looseness to allow of gaseous products of combustion being drawn down between them through the apertures provided by the peculiar shape of the bricks 9.

For the purpose of creating a draft sufficient to maintain the ignition of the charge and drawing off the products of combustion a pipe 14 is carried up beneath the oven, to the center thereof, its open end 15 reaching just to the bottom of the second course 8 of bricks. The pipe is also preferably provided with a branch 16, running from the bend 17 of the pipe 14 to the front of the oven, where it penetrates, just as does the end 15, through the bottom course of brick forming the false bottom. By this means a draft is created through the bottom of the oven at two points,

and by reason of joining the two pipes 16 and 15 at the bend 17 the draft is made equal at the upper end of each pipe, and thus the charge is prevented from burning away at one point faster than at the other. I consider it important to provide a pipe, such as 15, at the center of the oven, as by this means the process of coking is carried on much more equably than when such pipe is laid to the front only of the oven. The pipe 14 is carried along a convenient distance to any suitable receptacle, such as a siphon-box 18, which drains off through a short pipe 19 such of the products of combustion as have been condensed, the pipes 14 being laid on a slight incline, as shown, so that they will drain readily. The pipes 14 are preferably (see Fig. 2) continued a short distance beyond the boxes 18 and are then provided each with a valve 20, beyond which all the pipes 14 are connected to a gas-main 21, through which such of the products of combustion as have not been condensed are drawn by a suitable exhaustor attached to the pipe 21, which of course also maintains the draft in the oven. Air is admitted to the oven through apertures 22 in its front, arranged to be closed at pleasure. In the preferred form of my oven these apertures connect with pipes 23, which lead to another pipe 24, carried around the oven near its top, from which pipe 24 a number of small apertures 25 open into the interior of the oven, through which the air is thus admitted in a number of fine gentle streams.

As I have previously stated, my process includes the admission of steam beneath the coke for the purpose of clearing and quenching the same, and I provide for its admission by means of pipes 26, laid around the circumference of the oven at the outer edge of the middle course of bricks 8. These pipes 26 are provided with a number of holes 27, opening into the space formed in the said course of bricks 8, and are connected with a system of pipes 28, through which steam may be forced as desired from any convenient source.

The process which goes on in my oven as thus constructed may be described as follows: The oven is charged with a suitable quantity of smudge, which is kindled on its top surface, and as soon as it is well lighted the flue 2 and the aperture 5 are closed, the front opening 29, Fig. 3, is bricked up, the valve 20 in the pipe 14 is opened, and the exhaustor attached to the said pipe is started, the apertures 22 being at the same time opened for the admission of air. A downward draft is thus immediately created, and the process of coking commences. The process goes on until the by-products resulting from the combustion—such as coal-tar, volatile oils, and ammoniacal liquors, as well as more or less of the sulfur usually found in coal—have been driven off. The valve 20 is then closed, the flue 2 or the aperture 5, Fig. 3, is opened, and steam is turned on through the pipes 28 and 26, whence it is forced through the channels

in the course of bricks 8 and up through the coke, thereby driving out such sulfurous gases as remain therein and at the same time quenching the coke. This is continued, of course, until the fire is extinguished, when the charge is drawn. The oils, ammoniacal liquors, &c., resulting from the combustion are condensed in the pipes 14 and siphon-boxes 18 and are thence drawn off through a main 30 to suitable separators, where they are separated and made ready to be utilized. The non-condensable gases, much the greater part of which is inflammable, are drawn through the pipes 14 and main 21 by means of the exhaustor and may be carried to any suitable washing apparatus, after which they may be used to produce heat or they may be carbureted and used to produce light. Thus it will be seen that I am able to save all the by-products produced by my process, which is thus made economical as well as efficient.

I consider an important feature of my process to consist in the reversal of the direction of the draft after the by-products have been volatilized and drawn off and the forcing of the steam upward through the coke, as by this means the sulfurous gases remaining in the coke are driven off and the resulting product is left very pure and free from sulfur.

Many changes may be made in the details of the apparatus which I have shown and described without departing from my invention, as will be obvious to those skilled in the art.

I claim—

1. The herein-described process of producing coke, which consists in igniting a charge of smudge at its top surface and introducing a supply of air above the same, producing a downward draft through the charge and thereby drawing the products of combustion through the same until the volatile constituents of the coal have been driven off, and then shutting off said downward draft and forcing steam in beneath the coke and up entirely through the same in the opposite direction to the original downward draft, in such quantity that the coke is thereby quenched and the remaining sulfurous fumes driven out thereof, all substantially as described.

2. In a coke-oven, a false bottom of the character described, apertures above the same communicating with an air-supply, and an exhaust-pipe penetrating partly through the said false bottom, at or near the center thereof, for the purpose set forth.

3. In a coke-oven, a false bottom, apertures above the same communicating with an air-supply, an exhaust-pipe penetrating partly through the said false bottom at or near the center thereof, and a separate exhaust-pipe connected with the main exhaust-pipe at a point below the false bottom and extending therefrom to one edge of the oven, for the purpose set forth.

4. In a coke-oven, a false bottom, consisting of three layers, the lower layer being impermeable and continuous, the middle layer

consisting of bricks having channels formed in their under faces and being provided with laterally-extending projections as described, and the upper layer consisting of bricks laid loosely to form a practically continuous top surface, the said latter bricks being beveled on their side faces, all substantially as described.

5. In a coke-oven, a false bottom, means for drawing the products of combustion downwardly through the same, pipes laid around the circumference of the same and connected with a steam-supply, said pipes being provided with a plurality of escape-openings for the steam and means for introducing air above the said false bottom, all substantially as described.

6. A coke-oven comprising an oven proper having a false bottom consisting of three layers of bricks, pipes arranged to draw the products of combustion downwardly through the said false bottom, said pipes being connected with suitable exhausting and condensing apparatus, pipes extending around the circumference of the false bottom, adjacent to the middle layer thereof and provided with a plurality of openings, these latter pipes being connected with a steam-supply, and pipes for the admission of air connected with a plurality of holes extending around the oven above the level of its charge, all substantially as described.

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In testimony whereof I have hereunto subscribed my name this 3d day of March, 1896.

JOHN THOMAS KEY.

Witnesses:

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