

No. 732,938.

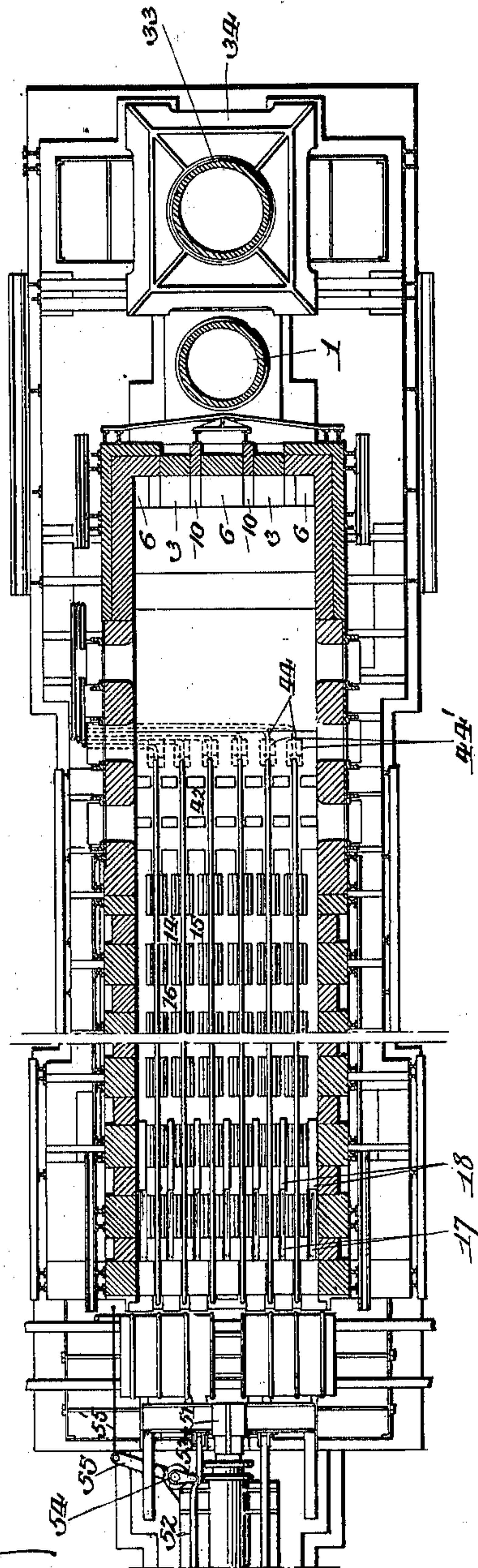
PATENTED JULY 7, 1903.

J. A. HERRICK.  
HEATING FURNACE.  
APPLICATION FILED MAY 6, 1902.

NO MODEL.

5 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:  
*Wiley Crane*  
*W. W. Partridge*

INVENTOR:  
*James A. Herrick*  
*By Charles N. Bunker*  
*Atty.*

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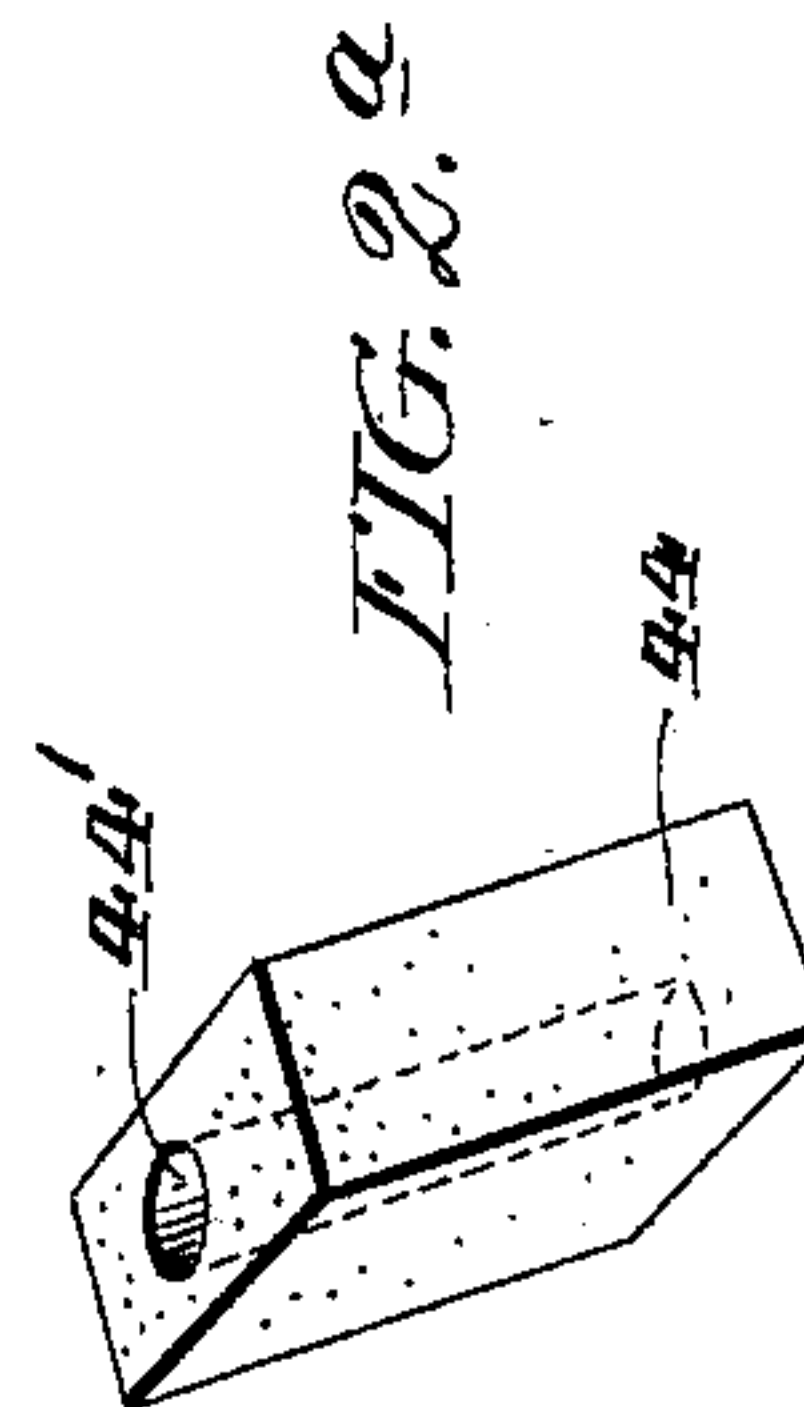
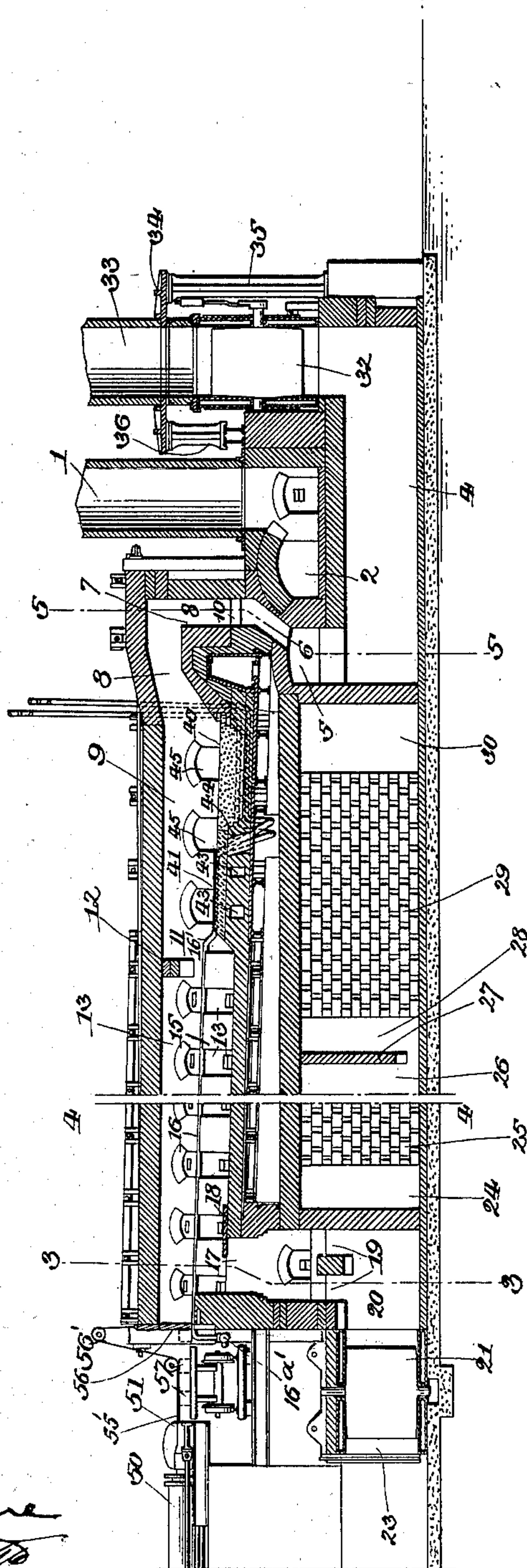
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APPLICATION FILED MAY 6, 1902.

NO MODEL.

5 SHEETS—SHEET 2.

FIG. 2.



WITNESSES:

Wiley Crane  
W. H. Hartley

INVENTOR:

James A. Herrick  
By Charles H. Butler  
att'y



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5 SHEETS—SHEET 3.

FIG. 3.

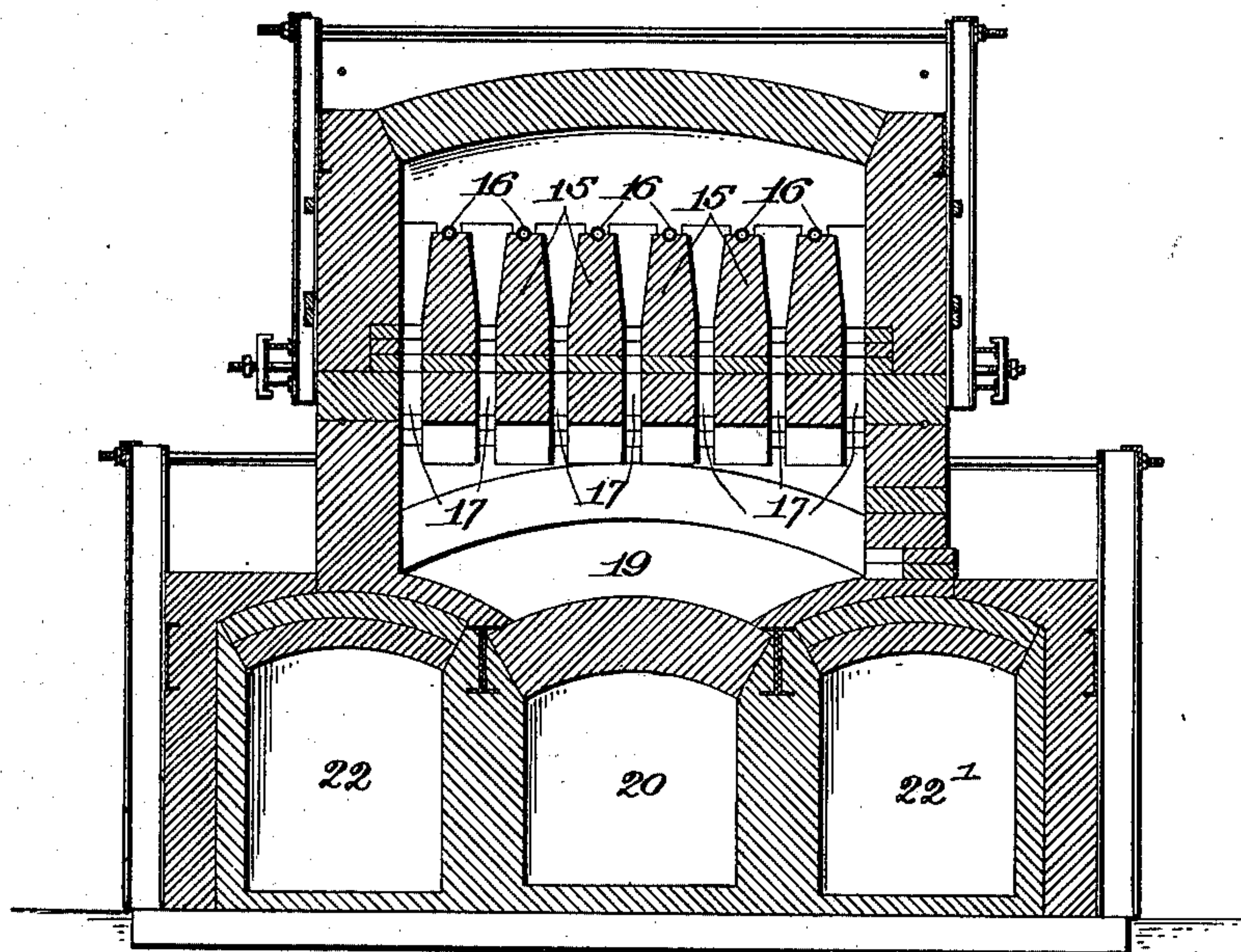
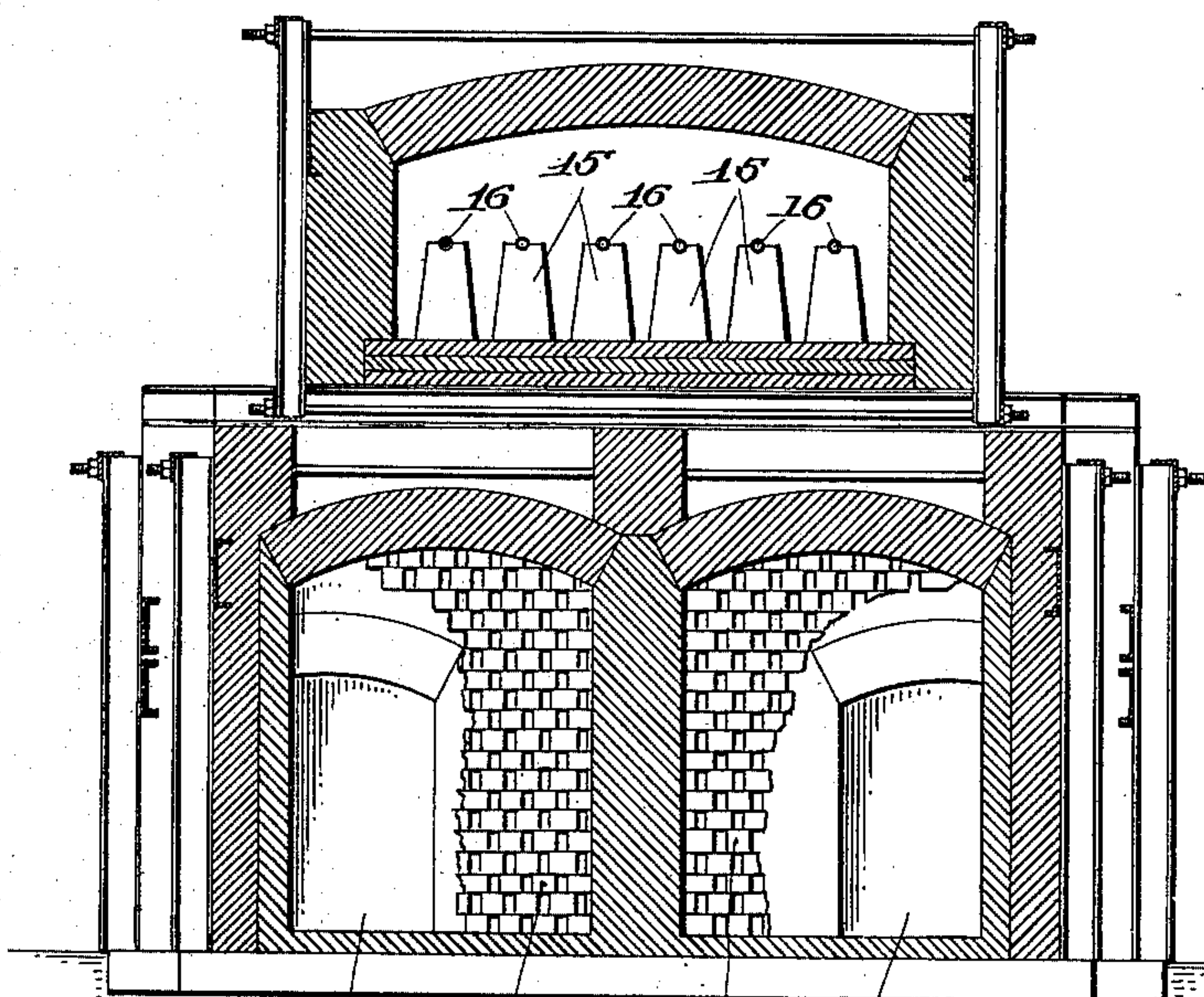


FIG. 4.



WITNESSES:

Wiley Crane  
M. C. Cartridge

22 25 25-1 22-1

INVENTOR:

James A. Herrick  
By Charles H. Butler  
att'y



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NO MODEL.

5 SHEETS—SHEET 4.

FIG. 5.

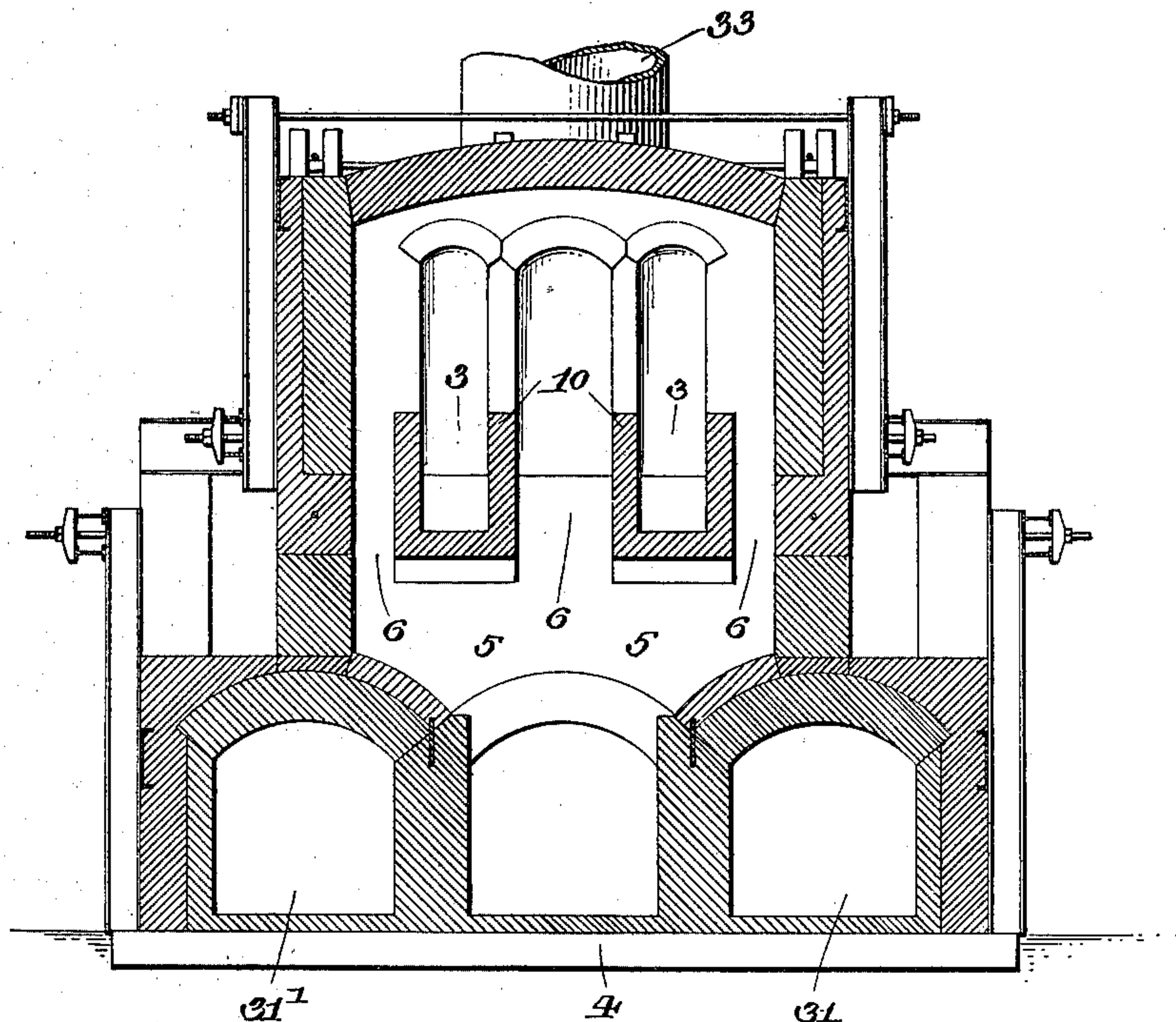
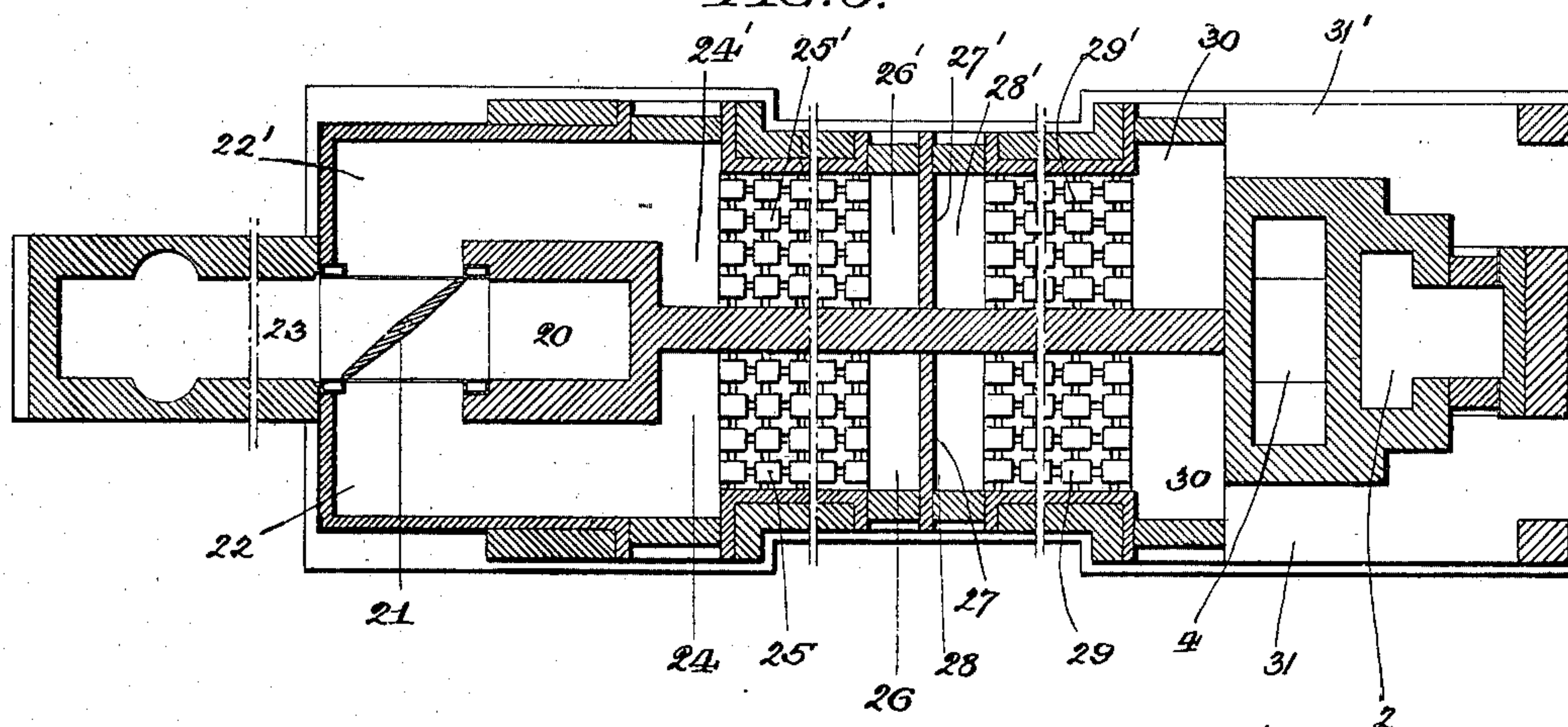


FIG. 6.



WITNESSES:

Walter E. Crane  
[Signature]

INVENTOR:

James A. Herrick  
By Charles N. Butler  
Atty



No. 732,938.

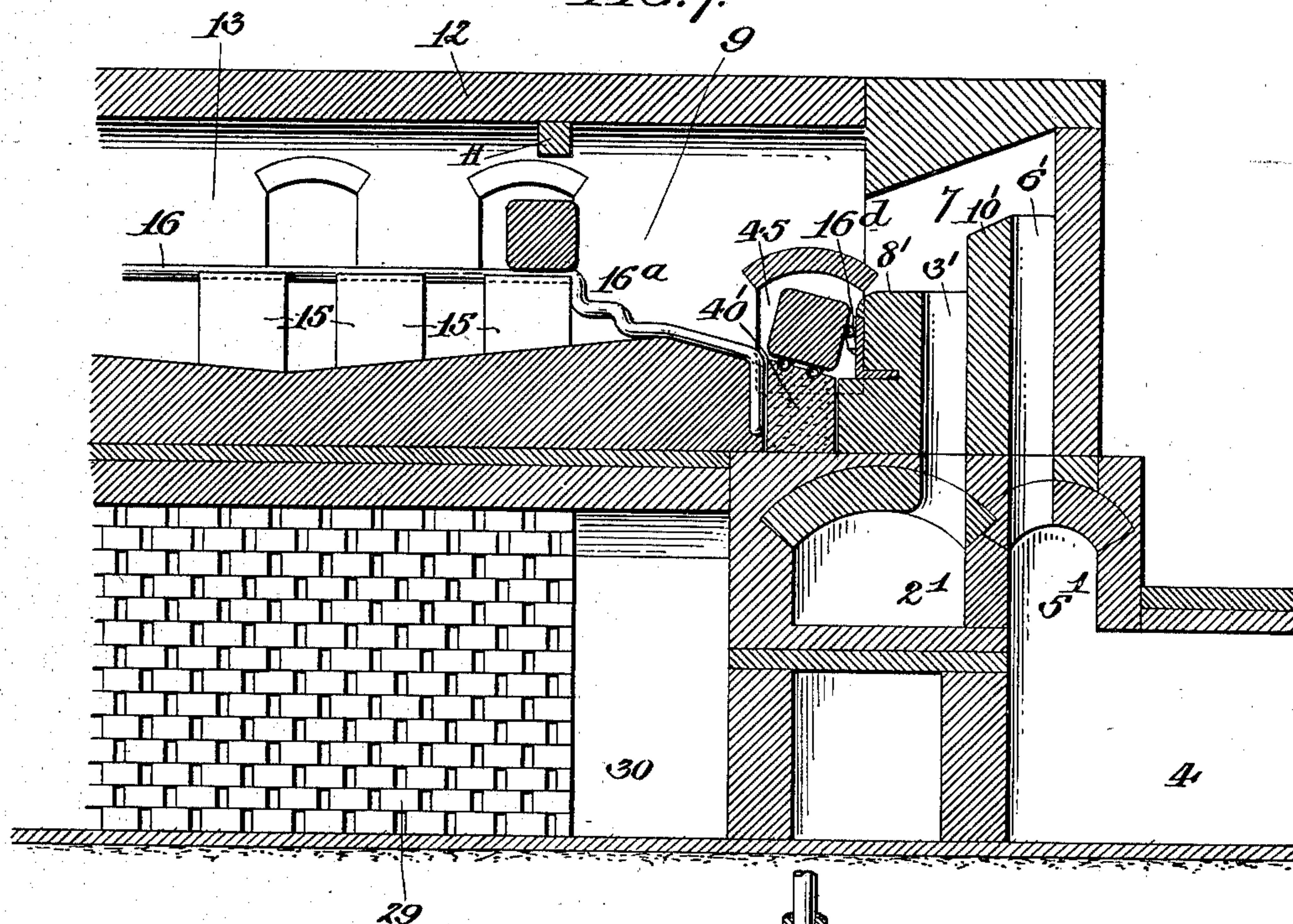
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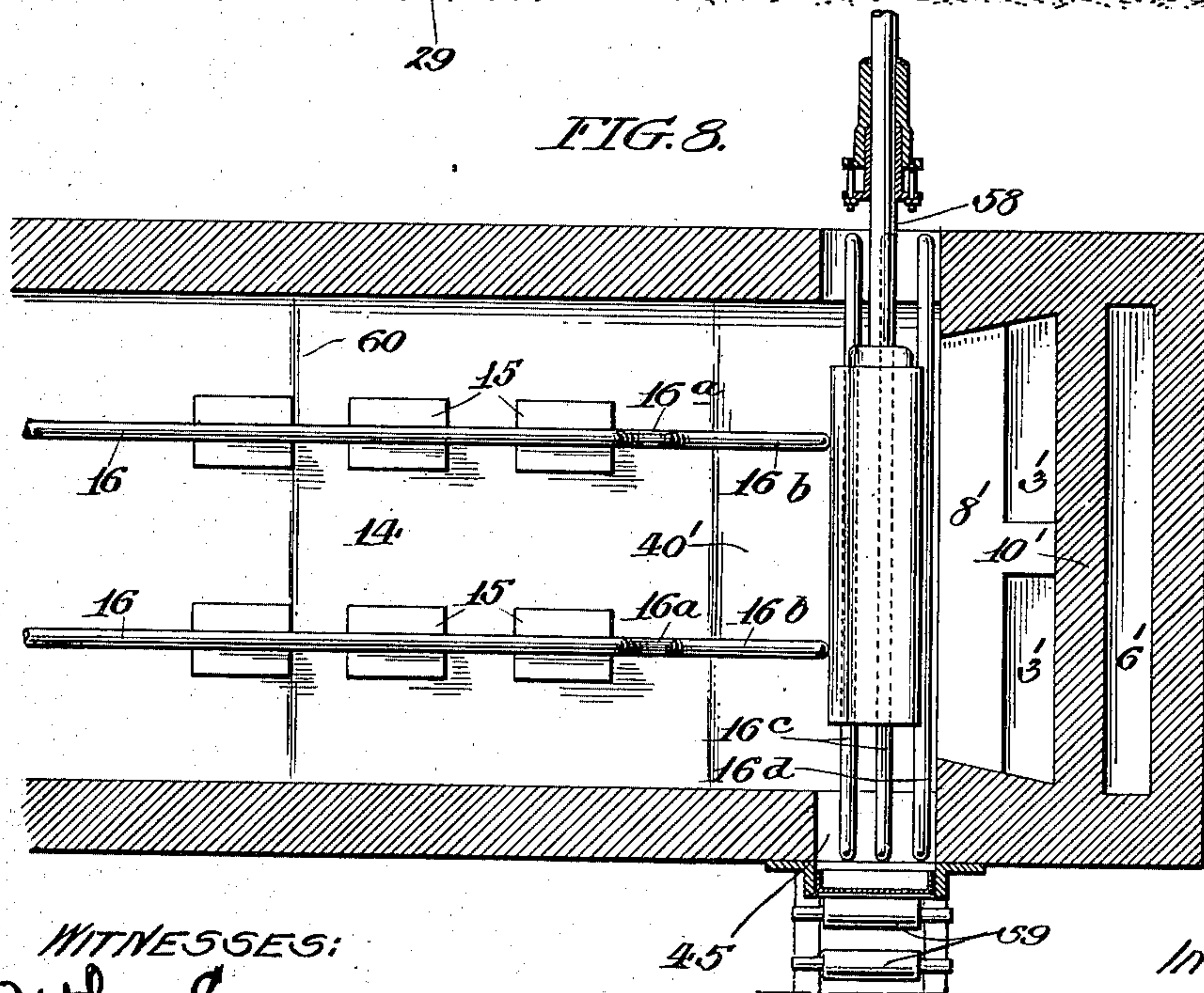
NO MODEL.

5 SHEETS—SHEET 5.

*FIG. 7.*



*FIG. 8.*



WITNESSES:

Utley Crane  
Part 1

**INVENTOR:**

James A. Herrick  
By Charles N. Butler  
att'y



# UNITED STATES PATENT OFFICE.

JAMES A. HERRICK, OF JENKINTOWN, PENNSYLVANIA.

## HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 732,938, dated July 7, 1903.

Application filed May 6, 1902. Serial No. 106,126. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES A. HERRICK, a citizen of the United States, residing at Jenkintown, in the county of Montgomery and State of Pennsylvania, have invented certain new and useful Improvements in Heating-Furnaces, of which the following is a specification.

This invention is a heating-furnace of improved construction having special means for handling the furnace-gases and the billets or ingots treated.

The nature and characteristic features of the improvements will more fully appear by reference to the accompanying drawings, in illustration thereof, of which—

Figure 1 is a sectional plan view taken through the heating-chamber. Fig. 2 is a vertical longitudinal sectional view. Fig. 2<sup>a</sup> is a perspective view of a block employed in constructing the heating-chamber bottom for passing the ways therethrough. Fig. 3 is a vertical transverse sectional view taken on the line 3 3 of Fig. 2. Fig. 4 is a vertical transverse sectional view 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 sectional plan view taken through the regenerators proper. Fig. 7 is a vertical longitudinal sectional view in illustration of the discharge end used for large billets and ingots, and Fig. 8 is a sectional plan view of the construction shown in Fig. 7.

Referring to the drawings, the furnace is heated by gas passed from the gas-tube 1 through the passage 2 and its ports 3, combined with hot air passed from the conduit 4 through the passage 5 and its ports 6, the gas and air combining and burning in the mixing-chamber 7 and combustion-chamber 8 with production of flame in the heating-chamber 9, in which the billets are subjected to a high degree of heat, or the arrangement may be modified so that the gas-passage 2', having the ports 3', combine with the hot-air passage 5', having the port 6', in delivering air and gas to the mixing-chamber 7. The formation of the ports 3 and 6 by means of the wall 10 or the ports 3' and 6' by means of the wall 10' admits of a ready regulation of the point at which the air and gas shall be combined and a consequent regulation of the place of combustion

through the facility with which the heights of the walls separating the ports may be varied, by which the heating operation in the chamber 9 may be regulated. In other words, the construction is such that the walls separating the ports can readily be built up or torn down to the point required for effecting the desired combination of air and gas without dismantling other parts of the furnace. To further regulate the heating action in the chamber 9 and to direct the flame issuing therefrom in the manner desired for heating the billets, a movable arch or baffle 11 depends from the furnace-roof 12, this arch baffling the flame and directing it downward toward and along the bottom of the chamber 13, so that the heating-gases flow through the passages 14 between the pedestals 15, beneath the billets or ingots, which are carried by the inclined water-cooled ways 16. It will be seen that since the arch is not an integral part of the roof, but may be removed without affecting the latter, it may be placed at or readily removed to the position required for directing the flame in the manner determined to be most efficient, and thereby the heating-gases may be directed through the chamber 13 in the manner best suited for heating the billets or ingots as they move along the ways 16 to the chamber 9. The waste gases escape from the chamber 13 through the ports 17, which are provided with sliding valves or baffles 18 for regulating the port-openings and controlling the escape from the heating-chamber 13, by which the heating action both above and below the billets may be regulated. From the ports 17 these gases escape through the passages 19 and 20 to the butterfly-valve 21, which directs them to the regenerative-passage 22, whence they flow through the chamber 24, checkers 25, chamber 26, beneath the baffle 27, chamber 28, checkers 29, chamber 30, passage 31, and valve 32 to the stack 33. In this position of the mechanism the cold air enters by the passage 23, now communicating with the passage 22', whence it flows by the chamber 24' through the checkers 25', chamber 26', beneath the baffle 27', through the chamber 28', checkers 29', chamber 30', and channel 31' to the valve 32, by which it in its now heated condition is directed into the passage 4. The chambers 24 and 24', 26 and 26', at the ends of the check-



ers 25 and 25', the baffles 27 and 27', the chambers 28 and 28', 30 and 30', at the end of the checkers 29 and 29', serve to effect an improved distribution of the waste gases and the air in their passage through the regenerators, tending to effect the more uniform distribution of the same throughout the height of the checkers.

It will be understood that the cold-air valve 21 may be located above the furnace-bed and arranged like the valve 32 at the stack end of the furnace.

The chamber 9 is provided with a basic and basic-brick bottom, the part 40 being made basic to resist the higher oxidizing influence to which it is subjected in the final heating of the billets deposited thereon, while the part 41 may be made of basic bricks, because it is less subject to influence from oxidation.

The portion 41 of the furnace-bottom has embedded therein a section of the water-cooled ways 16, upon which the billets are received as they slide down the inclines 16', these ways having the downwardly-inclined portion 16'', which are severally passed through specially-formed blocks 44, having apertures 44' therethrough.

The furnace is charged by means of a ram 50, whose head 51 carries a cam-track 52, which engages with the short arm 53 of a rocking lever pivoted at 54. This lever has an arm 55, which is connected by a chain 55' with the furnace-door 56, the chain passing over the rollers 56'. As the ram advances to push the billets or ingots 57 into the furnace the door is raised simultaneously therewith. The ways 16 extending through the charging end of the furnace downward to the header 16<sup>a</sup>, they receive the billets as they enter the secondary heating-chamber 13, through which they are carried to the primary heating-chamber 9, being deposited upon the hearth or bottom portion 41 and work forward to the bottom portion 40, from which they are removed, when sufficiently heated, through the doors 45.

In furnaces for large billets and ingots I prefer to adopt the construction shown in Figs. 7 and 8, in which the ways 16 are provided with the steps 16<sup>a</sup> for turning the billets or ingots over, from which they are carried down the inclined sections 16<sup>b</sup> to the bridge-wall 8'. In this position the ingot is supported by the transverse ways 16<sup>c</sup> of the hearth 40' and the way 16<sup>d</sup> of the bridge-wall 8'. The portions of the ingot which have been cooled by its travel upon the water-cooled ways or for any reason require further heating are exposed to the direct action of the flame as it strikes over the bridge-wall. When it is desired to remove the ingot, it is pushed by the ram 58 through the door 45 upon the rolls 59 of any suitable carrying mechanism.

To remove scale that may be deposited from the billets dropping upon the bottom portion 41, apertures 42 are formed therein, through which the scale is passed to the rake-out pas-

sages 43, which are easily accessible from the sides of the furnace. The trough 60 may be employed for collecting and removing deposits of scale and cinder.

Having thus described my invention, I claim—

1. A furnace having a primary heating-chamber, a secondary heating-chamber, a movable baffle variable for controlling the flame and gases in passing from said primary to said secondary chamber, a series of pedestals in said secondary chamber, a series of water-cooled ways supported by said pedestals and extending downwardly through said secondary chamber to said primary chamber, and passages between said pedestals for passing the gases parallel to and below said ways, substantially as specified.

2. A furnace having a primary heating-chamber, a secondary heating-chamber, a series of pedestals, providing transverse and longitudinal passages in said secondary chamber, a series of water-cooled ways supported by said pedestals and extending downwardly through said secondary chamber to said primary chamber, said primary chamber having a hearth by which said ways are supported, substantially as specified.

3. A furnace having a primary heating-chamber, a secondary heating-chamber, a baffle for controlling the flame and gases in passing from said primary to said secondary chamber, pedestals in said secondary chamber and, a series of water-cooled ways supported by said pedestals and extending downwardly through said secondary chamber to said primary chamber, said primary chamber having a hearth by which said ways are supported and through which they are passed, substantially as specified.

4. A furnace having gas and air ports having a separating-wall variable for determining the point of combining gas and air, a primary heating-chamber with which said ports communicate, a baffle for controlling the outlet from said chamber, a secondary heating-chamber, a series of pedestals in said secondary chamber, a series of water-cooled ways supported by said pedestals and extending downwardly through said secondary chamber to said primary chamber, said ways passing through the bottom portion of said primary chamber, and a series of openings through the bottom portion of said primary chamber, substantially as specified.

5. A furnace having gas and air ports separated by a wall variable for determining the place of combining gas and air, a primary heating-chamber with which said ports communicate, a secondary heating-chamber, a baffle for controlling the passage of flame and gas from said primary to said secondary chamber, a series of pedestals in said secondary chamber, a series of water-cooled ways supported on said pedestals and extending through said secondary chamber to said primary chamber, and valved ports for control-



ling the outlet from said secondary chamber, substantially as specified.

6. A furnace having a primary heating-chamber, a secondary heating-chamber, pedestals providing transverse and longitudinal passages in said secondary chamber, water-cooled ways supported on said pedestals and extending through said secondary chamber to said primary chamber, and a bottom in said primary chamber comprising blocks having apertures therethrough, through which said ways are passed from said primary chamber, substantially as specified.

7. A furnace having a heating-chamber, ways in said chamber, in combination with a ram for charging material into said chamber upon said ways, a camway movable with said ram, a rocking lever operated by said camway, and a door connected with said lever and operated thereby, substantially as specified.

8. In a heating-furnace, a hearth, in combination with inclined ways supported thereon and adapted for turning a billet or ingot carried thereby, and a bridge-wall adapted for holding said billet or ingot in the path of the furnace-flame, said bridge-wall being adapted for supporting said billet or ingot in its lateral movement from said hearth, substantially as specified.

9. In a heating-furnace, an inclined hearth, in combination with a bridge-wall at the lower end thereof adapted for holding billets or ingots in the path of the flame and supporting them in their lateral movement from said hearth, and water-cooled ways supported by said hearth for carrying said billets or ingots, substantially as specified.

10. In a heating-furnace, a hearth, a bridge-wall, ways for carrying billets or ingots over said hearth to said bridge-wall and disposing them in the path of the furnace-flame, and transverse ways supported by said hearth and bridge-wall for passing said ingots or billets through the side of the furnace, substantially as specified.

11. In a heating-furnace, a hearth, a bridge-wall, ways for carrying billets or ingots over said hearth in the path of the flame, transverse ways supported by said hearth and bridge-wall for passing said billets or ingots through the side of the furnace, and a ram for pushing said billets or ingots on said transverse ways, substantially as specified.

12. In a heating-furnace, a primary heating-chamber, a secondary heating-chamber, a series of pedestals in said secondary chamber, a series of water-cooled ways supported on said pedestals and extending through said secondary chamber to said primary chamber, and valved ports in the bottom of said secondary chamber for controlling the outlet therefrom, substantially as specified.

13. A furnace having a primary heating-chamber having a downwardly-inclined hearth, a secondary heating-chamber, a series of pedestals in said secondary chamber, a series of water-cooled ways supported by said pedestals and hearth, said ways extending downwardly through said secondary chamber onto said hearth and being stepped so as to turn the billets or ingots carried thereby, and a bridge-wall at the foot of said downwardly-inclined hearth adapted to receive said billets and hold them in the path of the flame, substantially as specified.

14. In a furnace for heating ingots, billets and the like, a combustion-chamber, in combination with a hearth, and a bridge-wall, said bridge-wall being adapted for holding billets, ingots and the like in the path of the flame and supporting them as they are moved transversely from said hearth, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of of the subscribing witnesses.

JAMES A. HERRICK.

Witnesses:

A. FLORENCE JERGER,  
UTLEY E. CRANE.