No. 672,381.

Patented Apr. 16, 1901.

A. LAUGHLIN.

HEATING FURNACE.

(No Model.)

(Application filed Dec. 2, 1898.)

3 Sheets—Sheet 1.

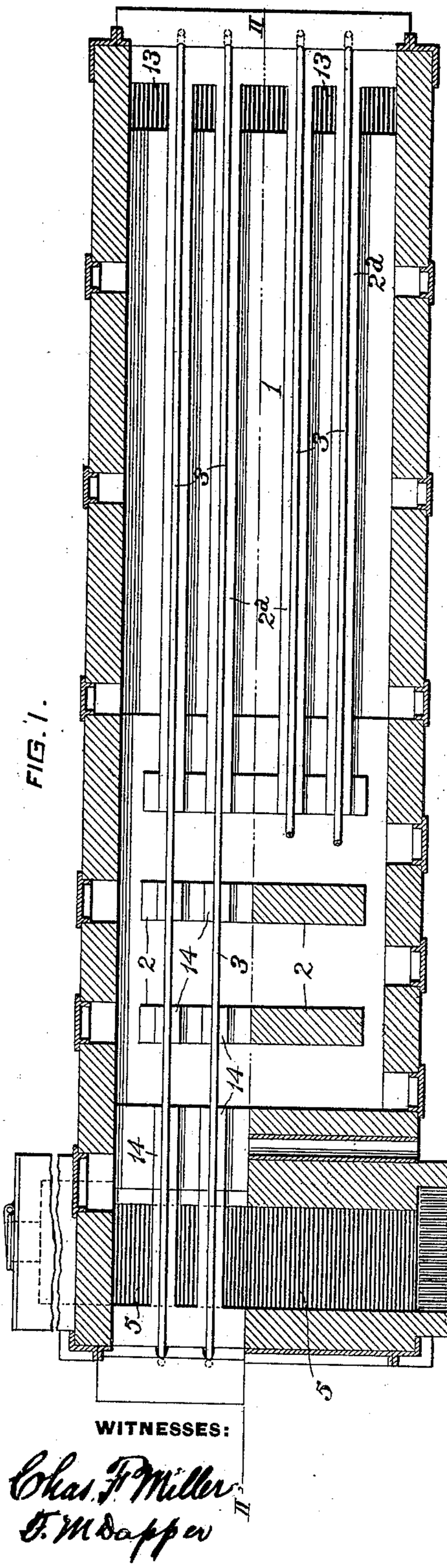

FIG. 1.

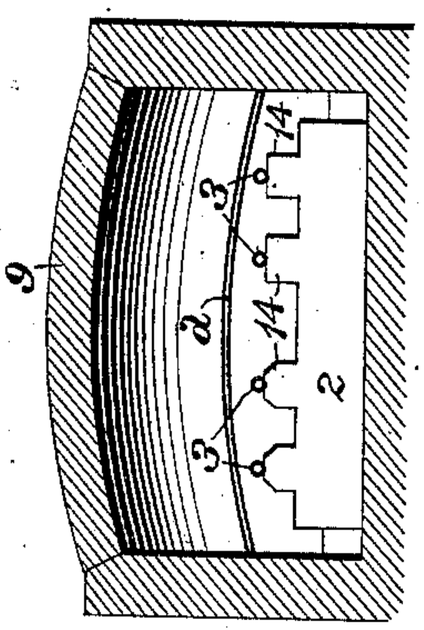

FIG. 2a

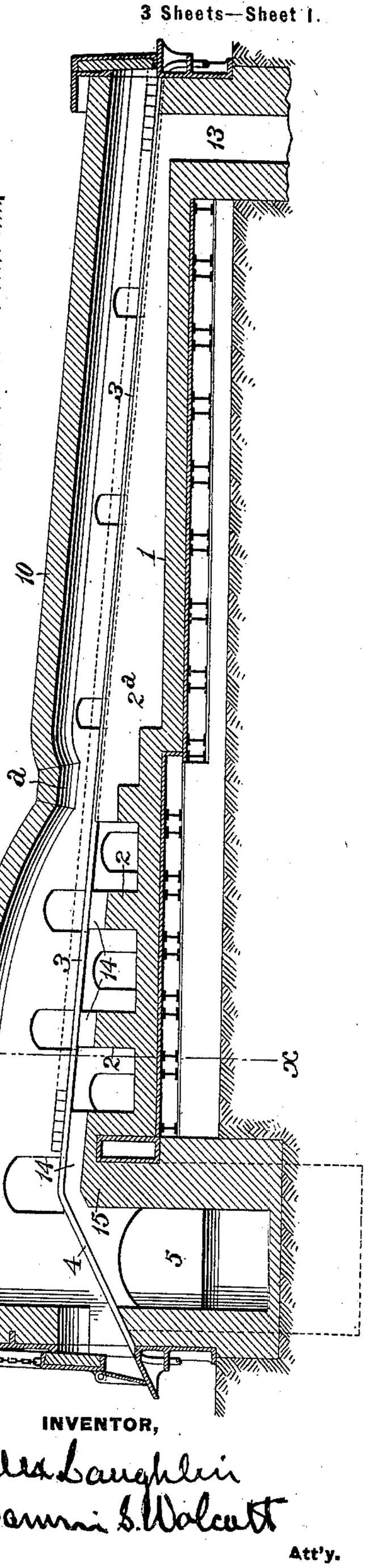

FIG. 2.

WITNESSES:

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FIG. 3.

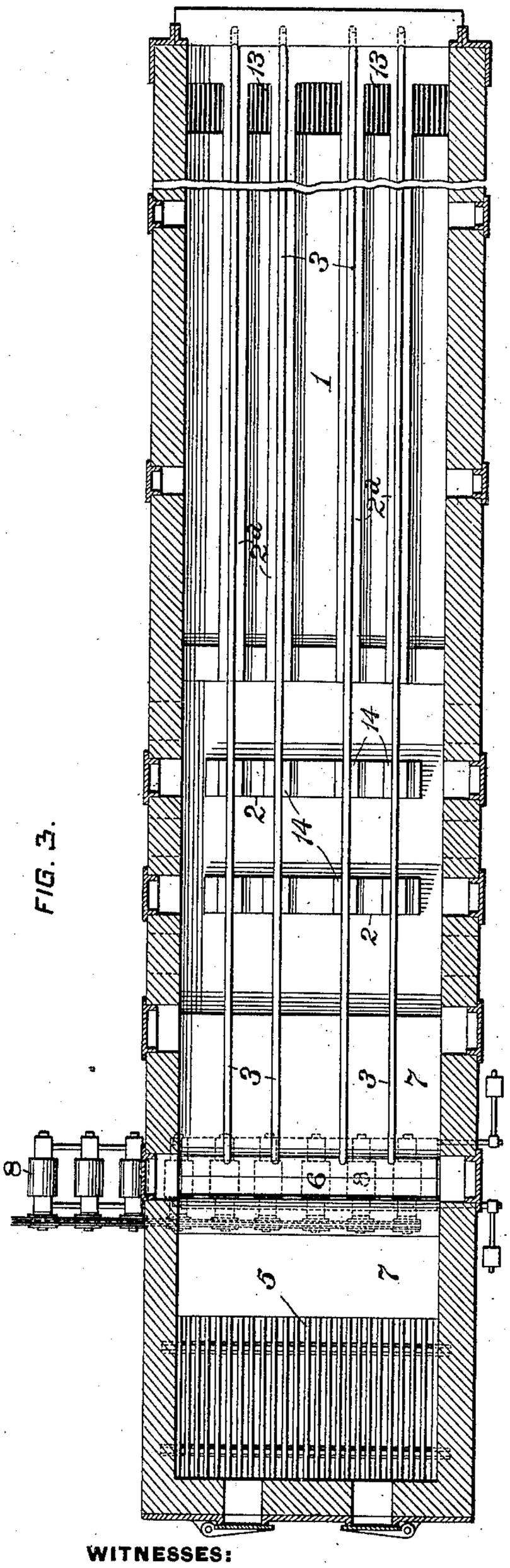
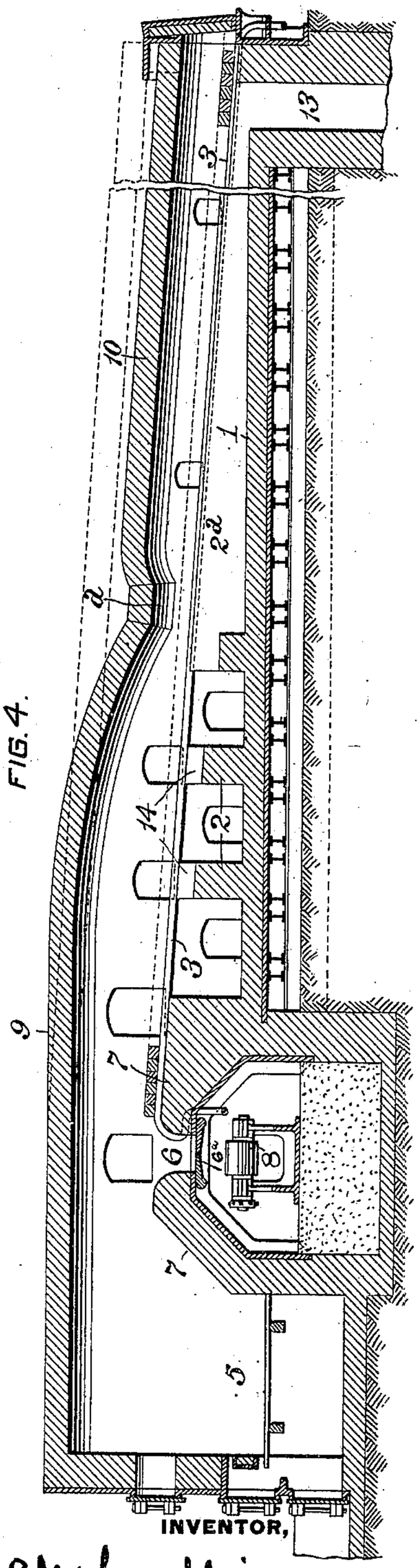


FIG. 4.



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No. 672,381. Patented Apr. 16, 1901.

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HEATING FURNACE.

(Application filed Dec. 2, 1898.)

(No Model.) 3 Sheets—Sheet 3.

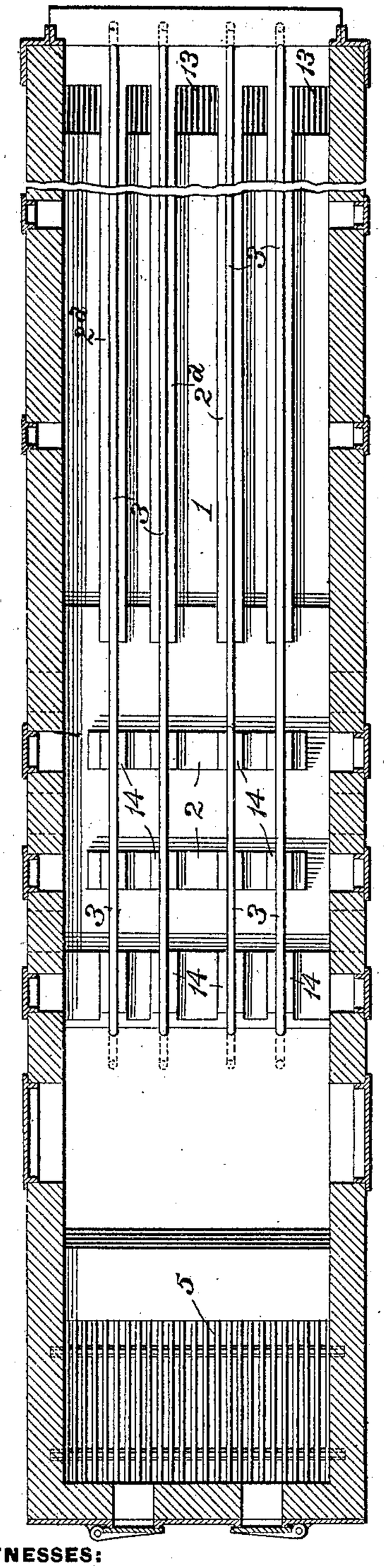

FIG. 5.

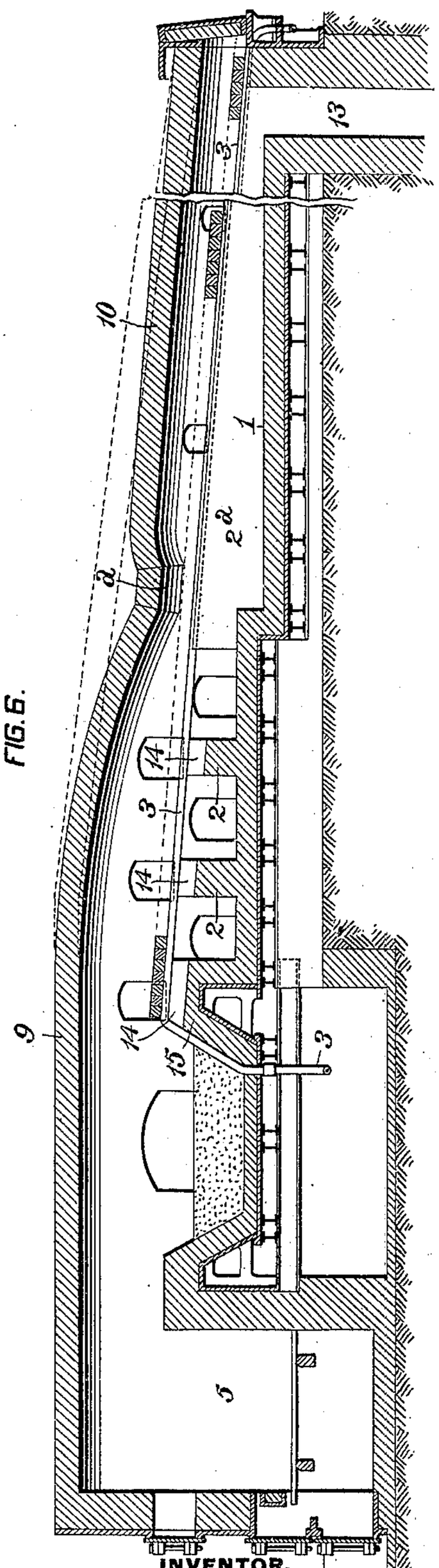

FIG. 6.

WITNESSES:

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UNITED STATES PATENT OFFICE.

ALEXANDER LAUGHLIN, OF SEWICKLEY, PENNSYLVANIA.

HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 672,381, dated April 16, 1901.

Application filed December 2, 1898. Serial No. 698,056. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER LAUGHLIN, a citizen of the United States, residing at Sewickley, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Heating-Furnaces, of which improvement the following is a specification.

It has heretofore been the general practice to construct continuous heating-furnaces with a roof approximately parallel from end to end with the bed of the furnace. This construction has been modified in some cases by giving the roof a gradual upward slope from the charging to the drawing or discharging end of the furnace, as shown in dotted lines in Figures 4 to 6. Both of these forms of furnaces are objectionable, for the reason that the heat and products of combustion have a free and unobstructed flow from the drawing or discharging end of the furnace back to the outlet-flues at the charging end. It follows by reason of this free flow that when sufficient heat is produced to raise the billets at the drawing or discharging end to the proper temperature approximately the same heating effect will extend nearly to the charging end of the furnace, so that the billets are raised and maintained at a high temperature for a considerable time before reaching the drawing or discharging end of the furnace. This high and maintained preheating results in a seriously high loss of metal by oxidation and bleeding at the billets.

The object of the present invention is to so construct this class of furnaces that the billets will be subjected to maximum heating only shortly prior to the time they are drawn or discharged from the furnace and will be gradually heated, but not to a temperature that will permit of material loss from the charging end up to the point where they will be subjected to the maximum heating.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Fig. 1 is a sectional plan view of a continuous heating-furnace of the automatic-discharge type having my improvement applied thereto. Fig. 2 is a longitudinal sectional elevation of the same. Fig. 2ª is a transverse section on the line *x x*, Fig. 2. Figs. 3 and 4 are views similar to Figs. 1 and 2, showing my improvement applied to furnaces having an automatic discharge through the bottom of the hearth. Figs. 5 and 6 are sectional plan and elevations showing my improvement applied to furnaces having drawing or discharge doors at the sides of the hearth.

In the practice of my invention the furnace as regards the bed 1, with its raised supports 2 2ª and the water-cooled bearings 3 for the billets, may be constructed in accordance with any of the forms known in the art; but it is preferred to provide for the automatic discharge of the billets from the point of highest heat, as set forth in reissued Letters Patent No. 11,666, granted to me and Joseph Reuleaux on the 31st day of May, 1898. This automatic discharge may be effected, as set forth in said Letters Patent, by extending the water-cooled bearings 3 with a sharp down inclination, as at 4, from the point of highest heat through an opening in the end of the furnace, the portions 4 of the bearings preferably extending over the inlet-flue 5. The bearings 3, with their extensions 4, form a practically continuous support for the billets from the charging to the discharging point. In the construction shown in Figs. 3 and 4 a slot or opening 6 is formed through the hearth 7 of the furnace, and the bearings 3 extend from the charging end of the furnace to this slot or opening, which latter is normally closed by downwardly-movable doors 6ª. A conveyer 8 of any suitable construction is arranged below the hearth in line with the slot or opening for transferring the heated billets as they drop through the slot and beyond the doors to the reducing-rolls.

The supports for the bearings 3 may be arranged transversely or longitudinally of the furnace; but it is preferred to combine both forms of supports, the longitudinal supports 2ª being arranged adjacent to the charging end of the furnace. Transverse supports are preferably employed in the heating-chamber, as the movements of the billets along the bearings will prevent any material accumulation of slag, &c., on the supports, and the pockets between such supports are readily accessible for the removal of the slag, &c. In heating large billets or ingots it is desirable

that the heat and products of combustion should pass under as well as over them, and in order to permit this circulation of the heat, &c., where transverse supports are used, the bearings 3 are raised above the transverse supports by narrow blocks or pillars 14, resting on the supports 2 and the bridge-wall 15, thereby forming longitudinal passages extending below the bearings 3 and in line with the passages formed by the longitudinal supports 2^a. It will be understood that these longitudinal passages may be formed by cutting away the bridge-wall and supports 2 at points intermediate of the bearings.

The roof of the furnace is formed in two or more sections 9 and 10. The section 9 is supported by the side and rear walls of the furnace at such a height above the furnace as will form an effective heating-chamber. The section 9 of the roof in the direction of its length is given a downward curve or inclination to its point of junction with the section 10, while the latter is extended on a straight line approximately parallel to the bearings 3. The roof of the furnace at the throat or point *a* of juncture between the sections 9 and 10 is supported at such a height above the bearings 3 that the billets shifted along said bearings will barely pass under the roof. The main portion of the section 10 may be a little higher than at the point *a;* but it is preferred that it should continue at approximately the same distance from the bearings 3 to the charging end or outlet-flues 13 of the furnace. By thus dropping the front portion of the roof a curtain or baffle wall is formed across the furnace to retard the flow of heat toward the charging end, so that the rear or heating chamber can be maintained at a much higher temperature than the front or preheating passage or chamber, and by the downward curvature in the roof a thorough dissemination of the heat is obtained. The lengths of the portions of the furnace covered by the two sections are so proportioned to the desired rate of movement of billets through the furnace that while passing through the preheating-chamber the billets will be heated as high as possible without injurious effects, and while passing from the baffle wall or curtain to the hearth or point of discharge they will be subjected for a sufficient time to the higher heat in the heating-chamber to raise them to a good rolling temperature.

As shown in Figs. 5 and 6, my improvement can be applied to that form of heating-furnace in which the billets are shifted along the water-cooled bearings to a hearth 11, from which they are removed through side doors 12 by tongs or other suitable means.

It will be readily understood by those skilled in the art that the furnaces may be heated by the combustion of solid fuel in a fire-chamber adjacent to the drawing or discharge end of the furnace, as shown in Figs. 1 to 6, or by the combustion of gaseous fuel introduced into the furnace by any of the many means well known in the art.

I claim herein as my invention—

In a continuous heating-furnace having billet-bearings extending longitudinally thereof, and having a heating-chamber adjacent to the drawing or discharge end of the furnace and a preheating-chamber adjacent to the charging end, a roof formed in two sections, the section above the heating-chamber being downwardly curved in the direction of its length in that portion remote from the point of discharge, and the section above the preheating-chamber approximately parallel to said bearings, and a drop or depressed portion in the roof intermediate said sections, substantially as set forth.

In testimony whereof I have hereunto set my hand.

ALEX. LAUGHLIN.

Witnesses:

DARWIN S. WOLCOTT,

F. E. GAITHER.