No. 696,607. Patented Apr. 1, 1902.

M. M. SUPPES & R. CROOKER, Jr.

HEATING FURNACE.

(Application filed Apr. 4, 1901.)

(No Model.) 4 Sheets—Sheet 1.

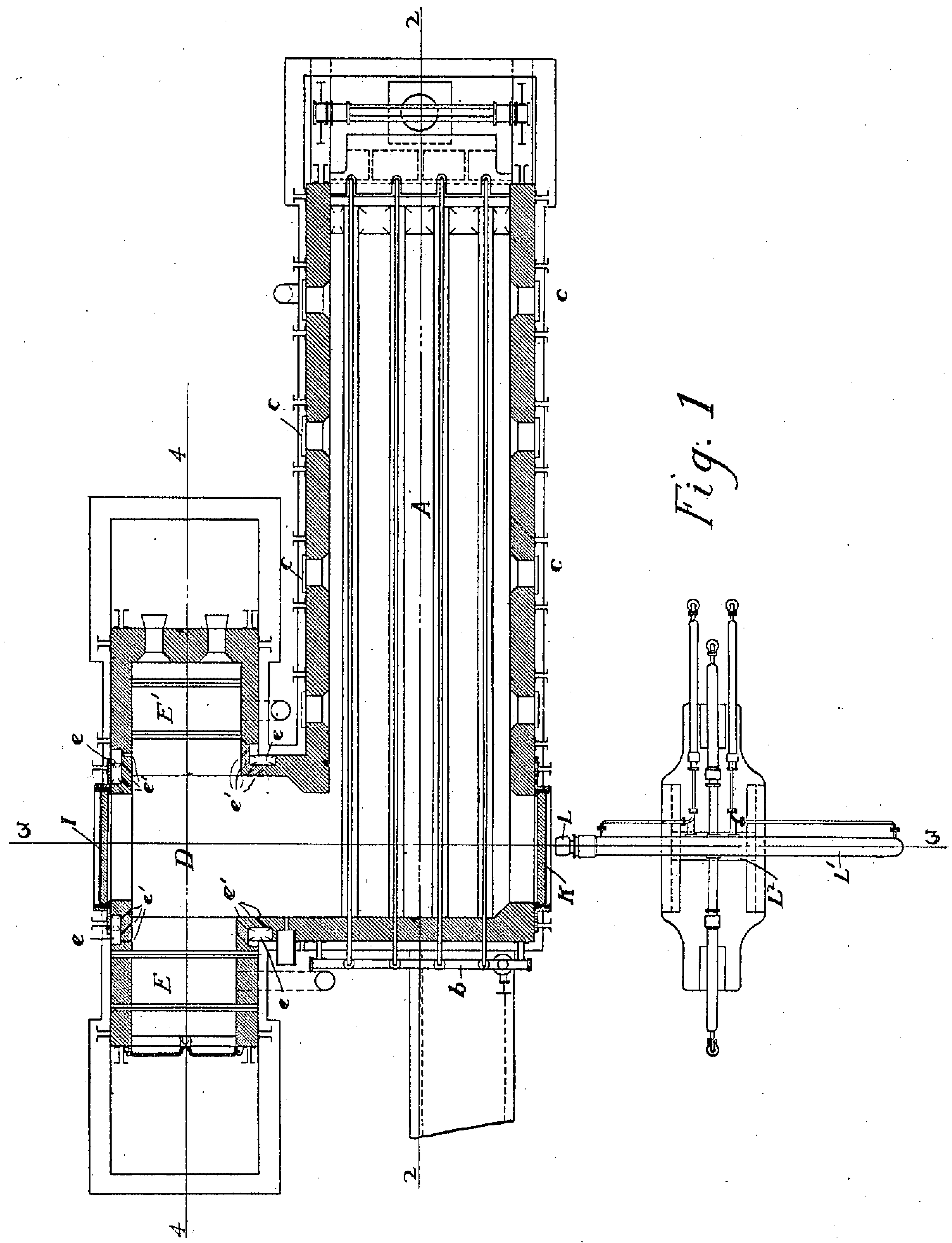

Fig. 1

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4 Sheets—Sheet 2.

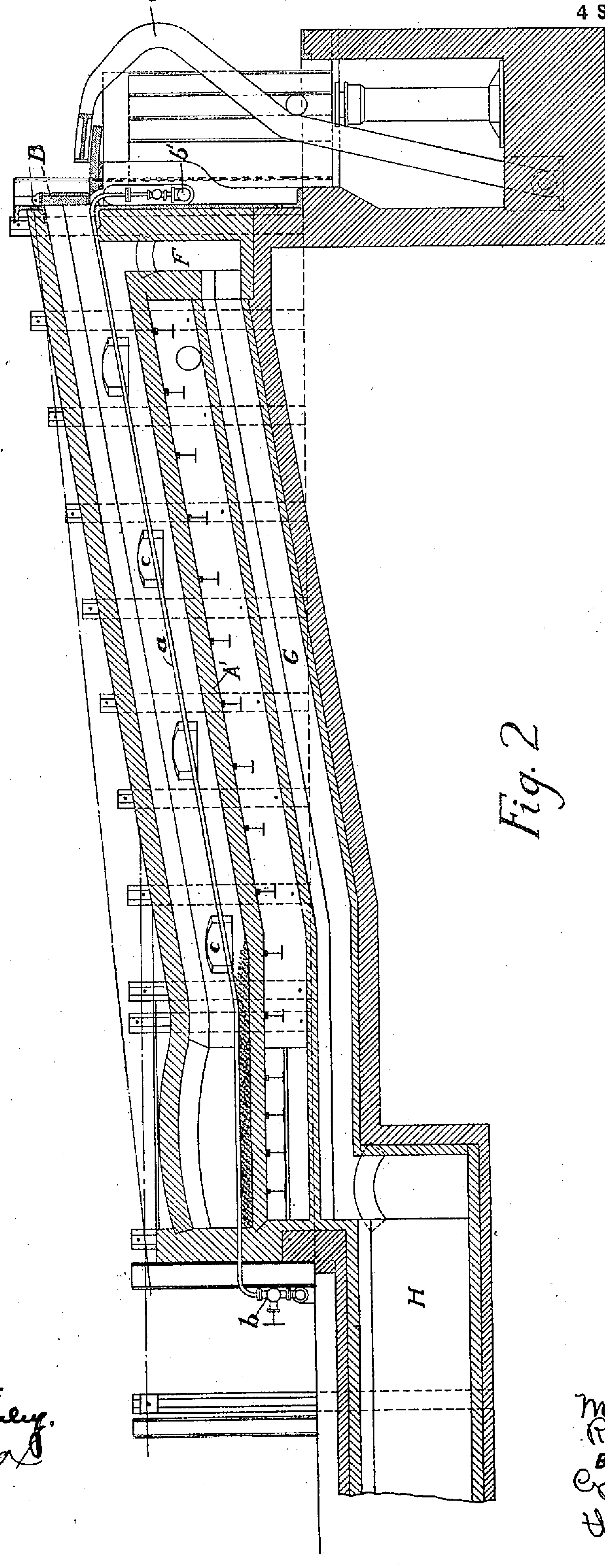

Fig. 2

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4 Sheets—Sheet 3.

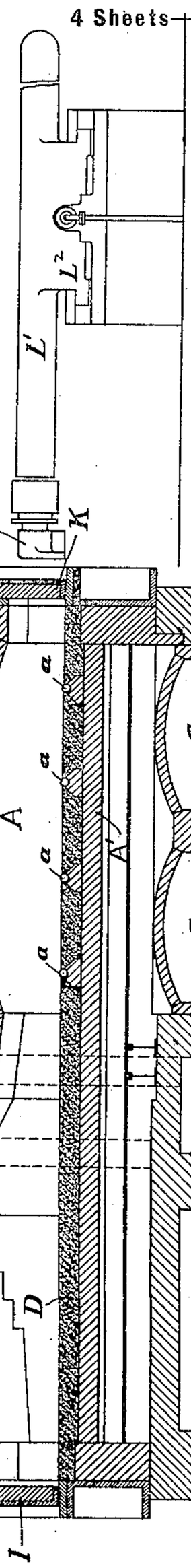

Fig. 3

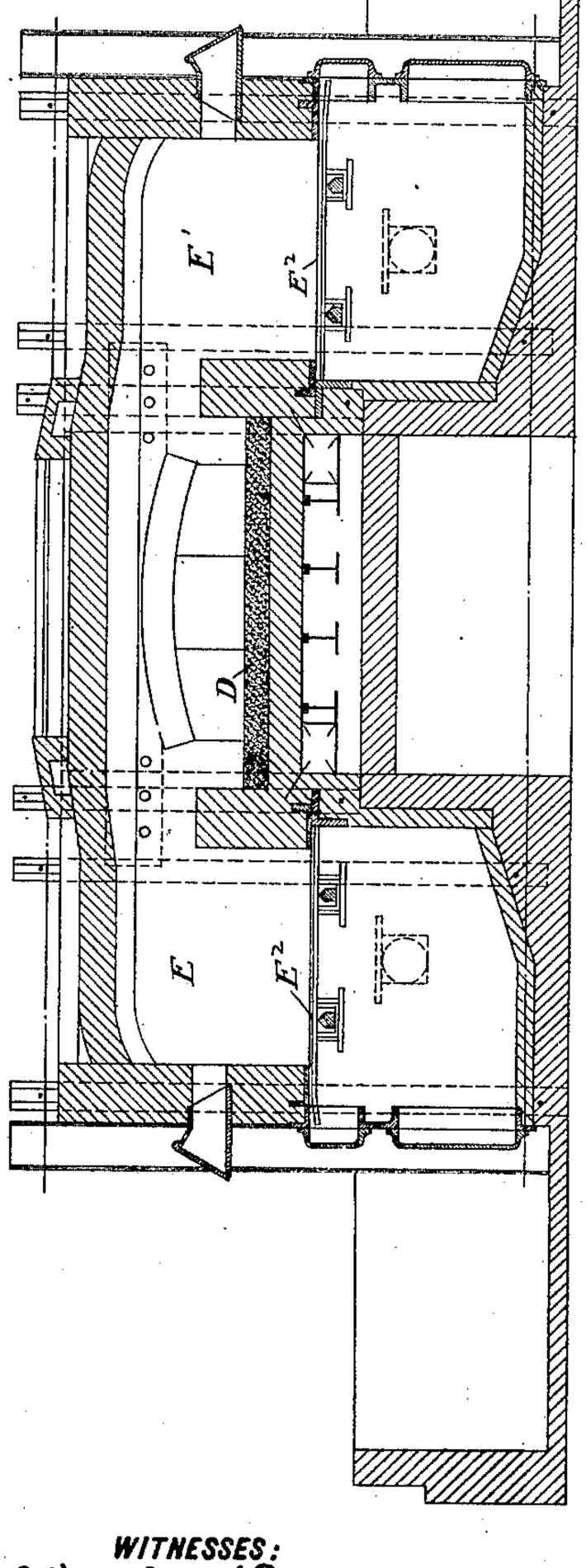

Fig. 4

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HEATING FURNACE.

(Application filed Apr. 4, 1901.)

(No Model.) 4 Sheets—Sheet 4.

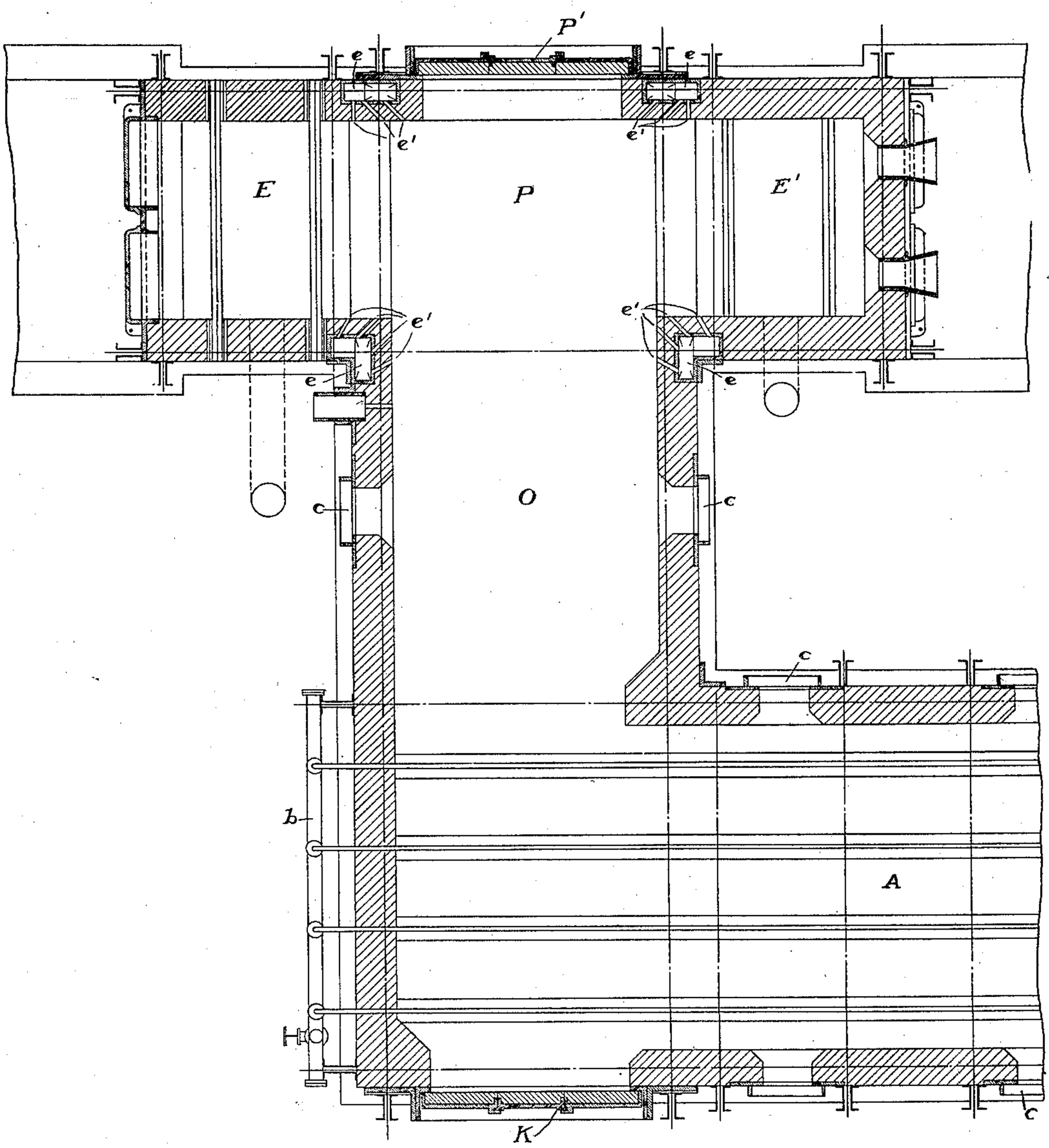

Fig. 5

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UNITED STATES PATENT OFFICE.

MAXIMILIAN M. SUPPES AND RALPH CROOKER, JR., OF ELYRIA, OHIO.

HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 696,607, dated April 1, 1902.

Application filed April 4, 1901. Serial No. 54,264. (No model.)

To all whom it may concern:

Be it known that we, MAXIMILIAN M. SUPPES and RALPH CROOKER, Jr., of Elyria, in the county of Lorain and State of Ohio, have invented a new and useful Improvement in Heating-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to furnaces for heating blooms, billets, ingots, &c., preparatory to rolling, and more particularly to what are commonly known as "continuous" furnaces, in which the blooms or other pieces being heated lie in a continuous row between the charging and delivery end of the furnace upon a suitable bed or hearth, along which they are moved by mechanical means, the introduction of successive blooms at the charging end causing the entire row to be advanced along said bed in the direction of the delivery end, where they are successively withdrawn.

The bed along which the blooms or other pieces are moved in the manner above described is usually formed by a number of water-cooled pipes, which act as skids or slides for the pieces, and those portions of the blooms which are in contact with such pipes are not heated uniformly with the rest of the billet, but are chilled or spotted to such an extent as to make them practically useless, except for a few special purposes. It has therefore been customary to provide at the end of the bed a finishing-hearth, onto which the pieces are pushed from the pipes and allowed to remain for a short time until uniformly heated. As heretofore constructed the finishing-hearth has been located at the end of the water-pipes, the continued movement of the blooms causing them to fall onto this hearth. Being highly heated, there is a constant tendency for the blooms to stick and weld together, and to prevent this they are manually manipulated and separated by means of suitable implements inserted through side doors of the furnace. This is a feasible and fairly successful practice with billets and other comparatively light pieces; but it is practically impossible to sufficiently manipulate heavy blooms and ingots in this manner to prevent their sticking and welding, and the treatment of such pieces in this type of furnace has heretofore presented a serious problem.

Our invention is designed to overcome the difficulties thus briefly stated and to provide means whereby the heating of blooms, ingots, &c., may be thoroughly equalized before they are taken to the rolls and at the same time may be readily kept from sticking and welding. We attain this object mainly by changing the location of the finishing-hearth from its old position at the end of the bed to a position at one side thereof, the blooms or other pieces being successively transferred from the bed to the hearth by an endwise movement or movement in a direction substantially at right angles to the line of their movement on the said bed. By this change in the location of the finishing-hearth we are enabled to transfer the blooms thereto without their sticking and welding together, while at the same time we retain to the full extent the equalizing effect of the hearth.

Our invention, therefore, broadly considered, consists in the combination, with a preheating furnace or chamber along which the blooms or other pieces are moved, of a laterally-situated finishing-hearth to which the blooms may be transferred by lateral or endwise movement. The finishing-hearth may be, and we prefer that it shall be, a part of the same furnace as the preheating-chamber, or it may be contained in a separate furnace connected with the preheating furnace or chamber by a passage through which the blooms are transferred.

Our invention also consists in the novel construction, arrangement, and combination of parts, all as hereinafter described, and pointed out in the appended claims.

The invention is also in its broadest sense independent of any particular type or construction of furnace and is therefore not limited to the particular type and construction shown in the accompanying drawings for purposes of illustration.

In these drawings, Figure 1 is a sectional plan view of a furnace embodying our invention; Fig. 2, a longitudinal vertical section on the line 2 2 of Fig. 1; Fig. 3, a transverse vertical section on the line 3 3 of Fig. 1; Fig. 4, a longitudinal vertical section on the line

4 4 of Fig. 1, and Fig. 5 a sectional plan view showing a modification.

The letter A designates the preheating-chamber, having the inclined bed or hearth A′, upon which are supported a number of longitudinally-extending water-pipes *a*. These pipes extend the full length of said chamber and through the end walls of the furnace, their lower ends being connected to the transverse header *b* of a water-supply system and their upper ends to the header *b′* of a discharge system.

B is the charging-door at the upper end of the furnace, and C indicates hydraulic charging apparatus of well-known character.

c represents the usual side doors giving access to the chamber A.

D is the finishing-hearth, which, as is clearly shown, is placed laterally of the lower end of the preheating-chamber and extends at right angles thereto.

E E′ are two fire-chambers situated on opposite sides of the hearth. Although we have shown these chambers as having grates E^2 for coal or other solid fuel, this is entirely immaterial to our invention, as gas or oil may be used.

e wherever seen indicates a draft-chamber, and *e′* indicates delivery flues or passages leading from said chambers into the furnace. This arrangement of draft-chambers and flues is designed to provide for a high degree of combustion over the finishing-hearth D. The products of combustion pass from the hearth-chamber into the preheating-chamber and over the bed or hearth A′ to the upper end of said chamber, then downwardly through the flue F to the passage G underneath the hearth A′, thence to the stack-passage H.

The hearth-chamber is provided with the delivery-door I, and directly opposite the finishing-hearth and door I the furnace has a door K, which may be opened to permit the operation of a hydraulic plunger L, by means of which the blooms may be pushed endwise and laterally off from the pipes *a* onto the hearth D. The cylinder L′, in which the plunger works, is mounted on a longitudinally-movable carriage or bed L^2, whereby the plunger may be moved to a position opposite to any desired portion of the finishing-hearth.

It will be readily seen that the blooms may be successively transferred from the preheating-chamber and water-pipes to the finishing-chamber in a manner which will keep them separated from each other and with very little difficulty.

Instead of the hydraulic plunger shown any other suitable means may be employed.

The construction shown in Fig. 5 differs from that just described in that the laterally-arranged finishing-hearth P is contained in a separate furnace P′, connected with the preheating-chamber by a passage O, through which the blooms are pushed by any suitable means.

As hereinbefore indicated, we do not wish to limit ourselves to the particular furnace and appurtenances herein shown and described, since the essential features of our invention as pointed out in the appended claims are capable of various embodiments.

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

1. In a furnace for heating blooms or other pieces of metal, the combination with a preheating chamber or hearth, and means whereby the blooms or other pieces may be moved along said hearth, of a finishing chamber or hearth situated laterally of the preheating chamber or hearth, and a connection between said chambers or hearths through which the blooms or other pieces may be transferred from the preheating to the finishing chamber or hearth by lateral movement.

2. The combination with a preheating furnace or chamber for blooms and other pieces of metal, and means for advancing the blooms or other pieces in contiguous succession through said furnace or chamber, of a finishing-hearth situated to one side of the delivery end of said furnace or chamber, and means for transferring the blooms or pieces to said hearth by endwise movement.

3. In a furnace for heating blooms or other pieces of metal, the combination with a preheating bed or hearth, and means for moving the blooms or other pieces along said bed or hearth, of a finishing-hearth located to one side of the preheating chamber or hearth and communicating therewith, and means for transferring the blooms or other pieces from the preheating bed or hearth to the finishing-hearth by a movement thereof in a direction substantially at right angles to their movement along the said bed.

4. In a heating-furnace of the class described, the combination with a furnace or chamber having an inclined bed of water-cooled pipes extending the full length thereof, and means whereby the pieces to be heated may be pushed along said bed, of a finishing-hearth located to one side of the lower end portion of said bed and communicating therewith.

5. In a heating-furnace for blooms and the like, a preheating-chamber adapted to receive the blooms or other pieces transversely thereof, and a finishing-hearth extending at right angles thereto and communicating therewith.

6. In a heating-furnace of the class described, a preheating-chamber and means for advancing the pieces to be heated in contiguous succession through said chamber, a finishing-hearth communicating therewith and extending at right angles thereto, and a pushing device for transferring the blooms from the chamber to the hearth by endwise movement.

7. In a heating-furnace of the class described, the combination of a preheating-chamber having therein a water-cooled bed and means for advancing the pieces to be heat-

ed in contiguous succession along said bed, a side door in said furnace opposite the lower portion of said bed, a finishing-hearth on the opposite side of the bed from the said door and communicating with said chamber, and a pushing device operative through said door and transversely across the said bed.

8. In a heating-furnace of the class described, the combination of a preheating-chamber, having an inclined bed and means whereby the pieces to be heated may be moved along said bed, a side door in the furnace opposite the said bed, a finishing-hearth on the opposite side of said bed and in line with said door, a pushing device operative through the said door and transversely across the said bed, and means for effecting a longitudinal movement of said pushing device to position it opposite any desired portion of the hearth.

9. In a heating-furnace of the class described, the combination of a preheating-chamber, having an inclined bed and means for advancing the pieces to be heated in contiguous succession along said bed, a finishing-hearth to one side of the lower end of said bed, and fire-chambers upon opposite sides of said hearth and communicating therewith and also with the preheating-chamber.

10. In a heating-furnace of the class described, the combination of a preheating-chamber, means for advancing the pieces to be heated through said chamber in contiguous succession, a finishing-hearth situated laterally of the delivery end of said chamber, a passage connecting the two, a side door in the furnace opposite the said passage, and a pushing device operative through the said door.

11. In a furnace for heating blooms and other pieces of metal, a preheating furnace or chamber having a transverse width greater than the length of the pieces to be heated, means for advancing the pieces through said furnace or chamber, a finishing-hearth located to one side of one end portion of said furnace or chamber and having the length greater than the length of said pieces, and a passage connecting said hearth with the said furnace or chamber.

In testimony whereof we have affixed our signatures in presence of two witnesses.

MAXIMILIAN M. SUPPES.
RALPH CROOKER, JR.

Witnesses:
W. B. N. HAWK,
D. W. LAWRENCE.