

(No Model.)

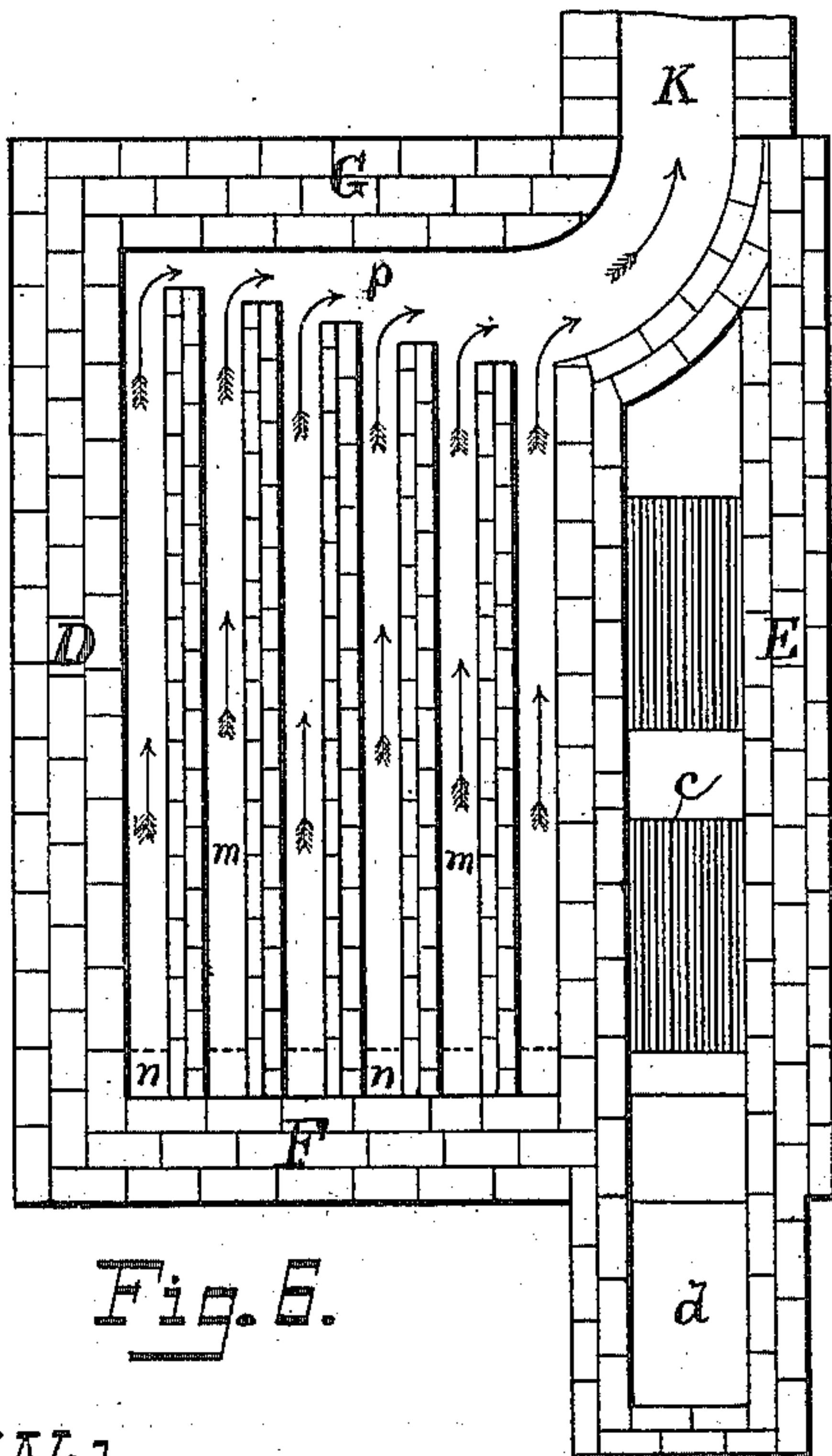
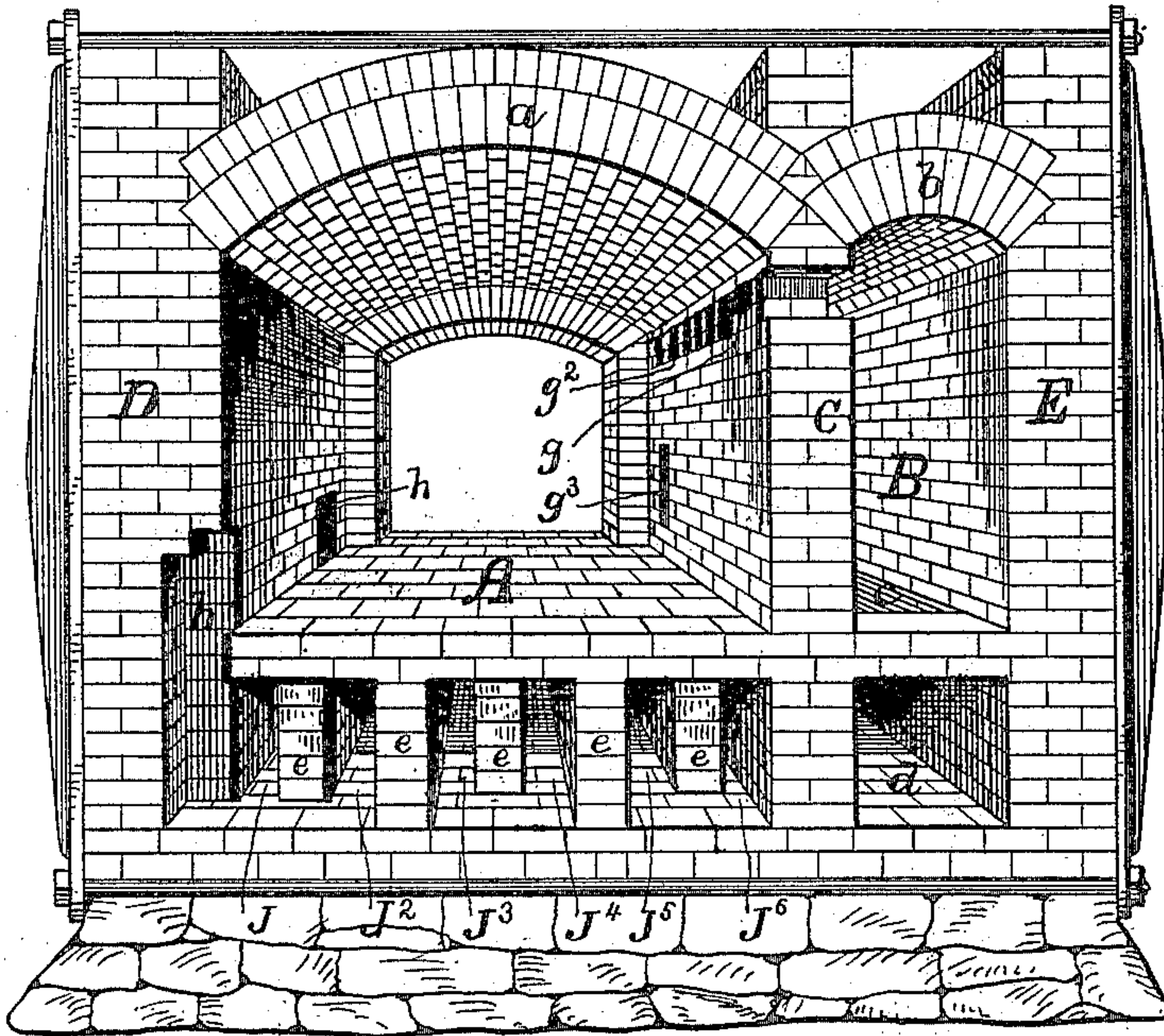
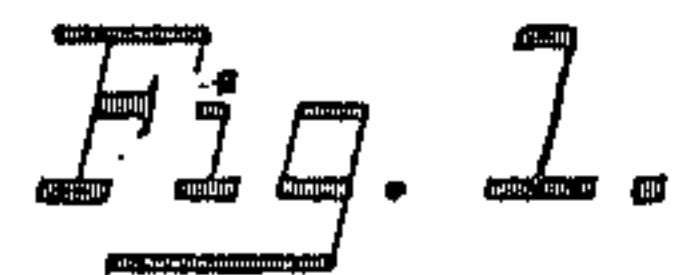
2 Sheets—Sheet 1.

B. HOWELL.

ANNEALING FURNACE.

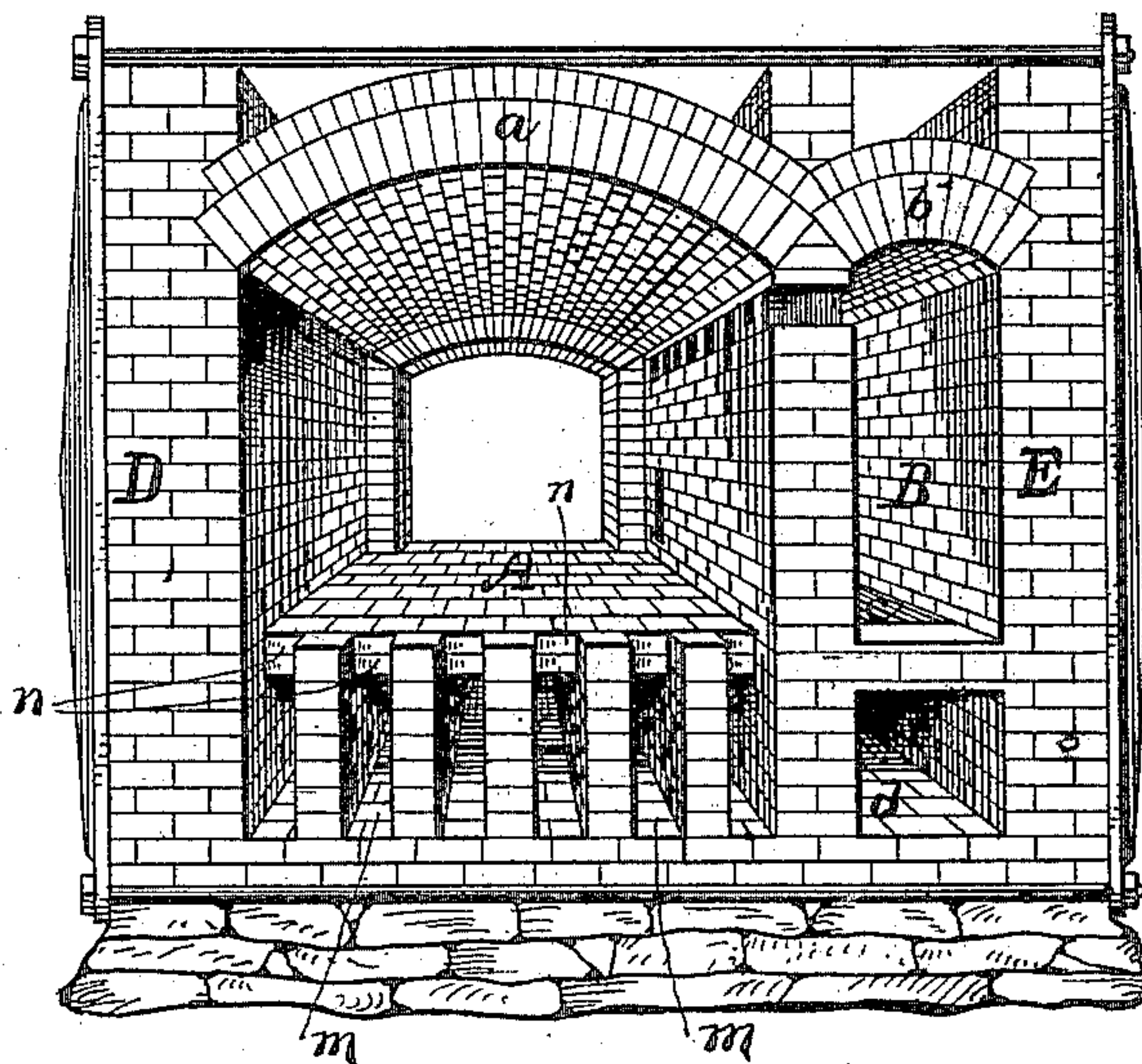
No. 363,292.

Patented May 17, 1887.



Witnesses:

Oscar C. Perrigo?
Fred State,



Inventor:

Benjamin Howell

(No Model.)

2 Sheets—Sheet 2.

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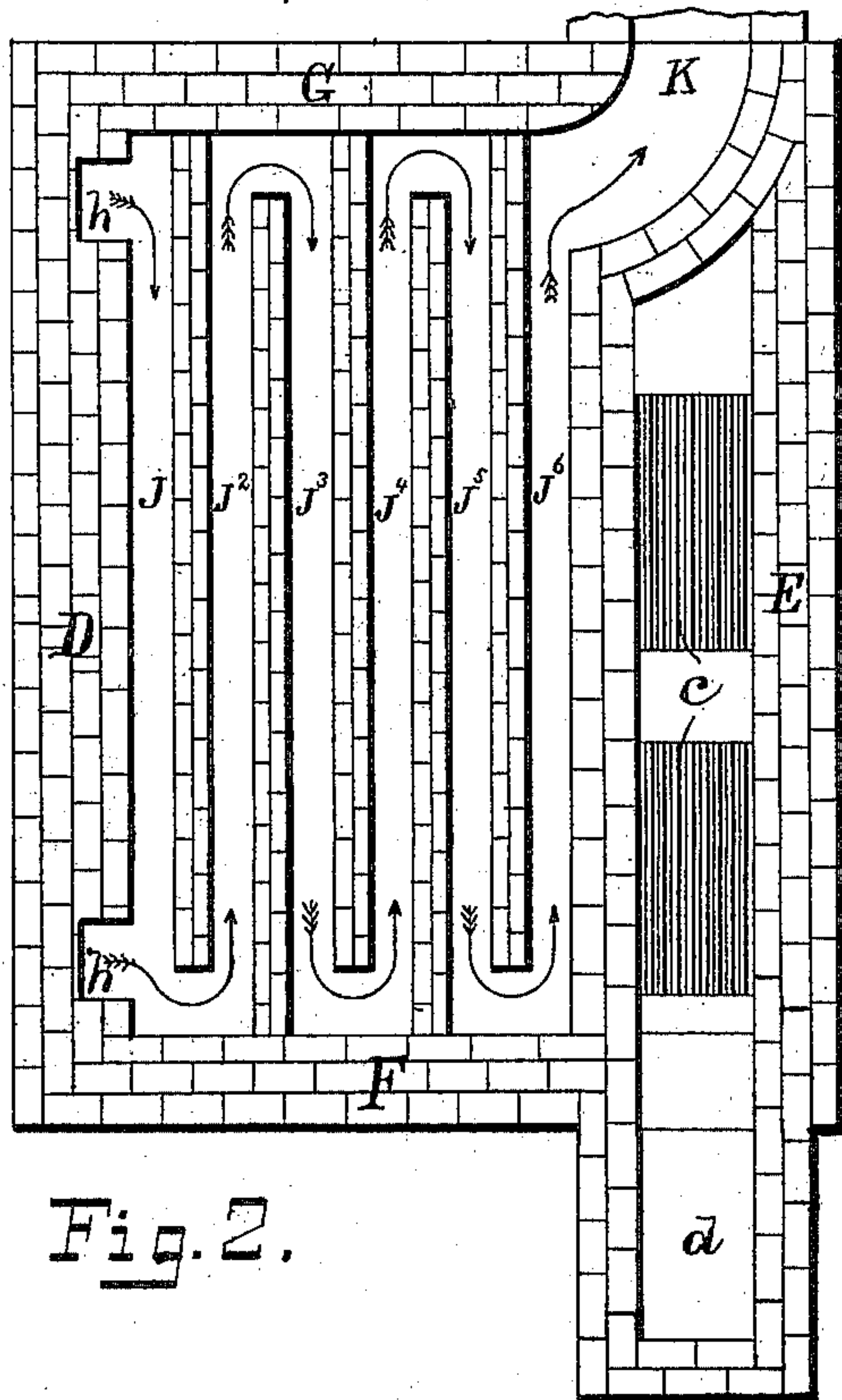
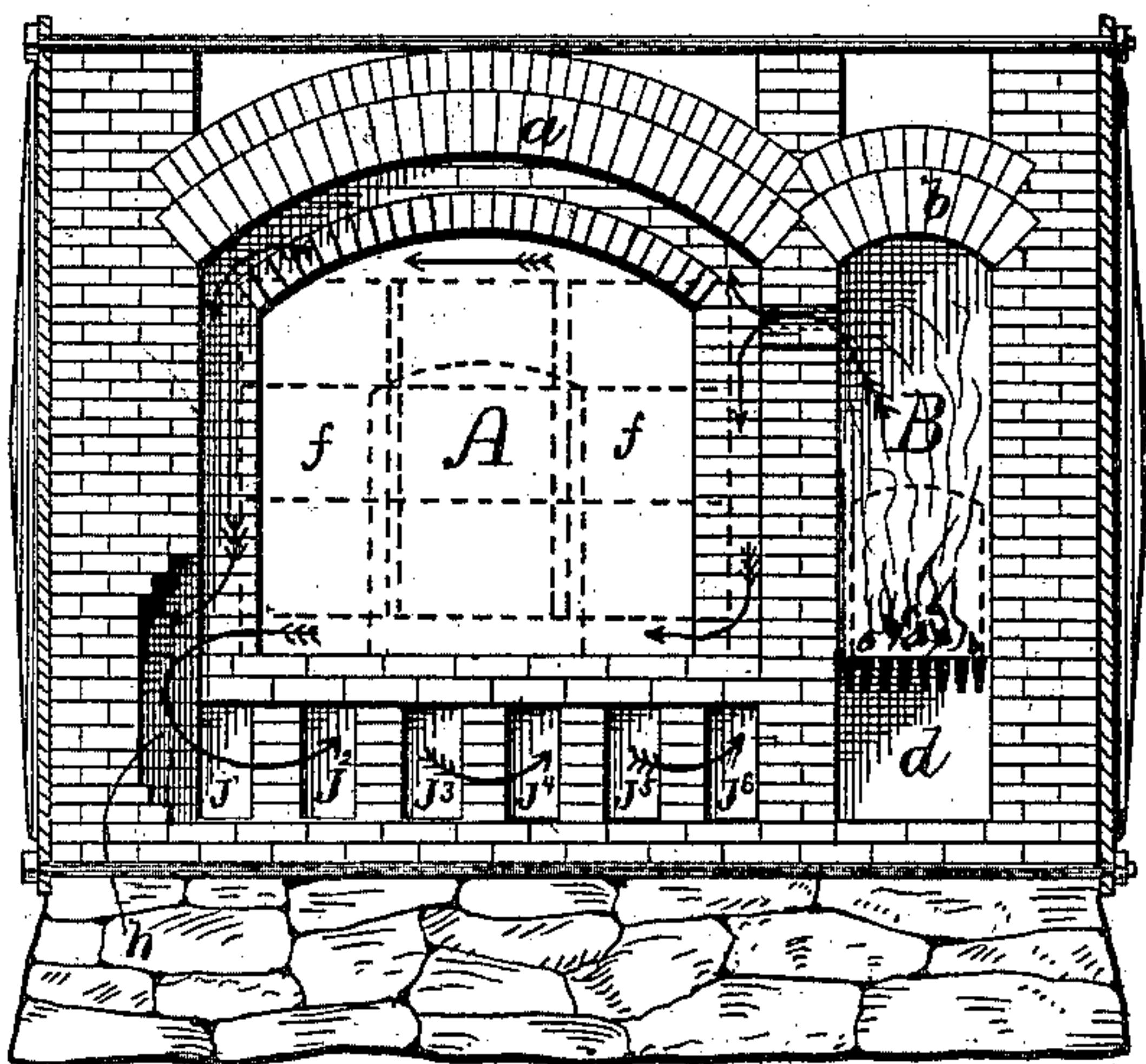
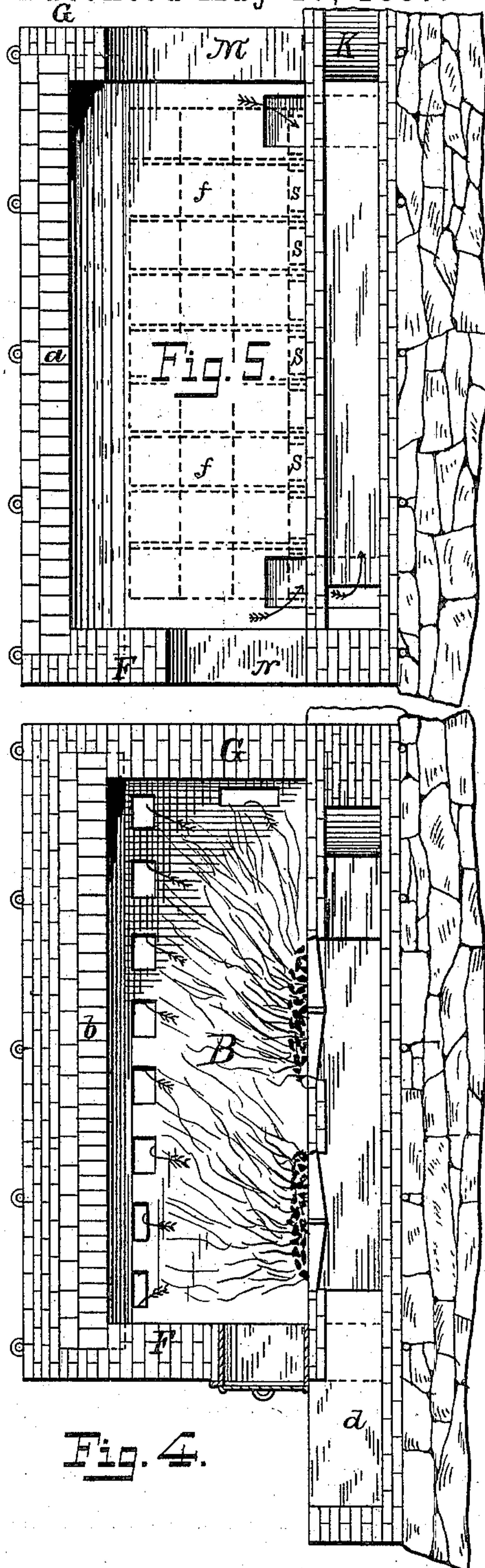


Fig. 2.



Witnesses: Fig. 3.

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44-4110-1000

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UNITED STATES PATENT OFFICE.

BENJAMIN HOWELL, OF SPRINGFIELD, OHIO, ASSIGNOR TO WILLIAM N. WHITELEY, OF SAME PLACE.

ANNEALING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 363,292, dated May 17, 1887.

Application filed July 9, 1886. Serial No. 207,570. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN HOWELL, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented a new and Improved Annealing-Furnace for Malleable Iron; and I hereby declare the following to be such a full, clear, and exact description of the same as will enable any person skilled in the art to which it pertains to construct and use the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to furnaces in general, and particularly to furnaces wherein the fire is built in a separate compartment and the heat drawn over a "bridge-wall" or through openings into another compartment wherein is placed the material to be heated, such as malleable iron or other substances requiring uniform and long-continued heating.

The objects of my invention are, first, to so construct the fire-box of a furnace that the gas from the burning coal shall be completely consumed, thereby adding a large percentage to the effective heating capacity of a given amount of coal, and consequently requiring much less coal to perform a given amount of work; second, to so construct the receiving-oven of a furnace that the heat shall be uniform upon all sides of the mass to be heated and capable of heating the cold material up to the required point in a short time and with a moderate consumption of coal, and, third, to so construct the annealing "pot" or receptacle that the heated air, gases, &c., may pass under as well as around them. I accomplish these objects by the construction illustrated in the accompanying drawings and hereinafter described.

In the drawings, Figure 1 is an interior perspective view of my furnace, the front wall having been removed for the purpose of showing its construction. Fig. 2 is a horizontal section through the flues and a plan of the fire-box. Fig. 3 is a transverse section through the receiving-oven and fire-box. Fig. 4 is a longitudinal section through the fire-box. Fig. 5 is a longitudinal section through the receiving-oven. Fig. 6 is a horizontal section through the flues; and Fig. 7 is an interior perspective view of a modification of the form of flues, &c., shown in Figs. 1, 2, 3, 4, and 5.

Similar letters refer to like parts in the several views.

The receiving-oven A and fire-box B are placed side by side and separated by the wall C. Over the top of each are the arches *a b*, the whole being inclosed by the side walls, D E, and end walls, F G.

The top of the floor of the receiving oven or chamber is level with the top of the grate-bars *c* of the fire-box, under which is the ash-pit *d*, in the usual form. The material to be annealed is placed in what is technically termed "pots," each of which consists of three oblong cast-iron boxes placed one above the other and arranged in such a form as to nearly fill the chamber, leaving only a narrow space at the sides, ends, top, and bottom, the space at the bottom being secured by casting to the bottom of the lower division of the pots downwardly-projecting ribs or supports which elevate the bottom of the pot a few inches from the floor of the receiving-oven. The arrangement of the pots in the oven is shown by dotted lines *f f f f* in Figs. 3 and 5, the transverse spaces formed by the ribs cast on the bottom of the pots being shown at *s s s*. These supports or ribs may be cast on the pot or be in the form of rails secured to the floor of the receiving-oven, or be loose bars laid upon the floor, as desired, but should be placed in such direction as to form flues for the passage of heated air, gases, &c., in the same direction as such currents pass over the mass to be heated.

Beneath the floor of the receiving-oven are arranged a series of flues, J, J², J³, J⁴, J⁵, and J⁶, as shown in Figs. 2 and 3, the dividing-walls *e* of which furnish the proper support for the floor of the receiving-oven.

Through the wall C, and nearly at the top, is a series of openings, *g g*², through which the heated air, gases, &c., pass from the fire-box B to the receiving-oven A. Two of these openings, *g*, at the front end of the fire-box are made smaller than the remainder, *g*², for the purpose of preventing the front of the mass from overheating, as the heat is much greater at the front end of the fire-box than elsewhere. Another opening, *g*³, is made near the back end of the fire-box and near the floor of the receiving-oven, for the purpose of sufficiently

heating that end of the mass, as it is found in practice that such an opening is necessary to secure a uniform heat on all sides of the mass to be acted upon.

5 Formed in the wall D are two or more recesses, *h h*, whose upper ends open into the receiving-chamber A and whose lower ends connect with the side flue, J, which connects at the front end with the flue J², which in turn
10 connects at the back end with flue J³, and so on, the last flue, J⁶, connecting with the smoke-flue K, leading to the smoke-stack.

The operation of my furnace is as follows, viz: The material to be annealed having been
15 placed in the annealing-pots and the pots arranged in the receiving-oven, as before described, the doors N M are bricked up, leaving only a small opening for observing the progress of the work, which opening is closed
20 by a loose brick. The fire is built upon the grate-bars *c*, and the flames, heated air, gases, &c., pass through the openings *g*, *g*², and *g*³ in direction of the arrows, and completely envelop the sides, ends, top, and bottom of the
25 mass, and escape down through the openings *h h*, thence successively through the flues J, J², J³, J⁴, J⁵, J⁶, and K to the smoke-stack. In their passage through the flues the floor of the receiving-oven is evenly and efficiently heated,
30 and by providing a space between the bottom of the pots and the floor the mass to be heated is uniformly and effectively acted upon. The operation of annealing being completed, the doors N M are opened and the pots removed,
35 after which they remain open for the purpose of cooling off the furnace.

In Figs. 6 and 7 is shown a modification of the arrangement of flues under the floor of the receiving-oven. In this case the openings or
40 recesses *h h* are replaced by a series of openings, *n n*, through the floor at the front end of the receiving-oven. These openings connect with a corresponding series of flues, *m m*, whose rear ends open into a transverse flue, *p*, which
45 connects with the smoke-flue K, and thence to the smoke-stack.

In constructing an annealing-furnace after my plan the flues may be placed transversely instead of longitudinally, or the series may be
50 divided into two systems opening into a center smoke-flue, or in various ways my plan may be modified without changing its essential features.

It will be noticed that the fire-box B is made
55 very high in proportion to its width, for the purpose of providing a large combustion-chamber, it having been ascertained in practice that the gases are more perfectly consumed, and therefore a given amount of coal
50 produces a much larger proportion of heat.

I am aware that annealing-furnaces have heretofore been constructed in which the fire-box and receiving-oven were located side by side, or with one fire-box to two receiving-
55 ovens, the former placed between the two latter—as, for instance, in the annealing-oven of Reynolds' United States Patent No. 52,605;

but in this case the grate-bars are set so far above the level of the floor of the receiving-oven that the combustion-chamber or fire-box
70 is so small that the fuel is very imperfectly consumed and a large percentage of it is wasted, while the material to be annealed is very slowly heated. The gases and similar products of combustion have also been carried through the
75 wall dividing the fire-box from the receiving-oven by a series of openings near the top thereof, but no provision was made for insuring a passage of heated air, &c., across the rear ends of the mass to be annealed. In my in-
80 vention I accomplish this very necessary object by means of the opening *g*³. Again, in the usual form of furnace (as Reynolds' United States Patent No. 52,605) the series of open-
85 ings have been all the same size. It is found in practice that, while the rear end of the mass is not sufficiently heated, as above described, the front end is subjected to too much heat. Therefore I have made the first two or three of
90 the openings much smaller than the others, and I find that it accomplishes the object perfectly and is a valuable improvement. Therefore, although annealing-furnaces have been heretofore constructed whose general form
95 bore some resemblance to the one herein described, I am not aware that any have contained the peculiar construction and arrangement herein described and claimed as new—
viz., placing the grate-bars on a level with the bottom of the receiving-chamber, thereby ob-
100 taining an unusually large combustion-chamber, constructing the openings between the combustion-chamber and receiving-oven of smaller size at the front end of the furnace, as
at *g*, Fig. 1, in order to prevent overheating
105 at this point, providing an additional opening near the floor at the rear end of the furnace, as at *g*³, Fig. 1, for the purpose of supplying heat to the rear of the mass to be heated, and providing proper flues beneath the floor of the
110 receiving-oven, preferably the system of "return-flues," as shown in Fig. 2. These features are of considerable practical importance when considered separately or in combination in producing a furnace in which the material to
115 be annealed may be economically, quickly, and uniformly acted upon in the process of annealing.

Having thus described my invention, its construction, arrangement, and use, and with-
120 out wishing to be understood as restricting my claims of invention to the precise form or proportion of the parts as shown and described, or to any particular construction or device not essential to the principles of construction
125 and mode of operation herein described, what I do claim as new, and desire to secure by Letters Patent, is—

1. In an annealing-furnace, the combination of the receiving-oven A, fire-box B, and the
130 intermediate partition-wall, C, provided with the apertures *g*² *g*² in the top of the wall C, also the apertures *g*, smaller than the others and in the front portion of said dividing-wall, and

the vertically-elongated aperture g^3 in the lower portion of said dividing-wall, with the escape-flues h h , connecting the lower portion of the oven A, and a series of horizontal flues under the floor of the same, substantially as shown and described, and for the purpose of more uniformly heating the mass to be annealed.

2. In an annealing-oven, the combination of the fire-box B and the receiving-oven A with the partition-wall C, provided with the openings g^2 g^2 in the top of the wall dividing the fire-box and annealing-chamber, the openings g , smaller than the others and in the front portion of said dividing-wall, the vertically-elongated openings g^3 in the lower portion of said dividing-wall, and escape-flues connecting the lower portion of the oven with any suitable system of flues under the floor of the receiving-oven for conducting away the products of combustion, all the parts being con-

structed and arranged substantially as described, and for the purpose of more economically, evenly, and quickly heating the material to be annealed.

3. In an annealing-furnace, the combination of the receiving-oven A, fire-box B, and the partition-wall C, provided with the apertures g , g^2 , g^2 , and g^3 in the dividing-wall C, and progressively enlarging from the front toward the rear of said wall, and escape-apertures in or near the floor of said oven A, connecting the same with the return-flues J J² J³ J⁴ J⁵ J⁶, all constructed and arranged substantially as shown and described, and for the purpose of more uniformly and quickly heating the material to be annealed.

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Witnesses:

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