

(No Model.)

A. J. NELLIS.

HEATING, TEMPERING, AND ANNEALING FURNACE.

No. 288,101.

Patented Nov. 6, 1883.

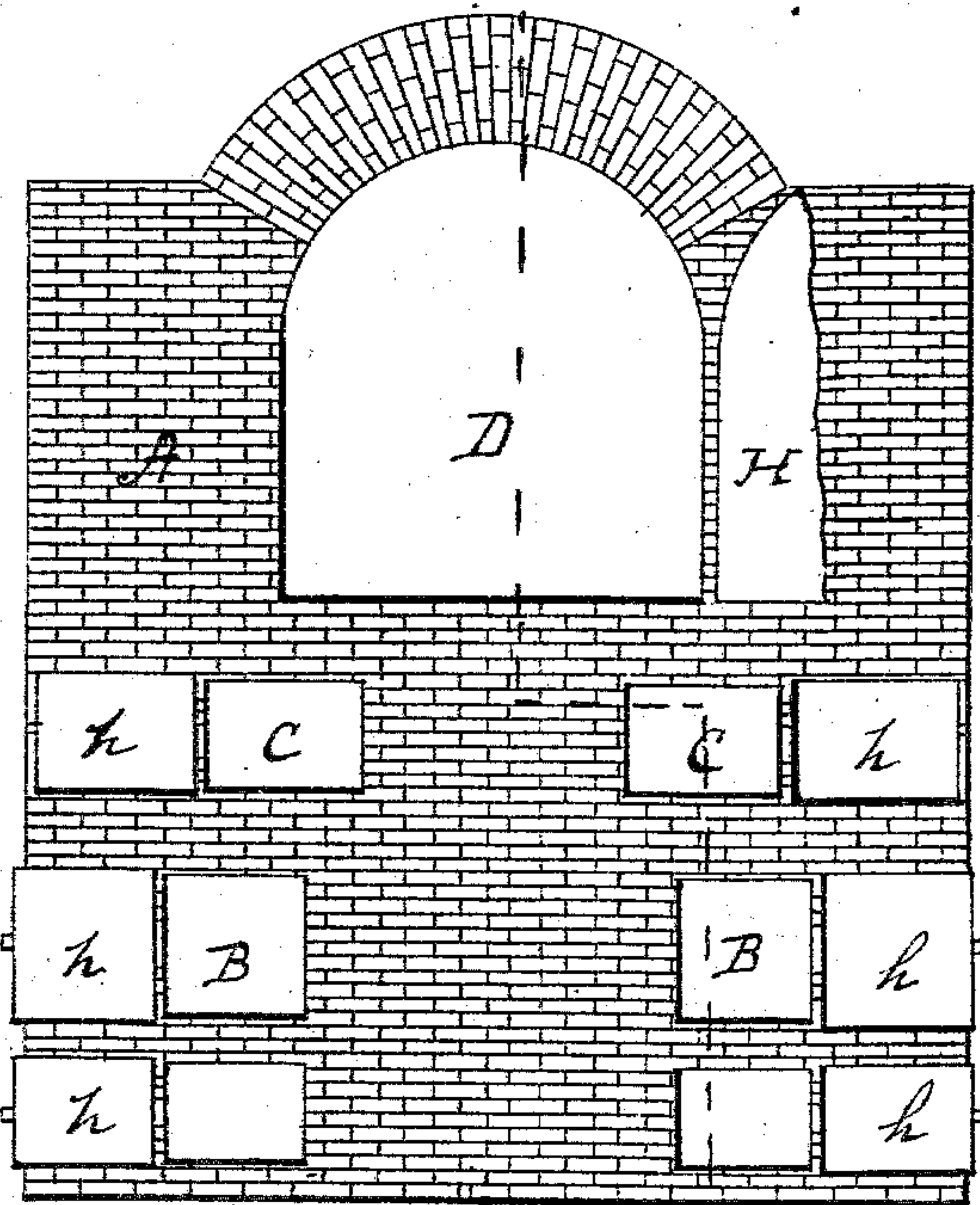


Fig. 1

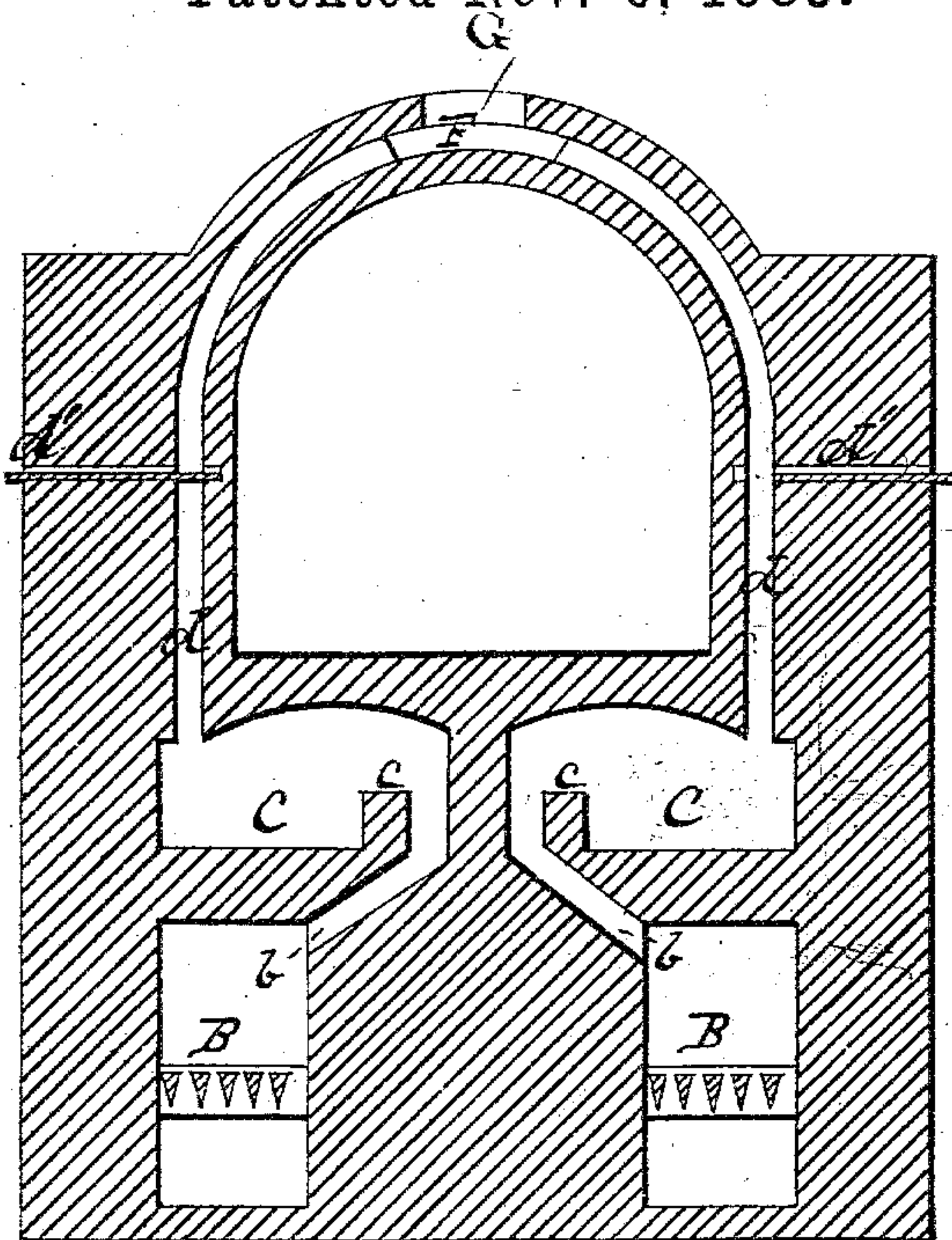


Fig. 3

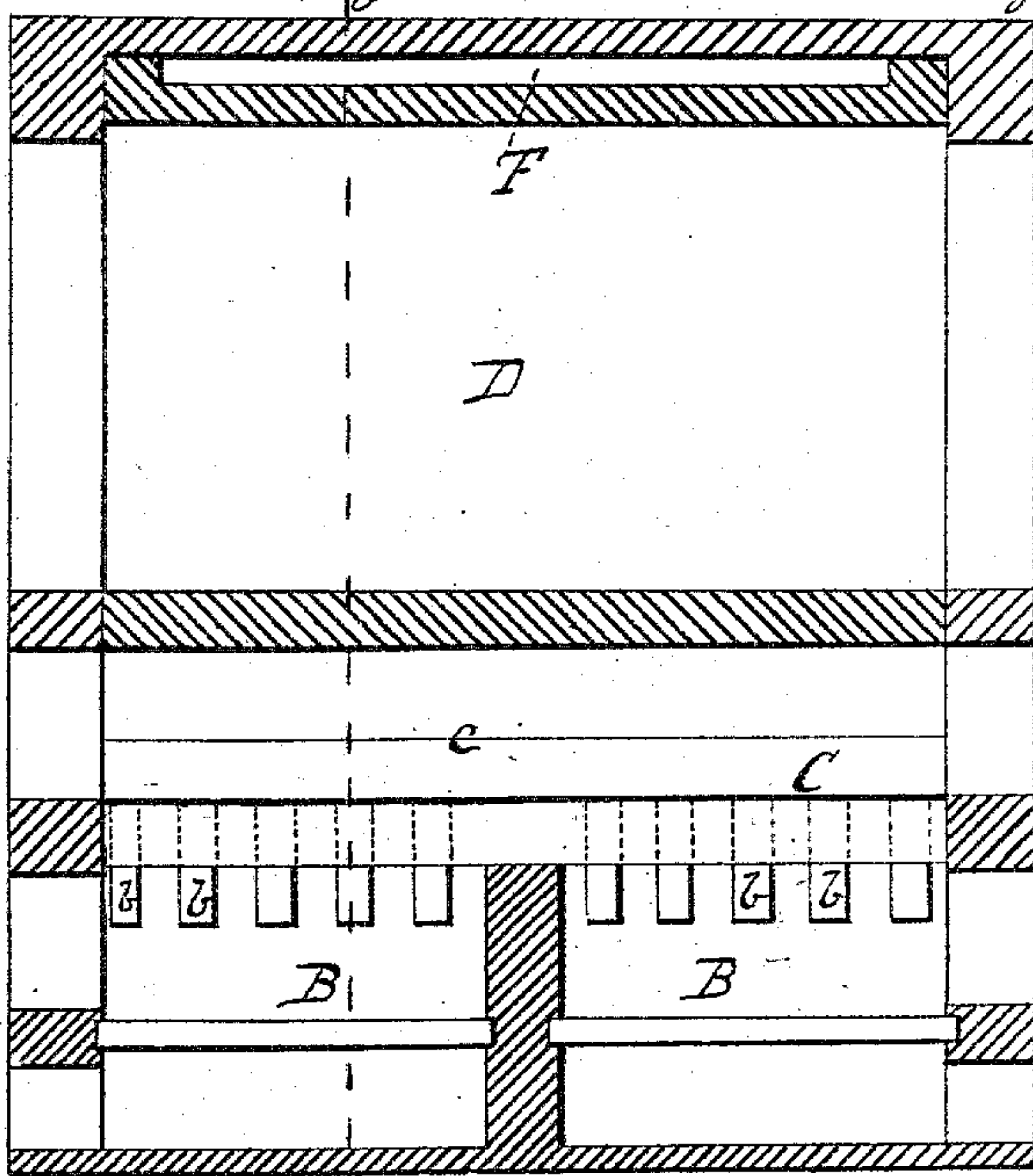


Fig. 2.

Witnesses.

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# UNITED STATES PATENT OFFICE.

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## HEATING, TEMPERING, AND ANNEALING FURNACE.

SPECIFICATION forming part of Letters Patent No. 288,101, dated November 6, 1883.

Application filed March 26, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, AARON J. NELLIS, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Heating, Tempering, and Annealing Furnaces; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation of a furnace embodying my invention. Fig. 2 is a vertical longitudinal section on the line *x x*, Fig. 1. Fig. 3 is a vertical transverse section on the line *y y*, Fig. 2.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of that class of furnaces employed for heating, tempering, and annealing metals, &c., and has for its object to insure the uniform and equal heating of the metal for the purpose of bending, working, or tempering the same, to preserve an equable temperature in the annealing-chamber in the subsequent treatment of the tempered metal, or in annealing, and to economize fuel.

Heretofore, in this class of furnaces, several difficulties have been encountered, the first and greatest of which is perhaps the inability to heat the article uniformly for its whole extent, especially if of considerable length. Of course, in tempering, unless the article is heated uniformly, it will not temper uniformly. The second has been to maintain the proper and uniform condition of the metal in the subsequent treatment, so that the article shall be uniformly annealed; and the third difficulty has been to prevent oxidation and loss of weight in the metal and needless waste of fuel. The main difficulty I have overcome by dividing up the fire-chambers and locating the primary heating-chamber directly over the series, so as to receive the radiated heat of all the fires and the products of combustion of the separate fires at different points along the length, so that products of combustion cross transversely instead of traversing the length of the heating-chamber; and the secondary difficulties I have overcome by lo-

eating the annealing-chamber over the primary heating-chambers and causing the waste products to encompass the same on their way to the stack.

I will now proceed to describe my invention more fully, so that others skilled in the art to which it appertains may apply the same.

In the accompanying drawings, A indicates the outer wall of the furnace, and B B the fire-chambers, of which a series divided by partition walls are shown. Instead of using one or more large fire-chambers, as heretofore commonly practiced, I employ a series of small chambers wherein the fires are easily controlled and combustion can be rendered uniform, and said several fires deliver into a common heating-chamber, though at different points, so that the products of combustion cross the heating-chamber transversely. Directly over the series of fire-chambers B B are placed the long heating-chambers C C, which extend from end to end of the furnace, and each heating-chamber is provided at the side with a bridge-wall, *c*, back of which are the vertical flues *b b*, which connect the several fire-chambers with the heating-chambers C C. It will be perceived that the products of combustion from the several fires will be uniformly and evenly distributed along the entire length of the chambers, and will sweep across the same, so that any article or articles upon the floor of the heating-chamber must be uniformly heated.

Placed centrally and directly over the heating-chambers C C is the annealing-oven D, which also, by preference, extends from end to end of the furnace, and is encompassed by a series of flues, *d*, each of which may be provided with a damper, *d'*. These flues *d* lead from the heating-chambers C C, and after inclosing the annealing-oven D unite in a common flue, F, which connects with the stack G.

The fire-chambers, heating-chambers, and annealing-oven are all supplied with suitable doors, H *h*, and the annealing-oven and the heating-chambers C C also, if desired, are provided with pyrometers.

The operation of my furnace will be as follows: Fires having been made in the several fire-chambers B B, the products of combustion



tion will, after impinging on the bottom of heating-chambers C C, pass by the flues *c c* to the adjacent portions of the chambers C C, and will cross the same from one side to the other, 5 then entering the flues *d* at the opposite sides of the furnace and passing on the two sides of the annealing-oven D, delivering up all their waste heat to the walls of the annealing-oven, will finally escape by the stack G.

10 If it should be desirable to change the direction of the draft or to cause more of the products of combustion to pass at one end than at the other end of the annealing-oven, this can be done by arranging the dampers *d'*.

15 The main advantages of my improved construction are the ability to perfectly control the fires and cause the delivery of the products of combustion and heat uniformly to the heating-chambers for their entire length, the 20 complete utilization of the radiated heat, ability to prevent any air-currents from striking the articles in the heating and annealing-chambers; and as results of these advantages I save fuel and weight of metal, can heat, temper, and anneal articles of any size or shape 25 throughout.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a heating-furnace, the combination, 30 with a single heating-chamber, of a group or series of small fire-chambers arranged directly beneath the heating-chamber, and connected therewith on one side and at different points along its length by flues, said heating-chamber 35 being provided with a series of flues leading from the opposite side thereof, whereby the products of combustion from the different fires cross the heating-chamber transversely at different points along the length thereof, substantially as and for the purposes specified. 40

2. In a heating, tempering, and annealing furnace, the combination of a series of fire-chambers, B B B B, provided with flues *b b*, with two overhead heating-chambers, C C, 45 and a superimposed annealing-chamber, D, encompassed by the flues *d d*, substantially as and for the purpose specified.

In testimony whereof I affix my signature, in presence of witnesses, this 24th day of March, 50 1883.

A. J. NELLIS.

Witnesses:

A. K. STEVENSON,  
WM. M. McELROY,  
E. N. BARTON.