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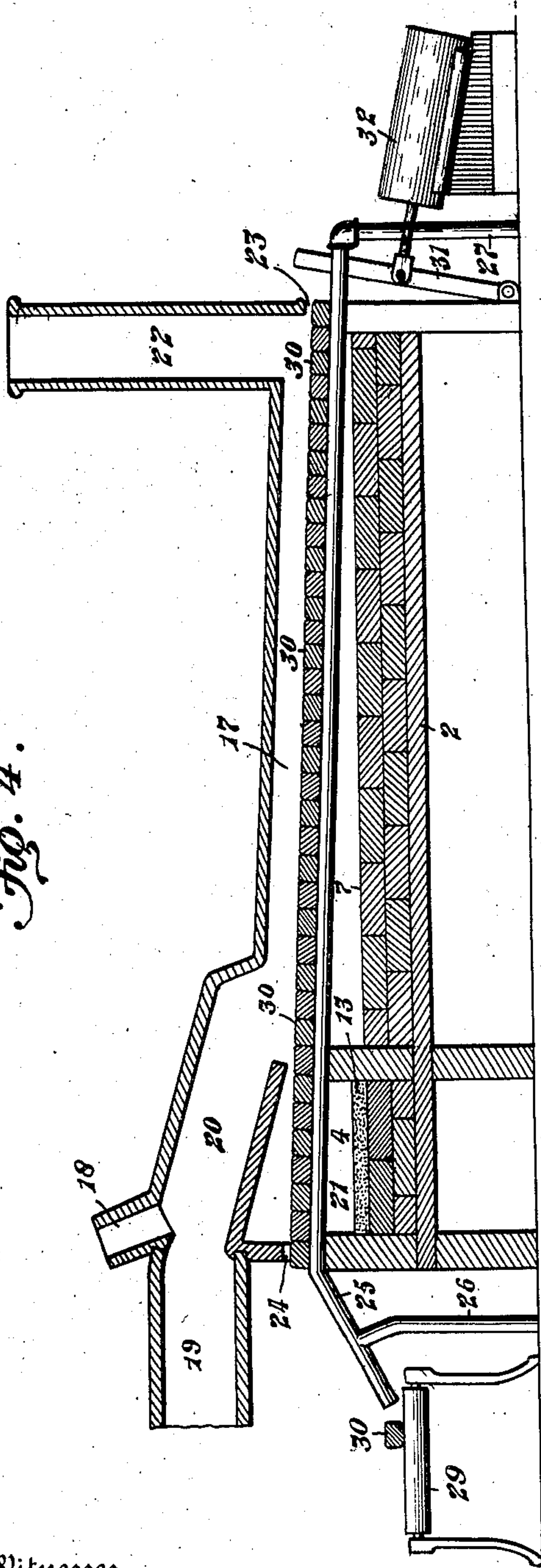
T. F. BAILY.
FURNACE.

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Patented May 9, 1911.

2 SHEETS—SHEET 2.

Fig. 4.



Witnesses
J. H. Bishop.
Irene Lutz.

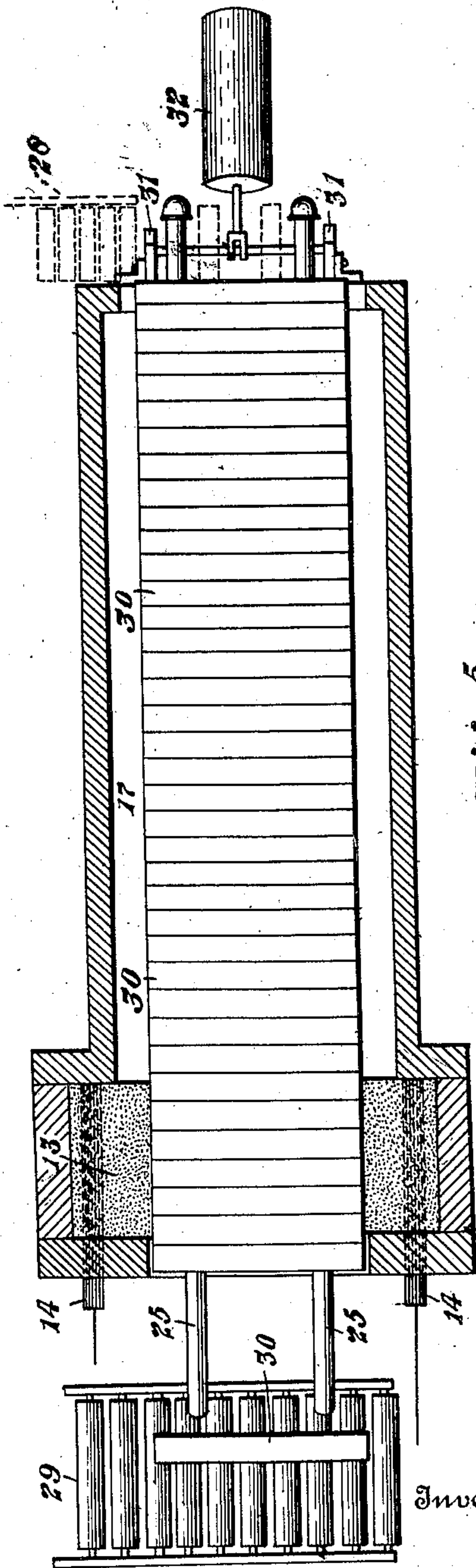


Fig. 5.

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UNITED STATES PATENT OFFICE.

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FURNACE.

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To all whom it may concern:

Be it known that I, THADDEUS F. BAILY, a citizen of the United States, residing at Alliance, in the county of Stark and State of Ohio, have invented a new and useful Furnace, of which the following is a specification.

My invention relates to improvements in furnaces, and particularly to a novel combination of gas and electric means for producing the necessary heat in said furnaces, said gas being adapted to produce a temperature up to the maximum temperature practically obtainable thereby, and the electric means adapted to furnish the necessary heat from such maximum up to much higher degrees of temperature.

It is well known to those skilled in the art that the efficiency of a furnace may be high up to a certain temperature of the material to be heated, but that as the temperature increases beyond a certain point the efficiency becomes less, and this fact, together with the fact that the gas flame, as compared with temperatures obtainable by electricity is not high, limits the practical usefulness of the gas furnace in modern industry. On the other hand the practical utility of electrically heated furnaces has been proved, although for the lower temperatures in the material to be heated the gas heated furnace is the more economical. It therefore becomes advisable to operate gas heating means and electric heating means in the same furnace, the said furnace being so constructed as to permit the simultaneous operation of the two heating means within it.

The object of my invention is to provide a furnace wherein gas and electric heating means will be combined for practical simultaneous operation, to generally improve furnaces of the character mentioned, and to attain other objects which will be readily apparent to those skilled in the art. I attain these objects by the constructions illustrated in the accompanying drawings, although my invention may be embodied in a variety of other mechanical forms, the constructions illustrated being chosen by way of example.

In the drawings Figure 1 is a vertical longitudinal section of a furnace embodying my invention and particularly adapted for the heating of bars for forging and the like,

Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1. Fig. 3 is a vertical transverse section on the line 3—3 of Fig. 2. Fig. 4 is a vertical longitudinal section of a billet heating furnace embodying my invention. Fig. 5 is a horizontal section of the billet furnace.

Throughout the several views similar reference numerals indicate similar parts.

The numeral 1 indicates a foundation or base upon which the furnace proper is arranged. The brick 2, or other heat resisting material of which the furnace is built are arranged to form the gas chamber 3 and the electric chamber 4, said chambers being entirely inclosed except for the openings hereinafter mentioned. In the front wall of the chamber 3 the outside opening 5 leads into the said chamber and provides a means of access to the interior of the furnace. In the rear wall of the chamber 3 the communicating opening 6 leads into the electric chamber 4. The lower side of the openings 5 and 6 are preferably elevated above the hearth 7 of the furnace.

Through one of the side walls of the gas chamber 3 the nozzle 8 extends, said nozzle preferably having a horizontally disposed slotted opening 9 permitting gas and air from the mixer 10 to enter the interior of the chamber 3, the mixer 10 being supplied by the gas pipe 11 and air pipe 12.

Arranged upon the hearth of the electric chamber 4 is the resistance body 13 preferably composed of carbonaceous material in granular form, crushed coke or its equivalent preferably constituting the principal part of said material. The electrodes 14, spaced from each other and preferably arranged at the sides of the furnace as illustrated in the drawings extend entirely across from rear to front of the electric chamber and the granular material of the body 13 is banked up around said electrodes, thus forming electrical contact with all of the surface of said electrodes exposed within the chamber 4, this feature being well illustrated in Fig. 3. In said figure it will also be noted that the portion of the resistance body intermediate said electrodes is of much less cross-section on a vertical plane than at or near the electrodes, thus increasing the heat in the center of the furnace where it is desired.

The electrodes 6 should be arranged in an electric circuit, and any suitable generator may be employed to supply the current necessary, a generator being shown in symbol at 15, and the wires 16 completing the circuit. It will be understood that when current is supplied from the generator 15 or other suitable source to the electrodes 14 an intense heat will be produced in the resistance body 13 by reason of the passage of the electric current from electrode to electrode therethrough.

The gas being ignited in the gas chamber 3 and the electric current supplied as described material to be heated may be introduced through the opening 5 into the chamber 3, there to remain until it has been heated to a point where the efficiency of the gas flame to further heat it becomes small, when it may be moved into the electric chamber 4 to receive the further and final heating. It should be noted that the material may be supported in the chambers 3 and 4 in any suitable manner, no claim being made herein for any particular means of support. The material may of course be permitted to rest upon the hearth 7 of the chamber 3 if desired instead of being supported above said hearth, but it is obviously preferable to support the material above the resistance body 13 in any suitable or well known manner. Attention should be called to the fact that some of the heat produced in the chamber 4 will enter the chamber 3, thus serving to raise the temperature of the chamber 3 while at the same time the opening 6 of the chamber 4 leading not to the outside air but to the heated chamber 3, will permit a very high temperature to be maintained in the chamber 4.

In the heating of bars of metal in forge work the advantages of this form of furnace are readily apparent. The end of the bar to be heated is introduced into the chamber 3 until the said end has been properly heated to be introduced into the chamber 4. When this point has been reached the bar is pushed farther into the furnace, the end which has just been heated in the chamber 3 now extending into the chamber 4 and a new portion of the bar being thus brought into the chamber 3. When the inner end of the bar has been sufficiently heated in the chamber 4 the bar may be removed from the furnace and the said inner highly heated end thereof used in the forging of the necessary work, while the bar is returned as soon as possible to the furnace, the portion which has just been heated in the chamber 3 now constituting the extreme inner end of the bar and being ready to be moved into the chamber 4 for further heating. In this way it will be noted that the extreme end of the bar is continuously being heated to a high temperature by the

resistance body 13, while the gas flame in the chamber 3 is constantly pre-heating a new portion of said bar to enter the chamber 4 when the next portion has been cut off in the process of forging. Other convenient uses of this efficient furnace will suggest themselves to those skilled in the art, the uses above described being selected by way of example.

Figs. 4 and 5, while illustrating a modification, show a furnace constructed and operating upon the same general principles as the furnace just above described. In said Figs. 4 and 5 the numeral 7 illustrates the hearth as before, the said hearth and the gas chamber 17 however being somewhat extended. The gas and air pipes 18 and 19 respectively conduct gas and air into the mixer 20 which is arranged above the electric chamber 21. The gas mixture will enter the chamber 17 at that end of the said chamber nearest the electric chamber and the flames will traverse the chamber 17 to the exhaust flue 22, through which the burned gases will escape. The resistance body 13 and electrodes 14 are arranged substantially as described in connection with the structure shown in Figs. 1, 2 and 3. An entrance aperture at 23 and an exit aperture at 24 are provided and running from the exterior of the aperture 23 through the furnace and out of the aperture 24 is the billet support 25, which is preferably formed hollow and supplied with water conducted through the pipe 26 and discharged through the pipe 27 for preventing the over-heating of said billet support. This feature of the construction is well known and not claimed herein. Arranged at the entrance end of the furnace, for the purpose of carrying billets to the same, are billet carrying rollers illustrated in dotted lines at 28 and at the exit end of the furnace are similar rollers for carrying the heated billets away from the furnace, said rollers being numbered 29. The billets 30, one by one are moved along the rollers 28 onto the billet support 25 in the manner well known in the art and then pushed sidewise through the entrance aperture 23 into the interior of the furnace by means of the pushing levers 31 operated by steam or hydraulic pressure in the cylinder 32. As each billet is brought into place and pushed through the entrance aperture 23 it pushes against the series of billets which have previously entered said aperture, the entire series being moved toward the exit aperture 24 upon the entrance of each new billet. Each billet will thus be gradually moved through the gas chamber 17 along the support 25, thus receiving a large amount of heat from the gas flame therein. When thus heated it passes on over the resistance body 13 in the electric chamber where it receives a final and more in-

tense heat just before being discharged through the exit aperture 24 onto the rollers 29.

Attention should be called to the fact that no claim is made herein for the details of construction of the billet support 25, the rollers 28 or 29, the pushing lever 31 or the cylinder 32, these devices being illustrated and incidentally described to show one practical method of operation of the device claimed.

I claim:—

1. A furnace of the character described comprising a gas chamber and an electric chamber arranged horizontally side by side, said gas chamber provided with gas heating means and said electric chamber provided with electric heating means, said chambers having an inter-communicating opening, and one of said chambers provided with an external opening.

2. A furnace of the character described comprising a structure built of heat resisting material arranged to form two chambers arranged horizontally side by side and entirely inclosed except for an opening leading from the second chamber into the first chamber and an opening leading from said first chamber to the exterior of said furnace, gas heating means in said first chamber and electric heating means in said second chamber, and said chambers adapted to receive bars of metal or other objects to be heated by the simultaneous action of said gas and electric heating means.

3. A furnace comprising a structure built of heat resisting material arranged to form two horizontally disposed chambers side by side and entirely inclosed except for an opening leading from the second chamber into the first chamber and an opening leading from

said first chamber to the exterior of said furnace, and an air and gas mixer, a nozzle connected to said mixer and extending into said gas chamber to permit gas and air from the mixer to enter said chamber, an electric resister in said electric chamber, said furnace adapted to receive bars of metal or other objects extending through said exterior opening and said opening leading from said second chamber into said first chamber, whereby said bars or other objects may be heated by said gas and said electric means.

4. A furnace of the character described comprising a gas chamber and an electric chamber constructed of heat resisting material and located horizontally side by side, the front wall of said gas chamber having an external opening constituting a means of access to the interior of the furnace, the rear wall of said gas chamber provided with a communicating opening leading into said electric chamber, a gas and air mixer provided with conducting means extending through the side wall of said chamber, and adapted to conduct gas and air from said mixer into the interior of said chamber, a resistance body located upon the hearth of the electric chamber, spaced electrodes in contact with said resistance body, said gas and electric chamber adapted to receive a bar of metal and adapted to heat the same by said gas and electric heating means.

In testimony that I claim the above, I have hereunto subscribed my name in the presence of two witnesses.

THADDEUS F. BAILY.

Witnesses:

IRENE LUTZ,
WILLIAM H. MILLER.