

(No Model.)

2 Sheets—Sheet 1.

W. H. BROOKS.

MEANS FOR UTILIZING THE WASTE HEAT OF FURNACES.

No. 278,496.

Patented May 29, 1883.

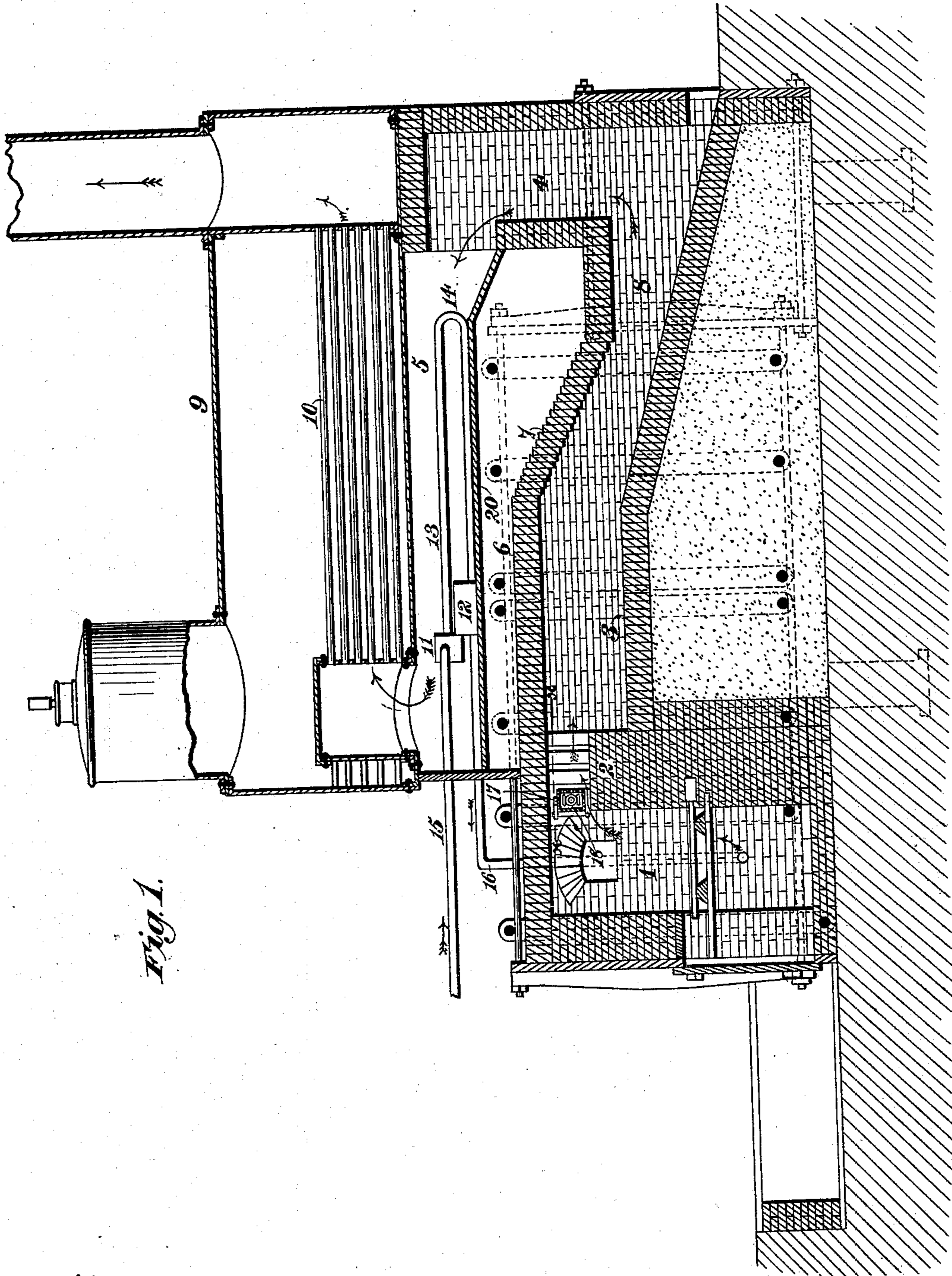


Fig. 1.

Witnesses.  
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A. H. Norris.

Inventor.  
William H. Brooks.  
By James L. Norris.

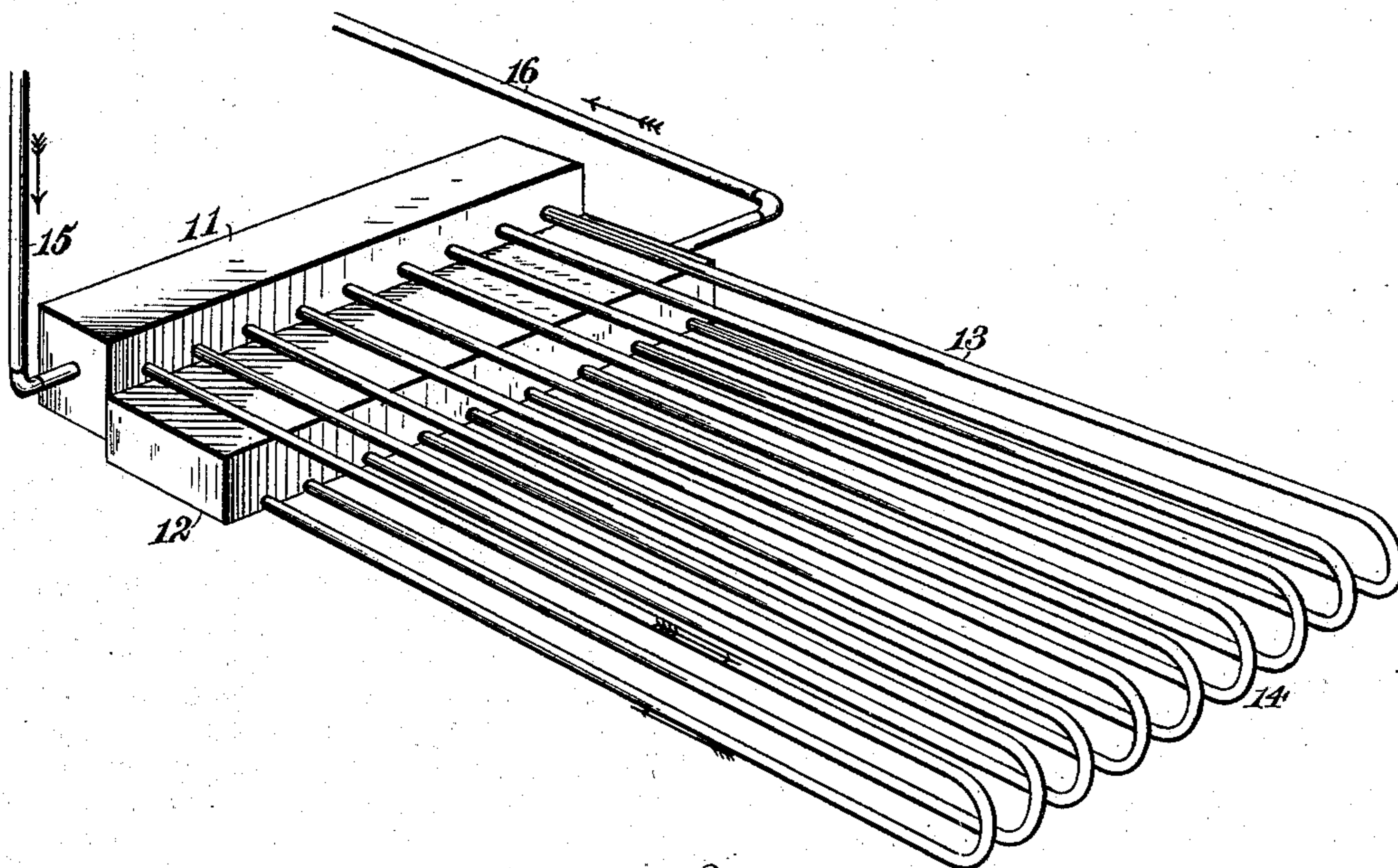
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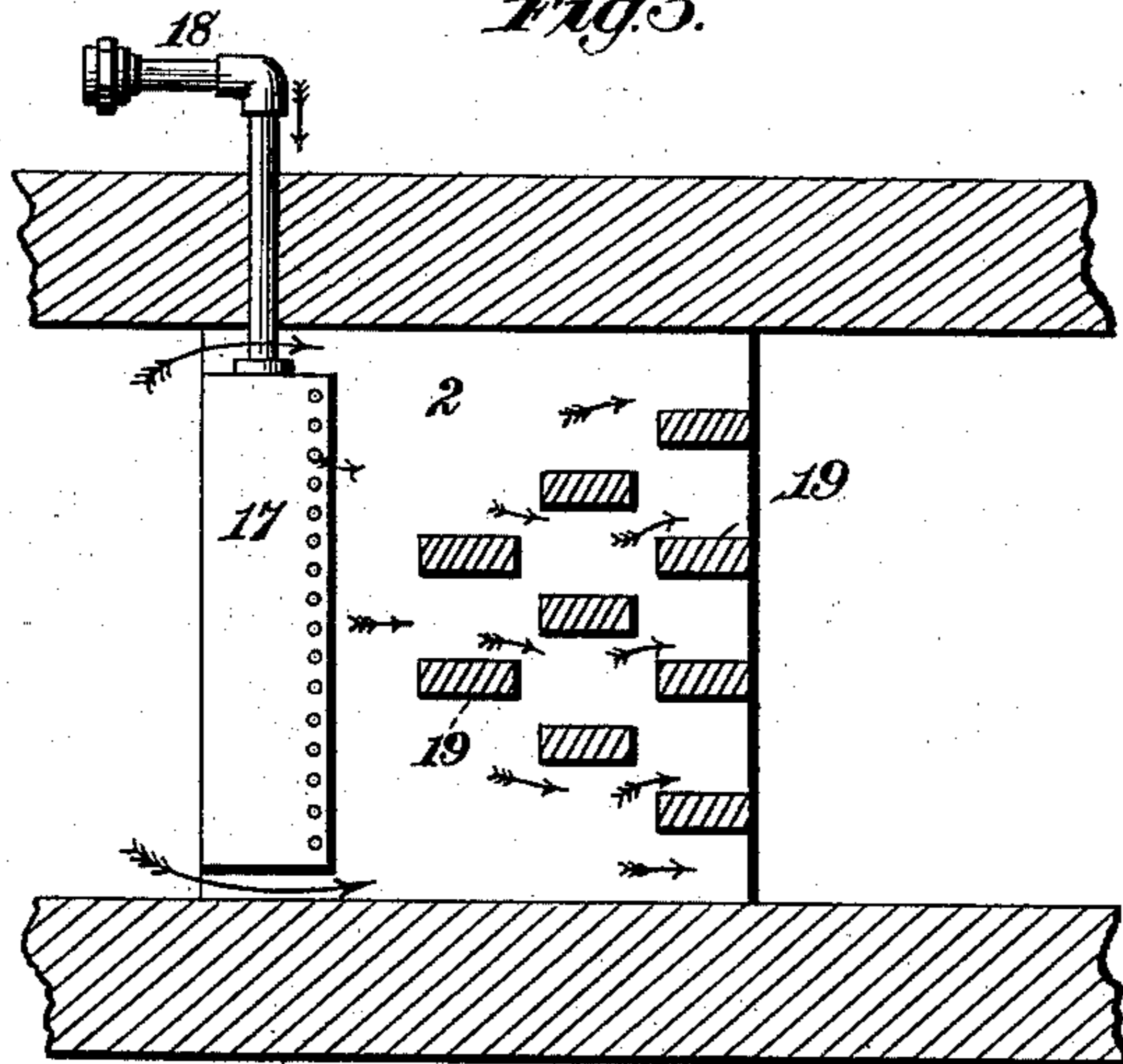
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*Fig. 2.*



*Fig. 3.*



*Witnesses.*

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# UNITED STATES PATENT OFFICE.

WILLIAM H. BROOKS, OF NEW YORK, N. Y.

## MEANS FOR UTILIZING THE WASTE HEAT OF FURNACES.

SPECIFICATION forming part of Letters Patent No. 278,496, dated May 29, 1883.

Application filed February 21, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM HENRY BROOKS, a citizen of the United States, residing at New York, in the county and State of New York, have invented new and useful Improvements in Means for Utilizing the Waste Heat of Furnaces, of which the following is a specification.

This invention relates to that class of furnaces in which ore, metal, or other material to be treated is spread upon a hearth and exposed to the action of a flame which passes over a bridge-wall.

The object of my invention is to utilize the waste heat from the furnace to heat air, which is conducted to the rear of the furnace and delivered into the furnace-chamber and around or upon a hydrocarbon-burner, for the purpose of supplying ample air in a heated condition to support combustion of the vapor-gas issuing from the burner, the flame from the burner being directed downward upon the furnace-hearth, whereby a flame of great intensity is provided and the furnace can be worked without coal or similar fuel, while the cost of flame-producing material is materially reduced over coal or like fuel.

The object of my invention I accomplish in the manner and by the means hereinafter described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical sectional view of a reverberatory furnace embodying my invention; Fig. 2, a detached perspective view of the tubes for receiving the air to be heated and conducted around or upon the vapor-burner, and Fig. 3 is a transverse broken sectional view taken on the line *xx* of Fig. 1.

The reverberatory furnace may be constructed, as usual, with a rear furnace-chamber, number 1, a bridge-wall, 2, a hearth, 3, a front vertical flue, 4, and an enlarged chamber, 5, above the top wall, 6, which is located over the hearth, such top wall being deflected, as at 7, to direct the waste heat and flame downward to the throat 8, which leads to the front vertical flue, 4. In the example shown a steam-boiler, 9, is located over the waste-heat-receiving chamber 5, in such manner that the waste heat is caused to pass through the flues 10 and out through a stack or chimney, thus producing steam in

the boiler for running an engine to actuate machinery.

Within the chamber 5 is arranged the apparatus for heating the air which is to be supplied around or upon the hydrocarbon-burner, and it consist of two rectilinear hollow boxes, 11 and 12, the former being placed against or near the rear side of the latter, and to the box 11 is secured one end of a series of tubes, 13, which are arranged parallel to each other, and bent, as at 14, to extend back to the box 12, with which this end of the series of tubes is secured. The rear box, 11, is provided with a pipe, 15, which is for the purpose of connecting with some air-forcing machine—such as a blow-fan—whereby air under pressure will be delivered to the said rear box and caused to traverse through the air-heating tubes into the front box, 12, which latter is provided with a pipe, 16, extending through the brick wall of the furnace into the lower portion of the furnace-chamber 1, in such manner that the heated air under pressure will rise in said chamber and be impelled over the bridge-wall 2, on which the hydrocarbon-burner 17 is located, thereby furnishing a large volume of highly-heated air to support the combustion of the vapor-gas which is supplied to the burner. This burner connects by a pipe, 18, with a hydrocarbon-vapor-generating apparatus, and is located in rear of a series of alternately-arranged pillars, 19, of some refractory material—such as fire-brick—built vertically on the top of the bridge-wall, and joined to the top wall, 6, of the furnace, the object of such pillars being to intercept and laterally deflect the flame issuing from the burner and cause it to spread so as to pass downwardly upon the material on the hearth in an extended stream of a width approximately that of the furnace. The waste heat and flame of the burner pass through the throat 8 into the vertical flue 4, and strike the arch or wall at the top thereof, which directs the heat and flame horizontally in a rearward direction between and around the tubes 13, which are thus highly heated, as well as the air contained therein, thereby utilizing the waste products from the furnace-heater to accomplish this important office. The boxes 11 and 12 constitute air-receiving chambers, and, with the

tubes, are supported horizontally in the chamber 5 by any suitable contrivance—such, for example, as a plate, 20, connected with the furnace-walls.

5 In practice either of the air-receiving chambers can be connected with the air-forcing machine, the other chamber being of course placed in communication with the furnace-chamber.

10 The construction of hydrocarbon-burner may vary and any well-known one used; but I prefer to employ that here illustrated, which is constructed in accordance with the invention forming the subject-matter of my applica-  
15 tion for Letters Patent filed January, 1883, in which the burner is composed of an oblong casing having a perforated side wall and a line of perforations along its top and bottom walls, and a vapor or gas supply pipe extend-  
20 ing into the casing and terminating at or near the center thereof in lateral branches, so that the vapor or gas is uniformly distributed in the casing and burned at the perforations in the latter. The air from the air-heating ap-  
25 paratus, being impelled by an air-forcing machine, is delivered to the furnace-chamber under pressure, and hence in passing around the burner it strikes the burning gas with force and drives it against the refractory pil-  
30 lars, creating a strong current, and delivering a streaming flame of great intensity upon the material on the hearth.

I do not confine myself to the location of the burner on the bridge-wall, as it could be oth-  
35 erwise arranged and supported adjacent to such bridge-wall.

I am aware that it is not new to utilize the waste heat in a metallurgic furnace for heat-  
40 ing air forced through a series of pipes located at one end of the furnace in the path of the waste heat and connected with the combustion-chamber of the furnace, to supply the same with heated air under pressure and ef-  
45 fect complete combustion of the gases. Such, therefore, I do not broadly claim.

Having thus described my invention, what I claim is—

1. The combination of a furnace having a rear furnace-chamber, a hearth, a front flue,  
50 and a waste-heat-receiving chamber located

over the top wall of the furnace and having its front end in direct communication with the front furnace-flue, with the two air-receiving chambers located in the rear part of the waste-  
heat-receiving chamber, the air-heating tubes 55 each having its ends connected, respectively, with the two air-receiving chambers, a pipe connecting one of said chambers with the rear furnace-chamber, and a pipe for connecting the other of said chambers with air-forcing 60 mechanism, substantially as described.

2. The combination of a furnace having a rear furnace-chamber, a bridge-wall, a hearth, a front flue, and a waste-heat-receiving cham-  
ber located over the top wall of the furnace 65 and having its front end in direct communication with the front furnace-flue, with the two air-receiving chambers located in the rear part of the waste-heat-receiving chamber, the air-  
heating tubes each having its ends connected, 70 respectively, with the two air-receiving chambers, a pipe connecting one of said chambers with the rear furnace-chamber, a pipe for connecting the other of said chambers with air-  
forcing mechanism, and a hydrocarbon-vapor 75 burner located upon or adjacent to the bridge-wall of the furnace, whereby a blast of air from the air-heating tubes is delivered upon or around the burner, substantially as described.

3. The combination of the furnace having 80 the rear furnace-chamber, a bridge-wall, the alternating refractory pillars built from the top of the bridge-wall to the top wall of the furnace, the waste-heat-receiving chamber, the air-heating apparatus therein, two pipes, one 85 connecting the air-heating apparatus with the rear furnace-chamber and the other for connecting with an air-forcing mechanism, and a hydrocarbon-vapor burner located horizontally at the top of the bridge-wall in rear of the al- 90  
ternating refractory pillars, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM H. BROOKS.

Witnesses:

J. A. RUTHERFORD,  
A. H. NORRIS.