

No. 869,617.

PATENTED OCT. 29, 1907.

T. S. BLAIR, JR.  
OPEN HEARTH FURNACE.  
APPLICATION FILED JULY 6, 1907.

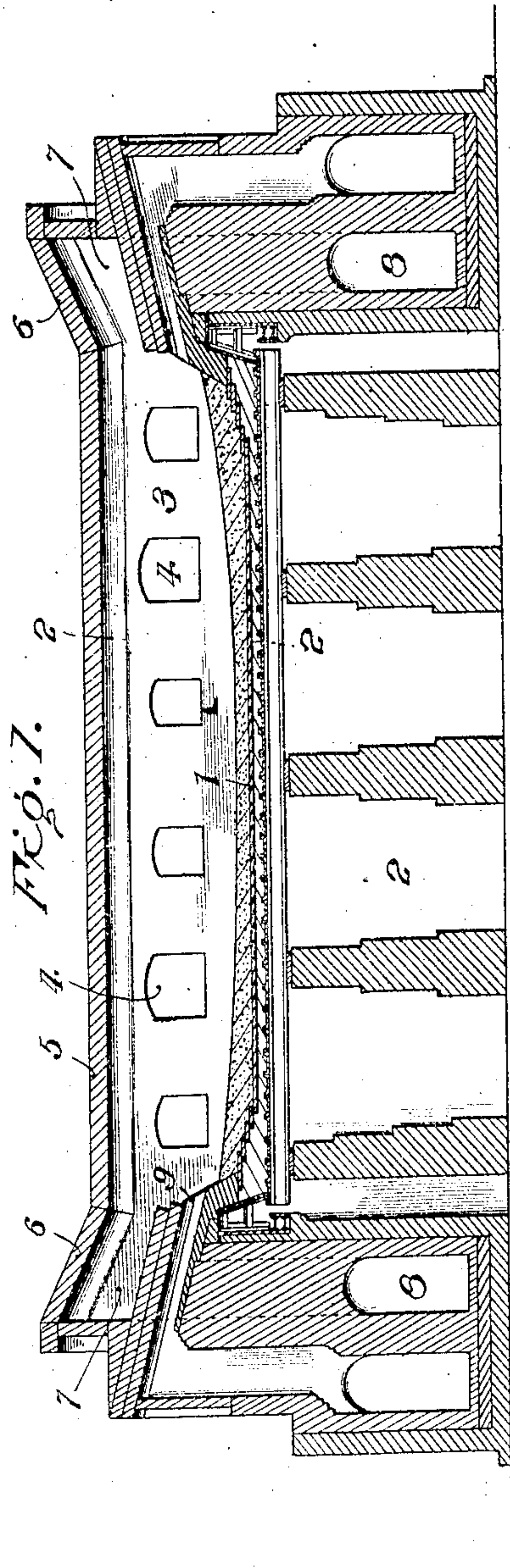


Fig. 1.

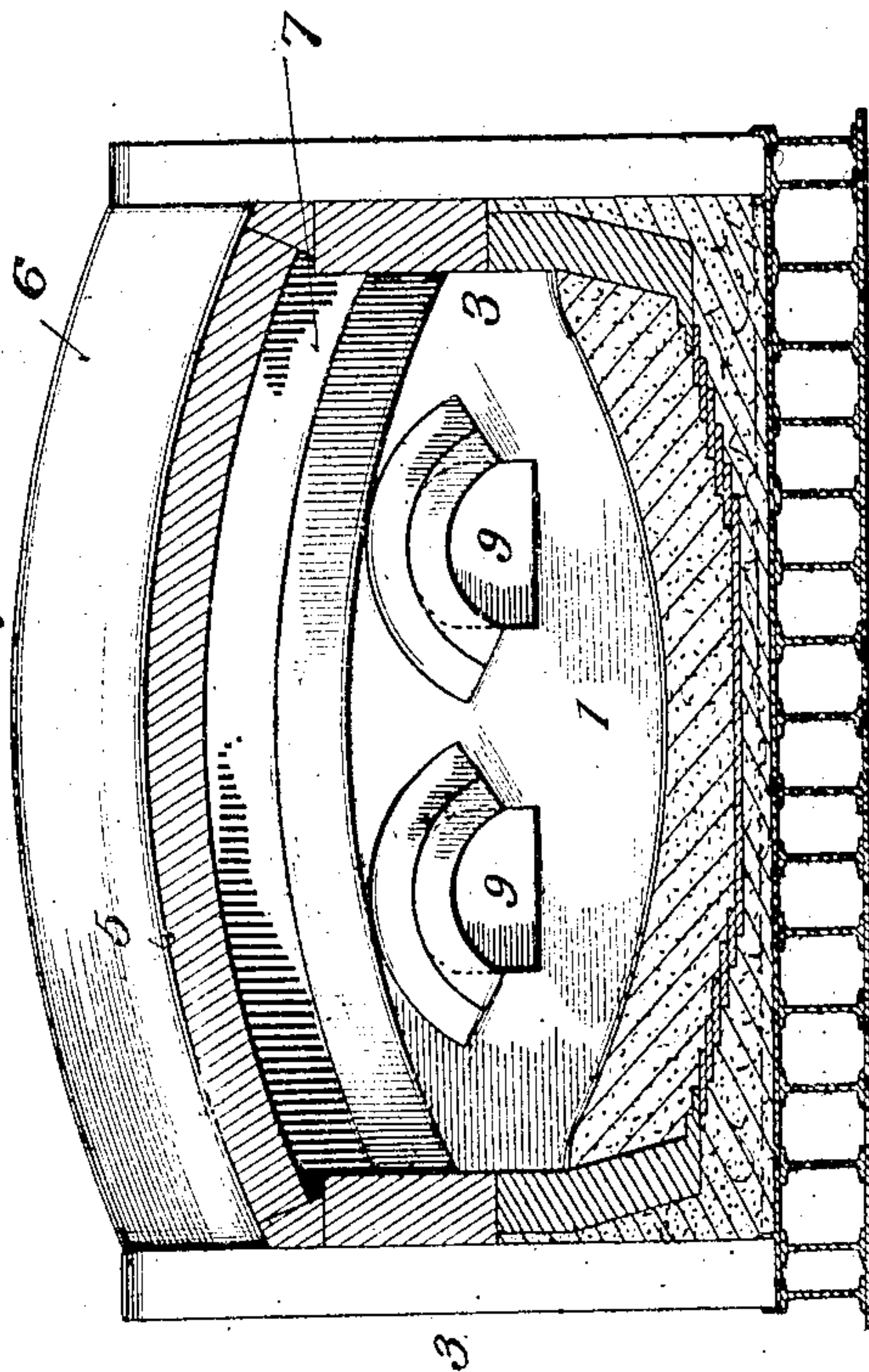


Fig. 2.

Inventor

Thomas S. Blair Jr.

Witnesses

Louis H. Schmidt.

*[Signature]*

By *[Signature]* Deyoufth, Lee, Christone & Wiles

Attorneys.



# UNITED STATES PATENT OFFICE.

THOMAS S. BLAIR, JR., OF ELMHURST, ILLINOIS.

## OPEN-HEARTH FURNACE.

No. 869,617.

Specification of Letters Patent.

Patented Oct. 29, 1907.

Application filed July 6, 1907. Serial No. 382,487.

*To all whom it may concern:*

Be it known that I, THOMAS S. BLAIR, Jr., a citizen of the United States, residing at Elmhurst, in the county of Dupage and State of Illinois, have invented  
5 certain new and useful Improvements in Open-Hearth Furnaces, of which the following is a specification.

My invention relates to certain new and useful improvements in open hearth furnaces, and the object of my invention is to so improve the construction and the  
10 method of operating the furnace as to enable me to build furnaces of any desired length, and to operate the same with greater rapidity and economy of fuel than has heretofore been possible.

In the prior construction of furnaces, it has been  
15 found, as a matter of fact, that it was impossible to carry the combustion over a length of hearth greater than 30 or 32 feet, and consequently this has been universally adopted as the maximum length of hearth which could be practically used.

I have discovered that it is possible to increase the  
20 length of the hearth to any desired extent and that the combustion of the gases can be carried over the hearth from end to end of the furnace, even when the hearth is 75 feet or more in length. Broadly speaking, my  
25 discovery is that, by feeding over the gases of combustion a blanket of air which is in excess of the maximum amount of air necessary for combustion, the gases will be held in close contact with the bath for the entire  
30 length of the furnace, and that the combustion will be carried to the full length thereof.

In the building of open hearth furnaces it has heretofore been customary to design the air ports on the  
theory that it was only necessary to have them of a size which would merely provide sufficient air for the com-  
35 bustion of the gases. By my invention I provide air ports of such size that they will supply an amount of air in excess of the amount required for combustion, which excess is preferably approximately equal to the amount necessary for combustion.

I have also discovered that, by feeding the gases into  
40 the furnace in a comparatively thin stream, and feeding the air over the top of the gases in a comparatively thin stream, a larger percentage of the heat generated by the combustion is delivered to the bath and the cost for  
45 fuel correspondingly reduced per ton of product.

I have also discovered that in order to provide a  
space for the increased amount of air fed into the furnace, that the distance between the top of the bath and the roof must be varied with the size of the fur-  
50 nace. It has heretofore been the common practice in designing this class of furnaces to provide substantially the same height of roof irrespective of the particular size of the hearth. That is to say, if a designer desired to build a furnace having a hearth twice as large as the

one the design of which he was copying, he would  
55 merely increase the size of the hearth and leave the space between the top of the bath and the roof the same.

I have also discovered that by having the roof of the  
furnace flat for the entire length of the hearth, the  
60 products of combustion will be held down in a more effective manner on the bath.

Referring to the drawings wherein I show an open-  
hearth furnace embodying my invention and discovery,  
and wherein the same part is designated by the same  
65 reference numeral wherever it occurs, Figure 1 is a central longitudinal section; and Fig. 2 is a section taken on line 2, 2 of Fig. 1.

1 designates the hearth supported on the usual sub-  
structure 2, and 3 designates the side walls provided  
70 with the usual charging doors 4.

5 designates the roof which is shown as flat with the  
upwardly extending end sections 6, below which are  
located the air ports 7, one in each end of the furnace.

Upon reference to Fig. 2 it will be seen that each of  
75 the air ports 7 extends the full width of the furnace and are adapted to supply a volume of air in excess of that required for the maximum combustion.

8 designates the usual down-take ports for the air,  
which of course are also of correspondingly increased  
80 size, in order to correspond to the increased size of the air ports 7.

9, 9 designate a pair of gas ports, which are arranged  
in line with each other, one pair in each end of the fur-  
nace and located immediately below the air ports 7. It  
85 will be noticed that these gas ports are of a width in excess of their height, so that the gases are delivered into the furnace in a comparatively shallow stream immediately below the air supply through the air ports 7.  
The gases beneath the blanket of air supplied through  
90 air ports 7 spread out in the space between the lower strata of air and the top of the bath and are confined therein. The air necessary for the combustion of the gases is drawn from the air between the gases and the roof, during the passage of the gases through the furnace,  
95 but the heating of the air in its passage through the furnace expands it to such an extent that the air remaining will operate to hold the gases down on the bath from one end of the furnace to the other. In other words, the gases in passing through the furnace are never released  
100 from the confining effect of the air between the gases and the roof. As the gases of combustion are fed in a comparatively thin stream into the furnace and are held in this condition and down on the bath by the blanket  
of air, it will be readily seen that a larger percentage of  
105 the heat developed will be utilized for heating the bath than has heretofore been possible with a resulting economy both in the fuel and the longer life of the furnace.



It will be noted that by providing a large amount of space between the hearth and the roof there will always be such a volume of air between the gases and the roof as to insure a surplus of air remaining over the gases of combustion when they pass out of the furnace.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

10 1. The method of heating open hearth furnaces which consists in supplying between the roof of the furnace and the burning gases a volume of air in excess of the amount necessary for complete combustion whereby there will always be a stratum of air interposed between the burning gases and the roof of the furnace.

15 2. The method of heating open hearth furnaces which consists in supplying the gases of combustion to the furnace in a stream of greater width than thickness, supplying a volume of air in excess of the amount necessary for complete combustion between the gases and the roof and over the entire stream of the gases whereby the gases of combustion will be held in a thin stream against the bath by the volume of air between the gases and the roof of the furnace.

20 3. In an open hearth furnace the combination with a gas port adapted to deliver a stream of gas into the furnace of an air port located over the gas port and adapted to deliver a stream of air between the gas and the roof of the furnace, the gas and air ports being so proportioned in relation to each other that the supply of air will

always be in excess of that required for the complete combustion of the gas.

30 4. In an open hearth furnace having a flat roof over the hearth, the combination with a gas port adapted to deliver a stream of gas into the furnace of an air port located over the gas port and adapted to deliver a stream of air between the gas and the roof of the furnace, the gas and air ports being so proportioned in relation to each other that the supply of air will always be in excess of that required for the complete combustion of the gas whereby there will always be a stratum of air between the gas and the roof to hold the gas in intimate contact with the bath and away from the roof.

35 5. In an open hearth furnace the combination with a pair of gas ports arranged side by side and adapted to deliver a stream of gas into the furnace, of an air port extending over the pair of gas ports and adapted to deliver a stream of air between the gas and the roof, the gas and air ports being so proportioned in relation to each other that the supply of air will always be in excess of that required for the complete combustion of the gases, the surplus air operating to hold the gases against the bath for the length of the furnace.

In testimony whereof I affix my signature in presence of two witnesses.

THOMAS S. BLAIR, JR. [L. S.]

Witnesses:

C. B. MOLAMPHY,

R. T. HARRIS.