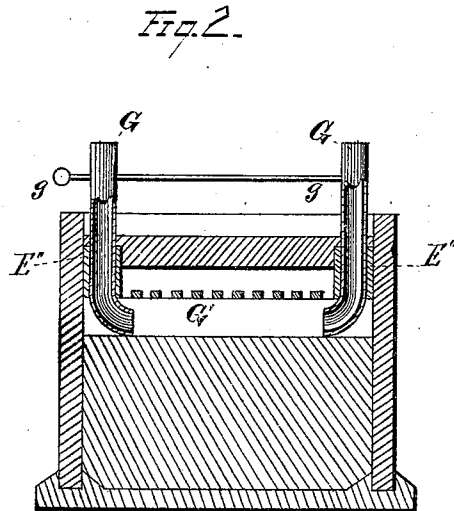
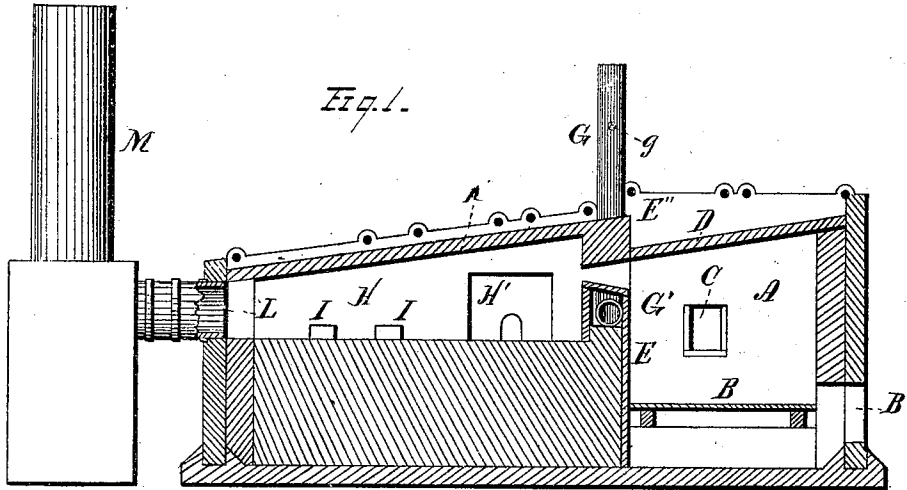


J. M. AYER.

Furnaces for Heating and Puddling Iron and Steel.

No. 150,122.

Patented April 28, 1874.



WITNESSES.

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IMPROVEMENT IN FURNACES FOR HEATING AND PUDDLING IRON AND STEEL.

Specification forming part of Letters Patent No. **156,122**, dated April 23, 1874; application filed April 21, 1874.

To all whom it may concern:

Be it known that I, JOHN M. AYER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in furnaces.

In the drawings, Figure 1 represents a longitudinal section of my invention, and Fig. 2 a cross-section of the same.

My invention consists in the various parts and combinations as hereinafter specified and claimed, wherein A is a chamber provided with a suitable grating, B, and ventilating-opening B', which may be made adjustable, so as to govern the amount of draft admitted to the furnace. C is a door, through which the furnace is supplied with fuel. D is the roof of the chamber A, and it is made to incline at a proper angle downward toward the chimney or stack M. E is a wall or partition, commonly known as the "fire-wall," standing between the chambers A and H. The upper or free portion of the fire-wall E is provided with the open flue, or what I term the "secondary combustion-chamber," G', which forms the upper portion of the fire-wall E, and is made continuous at each end with the secondary combustion-flues G G, which open outside the furnace, after passing a suitable distance through the same. The flues G G are provided with the regulating-dampers g g. The upper face of the secondary combustion-chamber G', which forms the upper portion of the fire-wall, as aforesaid, is made at a bevel or angle substantially opposite to that of the roofs D K and the lower free portion of the upper fire-wall E'. H is the heating or puddling chamber, provided with a roof, K, inclined at an angle parallel to that of the roof D of the fire-chamber A. The chamber H is provided also with a door or opening, H', through which the chamber H is supplied with piles, metal, or anything intended to be heated, and through which said chamber H may be inspected. I repre-

sents piles or other articles to be heated or charged. L is the exit-flue, commonly called the "velvet-flue," of the chamber H.

In my device, I place the chamber A at the rear of and below the floor of the chamber H. I prefer that the difference in height between the floors of the chambers A and H shall be substantially equal to the height of the fire-wall E.

The various parts, as herein specified, may be constructed of any suitable material possessing sufficient strength and capability of resisting high degrees of heat.

Fuel is placed upon the grating B in the chamber A, where the first combustion takes place. This combustion is, however, necessarily imperfect and incomplete. The heat, rising, and carrying with it the unconsumed matter, is so acted upon by the inclined roof D that a direct and undue draft from the chimney M will be counteracted, and this modified draft will conduct the heat and unburnt matter up and over the fire-wall E, and secondary combustion-chamber or perforated flue G' upon the upper portion thereof. At this point—i. e., the perforated combustion-flue G'—the combustion is made perfect and complete by a sufficient supply of oxygen through the flues G G, which, after the portions exposed within the furnace become sufficiently heated, operate in a manner sufficiently obvious not to demand specific demonstration.

Not only is combustion made perfect and complete at the secondary combustion-flues G' G G, but the angle of the flue G', and the opposing angle of the upper fire-wall E'', and the inclined roofs K and D, operate in such a way that the flames and heat, instead of rising and traveling along the crown and upper portion of the chamber H, as in all other furnaces of which I am aware, are made to take an opposite course, and drop upon and travel over the bottom or floor and lower portion of the chamber H, while the crown K and upper portion of the chamber H remain untouched and unaffected by the flames and intensified heat.

It will be seen that in my device the entire heat is applied in the best and most advantageous manner by being precipitated and retained directly upon the metal charged, while the crown, a portion heretofore rapidly burned

and destroyed, is preserved from undue heat, and made much more durable and lasting, inasmuch as the intensified heat does not come in contact with it.

Another advantage of my device is the saving insured to the velvet-flue, not only from the same causes that operate to save the crown K, but also from the fact that the heat, after having acted directly and continuously upon the piles or metal upon the floor of the chamber H, becomes sufficiently tempered and mellowed not to act so destructively upon the velvet-flue. Another advantage that I accomplish by my device will be clearly obvious by mere mention. It is evident that in the proportion that perfect and complete combustion is secured, in just that proportion is heat increased and fuel economized.

To secure this perfect combustion various devices, such as forced drafts, &c., have been employed; but I am not aware of any device such as herein specified, wherein not only a perfect combustion is secured without the employment of any but natural draft, but the flames and heat are directly, regularly, and continuously applied to the floor instead of the crown of the furnace. This effect, I consider, is materially assisted by the lowering of the chamber A below the floor of the chamber H, as specified, whereby a direct and undue draft is avoided.

By my device I claim to have accomplished, first, an increased heat, which acts directly, regularly, and continuously upon the metal charged; second, a saving of fuel, time, and labor, and consequent expense, by obtaining a complete combustion of all the fuel used, and applying this entire heat in a direct, regular, and continuous manner; third, cleanliness, inasmuch as it is evident that, with perfect combustion, no smoke, soot, &c., can come from the stack or chimney while the furnace is in operation; fourth, an improved product, and an economy of stock; fifth, a saving of material from which the furnace is constructed, on account of the disposition of the intensified heat, as heretofore specified, by preventing its direct contact with the crown of the furnace and the velvet-flue; sixth, a longer action and more effective application of the heat, by the action of the angular or inclined surfaces in modifying and governing the draft and the direction and action of said heat.

I do not limit the use of my invention to smelting or puddling furnaces, as it is evident that house-heaters could be constructed on similar principles, and the usual smoke and soot avoided by the perfect and complete combustion accomplished by my device.

I am aware of Patent No. 126,546, granted to Ira Hersey, wherein is shown a beveled lower fire-wall, opposed to which is the in-

clined roof of the primary combustion-chamber or fuel-magazine, whose angle is made to extend about midway over the lower fire-wall. In this device it is obvious that heat-rays or flames striking the fire-wall beyond a point opposite or below the angle of the roof above it would be reflected and thrown upward against the crown of the heating or puddling chamber.

My device is not liable to this objection. I extend the angle of my upper fire-wall E'' to a point opposite and above the higher angle of my fire-wall E.

By this provision none of the flames or intensified heat will be projected against the crown of my chamber H.

I claim as my invention—

1. The chamber A, placed in the rear of and below the floor of the bed of the chamber H, in combination with the fire-wall E, provided with the secondary combustion-chamber G', substantially as and for the purpose shown.

2. The combustion flue or chamber G', substantially as and for the purpose shown.

3. The combination of the perforated combustion-flue G' and the flues G G, substantially as and for the purpose shown.

4. The combination of the furnace H and flues G G, exposed partly to the action of the said furnace, substantially as and for the purpose shown.

5. The combustion-flue G', provided with the beveled or angular top, substantially as and for the purpose shown.

6. In combination with the beveled fire-wall E, the upper fire-wall E'', said wall E'' extending its angle to a point opposite and above the higher angle of the wall E, substantially as and for the purpose shown.

7. The combination of the fire-wall E, beveled combustion-chamber G', flues G G, and beveled upper fire-wall E'', substantially as and for the purpose shown.

8. The flues G G, provided with the dampers g g, in combination with the combustion-flue G', substantially as and for the purpose shown.

9. The combination of the chamber A, grate B, inclined roof D, fire-wall E, combustion-chamber G', flues G G, upper beveled fire-wall E'', and chamber H, provided with the angular or inclined roof K, substantially as and for the purposes specified and shown.

In testimony that I claim the foregoing I have hereunto set my hand this 21st day of April, 1874.

JOHN M. AYER.

Witnesses:

ROBT. M. BARR,
G. J. FERRISS.