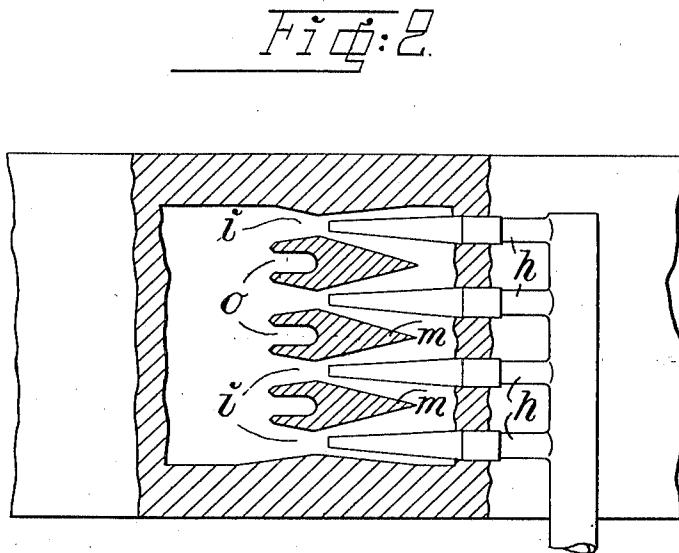
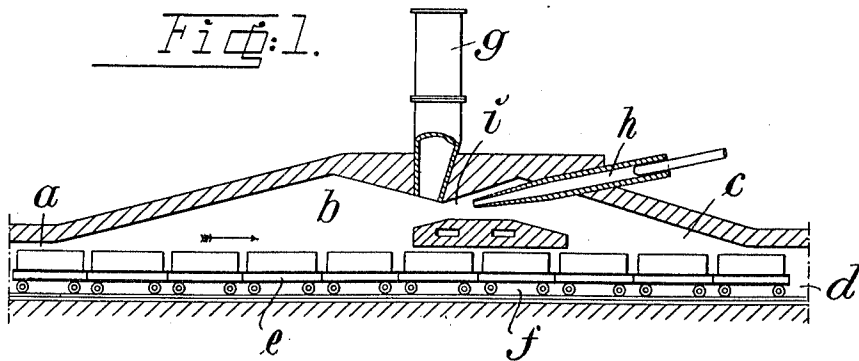


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CHANNEL FURNACE FOR BURNING ORE BRICKS.  
APPLICATION FILED AUG. 4, 1910.

1,089,868.

Patented Mar. 10, 1914.



WITNESSES

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# UNITED STATES PATENT OFFICE.

ARTHUR RAMEN, OF HELSINGBORG, SWEDEN.

CHANNEL-FURNACE FOR BURNING ORE-BRICKS.

1,089,868.

Specification of Letters Patent.

Patented Mar. 10, 1914.

Application filed August 4, 1910. Serial No. 575,541.

*To all whom it may concern:*

Be it known that I, ARTHUR RAMÉN, chief engineer, a subject of Sweden, residing at Villa Margit, Olympia, Helsingborg, Sweden, have invented new and useful Improvements in Channel-Furnaces for Burning Ore-Bricks, of which the following is a specification.

For burning bricks of ore and the like, as is well known, channel furnaces are used, which partly consist of an upper channel divided into a preheating chamber, a combustion chamber and a cooling chamber, partly of a lower channel separated from the upper one by means of a movable, refractory hearth. The latter is generally composed of a number of carriages running on a track in the lower channel and having their side edges plunging into sand grooves for separating the upper and lower channels tightly from each other. In burning ore bricks in such furnaces it is necessary to provide, at least in the combustion chamber, a steady, hot and oxidizing flame, which is preferably effected by introducing preheated air and gas under pressure in this chamber through suitable nozzles. It has been proved that the pressure under which these gases are introduced is of great importance, because an increased speed of the gas particles will increase the speed of combustion and thus also the temperature. In order to utilize the heat of the burnt material in such furnaces the combustion air has generally been introduced at the rear end of the furnace in opposite direction to that in which the hearth is moved, the air being hereby preheated by the said material on its way through the cooling chamber. By the friction against the material, the air, however, loses a great deal of its pressure, part of the air finding also its way to the lower channel (where a lower pressure is prevailing) and thus on account of the heat already absorbed counteracts the cooling of the movable hearth in the cooling chamber. Moreover, this arrangement does not permit the introduction of the preheated air from the cooling chamber through a small number of nozzles suitably arranged with respect to the gas introduced into the combustion chamber, the air on the contrary passing above and between the material as well as down between the edges of the hearth and the side walls of the furnace. Hereby the intimate mixing of the

gas and the combustion air that is necessary for producing the highest possible temperature of combustion, is prevented. It is, however, of great importance to acquire such a temperature in all cases, when an efficient generator gas is not available, but only a less efficient gas, for instance blast furnace gas, the use of which does not permit the obtaining of a sufficient heat in the channel furnaces hitherto employed.

The present invention has for its purpose to overcome the aforesaid difficulty by such an arrangement of the said furnaces, that the preheated air present in the inner end of the cooling chamber is introduced into the combustion chamber by channels or nozzles arranged in suitable position with relation to the gas inlets, by means of a current of gas or air, which may be preheated, and which is pressed into the said nozzles and hereby draws in the air as in a usual injector. It is obvious, that if gas under pressure is used as a driving agent, the whole air mixture hereby can obtain a higher speed, no pressure in the cooling chamber causing leakage to the lower channel taking place, and that if air under pressure is used, the air mixture can be introduced into the combustion chamber by means of nozzles suitably arranged in relation to the inlet openings for the gas, it being then necessary to impart to the said gas a speed corresponding to the said increased speed.

In using several channels of the kind described above, the said channels may be alternately used for the introduction of gas and air, so that what is called a gallery introduction is effected.

A further advantage of the furnace arrangement described lies in the fact, that the regulation of the gas and air quantities over the whole width of the furnace is permitted, independently of the largeness of the said width, this being of importance for effecting a uniform combustion. The said arrangement thus makes it possible to use furnaces of any width, for instance more than 3 meters, while hitherto—on account of the impossibility of regulating the air quantity introduced from the cooling chamber—furnaces larger than 1.5 meters have not been in use. This advantage is of great importance from a practical point of view.

In the accompanying drawing Figure 1 shows a channel furnace arranged accord-

ing to the present invention in a longitudinal vertical section, while Fig. 2 shows another form in a horizontal section.

In Fig. 1, *a* is the preheating chamber, *b* the combustion chamber and *c* the cooling chamber, to which combustion air is fed through the outlet end *d*. *e* is the movable hearth of the furnace (which may consist of carriages), *f* the lower channel, *g* the gas inlet and *h* a tube forming together with the channel *i* an injector for the introduction of air or gas under pressure (preheated if wanted), the said gas or air hereby drawing in air from the cooling chamber through the channel *i*, where it is mixed with gas. The fuel on the hearth keeps the greater part of the lower channel *f* closed, so that the greater part of the air must pass into the chamber *b* by the said channel *i*. If gas is introduced through the tube or tubes, no special gas introduction is of course required through the inlet *g*, which then can be omitted. If the furnace is to be operated by means of blast furnace gas, the air preheated in the hot air apparatus may preferably be used for drawing the air into the preheating chamber from the cooling chamber by injector action. The injector then may consist of water-cooled tubes, for instance inserted in water cooled channels of refractory material. It is also preferable to construct these tubes in such a way as to be introduced in different positions into the furnace, which may be effected by means of telescopic joints.

Furnaces, the cooling chambers of which are provided with air channels opening into the combustion chamber through the brickwork, are already known. In such furnaces a mixture between the combustion air and the gas may be effected, but the preheating of the air and the cooling of the burnt material will be poorer than by the present invention.

In Fig. 2, *m* are division walls separating the different channels *i* between the cooling chamber and the combustion chamber from each other; in each of these channels opens a nozzle *h*. Through these nozzles *h*, gas and air under pressure are alternately introduced into the channels *i* and therefrom into the combustion chamber. A gallery introduction of the kind described may, however, also be effected by introducing air under pressure through all the tubes *h* and gas from above through special tubes (as in Fig. 1); the latter tubes then should discharge into open grooves *o* in the walls *m* between the channels *i* at the sides opposing the combustion chamber. The gas then will pass between the air currents coming through the channels, whereby a very effi-

cient mixing of the gas and the air and thus a high temperature is obtained.

When not blast furnace gas, but generator gas is used (in which case no high pressure is required in the furnace), the last described arrangement may be more simple in use than that previously described, and will still effect a perfect mixing of the gas and air.

Having now particularly described the nature of my invention and the manner of its operation, what I claim is:

1. In a channel furnace, a movable hearth, a combustion chamber, a cooling chamber communicating therewith, a bridge positioned above said movable hearth intermediate said chambers whereby a channel is formed between the bridge and the roof of the furnace, and means for introducing a gaseous medium under pressure in said channel, and in the direction of the combustion chamber, whereby air will be drawn by injection from the cooling chamber and forced into the combustion chamber.

2. In a channel furnace a movable hearth, a combustion chamber, a cooling chamber communicating therewith, a bridge positioned above said movable hearth intermediate said chambers, a channel between the bridge and the roof of the furnace, vertical partition walls in the said channel dividing it into vertical channels and means for introducing a gaseous medium under pressure in said vertical channels and in the direction of the combustion chamber, whereby air will be drawn by injection from the cooling chamber and forced into the combustion chamber.

3. In a channel furnace a movable hearth, a combustion chamber, a cooling chamber communicating therewith, a bridge positioned above said movable hearth intermediate said chambers a channel between the bridge and the roof of the furnace, vertical partition walls in the said channel dividing it into vertical channels, means in the partition walls for introducing combustible gas under pressure between the said channels and means for introducing a gaseous medium under pressure in said channels and in the direction of the combustion chamber, whereby air will be drawn by injection from the cooling chamber and forced into the combustion chamber.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR RAMÉN.

Witnesses:

H. TELANDER,  
BIRGER NORDFELDT.