F. E. PARKS.

FURNACE PORT COOLING SYSTEM.

APPLICATION FILED APR. 12, 1912.

1,113,245.

Patented Oct. 13, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

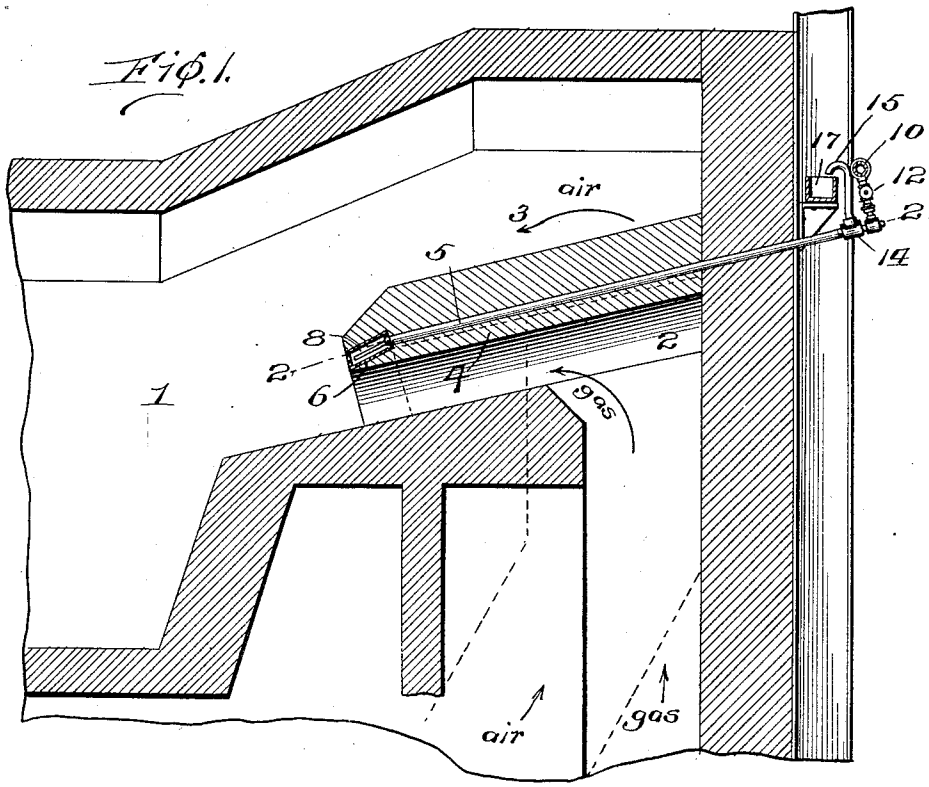
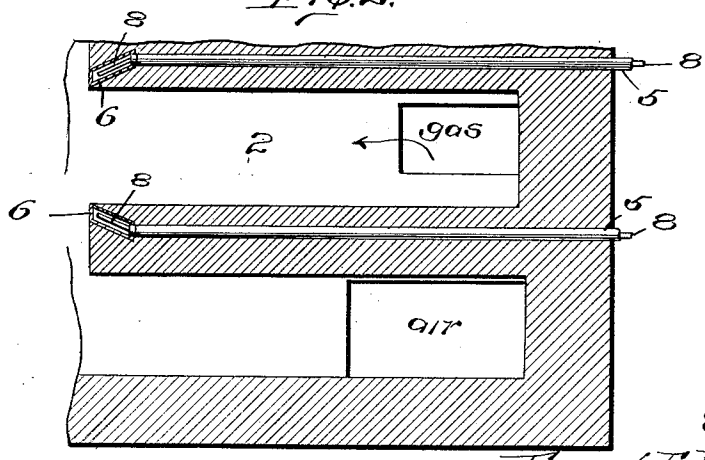


Fig. 2.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

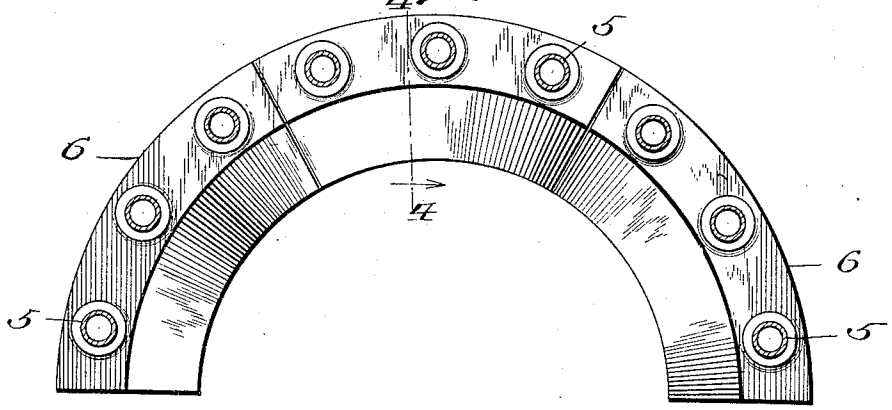


Fig. 4.

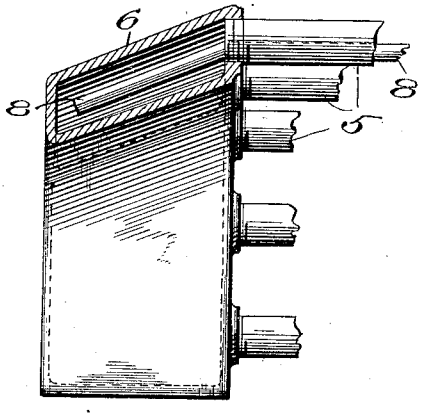
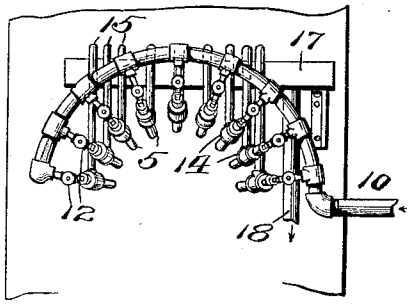


Fig. 5



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FURNACE-PORT COOLING SYSTEM.

1,113,245. Specification of Letters Patent. Patented Oct. 13, 1914.

Application filed April 12, 1912. Serial No. 690,338.

To all whom it may concern:

Be it known that I, FRANK E. PARKS, a citizen of the United States, residing at Pueblo, in the county of Pueblo and State of Colorado, have invented certain new and useful Improvements in Furnace-Port Cooling Systems, of which the following is a specification.

My invention relates to mechanism for cooling the arches and maintaining the gas ports of metallurgical furnaces, and is an improvement upon my prior Patent No. 932,493, and Patent No. 896,937, granted to H. A. Deuel and myself. While the cooling systems disclosed in said former patents have been satisfactory in practice, yet I have devised certain improvements which enhance the efficiency and insure the continuous operation of the cooling mechanism.

By my present invention, I am enabled to reduce the number of the arch cooling members, thereby increasing the stability of the arch.

One of the main objects, however, of my present invention is to provide a multiple water supply to each cooling member or element, which insures a constant supply even though one supply conduit may be temporarily clogged, and repairs may be made without interrupting the circulation of the cooling medium in any part of the terminal cooling-arch or endangering the integrity of any cooling member.

Another object is to so arrange the cooling members or elements with relation to the port as to insure protection to the supporting brick arch and also to maintain a fixed area to the port.

These advantages are secured by the construction shown in the accompanying drawings, illustrating one embodiment of my invention and in which—

Figure 1 is a longitudinal section of one end of an ordinary open hearth furnace, showing the manner of applying my invention; Fig. 2 is a horizontal section on the line 2—2 of Fig. 1; Fig. 3 is a rear elevation of a set of arch cooling members in assembled relation; Fig. 4 is a side elevation of the right-hand half of Fig. 3; and Fig. 5 is an end view of the arch structure, upon a reduced scale, showing the water-supply and discharge connections in elevation.

The furnace 1 is provided with the usual gas ports 2 and air ducts 3, leading from the slag pockets and regenerators into the furnace. The arch 4 of the ports is constructed of silica brick or other suitable refractory material, and is cooled in the manner described in said prior patents, by means of a plurality of water pipes 5, extending longitudinally directly above the arch and embedded in a covering of silica sand, magnesite, or other refractory material, which is tamped up to the required thickness over the arch bricks, thereby protecting the pipes or water conduits from the flame of the furnace and which by their juxtaposition with the arch, serve to cool and maintain the integrity of the refractory material of the port structure.

As in my prior Patent No. 932,493, each pipe 5 terminates in a hollow metal block 6, which may be a bronze casting, the pipe being preferably screw threaded therein, as shown in Fig. 4. In my present invention, the hollow metal blocks constituting cooling chambers are preferably symmetrical and constitute segments of the cooling-arch or frame, which is formed of three or more blocks. In practice I have found that an arch of three blocks is preferable, and that this construction provides an exceedingly stable frame. For the purpose of affording a greater protection to the inner end of the port, where the heat is greatest, than in the construction of my said former patent, I incline the longitudinal wales of the cooling blocks inwardly toward the port, so that the entire cooling-arch tapers inwardly. In order that the exposed ends of the cooling arch may conform to the end of the rectangular port walls, the cooling blocks are preferably rhomboidal in cross-section. It will be apparent that the angular relation of the cooling-arch to the port, with its innermost angle forming the marginal curved line thereof, maintains a fixed area, which is of very great importance in the operation of the furnace.

In my former patent each terminal cooling block was provided with a single supply pipe and a discharge pipe, and although this is efficient under normal conditions, it is inadequate when any obstruction or stoppage occurs in either pipe. In my present invention, I provide a plurality of supply and discharge conduits or pipes, thereby insuring a continuous circulation of water, even though one of the pipes should become

clogged, and permitting the cleaning of the pipes without interrupting the water circulation.

I have shown the chamber of each terminal cooling block provided with three sets of supply and discharge pipes, although it is obvious that a different number may be employed. The supply pipes 8 are each connected separately to a main water supply or header 10, and individually controlled by a valve or cock 12, the inner ends terminating near the inner exposed wall of the hollow metal blocks, so that the coolest water may strike the hottest part of the metal. The supply pipes may conveniently pass through the interior of the larger discharge pipes 5, the outer ends of which are connected by means of T-fittings 14 and short outlet pipes 15 with a trough 17, having a sewer connection 18.

After the cooling pipes are in position, extending in close contact with the upper surface of the arch bricks, the arches are tamped up to the required thickness with silica sand, magnesite, or other suitable refractory material; thereby protecting the pipes upon their upper sides and permitting the maximum cooling effect upon the bricks of the arch beneath the pipes. The arch is self-supporting, so that no weight or stresses are thrown upon the cooling system, which renders it more durable.

While I have illustrated and described a preferred embodiment of my furnace port cooling system having a multiple water supply, I am aware that other arrangements of circulating pipes and of the hollow terminal blocks may be employed without departing from the scope of my invention as expressed in the claims.

I claim:—

1. In a regenerative-furnace, a port structure extending therein, and means for maintaining the integrity of the port structure comprising a water-cooled frame composed of separate hollow cooling elements and constituting a portion of the inner end of the port, a plurality of fluid circulating conduits connected to each cooling element, and means for supplying a cooling fluid independently to each conduit.

2. In a regenerative-furnace, a port structure extending therein, and means for maintaining the intergrity of the port structure comprising a water-cooled frame having a plurality of independent chambers in the port structure adjacent the inner end thereof, and a plurality of sets of fluid circulating conduits connected to each chamber, whereby a fluid circulation may be maintained in one or more of said sets during the inaction of another of said sets.

3. In a port-structure of a regenerative-furnace, a water-cooled metal frame constituting an integral supporting portion of the inner exposed end of the port and forming the inner margin of the arch thereof and being flush with the inner end thereof, thereby maintaining a fixed port area.

4. In a port-structure of a regenerative-furnace, a water-cooled metal frame constituting a portion of the inner exposed end of the port and forming an arch whose longitudinal walls taper toward the inner end of the port an at angle to the inner port wall, and to the longitudinal wall of the arch.

5. In a port-structure of a regenerative-furnace, a water-cooled metal frame constituting a portion of the inner exposed end of the port and comprising separate, symmetrical, arcuate, hollow blocks at an angle to the inner port wall, and to the longitudinal wall of the arch.

6. A port-structure of a regenerative-furnace, comprising a water-cooled metal frame composed of hollow blocks rhomboidal in cross section having one face or end in the plane of the inner end of the port, and extending at an angle to the inner wall of the port.

7. A port-structure of a regenerative-furnace, comprising a water-cooled metal frame composed of hollow blocks rhomboidal in cross section having their longer sides arranged at an angle to the longitudinal axis of the port, and extending at an angle to the inner wall of the port.

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

FRANK E. PARKS.

Witnesses:
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."