2 Sheets—Sheet 1.

A. L. HOLLEY.

FURNACE.

No. 180,028. Patented July 18, 1876.

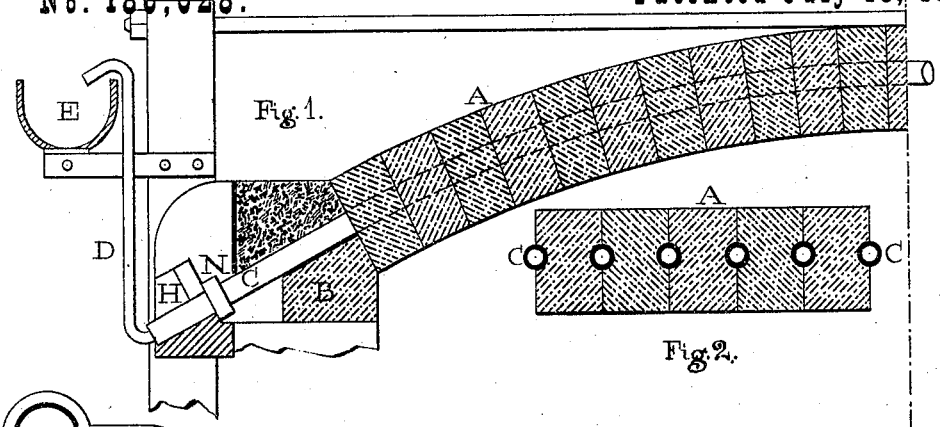

Fig. 1.

Fig. 2.

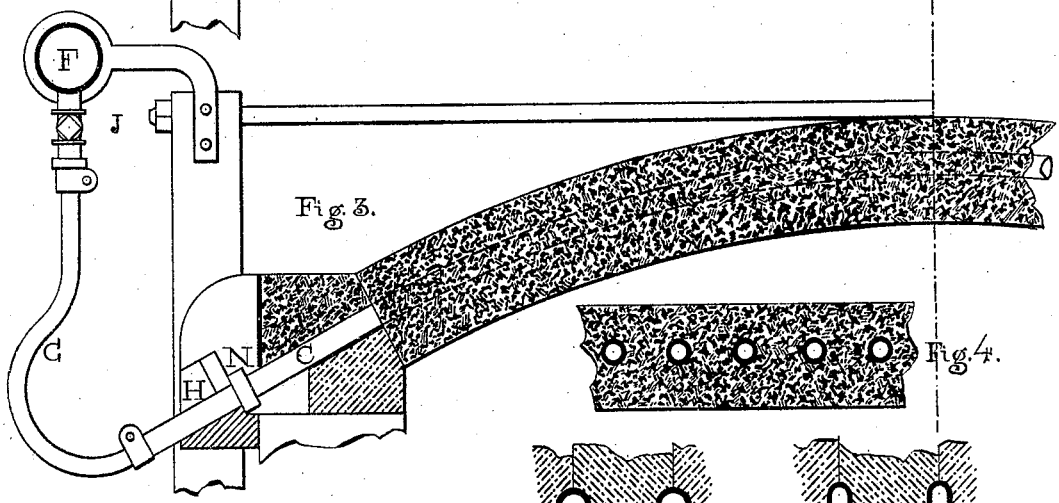

Fig. 3.

Fig. 4.

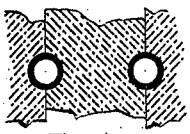

Fig. 5.

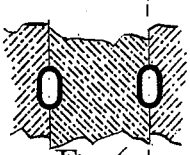

Fig. 6.

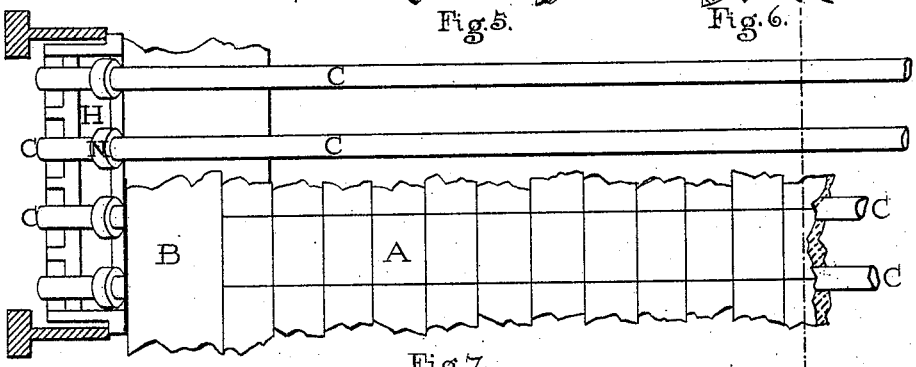

Fig. 7.

Witnesses,

H. Laureau

D. Barnes

Inventor

A. L. Holley

2 Sheets—Sheet 2.

A. L. HOLLEY.

FURNACE.

No. 180,028. Patented July 18, 1876.

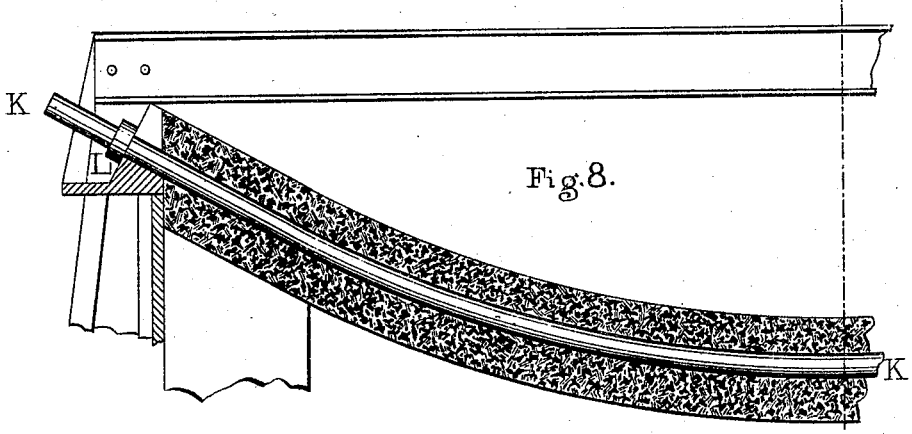

Fig. 8.

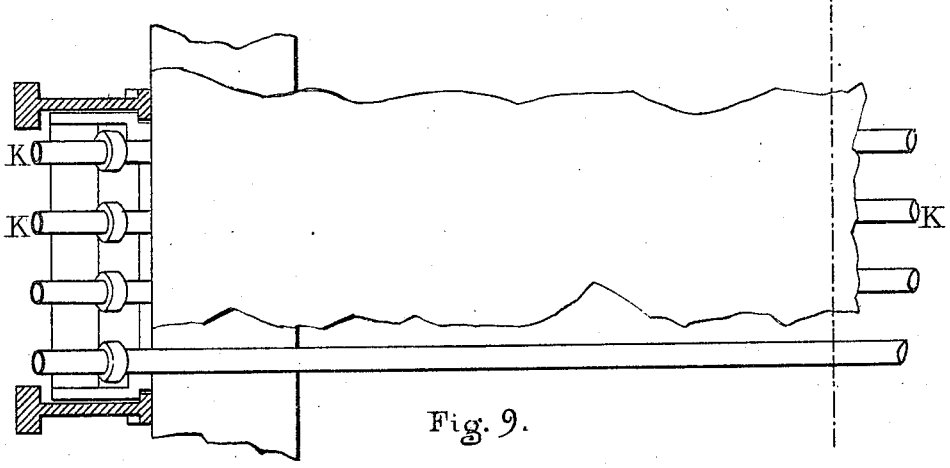

Fig. 9.

Witnesses.

H. Lawrence

D. Barnes

Inventor,

A. L. Holley

UNITED STATES PATENT OFFICE.

ALEXANDER L. HOLLEY, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN FURNACES.

Specification forming part of Letters Patent No. **180,028**, dated July 18, 1876; application filed January 22, 1876.

To all whom it may concern:

Be it known that I, ALEXANDER LYMAN HOLLEY, of Brooklyn, in the county of Kings and State of New York, have invented an Improvement in Furnaces, of which the following is a specification:

It is well known that the earthen walls of vessels subjected to high temperatures, such as metallurgical furnaces, may be more or less defended from the destructive action of heat and corrosion by means of water-jackets or water-pipes placed upon or in such walls. The earthen walls of such furnaces, however, in order to be self-sustaining, must frequently be of shapes which are more or less unsuited to the operations which go on within the vessels; for instance, it is desirable that the roof of an open-hearth steel-furnace should be shaped so as to perfectly and uniformly throw the flame down upon the bath. In order, however, to be self-sustaining, it is so arched as to interfere with these functions.

My invention consists in holding together and sustaining the walls and roofs of furnaces by means of conduits for water, air, or spray, employed for cooling said walls and roofs. I make these water, air, or spray conduits do the double duty of holding up the wall and defending it against heat.

The first advantage of my invention is, that the walls may be shaped to suit the operations going on in the furnace, as above explained. A second advantage is, that the walls may be made monolithic, and hence more cheaply than if built up of bricks in the usual manner.

Several forms of my invention are illustrated in the accompanying drawings, in which—

Figure 1 is a cross-section of a part of the roof and side wall of a reverberatory heating-furnace. Fig. 2 is a longitudinal section of a part of the roof. Fig. 3 is a cross-section illustrating another form of the improvement. Fig. 4 is a longitudinal section thereof. Figs. 5 and 6 are transverse sections illustrating different forms of the water-tubes. Fig. 7 is a plan of the roof, partly in section. Fig. 8 is a longitudinal section of a roof of another form illustrating the invention. Fig. 9 is a plan of the same.

A series of pipes, C C, forming arches, and abutting, by means of collars N, against the skewbacks H, span the hearth of the furnace, and have a tendency to sustain the brick roof A, which is built around them. Water, air, or spray may be admitted to each arch-pipe C by means of a cock, J, and hose G, leading from the common main F, as shown in Fig. 3.

When water is employed as the cooling medium, each arch-pipe C, Fig. 1, may discharge by means of the pipe D (which stands higher than the arch-pipe, and so keeps the latter full) and the common discharge-trough E.

Figs. 3 and 4 represent another form of my improvement, in which a similar series of arch-pipes, C, form a kind of frame, upon and around which a monolithic roof is consolidated, and by which the roof is sustained and cooled. The roof may be made of any suitable refractory material, such as the ganister used in Bessemer converters, or silica with a little lime, as used for "silica" brick. The material, being ground to sand and powder, is mixed with water until it is suitably plastic, and then rammed or otherwise formed around the arch-pipes, and dried and glazed in the manner familiar to the users of refractory materials.

Fig. 8 shows another form of my improvement. The water, air, or spray pipes K in the roof form tension members instead of arches, and are suspended from the collars L, which are held up by the shell of the furnace. Either a brick roof, like that shown by Fig. 1, or a monolithic roof like that shown by Fig. 3, is sustained by these tension-pipes in any depending form that may be desired; or, the sustaining water-pipes may run straight from side to side of the furnace, thus forming girders. These girders may be sustained by hangers at intermediate points between the sides of the furnace, and the conduits forming the girders may be flattened, as shown at Fig. 6, to increase their vertical stiffness, and to leave more space between the conduits for refractory materials, and the conduits may run longitudinally or diagonally, or be interlaced, and details may be modified in various ways to suit special cases.

The number of water, air, or spray pipes which may be necessary to sustain the roof and to properly cool it, and also the rate of

flow through the pipes, will depend on the degree of heat employed, the character of the refractory material, the shape and size of the roof, and the degree of heat which may be spared from the furnace, all of which may be readily determined for each case.

For ordinary iron-heating furnaces of six to eight feet width, I prefer for a monolithic roof two-inch heavy wrought-iron pipes from six to nine inches apart.

I have mentioned that the use of water jackets and pipes to cool and preserve furnace-walls is well known, and I do not claim such use.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent—

The combination, with a furnace wall or roof, of a structure for sustaining said wall or roof, constituting a water, air, or spray conduit for cooling the same, substantially as described.

A. L. HOLLEY.

Witnesses:
P. BARNES,
C. EDMUNDS.