No. 896,937. PATENTED AUG. 25, 1908.

F. E. PARKS & H. A. DEUEL.

FURNACE PORT COOLING MEANS.

APPLICATION FILED MAR. 3, 1908.

2 SHEETS—SHEET 1.

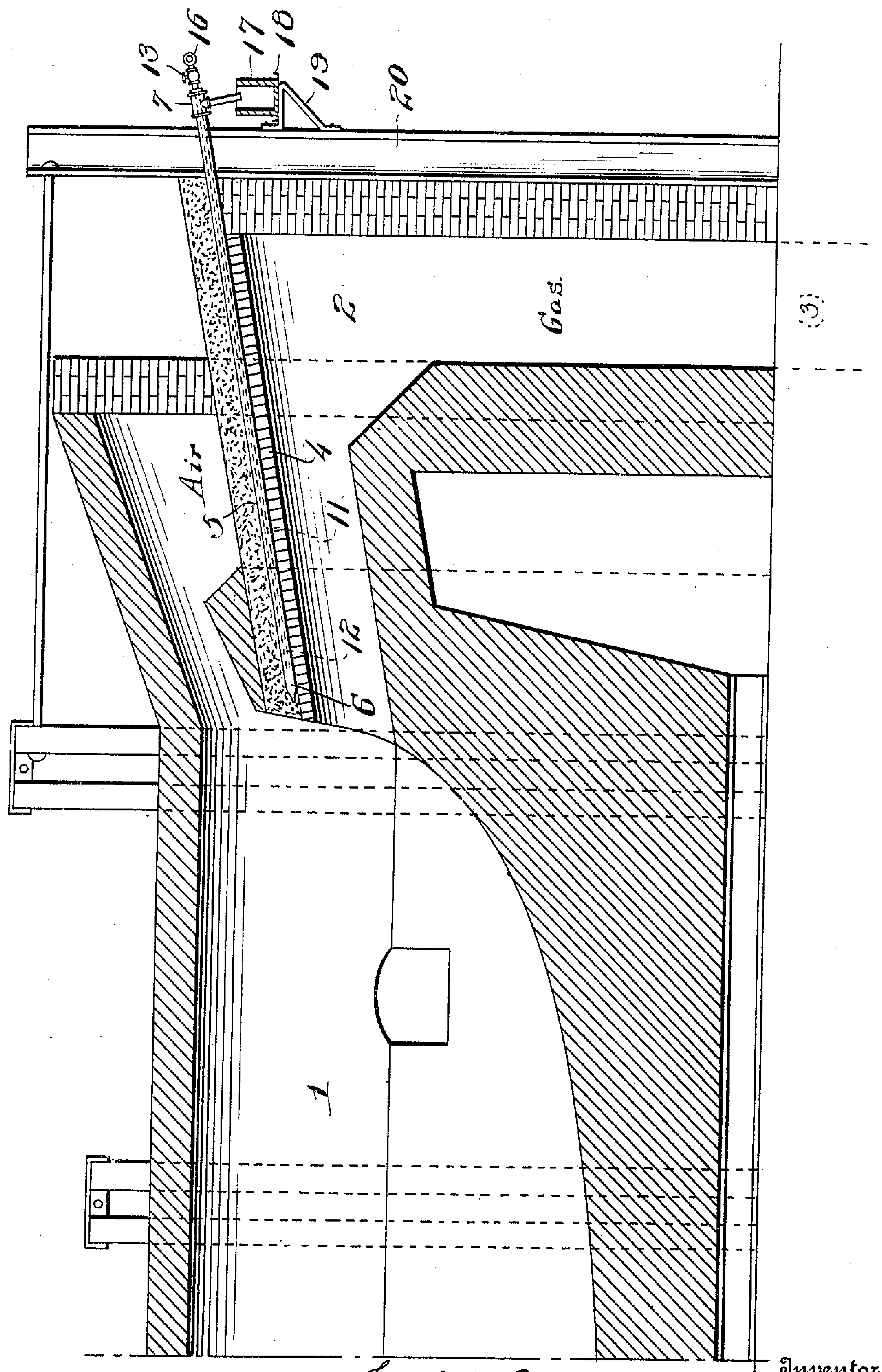

Fig. 1.

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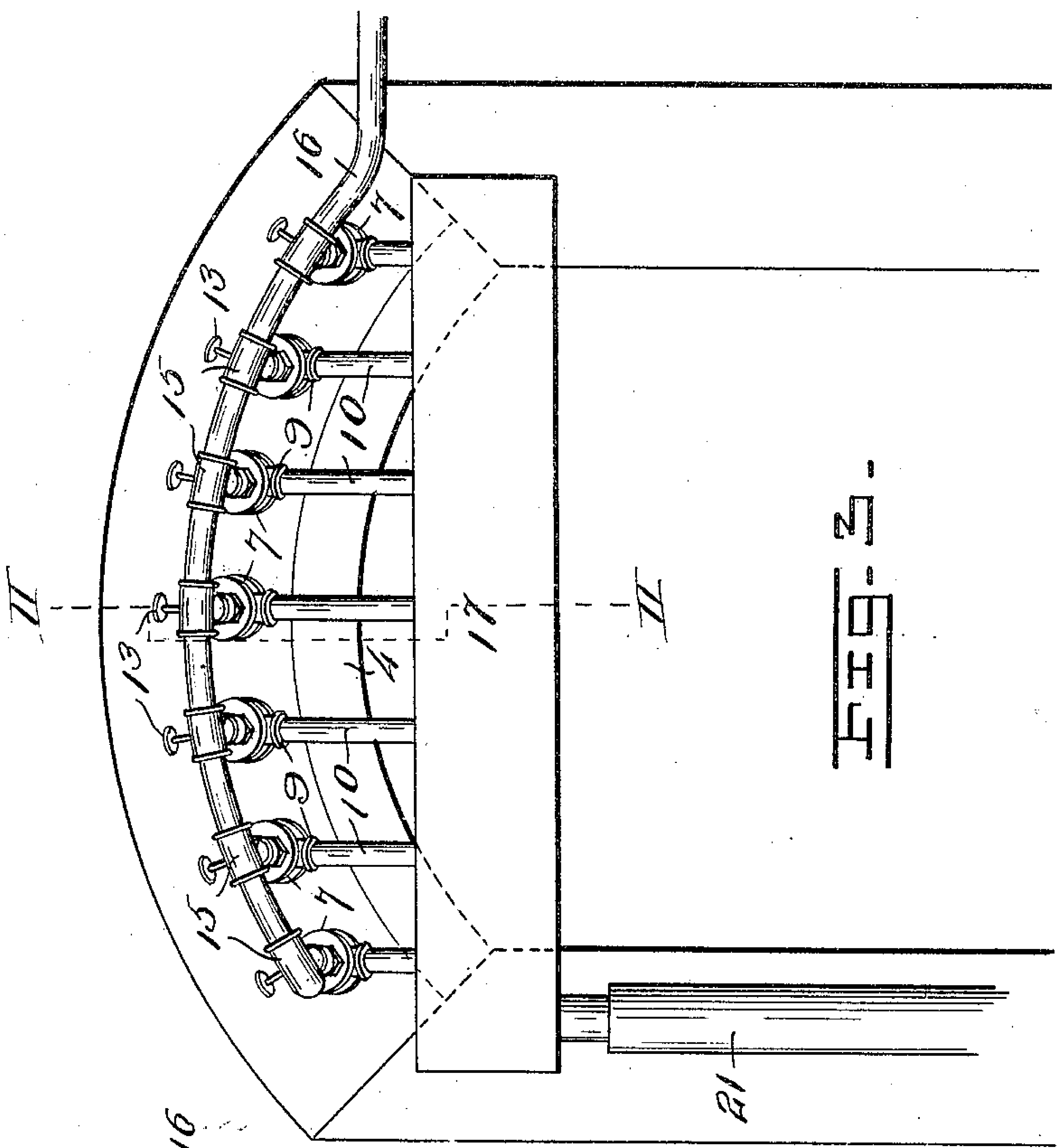

Fig. 3.

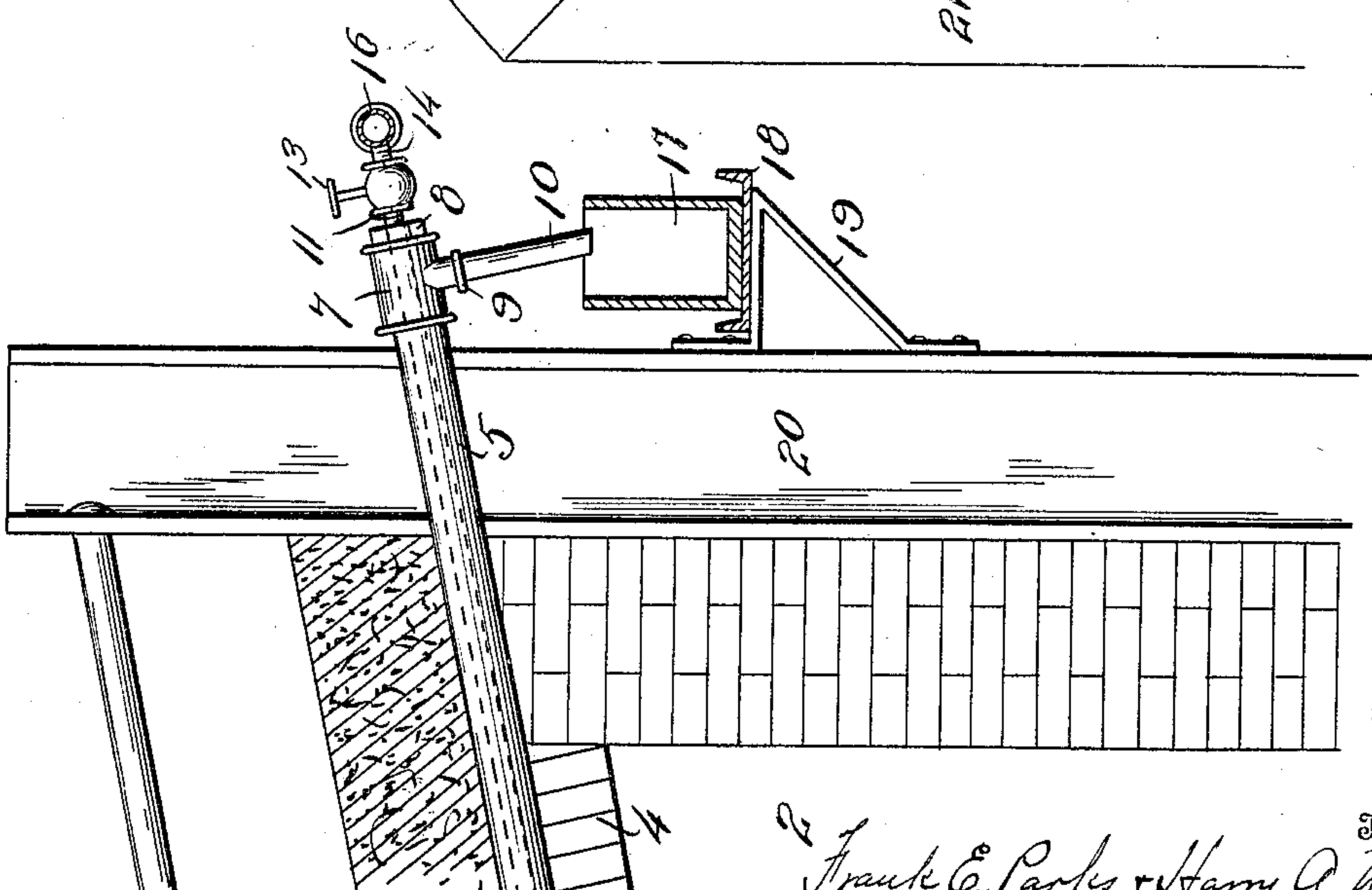

Fig. 2.

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UNITED STATES PATENT OFFICE.

FRANK E. PARKS AND HARRY A. DEUEL, OF PUEBLO, COLORADO.

FURNACE-PORT-COOLING MEANS.

No. 896,937. Specification of Letters Patent. Patented Aug. 25, 1908.

Application filed March 3, 1908. Serial No. 418,996.

To all whom it may concern:

Be it known that we, FRANK E. PARKS and HARRY A. DEUEL, citizens 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 Means, of which the following is a specification.

Our invention relates to arch cooling means for the gas ports of metallurgical furnaces, and its object is to provide a construction whereby the arch is efficiently cooled while remaining self supporting; the refractory material of the arch being protected without abstracting any appreciable portion of the heat imparted to the gas by the regenerators or to the products of combustion heating the opposite regenerators. At the same time, the walls of the ports are prevented from cutting back, particularly at their junction with the furnace; thereby preserving their original construction and dimensions and keeping the gas confined so that it does not spread and cut the front and back walls of the furnace. We secure these advantages by the construction shown in the accompanying drawing, in which—

Figure 1 is a diagrammatic longitudinal section of one half of an ordinary form of open hearth furnace, showing the manner of applying our invention; Fig. 2 is similar view of a portion of the outer end of the arch, corresponding to a section on the line II—II of Fig. 3, and Fig. 3 is an end view of the arch structure showing the water-supply and discharge connections in elevation.

1 is the body of the furnace supplied by the usual gas ports 2 leading, at 3, to the regenerators or slag pockets (not shown).

The arch, 4, of the ports is constructed of suitable refractory material, preferably silica brick, and immediately above the arch are placed a plurality of pipes 5, extending longitudinally thereof as nearly as practicable to the inner or furnace end of the arch; the inner ends of these pipes being suitably closed at 6, (Fig. 1) preferably by welding. The outer end of each pipe is fitted with a T, 7, one end of which may be partially closed by a reducer 8, while the side connection 9 is fitted with a short discharge pipe 10.

Passing inside each of the pipes 5, and secured therein by the reducers, are lengths of smaller supply pipe 11, open at their inner ends 12 (Fig. 1) and each fitted at its outer end with a cock or valve 13. Short nipples 14 may be used to connect the pipes 11, outside the valves 13, to T's or other suitable fittings 15, on a common supply pipe 16; though any other preferred arrangement may be substituted which will permit each pipe 11 to be supplied independently of the others; for example, independent supplies, instead of a common pipe 16, might be provided; adapted for ready disconnection and the application of higher-pressure connections, for cleaning in case of stoppage.

The overflow pipes 10 empty into a common waste trough 17, preferably supported in a slightly inclined length of channel-iron 18, carried by brackets 19, secured to the buck-stays 20. A sewer connection 21 is provided at the lower end of the water-trough.

Any desired number of cooling pipes may be used, and of suitable stock sizes; 2½ inch pipes with one inch supplies and overflows having been found adequate. By flattening the pipes 5 to elliptical cross section where they are embedded in the arch, and arranging longer axes of the ellipses horizontally, the cooling effect may be more evenly distributed on the upper surface of the arch, if desired.

It will be noted that the incoming cold water is discharged at the inner ends of the pipes over the hottest portion of the arch; and that if leakage occurs in any pipe its supply may be temporarily cut off till repairs can be made. Moreover, if stoppage occurs in any pipe, the full force of the supply may be thrown through it by closing the other supply pipes.

After the cooling pipes are laid 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 from the flame of the furnace, giving close contact with the cooling surface of the pipe and insuring maximum radiation.

Although we have illustrated and described the preferred embodiment of our invention, it is evident that other arrangements of circulating pipes might be used which would supply the cooling liquid in close contact with the upper surface of the self-supported arch material.

We are aware that the inner edges of furnace ports have been cooled by embedded pipes, that cooling means have been provided below the arch and within the port and that arches, both upright and inverted, have been supported by a grid or frame-work of cooling pipes; but the advantages of our invention result from the fact that the ordinary form of arch is efficiently cooled and rendered durably self-supporting, the cooling system itself made more durable by reason of its sustaining no weight of wall, and the full available heat of the gases utilized by reason of the rapidly-conducting metallic water-conduits being removed from direct contact therewith.

What we claim is:—

1. Cooling means for regenerative-furnace port-walls, comprising a self-supporting wall, a plurality of fluid-circulating conduits arranged longitudinally of said wall and embedded in refractory material, and independent fluid-supply connections to each conduit; substantially as described.

2. Cooling means for regenerative-furnace port-arches, comprising a plurality of fluid-circulating conduits arranged longitudinally of and in close contact with the upper side of the arch-wall and embedded in refractory material, and independent fluid-supply connections to each conduit; substantially as described.

3. Cooling means for furnace-ports, comprising a self-supporting arch, a plurality of fluid conduits for absorbing and conveying heat from said arch, said conduits being located out of contact with the heated gases, and means for supplying a cooling fluid to said conduits at the hottest part of said arch; substantially as described.

4. A furnace-port having a self-supporting arch, a plurality of water-pipes arranged longitudinally of the upper surface thereof, independent supply connections for each pipe, and a common discharge-trough for the pipes; substantially as described.

5. A water-cooled port for open-hearth furnaces, comprising a self-supporting arch of refractory material, a plurality of cooling pipes arranged in close contact with the upper side of said arch, an independent fluid-supply pipe arranged to discharge fluid at the inner end of each cooling-pipe, closing means for each supply-pipe and discharge orifices for the cooling pipes; substantially as described.

6. A water-cooled gas-port for open-hearth furnaces, comprising a self-supporting arch, a plurality of cooling-pipes arranged longitudinally in close contact with the outer side of said arch, fluid-supply pipes arranged to discharge a cooling-fluid near the closed end of each cooling pipe, independent closing means for each supply-pipe, a common collecting trough for the heated fluid discharged from the cooling-pipes, and heat- protecting and -radiating material closely covering said cooling-pipes; substantially as described.

7. Cooling means for regenerative furnace ports, comprising a self-supporting refractory arch, a plurality of fluid-circulating conduits arranged longitudinally of and embedded in the refractory arch out of contact with the heated gases, and independent fluid-supply connections arranged to supply cooling fluid to said conduits at the hottest part of the arch; substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

FRANK E. PARKS.
HARRY A. DEUEL.

Witnesses:
JAMES H. ROBINSON,
J. H. MEANS.