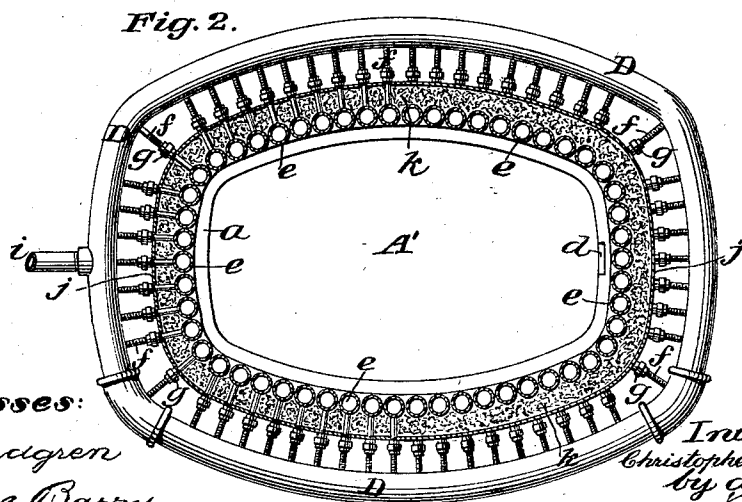
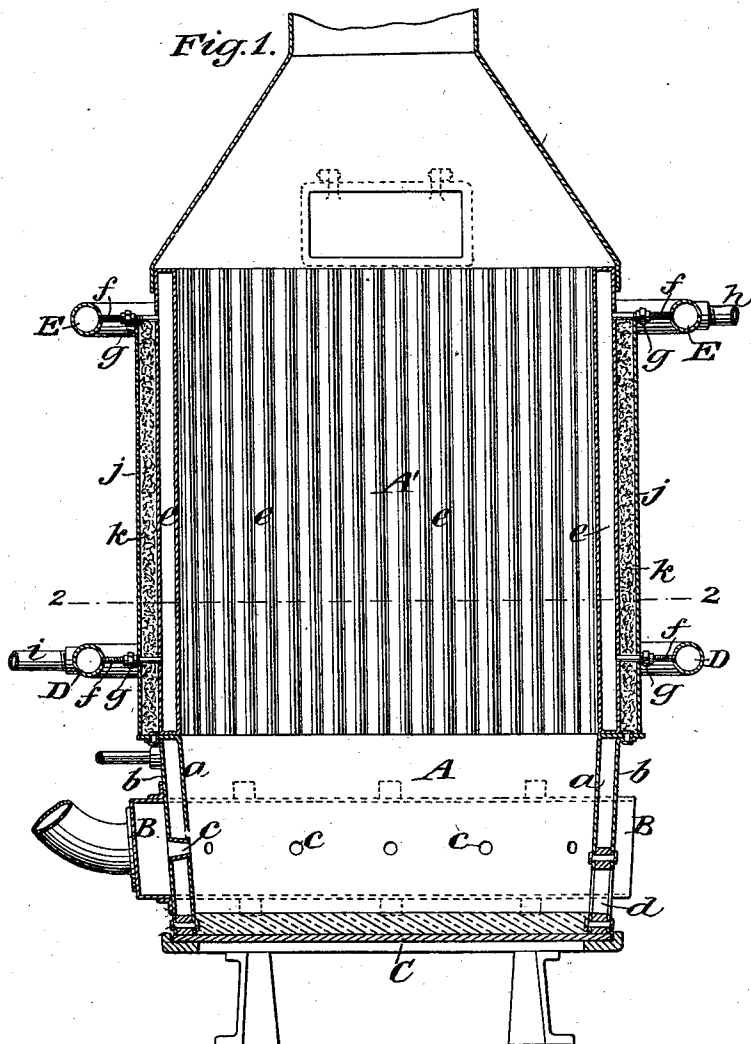


(No Model.)

C. CUNNINGHAM, Jr.
SMELTING FURNACE.

No. 555,680.

Patented Mar. 3, 1896.



Witnesses:

C. Sundgren

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Inventor:

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UNITED STATES PATENT OFFICE.

CHRISTOPHER CUNNINGHAM, JR., OF BROOKLYN, NEW YORK.

SMELTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 555,680, dated March 3, 1896.

Application filed June 19, 1895. Serial No. 553,310. (No model.)

To all whom it may concern:

Be it known that I, CHRISTOPHER CUNNINGHAM, Jr., of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Smelting-Furnaces, of which the following is a specification.

This invention relates to smelting-furnaces, more especially to those for smelting copper, in which the smelting-chamber is surrounded wholly or in part by a water-jacket; and it relates particularly to the construction of such water-jacket. Water-jackets for such furnaces as heretofore constructed have been composed of one inner shell completely surrounding the smelting-chamber of the furnace and one outer shell surrounding the inner shell, with a space between the two shells for water. Owing to the unequal expansion and consequent racking action to which different parts of the inner shell of such jacket is subject, its joints are liable to become leaky, and when leakage occurs it is difficult to repair.

The object of my improvement is to obtain a water-jacket for such a furnace which is less liable to leak and which on becoming leaky in any part may easily be repaired by renewing that part without disturbance to the other parts of the jacket; and to this end my invention consists in the combination, in such a jacket, of upright water-tubes and means of supplying the water thereto and establishing a circulation therethrough, as hereinafter described and claimed.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 represents a central vertical section of a copper-smelting furnace embodying my invention. Fig. 2 represents a horizontal section in the line 2 2 of Fig. 1.

Similar letters of reference designate corresponding parts in both figures.

A A' designate the smelting-chamber of the furnace. The lower part, A, of this chamber consists of a water-jacket formed of an inner shell, *a*, and an outer shell, *b*, having a water-space between them, and a sole-plate C lined with fire-brick. The outer shell, *b*, is surrounded, or almost completely so, by an air-box B, between which and the interior of the said lower part, A, are provided openings *c*

for tuyeres, and in its lower part is the discharge-opening *d*.

The upper part, A', of the smelting-chamber, including the greater portion of its depth, consists of a water-jacket composed of numerous upright metal tubes *e*, preferably of iron or steel, arranged close together side by side and closed at their ends, the lower ends resting upon the jacket *a b*. The interiors of these tubes have communication near their lower ends with a water pipe or conduit D and communication near their upper ends with a water pipe or conduit E, the said pipes or conduits surrounding the several tubes *e* and each of said pipes or conduits being common to all of said tubes. The communications between the conduits D and E, respectively, and the tubes *e* are made by small branch pipes *f*, in which are detachable couplings *g*—such, for instance, as are commonly known as “unions”—which afford provision for the disconnection and removal from the said conduits of any one of the tubes *e* and its replacement by a new tube without disturbing any other tube.

To provide for the constant supply of cooling-water to the conduits D E and tubes *e*, the said conduits D and E are represented as furnished with inlet and outlet *h* and *i*, the inlet being to the upper conduit, E, and the outlet from the lower conduit, D, or vice versa, according to the direction in which the circulation through the tubes *e* may be desired, such direction not being material to my invention. The cooling-water may be supplied by natural pressure from an elevated reservoir or by a pump.

The tubular water-jacket, consisting of the upright tubes *e*, is represented as surrounded with an outer shell or casing of metal plating, *j*, between which and the exteriors of the tubes there is a space left for a packing or filling of asbestos or other non-conducting material *k*. The union-couplings *g* are outside of this casing *j*, so that the said casing need not be disturbed for the disconnection and replacement of either of the tubes *e*, the said tubes when the couplings are disconnected being easily removable and replaceable from the inside of the chamber.

It is obvious that the tubular jacket might

be continued downward to any depth, but it is more convenient on account of the air-box and the tuyeres that the water-jacket forming the lower part of the chamber should consist simply of inner and outer shells. This construction of the lower part of the chamber is not liable to the same objections as the construction of the higher or upper part thereof, as the heat in the lower part is not so intense.

10 What I claim as my invention is—

1. In a smelting-furnace, the combination of a water-jacket composed of a series of upright tubes, a conduit for supplying water to said tubes near one end of each, branch pipes 15 from said conduit one for each tube, a conduit for the escape of water from the said tubes near the other end, branch pipes one for each tube leading to the latter conduit,

and detachable couplings in said branch pipes to permit the separate removal and replacement of the tubes, substantially as herein set forth. 20

2. In a smelting-furnace, the combination of a water-jacket composed of a series of upright tubes, a casing surrounding said jacket, 25 a water-supply conduit and a water-escape conduit surrounding the said jacket outside the casing, branch pipes between the several upright tubes and the supply and escape conduits respectively, and detachable couplings 30 in said branch pipes located outside of the casing, substantially as herein set forth.

CHRISTOPHER CUNNINGHAM, JUNIOR.

Witnesses:

FREDK. HAYNES,
LIDA M. EGBERT.