

No. 786,121.

PATENTED MAR. 28. 1905.

P. HEALEY.  
SMELTING FURNACE.  
APPLICATION FILED AUG. 22, 1904.

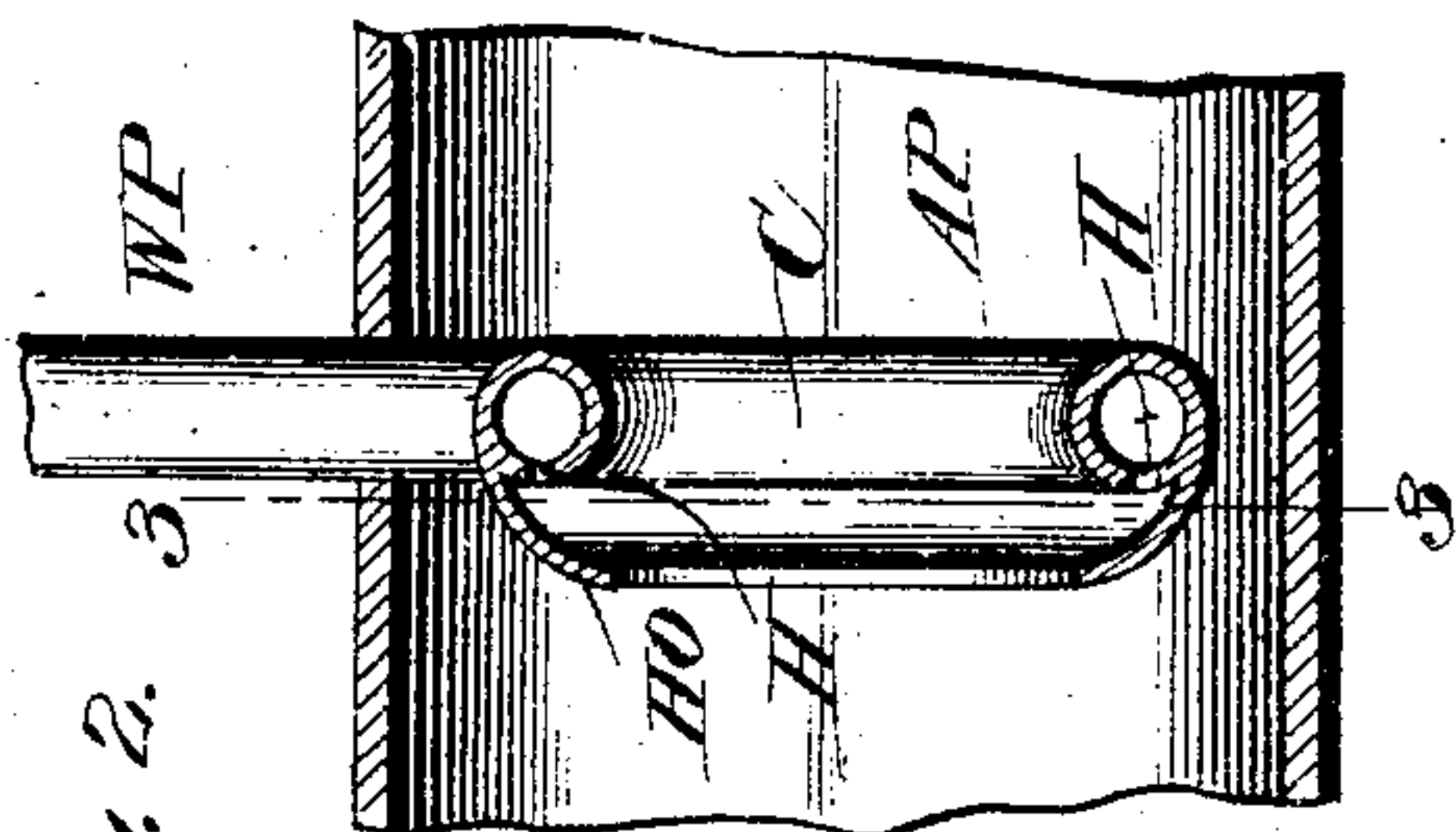


Fig. 2.

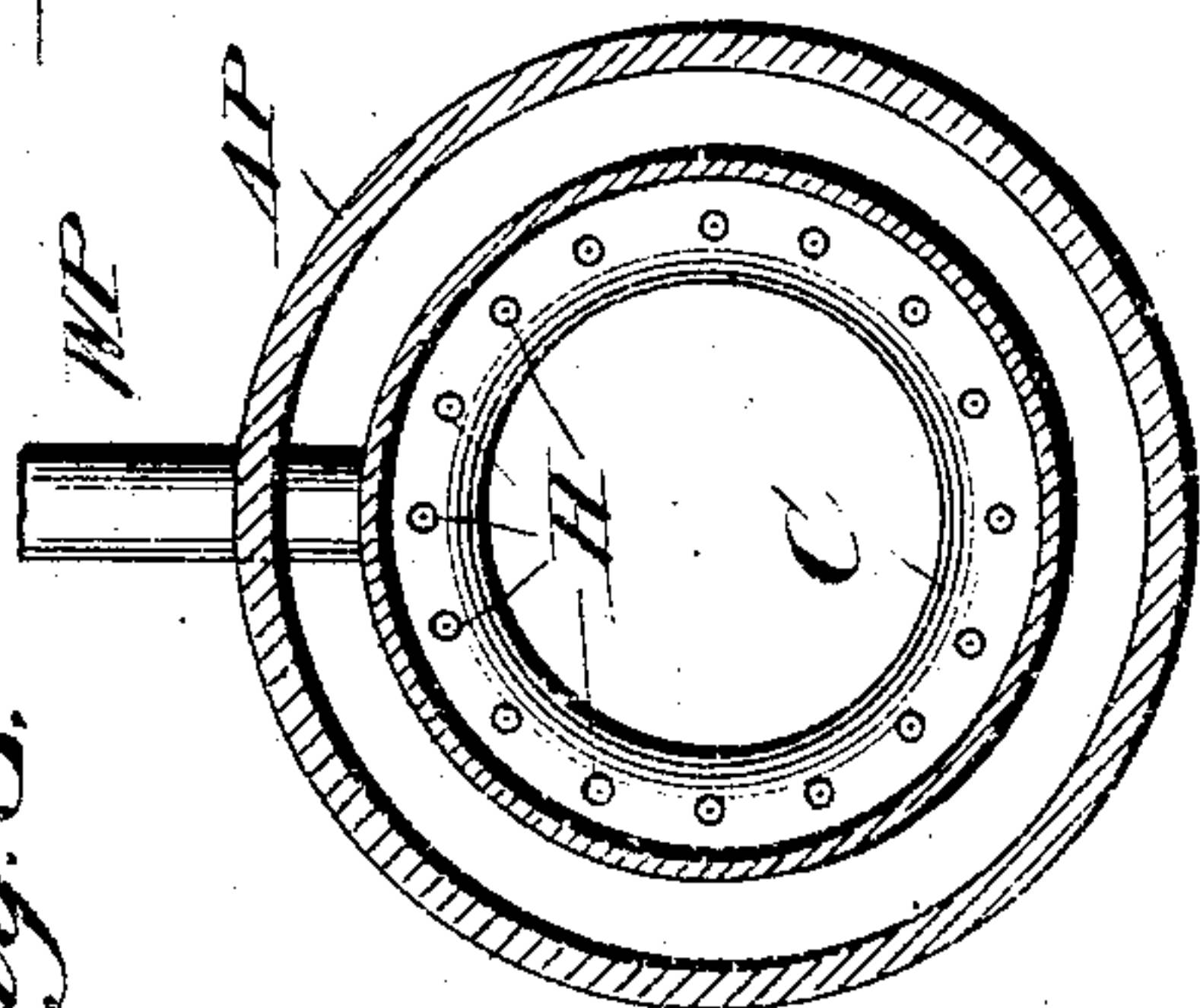


Fig. 3.

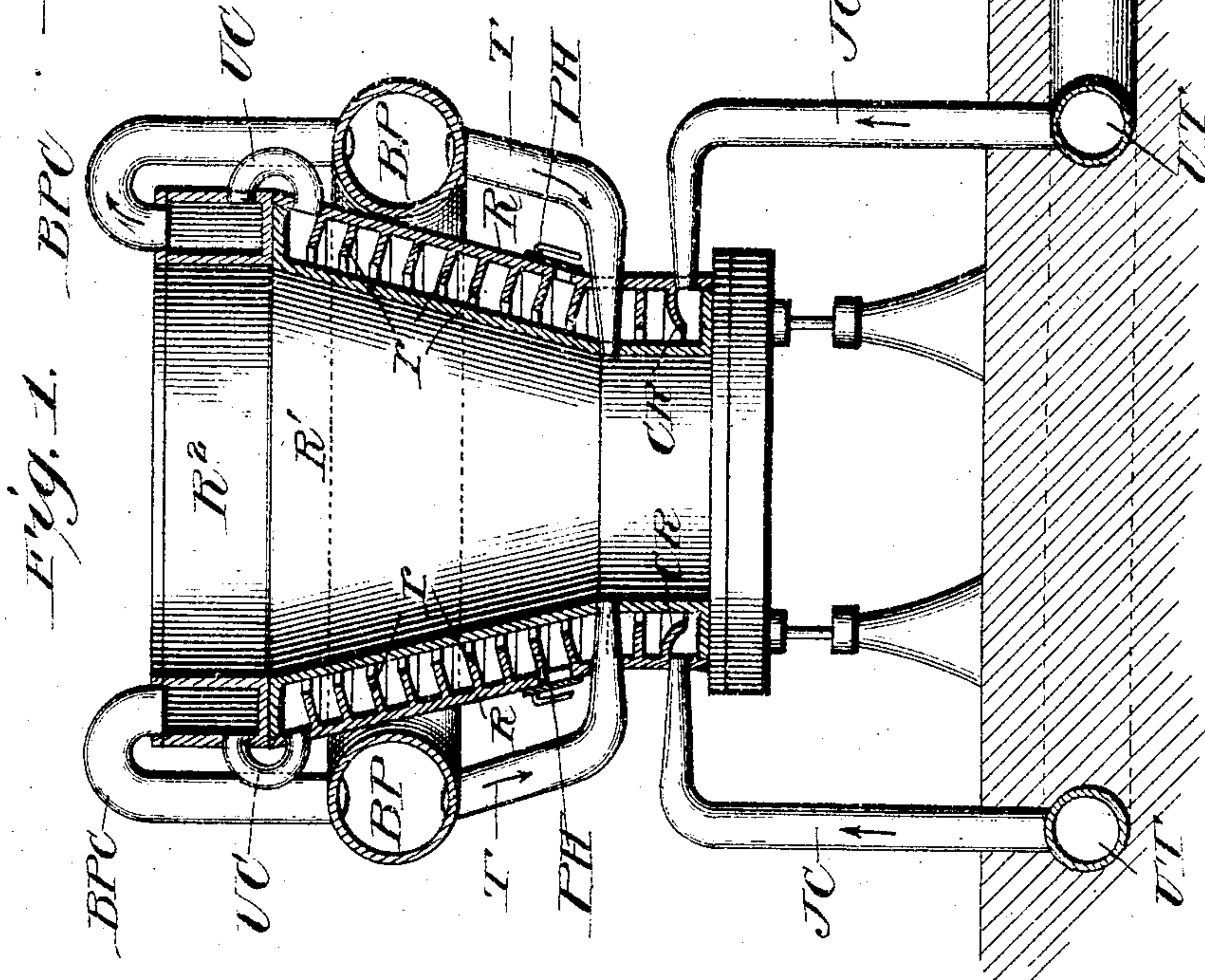


Fig. 1.

WITNESSES:

*Frederick Bradford*  
*Edw. U. Byrne*

INVENTOR  
*Patrick Healey*  
BY *Munn & Co.*  
ATTORNEYS



# UNITED STATES PATENT OFFICE.

PATRICK HEALEY, OF CAMPBIRD, COLORADO, ASSIGNOR OF ONE-HALF  
TO JAMES D. IRELAND AND AVERY BUCKINGHAM, OF CAMPBIRD,  
COLORADO.

## SMELTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 786,121, dated March 28, 1905.

Application filed August 22, 1904. Serial No. 221,729.

*To all whom it may concern:*

Be it known that I, PATRICK HEALEY, a citizen of the United States, residing at Campbird, in the county of Ouray and State of Colorado, have invented a new and useful Improvement in Smelting-Furnaces, of which the following is a specification.

My invention relates to that class of smelting-furnaces in which the lower portion of the stack is provided with double walls, forming an annular jacket for water or air, by which that portion of the stack around the zone of fusion is kept cool.

My invention uses neither water nor air alone, but a mixture of the two in the form of an atomized spray, which mixture of air and spray secures a much better cooling effect and which spray after having become converted into steam by the absorbed heat is discharged through the twyers into the stack to promote a more rapid combustion and generate a more intense heat.

My invention comprises a novel construction and arrangement of furnace for carrying out the above-described principle of action, which I will now proceed to describe with reference to the drawings, in which—

Figure 1 is a vertical section through the lower portion of a furnace constructed in accordance with my invention. Fig. 2 is a longitudinal section through the blast-pipe and the spray device, and Fig. 3 is a section through the latter on line 3 3 of Fig. 2.

In the drawings, A P represents the air-pipe, which conveys air from the blower to the furnace, and W P is a water-pipe which leads to a spray device C. This spray device consists of a hollow ring-shaped casting perforated with holes H on one side and is provided with an inwardly-projecting flange H O, extending as a hood from the outer edge of the hollow ring inwardly in front of the series of holes H in the ring, but still allowing a larger central opening through the hood, through which air may pass. This spray device is suspended centrally in the air-pipe A P, and as the streams of water running through the holes H strike the flange of the hood they are

converted into a circular film or sheet which is instantly atomized into finely-divided spray by the blast of air, which carries this spray along with it and holds it in suspension until discharged into the furnace.

The air-pipe A P communicates with a circular underground trunk U T, from which rise two or more jacket-connection pipes J C, which carry the mixture of air and spray into the annular jacket around the lower part of the furnace. The jacket is formed of an inner section R', having outwardly-projecting flanges at top and bottom, and an outer section R, which latter is cast with a series of closely-juxtaposed ribs *r* on its inner surface. The two sections R and R' of the jacket are bolted together, so that the inner section may be renewed without having to renew the outer ribbed section. The purpose of the ribs *r* is to repeatedly throw the spray-laden air against the inner wall of the jacket, so as to absorb the heat of the same and convert the spray into steam. The first rib C R at the bottom of the jacket is a downwardly-curved rib, which is immediately above the inlet end of the pipes J C. This curved rib serves to throw the air and spray down to the very bottom edge of the inner jacket-lining, so as to cool this portion of the same.

From the top of the ribbed jacket R R' curved pipes U C carry the air and steam to an upper jacket R<sup>2</sup>, where they are further heated, and thence they pass through pipe B P C to the horizontal bustle-pipe B P, and from this point the blast is led into the interior of the furnace through the twyer-pipes T. Each jacket is provided with two peep-holes P H, which can be easily opened to allow an inspection of the inner wall at any time at the smelting zone.

In defining my invention with greater clearness I would state that I am aware that the lower side walls of a furnace have been surrounded by an air-jacket containing spiral flanges, by which the air is made to traverse and cool the inner wall, and thereby become itself heated, and I do not claim this construction. I am also aware, on the other hand, that



air carrying water in the form of spray has been directly fed to the twyers. In my invention the water spray is commingled with the air and is made to repeatedly impinge  
 5 against the inner wall of the furnace, for as the spray-laden air makes the turn in passing by the ribs the water particles are by their superior gravity thrown from centrifugal action directly against the inner wall of the  
 10 furnace. This produces two important results. In the first place as the water strikes against the inner wall it is converted into steam, and the change from the liquid condition to the gaseous condition absorbs an enormous amount of heat, according to well-known  
 15 physical laws, and thus makes a most effective cooling of the inner wall of the furnace. In the second place this action mingles with the air a quantity of steam, which when it finally  
 20 enters the furnace through the twyers greatly promotes the disintegration of the ore and also gives a better heat and a more perfect smelting action.

This furnace is especially adapted to countries in the Northwest, where water is scarce  
 25 and where large deposits of copper are found, which cannot be smelted for scarcity of water. My furnace uses a very small quantity of water only and yet gives very important  
 30 and valuable results.

Having thus described my invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a double-walled blast-furnace; of an air-pipe for introducing  
 35 air between the walls, and a spraying device in the air-pipe located at a point outside of the point where the air-pipe enters the outer wall of the furnace for charging the air with an atomized spray of water and cooling the  
 40 inner wall thereby substantially as described.

2. The combination with a double-walled blast-furnace having projections on the inner side of the outer wall; of an air-pipe for introducing air between the walls, and a spray-  
 45 ing device for water located in the air-pipe outside the point where the air-pipe enters the outer wall substantially as described.

3. In a blast-furnace as described, the combination of the ribbed lower jacket, a separa-  
 50 ble upper jacket, connecting-pipes for the two, and a bustle-pipe and twyers for carrying the air from the upper jacket to the interior of the furnace, said bustle-pipe being arranged in the plane of the ribbed jacket and  
 55 having a pipe connecting it with the upper jacket substantially as described.

PATRICK HEALEY.

Witnesses:

WALTER F. B. LUND,  
 ANNA S. RIDENOUR.