A. R. WILFLEY.

ORE ROASTING FURNACE.

APPLICATION FILED NOV. 7, 1906.

930,254.

Patented Aug. 3, 1909.

3 SHEETS—SHEET 1.

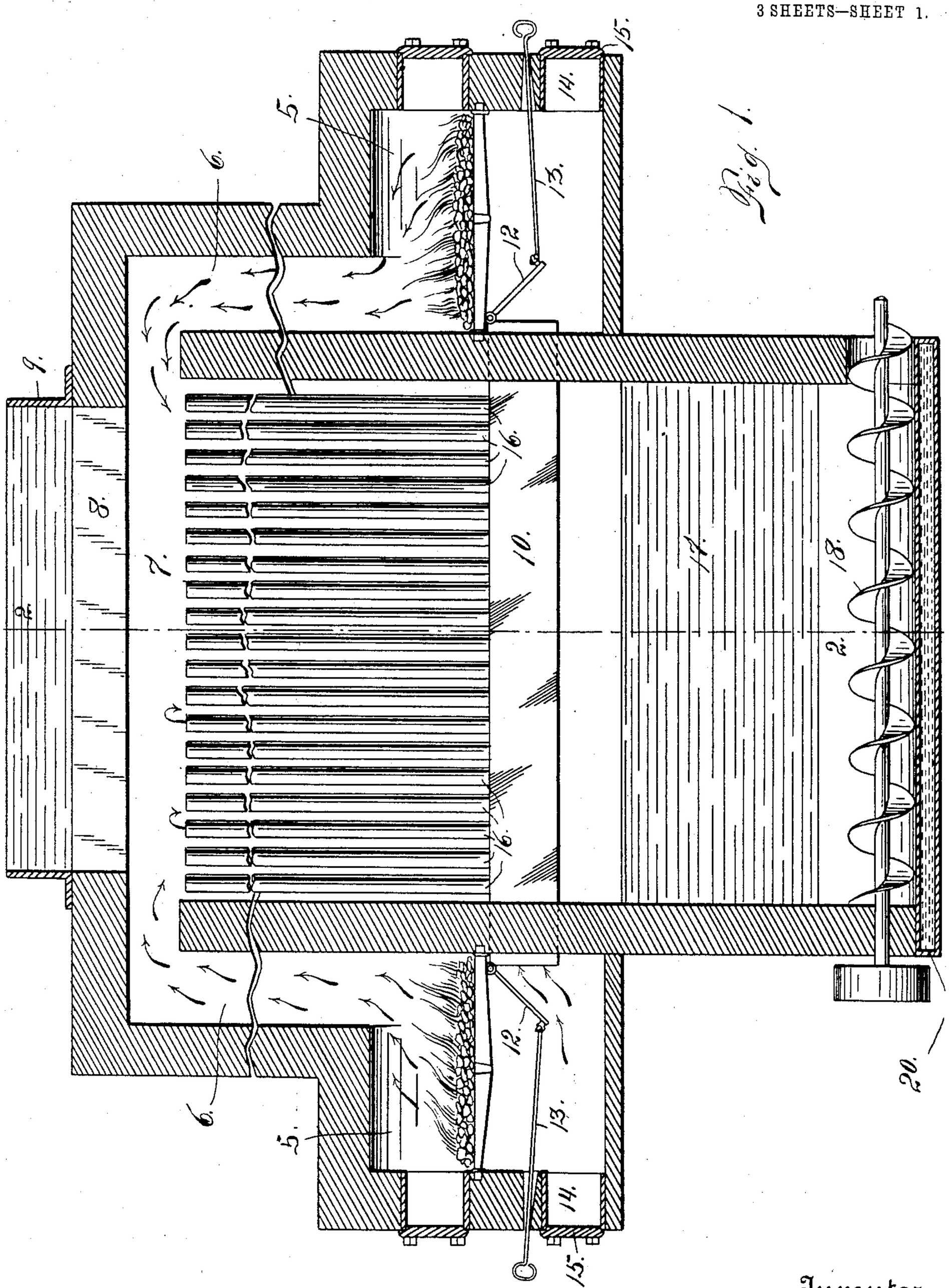


Fig. 1.

Witnesses

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Dena Nelson

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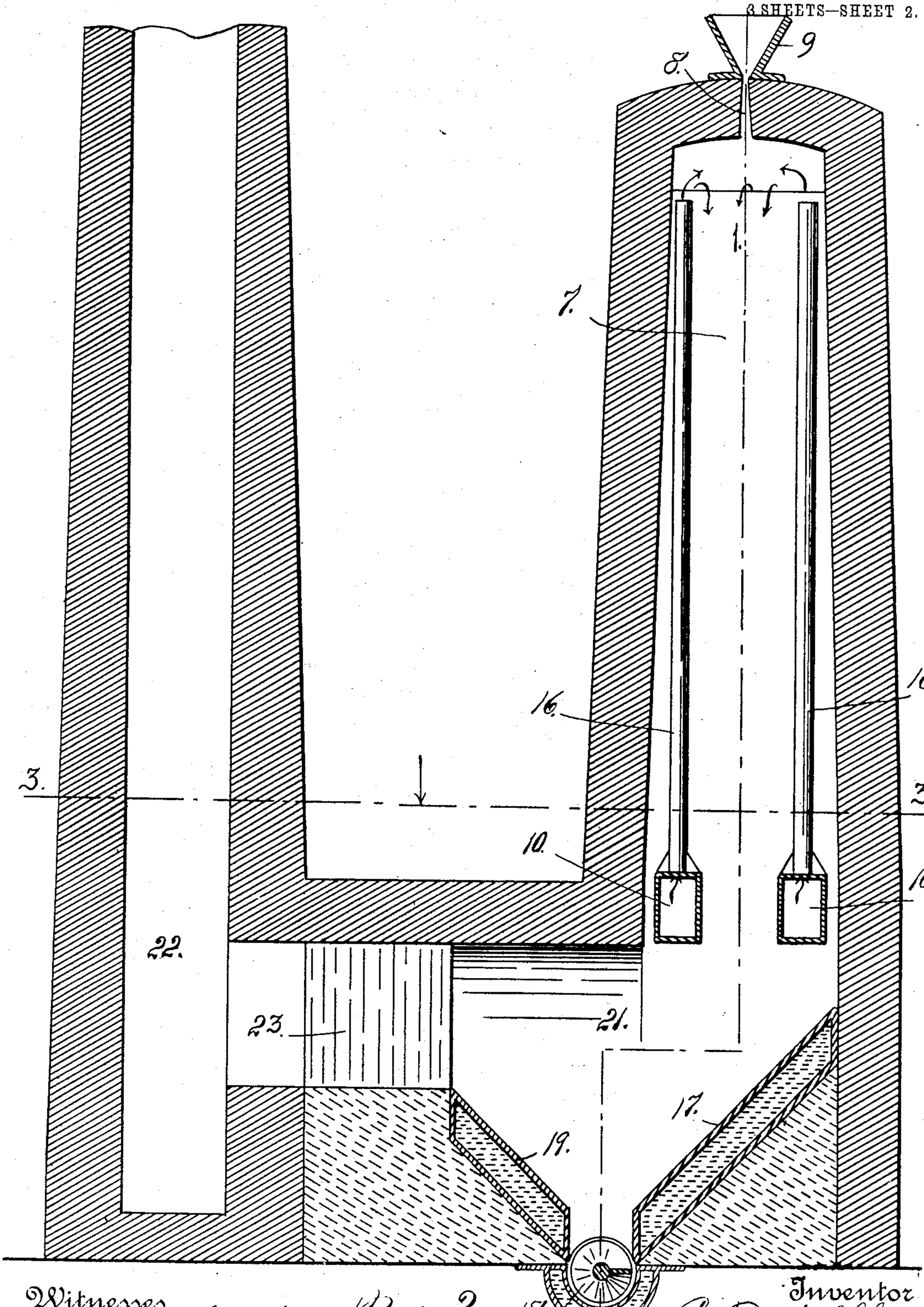


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Fig. 2.

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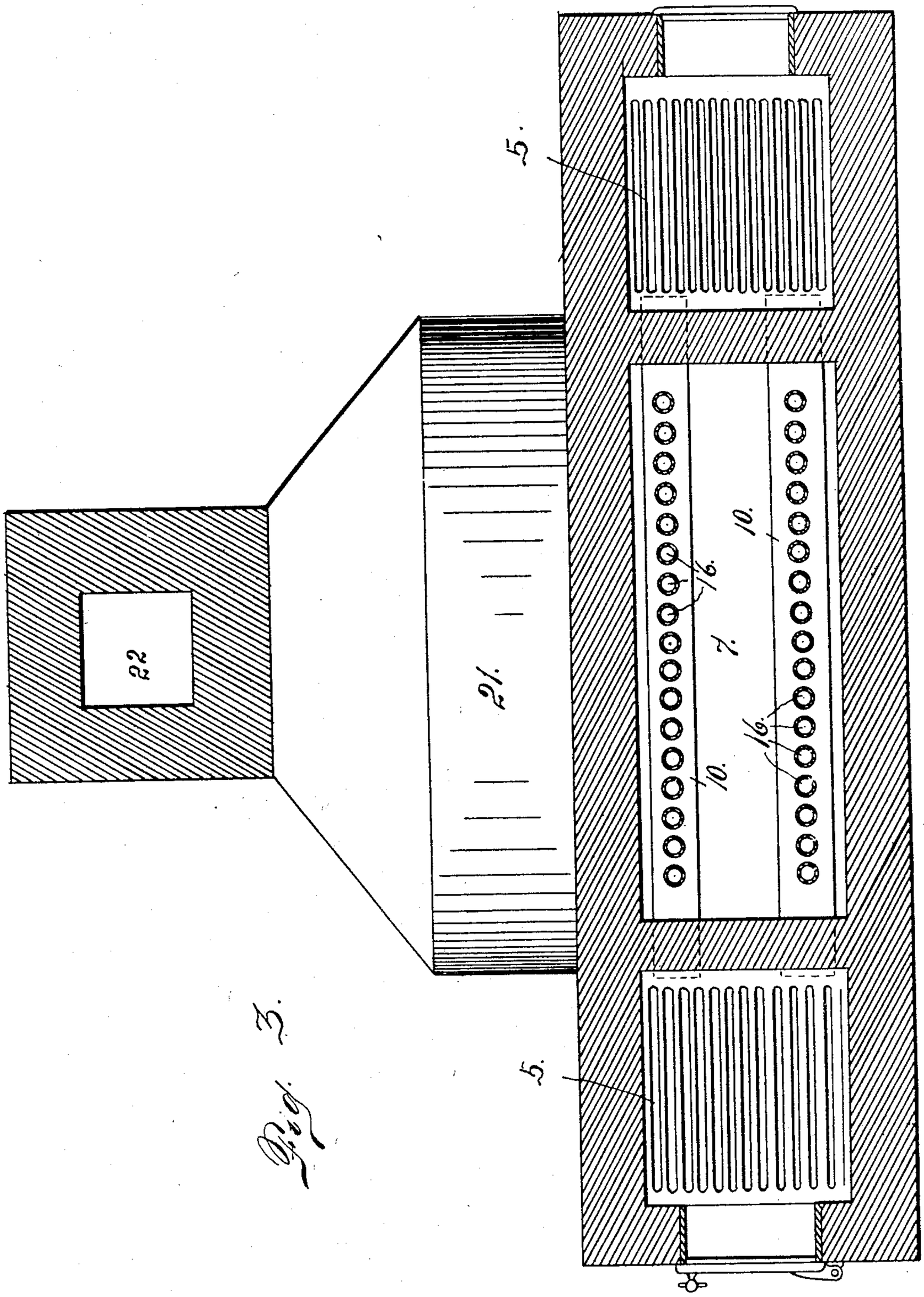


Fig. 3.

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# UNITED STATES PATENT OFFICE.

ARTHUR R. WILFLEY, OF DENVER, COLORADO, ASSIGNOR OF ONE-HALF TO JOSEPH SEEP, OF TITUSVILLE, PENNSYLVANIA.

## ORE-ROASTING FURNACE.

No. 930,254. Specification of Letters Patent. Patented Aug. 3, 1909.

Application filed November 7, 1906. Serial No. 342,429.

*To all whom it may concern:*

Be it known that I, ARTHUR R. WILFLEY, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Ore-Roasting Furnaces; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in ore roasting furnaces, my object being to provide a construction of this class more especially adapted for producing a magnetic roast.

The object of my present construction is the same as that set forth in my previous applications filed Oct. 13th, 1906, and numbered 338,725 and 338,726, respectively.

In obtaining a roast to be followed by magnetic separation, it is absolutely essential to prevent the ore particles from clinging together by reason of too much heat resulting in semi or partial fusion. In order to prevent this difficulty, I cause the ore to drop downwardly through a flue or chamber. At the bottom of this flue I arrange a water jacket or other cooling medium which the ore engages as it falls thus suddenly cooling it before its particles are allowed to come in contact under such circumstances as to permit them to cling together. This feature is embodied broadly in my said applications.

As the ore starts downwardly in the flue or chamber it is subjected to the action of the heat from the fire boxes below, and as the impurities as sulfur are ignited, the tendency of the ore is to rise in temperature as it moves downwardly, and there is some danger that before reaching the bottom of the flue or chamber it may become heated to such a degree that there will be a strong tendency for the particles to cling together as they come in contact.

The object of my present invention is to overcome this difficulty, and I accomplish it by the introduction of cold air at the bottom of the ore flue or chamber and carry it upwardly therethrough in conduits, whereby it is separated from the ore and therefore does not interfere with the downward movement of the ore or with the draft of the furnace. As this air travels upwardly through the pipes within the ore flue or chamber, its temperature rises and by the time it reaches the top of the flue and escapes from the air pipes or conduits, it is exceedingly hot and comes in contact with the falling ore. By reason of this construction and arrangement, the ore as it moves downward is subjected to the action or influence of the air within the pipes which gradually becomes colder as the ore approaches the lower extremity of its flue or chamber. In this way the ore is partially cooled as it passes downwardly in the flue and the tendency to become overheated is neutralized. At the same time by the introduction of the air through the pipes, into the ore in the upper part of the flue, it becomes practicable to roast a heavy sulfid ore, without additional fuel after the original firing of the furnace or the commencement of the roasting operation.

Having briefly explained my improved construction as well as the function it is intended to perform, I will proceed to describe the same in detail reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is a vertical section taken through the furnace on the line 1—1 Fig. 2. Fig. 2 is a central vertical section taken on the line 2—2 Fig. 1. Fig. 3 is a horizontal section taken on the line 3—3 Fig. 2.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate each of two fire boxes, from which flues 6 lead upwardly and communicate at the top with an ore flue or upright chamber 7 arranged to receive ore through a passage 8 formed in the top wall of the chamber and communicating with the hopper 9. In the lower part of the chamber 7 and occupying positions on opposite sides thereof, are cold air conduits 10 whose opposite extremities are controlled by dampers 12 to which are attached rods 13 accessible from the outside of the furnace. The extremities of the conduits 10, communicate with the ash pits of the fire boxes 5 and these conduits receive their air through the openings 14 of the ash pits, the doors 15 being left open for the purpose. Connected with each cold air conduit 10 is a series of open ended air pipes 16, the two series of pipes extending upwardly on the opposite sides of the upright ore

chamber and terminate in the upper portion thereof where the ore enters the said chamber through the passage 18. These pipes being arranged on opposite sides of the ore chamber, and the ore being fed into the central portion thereof, there is no tendency of the ore to enter the air pipes.

Below the cold air conduits 10 and occupying a position directly in the path of the falling ore, is a jacket 17 through which a cooling fluid as water is continually circulated. At the lower extremity of this inclined jacket, is located a screw conveyer 18 for removing the roasted ore from the furnace. On the opposite side of the screw conveyer is located another inclined jacket designated 19, arranged to further cool any ore that may be thrown to the opposite side of the chamber from the jacket 17, as the ore strikes the last named jacket. The screw conveyer is also surrounded by a water jacket designated 20. The chamber containing the water jackets 17 and 19 is designated 21 in the drawing. This chamber at its extremity opposite the water jacket 17, communicates by way of an opening 23 with a stack or chimney 22.

From the foregoing description the use and operation of my improved construction will be readily understood. Assuming that fires are lighted in the fire boxes 5, the heat and products of combustion are carried upwardly through the flues 6 at the opposite ends of the upright ore chamber 7, and delivered into the top of the last named chamber, adjacent the open extremities of the air pipes 16. It must also be assumed that the ore is entering the top of the upright chamber through the passage 8. Hence the heat from the fire boxes below, together with the air in the pipe 16, mingles with the falling ore, resulting in the combustion of the impurities as sulfur contained therein. After the initial firing, the impurities of the ore especially if it be of a heavy sulfid character, will be sufficient to supply the fuel for roasting purposes and the fire within the fire boxes 5 may be allowed to go out.

As the impurities of the air are first attacked by the heat in the upper extremity of the upright chamber, it is evident that the combustion will increase as the ore falls downwardly, with the result that the temperature of the ore is continually rising. However, the tendency of overheating resulting from this cause, is neutralized by the cold air passing upwardly through the pipes 6 from the cold air ducts 10, thus preventing the overheating of the ore and overcoming any clinging tendency which otherwise might result. Then as the ore falls upon the water jacket 17 it is further cooled within the furnace to such an extent as to prevent the ore particles from clinging together as they pass into the screw conveyer and are removed from the furnace. This cooled condition of the ore also prevents any further roasting outside of the furnace as the air comes in contact with the oxygen of the atmosphere or outer air.

Having thus described my invention, what I claim is:

In an ore roasting furnace, the combination of an upright flue or chamber constructed to permit the ore to be fed into the top thereof, a horizontally disposed conduit communicating directly with the outer air, pipes connected at the bottom with said conduit, and passing upwardly their entire length through said flue or chamber, said pipes being open at the top to allow the air from the conduit to come in contact with the falling ore, and means for introducing heat to the ore at the top of the chamber.

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

ARTHUR R. WILFLEY.

Witnesses:

DENA NELSON,

A. J. O'BRIEN.