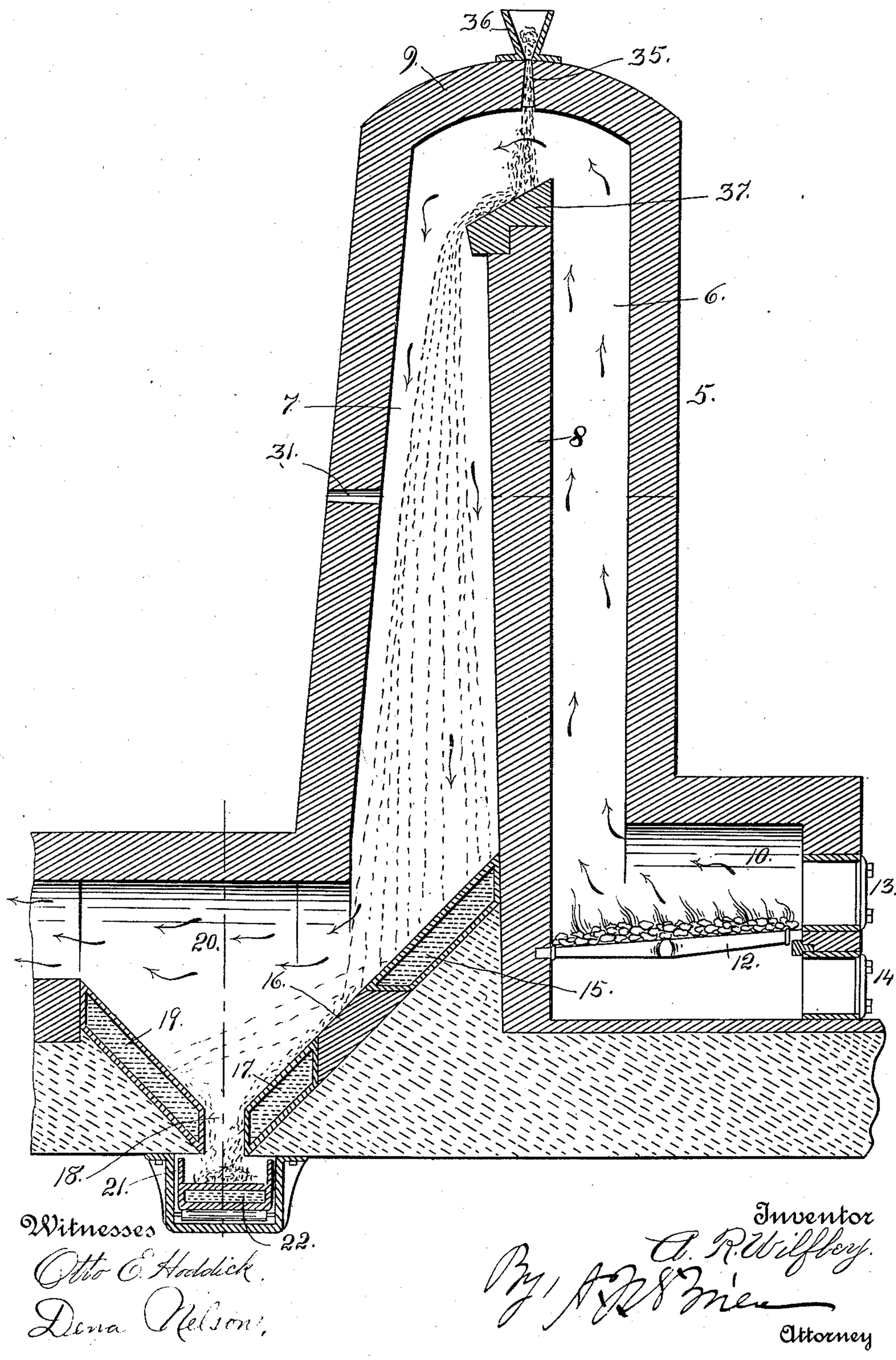
No. 859,420. PATENTED JULY 9, 1907.

A. R. WILFLEY.

ORE ROASTING PROCESS.

APPLICATION FILED OCT. 13, 1906.



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UNITED STATES PATENT OFFICE.

ARTHUR R. WILFLEY, OF DENVER, COLORADO.

ORE-ROASTING PROCESS.

No. 859,420. Specification of Letters Patent. Patented July 9, 1907.

Application filed October 13, 1906. Serial No. 338,725.

To all whom it may concern:

Be it known that I, ARTHUR R. WILFLEY, a citizen of the United States, residing at the city and county of Denver and State of Colorado, have invented a certain new and useful Ore-Roasting Process; 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 letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to a process of roasting ores, my object being to produce what is known as a magnetic roast, or subject the ore to such treatment that the magnetic material may be advantageously separated from the non-magnetic material. Heretofore great difficulty has been experienced in obtaining a proper roast of this class of ores, owing to the fact that the temperature of the ore becomes so great, as to produce a slightly fused condition causing the ore particles to cling together whereby the magnetic material is more or less fouled or contaminated and the object of the roast neutralized or defeated.

In my improved process I make provision for an even roast of the ore by causing it to travel downwardly with a current of hot air instead of upwardly against said current as is the usual custom. Furthermore at the lower extremity of the flue through which the ore is traveling downwardly, I provide a cooling medium preferably a water jacket which is downwardly and outwardly inclined from the flue whereby the ore is simultaneously cooled and carried outwardly away from the flue preparatory to its discharge from the furnace.

In carrying out my process any suitable apparatus may be employed.

In the drawing which is a vertical section taken through a furnace equipped to carry out my process, let the numeral 5 designate an upright roasting chamber provided with two vertically disposed compartments 6 and 7 separated by a partition 8 whose upper extremity terminates a short distance below the arch 9 at the top of the furnace whereby the two flues or compartments 6 and 7 communicate with each other at the top. The lower extremity of the flue 6, is in communication with a fire box 10 having a grate 12, doors 13 and 14 communicating with the fire box, and the ash pit, respectively. The flue 7 is narrowest at the top and increases in size as it extends downwardly therefrom. At the bottom of this flue is located a water jacket member 15 which forms a bottom inclined downwardly from the partition 8. Below this water jacket member 15 is a fire clay member 16 while below the last named member is another water jacket member 17. The three members 15, 16 and 17 are inclined in the same direction and form a continuous surface down which the ore slides as it leaves the flue 7. At the lower extremity of the water jacket member 17, is an outlet passage 18 while on the opposite side of this passage is a water jacket member 19 also sloping toward the said passage and adapted to guide downwardly into the said passage, any particles or pieces of ore which may bound from the inclined surface composed of members 15, 16 and 17. Some of the particles particularly the larger particles, when they strike the inclined members at the bottom of the flues 7, are liable to bound across the chamber 20 and strike upon the opposite water jacket 19. When this occurs these particles as before stated are guided downwardly into the outlet passage 18 whence they pass into a vibrating trough receptacle 21 provided with a water jacket bottom 22. Provision is made for imparting a longitudinal reciprocating or vibratory movement to this trough whereby the roasted ore is caused to travel out of the furnace.

In carrying out my process sufficient heat is generated in the fire box 10 and passes upwardly through the flue 6 downwardly through the flue 7, into the chamber 20 and out into a stack (not shown). The material to be treated is fed into the top of the furnace through the inlet opening 35 from a hopper 36, and passes downwardly through the flue 7, in the same direction as the current of heat or hot air which passes from the flue 6. During the downward travel of the ore, it expands or separates owing to the expanding character of the flue 7, whereby the ore particles are prevented from having any clinging tendency and at the same time prevented from becoming unduly heated by the introduction of a limited quantity of atmospheric air through the ports 31. As this falling ore reaches the bottom of the flue 7, it comes in contact with the cooling medium 15 which lowers its temperature sufficiently within the furnace to overcome the evil effects of excessive heating of the ore, and prevent the ore particles from clinging to each other as ordinarily results from over-heating.

My invention is based upon the fact that during the roasting of ores for the purpose heretofore outlined, it is almost impossible to subject the ore to exactly the proper degree of heat. The result is that the ore is usually subjected to excessive heat or is usually heated sufficiently to cause the ore particles to cling together if allowed to come together in a mass while still in the excessively heated condition. The cooling step of my process, however, takes place while the ore particles are still separated, that is to say these particles are brought in contact with the cooling medium while in their separated or disseminated condition at the bottom of the flue, whereby they are suddenly cooled and when subsequently brought together *en masse*, the ore particles are sufficiently cooled to prevent the clinging tendency and the fouling or contamination of the particles incident to such action.

It will be understood that the clinging together of the ore particles retards magnetic separation since in order to obtain the best results the ore particles must be free or independent of each other, otherwise the magnetic particles will carry with them the non-magnetic particles.

One of the objects of my improved process is to cool the entire body of ore beyond the roasting point before it reaches the outer air, since if this is not done the oxygen of the air uniting with the exceedingly hot ore, will produce an over-roast of the outer layer of the mass and thus counteract or retard the beneficial effects obtained within the furnace.

Having thus described my invention, what I claim is:

1. A process of roasting ore preparatory to magnetic separation, consisting in subjecting the ore particles while falling, to sufficient heat for roasting purposes, and cooling the said particles while in the disseminated state, sufficiently to overcome the clinging tendency, by bringing them in contact with a non-liquid cooling medium.

2. A process of roasting ore preparatory to magnetic separation, consisting in subjecting the ore particles while falling, to sufficient heat for roasting purposes, cooling the ore particles while in a disseminated state, sufficiently to overcome the clinging tendency, by bringing the said particles in contact with a non-liquid cooling medium, and causing said particles to be removed from said medium as fast as they fall, whereby the medium is maintained in a condition to effectively act on the successively falling particles.

3. An ore roasting process consisting in subjecting the falling ore particles to the action of heat, cooling the said particles while in the disseminated condition incident to their falling action, by bringing them in contact with a non-liquid cooling medium, and constantly removing the cooled particles from the falling position.

4. An ore roasting process consisting in subjecting the falling ore particles to the action of heat for roasting purposes, cooling the said particles while in the disseminated state by bringing them in contact with a non-liquid cooling medium and simultaneously removing them from the path of their fall, whereby the medium is maintained in a condition to act effectively on the successively falling particles.

5. A process of roasting ore preparatory to magnetic separation, consisting in subjecting the ore while falling, to sufficient heat for roasting purposes, quickly cooling the falling particles when in a disseminated state, to overcome the clinging tendency, by bringing them in contact with a non-liquid cooling medium, and causing all of said particles to be removed from said medium as fast as they fall whereby the medium is maintained in a condition to act effectively on the successively falling particles.

6. The herein described ore roasting process consisting in subjecting the ore while falling to the action of a current of heated air, and causing the ore to drop upon a cooling surface from which it is caused to slide.

7. The herein described process consisting in subjecting the ore particles while falling, to the action of a current of hot air traveling in the same direction as the ore, and bringing the falling ore particles in contact with a cooling medium from which the ore is caused to slide.

8. The herein described ore roasting process consisting in subjecting the falling ore particles to the action of a current of heat traveling in the same direction as the ore, and finally bringing the ore particles in contact with a water jacketed surface from which the said particles are caused to slide.

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

ARTHUR R. WILFLEY.

Witnesses:
DENA NELSON,
A. J. O'BRIEN.