J. E. GREENAWALT.

PROCESS OF TREATING MATERIALS BY THE ACTION OF AIR OR OTHER GASES.

APPLICATION FILED MAR. 27, 1905.

904,060. Patented Nov. 17, 1908.

3 SHEETS—SHEET 1.

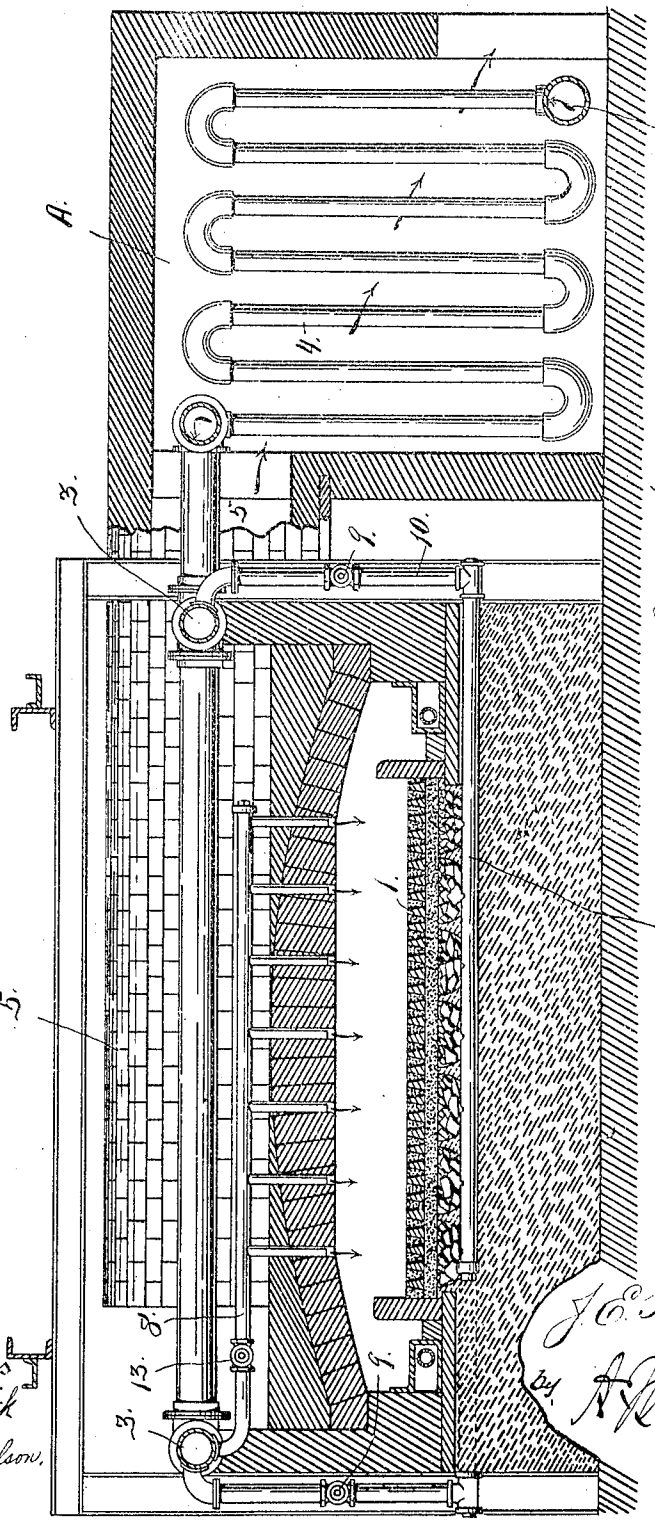


Fig. 1.

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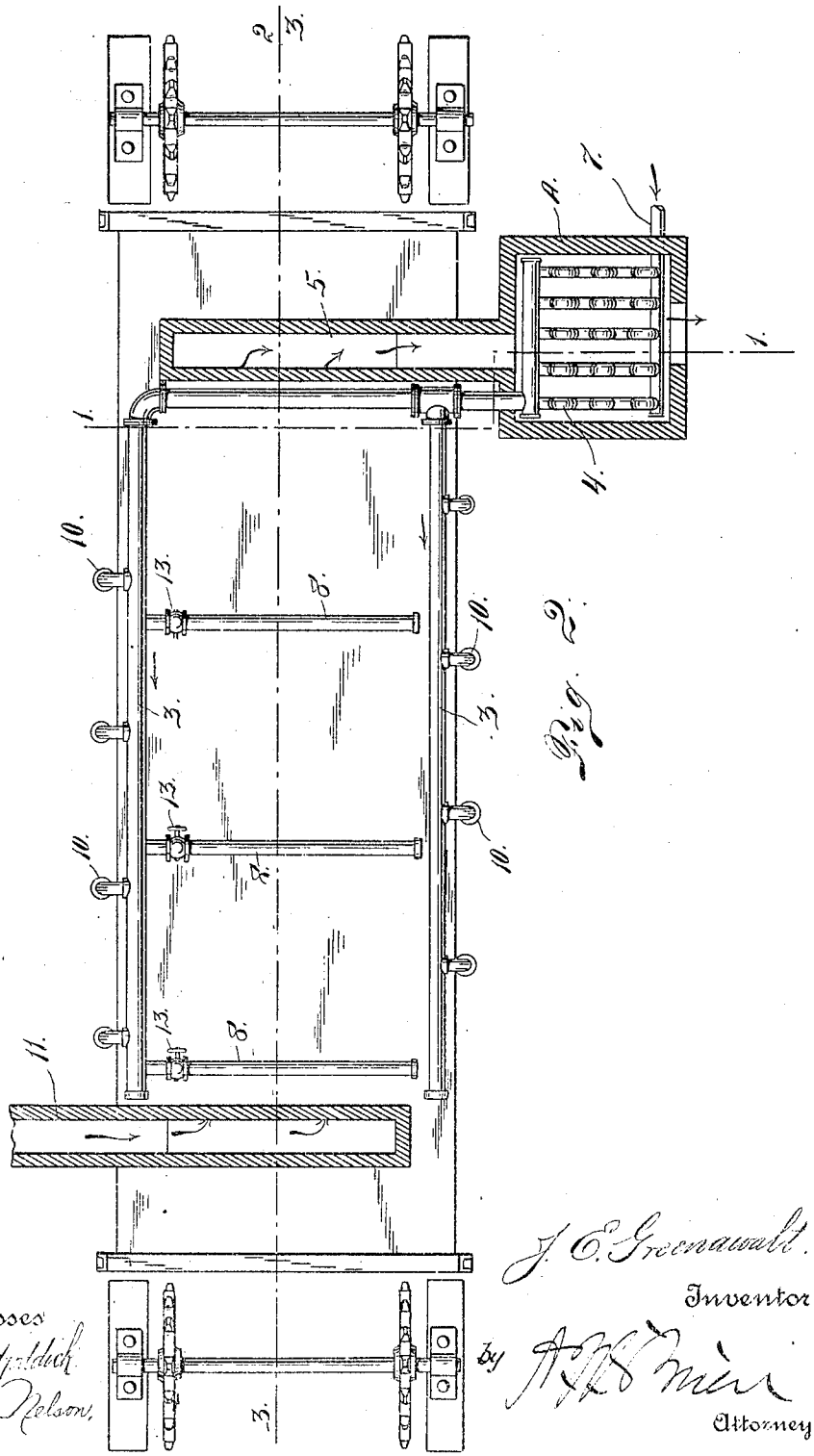
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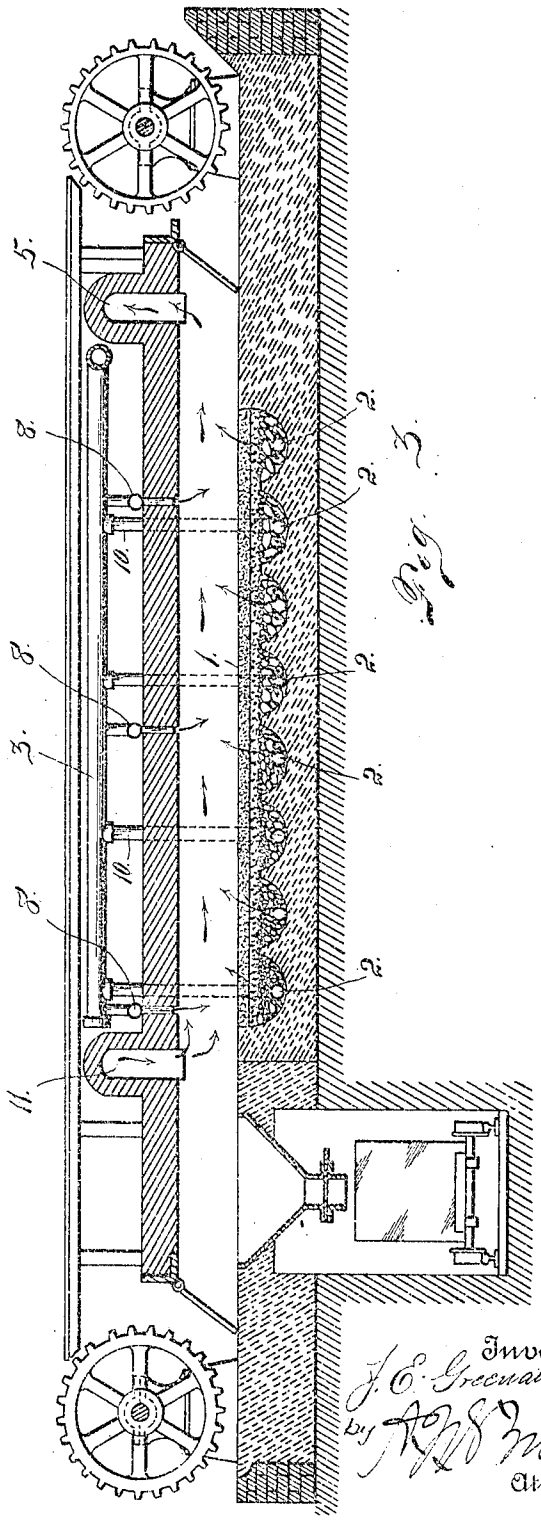
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3 SHEETS--SHEET 3.



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PROCESS OF TREATING MATERIALS BY THE ACTION OF AIR OR OTHER GASES.

No. 904,060. Specification of Letters Patent. Patented Nov. 17, 1908.

Application filed March 27, 1905. Serial No. 252,106.

To all whom it may concern:

Be it known that I, JOHN E. GREENAWALT, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented a certain new and useful Process of Treating Materials by the Action of Air or other Gases; 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 treating materials by the action of air or other gases.

The invention herein described will be explained in connection with its utility for the roasting or oxidizing of ores, although it must be understood that I do not limit the invention to this specific use.

It embraces the placing of the ore upon the porous bed or hearth of a furnace of the character set forth in my previous application Serial No. 87,510, filed Dec. 27th, 1901; and subjecting the same to the action of air or other gases passed up through the hearth of the furnace.

It further embraces the introduction of air in distributed volume through the arch of the furnace whereby it is caused to mingle with the unconsumed products of combustion which have escaped from the fire box of the furnace.

An important feature of my present invention consists in the heating of air preparatory to its introduction to the furnace either through the porous bed from below or into the roasting chamber from above.

I have found in practice that if the combustible gas, producer gas for instance, is introduced into the furnace, that it is difficult to secure proper combustion of these gases within the furnace, owing to the difficulty in securing a mixture of these gases and air. The combustible gases from the gas producer or fire box, are at a higher temperature and also of less specific gravity than the air introduced into the furnace under ordinary conditions, so that consequently, and as a matter of fact, these gases hug the inside of the furnace arch and do not mingle to any great extent with the air. This means that a large proportion of the combustible gases is carried to the chimney or by mixing with the air in the furnace flue are burned in the flue, but in either case their heating capacity is lost. I have determined in practice that by introducing air in a series of jets properly distributed through the arch, that almost perfect combustion can be secured and the heat of the furnace properly regulated and distributed for the purpose of roasting. I have also demonstrated in a practical operation of the porous hearth furnace, that cold air has a chilling or cooling effect upon the material to be roasted or oxidized and that heating the air has a marked advantageous effect upon the economy and also the effectiveness of the air so introduced.

A suitable mechanical construction or apparatus for practicing my improved process, is illustrated in the accompanying drawing which will now be described though it must be understood that the invention is not limited to the specific mechanism set forth.

In this drawing, Figure 1 is a vertical cross section taken through a porous hearth roasting furnace, the dust chamber into which the heated gases are delivered, being also shown in section. Fig. 2 is a top plan view of the furnace with parts shown in section and on a smaller scale. Fig. 3 is a longitudinal section of the furnace taken on the line 3—3 Fig. 2.

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

Let 1 designate the porous hearth of the furnace to which the air is introduced through the instrumentality of perforated supply pipes 2 connected with a main conduit 3 which leads to the heating coil 4 in the dust chamber A. The waste or heated gases leave the furnace through a rear flue 5 shown partly in elevation and partly in section in Fig. 1. This flue is also shown in horizontal section in Fig. 2 and in vertical section in Fig. 3. The heated waste gases pass to the dust chamber from this flue. In passing through the dust chamber, the heated gases impinge and come in contact with the heating coils 4. The air flows in the opposite direction entering the coils 4 through the inlet pipe 7 which is connected to a blower (not shown) and passing thence through the heating coils 4 to a main 3 and finally by means of the distributing pipes 2

to the porous nearth; and also to the combustible gases by means of the supply pipes 8 shown in Figs. 1 and 2.

In supplying the air to the porous hearth, I prefer to alternate the distributing pipes, that is to say have one-half of the pipes enter at one side of the furnace and the other half at the other side, these pipes alternating as shown in Fig. 1. This arrangement gives a more perfect distribution of the air. The air supply is regulated to the hearth by means of valves 9 located in vertical branch pipes 10 leading downwardly from the main conduit 3 on one side of the furnace and communicating with the outer extremities of the perforated pipes 2; and to the arch by means of valves 13 carried by the distributing pipes 8.

The gas enters the furnace at the front flue 11 and is then supplied with air at intervals through the arch by the pipes 8. By distributing these pipes, the combustion does not take place near one point and the heat is properly distributed, an important matter in roasting ores. The air by being delivered above the gas stratum and by reason of its being cooler and of slightly greater specific gravity, settles through the combustible gas, mixes with it and produces ideal conditions for complete combustion.

Having thus described my invention, what I claim is:

1. The process of treating materials, which consists in placing the materials in a furnace having a bed or hearth which is naturally porous, heating the materials and causing a suitable gas to pass upwardly through the porous bed into the said materials, the said gas being suitably heated preparatory to its passage through the porous bed, and introducing gas in distributed volume through the top of the furnace for the purpose set forth.

2. The process of subjecting any desired materials to the action of a gas, which consists in placing the materials on a bed of sand or the like and then causing the gas to pass upwardly through the said bed and into the said materials, the gas being heated preparatory to its introduction to the porous bed, and introducing gas in distributed volume through the top of the furnace for the purpose set forth.

3. The process of oxidizing materials which consists in placing the materials in a furnace having a porous bed, heating the materials and forcing air upwardly through said bed and into the said materials, the air being heated preparatory to its delivery to the porous bed, and introducing gas in distributed volume through the top of the furnace for the purpose set forth.

4. The process of subjecting any desired materials to the action of gas which consists in placing the material on a bed composed of a substance which is naturally porous, subjecting the materials to heat, passing heated gas upwardly through the said porous bed and into said materials, and introducing heated gas in distributed volume through the top of the furnace for the purpose set forth.

5. The process of roasting ore sulfids which consists in placing the sulfids on a porous bed of loose granular material and then subjecting the sulfids to heat forcing air upwardly through the bed and introducing air in distributed volume through the top of the furnace, the air being heated preparatory to its delivery to the bed.

6. The herein described ore roasting process, consisting in placing the ore upon the porous bed of a furnace, passing heated air up through the bed into the ore thereon, the latter being first subjected to heat from a suitable source, and introducing heated air in distributed volume through the top of the furnace for the purpose set forth.

7. The herein described ore roasting process consisting in placing the ore upon the porous bed of a furnace, heating the said ore, passing air up through the bed into the ore thereon, and introducing air in distributed volume through the top of the furnace for the purpose set forth.

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

JOHN E. GREENAWALT.

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