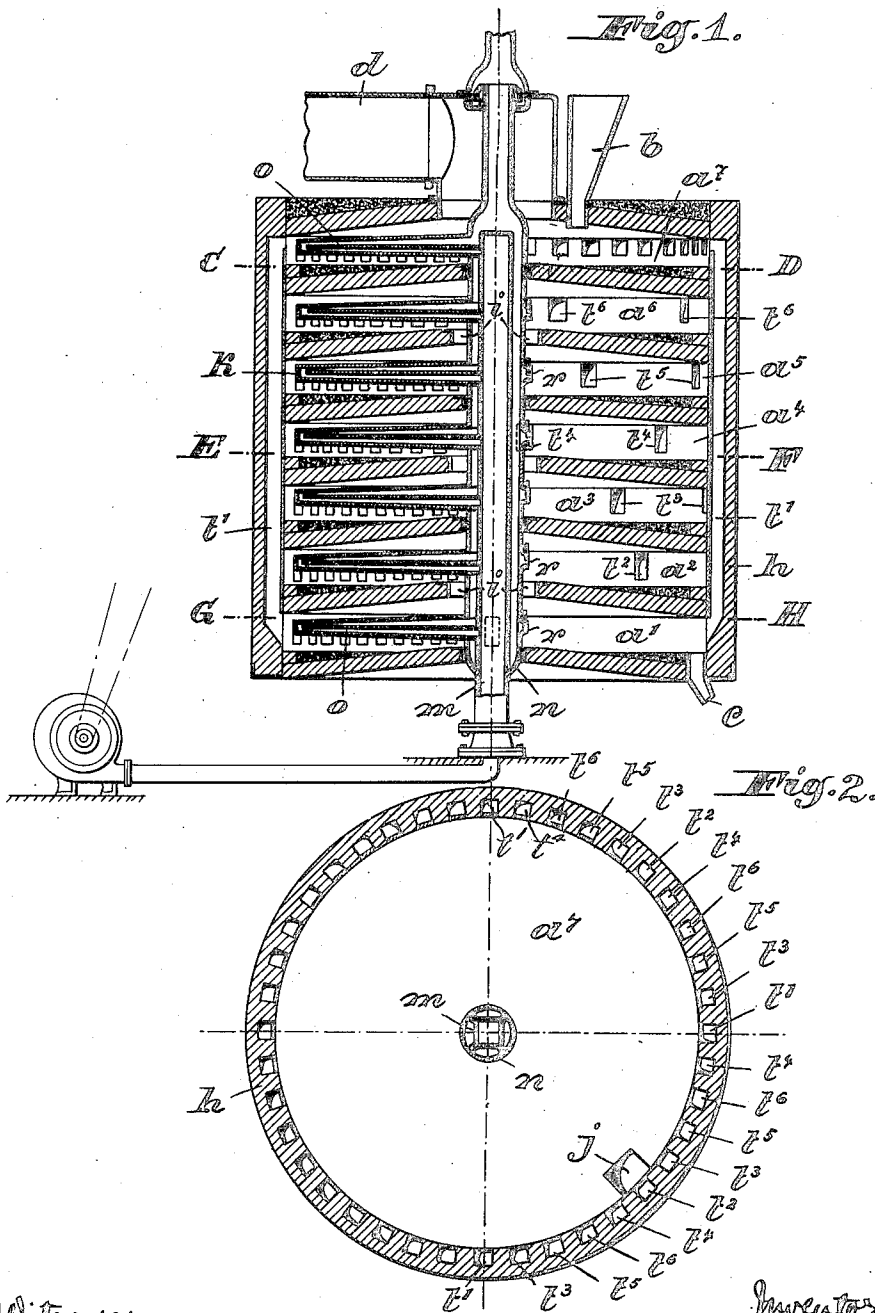


R. SCHERFENBERG.
 MULTIPLE FLOOR FURNACE FOR ROASTING ORES.
 APPLICATION FILED NOV. 21, 1911.

1,057,584.

Patented Apr. 1, 1913.

3 SHEETS—SHEET 1.



Witnesses
 H. H. Knight
 Ray J. Ernst.

Inventor
 Reinhold Scherfenberg
 by his attorneys
 [Signature]

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Fig. 3.

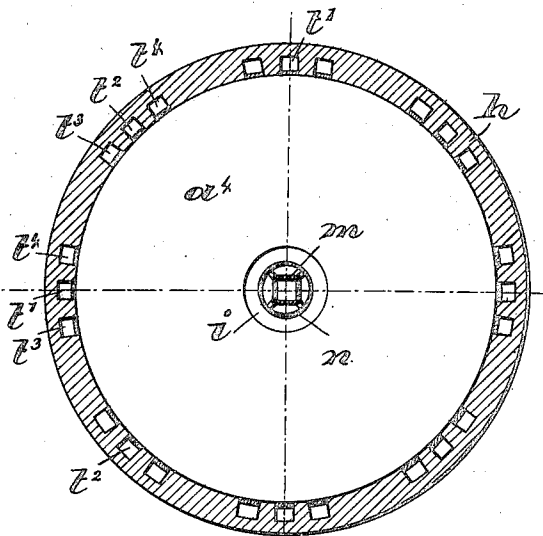
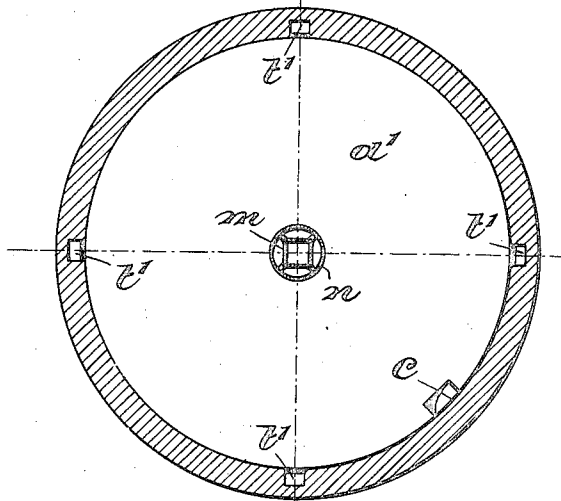


Fig. 4.



Witnesses
 W. H. Knight
 Ray J. Ernet.

Inventor
 Reinhold Scherfenberg
 by his attorneys
 Burr & May

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Fig. 5.

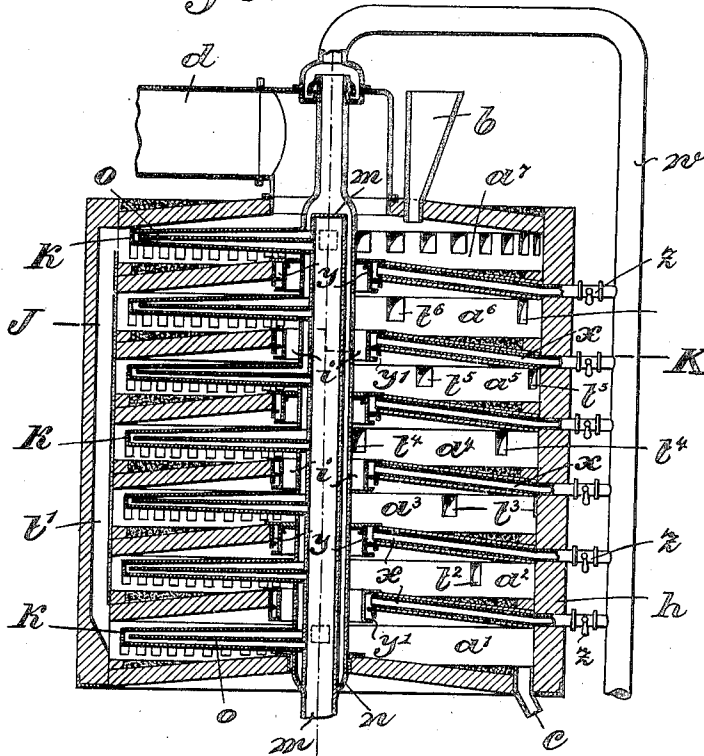
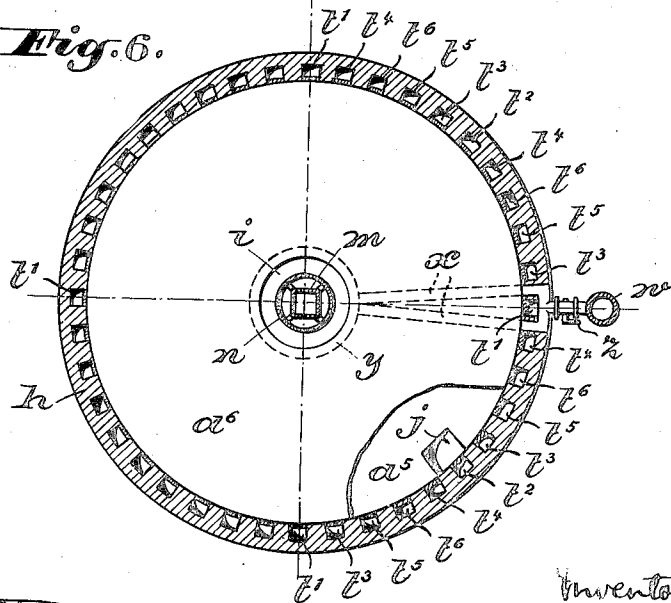


Fig. 6.



Witnesses
 H. H. Knight
 Ross J. Ernst.

Inventor
 Reinhold Scherfenberg
 by his attorney
 H. H. Knight

UNITED STATES PATENT OFFICE.

REINHOLD SCHERFENBERG, OF BERLIN, GERMANY.

MULTIPLE-FLOOR FURNACE FOR ROASTING ORES.

1,057,584.

Specification of Letters Patent.

Patented Apr. 1, 1913.

Application filed November 21, 1911. Serial No. 661,474.

To all whom it may concern:

Be it known that I, REINHOLD SCHERFENBERG, of Berlin, Germany, a subject of the King of Prussia, and whose post-office address is Rosenheimerstrasse 29^a, Berlin, Kingdom of Prussia, German Empire, have invented a new and useful Multiple-Floor Furnace for Roasting Ores, of which the following is a specification.

10 In mechanical ore roasting furnaces with several superposed hearths according to McDougall's system (see British Patents Nos. 3985/83 and 22504/91) the iron pyrites to be
15 roasted is conveyed by means of a stirring device through all the floors from the top downward and leaves the furnace at the bottom floor in the form of clinkers. The atmospheric air required for burning sulfur is admitted through air branches into the
20 bottom floor and follows the same path as the ore but in the opposite direction, to the top where it is discharged from the furnace in the form of gas (SO_2) produced by mixing with the sulfur vapors and is conveyed
25 away for further treatment. This method of working has several important drawbacks affecting the efficiency, attendance and life of the furnace, owing to the cold air which is admitted at the bottom floor arriving superheated and saturated with sulfur vapors at the central or upper floor where the strongest roasting of sulfur takes place, and where therefore a larger quantity of air in proportion is required than in the
35 bottom floors. Owing to the heat generated in the upper floors, the gas which has been superheated in the lowest floors, is further superheated to a temperature of about 200–250° above the burning point of the sulfur
40 in the ore, which, as is well known, amounts to 700°. Owing to this superheating of the furnace, all the iron parts in the interior of the furnace, are of course quickly destroyed and decomposed into iron sulfid. From the
45 superheated hearths there is further formed the so-called "enamel" and the incandescent layers of ore must be raked in these floors by workmen with long iron rakes at regular intervals, and the enamel removed.
50 Moreover, excessive temperature with insufficient supply of fresh air, brings about a volatilization and sublimation of sulfur. If in order to obviate that drawback, it were attempted to keep the temperature in these
55 upper floors of known furnaces at only 700°, the charge of the roasting material as well

as the quantity of air, would have to be considerably reduced, and the output of the furnace would become very small compared to the size. For that reason, it has been
60 necessary hitherto to work furnaces with an excess of air and with superheated floors, and apart from the work of raking which is very unhealthy for the men, the cost of repairs has been very heavy. Moreover,
65 owing to the excess of air sulfuric acid trioxid SO_3 is formed which has a very disturbing effect on some further treatment, for instance in the manufacture of sulfitcs.

The above drawbacks are obviated by the
70 present invention, and the output of the furnace with a working temperature of 700° can be made nearly four times as great as that of furnaces working with superheated floors, and at the same time the unhealthy
75 raking work and repairs are done away with.

In the furnace according to this invention the gases enriched with SO_2 , are conveyed from the single floors direct into the upper-
80 most floor forming a mixing chamber and fresh air free from SO_2 is introduced after having been subjected to preliminary heating into the floors directly connected to the said mixing chamber. In that way the tem-
85 perature of the furnace can be regulated exactly in all the floors, more particularly in the central and upper ones, so that the injurious superheating in the upper floors, and its consequences, are avoided, and at the
90 same time a quantity of air corresponding to the progressing roasting process, and much greater in proportion is supplied to the central and upper floors.

Various apparatus can be used for carry-
95 ing out the process, for instance the conduit for forcing the fresh air into all the floors, or only into the central and upper floors, as well as the conduits for conveying the gases directly into the uppermost floor, can
100 be placed in the wall of the furnace. The preliminary heating in that case would be however insufficient, unless in special cases in which air already heated is available. Consequently, it is advantageous to use an
105 apparatus in which the heated fresh air is taken from the air which is forced into the stirring device spindle and cools the stirring device.

Two preferred constructions of an ore
110 roasting furnace are shown in the accompanying drawing, Figure 1 showing one con-

struction in longitudinal section and Figs. 2-4 cross-sections on lines C—D, E—F, and G—H respectively of this construction. Fig. 5 is a longitudinal section and Fig. 6 is a cross-section on the line J—K of the second construction.

The furnace shown in Figs. 1 and 2, contains in the known manner a number of hearths a^1 a^2 . . . a^7 arranged one above another like floors, within a casing h . The second, fourth and sixth hearths are provided in the known manner with a central passage opening i for the ore while the first, third and fifth hearths are provided with an ore passage opening j , (Fig. 2) arranged at the circumference. Above each hearth rotates a stirring arm or arms k , the blades of the said arms being arranged in the known manner alternately in opposite directions, in accordance with the direction of movement of the roasted material changing from inside to outward and from outside to inward in the superposed floors. The ore is admitted from the top through the charging branch or hopper b and is discharged from the bottom floor of the furnace in the form of clinkers through an outlet channel c . The stirring arms k are mounted on a double walled spindle slowly driven by an outer gear (not shown), the said spindle consisting of an inner tube m closed at the top, and of an outer jacket tube n closed at the bottom. The stirring arms k start from the inner tube m and are provided in the known manner with intermediate walls o for guiding the air forced from below into the inner tube m by means of a pump, fan, blower or the like (not shown) located at any suitable place outside the furnace. In the upper floors above the hearths a^1 , a^2 , a^3 a^4 a^5 and a^6 the outer tube n is provided with openings r for the escape of the air, regulated by means of slides or the like. According to this invention there are provided a number of wall conduits t^1 — t^6 starting from the floors above the hearths a^1 — a^6 , respectively, and leading direct to the uppermost floor used as a mixing chamber, above the hearth a^7 . The gases enriched with SO_2 and mixed above the hearth a^7 by the stirring device, are drawn off through the branch d . After the furnace is started, the heated fresh air forced into the floors from the stirring apparatus, is adjusted by means of the slides at the openings r so that the temperature in the upper floors does not reach the injurious limit. After this regulation has been once effected, the furnace can be worked permanently without any further adjustment of the corresponding slides, and has then the advantages mentioned in the introduction. The enriched gases from all the floors are conveyed direct into the uppermost floor above the hearth a^7 , by arranging four con-

duits t^1 (Fig. 4) distributed about the circumference and starting from the lowest floor, above the hearth a^1 . From the next higher floor, above the hearth a^2 , start also four conduits t^2 distributed on the circumference and leading into the uppermost mixing chamber. From the next higher floor a^3 , eight conduits t^3 distributed on the circumference, pass into the uppermost mixing chamber, and in a similar manner from each of the next floors, above the hearths a^4 a^5 a^6 , eight such conduits t^4 t^5 and t^6 , so that all these conduits distributed on the circumference of the single floors, open into the uppermost mixing chamber, above the hearth a^7 , as shown in Fig. 2.

In the modified construction of the furnace shown in Figs. 5 and 6 the enriched gases are conveyed from all the floors direct into the uppermost floor or mixing chamber in the same manner as described and shown for the furnace of Figs. 1-4. The heated fresh air, taken from the hollow spindle of the stirring apparatus, passes into a conduit or tube w and then through tubes x extending from the tube w into annular chambers y provided with circumferential openings y^1 . In the tubes x are inserted outside of the furnace regulating slides or clapets z . This modification involves the advantage that the air-distribution can be regulated from outside and without stopping the stirring apparatus.

What I do claim as my invention, and desire to secure by Letters Patent of the United States, is:—

1. In a multiple floor ore roasting furnace the combination of a plurality of floors, passages arranged in the floors alternately centrally and circumferentially, stirring arms mounted on a hollow rotating spindle with means for forcing air free from SO_2 into the floors and means for conveying the gases enriched with SO_2 from floors directly into the uppermost floor, substantially as set forth.

2. In a multiple floor ore roasting furnace the combination of a plurality of floors, passages arranged in the floors alternately centrally and circumferentially, stirring arms mounted on a hollow rotating spindle with means for forcing air free from SO_2 through the hollow rotating spindle into the individual floors and means for conveying the gases enriched with SO_2 from floors directly into the uppermost floor, substantially as set forth.

3. In a multiple floor ore roasting furnace the combination of a plurality of floors, passages arranged in the floors alternately centrally and circumferentially, stirring arms mounted on a hollow rotating spindle with means for forcing air free from SO_2 into the floors, means for conveying the gases enriched with SO_2 from the individual

floors directly into the uppermost floor and means for regulating the passage of the said air, substantially as set forth.

4. In a multiple floor ore roasting furnace the combination of a plurality of floors, passages arranged in the floors alternately centrally and circumferentially, stirring arms mounted on a hollow rotating spindle with means for forcing air free from SO_2 into the floors, separate conduits distributed on the circumference of the single floors for conveying the gases enriched with SO_2 directly into the uppermost floor and means for regulating the passage of the said air, substantially as set forth.

5. In a multiple floor ore roasting furnace the combination of a plurality of floors, passages arranged in the floors alternately

centrally and circumferentially, stirring arms mounted on a hollow rotating spindle, a plurality of tubes connected with the outer jacket tube of the hollow rotating spindle for conveying air free from SO_2 into the floors, separate conduits distributed on the circumference of the single floors for conveying the gases enriched with SO_2 directly into the uppermost floor and means for regulating the passage of the said air, substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

REINHOLD SCHERFENBERG.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.