J. HARRIS.

MECHANICAL ORE ROASTING FURNACE.

APPLICATION FILED JUNE 2, 1911.

1,035,186.

Patented Aug. 13, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

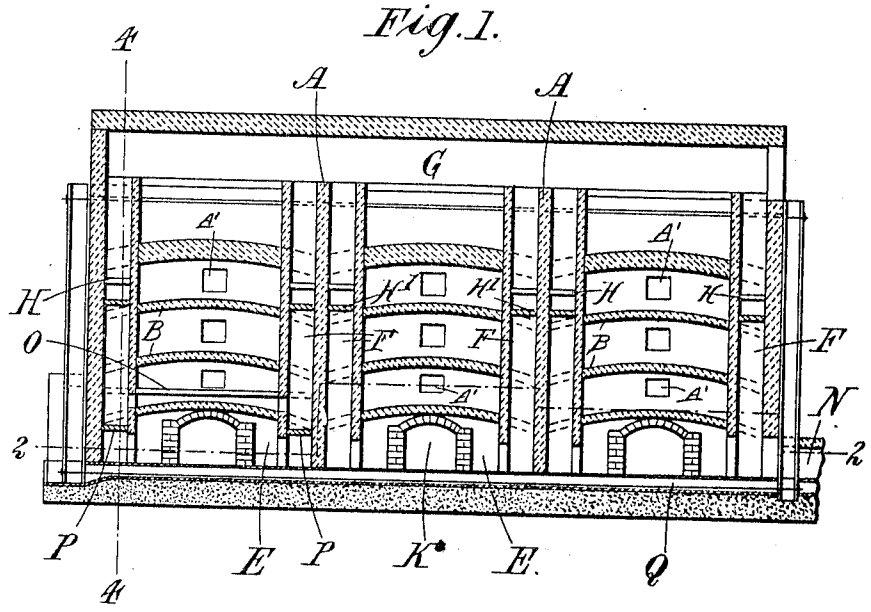
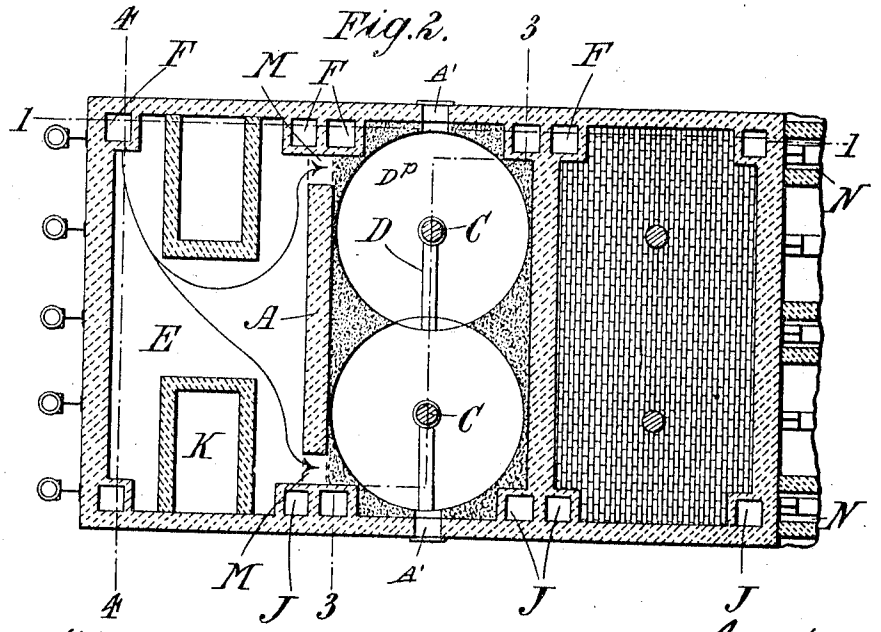


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

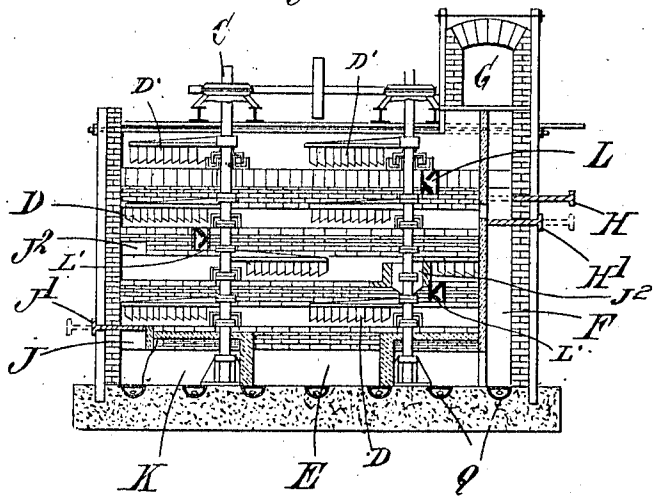
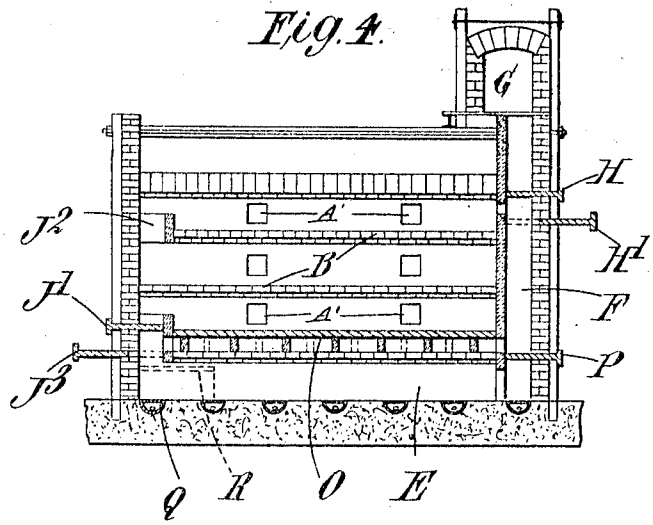


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN HARRIS, OF SHEFFIELD, ENGLAND.

MECHANICAL ORE-ROASTING FURNACE.

1,035,186. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed June 2, 1911. Serial No. 630,757.

To all whom it may concern:

Be it known that I, JOHN HARRIS, a subject of the King of England, residing in Sheffield, in the county of York, England, have invented certain new and useful Improvements in or Relating to Mechanical Ore-Roasting Furnaces, of which the following is a specification.

This invention relates to mechanical ore roasting furnaces and has for its object to provide improvements in the construction and operation thereof, whereby a portion of the furnace may be cooled for any purpose, such as effecting repairs or renewals, without interfering with the continuous operation of the remainder of the furnace, and whereby such a cooled portion may be reheated without using coal or like fuel. Heretofore even the smallest breakdown inside has necessitated the whole furnace being cooled down, and after the repair has been made, the furnace has had to be lighted up again with coal or like fuel, resulting in its being idle for many days or even for two or three weeks. By the employment of the present invention, however, a breakdown can be repaired or a renewal effected with greater ease than heretofore and without stopping the whole furnace, and afterward considerable time is saved in reheating the cooled portion by the hot gases from the remainder of the furnace which has been in continuous operation while the repair or renewal has been made. By the employment of this invention also the dust raised in the furnace is reduced to a minimum with the consequent increase of purity in the acid obtained when dealing with sulfur ores. Means are also provided for enabling, when desired, a concentration of heat to be effected upon, or auxiliary heat to be directed upon a portion of the furnace.

In the accompanying drawings:—Figure 1 is a longitudinal section of a furnace according to this invention, the section being taken on the line 1—1 of Fig. 2 which is a sectional plan taken on the line 2—2 of Fig. 1. Fig. 3 is a transverse section taken on the line 3—3 of Fig. 2 and Fig. 4 is a transverse section on the line 4—4 in Figs. 1 and 2.

Like letters indicate like parts throughout the drawings.

A furnace according to this invention is built in two or more vertical sections, three being shown in the drawings separated by walls A. Each section comprises a plurality of superimposed hearths in the form of arched floors or the like B which thus divide the section into the desired number of tiers or compartments. In each section there is a pair of vertical rake shafts C carrying a rake D in each tier. A space is provided beneath the lowest floor B in each section to form a dust chamber E. One or more vertical flues F are provided for each section communicating with the dust chamber E at the bottom and with an exit flue or channel G at the top leading to the acid forming tower or chimney. The flues F of each section also communicate by a suitable port with the uppermost tier thereof, and two dampers H and H^1 (Figs. 1, 3 and 4) are provided adjacent to such communicating aperture so that the gases from the interior may be led either to the channel G or to the dust chamber E by manipulating these dampers. An aperture J controlled by a damper J^1 is provided between the dust chamber E and the lowest tier of each section, and similar openings J^2 are also made in the arched floors B separating the various compartments of the section. The apertures J^2 are preferably arranged at alternate ends of successive floors B as shown in Fig. 3, those adjacent to the flue F being conveniently formed by an enlargement of the hole in the floor through which the rake shaft C at this end passes.

The rake shafts C are mounted on suitable pedestals separated from the interior of the dust chamber by compartments K. The two rakes D in each tier are arranged so that their paths overlap only a comparatively short distance as indicated by the circles D^p in the central section shown in Fig. 2. The ore to be roasted is fed through a suitable feed aperture L in the roof of the furnace (Fig. 3) adjacent to the center of one of the rakes in the uppermost tier. The blades on this rake are so arranged in relation to its sense of rotation that the ore is gradually moved toward the circumference of the rake path, where it comes under the action of the other rake in that tire whose blades are arranged to move the ore toward its shaft to a feed opening L^1 adjacent thereto whence the ore passes to the next tier and so on until it

is finally delivered from the lowermost tier. In Fig. 3 rakes D^1 are also shown above the roof of the furnace and in this way the heat of the roof may be employed to dry damp ores.

The dust chambers E communicate with one another by means of ports or passages M (Fig. 2) in the separating walls A. Flues N are provided leading from the series of dust chambers to the acid forming tower on chimney (either directly or by joining the exit flue G).

In operation the dampers H are open and H^1 and J^1 closed, the gases from each section passing from the uppermost tier direct to the channel G. If too much dust finds its way through the channel G, the gases from the section or sections causing the dust may be passed through the chambers E in order that the dust may settle therein, by closing the dampers H and opening H^1. From the chambers E the gases will pass to the channel G by way of the flues N or their equivalent or through one section by way of the ports M and opening J. In case it is desired to permit any section to become cool, as for instance to make repairs or renew some part thereof, the generation of gases therein is prevented by cutting off the feed of ore thereto. The cooling may be, and preferably is, expedited by opening the damper J^1 and closing the dampers H and H^1 of the section to be cooled, and by opening to their fullest extent the air inlets A^1 of that section which, as is well known, it is necessary to provide in all ore roasting furnaces to supply the air necessary for the combustion of the sulfur contained in the ore. It will thus be seen that the discontinuance of such section is effected without interfering with the continuous operation of other sections. The cold section or sections may be reheated quickly and easily without the use of coal or like fuel by feeding the ore (slowly at first) and directing the hot gases from the other section or sections through it by closing the dampers H and opening H^1 of the hot section, and opening the dampers J^1 and H and closing H^1 of the cold section. The hot gases from the section in operation will then pass into its dust chamber and thence as indicated on the left hand side of Fig. 2 through the ports M and J into and through the various tiers of the cold section and finally into the channel G. The rods tying the lower ends of the girders supporting the furnace are preferably arranged in channels beneath the dust chamber as shown diagrammatically at Q. These channels have one end open to the atmosphere, the other being suitably connected to an air inlet opening of the furnace. A double advantage is thus obtained, the current of air passing along the channels to the furnace being delivered thereto in a heated condition and the tie rods being kept at a lower temperature than they would be if buried in the concrete foundation according to the usual method.

When roasting certain ores it is well known that to complete the operation auxiliary heat is required. This is especially the case with zinc and copper sulfid ores which would still retain a small proportion of sulfur if treated simply in the manner described above. To complete the roasting of such ores and thoroughly to eliminate the sulfur therefrom a furnace according to this invention is modified as indicated in Fig. 4 and in the left hand section shown in Fig. 1 by providing a flat false floor O (conveniently of tiles) a short distance above the arched floor B of the lowermost tier, this floor B being preferably arranged somewhat farther below the one above it than would otherwise be the case. The floor O is supported on this arch by a number of transverse walls extending from one side of the section but not quite reaching the opposite side and alternately arranged so as to provide also a baffled passage between the lowest arch B and the floor O. At one end of the section this passage is open to one or more of the flues F a damper P being arranged below such opening or otherwise so that hot gases from the flue F may be directed into this passage. At the other end the passage may be provided with a flue leading to the channel G or is as shown open to the port or ports J. In the latter case two dampers J^1 and J^3 are furnished for the port J; the upper one J^1 is only open to heat the section by the hot gases from other sections, while the lower one J^3 is also used to open a path between the passage under the floor O and the dust chamber E. It will thus be appreciated that the hot gases emerging from the uppermost tier of a section may be directed through the baffled passage beneath the flat floor O in order to provide the auxiliary heat necessary completely to eliminate the sulfur from certain ores or as may be desirable in any other case.

What I claim and desire to secure by Letters Patent is:—

1. In a roasting furnace of the kind described the combination of segregated sections thereof, and means for connecting the space above the uppermost hearth of one section with that above the lowermost hearth of another section for the purpose set forth.

2. In a roasting furnace of the kind described the combination of segregated sections thereof, an exit flue, a dust chamber, a passage between the dust chamber and each section, dampers controlling said passages, a flue for each section communicating with the exit flue and with the dust chamber, a port between each section and its flue,

a damper in each section flue between said port and the exit flue and a second damper in each section flue between said port and the dust chamber for the purpose set forth.

3. In a roasting furnace of the kind described the combination of segregated sections thereof each comprising a plurality of superimposed hearths, an exit flue, a dust chamber, a passage between the dust chamber and each section, dampers controlling said passages, a flue for each section communicating with the exit flue and with the dust chamber, a port between each section and its flue, a damper in each section flue between said port and the exit flue, a second damper in each section flue between said port and the dust chamber, an outlet flue from the dust chamber, a passage below the lowermost hearth in each section and means for supplying heat to said passage for the purpose set forth.

4. In a roasting furnace of the kind described the combination of segregated sections thereof each comprising a plurality of superimposed hearths, an exit flue, a dust chamber, a passage between the dust chamber and each section, dampers controlling said passages, a flue for each section communicating with the exit flue and with the dust chamber, a port between each section and its flue, a damper in each section flue between said port and the exit flue, a second damper in each section flue between said port and the dust chamber, an outlet flue from the dust chamber, a passage below the lowermost hearth in each section and means for directing the products of combustion from the section flue through said passage to the dust chamber for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN HARRIS.

Witnesses:
ARTHUR H. GREENWOOD,
EDITH A. PORTEUS.