

G. RIGG.
BLAST ROASTING APPARATUS AND THE LIKE.
APPLICATION FILED JUNE 9, 1920.

1,421,989.

Patented July 4, 1922.
2 SHEETS—SHEET 1.

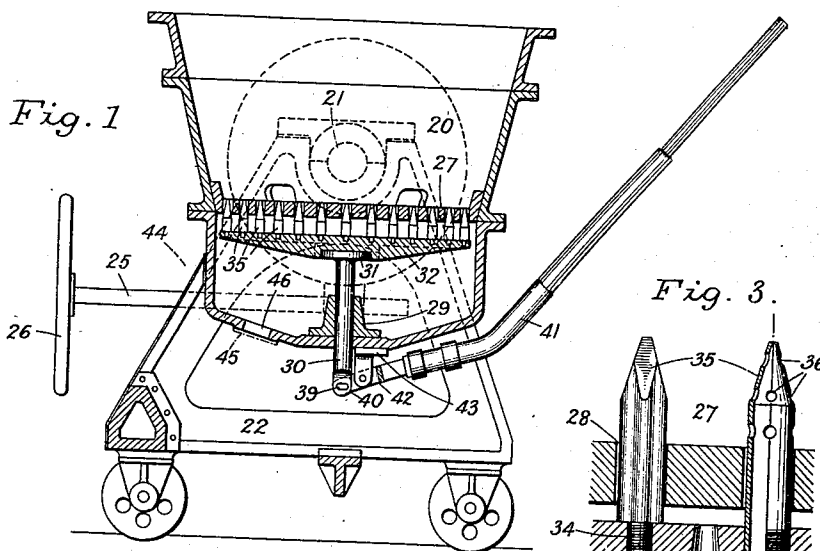
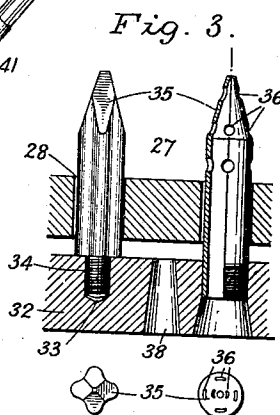


Fig. 4.

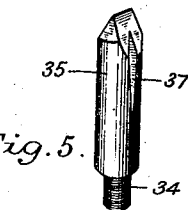
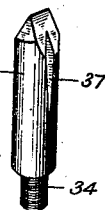
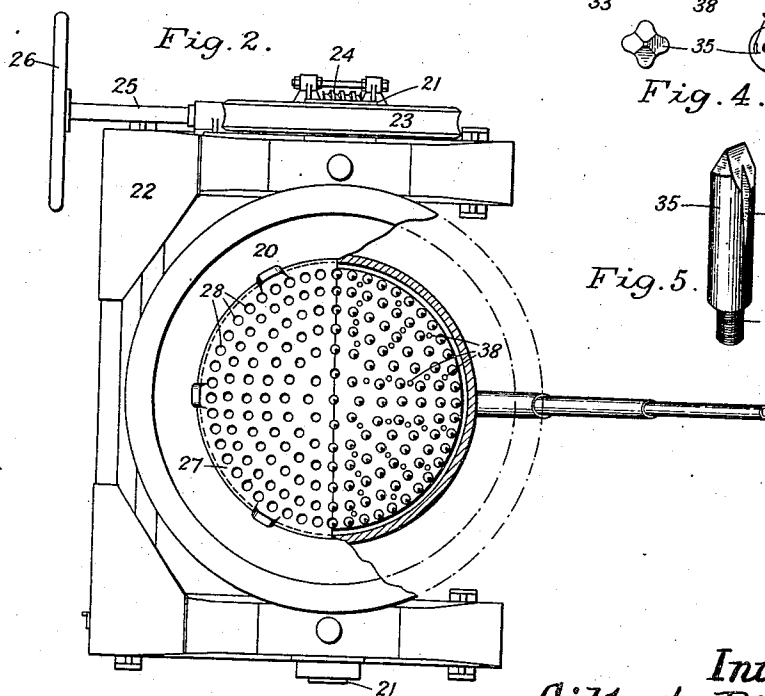


Fig. 5.

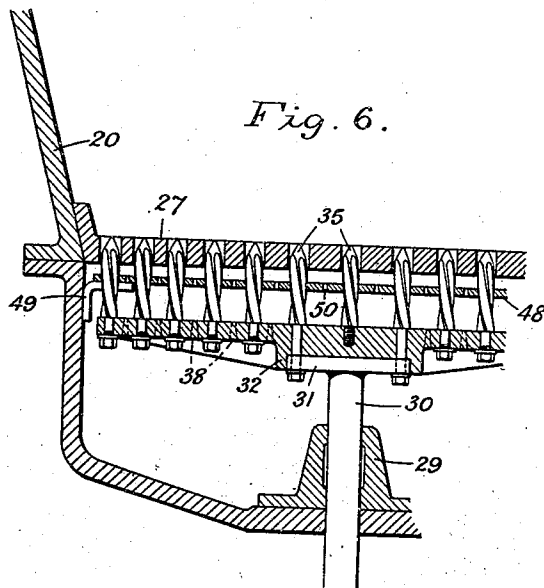
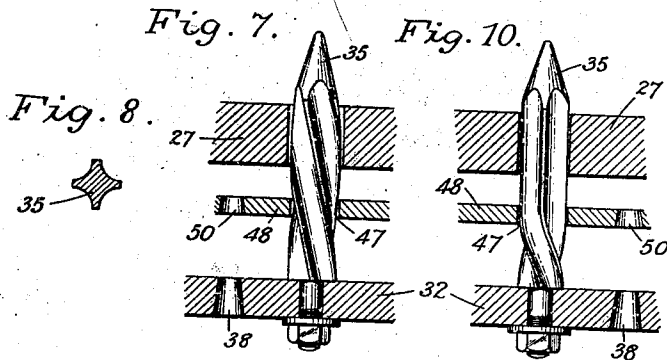
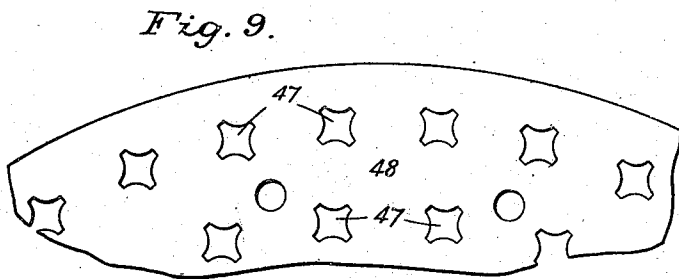


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UNITED STATES PATENT OFFICE.

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BLAST-ROASTING APPARATUS AND THE LIKE.

1,421,989.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GILBERT RIGG, a subject of the King of Great Britain, residing at (care of The Broken Hill Associated Smelters Proprietary, Limited, of Collins House, 360-366 Collins Street) Melbourne, in the State of Victoria, Commonwealth of Australia, metallurgist, have invented certain new and useful Improvements in and Connected with Blast-Roasting Apparatus and the like, of which the following is a specification.

This invention relates to certain improvements in blast roasting operations and the like and refers to operations for the treatment of ores in which a blast or current of air is induced or forced through a body or charge of material such as, for example, in blast roasting operations or in the treatment of ores for the formation of oxides and the like by the operation of a blast or current of air through a mixture of the ore and fuel. The invention refers more especially to means for breaking, perforating or opening up the clinker which normally forms immediately over the grates in such operations.

In various metallurgical operations involving the passage of a blast or current of air through a body or charge of ore upon a grate it has been found that the layer of material immediately over the grate is usually fused into a more or less impervious cake or clinker and that consequently the passage of air is seriously impeded and frequently rendered irregular and uneven, involving constant attention in the filling up of blowholes to avoid intense local action. In many cases this results in the limiting of the thickness of the charge to a comparatively thin layer and retards the completion of the operation.

It has been found by an examination of the treated charge that the lower layer has fused into a compact mass of clinker although the upper portions of the charge are not so affected.

Now the object of the present invention is to provide means whereby the aforesaid layer of clinker or slag formed over the grate is periodically broken or perforated and thereby opened up for the passage of the air blast.

Although this invention relates primarily

to a device for breaking the clinker formed in blast roasting pots or to pots used for the production of oxides and the like by the operation of a blast or current of air through a mixture of the ore and fuel, yet it will obviously be useful and applicable for breaking perforating or opening up clinker which forms as the result of any air or other gas blasting operation.

I accomplish the object of this invention by providing mechanical means by which the aforesaid layer of clinker or slag is intermittently broken or perforated. These mechanical means preferably comprise a number or series of projecting teeth or spikes adapted to be intermittently forced through the aforesaid layer of clinker or slag as the same is formed over the grate, thereby perforating and opening it up for the passage of the air current. These projecting teeth or spikes are preferably adapted to work in conjunction with the grate and in practise the same teeth or spikes are caused to project through the perforations or interstices of the said grate being mounted upon a suitable carrier or member which is adapted to be moved up and down by suitable mechanical means.

An apparatus embodying the features above described is illustrated in the accompanying sheets of explanatory drawings wherein:—

Figure 1 is a view in sectional side elevation of a pot (as used in the Huntington Heberlein process for the desulphurization of lead ores) fitted with mechanical devices for breaking or perforating the clinker formed over the grate therein.

Figure 2 is a view in plan of Figure 1, part of the pot being shown broken away to show details in the mechanical means devised for breaking the clinker.

Figure 3 is a view illustrating two forms of spikes or teeth for use with the apparatus.

Figure 4 is a view in plan of the spikes or teeth shown in Figure 3.

Figure 5 is a view in perspective of another form of spike or teeth.

Figure 6 is a view in sectional elevation of part of a pot showing a modification in the means employed for breaking or perforating the clinker and hereinafter is fully described.

Figure 7 is a view in sectional elevation of part of Figure 6 and shows a modified form of tooth or spike.

Figure 8 is a view in sectional plan of the tooth shown in Figure 7.

Figure 9 is a view of part of a constructional detail shown in Figure 6.

Figure 10 is a view similar to Figure 7 showing another modified form of tooth or spike.

In these drawings the reference numeral 20 designates a pot having trunnions 21 supported on a frame 22 provided with transport wheels of approved form. One of the trunnions 21 is fitted with a worm wheel 23 which gears with a worm 24 carried by a shaft 25 fitted with a hand wheel 26 which is adapted to be operated to tilt the pot sufficiently to empty some of its contents as desired.

A grate 27 is supported at an approved point in the height of the pot and this said grate preferably comprises a cast metal plate having a series of holes 28 formed vertically therein. The grate 27 preferably is mounted removably within the pot to permit of it being replaced by another when worn out or damaged.

The bottom of the pot is provided with a centrally disposed hole above which is mounted a guide member 29 for a spindle 30 which is adapted to be reciprocated vertically therein. The upper end of the spindle 30 is formed with a cap or flange 31 which is bolted to the centre of a plate 32 which conforms to the shape, and is somewhat smaller than the interior of the lower part of the pot.

The plate 32 is formed with a series of threaded holes 33 which are adapted to take the screwed shanks or stems 34 on the lower ends of a series of teeth or spikes 35. The teeth or spikes preferably, are pointed or sharpened on their upper ends and normally project upward into the bottom of the holes 28 in the grate 27.

The teeth or spikes 35 may be made to the same shape as, but slightly smaller in cross section than the holes in the grate or they may be made of such other cross sectional shape as will permit of the passage of air through the said holes when the said teeth or spikes are thrust upwardly therethrough.

The teeth or spikes may be given a cruciform shape in cross section as shown to the left of Figures 3 and 4 of the drawing or they can be made hollow as represented partly in sectional elevation in the right hand side of the same figures. When the teeth or spikes are made hollow as shown, the plate 32 is bored right through to permit of the air, forced under pressure into the bottom of the pot, passing freely upward to and through the holes 36 formed

in the upper end of the said hollow teeth or spikes. It will be obvious that either form of tooth shown may be used, or that both forms may be included in the same operative structure.

The upper ends of the teeth or spikes can be provided with chisel points and when made of round bar material their sides may be formed with grooves or flutings 37 (see Figure 5 of the drawings.)

In order to permit of the uniform distribution of the blast beneath the grate 27 the plate 32 carrying the teeth or spikes 35 is provided with a number of holes 38 through which the blast of air is allowed to pass directly upward to the bottom of the grate.

When hollow spikes are used the air holes 38 may be dispensed with.

The lower end of the spindle 30 is slotted horizontally to take a pin 39 fitted to the cheeks of a jaw 40 formed on the working arm of a lever 41 which is pivotally mounted on a pin 42 carried by a bracket 43 secured to the bottom of the pot. The power arm of the lever 41 preferably, is made up of two or more telescopically connected parts to permit of it being shortened when the pot is to be tilted to empty it of its contents. The connections between the parts of the power arm of the lever 41 can be made in any well known manner.

The air blast is supplied to the lower part of the pot through a pipe 44 as shown in dotted lines in Figure 1 or in any other approved way. The lower part of the pot can be cleaned as and when desired by removing the cover 45 on an opening 46 in the bottom thereof.

If preferred, the teeth or spikes 35 can be made as shown in Figures 6 and 7 of the drawings and means may be provided for effecting a partial rotation of the said teeth or spikes when they are being thrust upwardly through the holes in the grate 27. In this last mentioned form of apparatus the teeth or spikes are made of cruciform or other irregular shape in cross section and twisted into the form of screws.

The twisted teeth or spikes are adapted to pass through correspondingly shaped holes 47 formed in a plate 48 which is supported by brackets 49 a short distance below the bottom of the grate.

The stems 34 of the teeth or spikes 35 in this instance are free to rotate in the plate 32 when the said teeth or spikes are thrust upwardly through the holes 47 in the plate 48. The plate 32 and plate 48 are provided with holes 38 and 50 respectively to permit of the free passage of the air blast to the grate.

When the lower parts only of the teeth or spikes are twisted as shown in Figure 10 of the drawings the said teeth or spikes will

be partially rotated when their screwed or twisted parts are passing through the holes 47 in the plate 48.

After the charge in the pot has been ignited and the blast turned on, the formation of dense clinker or partially slagged material commences to take place. By means of the lifting mechanism the teeth are forced upwards into this dense layer which they perforate, thus allowing the blast to pass through. It will be seen that as these teeth are uniformly distributed over the lower surface of the charge, a uniform distribution of air through the charge is effected.

The operation of raising the teeth and opening up the bottom clinker can be repeated as often as is found necessary thus keeping the charge always open; in consequence a more rapid rate of roasting, and a more uniform roasted product are obtainable in the case of blast roasting whilst in the case of the treatment of ores for the formation of oxides and the like by the operation of a blast or current of air through a mixture of the ore and fuel it is possible to work with much deeper charges than have hitherto been found practicable.

The addition of atomized water to the air blast can be conveniently made use of in regulating the temperature of the roasting mass. This application is made possible by the uniformity of the blast distribution. Where blast distribution is irregular and patchy the cooling effect of the atomized water would be localized and give rise to irregular roasting.

The apparatus outlined will obviously permit of some modification to suit the particular circumstances peculiar to different metallurgical operations. In some cases it may be desirable to give the spike carrying plate a radial motion or the spikes themselves a similar radial movement.

I claim—

1. In blast roasting operations and the like for the treatment of ores maintaining the permeability of the charge by periodically breaking perforating or opening up the clinker formed over the grate thus permitting a uniform passage of the blast.

2. In blast roasting operations and the like for the treatment of ores means for maintaining the permeability of the charge consisting of projecting bars adapted to be periodically inserted into the clinker as formed.

3. In blast roasting operations and the like for the treatment of ores means for maintaining the permeability of the charge consisting of projecting bars or teeth adapted

to be inserted through the interstices of the grate.

4. In blast roasting operations and the like for the treatment of ores means for maintaining the permeability of the charge consisting of the combination with a grate of movable teeth adapted to project through the holes or interstices of the grate and project up into the bottom of the charge.

5. An apparatus for blast roasting operations and the like consisting of a pot in which is disposed a perforated grate, spikes or teeth adapted to be periodically passed through the interstices of the grate whereby the clinker is broken or perforated thus permitting a uniform passage of the air.

6. An apparatus for blast roasting operations and the like consisting of a pot in which is disposed a perforated grate, teeth adapted to be periodically passed through the perforations of the grate and so open up or break the clinker the said teeth being of such a cross sectional shape or size that on being held in operative position the passage of the air is permitted between the walls of the grate perforations and the sides of the teeth, thus permitting a uniform passage of the blast.

7. An apparatus for blast roasting operations and the like consisting of a pot in which is disposed a perforated grate, teeth adapted to pass upward through the grate receiving at the same time a partial rotary movement whereby the clinker is perforated or opened up so permitting a uniform passage of the blast.

8. An apparatus for blast roasting operations and the like consisting of a pot having disposed therein a perforated grate; teeth fixed and uniformly spaced in a plate below the grate the said plate being actuated by means for giving it a reciprocating motion whereby the teeth are periodically caused to pass through the grate perforations and so open up the clinker adjacent thereto thus permitting the continued uniform passage of the blast.

9. Apparatus for blast roasting operations comprising a pot having a perforated grate mounted therein, means for admitting a blast of air below the grate, a plate located beneath the grate, provided with a number of uniformly distributed holes, teeth projecting upwards from said plate, and means for giving to said plate a reciprocating motion, whereby said teeth are intermittently caused to perforate and open up the clinker, thus permitting a uniform passage of the blast.

GILBERT RIGG.