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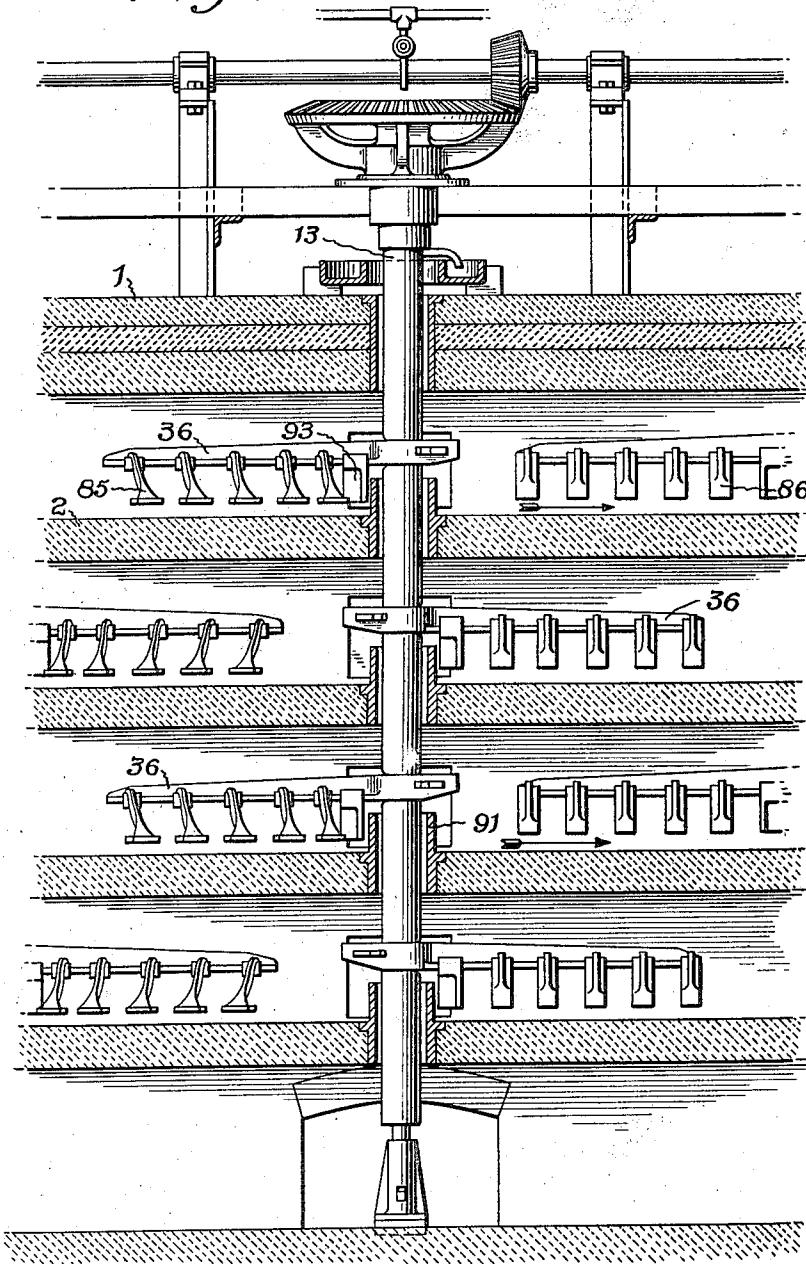
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A. V. LEGGO

ROASTING FURNACE

Original Filed Dec. 22, 1921 3 Sheets-Sheet 1

Fig. 1.



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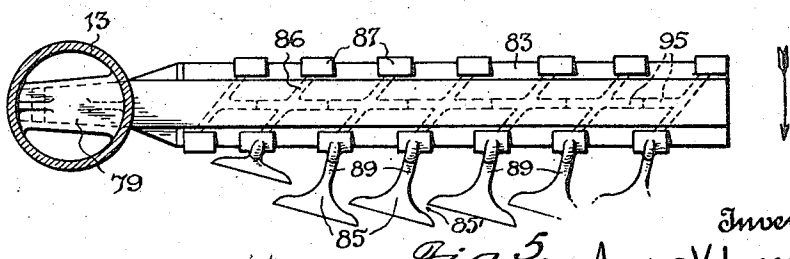
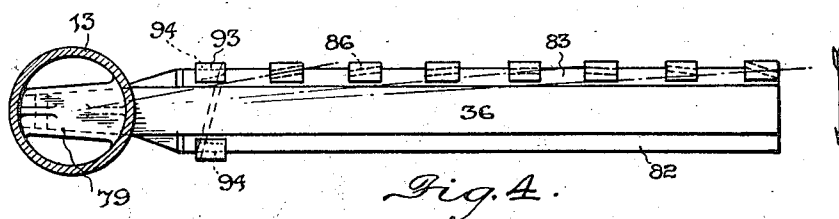
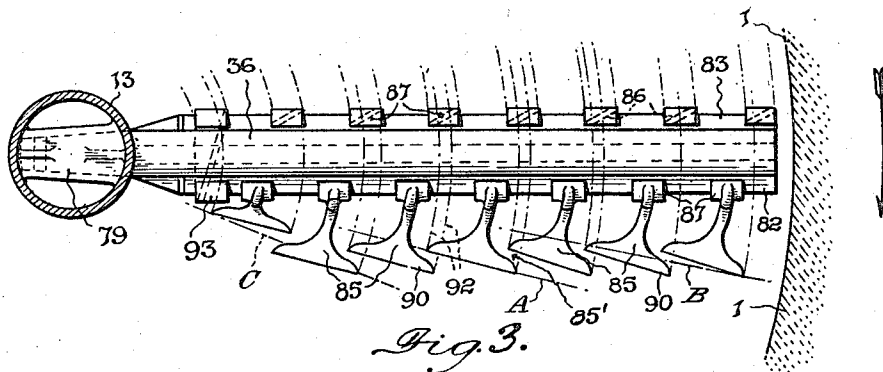
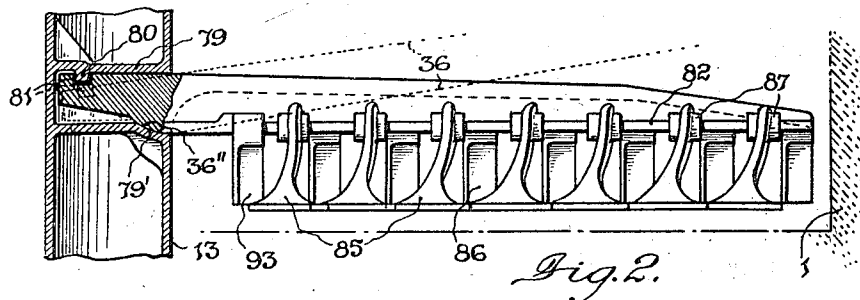
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ROASTING FURNACE

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ROASTING FURNACE

Original Filed Dec. 22, 1921

3 Sheets-Sheet 3

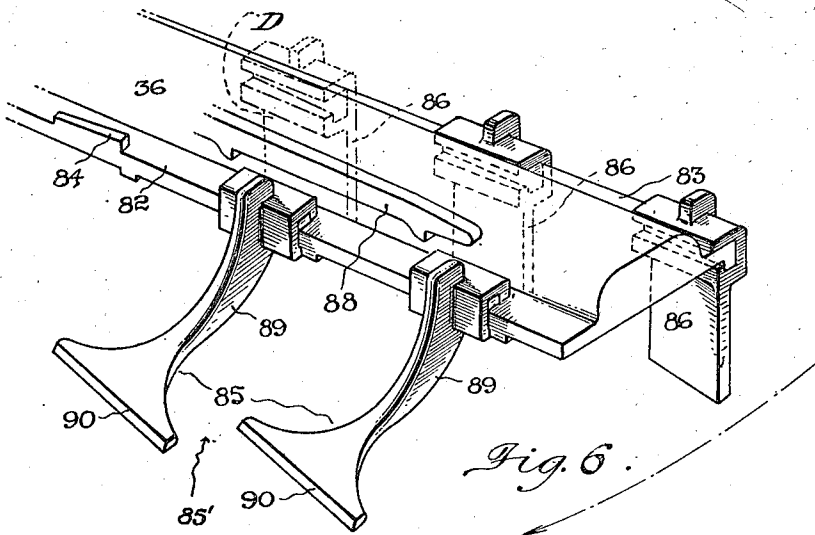


Fig. 6.

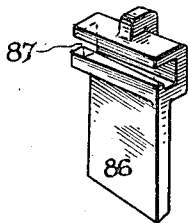


Fig. 7.

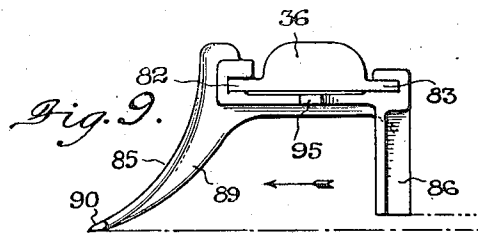


Fig. 9.

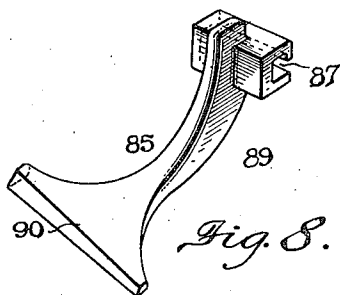


Fig. 8.

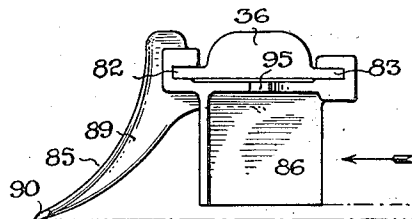


Fig. 10.

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UNITED STATES PATENT OFFICE.

ARTHUR VICTOR LEGGO, OF MELBOURNE, VICTORIA, AUSTRALIA.

ROASTING FURNACE.

Original application filed December 22, 1921, Serial No. 524,301. Divided and this application filed July 3, 1923. Serial No. 649,382.

To all whom it may concern:

Be it known that I, ARTHUR VICTOR LEGGO, of 497 Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia, metallurgist, have invented certain new and useful Improvements in Roasting Furnaces, of which the following is a specification.

This invention relates to improvements in the rabbling mechanism of ore roasting furnaces and refers especially to the arms and teeth on the rabble shafts for stirring and exposing the ore in its passage through the furnace.

The object of the invention is to provide certain improvements in the construction and arrangement of rabble teeth for attachment to a rabble arm whereby a thorough stirring and even distribution of the ore passing over the hearth of a furnace and an effectual exposure of the ore being stirred to the action of the furnace gases is effected.

I accomplish the abovementioned object by providing the rear of a rabble arm with a row of detachable furrow forming teeth and the front of the arm with a row of stirring teeth having downwardly, forwardly and inwardly inclined narrow shanks terminating in broad feet set at an angle to the front of the arm and disposed to travel between the centres of the paths traversed by the furrow forming teeth.

The stirring teeth may be arranged with the front of the foot on the centre tooth set radially to the pivot point of the arm and with the feet of the teeth on the inner and the feet of the teeth on the outer parts of the arms set at opposite angles to the radial line whereby the said teeth in the act of stirring the ore will ensure the same being maintained at a uniform depth over the whole area of the furnace hearth.

In order that the invention may be readily understood reference will now be had to the accompanying sheets of explanatory drawings wherein

Figure 1 is a view in sectional elevation of part of a "straight line" multiple hearth furnace showing a rabble shaft with arms fitted with teeth constructed in accordance with the present invention.

Figure 2 is a view in elevation of a rabble arm fitted with stirring and furrow forming teeth constructed and arranged in accordance with the present invention. In

this view the inner end of the rabble arm and part of a rabble shaft are shown in section.

Figure 3 is a view in plan of Figure 2.

Figure 4 is a view similar to Figure 3 showing a modified form of furrow forming tooth attached to the rear of the rabble arm.

Figure 5 is a view similar to Figures 3 and 4 showing combined stirring and rabbling teeth attached to the arm.

Figure 6 is a view in perspective of the outer end of a rabble arm fitted with stirring and furrow forming teeth and drawn to a larger scale than the other figures.

Figure 7 is a view in perspective of an oblique furrow forming tooth for attachment to the rear of the rabble arm.

Figure 8 is a view in perspective of a modified form of stirring tooth for attachment to the front of a rabble arm.

Figure 9 is a view in end elevation of a rabble arm showing a combined stirring and furrow forming tooth attached thereto.

Figure 10 is a view similar to Figure 9 and shows a slight modification in the construction of the combined stirring and furrow forming tooth.

In these drawings the numeral 13 designates a rabble shaft having rabble arms projecting alternately from opposite sides thereof.

The rabble arms are formed with longitudinally disposed flanges 82 and 83 which project horizontally from both sides thereof and on the upper side of the leading flanges 82 and on the underside of the following flanges 83 are formed a plurality of tapered projections 84.

A plurality of stirring teeth 85 and a plurality of furrow forming teeth 86 are detachably secured to the flanges on the rabble arms by tapering jaws 87 which are adapted to be passed over the flanges and moved laterally thereon to engage with the tapered projections 84, and the said teeth can be locked securely on said flanges by means of locking bars 88 or other approved devices in the ordinary way.

Part only of a locking bar 88 is illustrated in Figure 6 of the drawings and it is shown ready to be dropped into position so that projections on the underside thereof will prevent the jaws of the teeth moving inward off the tapered projections 84.

When the rabble teeth are affixed to the

arms as above described they will remain securely in position when in use and any one or more can be removed when worn or broken and replaced with a new one without necessitating the removal of or interference with the remaining teeth on the same arm.

The stirring teeth 85 on the leading flanges 82 of the arms are formed with narrow shanks 89 which incline forwardly, inwardly and downwardly and terminate in broad feet 90 having bevelled lower edges (see Figure 6).

The upper surfaces of the broad feet of the stirring teeth are made horizontal as shown in Figure 27 or they can be thickened on one side so as to give them a suitable lateral inclination (see Figure 8) in either direction to cause the ore to be moved inward or outward as desired during the stirring operation. The inclination of the feet on the teeth (shown in Figure 8) is arranged to cause the ore being rabbled to be moved outwardly and it will be obvious that when an opposite inclination is given to the feet the ore will be moved inwardly.

The shanks 89 of the front teeth are inclined inwardly so as to lie more or less in line with the centre of the paths of movement of their lower ends when the arm is in operation.

All the front teeth 85 with the exception of the innermost one are made uniform in size and shape and owing to the set of the shanks the front edges of the feet thereon are disposed at an angle to the front of the rabble arm. The front of the feet on the teeth near the centre of the row is disposed in or approximately in a radial line (marked A in Figure 3) drawn from the centre of the rabble shaft and the front of the foot of the outermost tooth is so arranged that its outer side is in advance of the inner side as clearly indicated by a radial line (marked B in Figure 3) drawn from the centre of the rabble shaft through the inner side of the said foot. The front of the foot on the innermost tooth is arranged so that its inner side is in advance of its outer side and may be in the same radial line (marked C in Figure 3) to that passing through the outer side of the leading edge of the next adjacent tooth.

In most rabbling operations where rotating rabble arms are employed to pass ore over the hearth there is a tendency for the ore to be distributed more or less unevenly and with a greater depth toward the outer part of the paths traversed by the said arms, and for the dead ore on the hearth to be left exposed to the furnace gases at the bottom of the furrows formed by the teeth. Many ores are likely to form cakes when left undisturbed and exposed to the furnace gases and more especially those ores containing zinc and lead. The construction and ar-

range of the front teeth as above described tends to obviate the uneven distribution of the ore as the angles of the feet of the outer teeth serve to counteract such tendencies, and to keep a complete covering of rabbled ore evenly disposed over the bed so as to prevent the exposure of the unrabbled ore to the gases and so retard or prevent the dead ore forming into hard cakes. The set of the feet of the inner front teeth serves to move outwardly any ore which may mount up adjacent to the rabble shaft and thereby prevents the said ore passing down the sleeve 91 surrounding the shaft, to the hearth beneath.

The feet 90 of the teeth may be made sufficiently broad to ensure the sides of each tooth traversing a path which meets with or overlaps the path traversed by the nearest sides of the adjacent teeth as shown by the concentric dotted lines 92 in Figure 3 of the drawings. The outer side of each front tooth is disposed in advance of the inner side of the next outermost tooth thereby leaving openings 85' through which the ore passes radially between the feet when the rabbling mechanism is in operation thus facilitating the passage of the teeth through the ore.

The construction and set of the front teeth are such that they thoroughly stir the whole bed of ore well in advance of the rabble arm without causing it to bank up unduly with the result that the load on the arm is kept smaller and the teeth attachments kept cooler than when it is banked up toward the bottom of the said arm.

By obviating the banking up of the ore in front of the rabble arm a free passage is provided beneath the said arm for the furnace gases and consequently all that part of the ore being turned over or stirred is brought into intimate contact with the atmosphere of the furnace.

The two rows of teeth 85 and 86 on the rabble arm effect a double rabbling of the ore, the front teeth 85 thoroughly open up the ore so as to ensure a fresh surface being exposed and the back teeth 86 (which are made shorter than the front teeth) leave the surface of the ore formed into deep furrows and ridges thereby causing a maximum of surface to be exposed. On the next revolution of the arm the shanks 89 of the front teeth 85 pass through the ridges left between the furrows and distribute the ore laterally so that the bed of ore is flattened more or less before the oncoming rear teeth 86 again form it into furrows.

In the present invention the teeth are designed especially to keep the ore evenly distributed over the hearth of the furnace and prevent any unrabbled ore from being exposed to the furnace gases at the bottom of the furrows formed by the back teeth.

As the bottom of the back teeth is higher than the bottom of the front teeth it will be apparent that no exposure of unrabbled ore on the hearth can take place which might cause a caking or setting of the same.

The inner ends of the rabble arms are fitted with broad obliquely disposed teeth 93 which operate to move the ore away from the rabble shaft and prevent the said ore banking up sufficiently to pass down the sleeve surrounding the said shaft and falling to the hearth therebeneath.

The angle of the inner stirring teeth on each arm is greater than that of the remaining stirring teeth with the result that they act to throw further outward the ore pushed back by the action of the oblique teeth and thereby effect a more even distribution of the ore on the hearth.

The furrow forming teeth 86 on the following flange 83 are set to track midway between the shanks of the front teeth and depend from the said following flange as shown in Figures 2 to 6 of the drawings.

The faces of the rear teeth 86 for forming furrows and ridges in the ore are flat and may be set in line with the edge of the following flange as shown at D in Figure 6 or some or all of the teeth may be set obliquely to the said flange as shown in Figures 3 to 5 and on the outer end of the arm shown in Figure 6, as desired. When the teeth 86 are set obliquely some of them can be arranged to move the ore radially in one direction and the remaining or some of the remaining teeth can be arranged to move the ore radially in the opposite direction (see Figure 4). The rear teeth can all be arranged at the same angle as shown in Figure 3 or some of the teeth can be formed with more or with less obliqueness than the others as desired.

The arrangement of the rear teeth as above described enables the ore being rabbled to be passed over a hearth in any direction at a desired rate of speed whilst keeping the same at a more or less uniform depth throughout all parts of the hearth.

In lieu of securing the stirring and furrow forming teeth detachably to the rabble arms either or both can be cast integrally on the front and rear thereof and be otherwise constructed and arranged as above described.

In an alternate construction (see Figures 9 and 10) the stirring and furrow forming teeth are formed integrally with each other and the furrow forming teeth are set obliquely to the axis of the arm, and as shown in Figures 5 and 10 the furrow forming teeth can be formed of greater breadth than the furrow forming teeth illustrated in the other figures of the drawings.

The combined stirring and furrow forming teeth are formed with two jaws which

engage both flanges of the rabble arms and the teeth are retained in correct spaced relationship by means of distance pieces 95 formed on the sides thereof and which abut against each other when the teeth are thrust over the ends of the arms and into position thereon. The obliquity and shape of the furrow forming teeth are shown in dotted lines in Figure 5 and this form of furrow forming tooth is particularly adapted to facilitate the movement of the ore over the hearths of "turret" furnaces.

I claim:

1. In roasting furnaces, a rabble arm, a row of stirring teeth on the front and a row of furrow forming teeth on the back of the rabble arm, and downwardly, forwardly and inwardly inclined shanks on the stirring teeth having broad feet set at an angle to the front of the rabble arm.

2. In roasting furnaces, the combination with a rabble arm of a row of furrow forming teeth on the rear of the arm, a row of stirring teeth on the front of the arm having narrow downwardly, forwardly, and inwardly inclined shanks adapted to pass through the ridges of ore between the furrow formed by the rear teeth, and broad feet on the stirring teeth having their front faces set at an angle to the front of the arm whereby when the arm is in motion the paths of the stirring teeth overlap and the ore being stirred will pass radially between the sides of the feet and between the front of one stirring tooth and the back of the next adjacent stirring tooth.

3. In roasting furnaces, the combination with a rabble arm of a row of furrow forming teeth on the rear of the arm, a row of stirring teeth on the front of the arm having downwardly, forwardly and inwardly inclined shanks, broad feet on the stirring teeth set at an angle to the front of the arm, the front of the foot of the centre stirring tooth being set approximately radially to the pivot point of the arm, and the feet of the teeth on the inner and the feet of the teeth on the outer parts of the arm being set at opposite angles to the radius of their path whereby the said teeth in the act of stirring the ore will ensure the same being maintained at a uniform depth over the whole area of the furnace hearth substantially as described.

4. In roasting furnaces, a rabble arm having a row of stirring teeth on the front thereof, and a row of furrow forming teeth depending from the arm at the rear of the stirring teeth and having oblique faces arranged to move the ore being rabbled in a radial direction.

5. In roasting furnaces, a rabble arm having a row of stirring teeth on the front thereof, and a row of furrow forming teeth on the rear of the arm, some of the said furrow

forming teeth having faces set obliquely to the arm and the remaining furrow forming teeth having faces set in line with the said arm.

6. In roasting furnaces, a rabble arm having stirring teeth on the front thereof provided with depending narrow shanks having broad shallow feet adapted to cover the whole path of the rabble, and furrow forming teeth on the rear of the arm having their lower ends disposed above the level of the feet on the stirring teeth.

7. In roasting furnaces, a rabble arm, having a row of teeth on the rear and a row of teeth on the front thereof, tapered projections on the front and rear of the arm, jaws on the upper ends of the front teeth engaging the projections on the front of the arm, narrow shanks inclining inwardly, forwardly and downwardly from the said jaws, broad feet on the lower parts of the said shanks set at an angle to the front of the rabble arm and adapted to track so that the sides of the path traversed by the edges of each tooth will overlap the paths of the adjacent teeth on the arm.

8. In roasting furnaces, a rabble arm, a row of stirring teeth on the front and a row of furrow forming teeth on the rear of the arm, said stirring teeth having forwardly

and inwardly inclining shanks, broad feet on the shanks having horizontal lower surfaces and inclined upper surfaces whereby when the rabble is in action the inclination of the upper surfaces of the said broad feet will move the ore laterally.

9. In rabbling mechanism of roasting furnaces, a rabble arm having combined stirring and furrow forming teeth attached thereto comprising narrow forwardly, downwardly and inwardly inclined shanks having broad feet set at an angle and depending obliquely disposed blades at the rear of and set to one side of the said shanks.

10. In rabbling mechanism of roasting furnaces, a rabble arm having combined stirring and furrow forming teeth comprising narrow forwardly, downwardly and inwardly inclining shanks having a broad foot at their lower ends obliquely disposed blades at the rear of the shanks said obliquely disposed blades being arranged to track at one side of the paths taken by the feet on the inclined shanks and having their lower ends above the bottom of the said feet, and means for attaching the combined teeth to the rabble arm.

In testimony whereof I have affixed my signature.

ARTHUR VICTOR LEGGO