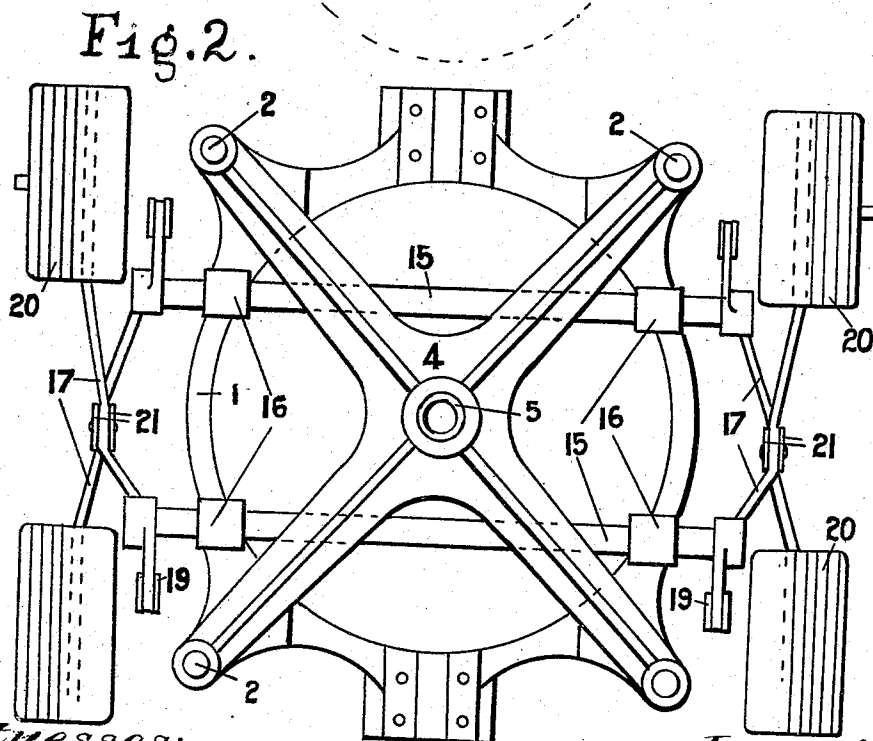
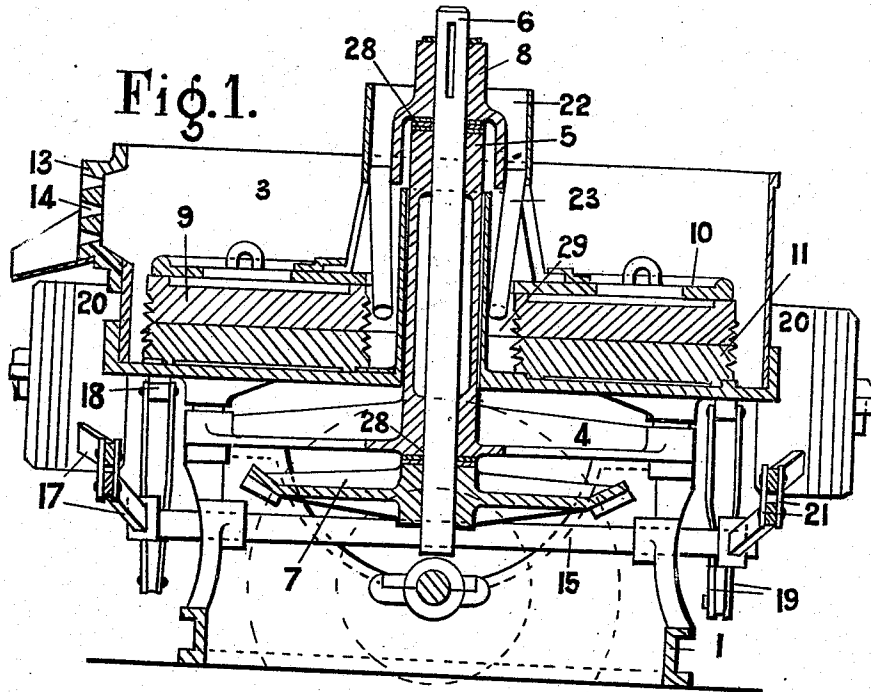


W. MIDDLETON & H. N. G. COBBE.
GRINDING PAN.

APPLICATION FILED NOV. 30, 1906.

936,794.

Patented Oct. 12, 1909.
2 SHEETS—SHEET 1.



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Fig. 3.

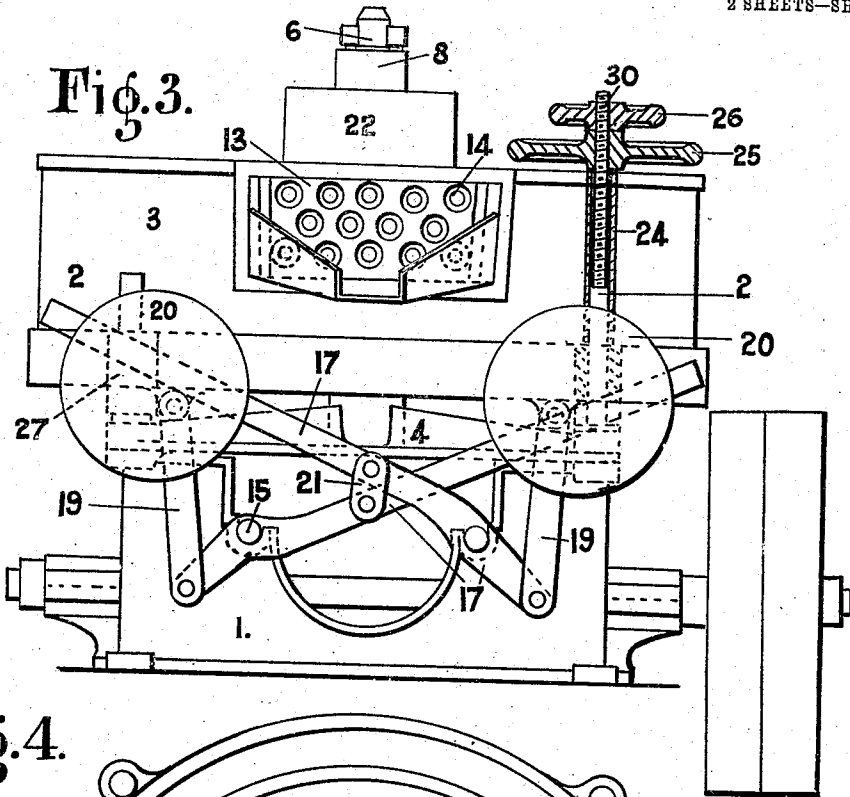
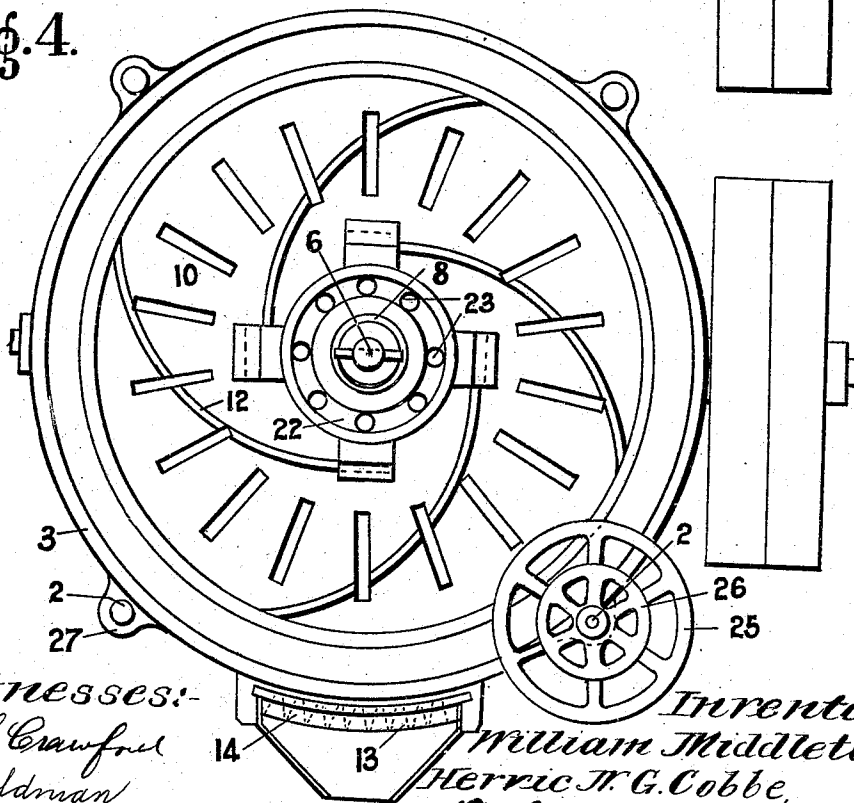


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM MIDDLETON AND HERVIC NUGENT GRAHAME COBBE, OF KALGOORLIE,
WESTERN AUSTRALIA, AUSTRALIA.

GRINDING-PAN.

936,794.

Specification of Letters Patent.

Patented Oct. 12, 1909.

Application filed November 30, 1906. Serial No. 345,695.

To all whom it may concern:

Be it known that we, WILLIAM MIDDLETON and HERVIC NUGENT GRAHAME COBBE, subjects of His Majesty King Edward VII, residing at Kalgoorlie, in the State of Western Australia, Commonwealth of Australia, have invented a new and useful Grinding-Pan, of which the following is a specification.

The object of this invention is to provide means whereby any desired constant pressure may be obtained between the grinding surfaces of grinding pans, of the type usually employed in the fine grinding of gold ores, or other material, or in other mills in which the grinding is effected under a rotated muller, and thereby entirely overcome the loss in efficiency, which was formerly experienced in practice with this class of pan as the shoes and dies wear away.

In order that our invention may be readily understood, we will describe its most usual form, by reference to the accompanying drawings in which:—

Figure 1. is a vertical, central, section of a pan constructed according to our invention, Fig. 2. is a plan of the frame carrying the pan, Fig. 3. is a side elevation and Fig. 4. is a plan of the same.

Similar figures refer to similar parts throughout the drawings.

In carrying our invention into practice we form a base, or frame, 1 preferably of the circular shape shown in the drawings, from which four guides, or stout steady pins 2 project vertically, so that they may pass through four substantial lugs 27 cast on the side of the pan 3 when it is placed on the frame and thereby keep it steady vertically as it is raised or lowered. Before the pan 3 is placed in position, a strong subsidiary frame 4, preferably in the shape of a cross is placed over the pins 2 so that the pins project upward through holes in the ends of the cross. This subsidiary frame 4 is securely fastened to the main frame 1. A vertical hollow column 5 is secured to, or cast with, and projects upward from, the center of this subsidiary frame 4. Two bearings are fitted to this column 5 to receive a vertical spindle 6 which is fitted with bevel gear 7 at its lower end and with a yoke 8 at the upper end. Friction rings or balls 28 are placed between the bevel gear 7 and the column 5 and between the column 5 and yoke 8,

so that the shaft can revolve freely, but cannot move vertically.

Shoes 9 are secured in any ordinary manner to a muller plate 10 which latter is rigidly attached to the yoke 8, while the bottom of the pan 3 is fitted with dies 11, as is customary. Curved radial vanes 12 are cast with, or secured on the top of, the muller plate 10 which will collect any unground material as the muller revolves and return it to the center, or feeding space 29, so that it will pass between the shoes and dies.

A casting 13 having a number of plug holes 14 is bolted or otherwise secured to the side of the pan 3, so that the amount of water and pulp within the pan, may be varied, by plugging as many of the holes 14 as desired. Two rocking shafts 15 are now placed horizontally in bearing 16, secured in the frame 1, and two compensating levers 17, are secured to the end of each of these shafts. The short ends of these levers are connected to lugs 18, cast with, or secured to, the bottom of the pan 3, by connecting rods 19; and adjustable weights 20 are secured upon the long ends of the levers 17, so that the weights 20, tend to raise the pan 3. The two levers 17 which project from one of the shafts 15, are respectively connected, by links 21, to the levers 17, projecting from the other shaft 15, so that the whole system of levers will move together, and the pan will be held horizontally, while it is being moved vertically. The levers 17 are made so that as the weights 20 sink down the leverage becomes less and less, thereby compensating for the loss of weight in the dies, due to their being ground away and keeping the pressure between the shoes and dies constant.

It will be noted by reference to Fig. 3 that, as the free ends of the levers 17 descend under the action of the weights, the purchase or leverage will gradually decrease as the levers approach a horizontal position and as the power applied by the weights 20 is substantially constant it will be seen that the pressure with which the die 11 engages the shoe 9 will gradually decrease as the die wears off and loses weight, thereby maintaining a substantially constant pressure between the die and the shoe.

In order to enable the operator to stop the grinding action of the pan without stopping

the muller one of the steady pins 2, is made longer than the others, and its upper end provided with a screw thread 30. A convenient length of piping 24 is slipped loosely
 5 over this pan, so that its lower end rests upon the lug 27, projecting from the pan, while the screw projects above the top end of the pipe and is fitted with a tapped hand wheel 25 and locking wheel 26. When it is
 10 desired to stop the grinding action of the pan, the hand wheel 25 is screwed down, depressing the pipe 24 and the lug 27 of the pan 3, which communicates its motion through the connecting rod 19, directly be-
 15 low it, to its lever 17 and from its lever to the others of the set, so that the weights are raised and the pan depressed practically horizontally, without any of the risk which attends the same operation with the ordinary
 20 type of grinding pan, in which a man must get on top of the pan and grasp a wheel, which is going at some 50 revolutions per minute, in order to turn it and thereby raise the muller.

25 The operation of a grinding pan constructed according to our invention is as follows.—When the parts have been set up and the weights adjusted to give the desired pressure between the shoes 9 and dies 11, which
 30 in most cases will just about equal the weight of a new set of shoes and the muller, so that when the pan is first started very little upward, or downward, pressure will be taken by the shaft 6, and the shoes will practically
 35 float on the dies, as they are driven around. Water and the material to be ground will be fed into the pan by a launder either direct, or through a central feed hopper 22, and pipes 23, as shown in the drawings and the
 40 coarse material will flow into spaces between the shoes and the spaces between the dies in the ordinary manner and from there it will be drawn between the shoes and dies, and be ground, while any coarse material which
 45 gets to the periphery of the pan, will be conducted back to the center by the vanes 12. As the shoes and dies wear, the pan 3 will be raised by the weights 20, springs, or hydraulic pressure, and the muller and shoes
 50 will be held down by the friction rings between the bevel gear 7 and the column 5, so that the pressure between the grinding surfaces will remain constant, despite the gradual loss of weight of the shoes and dies,
 55 until the shoes and dies are quite worn out. When it is desired to replace the shoes and dies by a fresh set, the cotter pin, in the top of the shaft 6, is removed and the muller and the worn out shoes removed by suitable

blocks and tackle. A fresh set of shoes and 60 dies are then secured and the muller replaced and secured in position, by the cotter pin, when the pan may be started again. If it is required to stop the grinding action of the pan at any time, a few turns of the hand 65 wheel 25, are all that is necessary.

What we do claim as our invention, and desire to secure by Letters Patent is.—

1. In combination, a grinding pan, a die carried thereby, guides affording vertical 70 movement for said pan, links and weighted levers for normally raising said pan, means limiting movement of said pan upwardly, an operating shaft provided with a yoke, a muller carried by said yoke, a shoe carried 75 by said muller and adapted to coöperate with said die in grinding the material, said shoe and die being recessed to form a feeding space, and means for guiding the material toward said feeding space. 80

2. In combination, a grinding pan, a die carried thereby, guides affording vertical movement for said pan, links and weighted levers for normally raising said pan, means limiting movement of said pan upwardly, 85 an operating shaft provided with a yoke, a muller carried by said yoke and provided with feeding vanes, and a shoe carried by said muller and adapted to coöperate with said die in grinding the material. 90

3. In combination, an operating shaft provided with a yoke, a muller carried by said yoke, a shoe suspended from said muller, a grinding pan surrounding said shoe, a die 95 carried by said pan and coöperating with said shoe, guides affording movement of said pan to vary the distance between said die and shoe, means limiting movement of said pan upwardly, and compensating counterweight means for raising said pan to main- 100 tain engagement between said die and shoe.

4. In combination, an operating shaft provided with a yoke, a shoe carried by said yoke, a grinding pan surrounding said shoe, a die carried by said pan and coöperating 105 with said shoe, guides affording vertical movement of said pan, and compensating means for raising said pan to maintain engagement between said die and shoe.

In testimony whereof we have signed our 110 names to this specification in the presence of two subscribing witnesses.

WILLIAM MIDDLETON.

HERVIC NUGENT GRAHAME CORBEE.

Witnesses to both signatures:

WILLIAM GEORGE MANNERS,
 LANCELOT ELDIN DE MOLE.