W. E. KIMBER.

OPERATING MECHANISM FOR STAMP MILLS.

APPLICATION FILED SEPT. 25, 1909.

1,001,282. Patented Aug. 22, 1911.

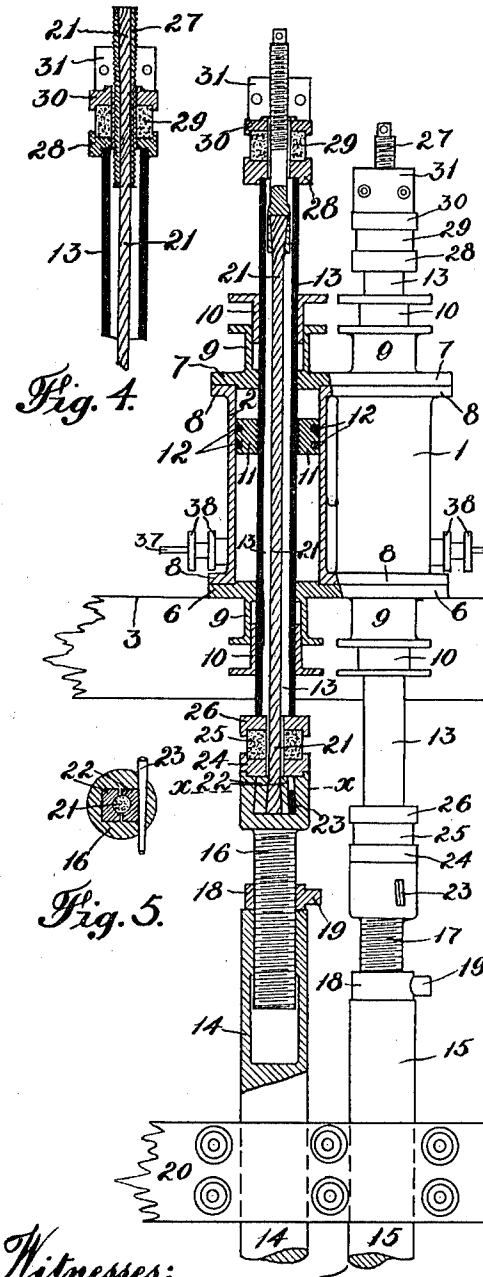

Fig. 1.

Fig. 4.

Fig. 5.

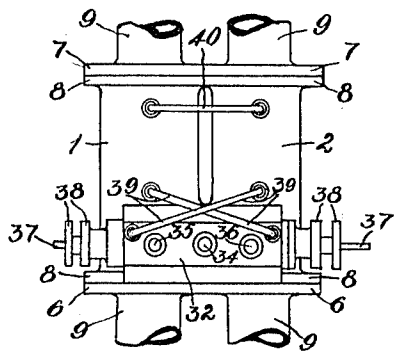

Fig. 2.

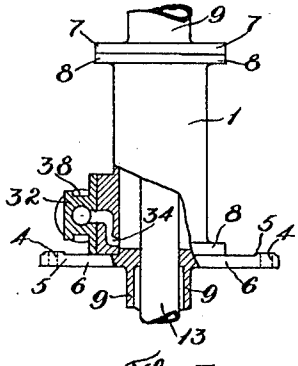

Fig. 3.

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OPERATING MECHANISM FOR STAMP-MILLS.

1,001,282. Specification of Letters Patent. **Patented Aug. 22, 1911.**

Application filed September 25, 1909. Serial No. 519,599.

To all whom it may concern:

Be it known that I, WALTER EDWARD KIMBER, a subject of the King of Great Britain, and resident of Johannesburg, Transvaal, have invented certain new and useful Improvements in Operating Mechanism for Stamp-Mills, of which the following is a specification.

This invention relates to the operating of gravity stamps of stamp mills employed for the reduction of ore and other materials.

The object of the invention is to construct a combined fluid actuated gravity stamp, or one in which a fluid under pressure, such as steam, compressed air or the like, is utilized for raising or lifting the stamp which is then allowed to fall by gravity to operate on the ore or other material within the mortar box or its equivalent.

By the adoption of my invention I obviate the necessity for the employment of the ordinary rotary steam engine or motor, pulley wheel, cam shaft, cams, tappets and their accessories.

The invention has been primarily designed for use in small portable mills, but it may also be employed in large stationary mills if desired.

The invention provides a simple and efficient means which can be easily arranged in operative position and in which the vibration is largely confined to the stamp and mortar box, so that the framework carrying the operating means for the stamp or stamps can be of lighter construction than at present.

In carrying out the invention I employ one or more cylinders—one for each stamp—which may, as preferred, be arranged either singly or in pairs. I prefer to arrange and support them in pairs above the stamps. Within each cylinder is arranged a piston and a hollow or tubular piston rod. The tubular piston rods move vertically through both ends of their cylinders. A wire rope or other suitable flexible connection is attached at one end to the stamp stem or a piece fixed thereto. The flexible connection is preferably passed up through the hollow piston and piston rod and attached at the other extremity preferably to the top or other end of the piston rod or to a piece attached thereto. Resilient means are preferably provided for maintaining the wire rope or other flexible connection taut between its points of attachment to the stem and to the piston rod. The diameter of the hole through the tubular piston rod is much greater than the diameter of the rope to allow for play, and so obviate the transmission of the vibration to the piston or working parts of the cylinders. The wear of the shoes and dies of the stamps may be taken up by extending or lengthening the stem; this may be accomplished either by means of a screw or in any other convenient manner. It provides a ready means for adjusting the drop of the stamp as well as to compensate for wear of the shoe and die.

The steam, compressed air or other actuating fluid is admitted to the cylinder beneath the piston through a suitable port or ports provided in the cylinder and so lifts the piston and through the medium of the flexible connection the stamp. The actuating fluid is then exhausted from the cylinder through the valve or its equivalent and so allows the stamp to fall by gravity. When the cylinders are arranged in pairs then the actuating fluid from one cylinder actuates the valve to admit the fluid to the other cylinder, thereby lifting the stamps alternately. The valve is preferably constructed to admit the fluid gradually to the cylinder and exhaust suddenly.

In a modified arrangement the flexible connection between the piston rod and stamp may be made between the bottom of the rod and the top of the stamp and not pass through the rod, but I prefer the first described construction in which the flexible connection is passed through the rod.

If desired, any suitable means may be provided for imparting rotary motion to the stamps.

The invention will now be more fully described by aid of the accompanying sheet of drawings wherein I show sufficient of a stamp mill to illustrate the application of the invention.

In the drawings Figure 1 is a part sectional front elevation showing the upper portions of the stems of two stamps and their operating means. Fig. 2 is an elevation of the cylinders 1 and 2 as seen from the back and showing the arrangement and position of the inlet and exhaust ports in the valve chest. Fig. 3 is a side part sectional elevation of one of the cylinders and showing the inlet port. Fig. 4 is a section through the upper portion of one of the tubular piston rods showing the slightly modified mode

of attaching the wire rope or flexible connection to the tension screw. Fig. 5 is a section of Fig. 1 on line *x*—*x*.

Referring more particularly to Figs. 1, 2, 3, and 5 of the drawings 1 and 2 represent the two cylinders, one for each stamp. The cylinders are preferably constructed and arranged in pairs as shown, although they may be constructed and operated singly. The cylinders 1, 2 are carried by means of beams or timbers 3 forming part of the framework of the mill or in any other convenient manner immediately above the stamps. The cylinders, may, as shown in Fig. 3, be bolted or otherwise secured to the beams or timbers 3 through holes 4 formed in flanges or projections 5 on the cylinder bottom covers 6. The cylinders 1, 2 are provided at the top and bottom with covers 7, 6 to which they may be bolted or otherwise suitably attached through the flanges 8 on the ends of the cylinders. Covers 6, 7 are constructed to provide stuffing boxes 9 for glands 10.

11 in Fig. 1 represents the piston which is reciprocally arranged inside the cylinder 2. This piston is provided with suitable packing rings 12. The piston is provided with an internally screw-threaded hole into which is screwed (it may be fixed therein in any other convenient manner) a hollow or tubular piston rod 13. Piston rods 13 as shown in Fig. 1 project and work through the stuffing boxes and glands in both ends of the cylinders.

14, and 15 represent the upper portions of the stems of the stamps which latter operate to crush the ore or other material in the mortar box in a manner well understood.

16, 17 represent the adjustable upper portions of the stems. These parts 16, 17 may as shown be constructed with a screw-threaded portion adapted to be screwed into the interiorly threaded open upper ends of the stems 14, 15.

18 represent lock nuts for locking parts 16, 17 of the stems in their position after adjustment, 19 being projections on said lock nuts for tightening or releasing them on the parts, 16, 17. Instead of screwing the adjustable parts 16, 17 to the upper portions 14, 15 of the stems they may be keyed or secured thereto in any other suitable manner.

20 are the guides (which may be of any suitable construction) for the stems 14, 15.

The adjustable parts 16, 17 of the stems 14, 15 are constructed with heads or enlargements in which are provided dovetail or undercut recesses which as hereinafter described serve for making the connections between the lower end of the wire rope or other suitable flexible connections and said adjustable parts 16, 17.

21 in Fig. 1 represents the wire rope which serves for making the flexible connection between the upper end of part 16 of stem 14 and upper end of tubular piston rod 13. Both ends of the wire rope 21 are "capped" that is to say the wires of each end are frayed out or expanded and made slightly conical and the space left between the expanded wires then filled with metal by placing the expanded wires in a mold and running the metal around them or otherwise in a manner well understood. In the dovetailed recess in the upper end of part 16 is placed a two part bush 22 (see also Fig. 5). Between the adjacent faces of the halves of the bush 22 is provided a conical or tapering hole in which fits the capped lower extremity of the wire rope 21.

23 represents a key which as shown passes through a transverse hole in the upper end of part 16 and passes through the dovetailed recess and engages on the inside one half of the bush 22. The movement of key 23 in one direction causes the capped end of wire rope 21 to be firmly gripped between the halves of the two part bush 22.

Around the wire rope 21 above the head of the adjustable part 16 is arranged what I may designate a bottom compression plate 24 which may as shown be constructed on the one side to fit a recess in the top of the head of part 16.

25 is an india rubber or other suitable resilient buffer placed around the rope 21 above plate 24, and 26 is a top compression plate placed around the rope between the top of buffer 25 and the lower end of the tubular piston rod 13, which as shown in Fig. 1 rests directly upon it. Plates 24, 26 may as shown in Fig. 1 be recessed to receive buffer 25.

The wire rope 21 extends up through the hollow piston rod 13. It is attached at its capped upper extremity to the lower end of a tension screw 27. This as shown may be accomplished by capping the end of rope 21 in a conical or dovetail recess in the end of screw 27.

28 is a bottom compression plate arranged around tension screw 27 and resting upon the upper end of tubular piston rod 13.

29 is a resilient buffer, and 30 a top compression plate resting upon buffer 29.

31 is an adjustment nut (which may be conveniently constructed in halves bolted or otherwise secured together) screwed on the tension screw 27 up to the top compression plate 30. Nut 31 serves for placing and maintaining wire rope 21 in tension to the desired extent.

It will be apparent that the rubber or other suitable resilient buffers 25, 29, provided at the top and bottom of the tubular piston rod 13 operate to keep the wire rope 21 always in tension. When the wire rope 21 is in tension and the buffers 25, 29 at its opposite ends are drawn toward each other

then the measure of the tension on the rope 21 is that transmitted to it through said rubber buffers 25, 29.

In operation, on the upstroke the top buffer 29 contracts and the bottom buffer expands to the same degree. On the down stroke the movement of the stamp being suddenly arrested, and the piston wanting to continue its downward movement, is cushioned on the bottom buffer 25 which buffer thereupon contracts and the top buffer 29 expanding to the same degree keeps rope 21 in tension all the time or during the complete cycle or operations.

As will be understood from Fig. 1 of the drawings the means for actuating the stem 15 of the other stamp is constructed and operated in the same manner as the stem 14.

32—see Figs. 2 and 3—represents the valve chest for the cylinders 1, 2, 33 the inlet ports and 35, 36 the exhaust ports for cylinders 1, 2 respectively.

37 is a valve rod which as shown works through stuffing boxes and glands 38 at the opposite ends of the valve chest 32. The extension or that end of the valve rod which works through the valve chest may serve as a convenient means for moving the valve should it stick on its center. The valve (not shown) may be constructed in any suitable manner so that when the piston in one cylinder is moving through its upward stroke the other is at the end of its downward stroke or descending.

39 in Fig. 2 represents pipes placing cylinders 1, 2 (at suitable points) in communication with the ends of the valve chest 32 to effect due reversal of the valve.

40 in Fig. 2 represents a pipe which connects the cylinders 1, 2 at or in proximity to the top and serves to permit any fluid that may escape past the pistons to pass from one cylinder to the other so that as the one piston rises it prevents the formation of a vacuum in the other cylinder (and vice versa) and assists in the downstroke of the other stamp.

In the modified arrangement illustrated in Fig. 4 for attaching the upper end of the wire rope 21 to the tension screw 27 the latter is made hollow and the wire rope passed through it and capped inside the tension screw at its upper end. The arrangement of the adjustment nut and top buffer and compression plates are the same as those described in connection with Fig. 1.

What I claim as my invention and desire to protect by Letters Patent is:—

1. In a stamp mill, a gravity actuated stem, a cylinder and piston therein for raising said stem, a hollow rod secured to said piston, and a flexible connection extending through the piston having one end connected to the upper end of the rod and the other end connected to said stem.

2. In a stamp mill, a gravity actuated stem, a cylinder and piston therein for raising said stem, a hollow rod secured to said piston, a flexible connection extending through the piston having one end connected to the upper end of the rod and the other end connected to said stem, and resilient means for forming the connection between the flexible connection and the hollow rod and the flexible connection and the stem.

3. In a stamp mill, a gravity actuated stem, a cylinder and piston therein for raising said stem, a hollow rod secured to said piston, said hollow rod being arranged to work through both ends of the cylinder, a flexible connection extending through the piston, resilient means forming the connection between the upper end of the rod and the flexible connection, and resilient means interposed between the lower end of the rod and the connection formed between the flexible connection and the stem.

4. In a stamp mill, a gravity actuated stem, a cylinder and piston therein for raising said stem, a hollow rod secured to said piston and extending through both ends of the cylinder, a flexible connection in the rod, means for connecting said flexible connection at its lower end to the stem, resilient means interposed between said latter means and the lower end of the rod, and adjustable resilient means for attaching the upper end of the flexible connection to the upper end of the rod.

5. In a stamp mill, a gravity actuated stem, a cylinder and piston therein for raising said stem, a hollow rod secured to said piston and extending through both ends of the cylinder, a flexible connection in the hollow rod, means for connecting said flexible connection at its lower end to the stem, resilient means interposed between said latter means and the lower end of the rod, said resilient means comprising a pair of compression plates and a resilient buffer between said plates, and adjustable resilient means for attaching the upper end of the flexible connection to the upper end of the rod.

6. In a stamp mill, a gravity actuated stem, a cylinder and piston therein for raising said stem, a hollow rod secured to said piston and extending through both ends of the cylinder, a flexible connection in the hollow rod, means for connecting said flexible connection at its lower end to the stem, resilient means interposed between said latter means and the lower end of the rod, said resilient means comprising a pair of compression plates and a resilient buffer between said plates, and adjustable resilient means for attaching the upper end of the flexible connection to the upper end of the rod, said adjustable resilient means comprising a pair of compression plates, a re-

silient buffer between said plates, a tension screw to the lower end of which the flexible connection is fixed, and a nut screwed on to said tension screw above the top compression plate.

7. In a stamp mill, a gravity actuated stem, a cylinder and piston therein for raising said stem, a hollow rod secured to said piston and extending through both ends of the cylinder, a flexible connection in the hollow rod, means for connecting said flexible connection at its lower end to the stem, said means comprising a two-part bush of dove-tail cross section and a key, resilient means interposed between said latter means and the lower end of the rod, said resilient means comprising a pair of compression plates and a resilient buffer between said plates and adjustable resilient means for attaching the upper end of the flexible connection to the upper end of the rod, said adjustable resilient means comprising a pair of compression plates, a resilient buffer between said plates, a tension screw to the lower end of which the flexible connection is fixed and a nut screwed on to said tension screw above the top compression plate.

8. In a stamp mill, a gravity actuated stem, a cylinder and piston therein for raising said stem, a hollow rod secured to said piston and extending through both ends of the cylinder, a flexible connection in the hollow rod, a member adjustably connected to the stem, means for connecting the flexible connection at its lower end to the member adjustably connected to the stem, resilient means interposed between said latter means and the lower end of the rod, and adjustable resilient means for attaching the upper end of the flexible connection to the upper end of the rod.

9. In a stamp mill, in combination, a pair of gravity actuated stems, a pair of cylinders and a piston in each cylinder for raising said stems, a hollow rod secured to each of said pistons, said rods extending through both ends of their cylinders, a flexible connection in each rod, means for adjustably and resiliently connecting said flexible connections at their lower ends to their respective stems, means for adjustably and resiliently attaching the upper ends of the flexible connections to the upper ends of their respective rods, and means which place the cylinders in communication to maintain an equal pressure in said cylinders above both pistons and thereby assist in the downstroke of the one and at the same time facilitate the upstroke of the other, as set forth.

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

WALTER EDWARD KIMBER.

Witnesses:
CHAS. OVENDALE,
W. S. AVES.