E. P. DARGIN.

STAMP MILL.

APPLICATION FILED JAN. 31, 1910.

985,012.

Patented Feb. 21, 1911.

2 SHEETS—SHEET 1.

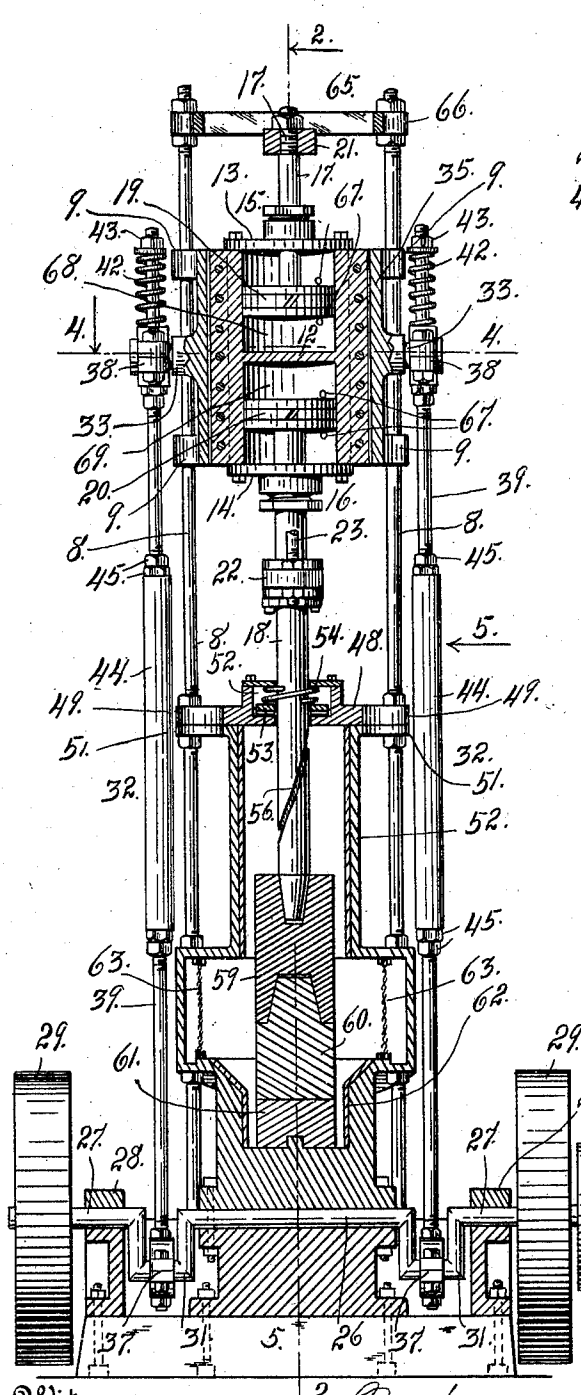

Fig. 1.

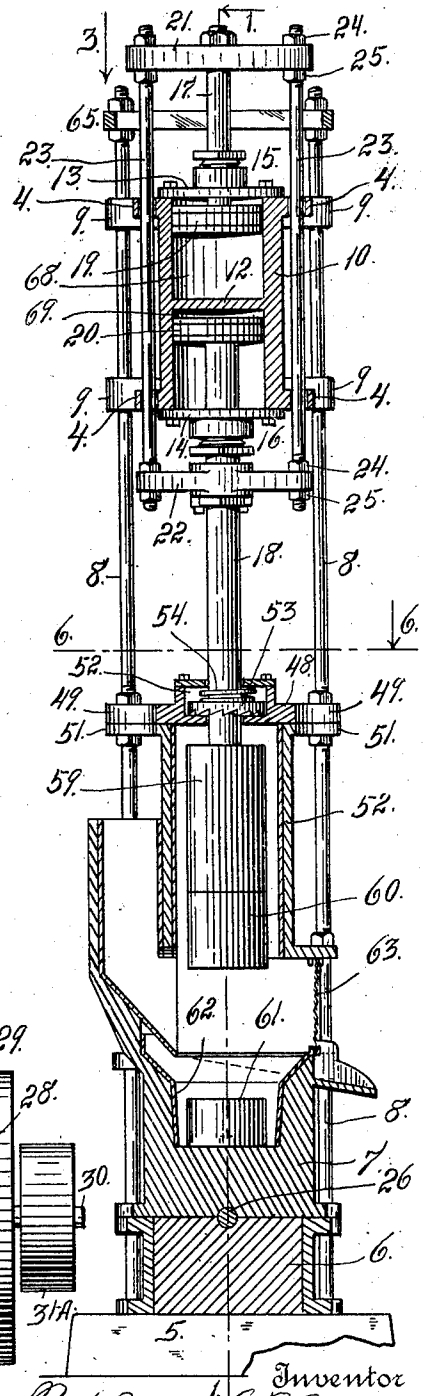

Fig. 2.

Witnesses

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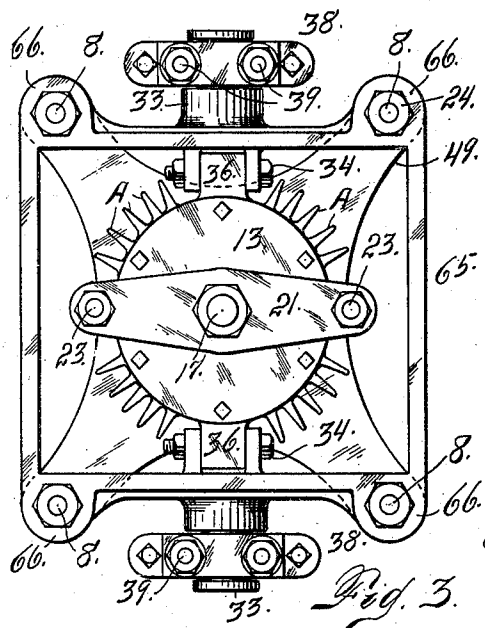

Fig. 3.

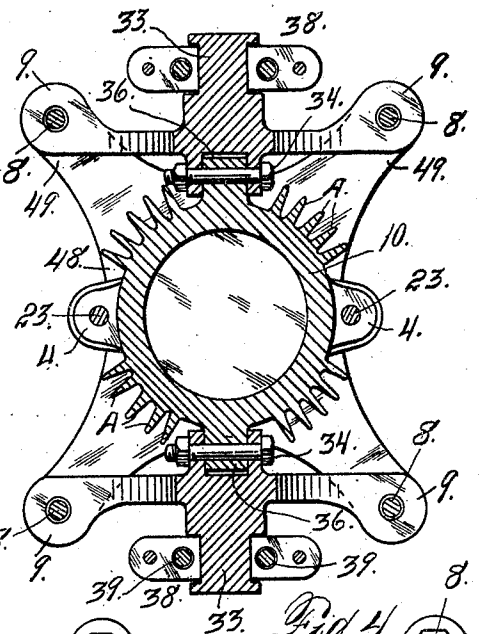

Fig. 4.

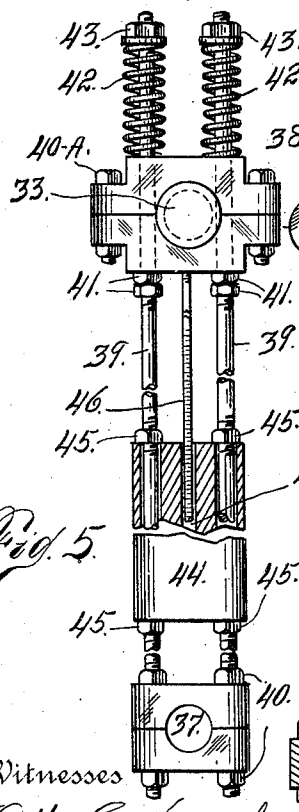

Fig. 5.

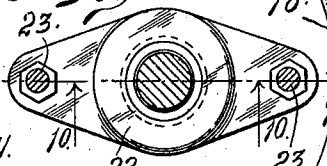

Fig. 8.

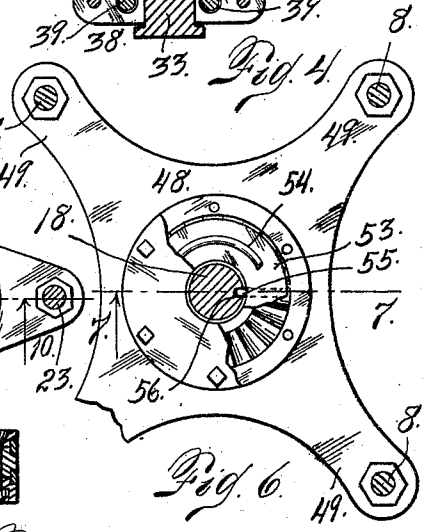

Fig. 6.

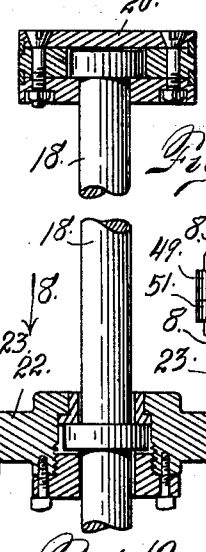

Fig. 9.

Fig. 10.

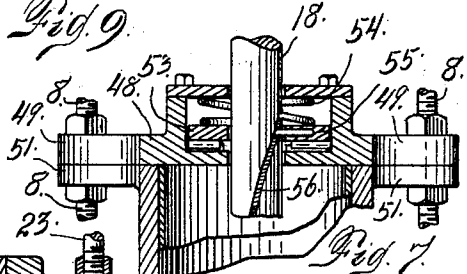

Fig. 7.

Witnesses

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UNITED STATES PATENT OFFICE.

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STAMP-MILL.

985,012. Specification of Letters Patent. Patented Feb. 21, 1911.

Application filed January 31, 1910. Serial No. 541,088.

To all whom it may concern:

Be it known that I, ERNEST P. DARGIN, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Stamp-Mills; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in stamp mills in which the stamp is lifted through the action of a reciprocating cylinder containing two compartments in which are located pistons, one of which is directly connected with the stamp stem, while the other is connected with the said stem by means of rods extending above and below the cylinder and connected by yokes. In other words, the stamp stem may be said to be divided, its two members having pistons at their adjacent extremities and located on opposite sides of a partition centrally located in the cylinder. As the cylinder is moved upwardly, the air is compressed below both pistons and by the time the cylinder has reached its upward limit of movement the compression of the air above the two pistons is such that its expansion acting on the stamp stem through the pistons will cause the stamp to descend with greatly increased force, thus increasing the efficiency of the machine as compared with a stamp whose downward movement results from gravity alone. The cylinder slides vertically on guide rods which are securely connected with the stationary structure of the apparatus. The rods which connect the two members of the stamp stem, pass through openings formed in lugs mounted on the opposite sides of the cylinder, the said lugs forming guides for the stamp stem rods. The reciprocating movement is imparted to the cylinder through the agency of side members connecting cranks, with which the operating shaft is provided, with trunnions formed on opposite sides of the reciprocating cylinder. The crank shaft is journaled in an opening half of which is formed in the top of the mortar block and the other half in the bottom of the mortar box, the block and the box being securely joined by means of the stationary guide rods upon which the aforesaid cylinder slides freely during its reciprocating movement. Provision is made for imparting rotary movement to the stamp and its stem during each reciprocation. This rotary action is accomplished, as illustrated in the drawing, by mechanism arranged to cause the stamp to make a partial rotation during its downward movement.

Having briefly outlined my improved construction I will proceed to describe the same in detail, reference being made to the accompanying drawing, in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a central vertical section taken through a stamp mill equipped with my improvements, the section being taken lengthwise of the operating shaft and on the line 1—1, Fig. 2. Fig. 2 is a section taken at right angles to the section in Fig. 1, or on the line 2—2, Fig. 1. Fig. 3 is a top plan view of the machine looking in the direction of arrow 3, Fig. 2, the parts being shown on a larger scale. Fig. 4 is a horizontal section taken on the line 4—4, Fig. 1, shown on a larger scale. Fig. 5 is a detail side elevation partly in section, of one of the side members employed to connect the operating shaft with the reciprocating cylinder. This view is obtained by looking in the direction of arrow 5, Fig. 1, but shown on a somewhat larger scale. Fig. 6 is a section taken on the line 6—6, Fig. 2, looking downwardly, the mechanism for rotating the stamp being shown on a larger scale. Fig. 7 is a section taken on the line 7—7, Fig. 6. Fig. 8 is a view looking in the direction of arrow 8, Fig. 10, the stamp stem and the connecting rods being shown in section. In this view the lower stamp stem yoke is illustrated. Fig. 9 is a section taken through one of the stamp stem pistons. Fig. 10 is a sectional view of the lower stamp stem yoke, the stem being shown in elevation.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the stationary bed to which is secured the mortar block 6 upon which rests the mortar box 7, the block and box being secured together and connected with the bed by vertically disposed rods 8 which are four in number and pass through openings formed in arms 9 with which the cylinder 10 is provided. This cylinder has an integral centrally lo-

cated partition 12 dividing its chamber into upper and lower compartments which are closed by plates 13 and 14, respectively, which form parts of stuffing boxes 15 and 16 through which the stamp stem members 17 and 18 pass and slide freely during the operation of the machine. Within the upper compartment is located a piston 19 connected with the lower extremity of the upper stamp stem member; while within the lower compartment is a piston 20 connected with the upper extremity of the lower stamp stem member. The two stamp stem members are connected with each other by means of upper and lower yokes 21 and 22 which are respectively mounted on the members 17 and 18 and connected by means of rods 23 which pass through openings formed in the yoke extremities, the rods being secured in place by nuts 24 and 25 located above and below the yokes. Apertured cylinder lugs 4 form guides for these rods.

The operating shaft 26 is journaled in an opening formed partly in the bottom of the mortar box and partly in the top of the mortar block. Its extremities or end members 27 are journaled in bearing blocks 28 while beyond these blocks are fly wheels 29. The shaft is further extended on one side as shown at 30 and to this extremity an operating pulley 31[A] is secured. Between the bearing blocks 28 and the mortar block and mortar box, cranks 31 are formed in the operating shaft and these cranks are connected by means of members 32 with trunnions 33 connected with the opposite sides of the cylinder 10 by means of bolts 34. These trunnions are provided with members 35 extending both above and below the trunnions proper and grooved to receive tongues 36 with which the opposite sides of the cylinder are provided. These trunnion extensions 35 are provided with openings on opposite sides of the groove which register with openings formed in the cylinder tongues 36. A series of bolts 34 is passed through these registering openings, whereby the trunnions are securely attached to the cylinder and at the same time are made detachable to facilitate their removal after becoming worn while the body of the cylinder is preserved.

The lower extremities of the connecting members 32 are provided with boxes 37 in which the cranks 31 are journaled; while their upper extremities are provided with boxes 38 which connect the said members with the trunnions 33. The connecting members 32 are each composed of two rods 39 which are connected with the members of the bearings 37 by nuts 40. The members of the upper boxes 38 are connected with each other by means of bolts 40[A]. These boxes are supported upon the rods 39 by nuts 41 located on the rods below the boxes. These rods extend above the boxes 38 and upon them are mounted spiral springs 42 whose lower extremities engage the upper box members while their upper extremities bear against nuts 43 mounted on the upper extremities of the rods 39. In order to stiffen the rods 39 of each connecting member 32, castings 44 are mounted on the said rods being supported thereon by nuts 45 which are properly regulated so that the connecting members 32 are correspondingly arranged on both sides of the machine. It is important that these members 44 shall be arranged to harmonize as regards their vertical location upon the two connecting members and in order to facilitate their proper adjustment, a graduated gage rod 46 is connected with the upper box 38 and extends downwardly into a central opening 47 formed in each member 44. By virtue of the graduated feature of these gage rods, it becomes practicable to accurately adjust the members 44 to harmonize as to vertical location.

Mounted on the guide rods 8 approximately midway between their extremities is a plate 48 having arms 49 through which the rods 8 pass, the said arms having perforations for the purpose. These arms engage similar arms 51 mounted at the upper extremity of the stamp mill casing 52. This plate 48 is provided with a recess 52 having a toothed bottom, the teeth coöperating with those of a loose disk 53 held in engagement with the teeth of the plate by a spring 54. On this loose toothed disk 52 is located a pin or dog 55 which engages a spiral groove 56 formed in the stamp stem. In the construction shown in the drawing, as the stamp stem moves upwardly, the disk is turned since the teeth of the two members are so arranged as to permit this result. However, during the downward movement, the disk is locked against rotation by virtue of the arrangement of the teeth of the coöperating members and consequently the stamp is given a partial rotary movement during its downward travel.

The lower extremity of the stamp stem is equipped with a body member 59 having a removable shoe 60 adapted to engage a die 61 with which the mortar box is provided. The mortar box is circular interiorly and provided with a lining 62 of sheet steel or other suitable material. Above the mortar box the structure is equipped with screens 63 having a mesh corresponding with the fineness to which the pulverized material is to be reduced before escaping from the mortar. In the bottom of the mortar box the die 61 coöperates with the shoe in performing the pulverizing function.

The guide rods 8 extend above the cylinder and their upper extremities are connected by a rectangular frame member 65 which

is reinforced at each corner, as shown at 66, and perforated to receive the said rods, which are four in number.

Referring again to the reciprocating cylinder 10, it is important that its wall contain ports 67 communicating with its upper and lower compartments, the latter being respectively designated by reference characters 68 and 69. Assuming now that the stamp is at its downward limit of movement as shown in Fig. 1, as the cylinder begins its upward stroke, the stamp stem and the pistons 19 and 20 will not move instantly and consequently the lower ports 67 of both cylinder compartments 68 and 69 will be immediately covered by the pistons and the air which at the beginning of the upward stroke of the cylinder is of normal atmospheric density, will be compressed below both pistons, and this pressure will attain such a degree before the upward movement of the pistons can attain the speed of the cylinder that the expansion of the air will drive the pistons upwardly at a greater speed than the movement of the cylinder, whereby the parts, when the stamp is at its upward limit of movement (see Fig. 2) will occupy approximately the position shown in the last named figure. It is evident that as soon as the pistons pass the upper ports 67 of their respective compartments, the air will be compressed between the upper piston and the upper extremity of the cylinder and between the lower piston and the partition 12 of the cylinder; and by the time the pistons reach their upward limit of movement, the pressure of the air in the upper extremities of the two compartments will be such that its expansion will act to drive the stamp and its attachments downwardly with a force greatly in excess of that which could be obtained by gravity. It is evident that before the stamp has reached its upward limit of movement, the lower ports of the two compartments 68 and 69 will be uncovered, thus allowing the air originally compressed therein to escape or become reduced to normal atmospheric pressure, whereby there is practically no resistance to the downward movement of the stamp incident to the travel of the pistons downwardly within their respective compartments.

By virtue of the fact that the operating shaft 26 of my improved stamp mill is journaled in the base of the structure and directly below the mortar, the power is advantageously applied for stamp operating purposes and the structure is confined within small compass which is an important advantage. Furthermore, the solidity of the structure in which the operating shaft is journaled is an important feature.

In order to facilitate heat radiation, the cylinder 10 is provided exteriorly with relatively deep corrugations or teeth forming a comparatively extensive radiating surface for the dissipation of the heat resulting from the friction due to the reciprocating action of the cylinder and the air compression therein, as heretofore explained. This corrugated or toothed construction is indicated by the reference letter A in Figs. 3 and 4.

Having thus described my invention, what I claim is:

1. In a stamp mill, the combination with a stamp, of a divided stamp stem having pistons at its free extremities, the stamp stem members being connected to move in unison, and a cylinder mounted to reciprocate and having two compartments in which the respective pistons of the stamp stem members are located, the cylinder compartments having ports for the purpose specified, and means for reciprocating the cylinder, whereby the same is actuated, substantially as described.

2. A stamp mill, comprising a stamp, and a divided stem connected with the stamp, the stem members being each equipped with a piston, a cylinder having two compartments in which the respective stamp stem pistons are located, the stamp stem members being connected together outside of the cylinder, and means for reciprocating the cylinder whereby the stamp is operated, substantially as described.

3. A stamp mill, comprising a stamp, a stamp stem composed of two members having their free extremities equipped with pistons, a cylinder mounted to reciprocate and having two compartments in which the pistons of the stamp stem members are located, each cylinder compartment having ports, for the purpose set forth, and means for reciprocating the cylinder, substantially as described.

4. A stamp mill, comprising a stamp, a stamp stem composed of two members terminating at their free extremities in pistons, a cylinder having two compartments in which the pistons of the respective stamp stem members are located, a connection between the two stamp stem members consisting of yokes connected with the respective members above and below the cylinder, and rods connecting the yokes causing the two stamp stem members to move in unison, the cylinder being mounted to reciprocate, stationary guide rods for the cylinder, and means for reciprocating the latter, substantially as described.

5. A stamp mill, comprising a stamp, a stamp stem composed of two members having their free extremities equipped with pistons, a cylinder having two compartments in which the respective pistons of the stamp stem members are located, the cylinder having trunnions on opposite sides, an operat-

ing shaft having cranks, and members located on opposite sides of the apparatus connecting the cranks of the operating shaft with the trunnions of the cylinder for reciprocating the latter, substantially as described.

6. A stamp mill, comprising a stamp, a stamp stem composed of two members whose free extremities terminate in pistons, a cylinder having compartments in which the respective pistons of the stamp stem members are located, a connection between the stamp stem members comprising yokes attached to the said members above and below the cylinder, and rods connecting the said yokes, the cylinder having perforated guide lugs through which the rods pass, trunnions located on opposite sides of the cylinder and having parts extending in both directions from the trunnions and grooved to receive tongues with which the opposite sides of the cylinder are equipped, bolts for connecting the tongues of the cylinder with the grooved members of the trunnions, an operating shaft having cranks, and members connecting the said cranks with the trunnions of the cylinder for operating purposes, substantially as described.

7. A stamp mill, comprising a stamp, a divided stamp stem, pistons with which the stem members are equipped, a cylinder having compartments in which the pistons are located, a rigid connection between the stamp stem members, including rods located outside of the cylinder and passing through guide lugs with which the latter is equipped, the extremities of the guide rods being connected by yokes mounted above and below the cylinder, the cylinder having trunnions on opposite sides, an operating shaft having cranks, members located on opposite sides of the apparatus connecting the cranks of the operating shaft with the cylinder trunnions, the said connecting members each consisting of a pair of rods, and a casting centrally mounted thereon for strengthening purposes, substantially as described.

8. In a stamp mill, the combination with a stamp, of a divided stamp stem, the two stamp stem members terminating in pistons, a cylinder having compartments in which the said pistons are respectively located, a connection between the stamp stem members, including rods located outside of the cylinder, the latter, however, being equipped with perforated guide lugs through which the said rods pass, means for reciprocating the cylinder whereby the stamp is operated, and means for imparting partial rotary movement to the stamp stem during each reciprocation, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ERNEST P. DARGIN.

Witnesses:
JESSIE F. HOBART,
ALBERT O'BRIEN.