

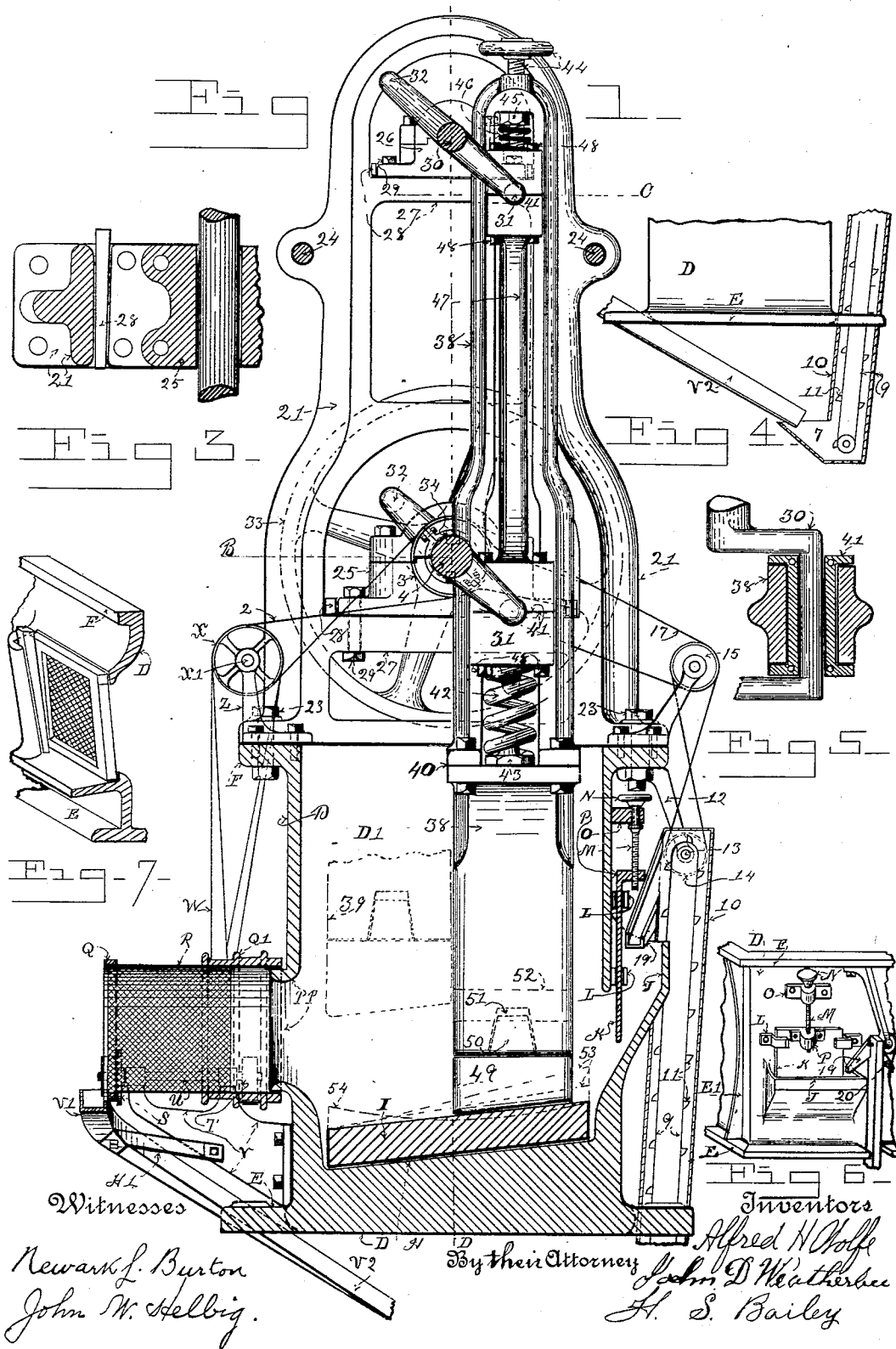
(No Model.)

2 Sheets—Sheet 1.

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ORE STAMPING MILL AND PULVERIZER.

No. 580,029.

Patented Apr. 6, 1897.



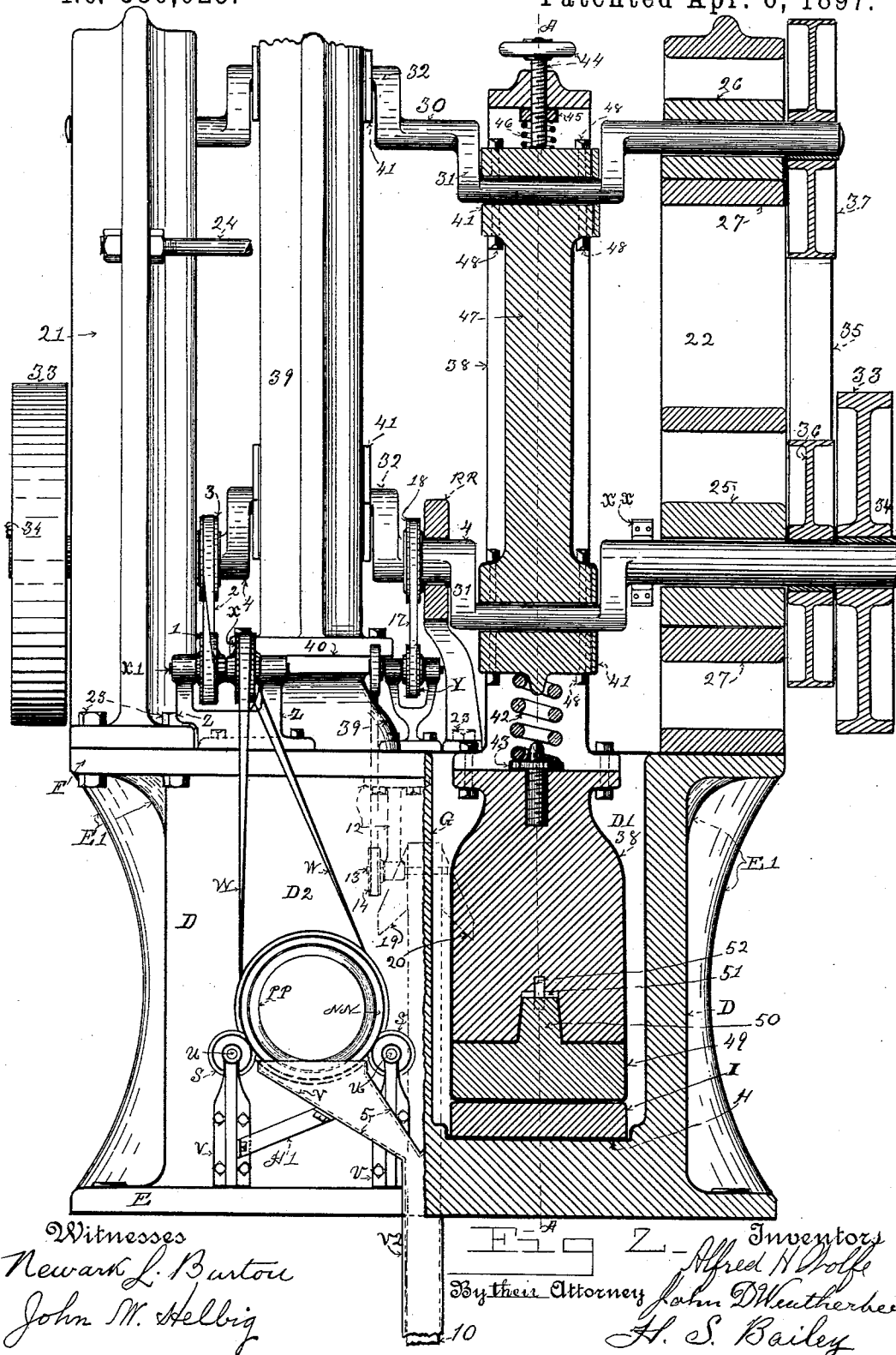
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Witnesses
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UNITED STATES PATENT OFFICE.

ALFRED HERMAN WOLFE AND JOHN DUGLAS WEATHERBEE, OF DENVER,
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ORE STAMPING-MILL AND PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 580,029, dated April 6, 1897.

Application filed December 7, 1895. Renewed September 3, 1896. Serial No. 604,811. (No model.)

To all whom it may concern:

Be it known that we, ALFRED HERMAN WOLFE and JOHN DUGLAS WEATHERBEE, citizens of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Ore Stamping-Mills and Pulverizers; and we 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.

Our invention relates to improvements in ore stamping and pulverizing mills, and the objects of our invention are, first, to provide a mill in which the stamping and grinding stems are given a sliding movement over the dies; second, to provide means for screening the pulp and for continually conveying that portion of the ore which is not stamped fine enough to pass through the meshes of the screen back again to the feed-inlet of the mortar in order that it may be stamped to the required fineness; third, to provide means for adjusting the stems and shoes in relation to the dies; fourth, to provide an adjustable feeding device; fifth, to provide a rotary screening device; sixth, to provide a resilient adjustable connection between the stems and their driving elements. We attain these objects by the mechanism illustrated and described in the accompanying drawings and specification, in which—

Figure 1 represents a side elevation of the stamp-mill in section through the mortar on line A of Fig. 2, but showing the stamping and grinding stem of that section of the mortar in elevation. Fig. 2 represents a front elevation of one half of the mill and a section of the opposite half on line D of Fig. 1. Fig. 3 represents a fragmentary sectional plan view of a part of the shaft-box and one side of frame on line B of Fig. 1 of one of the standards. Fig. 4 represents a continuation, on a smaller scale, of the lower terminal of the ore-chute from the screens and the elevator employed to convey the coarse-stamped ore

discharged from the mortar back to the feed-inlets of the mortar. Fig. 5 represents a fragmentary cross-section of one of the stems, its driving-crank, and its box on line C of Fig. 1. Fig. 6 represents a fragment of the mortar in perspective, showing a perspective view of one of the adjustable feed-gates of the feed-inlet. Fig. 7 represents a fragment of the mortar in perspective, showing the application of a common rectangular screen to it instead of the rotary screen illustrated in Fig. 1.

Similar letters and figures of reference refer to similar parts throughout the several views.

Referring to Fig. 1, D designates the mortar. It has a base-flange E and a top flange F, which are connected by ribs E'. The mortar, as illustrated, is adapted for one set of two stamping and grinding stems, which would be the lowest number of stems used in a machine. Mortars adapted for a battery of sets of stems would be made longer. The mortar is divided into two compartments D' and D² by a transverse partition G, which separates the crushing end of the stems from one another. In the bottom of each compartment is a recess H, in which a die I is loosely seated. This die is constructed of very hard metal, preferably hardened steel. On one side of the mortar there is an ore-feed inlet J, leading into each compartment of the mortar to the dies. A gate K, which is made of boiler-iron, is secured to the side of the mortar (see Fig. 6) by cleats L, which are secured to the mortar by bolts or rivets. The gate is raised or lowered to increase or diminish the feed of the ore by manually turning a screw M, which is provided with a hand-wheel N and is supported by a bracket O. The screw is threaded to a lug P, which is riveted to the gate. On the opposite side of the mortar from the feed-inlets a discharge-outlet for each compartment is made. This discharge-opening *pp* is made circular, and around each opening is arranged a rotary screen which is adapted to receive upon its inner surface the discharge of the mill.

The screens comprise two metal rings Q and Q', with a wire cylindrical screen R secured on their inner surfaces. The rings rest

on rollers or wheels S and T. These rollers are loosely mounted on shafts U, which are journaled in brackets V. These brackets are bolted to the mortar. The ring Q is adapted to receive a belt W, by which it is rotated. This belt connects it with pulley X, which is secured rigidly to a counter-shaft X' at right angles to the axis of the screen. This counter-shaft is supported by a bracket Z, which is bolted to the top flange of the mortar. Beside the pulley X and secured rigidly to the same shaft is a second pulley 1, which is driven by a belt 2 from a split pulley 3, which is clamped to the main driving-shaft 4 of the stamp-mill, from which power is transmitted to the screens through the belts and pulleys just described.

In Fig. 1 the screen shown in section and the chute 5 is the screen of the compartment D' of the mortar shown in section in Fig. 2 and also the chute of that screen. The belt W (shown in Fig. 1) and also the brackets Z and pulleys X and 1 and 3 and the belt 2 are these respective parts illustrated in the elevation part of mill in Fig. 2. The screen of each mortar-compartment D' is driven by a system of pulleys and belts exactly like that above described from a split pulley X X, one-half of which is shown on the shaft 4 in a position similar to that occupied by the pulley 3. By this arrangement each screen is rotated independent of the other, and if when a battery of several sets is used one stem has to be cut out from accident for a time none of the others are interfered with.

The screens discharge the ore not stamped fine enough to pass through their meshes into a chute 5, which is supported by arms H' from the brackets V. The chute is constructed to convey the ore from each screen by independent passages V and V' to a central passage V², placed centrally between the two compartments of the mortar, which conveys it under it to the boot 7 of the belt-elevator 9, which is properly housed and journaled at each end in a framework 10 and is provided with buckets 11. The top of the elevator is supported by a bracket 12, which is bolted to the under side of the top flange of the mortar. This bracket supports the top shaft 13 of the elevator-belt. A pulley 14 is secured to this shaft. It is belted to a pulley 15, which is secured to a counter-shaft 16. The counter-shaft is journaled in a bracket S S, which is bolted to the mortar. A second pulley Y is secured to this shaft 16, which is driven by a belt 17 from a split pulley 18, which is clamped to the driving-shaft 4. The elevator is placed centrally between the feed-inlets of the mortar. From the top of the elevator discharge-spouts 19 and 20 diverge in opposite directions to the feed-inlets and discharge into them, as shown in Fig. 6 and indicated by dotted lines in Fig. 2.

21 and 22 and R R are standards. They are securely bolted by bolts 23 to the top flange of the mortar at its opposite ends. The stand-

ards are connected together near the top by adjustable threaded rods 24, which are adapted to prevent them from springing either away from or toward one another. The standards are adapted to support the detachable boxes 25 and 26 in vertical alinement on transverse portions 27, which have an opening through the standards above them and around the sides and tops of the boxes. Between the sides of the boxes and the sides of opening in the standards in which they are placed wedges 28 are inserted to key the boxes against slipping laterally on their bolts 29. The boxes are positioned on the standards to support the crank-shafts 4 and 30 parallel with one another and in a vertical plane and also centrally over the longitudinal center of the mortar. The cranks 31 and 32 of each shaft are of the same throw and are set to move in unison and to always occupy parallel planes as they rotate, and the two cranks of each shaft are set at diametrical opposite points from the shaft's center. The lower shaft is the driver or main shaft of the mill. It is driven by a belt connecting one of the fly-wheels 33 with some source of power. The fly-wheels are keyed to the shaft 4 by keys 34. The upper shaft is driven by a belt 35 from the pulley 36, which is keyed to main shaft 4 and which connects with the pulley 37, keyed to shaft 30.

38 and 39 designate the stamping and grinding stems of the mill. They are cast or malleable iron or steel castings. They are divided into two parts at 40, where they are securely bolted together. The upper part is in the form of a yoke and contains a slideway, which is arranged to straddle the boxes 41 and pass between flanges on opposite sides of them, as shown in Fig. 5, which is a fragmentary plan view on line C of Fig. 1. The yoke portion is closed at the top, and the slideway extends to below the main shaft's crank-boxes to make a space for the expansive spring 42 between the box-cap and the bottom of the opening in the yoke. The lower end of the spring rests on a stud 43, which is threaded into the stem. The spring rests around a projection formed on the head of the stud. A projection is also cast on the cap of the box. They operate to hold the spring in position. The stud is adapted to adjust the resilience of the spring as the shoes at the lower ends of the stems wear away and the stems settle down. This adjustment is necessary, as the boxes are free to move in the opening in the yokes of the stem and do not move down with the stems as the shoes wear, and as the shoes wear the distance between the bottom of the opening in the yokes and the caps of the lower crank-boxes is increased. At the top of the stems a hand-screw 44 extends through the stem and bears on the cap of the top box. A check-nut 45 is used to lock the screw in its adjusted position, and an expansible spring 46 is placed around the screw between the cap and the nut or stem to relieve the upward thrust of the boxes on their upward throw

against the screw. The base or body of both upper and lower boxes is a continuous bar of metal 47, in which one half of the bearing of each crank is journaled, the bar and caps forming a pitman. The caps are secured to the base-bar by bolts 48, which are inserted through the base-piece into the lower cap.

The shoes 49 are chilled castings or steel-hardened forgings and are detachably secured to the stems by means of a taper projection 50, which fits into a taper-hole 51 in the end of the stems. A keyway 52 is formed transversely through the stems, in which a key is inserted to drive the shoe off. The face or bottom of the shoe and also the face of the die are made straight across both ways, but the face of the die and shoe inclines downward from the feed-inlet side of the mortar toward the discharge, the floor of the mortar being cast on an incline in order that the die can be of even thickness, or nearly so, even if the angle of the die should be changed considerably. The angle of the die should be varied when treating ores of different degrees of hardness to obtain the best results. Thus the dies for some ores could be made of greater angle, as indicated by the dotted lines 53, but for extremely soft rock the face of the dies could be curved concentric with the center of the main shaft, as shown by the dotted line 54. The faces of the shoes must be of the same pitch and form as the dies.

The operation is as follows: Power being transmitted by belt to one of the fly-wheels, the main crank-shaft is rotated in the direction of the arrow 55, and consequently the auxiliary or upper shaft, which is belted to it and is also rigidly connected to it by the crank-boxes. The cranks of the two shafts, being of the same throw and being connected to rotate together in planes parallel to one another, hold the stems always in a vertical position, but move them in a true circle except where they contact with the downward-inclined dies shown in Fig. 1, where they slide down the dies until the cranks lift them on their upward movement. In Fig. 1 but one stem is shown in order to avoid confusion, but the correct position of the opposite stem in relation to the one shown is illustrated by a fragment of its lower end in dotted lines. When the cranks come over on their downward movement, the shoes are impinged against the face of the die or upon the ore that is fed through the feed-inlet upon them, as the velocity given the cranks is much greater than the velocity of the natural drop of the stems would be if falling through a distance equal to the throw of the cranks. A heavy blow is struck. The minute the shoe strikes the ore on the die the stem and shoe commence to slide down the die, being drawn down by the cranks as they rotate. The cranks as they rotate after a shoe strikes a die slide the pitman down in the stems, which compresses the springs 42 until the cranks pass their lower centers, when they move the pit-

man upward against the spring 46 at the top, which receives the first upward shock, and then against the hand-screw 44. Then the stems are lifted from the die and carried up and over. As the stems and shoes slide down the dies the ore is ground and pulverized between them in addition to being stamped by violent impingement of the shoes as they come down on the dies, and as it accumulates it works out and is assisted out by the movement of the stem onto the rotary screens, which are of about forty-mesh. Particles of ore larger than the rest travel through the screens and drop into the chutes and are returned by the elevator to the dies to be further diminished by the shoes, while the screenings are collected and conveyed away or are allowed to drop onto amalgamating-tables, over which they are carried by water.

The arrangement of the cranks at opposite points from one another allows the weight of one stem to balance the weight of the opposite one and enables them to rotate smoothly and without severe shock to the shafts. As the shoes wear, the hand-wheel, its nut, and the lower stud of each stem can be adjusted to keep the boxes and springs in proper operative relation. This stamp-mill is adapted for either wet or dry stamping. When used as a wet stamp, a stream of water is kept flowing into the mortar, but it is better adapted, as illustrated, for dry stamping.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a combined stamp and pulverizing mill the combination with the mortar, of the standards, and crank-shafts journaled therein having a plurality of sets of cranks with each crank of each shaft diametrically opposed to the one adjacent to it, said shafts journaled in said standards in vertical alignment, one above the other and their like-disposed cranks arranged to register in vertical alignment with each other, stamping-stems pivotally connected to a crank of each shaft and extending into the mortar in operative relation thereto, means for rotating the lower shaft, and means for driving the upper shaft from the lower and for rotating its cranks in unison and in planes parallel with the cranks of the lower shaft whereby the said stems are held in vertical position and are reciprocated in the mortar by a rotary movement, substantially as described.

2. The combination with the mortar, the standards, the crank-shafts and the stems, of the pitman adapted to connect the like-disposed cranks of the shafts together, the springs above and below said pitman, the adjustment for the said springs, a hardened removable die in the floor of said mortar having a beveled impact-surface, and a hardened detachable shoe on the lower end of said stems having its impact-surface beveled to register with the die.

3. The combination of the mortar having a

partition dividing it into compartments, the feed-inlet, the adjustable feed-gate, the discharge-outlet, the rotary screens, means for rotating said screen substantially as described, the chute, the elevator, the standards, the main crank-shaft, the fly-wheels, means for rotating said shaft, the auxiliary shaft, the pitman connecting said crank-shafts, the stems having a slideway and adjustable yielding driving connections with said cranks, substantially as described.

4. The combination of the mortar having divided compartments and inclined dies in the floor of said compartments having a beveled or concave surface concentric to the main driving-shaft, the feed-inlet, the adjustable feed-gate therein, the circular discharge-outlet, the rotary screen, the rollers, the belts and pulleys operating said screens, the chute, the elevator, the standards, the crank-shafts, the fly-wheels, means for rotating both shafts in unison, the pitman connecting the cranks of the shafts together and slidably confined in a slideway in the stems, a resilient adjustable connection between said pitman and said stem at each end, an adjustable abutment at the upper end of said pitman and detachable hardened shoes on the ends of said stems registering with the surface of the dies.

5. The combination with the mortar and the standards, of two crank-shafts journaled one over the other in vertical alinement having two oppositely-arranged cranks on each shaft of equal throw and adapted to register vertically with one another in horizontal planes radiating from each shaft's respective center, fly-wheels on the main shaft, means for rotating said main shaft, belt connection between the two shafts whereby the upper or auxiliary shaft is rotated by the main shaft, stamp-stems journaled to the same disposed

and alined cranks of both shafts in suitable boxes adapted to slide vertically in said stems, resilient abutments above and below said journal-boxes secured to said stems, and means for adjusting the upward movement of said boxes relatively to the stamping-surfaces of the stems, substantially as described.

6. The combination in a stamp-mill of a mortar having a feed-inlet and discharge-outlet, a hardened die therein inclined downward from the feed side toward the discharge-outlet side of said mortar, standards secured to said mortar, two cranks arranged vertically one above the other in boxes detachably secured to said standards, a set of two or a plurality of sets of two oppositely-arranged cranks on each shaft in vertical alinement, fly-wheels on the lower or main shaft adapted for belt connection with a source of power, belt connection between said lower and upper shafts whereby they are rotated together in unison, stamp-stems in said mortar, a slideway in said stems, a pitman journaled to a like-disposed crank of each shaft and adapted to move freely vertically in said slideway, an expansive spring at each end of said slideway in engagement with said pitman, means for adjusting the springs and for holding them in place, an adjustable abutment for the upper end of said pitman and a detachable hardened shoe at the lower end of said stems having its impact-surface registering with the inclination of the die, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

ALFRED HERMAN WOLFE.
JOHN DUGLAS WEATHERBEE.

Witnesses:

NEWARK L. BURTON,
JOHN W. HELBIG.