No. 891,497. PATENTED JUNE 23, 1908.

F. I. MATTHEWS.

STAMP MILL.

APPLICATION FILED JULY 19, 1907.

2 SHEETS—SHEET 1.

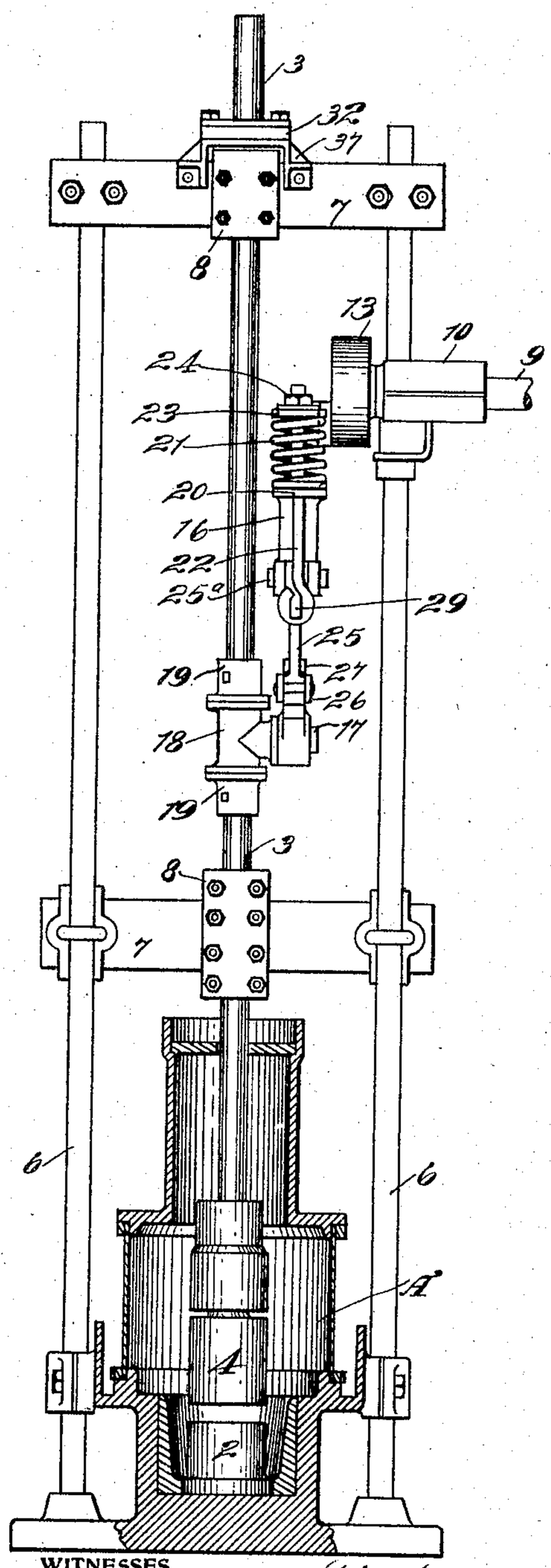

Fig. 1.

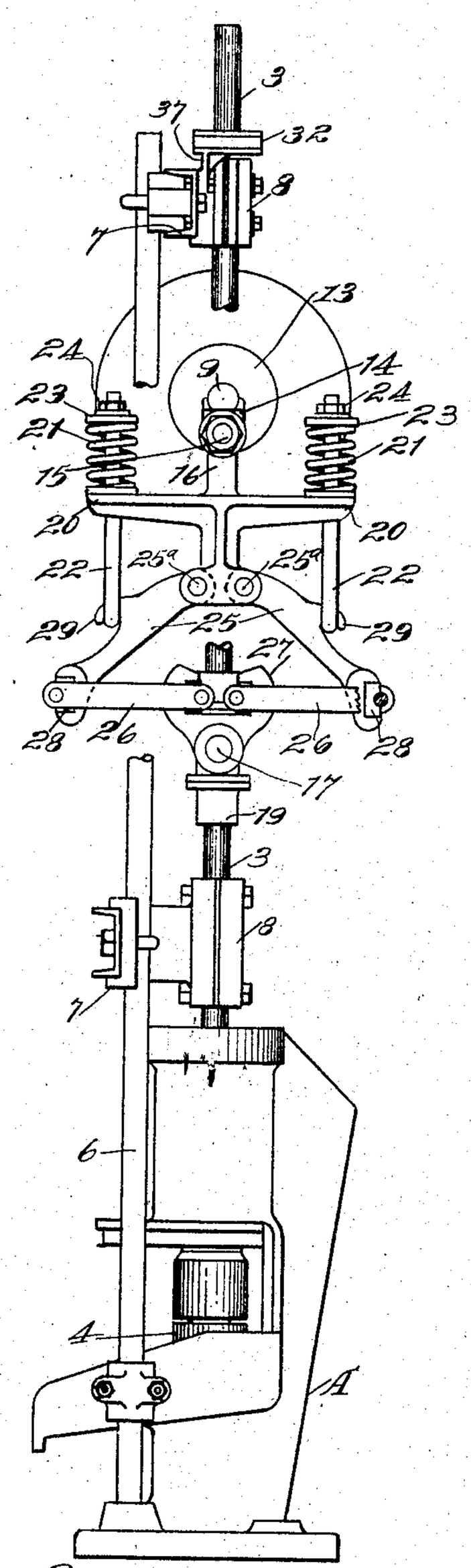

Fig. 2.

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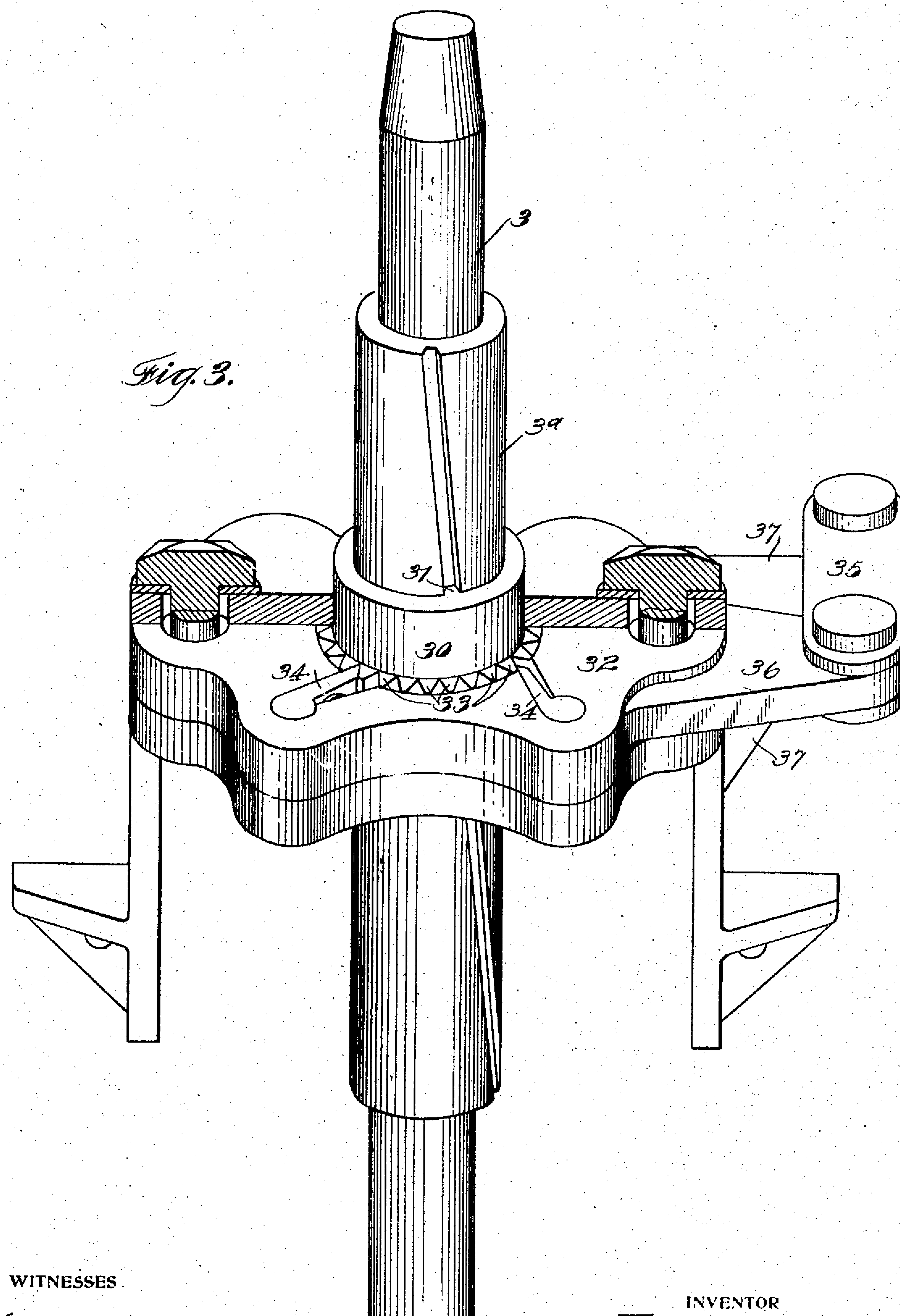
Fig. 3.



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FRANCIS I. MATTHEWS, OF OAKLAND, CALIFORNIA, ASSIGNOR TO OAKLAND STAMP MILL CO., OF OAKLAND, CALIFORNIA, A CORPORATION.

TAMP-MILL.

No. 891,497. Specification of Letters Patent. Patented June 23, 1908.

Application filed July 19, 1907. Serial No. 384,601.

To all whom it may concern:

Be it known that I, FRANCIS I. MATTHEWS, citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented new and useful Improvements in Stamp-Mills, of which the following is a specification.

My invention relates to improvements in mills of that class which is designed for crushing ore and the like.

It consists in the combination of parts and in details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a front elevation and partial section of my apparatus. Fig. 2 is a similar elevation taken at right angles with Fig. 1. Fig. 3 is a perspective view of the stamp turning devices.

It is the object of my invention to provide an apparatus in which the maximum of crushing power may be applied, with the minimum of bulk and weight, so that such an apparatus may be profitably employed in places where the larger and more bulky apparatus could not be used.

A is a mortar of any suitable description, having dies 2 fixed in the lower part. The stamp stems 3 carrying the stamp heads and shoes 4 are guided and vertically reciprocable, so as to crush the ore which is fed into the mortar through a suitable inlet, and the ore thus fed passes between the shoes and dies. When the material is sufficiently pulverized it passes out through screens upon the side of the mortar, and is received in conveyers which deliver it to other parts of the apparatus.

The apparatus as here illustrated consists of a single unit of the above description, having standards or equivalent supports 6. Timbers 7 are fixed transversely to these standards at suitable distances apart, and are provided with boxes 8, through which the stamp stems are guided and slidable.

9 is a horizontal shaft journaled in boxes, as at 10, and by means of a belt pulley or equivalent attachment power is transmitted to revolve the shaft. This shaft has a crank which in the present case is in the form of a radially slotted disk 13 fixed to the end of the shaft, and the block 14 is slidable in the disk and carries a crank pin 15 to which the upper end of the yoke or pitman 16 is attached. The stroke of the pitman is adjustable by moving the crank pin to or from the center of revolution. It will be manifest that any suitable or desired form of crank or reciprocating device may be employed at this point, but the above device allows for ready adjustment of the length of the stroke.

The lower end of the pitman is connected with a wrist-pin 17, by mechanism to be hereafter described. This wrist-pin is fixed to and projects from the sleeve 18, through which the stamp stem 3 passes loosely. Collars 19 are fixed to the stamp stem above and below the sleeve 18, and these collars retain the sleeve in a fixed position with relation to the stamp stem, the latter being freely turnable within the sleeve by means to be hereafter described. The connection of the pin 17 with this sleeve, and the action of the crank and pitman serve to reciprocate the stamp stem, and to cause the stamp to rise and fall at any desired rate of speed. In order to connect the pitman with the wrist-pin, and to apply a force much greater than the normal weight and momentum of the stamps would produce, I have shown the following connection: The pitman 16 carries a table or arms 20, which are here shown as projecting upon each side, and upon these arms are mounted the stiff springs 21. Holes are made through the table or arms 20 in line with the axis of the spring, and rods 22 extend through these holes from the top of the spring down to a point of attachment below, to be hereafter described. Upon the top of each spring 21 is a plate 23, and the rods 22 passing through these plates and being screw-threaded at the upper end, receive suitable nuts 24 which may be screwed down so as to compress the springs 21 upon the plate 20 with any degree of force.

25 are suitably curved arms having their inner ends hinged or pivoted to the pitman 16 by pins, as shown at 25[a]. These arms are here shown as curving downwardly, and their lower ends divergent from the central line. These lower ends are provided with journal boxes 28, as shown. Links 26 have their outer ends mounted in these journal boxes, and the inner ends similarly connected with the head or part 27, which connects the wrist-pin 17, and through which connection is made with the stamp stem 3. The pivots at the inner and outer ends of the links 26, thus supported in boxes, will allow an oscillating movement of the pins with the least possible wear. Hard wood boxes are very

suitable for such conditions, but any material that may be found suitable may be employed at these points. These radial rods or links 26 thus connect the lower ends of the arms 25 with the stamp stem and prevent their being separated about their fulcrum points 25[a] by the tension of the springs.

The lower ends of the spring tension rods 22 are engaged with boxes or sockets on the arms 25, as shown at 29, so that they exert an upward and downward pull upon the arms 25 by reason of the tension of the springs 21 which, as before described, may be made as great as desired; and this upward pull is resisted by the radial links 26 connecting with the lower ends of the arms 25.

The operation of this portion of the apparatus will then be as follows: Power being applied to rotate the crank shaft, the crank will act to reciprocate the pitman 16, and through the arms 25 and links 26 an elastic movement is transmitted to the wrist-pin 17 and stamp stem 3. The inertia caused by the weight of the moving parts will act to compress the springs 21 when the crank moves upwardly, this compression being produced by the pull upon the pitman 16 through its connection with the stamp stem, and this pulling down upon the radial links 26, acts correspondingly to pull the arms 25 downward, turning about their pivots 25[a]; and this movement acting through the rods 22 upon the springs 23 compresses the springs. On the downward movement of the crank and pitman the reverse action takes place, the springs being relieved and allowing the links or arms 26 to first arrive at their normal position in a substantially straight line; then the further downward movement of the crank and the inertia of the stamp causes the inner ends of the links to be temporarily moved upwardly, and the same compression of the springs takes place. The tension of the springs thus alternately applied after the inertia of the stamp has been overcome will impel the stamp with increased power, and with a stroke considerably in excess of that of the crank. Thus with a crank movement of five inches, a movement of the stamp stem of substantially eight inches may be effected by reason of the alternate up and down vibrations of the links 26, and the springs being compressed at each reciprocation will exercise their power to act upon the stamp. The result of these actions is first to enable the stamp to be run at a high rate of speed, and by reason of the alternate compression and expansion of the springs an exceedingly heavy blow may be struck, far in excess of any blow that can be struck by mere gravitation of a falling stamp, while the rate of speed with which the blows can be struck is only limited by the strength of the springs and the ability of the moving parts to resist the strain upon them.

For the purpose of revolving the stamp stem during its reciprocation so as to continually present new surfaces of the stamp as it falls, I have shown a spiral groove and an engaging tongue, one being formed in the stem 3, or preferably on a sleeve 3[a] carried by the stem, and the other in an inclosing collar 30, through which the stem and sleeve are slidable. In the present case the spiral groove is shown formed upon the sleeve which is fixed to the stem, and the engaging tongue 31 in the collar.

The collar is freely turnable in a box or support 32 carried upon the upper guide 7, as shown, and the collar has projecting teeth 33 surrounding it, which are engaged by spring pressed pawls 34 carried in the sockets in box 32, so that their inner ends are constantly pressed against the ratchet teeth 33. While one of said pawls may be operative, I prefer to use a plurality of such pawls located in such positions that they engage the teeth of the ratchet approximately equidistant from each other, and so disposed that one opposed pair of the pawls will be engaged with the teeth of the ratchet, while the other pair are intermediate of the holding positions and ordinarily moving over the teeth of the ratchet. Four such pawls will produce this result. Consequently, the movements of the stem will alternately engage one opposed pair of the pawls and then the other. The reciprocation of the stamp stem through the collar and the action of the spiral groove will turn the collar freely in one direction, preferably while the stamp is rising, thus allowing the stamp to rise directly with no undue friction; and when the stamp falls, the action of the spiral will cause the pawls and the teeth to engage so that the stamp stem will be rotated by reason of the collar being temporarily locked.

There is always considerable wear in the guide boxes on account of the continuous reciprocation of the stem through them, and in order to prevent the parts above described from getting out of alinement, I have shown a connection consisting of a link 35 connecting a lug 36 on the casing with a support 37 of the frame. The bolts by which the part 32 is connected with the frame pass through holes which are sufficiently enlarged to allow a free movement of the member or casing 32 with relation to the frame, and the connection causes these movements to be made in unison with those of the stamp stem, so that if the latter should get out of alinement with the frame or move irregularly, due to wear on the boxes, or for other causes, the relation of the collar, the stamp stem and the turning devices will be properly maintained.

As the stamp stems are of more value and more difficult to replace than most of the other parts, it is desirable to give them as long life as possible. Consequently, I fit each

end of the stamp stem to receive the stamp head or the spiral groove sleeve 3^a; thus when the stamp stem is first used, one end being tapered in the usual manner is locked with the stamp head which carries the stamp at the lower end, while the upper end has the sleeve 3^a secured to it.

If at any time it is desirable to reverse the stem, it is only necessary to disengage it from the stamp head and the sleeve, reverse it, and re-connect the ends with the relative parts.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In a stamp mill, the combination of a stamp stem, a sleeve within which the stem is turnable, said sleeve having a projecting wrist-pin, means on the stamp stem for retaining the sleeve in a fixed position relative to the stem, a crank and a connecting rod or pitman through which motion is transmitted to reciprocate the stamp stem, hinged arms connected with the pitman, a table carried by said pitman, springs mounted upon the table, tension rods connecting the springs with the hinged arms, and means connecting the outer ends of the hinged arms with the wrist-pin.

2. In a stamp mill, a stamp stem, a wrist-pin projecting to one side therefrom and so connected as to move in unison therewith, a pitman, said pitman having a horizontal portion or table, springs supported upon said table, divergent arms fulcrumed to the pitman below the table, links having their outer ends connected with the divergent arms and means connecting the inner ends of the links with the wrist-pin, and tension rods having their lower ends connected with the divergent arms and the upper ends adjustably connected with the springs.

3. In a stamp mill, means to impart a reciprocating motion to the stamp, said means consisting of a crank and a pitman driven thereby, divergent arms fulcrumed to the pitman, links connecting with the outer ends of the arms and means connecting the inner ends of the links with the stamp stem, a horizontal portion or table carried by the pitman, springs mounted upon said table, and tension rods connecting the springs with the divergent arms.

4. A reciprocating connection for stamp stems and the like, said connection consisting of a crank and a pitman driven thereby, divergent arms pivoted to the pitman, a wrist-pin and means connecting the same with the stamp stem, links, pivots by which the outer ends of the links are connected with the divergent arms, and the inner ends with the wrist-pin connection, respectively, springs mounted upon the pitman, and tension rod connections between the springs and the divergent arms.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANCIS I. MATTHEWS.

Witnesses:
S. H. Nourse,
Frederick E. Maynard.