

(No Model.)

2 Sheets—Sheet 1.

G. M. GROSS.  
ORE STAMPING MILL.

No. 538,961.

Patented May 7, 1895.

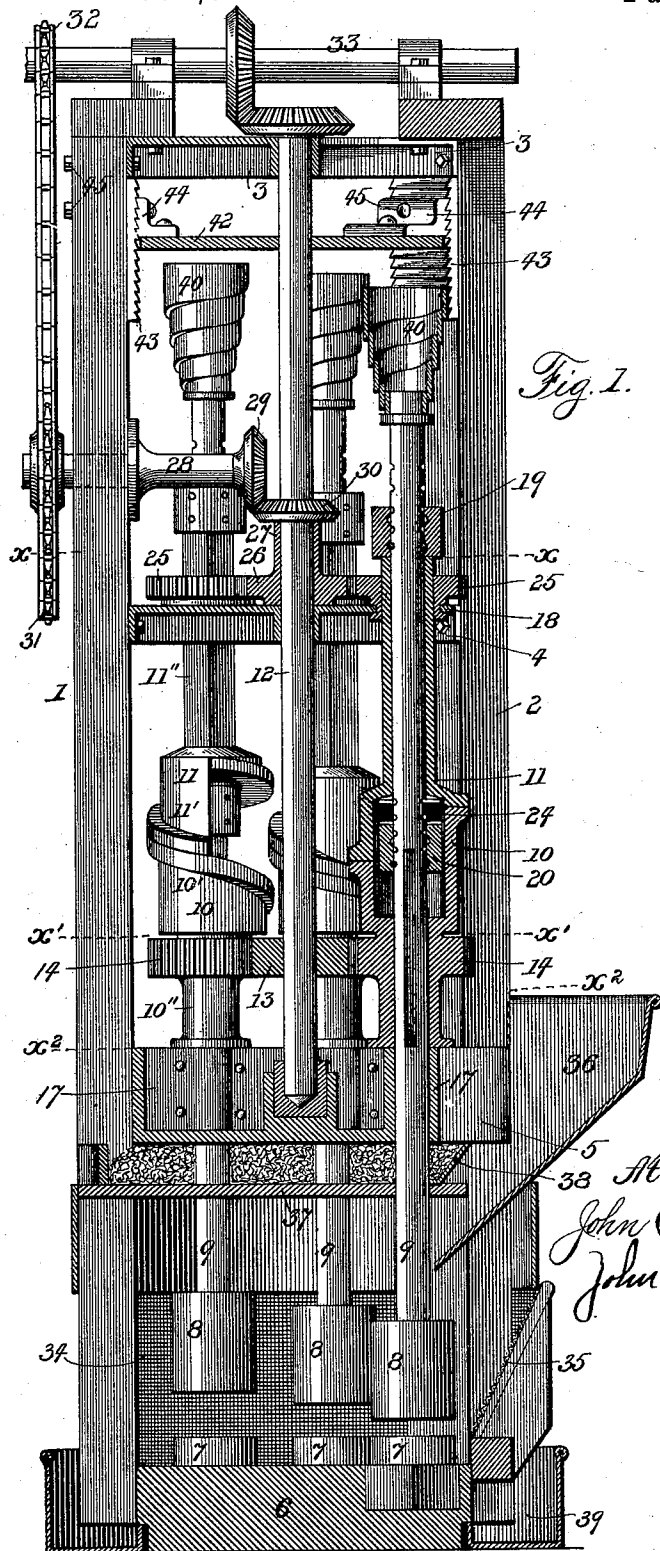


Fig. 1.

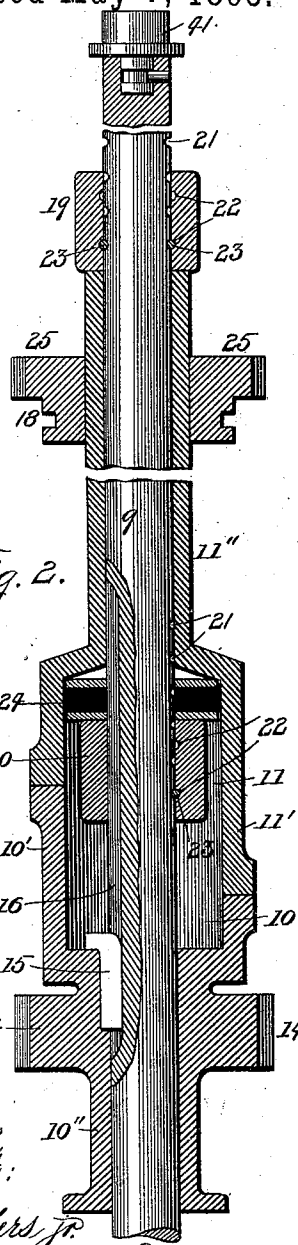


Fig. 2.

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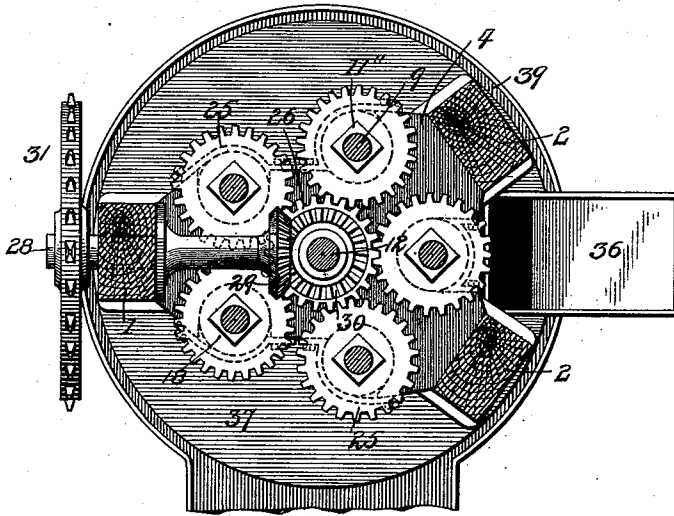


Fig. 3.

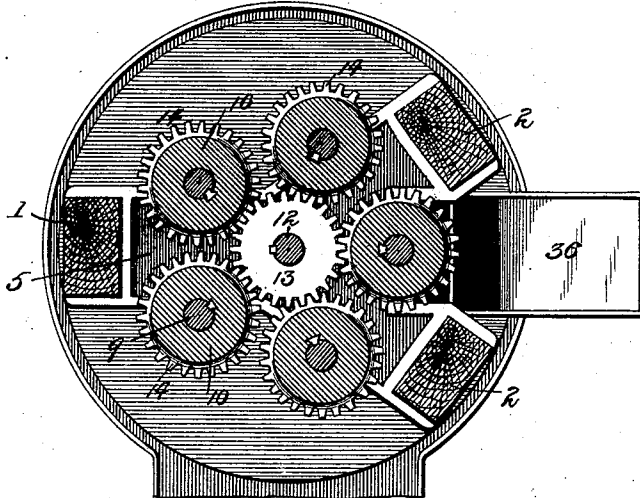


Fig. 4.

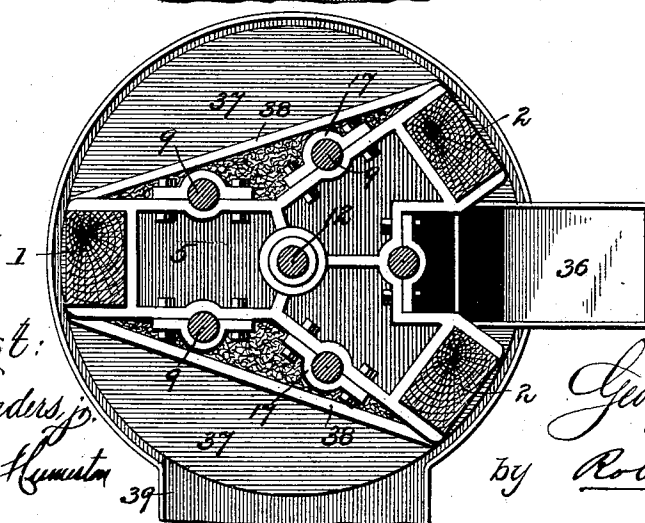


Fig. 5.

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# UNITED STATES PATENT OFFICE.

GEORGE M. GROSS, OF CHICAGO, ILLINOIS.

## ORE-STAMPING MILL.

SPECIFICATION forming part of Letters Patent No. 538,961, dated May 7, 1895.

Application filed August 27, 1894. Serial No. 521,456. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE M. GROSS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Ore-Stamping Mills; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to that class of stamp mills in which the stamp head is lifted by a cam, and falls by gravity alone, or gravity assisted by the elasticity of a spring, to crush the ore or other material contained within the mortar box; and also to that particular type of stamp batteries in which a number of stamp heads are arranged in a concentric cluster, and drop in a successive manner during the crushing or stamping operation; and the present improvements have for their objects to provide a simple and efficient means for attaining a positive and differential revolution in the same direction of the concentrically arranged lifting cam and cam tappet of a stamp mill, to effect a continuous change of the face of the stamp head with relation to the face of its stationary anvil block or die, and so attain an even and uniform wearing away of the stamp head, &c., during continued use; also to provide a simple and durable means for increasing or diminishing at will, the force or impact of the stamp heads in their down stroke, and in which such downwardly impelling means for the stamp heads, is capable of adjustment to compensate for wear upon the stamp head by continued use; and finally to provide a simple and durable general construction and arrangement of a cluster stamp battery embodying the features of the usual stamping action, supplemented by a grinding action due to a positive rotation of the stamp heads; a yielding connection between the stamp stems and their operating cam mechanisms, that takes up in a great measure the jar upon the operating mechanism, due to the rebound from the downward impact of the stamp head, and which at the same time tends to force the face of the stamp head downwardly in a yielding manner during the grinding or mulling action of the same

upon the ore under treatment; a simple and durable adjustment of the stamp stems, downwardly with relation to their operating cam mechanisms, to compensate for wear of the stamp head by continued use; and an effective and substantial attachment of the individual stamp heads and operating cam mechanisms in proper position, in a manner that admits of the ready and convenient detachment and replacement of any one stamp head and its individual operating cam mechanism, in making repairs, without disturbing in the least, the functions or actions of the remaining stamps. I attain such objects by the construction and arrangement of parts illustrated in the accompanying drawings, in which—

Figure 1 is a vertical sectional elevation of a cluster-stamp mill or battery constructed in accordance with the present invention; Fig. 2, an enlarged detail sectional elevation of the lifting-cam, cam-tappet, and stamp-head stem; Figs. 3, 4, and 5, horizontal sections at lines  $x x$ ,  $x' x'$ ,  $x^2 x^2$ , respectively, Fig. 1.

Similar numerals of reference indicate like parts in the several views.

As represented in the drawings the main supporting frame of the mill consists of a single upright or post 1, at one side, and a pair of uprights or posts 2, at the other side, which are firmly connected together by the horizontal tie members, 3, 4 and 5, that have a bifurcated or Y formation, and which are preferably made in the form of castings, and provided with suitable flanges by means of which they are securely bolted to the posts 1 and 2, to constitute a rigid and substantial supporting frame for the mill mechanism.

At the bottom the posts 1 and 2, are bolted to the sides of the base or bottom casting 6, that receives and holds the stationary stamp dies 7, and constitutes the bottom of the mortar box.

8, are the stamp heads having the usual guide stems 9, by which they are guided in their vertical reciprocating movement.

10, are the lifting cams, and 11, the guide stem tappets.

In the present invention a series of individual stamps, lift-cams, and tappets, are arranged in a circular cluster concentric with

the main driving shaft 12, that carries a spur gear 13, which meshes with and drives the series of spur gears 14, that are attached to and form a portion of the lifting cams 10.

- 5 Each individual stamp lifting cam 10, is of a cylindrical form, arranged to surround its individual stamp stem 9, and connected thereto by means of a key or spline 15, secured in the axial bore of the cam and adapted to have  
10 movement in the vertically extending keyway or groove 16, in the stamp stem, so as to admit of the independent vertical reciprocation of such stem, and yet impart the same rotary motion to such stem and its stamp head, that  
15 is received by such cam from the main driving shaft; and the cam portion proper of the cam is in the form of an upwardly extending annular rim 10', that is cut away spirally to form the spirally inclined lifting face of  
20 the cam, that preferably extends around the whole circular surface of the rim to constitute a single lift cam, so that with each complete revolution of the said cam a single stroke will be imparted to the stamp head.
- 25 In order that the portion of the stamp stem in which is formed the keyway 16, will not at any time pass out of the cam bore and enter the guide box immediately underneath, the body of the cam is extended downward a sufficient distance in the form of a hub extension 10'', either separate or integral, that rests  
30 directly above the aforesaid guide box 17, and on the top surface of the lower horizontal tie member 5, to support the aforesaid cam in operative position.

- 35 Each individual cam tappet 11, of the stamp stems will preferably be of a counterpart construction with the lifting cams 10, and will consist of a body portion surrounding the  
40 stamp stem 9, and a downwardly extending rim portion 11', that is cut away spirally, so as to have a uniform bearing upon the adjacent spiral lifting face of the lifting cam 10.

- Each tappet has an upward extension 11'',  
45 the outer periphery of which is of a non circular shape, preferably square as shown, that is adapted to have an independent endwise vertical movement in the guide box 18, on the intermediate horizontal tie member 4, but held  
50 from any rotary movement independent of such box. Such box 18 may be made a fixture on the member 4, but it is preferable to make it revoluble, as will hereinafter more fully appear.

- 55 Each stamp stem 9, is free to revolve independently of its cam tappet, but independent vertical endwise movement of the two is prevented by means of the top and bottom confining collars 19 and 20, secured to the  
60 stamp stem 9 above and below the cam tappet as shown. In the present improved construction these collars are made adjustable on the stamp stem, so that said stamp stem can be let down through the cams, to  
65 compensate for wear of the stamp head in continued use. In this, 21, is a vertical series

of notches at each side of the stamp stem, placed, say one inch apart, and 22, shows vertical pairs of counterpart notches or orifices through the collars 19 and 20, placed one and  
70 one half inches apart, so that when one pair of the orifices 22, is in line with a pair of the notches 21, in the stamp stem, to receive the pair of connecting pins or gibs 23, the other pair of the orifices 22 will be one half  
75 an inch away from the next adjacent pair of the notches 21, of the stamp stem. By this means successive adjustments of one half inch each can be readily effected to compensate for wear of the stamp head by continued  
80 use; and it is quite evident that a greater or less adjustment may be effected by a nearer or farther apart arrangement of the series of notches and orifices 21 and 22.

24, is a spring cushion interposed between  
85 the lower collar 20, and the under surface of the body of the tappet 11, so as to admit of a limited independent vertical movement between the parts in use, and constitute a yielding connection at such point, that will absorb  
90 in a great measure the jar upon the cams and other operating parts, due to the rebound from the downward impact of the stamp head, and which at the same time acts to force the face of the stamp head downward in a yielding  
95 manner, during the grinding or mulling action of the same upon the ore under treatment.

The cluster of stamps will be usually five in number, and the same will be supported  
100 and guided in proper position by the guide boxes 17 and 18, on the vertical and outer faces of the intermediate and lower horizontal tie members 4 and 5 of the main frame, and as so arranged permits of the ready removal  
105 and replacement of any one stamp and its individual connections, in making repairs, without disturbing in the least the action or function of the remaining stamps.

In my preferred arrangement as illustrated  
110 in Figs. 1, 2 and 3, of the drawings, I arrange the guide boxes 18 of the cam tappet to have differentially slower motion than the operating cams and stamps, and in the same direction, so as to effect a change at each stroke of  
115 the stamp heads, of the face of such heads with relation to the face of their dies, by giving an advancing part turn to such heads. In this construction the guide boxes are journaled to revolve in the intermediate horizontal  
120 tie piece 4, and are provided with concentric spur gears 25, that form a cluster around and mesh with a central driving spur gear 26, that is arranged upon a hollow shaft 27, surrounding the main vertical shaft 12.

125 Motion is communicated to the hollow shaft 27, in any suitable manner preferably by means of a horizontal countershaft 28, carrying at its inner end a bevel gear 29, meshing with a bevel gear 30 on the hollow shaft, and  
130 at its outer end provided with a chain or other pulley 31, connected to and driven by a cor-

responding chain or other pinion 32, on the main driving shaft 33 of the machine and which will usually be arranged in suitable boxes at the top of the mill, and connected to the vertical driving shaft 12 by means of a pair of bevel gears as shown. The driving shaft 12, is supported at its lower end in a step bearing at the central portion of the lower horizontal tie member 5, as shown.

The relative diameters of the chain wheel 31, and the chain pinion 32, will regulate the slower revolutions of the cam tappet with relation to the revolution of the operating cam, and will afford a ready means for changing such relative rotations, by substituting chain wheels and pinions of the required relative diameters.

The mortar box 34 surrounding and inclosing the circular cluster of stamp heads will be of any usual construction, having its sides provided with the usual detachable pulp screens 35 and its top with the usual feed hopper 36. 37, is a top plate that may form preferably the top or cover of the mortar box, and which plate in the present invention is arranged a short distance below the horizontal lower tie member 5, and provided with upturned marginal flanges 38, so as to form a waste receiving recess or chamber that is packed with cotton or other waste. This waste surrounds the cluster of stamp stems, and constitutes a wiper therefor, so as to prevent the passage of any oil or lubricant down from the guide boxes into the mortar box.

39, is an annular pulp collecting trough at the bottom of the mill or battery for receiving the pulp discharged through the screens of the mortar box in the operation of the stamp battery.

The cluster stamp battery so far described, constitutes a very efficient gravity drop battery, and in larger sizes will usually be so constructed, but in the smaller sizes of stamp batteries, such for instance as prospecting mills, in which great lightness combined with crushing capacity is a very desirable feature, springs for accelerating the down stroke of the stamp heads, will be used. In the present invention these springs 40, usually of a conical shaped volute form will be attached by means of the turning heads 41, to the upper ends of the stamp stems 9, so that the turning movement of said stems may take place independently of such springs.

42, is a vertically adjustable head arranged above the springs 40, and in the path thereof, so that as said springs are raised in the upward movement of the stamp stems, the springs will be first brought in contact with such heads 42, and then compressed against the same, so that as the stamp stems begin to descend, the force stored up in such springs will be brought into action to impart an accelerated downward stroke to such stems and the stamp heads at the lower end of the same.

To vary the amount of compression, as well

as to compensate for the descent of the stamp stem, &c., due to gradual wear of the stamp head in use, the spring abutment head 42, is made vertically adjustable upon the main uprights or posts 1 and 2, by means of ratchet bars 43, secured thereto, ratchet dogs 44, on the top of the abutment head 42, and clamping bolts 45, that hold the ratchet dogs 44, and ratchet bars 43, at any desired adjustment to which they may be set.

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

1. A stamp mill comprising in combination a reciprocating stem carrying a stamp head, a cam tappet secured to the stamp stem, an actuating cam having an annularly arranged cam face and adapted to revolve around the axis of the stamp stem, independently of the reciprocation of the same, and means for imparting a differential rotation to the cam and cam tappet in the same direction, substantially as set forth.

2. A stamp mill, comprising in combination, a reciprocating stem carrying a stamp head, a cam tappet secured to the stamp stem, an actuating cam, having an annularly arranged cam face and adapted to revolve around the axis of the stamp stem, independently of the reciprocation of the same, and means for imparting a differential and continuous rotation to the cam and cam tappet in the same direction, substantially as set forth.

3. A stamp mill, comprising in combination, a reciprocating stem carrying a stamp head, a cam tappet secured to the stamp stem, an actuating cam, having an annularly arranged cam face and adapted to revolve around the axis of the stamp stem, independently of the reciprocation of the same, and means for imparting a differential and continuous rotation to the cam and cam tappet in the same direction, the adjacent faces of the cam and cam tappet being made of a counterpart formation, substantially as set forth.

4. A cluster stamp mill, comprising in combination, a series of dies, a series of reciprocating stamp heads and stems, a series of cam tappets secured to stamp stems, a series of actuating cams having annularly arranged cam faces, and adapted to revolve around the axes of the stamp stems independently of the reciprocation of the same, and means for imparting a differential and continuous rotation to the cams and cam tappets in the same direction, the same consisting of the centrally arranged driving shafts 12 and 27, each carrying a spur gear 13, 26, the duplicate cluster of spur gears 14, 25, attached to the cam and cam tappet and means for imparting differential rotation to the shafts 12 and 27, substantially as set forth.

5. A cluster stamp mill, comprising in combination, a series of dies, a series of reciprocating stamp heads and stems, a series of actuating cams having annularly arranged cam

faces, and adapted to revolve around the axes of the stamp stems independently of the reciprocation of the same, and means for imparting a differential and continuous rotation to the cams and cam tappets in the same direction, the same consisting of the centrally arranged driving shafts, 12 and 27, each carrying a spur gear 13, 26, the duplicate cluster of spur gears 14, 25, attached to the cam and cam tappet, the countershafts 28 and 33, pair of bevel gears 29 and 30, and pulleys 31 and 32, substantially as set forth.

6. A cluster stamp mill, comprising in combination, a series of dies, a series of reciprocating stamp heads and stems, a series of cam tappets secured to the stamp stems, a series of actuating cams connected to the stamp stems by a key and keyway so as to admit of the independent reciprocation of said stamp stems, a series of springs carried by the stamp stems, and an adjustable abutment plate arranged in the path of said springs, substantially as set forth.

7. A cluster stamp mill, comprising in combination, a series of dies, a series of reciprocating stamp heads and stems, a series of cam tappets secured to the stamp stems, a series of actuating cams connected to the stamp stems by a key and keyway so as to admit of the independent reciprocation of said stamp stems, a series of springs carried by the stamp stems, and an abutment plate arranged in the path of said springs, and made adjustable by means of the ratchet bars, 43, ratchet dogs 44 and clamping bolts 45, substantially as set forth.

8. A stamp mill, comprising in combination, a die, a reciprocating stem carrying a stamp head, a cam tappet secured to the stamp stem, a lifting cam for the same, a spring carried by the stamp stem, and an adjustable abutment plate arranged in the path of the spring, substantially as set forth.

9. A stamp mill, comprising in combination, a die, a reciprocating stem carrying a stamp head, a cam tappet secured to the stamp stem, a lifting cam for the same, a spring carried by the stamp stem, and an abutment plate arranged in the path of the spring and made adjustable by means of the ratchet bars 43, ratchet dogs 44 and clamping bolts 45, substantially as set forth.

10. A stamp mill, comprising in combination, a die, a reciprocating stamp head and stem, an operating cam, and a cam tappet secured to the stamp stem by collars 19 and 20, made vertically adjustable by means of the pin 23, the series of notches 21, in the stem, and the vertical pair of orifices 22, in the collars 19 and 20, the orifices 22, being farther apart than the notches 21, substantially as set forth.

11. A stamp mill, comprising in combination, a die, a reciprocating stamp head and stem, an operating cam, a cam tappet secured in place by means of collars 19 and 20, and a

cushion 24, interposed between the collar 20, and the under side of the cam tappet, substantially as set forth.

12. A stamp mill, comprising in combination, a die, reciprocating stamp head and stem, an operating cam, a cam tappet secured in place by means of collars 19 and 20, a cushion 24, interposed between the collar 20, and the under side of the cam tappet, the stamp stem being made vertically adjustable with relation to the cam tappet by means of the pin 23, the series of notches 21, in the stem, and the vertical pair of orifices 22, in the collars 19 and 20, the orifices 22, being farther apart than the notches 21, substantially as set forth.

13. A cluster stamp mill, comprising in combination, a centrally arranged driving shaft, a cluster of stamp heads and stems arranged concentrically therewith, a series of lifting cams and tappets individual to the series of stamps, and means for imparting motion from the central driving shaft to the series of cams, substantially as set forth.

14. A cluster stamp mill, comprising in combination, a centrally arranged driving shaft, a cluster of stamp heads and stems arranged concentrically therewith, a series of lifting cams and tappets individual to the series of stamps, and means for imparting motion from the central driving shaft to the series of cams, the same consisting of a single driving spur gear on the central driving shaft, and individual gears on the lifting cams, that mesh with and are driven by the single driving gear, substantially as set forth.

15. A cluster stamp mill, comprising in combination, a main supporting frame, a centrally arranged driving shaft, a cluster of stamp heads and stems arranged concentrically therewith, a series of cam tappets secured to the stamp stems, means whereby such tappets are held from rotating with the stems, a series of lifting cams connected to the stamp stems by a key and keyway, so as to admit of the independent reciprocation of such stems, and means for imparting motion from the central driving shaft to the series of cams, substantially as set forth.

16. A cluster stamp mill, comprising in combination, a main supporting frame, a centrally arranged driving shaft, a cluster of stamp heads and stems arranged concentrically therewith, a series of cam tappets secured to the stamp stems, means whereby such tappets are held from rotating with the stems, a series of lifting cams connected to the stamp stems by a key and keyway, so as to admit of the independent reciprocation of such stems, and means for imparting motion from the central driving shaft to the series of cams, the same consisting of a single driving spur gear on the central driving shaft, and individual gears on the lifting cams that mesh with and are driven by the single driving gear, substantially as set forth.

17. A cluster stamp mill, comprising in com-

bination, a main frame having Y shaped horizontal tie members, a cluster of stamp heads and stems, supported in guide boxes on the exterior vertical faces of such members, so as to admit of ready removal and replacement of any one stamp, a series of lifting cams and tappets individual to the series of stamps, and means for imparting motion to the cams, substantially as set forth.

18. A cluster stamp mill, comprising in combination, a main frame having Y shaped horizontal tie members, a cluster of stamp heads and stems, supported in guide boxes on the exterior vertical faces of such members, a series of lifting cams and tappets individual to the series of stamps, means for imparting motion to the same, and a waste chamber, formed immediately beneath the lower horizontal tie member 5, to prevent the downward passage of the lubricant, substantially as set forth.

19. A cluster stamp mill, comprising in combination, a main supporting frame, a centrally arranged driving shaft, a cluster of stamp heads and stems arranged concentrically therewith, a series of cam tappets secured to the stamp stems by means of collars 19 and 20, means whereby such tappets are held from rotating with the stamp stems, cushions 24, interposed between the collars 20 and the under side of the tappets, a series of lifting cams connected to the stamp stems by a key and key way so as to admit of the independent

reciprocation of such stems, and means for imparting motion from the central driving shaft to the series of cams, substantially as set forth.

20. A cluster stamp mill, comprising in combination, a main supporting frame, a centrally arranged driving shaft, a cluster of stamp heads and stems arranged concentrically therewith, a series of cam tappets secured to the stamp stems by means of collars 19 and 20, and made adjustable with relation to each other by means of the pin 23, the series of notches 21 in the stems, and vertical pairs of orifices 22 in the collars 19 and 20, the orifices 22 being farther apart than the notches 21, means whereby such tappets are held from rotating with the stamp stems, cushions 24, interposed between the collars 25 and the under side of the tappets; a series of lifting cams connected to the stamp stems by a key and keyway so as to admit of independent reciprocation of such stems, and means for imparting motion from the central driving shaft to the series of cams, substantially as set forth.

In testimony whereof witness my hand this 17th day of August, 1894.

GEORGE M. GROSS.

In presence of—

ROBERT BURNS,  
JOHN ENDERS, Jr.