

April 9, 1935.

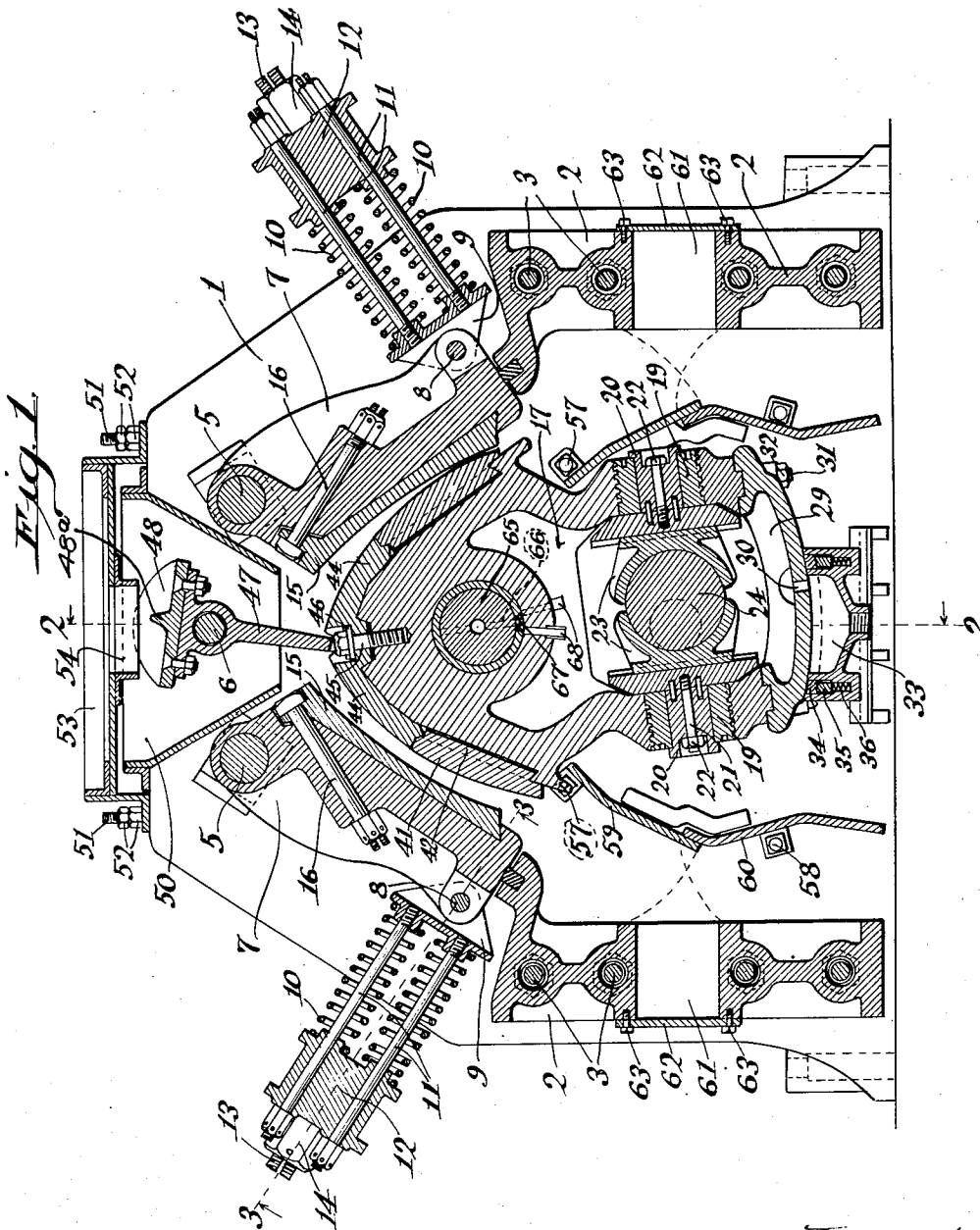
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1,997,214

ROCK CRUSHER

Filed Nov. 27, 1929

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2

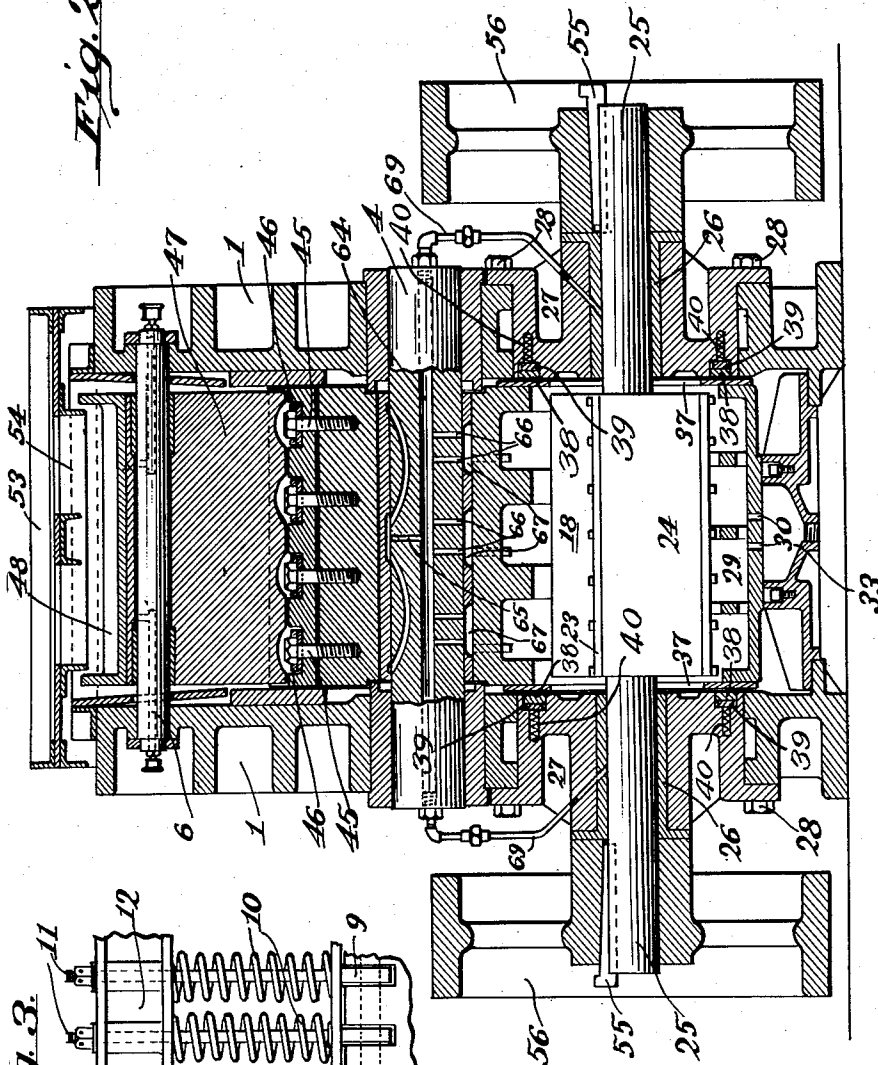
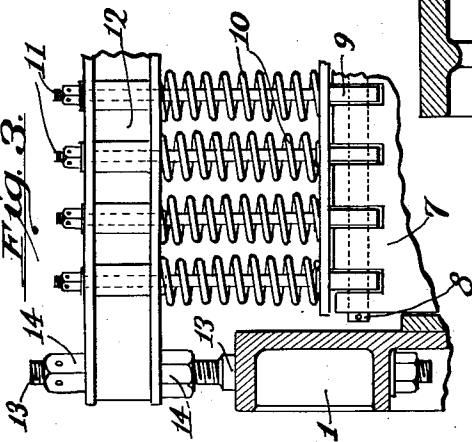


Fig. 3.



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UNITED STATES PATENT OFFICE

1,997,214

ROCK CRUSHER

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Application November 27, 1929, Serial No. 410,094

20 Claims. (Cl. 83—53)

My invention relates to a rock crusher and among the objects of my invention are, to provide a relatively simple, inexpensive, strong and durable compact machine that is especially designed for crushing rock and which machine has a relatively high degree of efficiency, capable of being operated with minimum power consumption, capable of being readily adjusted in operation so as to crush rock or other products to the desired size or sizes, further, to provide a crusher of the character referred to wherein adjustment to take up wear of the principal moving parts may be readily accomplished without dismantling the crusher and further, to provide means for permitting the passage of uncrushable foreign objects that may be accidentally delivered into the crusher, without producing undue strains or breakage of the crusher or the operating parts thereof. A further object of my invention is, to arrange and fulcrum the pestle between the yielding crushing jaws so that portions of the crushing faces of the pestle on opposite sides of the axis thereof simultaneously engage and crush the material passing through the machine, thereby producing a balanced action or application of crushing forces while the crusher is in operation.

With the foregoing and other objects in view, my invention consists in certain novel features of construction and arrangement of parts that will hereinafter be more fully described and claimed and illustrated in the accompanying drawings, in which:

Fig. 1 is a vertical section taken on a longitudinal plane through the center of a crusher embodying the principles of my invention.

Fig. 2 is a vertical cross section taken approximately on the line 2—2 of Fig. 1.

Fig. 3 is a detail section taken approximately on the line 3—3 of Fig. 1.

Referring by numerals to the accompanying drawings which illustrate a practical embodiment of my invention, 1, 1 designate vertically disposed upright side frames that are supported laterally by end frames 2 and rod bolts 3. Seated in the central portions of the side frames are the ends of a large rod or shaft 4 that supports the pestle of the crusher and seated in the upper portions of the frames which are the ends of rods 5 that serve as supports for the jaws of the crusher.

Positioned between and slightly above the rods 5 is a rod 6, the ends of which are seated in the upper portions of frames 1 and this rod serves as a support for a material feed regulating bar and distributing plate.

Journaled upon and supported by the rods 5 are crushing jaws 7, the lower ends of which are pivotally connected by means of pins or bolts 8 to cushion plates 9 upon which rest the lower ends of expansion coil springs 10 which latter are retained in position by bolts 11 and the upper portions of said bolts are arranged for sliding movement through beams 12, the ends of which are adjustably arranged on bolts 13 that project upwardly and outwardly from side frames 1.

Arranged on bolts 13, above and below the ends of the beams 12, are adjusting nuts 14. By manipulation of the nuts 14, the positions of beams 12 may be adjusted on the bolts 13 and by adjustment of nuts on the outer ends of bolts 11 the tension of the springs 10 may be adjusted and as a result the positions of the jaws 17 may be very accurately regulated and their resistance to outward movement readily controlled.

The spring cushions which are readily adjustable, yieldingly resist the outward and upward swinging movements of the lower portions of the jaws 7.

Detachably mounted on the inner faces of the jaws 7 are liners 15, preferably of hardened metal and which are removably retained in position on said jaws by bolts 16.

Oscillatively mounted on shaft or rod 4 is a crushing pestle 17 provided in its lower portion with a chamber and fitted to the inner faces of the walls of this pestle within the chamber therein are bearing plates 18 and which latter are detachably secured to the inner ends of screw blocks 19 by means of clamp pins 20, the latter being secured to bearing plates 18 by studs 21 on the outer ends of which are located nuts 22.

Mounted for vertical sliding movement on the inner faces of the bearing plates 18 are sliding bearing blocks 23 and arranged between the latter is an eccentric 24 that is formed integral with shaft 25, the ends of the latter being journaled in bushings 26 and the latter being seated in bearing blocks 27 that are secured to the lower portions of side frames 1 by bolts or screws 28.

Detachably secured on the underside of pestle 17 is an oil pan 29 provided with drain openings 30 and this drain pan is secured to the pestle by means of studs 31 and nuts 32.

Arranged between the lower portions of side frames is an oil receptacle or sump 33, the upper edges of which are engaged by the convex underface of oil pan 29 and arranged in the upper face of the wall of this sump is a

groove that is occupied by a suitable packing 34 beneath which is arranged a packing ring 35 and the latter being yieldingly supported by compression springs 36. The construction just described prevents oil leakage and forms a seal against the entry of dust.

Secured on the side faces of the pestle 17 are oil and dust seal plates 37 that slidably engage packings 38, that are supported by packing rings 39 and behind which latter are arranged compression springs 40. The packing members just described are seated in the inner portions of the bearing blocks 27 and they provide simple and efficient means for preventing entry of dust and leakage of oil.

The crushing faces of the pestle are provided with replaceable lower liners or wear plates 41 that are secured to the pestle by means of dovetail tongues 42 that fit into dovetail grooves 43 in the pestle and these lower plates are located against upward movement by upper liners or wear plates 44 that are secured to the top of the pestle by cap screws 45 and lock washers 46.

Oscillatively mounted on rod or pin 6 is a feed regulating bar 47, the lower end of which occupies a groove in the upper portion of wear plate 44 and detachably mounted on top of the bar 47 is a material distributing plate 48 that is secured by means of bolts 49. Formed integral with or fixed to the top of plate 48 and extending transversely thereof, is a centrally arranged rib 48^a, which is of material assistance in effecting an equal distribution of the material after it is fed to the crusher.

Suspended between the upper ends of the jaws 7 and surrounding the distributing plate 48 and the upper portion of regulating bar 47 is a feed hopper 50 and supported by and secured to the tops of the side frames by studs 51 and nuts 52 is a platform 53 provided with short depending spouts 54 for controlling the distribution of the material that discharges upon plate 48.

Mounted on the ends of shaft 25 and secured thereto by gib keys 55 are fly wheel pulleys 56 and which latter may be driven from any convenient motive power for effecting operation of the crusher.

Arranged between the side frames and rotatably mounted on bolts 57 and 58 are baffle plates 59 and 60 that function to deflect the crushed material away from the lower portion of the pestle and the parts associated therewith.

Formed in the end frames 2 are ports or openings 61 that are normally covered by removable plates 62 and which latter are secured by means of cap screws 63.

By locking the baffle plates 59 and 60 in open positions by tightening bolts 57 and 58 and removing cover plates 62, wrenches may be readily inserted through the openings 62 for the purpose of manipulating nuts 22 and the adjusting screw blocks 19 so as to take up any wear that may occur between the parts 18, 23 and 24.

Lubrication of the operating parts of the crusher is accomplished by introducing lubricating oil into an axial oil duct 64 that is formed in rod or shaft 4 and this oil under pressure passes from duct 64 through radial ducts 65 and 66 and thence through slots 67 that are formed in the bushing for shaft or rod 4 and from the slots 67 the oil discharges through ducts 68, thereby flooding the sliding blocks 23 and eccentric 24.

After passing downwardly over the parts 18,

23 and 24, the oil discharges into the oil pan 30 and from the latter it passes into sump 33 through the opening 30 and from said sump it may be taken to a suitable receptacle and returned to duct 64 in any suitable manner, preferably by means of an independently operated oil pump or a pump operated from shaft 25.

From the ends of duct 64, suitable oil conduits 69 lead to the bearings for shaft 25.

During operation of my improved crusher, power applied to the fly wheel pulleys 56 rotates shaft 25 and the eccentric 24 positioned between the bearing blocks 23, oscillates the pestle upon its axis, (the rod or shaft 4) and during this oscillation of the pestle, bearing blocks 23 slide vertically upon the blocks 18.

As the pestle is thus oscillated, the feed regulating bar and distributing plate 48 will be oscillated upon pin or shaft 6, as a result of the engagement of the lower end of bar 47 with the upper end of the pestle.

The movement of the upper portion of the pestle between the jaws 7 produces a combined crushing and rolling motion or a rocking action of the crushing faces about the shaft or pin 4 and the material that is delivered by the distributing plate 47 first on one side and then on the other, passes through the spaces between the crushing faces of the pestle and the jaws and said material is rolled by the crushing faces of the pestle against the jaws, so as to expose the material to crushing action along the lines of least resistance, viz: the cleavage contacts of the material.

The crushing faces of the pestle are formed slightly convex from their upper to their lower edges and the adjacent faces of the jaws are slightly concave from their upper to their lower ends and, as a result of this construction and the oscillatory movement of the pestle, the crushing advancing action of the pestle toward the fixed jaws is approximately tangential to the curvature of the crushing faces of the pestle.

A particularly advantageous feature of my invention is the location of the axis for the pestle in a horizontal plane that is practically coincident with the horizontal plane occupied by the lower portions of the crushing faces of the jaws 17 and in a plane slightly above the plane occupied by the lower ends of the crushing faces on the plates 41 that form the lower portions of the crushing faces on the pestle.

As a result of my improved construction of pestle and the arrangement of the axis therefore, each crushing face of the pestle comprises two zones, the lower one of which cooperates with the lower face of the adjacent body in the crushing and production of comparatively fine material and the upper zone effects an initial crushing of the material passing through the crusher and thereby produces a relatively coarse crushed material that is subsequently crushed to finer material as it passes over the lower zones or between the plates 41 and the lower portions of the plates 15.

Further, the location of the axis of the pestle in a plane practically below the crushing zones enables the pestle to effect the final crushing action by an upward movement of the crushing faces of plates 41 relative to the lower portions of the crushing faces of plates 15 and the initial or relatively coarse crushing is effected by a downward swinging movement of the crushing faces of plates 44 relative to the upper portions of the crushing faces of plates 15.

Further, the provision of two crushing zones on each side of the upper portion of the pestle brings about simultaneous crushing action on opposite sides of the pestle for as one of the plates

14 moves upwardly toward the lower portion of the adjacent plate 15, the plate 44 on the opposite side of the pestle moves downwardly with respect to the upper portion of the adjacent plate 15, thereby producing a balanced action or equalization of the application of the crushing strains.

The outward swinging movement of the lower portions of the jaws 7 is yieldingly resisted by the spring cushions that are supported by the beams 12 and, as a result of this construction an additional vibration during actual crushing action is produced and such vibration tends to shatter the material under pressure of the pestle.

Thus it will be seen that I have provided a rock crusher that is relatively simple in construction, inexpensive of manufacture, capable of being readily adjusted so as to compensate for wear and which crusher may be economically operated and is very effective in performing the function for which it is intended.

It will be understood that minor changes in the size, form and construction of the various parts of my improved rock crusher may be made and substituted for those herein shown and described without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. In a crusher, a pair of side frames, a pair of spring resisting jaws arranged between said side frames, said jaws being mounted for independent swinging movement toward and away from each other, a pestle arranged for oscillatory movement between and below said jaws, an eccentric for actuating said pestle, adjustable bearings for said eccentric, a material distributing plate mounted for oscillating movement above and actuated by said pestle, end frames arranged between the side frames and said end frames having openings to permit access to said eccentric bearings.

2. In a crusher, a frame, a pair of crushing jaws arranged in the upper portion of said frame, said jaws being mounted for independent swinging movement toward and away from each other, an oscillatory pestle arranged for operation between and below said jaws, a material distributing plate mounted for oscillating movement above and actuated by said pestle, beams adjustably mounted on the upper portion of the frame, cushion plates pivotally connected to the lower ends of said jaws, bolts seated in said cushion plates and arranged for sliding movement through said beams, adjusting nuts located on the outer ends of said bolts and bearing on said beams and expansion springs arranged on said bolts between said cushion plates and beams.

3. In a crusher, a pair of oppositely arranged crushing jaws mounted for independent swinging movement toward and away from each other, a pestle mounted for operation between and below said jaws, the upper portion of which pestle is provided with crushing faces that oppose the faces of the crushing jaws, means for actuating said pestle so as to simultaneously move the lower portion of the crushing face on one side of said pestle upwardly relatively to the adjacent crushing jaw and the upper portion of the crushing face on the opposite side of the pestle downwardly with respect to the adjacent crushing jaw and means arranged for oscillatory movement above and ac-

tuated by said pestle for delivering material alternately between the crushing faces of the pestle and opposed crushing jaws.

4. In a crusher, a pair of oppositely arranged inclined spring resisted crushing jaws mounted for independent swinging movement toward and away from each other, a pestle having its upper portion positioned between the crushing faces of said crushing jaws, said upper portion of the pestle being provided with crushing faces that oppose the crushing faces of said jaws, means for actuating said pestle so as to cause portions of its oppositely arranged crushing faces to simultaneously move toward the adjacent portions of the crushing faces of said jaws and means arranged for oscillatory movement above and actuated by said pestle for delivering material alternately between the crushing faces of the pestle and opposed crushing jaws.

5. In a crusher, a pair of crushing jaws, a pestle arranged for oscillatory movement between and below said jaws, the lower portion of which pestle is provided with a chamber, an oil pan detachably secured to the lower end of the pestle and closing the chamber therein, said oil pan being provided with a discharge opening, an oil sump arranged beneath said oil pan and bearing against the under face thereof and means for producing oil and dust tight joints between said sump and pan.

6. In a crusher, a pair of oppositely arranged crushing jaws mounted for independent swinging movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for yieldingly resisting their outward swinging movement, a pestle mounted for oscillatory movement between said jaws the axis for said pestle being disposed in a plane below the main portions of the crushing faces of said pestle and jaws and a material distributing feed plate mounted for rocking movement between the upper portions of the crushing jaws and having engagement with the upper portion of the pestle, whereby said oscillating feed plate is rocked simultaneously with and in the opposite direction from the rocking movement of said pestle.

7. In a crusher, a pair of oppositely arranged crushing jaws mounted for independent swinging movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for yieldingly resisting their outward swinging movement, a pestle mounted for oscillatory movement between said jaws and means mounted for oscillatory movement in the crusher above and actuated by said pestle for controlling the delivery of material into the spaces between said jaws and pestle.

8. In a crusher, a pair of oppositely arranged jaws arranged for independent swinging movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for yieldingly resisting their outward swinging movement, an oscillating pestle having crushing faces arranged between said jaws, the axis of said pestle being disposed below the main portions of said crushing faces, means for imparting oscillatory movement to said pestle, a hopper arranged between the jaws of the pestle and a material distributing plate mounted for oscillatory movement in said hopper, which plate is oscillated by said pestle.

9. In a crusher, a pair of oppositely arranged jaws mounted for independent swinging movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for resisting their outward swinging

movement, an oscillatory pestle having crushing faces arranged between said jaws, the axis of which pestle is disposed below the crushing faces on said jaws, an eccentric for imparting oscillatory movement to said pestle, adjustable bearings between said pestle and eccentric, a hopper arranged between said jaws above said pestle and a material distributing plate mounted for oscillatory movement in said hopper and oscillated by said pestle.

10 10. In a crusher, a pair of oppositely arranged jaws mounted for independent swinging movement toward and away from each other, an oscillatory pestle having crushing faces disposed between said jaws, the axis of which pestle is disposed below the crushing faces on said jaws, spring cushions pivotally connected to the lower portions of said jaws for yieldingly resisting their outward swinging movement, an eccentric for imparting oscillatory movement to said pestle, adjustable bearings between said pestle and eccentric, a hopper between said jaws above said pestle and a material distributing plate mounted for oscillatory movement in said hopper and oscillated by said pestle.

11. In a crusher, a pair of oppositely disposed crushing jaws arranged for independent swinging movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for yieldingly resisting their outward swinging movement, a pestle mounted for oscillatory movement and having a portion disposed between said jaws, which portion is provided with a pair of oppositely arranged convex crushing faces, the axis of which pestle is disposed between the main portions of the crushing faces on said pestle and jaws, a hopper arranged between said jaws above said pestle and a material distributing plate mounted for oscillatory movement in said hopper and oscillated by said pestle.

12. In a crusher, a pair of oppositely arranged jaws mounted for independent swinging movement toward and away from each other, said jaws being provided on their inner portions with curved crushing faces, spring cushions pivotally connected to the lower portions of said jaws for yieldingly resisting their outward swinging movement, a pestle arranged for oscillatory movement and having a portion disposed between said jaws, said portion being provided with oppositely arranged curved faces that cooperate with the curved faces of the jaws in crushing material that passes between said jaws and pestle, the axis of which pestle is disposed between the main portions of the crushing faces on said pestle and jaws, a hopper arranged between said jaws above said pestle and a material distributing plate mounted for oscillatory movement in said hopper and oscillated by said pestle.

13. In a crusher, a pair of oppositely arranged jaws mounted for independent swinging movement toward and away from each other, said jaws being provided on their inner portions with curved crushing faces, spring cushions pivotally connected to the lower portions of said jaws for yieldingly resisting their outward swinging movement, a pestle arranged for oscillatory movement and having a portion disposed between said jaws, said portion being provided with oppositely arranged curved faces that cooperate with the curved faces of the jaws in crushing material that passes between said jaws and pestle and means mounted for oscillating movement above and actuated by said pestle for controlling the discharge

of material into the spaces between the jaws and pestle.

14. In a crusher, a pair of oppositely disposed inclined crushing jaws arranged for independent swinging movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for resisting their outward swinging movement, a pestle mounted for oscillatory movement between said jaws, a material distributing plate mounted for oscillatory movement above said pestle between said jaws and oscillated by said pestle and pivotally mounted crushed material deflectors located adjacent to the lower portion of the pestle below said jaws.

15. In a crusher, a pair of oppositely disposed crushing jaws arranged for independent swinging movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for resisting their outward swinging movement, a pestle journaled on a horizontal axis between and below the lower portions of said jaws, a material distributing plate mounted for oscillatory movement above said pestle between said jaws and oscillated by said pestle and an eccentric engaging the lower portion of said pestle for imparting oscillatory movement thereto.

16. In a crusher, a pair of oppositely disposed crushing jaws arranged for independent swinging movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for resisting their outward swinging movement, a pestle journaled on a horizontal axis between and below the lower portions of said jaws, a material distributing plate mounted for oscillatory movement above said pestle between said jaws and oscillated by said pestle, an eccentric engaging the lower portion of said pestle for imparting oscillatory movement thereto and adjustable bearings between said pestle and eccentric.

17. In a crusher, a pair of oppositely disposed crushing jaws arranged for independent swinging movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for resisting their outward swinging movement, a pestle journaled on a horizontal axis between and below the lower portions of said jaws, a material distributing plate mounted for oscillatory movement above said pestle between said jaws and oscillated by said pestle, an eccentric engaging the lower portion of said pestle for imparting oscillatory movement thereto, adjustable bearings between said pestle and eccentric and means for lubricating said adjustable bearings and the axis for the pestle.

18. In a crusher, a pair of oppositely disposed crushing jaws arranged for independent swinging movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for resisting their outward swinging movement, a pestle journaled on a horizontal axis between and below the lower portions of said jaws, a material distributing plate mounted for oscillatory movement above said pestle between said jaws and oscillated by said pestle, an eccentric engaging the lower portion of said pestle for imparting oscillatory movement thereto, adjustable bearings between said pestle and eccentric, means for lubricating said adjustable bearings and the axis for the pestle and adjustable material deflectors located adjacent to the lower portion of said pestle on opposite sides thereof.

19. In a crusher, a pair of oppositely disposed crushing jaws arranged for independent swing-

ing movement toward and away from each other, spring cushions pivotally connected to the lower portions of said jaws for resisting their outward swinging movement, a pestle journaled on a horizontal axis between and below the lower portions of said jaws, an eccentric engaging the lower portion of said pestle for imparting oscillatory movement thereto, adjustable bearings between said pestle and eccentric means for lubricating said adjustable bearing and the axis for said pestle, adjustable material deflectors located adjacent to the lower portion of said pestle on opposite sides thereof and means between the upper portions of the jaws and actuated from said pestle for regu-

lating the delivery of material into the spaces between said jaws and pestle.

20. In a crusher, a pair of oppositely arranged crushing jaws mounted for independent swinging movement toward and away from each other, a pestle mounted for oscillatory movement between and below said jaws, a hopper arranged to discharge material between said jaws, a material feed control member mounted for oscillatory movement within said hopper and a driving connection between said pestle and material feed control member whereby the latter is reversely oscillated with respect to the oscillatory movements of the pestle.

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