

Jan. 21, 1936.

J. R. BAKSTAD

2,028,643

CRUSHER

Filed Nov. 25, 1930

2 Sheets-Sheet 1

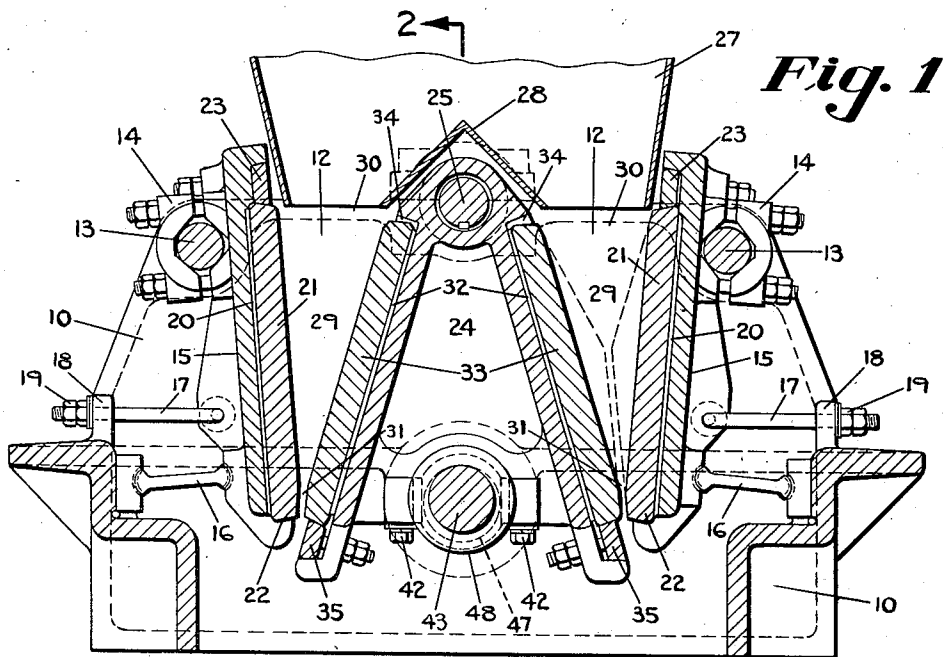


Fig. 1

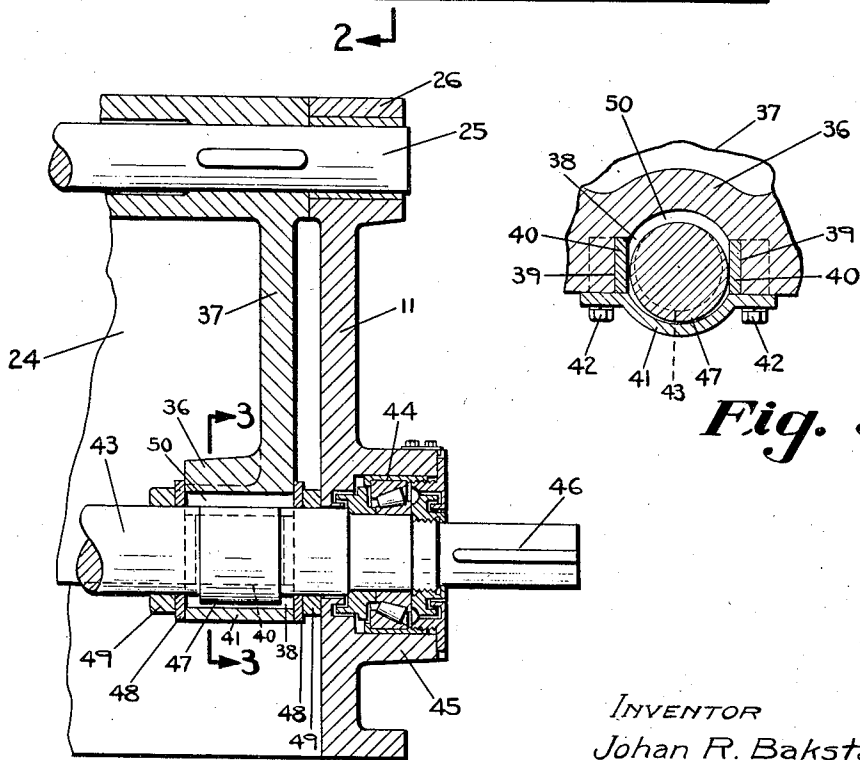


Fig. 3

Fig. 2

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2 Sheets-Sheet 2

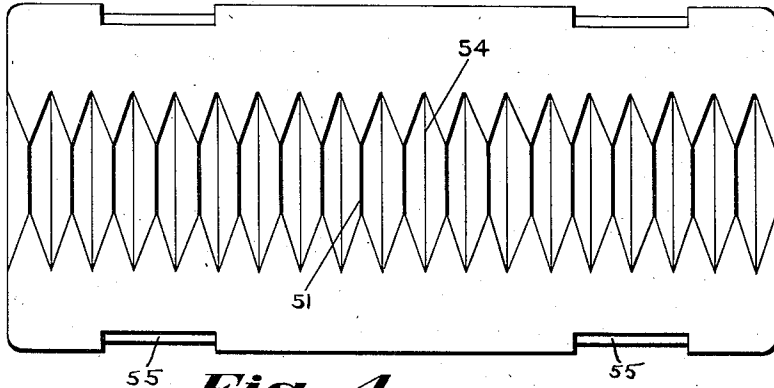


Fig. 4

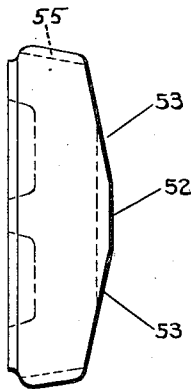


Fig. 5

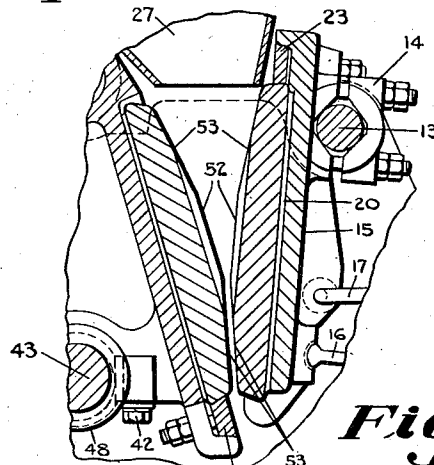


Fig. 7

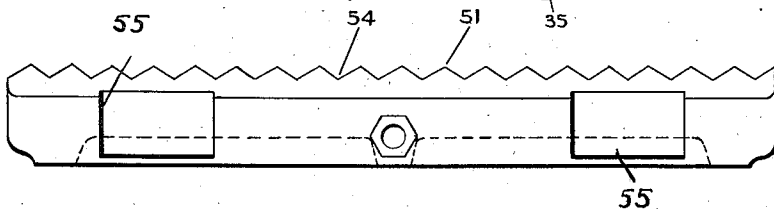


Fig. 6

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UNITED STATES PATENT OFFICE

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CRUSHER

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Application November 25, 1930, Serial No. 498,131

1 Claim. (Cl. 83—53)

This invention relates to new and useful im-
provements in crushers of the jaw type.

An important object of the invention is to pro-
vide a crusher adapted to reduce material such
5 as stone or the like, to a relatively fine, uniform
product by means of a movable jaw cooperating
with a stationary jaw, the former being vibrated
or oscillated at high velocity whereby material
10 passing between the jaws will be crushed or
pounded several times during its transit there-
between and be discharged in the form of a finer
product than is attainable with the jaw type
crusher possessing the slower squeezing action.

Another important object of the invention is
15 to provide simplified means for mounting and
oscillating the movable jaw, the oscillating means
being arranged relative to the pivot of the mov-
able jaw so as to effect powerful molar action
between the jaws of the crusher.

A still further object of the invention is to
20 provide an eccentric drive for the movable jaw
which obviates the necessity of providing a spe-
cial mounting therefor to restrict the jaw to true
oscillatory movements.

Still another object of the invention is to pro-
vide a pair of stationary jaws to cooperate with
the two jaw faces of the movable jaw to obtain
double crushing action for each oscillation of the
movable jaw and in order that the crusher may
30 be fed material from a hopper common to both
crushing pockets.

Another object of the invention is to provide
means for excluding extraneous material from
the operating mechanism.

Still another object of the invention is to pro-
vide the jaws of the crusher with specially formed
crusher or jaw plates which are shaped to be
reversible and interchangeable and whereby com-
plementary faces of these plates provide an ex-
40 tended grinding area gradually increasing in sep-
aration toward their upper ends to increase the
size of the mouths of the crushing pockets.

In one form of the invention, the jaw plates are
of such form and are so supported in the crusher
45 that when two plates are mounted in opposed re-
lation, the upper portions of their faces will
upwardly diverge to, in effect, form a throat in
which larger particles of material will be pre-
liminarily crushed, this portion of the respective
50 plates having a comparatively slight movement,
the lower portions of the plates being substan-
tially parallel and closely adjacent and having more
relative movement in order that the material will
be finely pulverized before passing from between
55 the plates.

In another form of the invention, crusher plates
are provided wherein the central portions of the
plates will have teeth formed on their crushing
faces, whereby the preliminarily crushed mater-
5 ial received from the upper diverging portions
of the plates will be acted upon with a cutting
effect before passing down between the paralleled
wall pulverizing portions of the plates.

Other objects and advantages of the invention
will become apparent during the course of the
10 following description.

In the accompanying drawings forming a part
of the specification and wherein like numerals are
employed to designate like parts throughout the
several views:

Figure 1 is a vertical section through the crusher
15 involving the present improvements.

Figure 2 is an enlarged fragmentary section
taken on the line 2—2 of Figure 1.

Figure 3 is a section taken along the line 3—3
20 of Figure 2.

Figure 4 is a plan of the crushing surface of a
modified form of jaw plate.

Figure 5 is an end elevation of the same.

Figure 6 is a side elevation of the modified form
25 of jaw plate, and

Figure 7 is a fragmentary vertical section of a
part of the crusher illustrating the assembled re-
lation of the modified jaw plates.

Referring to the drawings for a detailed de-
30 scription, the numeral 10 designates a crusher
casing which may be cast in one piece or made
up of a plurality of suitably joined sections, in-
cluding side walls 11 constituting opposite sides
of a crushing chamber 12.

The two ends of the crusher are equipped with
suitable bearings in which are journaled the
shafts 13, upon which are secured by clamps 14,
stationary jaws 15 forming the opposite ends of
the crushing chamber 12. These jaws are held in
40 the desired adjusted position by means of toggles
16 retained in their seats in the jaws and frame-
work by means of rods 17 pivotally connected to
the stationary jaws at one end and having their
opposite ends extended through stop lugs 18
45 formed on the frame and retained in adjusted
position, by means of nuts 19 in a manner well
understood in this art. It is also appreciated
that various size toggles 16 may be interposed be-
tween the stationary jaws and frame for effecting
50 any desired adjustments of these jaws.

Each of the stationary jaws includes a seat 20,
which seat receives a jaw plate 21, the opposite
edges of which are beveled, the jaw plates being
removable and interchangeable. The lower edges
55

of these jaw plates seat in retaining lugs 22 formed at the lower edge of each stationary jaw, while the upper edges of the plates are rigidly but removably secured to their seats by means of clamping members 23. A more detailed description of these jaw plates 21 will be set forth hereinafter.

The stationary jaws and jaw plates 21 are preferably disposed in upwardly diverging relationship as shown, for a purpose which will presently appear.

The movable jaw indicated in its entirety by the numeral 24 is of substantially inverted V-shape in vertical section and hangs freely pendant between the stationary jaws within the chamber 12. The apex of this movable jaw is keyed to a shaft 25 journaled in bearings 26 formed in opposite sides 11 of the casing. A feed hopper 27 depends into the crushing chamber of the casing to feed material thereto, and an inverted V-shaped dividing plate 28 is secured in position above the apex of the movable jaw to feed material to opposite ends of the crushing chamber, as well as to shield the mounting of the movable jaw.

The movable jaw 24 being interposed between the stationary jaws 15, divides the crushing chamber into two separate crushing chambers 29 of substantially triangular formation with an upper enlarged mouth portion 30 and a constricted grinding throat portion 31 from which the material is discharged from the crusher in finely reduced form. Opposite faces of the movable jaw are equipped with seats 32 to receive interchangeable jaw plates 33 corresponding in shape to the face plates 21. These jaw plates 33 have their upper edges seated under abutments 34 formed on the movable jaw while their lower ends are rigidly clamped in the movable jaw by means of the adjustable clamping members 35.

In order to oscillate the movable jaw 24 without imparting movements thereto in the vertical plane, the movable jaw, intermediate its two jaw plates on opposite sides, is equipped with eccentric bearings 36 supported by end webs 37 formed integral with the two jaws to close the ends thereof. These eccentric bearings are provided by equipping the web portions 37 with a recess 38 extending from the lower edges thereof, as best seen in Figure 3. Opposite sides of each recess are equipped with seats 39 for the reception of removable wear blocks 40 which are retained in position by means of a removable cover plate 41 bolted to the web portions by means of the machine screws 42. The bearings 36 are reinforced back to the jaws by means of the portions 36' formed integral with the bearings and jaws as shown.

An operating shaft 43 is journaled in anti-friction bearings 44 mounted in bosses 45 formed at opposite sides of the crusher casing. This shaft extends through the eccentric bearings 36 on opposite sides of the movable jaw and its axis is arranged in a plane extending parallel to the axis of the shaft 25. The operating shaft 43 is extended beyond one side of the casing as at 46 to receive a pulley or other form of driving element to impart rapid rotation to the shaft. The operating shaft is also equipped with eccentric cams 47 adjacent its ends for disposal within the bearings 36. Extraneous matter is prevented from access into these bearings by means of washers 48 and collars 49 disposed upon the shaft at opposite sides of the bearings.

In order to prevent the eccentricity of the op-

erating means from imparting the vertical movements to the movable jaw, it will be noted from Figure 3 that the recesses 38 above the eccentrics 47 are cut away sufficiently to afford clearance indicated at 50, and the cover plate 41 is correspondingly bowed to cause the eccentricity of the bearing above and below the eccentrics to slightly exceed the throw thereof. Due to this arrangement it will be obvious that the movable jaw will be moved in a true oscillatory path at a high rate of speed. By reason of the eccentrics contacting directly with the movable jaw adjacent the grinding throat portions of the crusher, and at points spaced substantial distances from the axis of the movable jaw, the greatest force of the operating means is exerted directly at the points where the hardest crushing action is required. Moreover, it is obvious from this arrangement, that the operating means is arranged within confines of the movable jaw and is thereby protected from the detrimental effects of extraneous material falling thereon and being ground into the same with the probability of damaging carefully machined bearing surfaces.

The jaw or crushing plates 21 and 33 of the stationary and movable jaws may assume many different forms. They may be equipped with the flat plane complementary crushing surfaces shown in full lines in Figure 1, or sloping surfaces such as are indicated in dotted lines in Figure 1. The sloping surfaces shown in dotted lines taper from the horizontal centers of the plates toward the top and bottom edges thereof, as shown, and when this form of plate is employed, the complementary lower sloping surfaces of the plates of the stationary and movable jaws are arranged in parallel relationship to form an extended and elongated crushing throat or chamber. The upper complementary sloping surfaces of these cooperating plates diverge upwardly in hopper-like relationship to enlarge the area of the mouths of the crushing chambers or spaces between the jaw plates.

In Figures 4 to 7 inclusive, another modification of the jaw plates is shown and since they are identical in construction whether used on the movable or stationary jaws, a description of one will suffice for all. In this form of plate, the face 51 thereof comprises a flat plane central surface 52 extending lengthwise thereof between its upper and lower edges. From the two longitudinal edges of this surface, the crushing surface 51 slopes away at angles of approximately $11\frac{1}{2}^\circ$ as at 53 to opposite edges of the plate. The longitudinal side edges of the plate are each provided with a pair of notches 55 for the reception of the jaw clamping means. The central surface of the crushing plate is provided with vertical V-shaped serrations 54 forming crushing teeth which extend substantial distances into the sloping surfaces 53. When this type of face plate is employed with the stationary and movable jaws, as shown in Figure 7, the lower sloping surfaces 53 are arranged in parallelism to constitute an elongated constricted crushing throat where secondary crushing of the material is effected. Due to this arrangement of the lower sloping surfaces, it will be obvious that the plane intermediate surfaces of complementary face plates diverge upwardly and constitute a preliminary crushing or cutting means intermediate the face plates. From these points upward, the upper sloping surfaces 53 diverge upwardly in a more pronounced degree to constitute an enlarged receiving mouth 75

between each stationary jaw and the intermediate movable jaw in which large particles will be broken. These jaw plates are clamped in their respective jaws by the same means disclosed in Figure 1 and are, therefore, interchangeable and readily removable for repair or replacement. In practice, these plates wear away more at points just above their bottom edges than any other points, and are, therefore, so shaped that they can be reversed or turned end for end when such wear occurs. This obviates scraping the jaw plates when only one end wears beyond efficient operation. Instead of throwing the plates away, when the lower grinding surfaces wear down, the plates are simply turned upside down or reversed so as to position the other sloping surfaces at the lower ends of the jaws to provide new crushing surfaces.

It is to be understood that various changes in the shape and arrangement of parts may be resorted to without departing from the scope of the appended claim.

I claim:

A crusher comprising a stationary jaw having an inclined plane face at its upper end, a substantially vertical plane face at its lower end, said

upper and lower faces being of substantially equal area, and a serrated central portion flattened at its middle and having sloping ends in line with said upper and lower plane surfaces; a movable jaw pivotally suspended at its upper end and having an inclined upper plane surface in non-parallel relation to the upper inclined plane surface of said stationary jaw, a lower end having a plane surface in parallelism with the plane surface at the lower end of said stationary jaw, a serrated central portion having a flat middle and sloping ends in line with the upper and lower plane surfaces; and jaw actuating means disposed substantially in the vertical plane of said movable jaw pivot to engage the lower end of said pivotally suspended jaw in line with the parallel lower plane surfaces of said jaw to effect a crushing movement of said movable jaw relative to the path of movement of material passing between the crushing portions of the jaws, the non-parallel faces forming a material receiving throat from which material is discharged in comminuted form, and the parallel faces being in close proximity to each other, to permit only finely powdered material to pass therebetween.

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