

No. 726,602.

PATENTED APR. 28, 1903.

M. F. WILLIAMS.
CRUSHER AND PULVERIZER.
APPLICATION FILED JAN. 4, 1901.

NO MODEL.

Fig. 1.

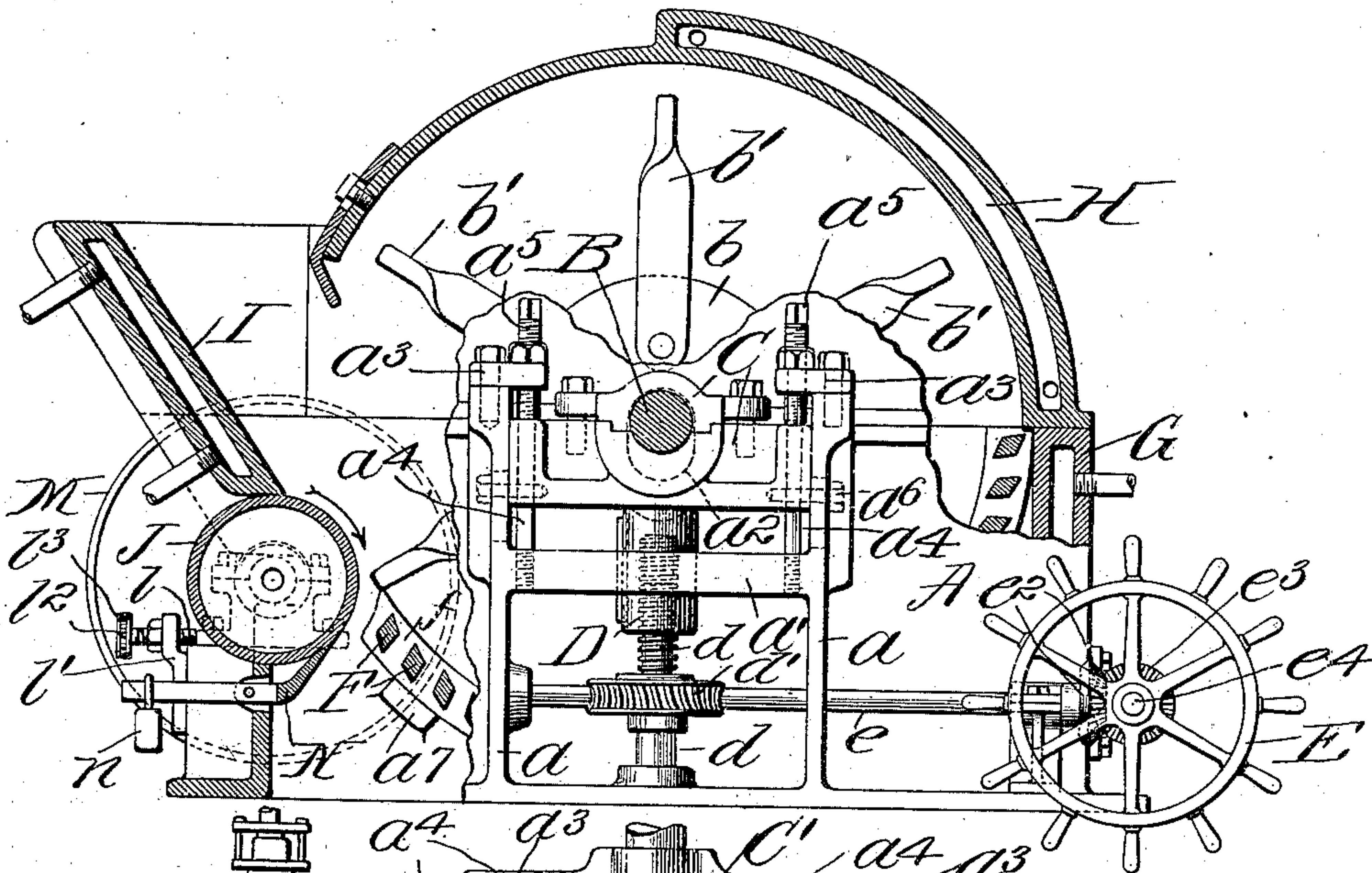


Fig. 2.

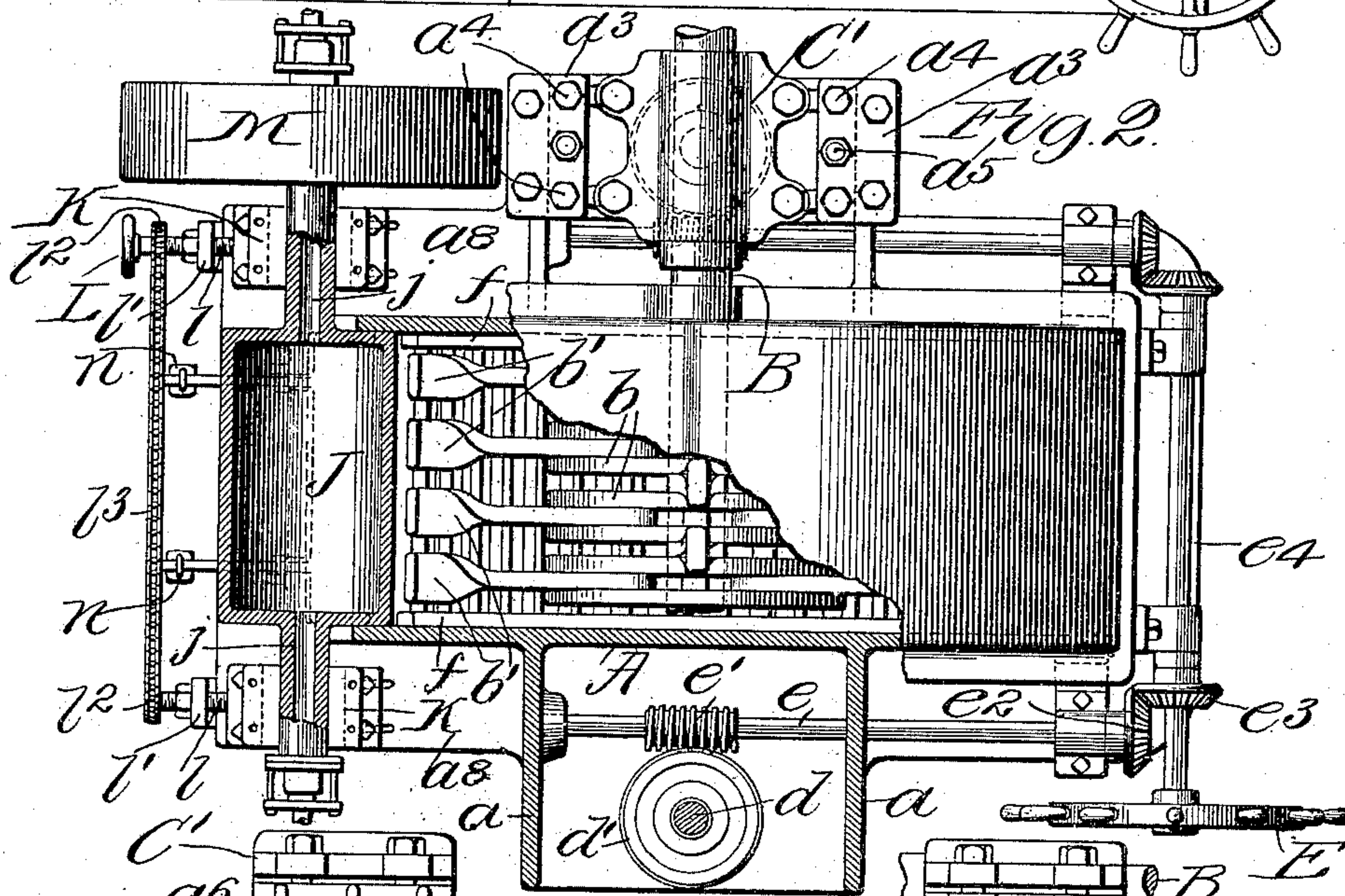


Fig. 3.

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UNITED STATES PATENT OFFICE.

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CRUSHER AND PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 726,602, dated April 28, 1903.

Application filed January 4, 1901. Serial No. 42,085. (No model.)

To all whom it may concern:

Be it known that I, MILTON F. WILLIAMS, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have
5 invented a certain new and useful Improvement in Crushers and Pulverizers, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use
10 the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevational view, partly in section, of my improved crusher and pulverizer. Fig. 2 is a top plan view, partly in section, of the same; and Fig. 3 is a detail front elevational view, partly in section, of the lower portion of the machine.

This invention relates to a new and useful
20 improvement in crushers and pulverizers, the object being to construct a machine of the character described which will be capable of handling wet clays coming directly from the bank, said machine shredding or reducing
25 such clays, serving in such capacity practically as a pug-mill.

Another object is to provide means whereby a hammer-carrying shaft may be adjusted toward or from the grinding-surface in order to
30 take up wear at the striking-point of the hammers and on said grinding-surface, and thus insure a relatively long life to the wearing parts of the machine.

Another object is to render the breaker-plate, or rather its equivalent, adjustable toward and from the striking-points of the hammers to take up the wear thereof and also to present a moving surface upon which the material entering the machine is initially
40 crushed, so that when the machine is handling wet material, such as clays, &c., the wet material will not bank in the feed end of the machine and retard or prevent the introduction of the new material.

With these objects in view the invention consists in the arrangement, construction, and combination of the several parts, all as will hereinafter be described, and afterward pointed out in the claims.

50 In the drawings, A indicates one of the side walls of the casing, from which extend suitable webs a , forming vertical guideways, said

webs being connected together near their upper ends by a shelf-like connecting-piece a' . The upper edge of this side wall is cut away, 55 as at a^2 , (shown in dotted lines in Fig. 1,) in which cut-away portion is received the main shaft B. This shaft B has circular disks b keyed to it within the casing, said disks forming hammer-supports, between which are pivoted the revolving beaters or hammers b' . As 60 shown in the drawings, these beaters or hammers are given a quarter-twist at their ends, so that the flat sides thereof contact with the material to be reduced. These beaters are 65 preferably arranged in longitudinal rows, the hammers or beaters of alternate rows being staggered with relation to adjacent rows.

C indicates a bearing in which the shaft B is mounted, said bearing being arranged between the upper ends of the guideways a . 70

a^3 indicates cap-pieces bolted to the upper edges of the guideways a and extending inwardly over the lateral wings of the bearing C, said cap-pieces supporting guide bolts or 75 rods a^4 , there being preferably one of such rods passing through an opening in each corner of the wing of the bearing C to guide said bearing in its vertical movement.

a^5 indicates set-screws arranged in the cap-piece, said set-screws being vertically adjustable and designed to bear upon the upper face of the bearing to lock the same against vertical movement when the bearing is adjusted. 85

a^6 indicates bolts arranged in the ends of the bearing and passing through slots in the guiding-web a , (see Fig. 3,) the purpose of which bolts is to clamp the bearing firmly in its adjusted position and prevent the same 90 from vibrating laterally.

D indicates a pillow-block passing through the web or shelf a' for supporting the bearing-block C. The bearing-block is preferably provided with a round knob on its lower face, 95 which is seated in a recess in the upper end of the cap-block, as shown in Fig. 3, while said cap-block has a threaded engagement with a shaft d , stepped in a suitable bearing provided in the base-flange of the side frame. 100 Shaft d carries a worm-gear d' , which meshes with a worm e' on a shaft e , one end of said shaft carrying a miter-gear e^2 , meshing with a miter-gear e^3 on a transverse shaft e^4 , on one

end of which is arranged an operating-handle E. The opposite end of this shaft e^4 carries a miter-gear for driving a shaft on the other side of the machine corresponding in all respects to the shaft e . This shaft on the opposite side of the machine actuates an adjustable bearing-block C' in a similar manner as has been described with respect to the bearing-block C. Thus when the handle E is actuated both the bearing-blocks C and C', assuming that the screws a^5 and a^6 are loosened, may be adjusted vertically, so that the striking-points of the hammers may be moved closer to or farther away from the grinding-surface, depending upon the kind of material to be handled in the machine or upon the amount of wear of the hammers. When the striking-points of the hammers have been adjusted to a proper position relative to the grinding-surface, the set-screws a^5 are turned down, so as to hold the bearing-blocks against upward vertical movement, after which the bolts a^6 are tightened to prevent the bearing-blocks from vibrating.

It is quite important in the class of machinery to which this invention relates to be able to adjust the shaft carrying the pivoted hammers or beaters, as said hammers or beaters are subject to such extreme wear that an hour's service frequently destroys the usefulness of the hammers. I am aware that the pivotal points of the hammers have been made adjustable toward and from the axis of rotation, such as shown in the Frickey patent, and this is of great value in insuring a longer life to the hammers; but adjusting the striking-points of the hammers in the manner described by the Frickey patent requires considerable time, and, furthermore, such adjustment is restricted to defined limits—as, for instance, where the centers of the openings are distant from the axis of rotation, say, eight inches, eight and three-eighths inches, eight and three-fourths inches, &c., respectively, it follows that an adjustment of the striking-points of the hammers in each instance will be three-eighths of an inch and that no finer adjustment can be made with this arrangement. In my present construction any adjustment of the striking-point of the hammers desired can be effected, depending upon the amount of movement imparted to the handle E. Another advantage consequent upon the adjustment of the pivoted beaters or hammers through the instrumentality of the movable bearings resides in the fact that when the striking-points of the hammers are worn and the shaft carrying said hammers is adjusted toward the grinding-cage it is not necessary to wait until the hammers are worn to their full extent—say three-eighths of an inch—before such adjustment can be made. Further, when the adjustment is made the path of the worn hammers is no longer concentric with the fixed concentric grinding-surface, but is eccentric with respect thereto, so that as the material is received from the grinding-sur-

face at the feed end of the machine it is gradually reduced by the action of the hammers, which at this point are most distant from the grinding-surface, and as the material moves backwardly on the grinding-surface it is further reduced, because the hammers approach nearer and nearer to the grinding-surface, and consequently the material is reduced to a degree of fineness corresponding to the action of the hammers thereon, which action becomes more violent as the hammers closely approach the grinding-surface. It follows that where the shaft is vertically adjustable, as shown in the drawings, the point where the striking-points of the hammers most nearly approach the grinding-surface in the adjustment of the shaft is at the lowest point of said grinding-surface and that the material entering the feed-opening will work down to said lowest point and be reduced to a degree of fineness proportionate to the approach of the striking-points of the hammers to the grinding-surface. Rearwardly beyond this point the hammers recede from the grinding-surface, and such particles as are not reduced sufficiently to pass through the openings of the grinding-surface fall back for further action by the hammers. It is obvious that instead of adjusting the shaft vertically, so as to cause the hammers to most nearly approach the grinding-surface at its lowest point, said shaft can be adjusted at an angle, so as to cause this approach of the hammers toward the grinding-surface at any desired point. It will likewise be understood that while I have shown a certain mechanism for effecting the adjustment of the shaft there are other mechanisms which can be adapted to accomplish the same result, and therefore I do not wish to be limited to the adjusting mechanism shown, except as such limitations may be expressed in the claims.

The grinding-surface before referred to is preferably in the form of curved bars f , supported upon lugs a^7 , projecting from the inner faces of the side walls, said curved bars being formed with openings in which are fitted the transversely-disposed bars F, forming the cage or grinding-surface. These grinding-bars F are substantially diamond-shaped in cross-section and so disposed that the longest axis is arranged at an angle considerably less than a right angle (about twenty-two and a half degrees) with respect to a radial line drawn from the center from which the bars f are described. This arrangement of the bars F presents a lip or cutting edge upwardly and forwardly, so that when the material is received on the grinding-surface this cutting edge materially assists in the quick reduction or comminution of said material. When the inner edges of these grinding-bars are worn, the cage may be removed and said bars taken out and inverted, so as to present a new lip inwardly. The advantage of this is that for some material a "lip-cage," as it is called, is of great impor-

tance, and where these lips are present on the cage-bars, making it possible to present new lips by reversing the bars, it follows that said bars will last practically twice as long as they would were they provided with a single lip. The back plate G, as well as the rear end of the cover or top wall H, is preferably steam-jacketed, as shown in Fig. 1, for obvious reasons.

I indicates the hopper arranged at the feed end of the machine, upon which the material to be reduced is placed. This hopper is preferably provided with a steam-chamber, as shown. Instead of having the hopper I extend down to the forward edge of the cage, as has heretofore been done, the inner end of said hopper serving in such a position as a breaker-plate, I terminate said hopper some distance above the forward edge of the cage and arrange a roller J therebetween and the forward edge of the cage. This roller serves as an anvil or movable breaker-plate and receives the material from the hopper, presenting the same to the action of the hammers or beaters, which initially crush or break the material on said roller. This roller is preferably hollow to form a steam-chamber, the inlet and exit passages leading to and from said chamber passing through the axles *j* of the roller, as shown in Fig. 2. These axles are mounted in boxes K, slidingly arranged upon a supporting-shelf *a*⁸, extending from the side frame of the machine. In order to adjust the boxes inwardly and outwardly, I provide screws *l* in the forward edges thereof, which screws are mounted in stationary lugs *l'*. The outer ends of these screws carry sprocket-wheels *l*², over which passes a chain *l*³, one of said screws having secured to it an operating-handle L. As the striking-points of the hammers wear, this rolling breaker may be adjustable inwardly to any desired degree adjacent the path of the hammers, so that when the material is placed upon the hopper I it falls upon the rolling breaker and is carried inwardly and downwardly to be acted upon by the hammers, which initially break or crush the material thereon, after which the material falls upon the grinding-surface and is further acted upon by the hammers.

M indicates a pulley mounted upon one of the axles *j* of the rolling breaker, whereby said breaker may be rotated in the direction of the arrow shown in Fig. 1. In order to prevent the material from accumulating on the surface of this rolling breaker, I pivotally mount a scraping-plate N in the front wall of the casing, which is designed to clean the surface of said breaker, the inner end of said scraping-plate being held against the breaker at all times by suitable weights *n*, which are preferably adjustable toward and from the fulcrum of the blade to regulate the pressure of the blade against the periphery of the roller.

In actual operation for working on wet clays the cage-bars are arranged about two inches

apart, and the main shaft B is rotated about one thousand revolutions per minute. The rolling breaker J is rotated about one hundred revolutions per minute, and as the impaction of the hammers tends to bank the material slightly in advance of the striking-points of the hammers said material if banked on the roller will be carried inwardly and downwardly, the hammers keeping the same clean. If any material clings to the surface of the rollers and is not carried away by the hammers, the scraping-blade will remove said material, as is well understood.

While I have shown and described a machine particularly adapted for use in connection with wet materials, it is obvious that my said machine may be employed in connection with dry materials, in which event the bars F would be arranged at appropriate distances apart.

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

1. In a machine of the character described, a casing having a disintegrating-chamber and a hopper leading thereinto, said casing having a portion cut away adjacent to the lower end of the hopper, a rotary breaker-plate arranged in said cut-away portion of the casing, a grinding-surface adjacent said breaker-plate, and pivoted beaters adapted to cooperate with said breaker-plate and the grinding-surface, substantially as described.

2. In a machine of the character described, a casing having a disintegrating-chamber therein provided with a grinding-surface at the lower portion thereof, a hopper discharging into said chamber, the end of said hopper terminating at a point short of the end of the grinding-surface to provide a space therebetween, a rotary breaker-plate arranged within said space between the end of the hopper and the end of the grinding-surface, and revolving beaters arranged to cooperate with said breaker-plate; substantially as described.

3. In an apparatus of the character described, the combination with a casing, of a grinding-surface at the lower portion thereof, revolving beaters mounted in said casing adapted to cooperate with said grinding-surface, a feed-hopper at one side of the machine, the end of said hopper terminating at a point short of the end of the grinding-surface to provide a space therebetween, a rotary breaker-plate mounted in said space between the end of the hopper and the end of the grinding-surface arranged to cooperate with the revolving beaters, and means for operating the beaters at a speed greater than that of the rotary breaker-plate; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 2d day of January, 1901.

MILTON F. WILLIAMS.

Witnesses:

WM. H. SCOTT,
A. S. GRAY.