

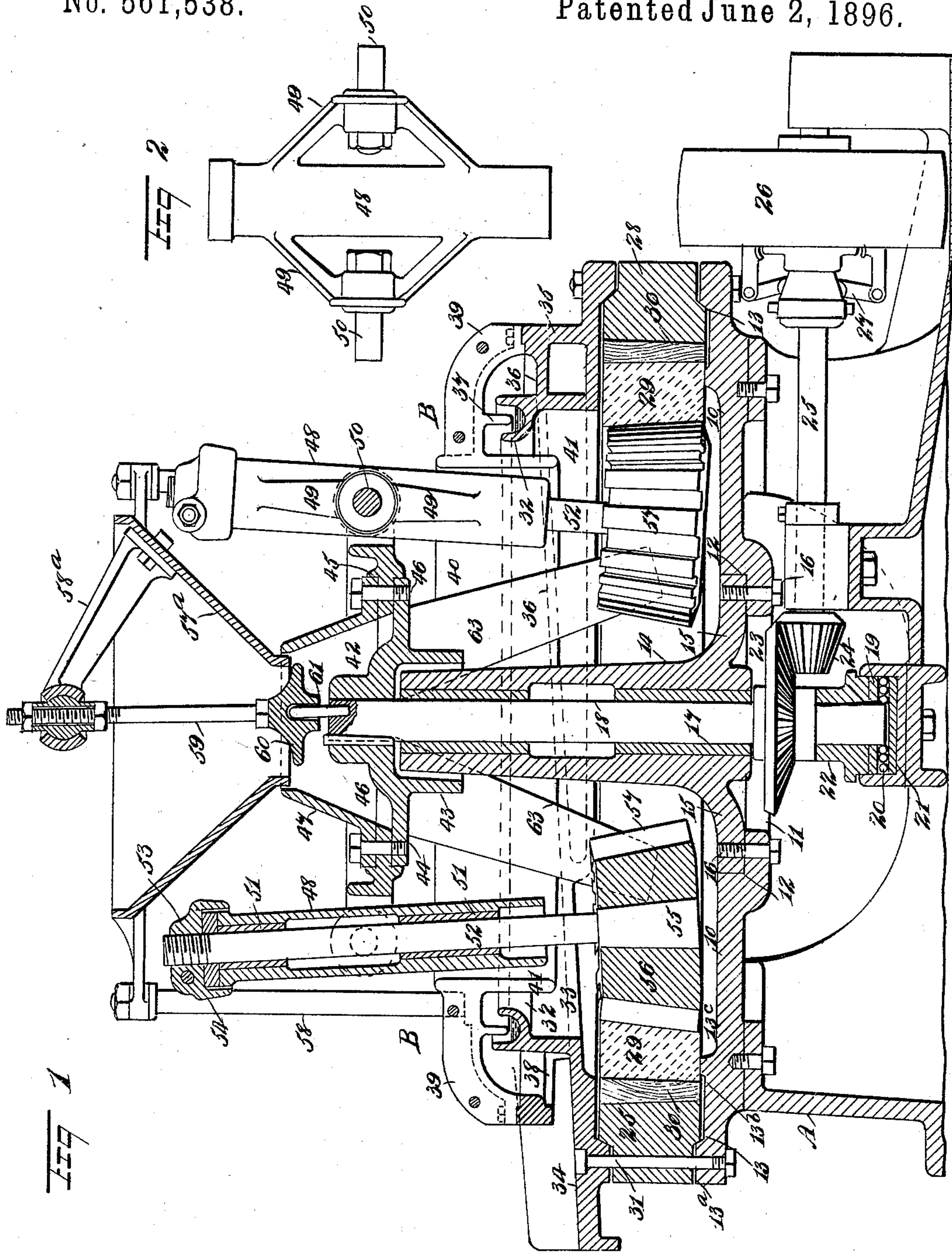
(No Model.)

2 Sheets—Sheet 1.

C. M. CARHART.  
CRUSHING MILL.

No. 561,538.

Patented June 2, 1896.



WITNESSES:

*H. Walker*  
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BY *Munn & Co*

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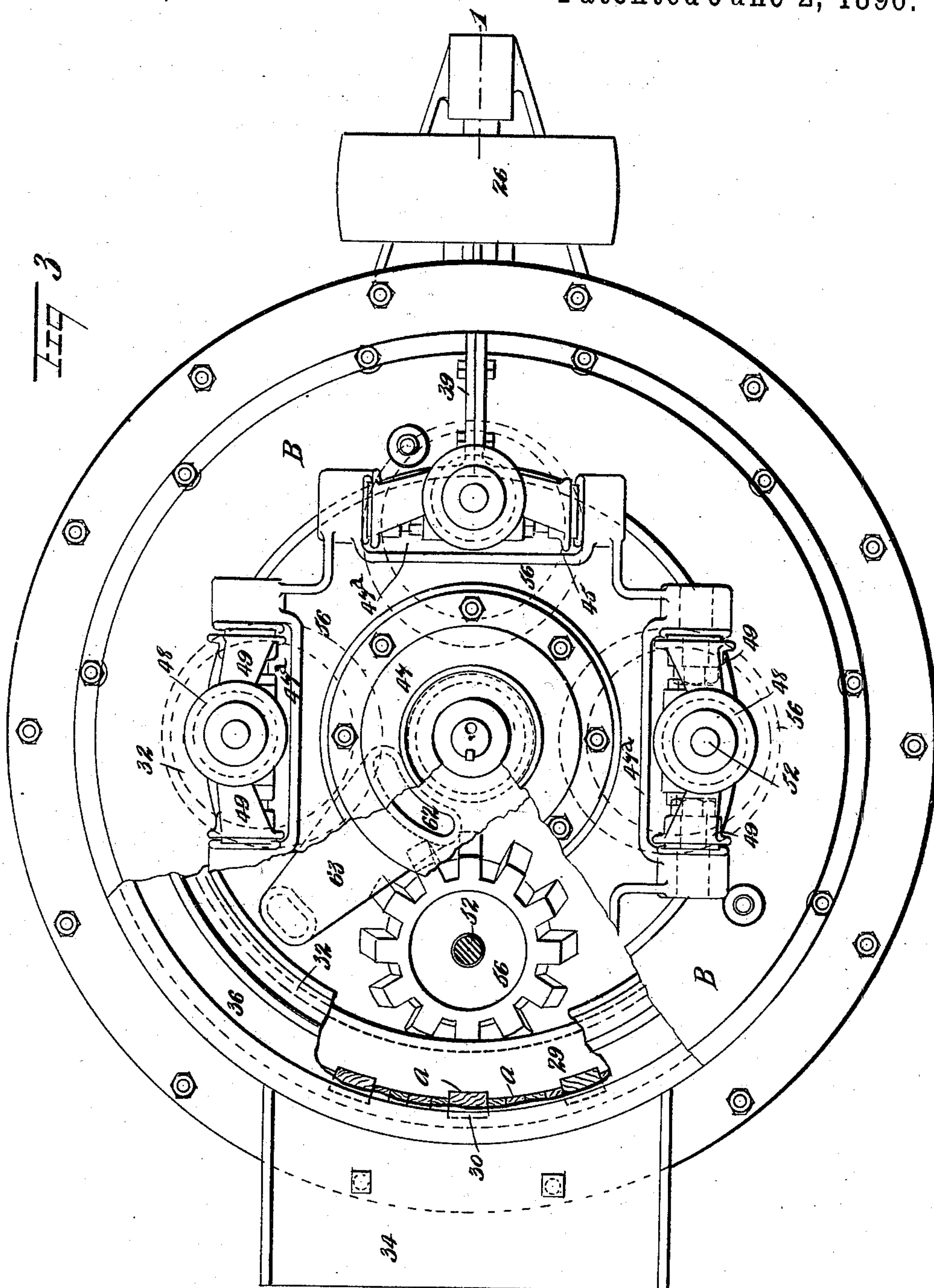
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*H. Walker*  
*Frederick A. Ker.*

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# UNITED STATES PATENT OFFICE.

CLARENCE M. CARHART, OF PLAINFIELD, NEW JERSEY, ASSIGNOR TO HIMSELF, AND ABRAM AMERMAN, OF RARITAN, NEW JERSEY.

## CRUSHING-MILL.

SPECIFICATION forming part of Letters Patent No. 561,538, dated June 2, 1896.

Application filed August 21, 1895. Serial No. 560,023. (No model.)

*To all whom it may concern:*

Be it known that I, CLARENCE M. CARHART, of Plainfield, in the county of Union and State of New Jersey, have invented a new and useful Improvement in Crushing-Mills, of which the following is a full, clear, and exact description.

My invention relates to an improvement in crushing-mills; and the object of the invention is to provide a mill simple, durable, and economic in its construction, and one in which the crushed or pulverized material will be conveyed in substantially a direct manner to an amalgamating pan or trough, and whereby, further, the pulverized material will be retarded in its action when passing over the aforesaid pan or trough to insure a maximum quantity of metal being taken up by the quicksilver.

Another object of the invention is to provide for a quick and thorough delivery of the waste products from the mill, and to furthermore provide for retarding the material while acted upon between the rollers and the die, so as to insure a complete pulverization of the said material, and, furthermore, to provide a cushion between the die and its support which will prevent undue jarring of the machine and undue noise, and, furthermore, to provide a means whereby the rollers may be connected with their actuating mechanism in a convenient and expeditious manner, and likewise to provide for a convenient and expeditious dismantling of the machine.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a central vertical section through the mill, taken substantially on the line 1 1 of Fig. 3. Fig. 2 is a side elevation of the carrier for the stem of one of the rollers, and Fig. 3 is a view in which the hopper is removed and a portion of the cap or covering broken away to disclose a roller and the cushion between the die and its support.

In carrying out the invention a base A is pro-

vided of any suitable or approved construction, and the said base is made to directly support a ring 10, and the said ring is provided with an annular countersink 12 around its central opening 11. The ring is furthermore provided with a marginal flange 13<sup>a</sup> upon its upper face and a second flange 13<sup>b</sup> between the center and the outer flange, and within the inner flange 13<sup>b</sup> a cavity or horizontal chamber 13<sup>c</sup> is formed upon the upper face of the aforesaid ring 10. A sleeve 14 is adapted for attachment to the base-ring 10, being provided with a flaring base 15, entering and fitting the countersink 12 of the said ring-base and being removably secured therein by bolts 16.

Bushings 17 are preferably placed within the said sleeve 14, and a shaft 18 is passed through the said bushings, as is best shown in Fig. 1. The lower end of the shaft is preferably attached to or is in frictional contact with a plate 19, held to revolve on ball-bearings 20, placed in a socket 21, formed in the central portion of the aforesaid base, and a collar 22 is placed at the foot of the shaft 18, holding it a predetermined distance from the bottom of the socket 21, while within the base a gear 23, having, preferably, beveled teeth, is secured on the aforesaid shaft 18, being made to mesh with a pinion 24, secured to a drive-shaft 25, carrying a driving-pulley 26 and a clutch 27 in engagement with the said pulley, or the equivalent of the clutch.

A body-ring 28 is fitted upon the flange 13<sup>a</sup> of the base-ring and the adjacent surface, the rib preventing the base-ring from having lateral movement, and a ring-die 29 is supported, preferably, upon the inner flange or rib 13<sup>b</sup> of the base-ring, being separated from the body-ring 28 by a cushion 30 of wood or a like material, and in order that the die 29 shall not slip or have movement of any description the cushion 30 is made up of a series of slabs, as shown in Fig. 3, comprising slabs *a*, fitted to the space between the die and the body-ring, and wider slabs *a'*, which enter recesses in the opposing faces of the two parts, serving to anchor the die where it is placed.

The space between the die and the body-ring is preferably tapering, and consequently the cushioning-blocks are of a wedge pattern, and



the inner face of the annular die 29 is likewise tapering, being inclined from the top downwardly and outwardly, so that its upper surface is wider than its lower surface, as is clearly shown in Fig. 1.

An amalgamating-pan 32 in the form of a trough is located over the die 29, the said pan or trough being of annular construction and provided with a downwardly and outwardly extending flange 33, thereby forming a support for the trough 32, whereby the same is held above the body-ring 28, said flange being secured, by means of bolts 31, to the body-ring 28; but the said flange is cut away at one side of the machine and in its stead a trough 34 is formed to conduct the surplus material from the machine. The inner part of the flange 33 overhangs the inner edge of the annular body-ring, so as to prevent the wedge-shaped cushion-sections 30 from being forced from between the body-ring and the die in the operation of the machine.

A gutter 36 is made to surround the amalgamating-pan, and this gutter is given an inclination in direction of the aforesaid trough 34, as shown in dotted lines in Fig. 1, and the said gutter is covered by a cap-plate B, supported on brackets 35, secured to the flange 33, which plate consequently extends over the amalgamating trough or pan 32, and is provided with an annular partition 37, which extends downward within the amalgamating trough or pan a predetermined distance, the said gutter being provided with an opening 38 over the trough 34, through which the material supplied to the gutter finds an exit.

The cap-plate B is made, preferably, in two sections, and the sections are connected by passing bolts through flanges 39, made at the terminals of the sections. The cap-plate is annular, being provided with a central opening 40, the opening being of slightly less diameter than the interior diameter of the ring-die over which it is located, and the said opening in the cap-plate is surrounded by a flange 41, which extends downward below the amalgamating pan or trough 32.

A driving-head 42, provided with a dust-flange 43 and a horizontal flange 44, is secured upon the upper end of the shaft 18, the dust-flange extending downward over the upper portion of the aforesaid sleeve 14, secured to the base-ring 10, and on the said horizontal flange 44 of the driving-head a plate 45 is secured by means of bolts 46 or their equivalents, the said bolts being likewise made to secure on the plate 45 a substantially conical casing 47, extending above the driving head and shaft 18.

The plate 45, which is attached to the driving-head, is polygonal in shape, and in each of its sides a recess 47<sup>a</sup> is produced, as shown in Fig. 3. In each of the recesses 47<sup>a</sup> a sleeve 48 is journaled, and each sleeve is provided with side arms 49, as shown in Fig. 2, the arms carrying bolt-trunnions 50, which are

journaled in perforated lugs formed at the ends of the recesses 47<sup>a</sup>. The sleeves 48 extend above and below their trunnions, and each sleeve contains, preferably, an upper and a lower bushing 51, as shown in Fig. 1, and in each sleeve 48 a stem or spindle 52 is entered, fitted to the bushings 51, and a flanged thrust-collar or equivalent enlargement 53 is secured upon the upper end of each of the stems, which are threaded, being fitted over the tops of the sleeves, and these thrust-collars are split, being connected by binding-screws 54, in order that these collars may be readily removed when occasion may demand.

The lower end of each stem 52 is enlarged and made tapering, as shown at 55 in Fig. 1, and the said tapering enlarged end of each stem is fitted in wedge fashion in the central portion of the roller 56. The rollers are provided with peripheral teeth 57, flat upon their outer or peripheral surfaces, and the peripheries of the rollers are upwardly inclined or are rendered tapering, whereby their upper ends are narrower than their bottom portions, and the tapering of the teeth corresponds to the inclination or taper of the inner wall of the ring-die 29, with which wall the rollers are adapted for contact. A hopper 57<sup>a</sup> is supported above the conical case 47 and is placed in loose communication therewith, being held by suitable uprights 58, which are supported, preferably, on the cap B.

A bracket 58<sup>a</sup> is projected upwardly from a wall of the hopper over the center thereof, and a stem 59 has a universal or ball-and-socket connection with the said bracket. At the lower end of the stem 59 a disk-shaped agitator 60 is secured in any suitable or approved manner, and this disk receives a wrist-pin 61, eccentrically placed in the top of the shaft 18, so that when this shaft is revolved the agitator is given an eccentric motion at the bottom of the hopper and consequently keeps the material feeding from the hopper in constant agitation.

The material from the hopper is fed into the conical casing 47 and finds an exit through openings 62 (see Fig. 3) in the horizontal flange of the driving-head 42 at the top of the shaft 18, and passes through these openings into chutes 63, which conduct the material close to if not practically in contact with the inner face of the annular die 29.

In the operation of the machine as the shaft 18 revolves the rollers are given a rotary motion by reason of the sleeve in which their stems are journaled being revolved, and the rollers likewise have independent rotary motion around their stems. The rollers impact on the inner face of the die 29 and thoroughly crush or pulverize the material supplied to them, the inclined faces of the rollers and dies serving to retard the material and prevent it from leaving these parts too soon, it being understood, however, that this retarding action



may be obtained by curving instead of inclining the contacting faces of the rollers and the die.

By reason of the rollers and die being toothed and having their teeth intermeshed it is evident that as the rollers turn the particles of ore will pass into the recesses in the die and will be held against movement and crushed by the action of the teeth on the rollers. Moreover, the rollers being mounted pivotally in such a way that they are adapted to swing, it is evident that as the rollers turn, their teeth on entering between the teeth of the die will strike the ore held between the teeth of the die and will have a stamping action, serving to pulverize the ore held between the said teeth.

The cushion 30, intervening the body-ring 28 and the die 29, serves to prevent the impact of the rollers on the die from unnecessarily jarring the machine, thus materially adding to the life of the latter, and it also serves to deaden the sounds which in machines of this character are very pronounced.

The material, after it has been pulverized between the rollers and the die, will by centrifugal action be thrown upward and over the amalgamating-pan 32, where the quicksilver will amalgamate the particles of metal, the refuse flowing over from the pan into the gutter 36 and finding an exit from the gutter into the trough 34, and it is obvious that the flange 37, extending down into the amalgamating-pan, will force all of the material sent upward by centrifugal force to pass slowly over the amalgam-bath, thereby insuring a maximum of metal being deposited therein.

Owing to the peculiar construction of this machine—that is, the manner in which the several parts are bolted—by removing the hopper, the casing 47, and the sleeves 48 the rollers may be readily removed from the machine and any metal that may have settled in the base-chamber 13<sup>c</sup> will be rendered accessible and may be readily removed. Ordinarily in this class of machines much time is

consumed and much trouble is experienced in dismantling the machine and replacing and securing its parts for action.

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

1. The combination of a driving-shaft, a hopper, and an agitator located at the outlet of the hopper, said agitator being held loosely at its upper part and having its lower part eccentrically connected with the said driving-shaft, as and for the purpose specified.

2. In a crushing-mill, the combination of a base, a body-ring arranged thereon, a die of circular form inside the body-ring, a cushion of wedge-shaped cross-section held between the body-ring and die, and a flange secured to the body-ring and overhanging the inner edge of the same, said overhanging portion of the flange being arranged to engage said cushion and die to prevent the same from being forced out of position, substantially as set forth.

3. The combination of a hopper, a stem, an arm supporting said stem and coupled to the upper end thereof by a universal joint, an agitator carried on said stem at the outlet of the hopper and of less dimensions than said outlet, a driving-shaft, and a wrist-pin on said shaft for moving said agitator, substantially as set forth.

4. In a crushing-mill, the combination of a base having a body-ring, a circular die inside the body-ring, a series of rollers carried on shafts pivotally mounted at their upper ends, said rollers being arranged to engage the die, a circular flange secured to the body-ring and extending over the upper edge of the die, and a circular mercury-chamber supported on said flange and surrounding said die, substantially as set forth.

CLARENCE M. CARHART.

Witnesses:

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JOHN KIRCH.