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PULVERIZING MACHINE

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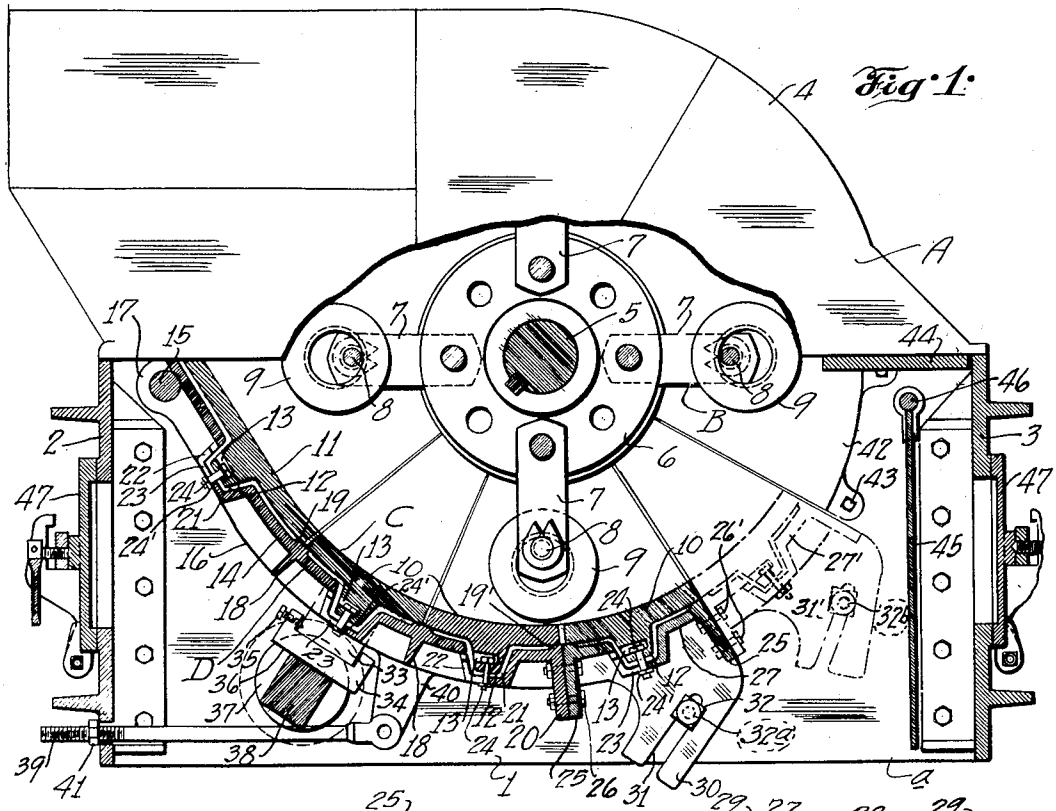


Fig. 1.

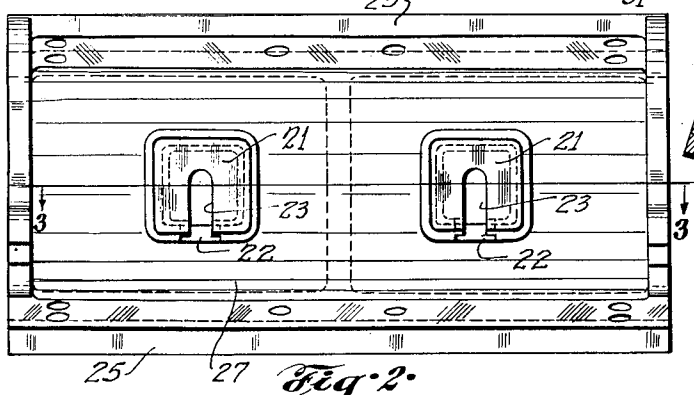


Fig. 2.

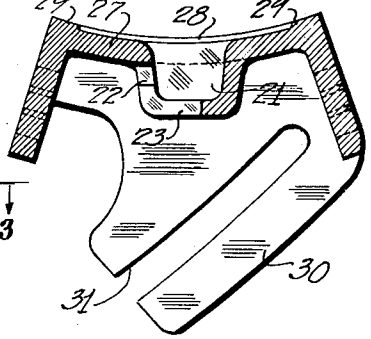


Fig. 4.

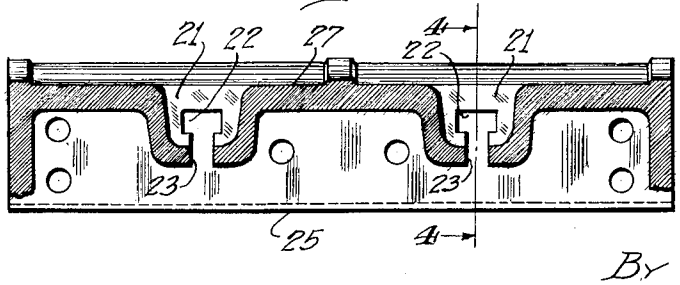


Fig. 3.

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PULVERIZING MACHINE

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Serial No. 494,659

11 Claims. (Cl. 83—11)

This invention relates generally to pulverizing or crushing machines, and more particularly, to a certain new and useful improvement in the grinding-plates of such machines.

Our invention has for its chief objects to provide, in a machine of the type stated, a grinding surface sectionally arranged for ease and economy in effecting repairs and replacements thereof; to provide a machine of the type stated with means swingable in the machine for supporting the grinding surface adjustably as a whole relatively to the hammer mechanism of the machine; and to provide a machine of the type stated with a grinding surface whose extent may be conveniently and effectively increased or decreased adjustably to meet different grinding conditions or installations.

And with the above and other objects in view, our invention resides in the novel features of form, construction, arrangement, and combination of parts hereinafter described and pointed out in the claims.

In the accompanying drawing,—

Figure 1 is a side elevational view of a pulverizing or crushing machine embodying our invention, a portion of the casing being broken away to show the interior arrangement;

Figure 2 is an enlarged bottom plan view of one of the cradle-extensions;

Figure 3 is a longitudinal sectional view of such cradle-extension taken approximately on the line 3—3, Figure 2; and

Figure 4 is a sectional view of such cradle-extension taken approximately along the line 4—4, Figure 3.

Referring now more in detail and by reference characters to the drawing, which illustrates a preferred embodiment of our invention, A designates the casing of a pulverizing or crushing machine, which includes a base *a*, opposed upstanding side walls 1 and end walls 2, 3, and a removable cover or upper casing section 4.

B designates the hammer mechanism of the machine, which is disposed for rotation within the casing A and preferably, in the present instance, includes a shaft 5 to which is keyed a carrier 6 having pivotally connected thereto for rotation therewith a plurality of hammer assemblies each including a pair of bails 7 connected by a pin 8, each pin 8 supporting a cylindrical hammer 9 mounted loosely in the bail for rotation with and relatively to the carrier 5, as more fully and particularly disclosed in our co-pending application for Letters Patent for Pulverizing machine, filed of even date, Serial No. 503,749, to which reference is hereby made.

Suitably and adjustably disposed within the casing A for co-operation with the hammer mechanism B, is a grinding surface C composed of a series or plurality of transversely arcuate sectionally adjoining concaves or grinding plates 10, each longitudinally extending substantially the width of the casing A between the side walls 1 thereof. Forming an obliquely upward tangent extension of the grinding surface C, is a feed plate 11, whose lower margin is, however, preferably slightly curved, as shown, to meet the there adjoining plate 10.

Each of the plates 10 and 11 is provided with a pair of depending or outwardly presented preferably pyramidal anchor-lugs 12, each provided with a laterally-opened T-shaped endwise-bolt-receptive slot 13, for a purpose presently appearing.

The plates 10, 11, are respectively detachably or removably mounted on, and supported by, a shiftable cradle or backing frame D, sometimes called a plate-cage, which includes a body-section 14, which, being pivotally suspended from a rod 15 disposed transversely between the casing walls 1 adjacent the upper rear corner thereof, swingably depends in a generally concave or downward and rearward curvilinear direction, substantially complementary to the grinding surface C, under the hammer mechanism B for adjustable movement of the supported grinding surface C, as a whole, relatively both to the paths of the hammers 9 and to the casing A.

Preferably the cradle-body 14 is provided marginally with outwardly presented or depending transverse ribs 16, enlarged at their upper ends to provide hubs 17 mounted on the rod 15, and connected by longitudinal ribs 18 each preferably disposed under, that is, oppositely to, longitudinal upstanding ribs 19 suitably disposed on the plate-engaging or upper face of the cradle-body 14 for supporting the meeting or confronting edges of the plates 10 or 10 and 11, as the case may be, and we might add that the free or swingable end of the cradle body 14 is provided with a half rib 19′ below which is a depending longitudinal flange 20, the latter for a purpose soon appearing.

Intermediate the ribs 18, the cradle-body 14 is provided with a plurality of inwardly opening outwardly projecting anchor-pockets 21, each complementary to, and suitably disposed for reception of, the lugs 12 of the plates 10

or 11, as the case may be, one side wall of each pocket 21 having a slot or aperture 22 opening into a lateral slot 23 provided in the bottom wall of the pocket, the aperture 22 and slot 23 being adapted, when and as the plates 10 and 11 are mounted on the cradle-body 14, for registration with the corresponding T-slots 13 of the respective lugs 12, whereby anchor-bolts 24 or other suitable fastening elements are adapted to be inserted from the back of the cradle-body 14 through the aperture 22, into the slots 13 and, depending endwise through the slot 23, are there threadedly engaged by nuts 24', which impinge the bottom wall of the respective pockets for detachably anchoring or securing the plates 10 and 11 to the cradle D, as best seen in Figure 1. By this construction, the grinding surface C is uninterrupted, promoting the uniform grinding of the material, while, it will be seen, the plates 10, 11, may sectionally be easily removed or replaced, as they become unduly worn or broken, or for substituting one form of attrition surface for another, thus affording a highly convenient, economical, and efficient grinding surface for the purposes intended.

Formed transversely of an arcuate or channel-shaped section, and adapted to be mounted, by means of one of its longitudinal depending flanges 25 on, and secured by suitable fastening elements 26, to, the complementarily depending flange 20, for forming a continuation of the there abutting free end of the cradle-body 14, is a detachable cradle-end section or so-called cage-extension 27 adapted to support a sectional plate 10 and provided, for such purpose, on its upper or plate-supporting face with transverse, preferably arcuate, ribs 28 and with longitudinal marginal ribs 29 adapted to supportingly engage, respectively, the width and length of the plate 10.

For like purpose and effect, as hereinbefore set forth, the end-section 27 is provided with a pair of the pockets 21, each having the side wall aperture 22 and the bottom wall slot 23, whereby the supported plate 10 may be detachably secured to the end-section 27 by a bolt 24 and nut 24', as described. And the end-section 27 is further provided at its opposite longitudinal ends with depending forwardly oblique arms 30, each having a longitudinal, preferably forwardly open, curved slot 31, formed to an arc of a circle having its center at the rod 15, that is, the pivotal axis of the cradle D, the exact radius depending, of course, on the intended position of the extension 27, as will shortly appear. The arms 30 are shiftable on suitable clamping means, as bolts 32, which, working in the slots 31, and passing through suitable apertures 32*a* in the respective side walls 1 of the casing A, are adapted to frictionally engage the arms 30, through the intermediary of suitable spacing elements 32', respectively, with the opposing side walls 1 of the casing A, and it will be seen that, when so frictionally engaged or clamped on the side walls 1, the extension 27 serves to firmly and effectively releasably secure or support the cradle D in adjusted position. Hence, the grinding clearance between the hammers 9 and plates 10, 11, may at will be suitably altered or adjusted by simply loosening the bolts 32 and shifting the cradle D as circumstances may require, either from within the casing A or in other convenient or desirable manner. However, we prefer to arrange the cradle D for shiftable actuation exteriorly the casing A, one form of mechanism which may be employed suitably for such purpose being more fully described in Letters Patent No. 1,696,219, of December 25, 1928, to Joseph Teipel, for Pulverizing machine, to which reference is hereby made, although we have improved thereon in certains respects, as we will point out.

Such mechanism, briefly, includes lugs or bosses 33, each outwardly presented or depending from one of the ribs 16, said lugs 33 having mounted endwise thereon suitable shoes 34 of our invention, the shoes 34 being removably gripped on the lugs 33 by set screws 35, and having flat end faces, as at 36, preferably obliquely disposed to the end wall 2. Fitted for rotary movement in the side walls 1, are bushings 37, and eccentrically journaled at its opposite ends in the bushings 37, is a preferably non-circular or prismatic bar or shaft 38, disposed thus for flatwise engagement and cooperation with the shoes 34 in such manner that, on rotation of the bushings 37 by any suitable means, the shaft 38 will be shifted obliquely relatively to the shoes 34, and, hence, the cradle D, and consequently the grinding surface C as a whole, will be pivotally shifted toward or from the hammers 9. Hence, by simply loosening the bolts 32 from outside the casing A, and from like position rotating the shaft 38, adjustments of the grinding surface C may be effected, and, more especially, secured, in a simple, facile and convenient manner. It will be seen that the removable shoes 34 efficiently provide for the maintenance of the end faces 36 in suitable flatwise shaft-engaging condition.

We might add that the Teipel Patent No. 1,696,219 also discloses the bolt 39, which, pivoted to a lug 40 depending from one of the ribs 16, is projected endwise therefrom through the end-wall 2 and has thereon threaded a nut 41 adapted for impingement upon the base-wall 2 to draw the shoe 34 against the shaft 38.

And the extent of the grinding surface C may be further adjusted and regulated, as shown in dot-dash lines in Figure 1, by mounting on the end-section 27 a slightly modified form of additional end-section 27', which in function and use is similar to the end-section 27, except that the radius of the arc of the slot 31' is, of course, suitably altered to provide for the greater distance of the end-section 27' from the rod 15, the respective end-sections 27, 27' being mountable one on the other by means of suitable fastening elements 26' engaging the abutting flanges 25 of the end-sections.

In such manner, the extent of the grinding surface C may conveniently and at will be extended or diminished according to the changing requirements of the material being pulverized or crushed, the side walls 1 being further suitably apertured, as at 32*b*, to permit this successive mounting of the end sections 27, 27' on the cradle D, as may be desired.

The casing A is provided with the usual segmental side liners or wearing plates 42, secured by bolts 43 in the conventional manner. Material discharged from the grinding surface C impinges in part on a cover-plate 44 mounted transversely the casing A at a suitable height rearwardly therein, and in part on a swingably mounted pendant striker-plate 45, pivotally supported on a rod 46 transversely disposed in and between the side walls 1 rearwardly spaced a suitable distance from the grinding surface C

and designed to swingingly absorb the impact of the material thrown thereupon and deflect the same downwardly out of the machine. We might add that the end walls 2, 3, of the casing A are preferably provided with suitably hinged access doors 47.

It will be seen that our invention accomplishes its objects, that the pulverizing or crushing of a product by a machine equipped with our improved grinding surface may be controlled and regulated with certainty and exactitude, that variations in the grindability of material fed to such a machine may with nicety and proficiency be compensated for by precise manipulative adjustments of the grinding surface, and that the grinding surface of our invention exhibits facility, economy and aptitude in its intended employment.

And it will be further understood that, while not here specifically shown, the plates 10, 11, may be in the form of screen-plates, grate-bars, or the like, with corresponding or co-operable construction of their supporting-members, and that other changes and modifications in the form, construction, arrangement, and combination of the several parts of the machine may be made and substituted for those herein shown and described without departing from the nature and principle of our invention.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In a machine of the class described, a casing, and a grinding-concave comprising a series of sectional grinding-plates, and a cradle for adjustably supporting said plates, the cradle including a body portion and an end section mountable on the body portion, and arms on said end-section adapted for connection with the casing for detachably securing the cradle in adjusted position.

2. In a machine of the class described, a grinding-concave including a cradle, a series of sectional plates mounted on the cradle, and means for detachably anchoring the plates individually to the cradle, said means including a plurality of inwardly opening outwardly presented anchor pockets on the cradle, lugs on said plates disposed in the respective pockets, said lugs and said pockets having registrable lateral openings and fastening devices disposed in the several openings and having securing engagement with the lugs and the end walls of the respective pockets.

3. In a machine of the class described, a grinding-concave including a cradle, a series of sectional plates mounted on the cradle, means for detachably anchoring the plates individually to the cradle, said means including a plurality of inwardly opening outwardly presented anchor pockets on the cradle, lugs on said plates adapted to engage respective pockets, said lugs and said pockets having registrable lateral and endwise openings accessible from the outer side of the cradle, and fastening devices, adapted to be laterally inserted in said openings for endwise presentation therefrom.

4. In a machine of the class described, a casing, a grinding-concave including a cradle pivotally supported at an end within the casing, and arms carried by the cradle having slots curved with the pivotal axis of the cradle as a center and adapted for engagement by a part of the machine for adjustably supporting the opposite end of the cradle.

5. In a machine of the class described, a casing, a hammer mechanism rotatory in the casing, a grinding-concave cradle pivotally supported in the casing and having an end swingable toward or from the hammer mechanism, a grinding surface including a series of plates mounted on the cradle for co-operation with the hammer mechanism, an end section mounted on the cradle for supporting an adjoining section of the grinding-surface, and means including members disposed on the end-section and adapted for co-operation with the adjacent walls of the casing for supporting the free end of the cradle.

6. In a machine of the class described, a casing, a hammer mechanism rotatory in the casing, a grinding-concave cradle pivotally supported in the casing and having an end swingable toward or from the hammer mechanism, a grinding surface including a series of plates mounted on the cradle for co-operation with the hammer mechanism, an end section mounted on the cradle for supporting an adjoining section of the grinding surface, spaced members disposed on the end section adjacent opposing walls of the casing and respectively having curved slots formed to the arc of a circle having its center at the pivotal axis of said cradle, and means including fastening elements presented from said walls and engaging said slots for grippingly engaging said members with said adjacent walls of the casing for supporting the free end of the cradle.

7. In a machine of the class described, a concave including a cradle, a grinding-plate mounted on the cradle, and means for detachably anchoring the plate to the cradle, said means including a pocket on the cradle, an outwardly presented lug on the plate for disposition within the pocket, said lug and pocket having registering lateral and endwise openings, and a fastening device disposed in said openings and having engagement with the lug and the end-wall of the pocket.

8. In a machine of the class described, a casing, a hammer-mechanism within the casing, a grinding-concave, and means for adjustably supporting the concave within the casing for co-operation with the hammer-mechanism, said means including a pivot-connection between the casing and an end of the concave slotted arms depending adjacent the casing side walls from the opposite end of the concave and inwardly presented members on the side walls of the casing engageable with the arms at said slots.

9. In a machine of the class described, a casing, a hammer-mechanism within the casing, a grinding-concave, and means for adjustably supporting the concave within the casing for co-operation with the hammer-mechanism, said means including a pivot-connection between the casing and an end of the concave, a cradle-enlarging section disposed at the opposite end of the cradle, fastening means rigidly joining said section to the cradle, arcuately slotted arms depending from said section adjacent the opposite side walls of the casing, and inwardly presented members on the casing side walls engageable with said arms at said slots.

10. In a machine of the class described, a casing, a grinding-concave including a cradle pivotally suspended at an end within the casing and flanged at its opposite end, a complementary concave-section for extending the cradle flanged for rigid attachment to the flange of the cradle and arms laterally depending from said section

for rigid connection with the casing for adjustably supporting the free end of the extended cradle.

11. In a machine of the class described, a casing, a grinding-concave including a cradle pivotally suspended at an end within the casing and flanged at its opposite end, means for selectively varying the extent of the cradle, said means comprising a first complementary concave-section flanged at its opposite side margins for rigid connection at one of said flanges with the flange of the cradle, and a second complementary concave-section having a flange for rigid connection with the second flange of the first section and slotted arms laterally depending from the second section for rigid connection with the casing for adjustably supporting the free end of the extended cradle.

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