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PULVERIZING OR CRUSHING MACHINE

Filed Nov. 10, 1930

Fig. 1.

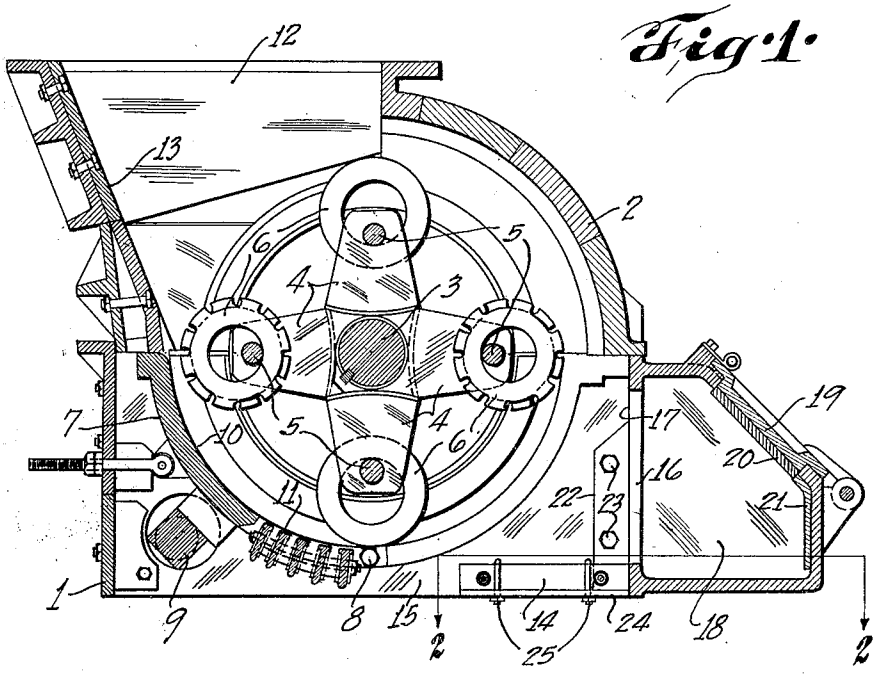
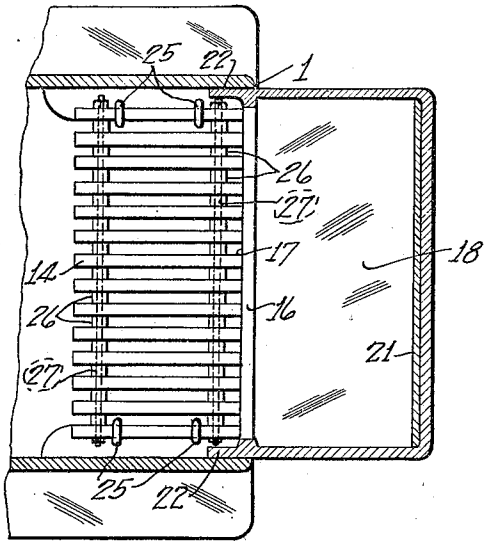



Fig. 2.




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# UNITED STATES PATENT OFFICE

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## PULVERIZING OR CRUSHING MACHINE

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This invention relates generally to pulverizing or crushing machines and, more particularly, to a certain new and useful improvement in such machines of the rotary hammer type.

Our invention has for its chief object the provision, in a machine of the type stated, of means adapted for the removal from the machine of such relatively uncrushable material as hard ore, tramp iron, straw, paper, rags, dunnage, or the like, as may be mixed with the product to be crushed or ground, such removal being effected by virtue of the relative differences in momentum of the uncrushable material with respect to the crushed material.

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 set forth in the claims.

In the accompanying drawing,—

Figure 1 is a longitudinal sectional view of a pulverizing or crushing machine embodying our invention; and

Figure 2 is a fragmentary sectional view of the machine taken approximately along the line 2—2, Figure 1.

Referring now more in detail and by reference characters to the drawing, which illustrates a preferred embodiment of our invention, we show a rotary hammer-mill of conventional type, which, briefly, includes a base or lower casing-section 1 and a complementary or upper-casing section 2 preferably detachably mounted on the base 1, bearing for rotation in the side walls of the casing, is the main shaft 3 of the machine, which supports a plurality of spiders 4 connected together adjacent the free ends of their several arms by a circumferential series of transversely disposed rods 5. Disposed on the respective rods 5, are so-called ring-hammers 6, each arranged not only for revolution in the casing 1, 2. with the shaft 3, but also and at the same time independently both axially rotatable about, and laterally shiftable or yieldable relatively to, its respective supporting axis or rod 5.

Disposed between the side walls of the base-member 1 for material-grinding co-operation with the hammers 6, is a concave or arcuate member 7, which, suitably pivoted, as at 8, to the central lower part of the respective side walls of the base 1, is, by means of an eccentrically rotatable bar 9 intermediately supporting the concave 7, shiftable swingably towards or from the shaft 3 for presentation of its upper and lower grinding surfaces 10, 11, respectively, more or less eccentrically to the path or revolution of the hammers 6, the grinding surface 10, we might add, being preferably, though not necessarily, imperforate, for effective grinding of the material, and the grinding surface 11 being apertured for passage of the ground or pulverized material therethrough.

Provided in the upper casing-section 2 and disposed peripherally to one side of the shaft 3, is a suitable feed opening or hopper 12, the lower wall 13 thereof being oliquely disposed inwardly and downwardly toward the hammers 6 and terminating approximately at the upper end of the concave 7 for guiding or feeding the material to be ground thereupon.

The material fed to the machine is ground, crushed, or pulverized between the hammers 6 and concave 7, some of the ground material escaping through the apertured grinding surface 11. A substantial part of the product of the machine will, however, by the co-operation of the grinding media 6, 7, be discharged from the end of the concave 7 in an initially horizontally tangential direction towards the opposing wall of the casing 1.

Obviously, such product of the machine is unsized, that is to say, it comprises a mixture of pulverulent material, uncrushable material, and an amount of crushed, though not pulverulent material. However, the substantially horizontal movement of the unsized materials allows the gravity separation thereof according to the variant momentum of its several constituents, some of which will possess a momentum sufficient to cause it to be overcast upon, and for gravitational separation by, a positive separating or screening means comprising, in the present instance, a plurality of spaced so-called grizzly bars 14

disposed longitudinally in the direction of movement of the material falling thereupon.

Preferably, the screening grid or bars 14 are disposed below the level of the concave 7 to allow for the drop in the path of the material discharged therefrom, and the ends of the bars 14 are spaced from the end of the concave 7 providing an opening 15 through which most, if not all, of the pulverulent material is discharged from the machine, the balance of the product falling or impinging upon the bars 14, which, selected in size and spacing suitably for the purpose, substantially effect gravity separation of the material, the crushed material passing between the bars 14 and thus out of the machine, and the uncrushed material being, as may be said, rejected and retained by the screen composed of the bars 14, such rejected material, however, by virtue of its residual momentum, partaking of a sliding movement on the bars 14, and from thence is overcast, or caused to pass, through an aperture 16 provided in the adjacent or facing wall 17 of the base-section 1 for lodgement and collection in a suitable lateral pocket or "metal receptacle" 18, so called by reason of the metallic nature of the material most likely to be found therein.

In actual practice, we might add, we prefer to make the wall 17 separable from the base section 1, and to integrally unite with said wall 17 the enclosing walls of the receptacle 18, the latter having preferably a sloping or inclined apertured upper wall normally closed by a hinged access door 19, and the door 19 and the receptacle-wall therebelow having suitable wearing plates or liners 20, 21, respectively.

Preferably, the wall 17 is provided with flanges 22 interfitting, and secured by fastening elements 23 to, the respective side walls of the base 1, and for supporting the grizzly bars 14, we prefer to provide the opposing side walls of the base 1 each with an inwardly extending lug or shelf 24, on which the grizzly rests, the end bars thereof being held on the shelf 24 by clamps-or-hook-bolts 25. The bars 14 of the grizzly are spaced by suitable washers 26 and the grizzly as a whole is tied together by bolts 27 in the conventional manner.

We are aware that the use of so-called "tramp-iron" pockets is not new in the pulverizing art, but, so far as we are aware, such pockets have heretofore been disposed so as to readily fill with the crushable material as well as the tramp-iron, the latter, in many cases, being intended to be embedded in the crushable material in the pocket.

In our present invention, the metal collected in the pocket 18 is substantially free from either the pulveruluent or partially pulverized material, and this we accomplish by providing the grizzly bars 14 over which the non-crushable material slides by virtue of its momentum and is hence self-propelled for movement to a point sufficiently remote from the hammers 6 to substantially effect, during such movement, the separation of the crushed or partially pulverized material from the uncrushable material.

It will be understood that, while not here specifically shown, the grizzly-bars 14 may be adapted for shiftable or vibratory movement, 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, in combination, a casing, rotary crushing means within the casing, and a screening grid disposed horizontally within the casing below the path of and tangentially to said rotary means for separating material cast therefrom.

2. In a machine of the class described, in combination, a casing, rotary crushing means within the casing, separating means including a screening-grid disposed horizontally within the casing below the path of said rotary means for receiving material tangentially cast by said rotary crushing means, and a collecting chamber disposed laterally of the grid for receiving the rejects overcast from said separating means.

3. In a machine of the class described, in combination, a casing, rotary crushing means within the casing, separating means including members disposed tangentially from and adapted to receive material cast by said rotary crushing means, and collecting means adapted to receive the rejects overcast from said separating means.

4. In a machine of the class described, in combination, a casing, rotary crushing means within the casing, separating means including members disposed in a plane tangential to and below, and adapted to receive material cast by, said rotary crushing means, and collecting means adapted to receive the rejects overcast from said separating means.

5. In a machine of the class described, in combination, a casing, rotary crushing means within the casing, separating means tangentially spaced from said crushing means for reception of material cast therefrom, and means for collecting the rejects overcast from said separating means.

6. In a machine of the class described, in combination, a casing, rotary crushing means within the casing, separating means tangentially spaced horizontally from said crushing means for reception of material cast there-

from, and means for collecting the rejects overcast from said separating means.

7. In a machine of the class described, in combination, a casing, rotary crushing means within the casing, separating means tangentially spaced from said crushing means for reception of material horizontally cast therefrom, and means for collecting the rejects overcast from said separating means.

8. In a machine of the class described, in combination, a casing, rotary crushing means within the casing, horizontally disposed separating means tangentially spaced from said crushing means for reception of material cast therefrom, and means for collecting the rejects overcast from said separating means.

9. In a machine of the class described, in combination, a casing, grinding media within the casing, including rotary means adapted to cast its product in an initially horizontal tangential direction, separating means tangentially spaced from said crushing means for reception of material cast therefrom, and means for collecting the rejects overcast from said separating means.

10. In a machine of the class described, in combination, a casing, grinding media disposed in the casing, said grinding media including rotary means adapted to cast its product in an initially horizontal direction, separating means tangentially spaced from said crushing means for reception of material cast therefrom, and means for collecting the rejects overcast from said separating means, said collecting means including a receptacle disposed exteriorly said casing.

11. In a machine of the class described, in combination, a casing, grinding media disposed in the casing, said grinding media including rotary means adapted to cast its product tangentially toward a wall of said casing, and separating means spaced tangentially from said rotary member and disposed adjacent said wall of the casing for reception of material cast from said rotary member.

12. In a machine of the class described, in combination, a casing, grinding media disposed in the casing, said grinding media including rotary means adapted to cast its product tangentially toward a wall of said casing, separating means spaced tangentially from said rotary member and disposed adjacent said wall of the casing for reception of material cast from said rotary member, said wall having an aperture aligned with said separating means, and collecting means adapted to receive material overcast from said separating means through said aperture.

13. In a machine of the class described, in combination, a casing, grinding media disposed in the casing, said grinding media including rotary means adapted to cast its product tangentially toward a wall of said casing, separating means spaced tangentially from said rotary member and disposed adjacent said wall of the casing for reception of material cast from said rotary member, said wall being separable from said casing and having an aperture aligned with said separating means, means for detachably securing said wall in said casing, and a receptacle presented exteriorly said wall for collecting material overcast from said separating means.

14. In a machine of the class described, in combination, a casing, grinding media disposed in the casing, said grinding media including rotary means adapted to cast its product tangentially toward a wall of said casing, separating means spaced tangentially from said rotary member and disposed adjacent said wall of the casing for reception of material cast from said rotary member, and means for supporting said separating means in said casing.

15. In a machine of the class described, in combination, a casing, a hammer mechanism in the casing, a grinding concave co-operable with the hammer mechanism for effecting an initially horizontal discharge of the product thereof, screening means disposed in the path of said discharged product for effecting gravity separation thereof, and means for collecting the rejected material overcast from said screening means.

16. In a machine of the class described, in combination, a casing, a rotary hammer mechanism in the casing, a grinding concave co-operable with the hammer mechanism for effecting an intially horizontal discharge of the product thereof, screening means including spaced bars disposed tangentially to the hammer mechanism and longitudinally in the direction of movement of said discharged product for effecting gravity separation thereof, and a chamber disposed in lateral relation to said bars for collecting the rejected material slidingly overcast from said bars.

17. Apparatus adapted for separating uncrushed material from crushed material in the product of a pulverizing machine, which comprises, in combination, means including a rotary hammer mechanism and a co-operating grinding concave for imparting an initially horizontal movement to said product, screening means disposed tangentially to the hammer mechanism adapted to gravitationally receive said product for effecting separation thereof, said screening means being adapted to slidingly support the material rejected thereby, whereby the latter may overtravel said screening means, and a chamber for collecting said overtraveled material.

In testimony whereof, we have signed our names to this specification.

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