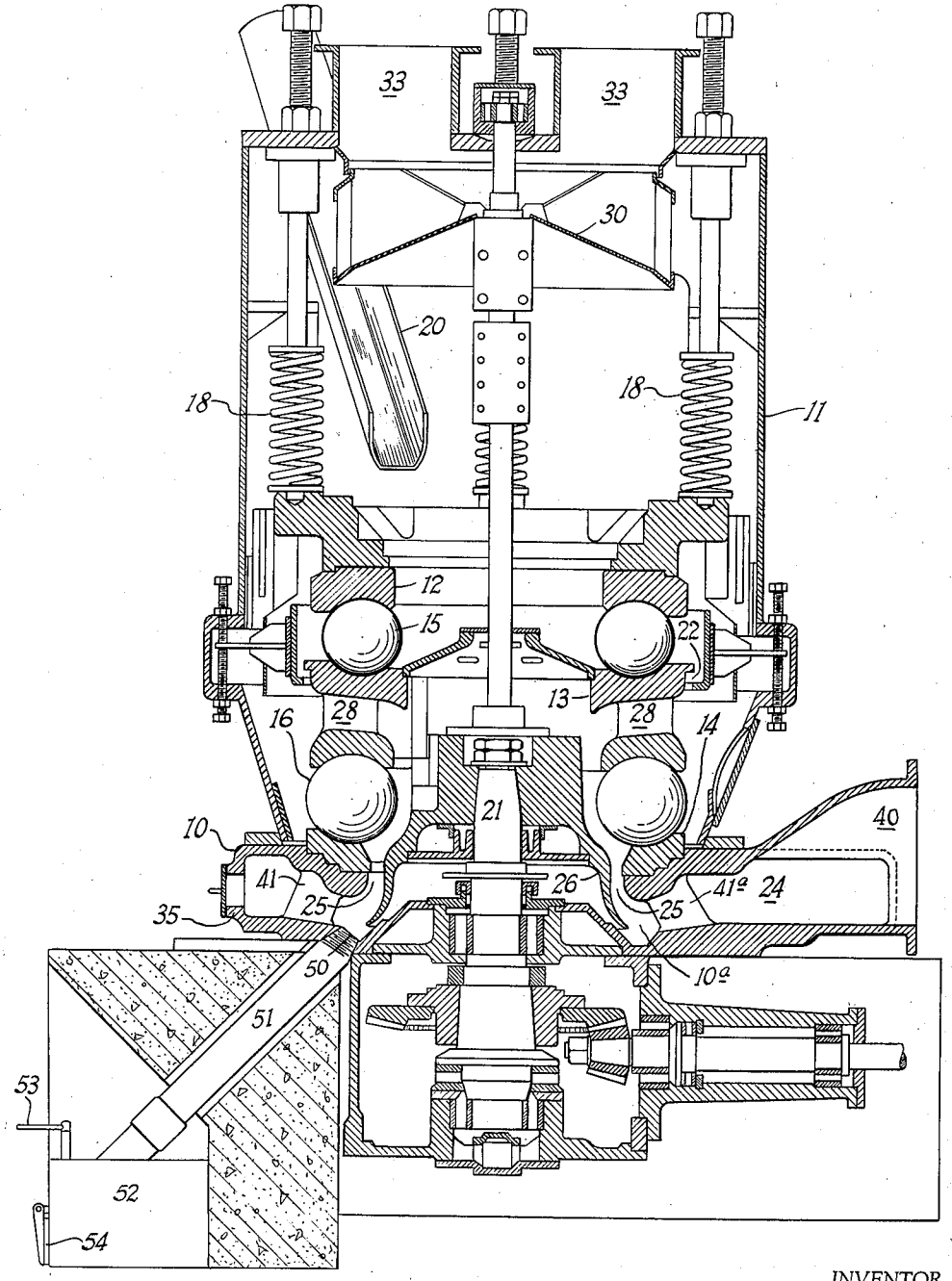
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PULVERIZER

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Fig. 1



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PULVERIZER

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Fig. 3

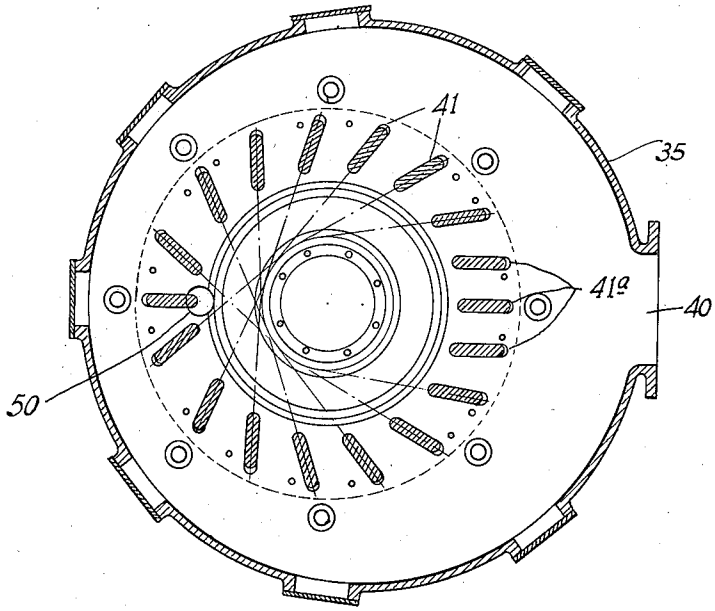
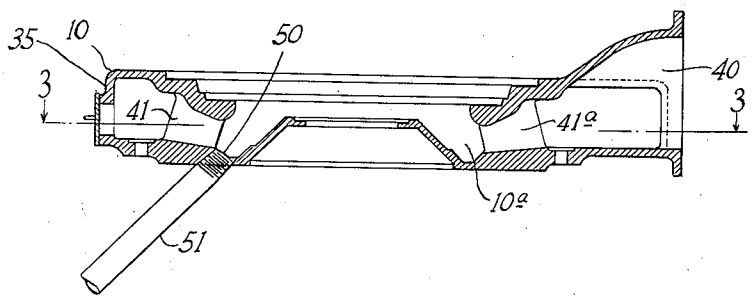


Fig. 2



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2,214,832

PULVERIZER

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Application April 6, 1937, Serial No. 135,217

6 Claims. (Cl. 83—45)

This invention relates in general to the construction and operation of pulverizers, and particularly to pulverizers in which the pulverized material is continuously removed from an annular grinding zone by a gaseous carrier medium, such as air, sweeping upwardly through the grinding zone and carrying the material pulverized to the desired fineness out of the pulverizer.

The main object of my invention is the provision of a pulverizer of the character described with a base construction providing a substantially uniform distribution of the carrier air introduced throughout the annular grinding zone and a relatively low air pressure drop through the base section. A further object is the provision of a pulverizer base construction in which the entering carrier air is distributed relative to the annular grinding zone in a manner which tends to facilitate the removal of pieces of pyrites and other heavy low grindability material dropping from the grinding zone into the air path of flow.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which is illustrated and described a preferred embodiment of my invention.

Of the drawings:

Fig. 1 is a sectional elevation of a pulverizer embodying my invention;

Fig. 2 is a view of the base section shown in Fig. 1; and

Fig. 3 is a horizontal section on the line 3—3 of Fig. 2.

The pulverizer shown in the drawings comprises a hollow base casting 10 supported on a suitable foundation and in turn supporting the remaining portion of the pulverizer which includes a substantially cylindrical casing 11 enclosing grinding parts forming upper and lower grinding stages through which the material to be pulverized successively passes. The grinding parts include a non-rotary top ring 12, a rotary intermediate ring 13, and a non-rotary bottom ring 14. A circular row of grinding balls 15 is positioned between the top and intermediate rings, and a similar row of balls 16 between the intermediate and bottom rings. Pressure springs 18 engage the top ring to exert a downward grinding pressure on the grinding parts. A feed spout 20 delivers the material to be pulverized to the inner side of the upper row of balls 15. The intermediate ring has a floating drive connection with a vertical drive shaft 21 arranged axially of the grinding rings and ball rows.

The material to be pulverized passes outwardly through the upper ball row through an annular adjustable ledge gap 22 to the outer side of the lower row of balls. The partly pulverized material then passes inwardly through the lower row of balls and on leaving the inner edge of the bottom grinding ring is swept up by an annular stream of carrier air from a circular wind box 24 formed in the base casting 10. The air stream passes upwardly through an annular throat 25 between the inner side of the bottom grinding ring and a skirt 26 carried by and rotatable with the drive shaft 21. The pulverized material is carried upwardly in suspension in the air stream and outwardly through ports 28 formed in the rotary intermediate grinding ring to the upper part of the pulverizer casing. A rotary bladed classifier 30 carried on an extension of the drive shaft 21 causes classification of the suspended material, the fine material and air passing inwardly between the classifier blades to outlet passages 33 in the top wall of the casing, while the coarse particles drop back to the grinding zones for further pulverization.

Pulverizers of the character described are particularly adapted for the pulverization of coal. When such pulverizers are incorporated in a pressure system, for example, an external fan is employed for delivering air under pressure to the wind box 24. With the paths of air and material flow described, a substantial air pressure drop will occur through the pulverizer. Since the fan requirements are determined by this pressure drop, it is desirable that the pressure drop be as low as possible for such flow paths. The air pressure drop through the base section of the pulverizer is substantially reduced by the construction hereinafter described.

It has also been found that certain coals have a relatively high percentage of material of low grindability, such as slate or pyrites. Pieces of such material pass with the coal stream through the successive grinding stages, but instead of being swept up by the air stream when leaving the inner side of the lower row of balls drop through the throat 25 into the subjacent enlarged annular portion 10a of the base casing which in effect forms a plenum chamber for the throat. It is necessary to provide for the removal of such material to prevent obstruction of the air flow path, and for this purpose one or more openings are

usually provided in the base casting through which such material may accumulate or pass to an external receptacle.

In accordance with my invention, and as shown particularly in Figs. 2 and 3, the outer peripheral wall 35 of the base casting has an eccentric arrangement relative to its central raised portion and to the drive shaft axis. A radially directed air inlet 40 in the wall 35 opens into the section of the wind box of greatest cross-sectional area. At each side of the inlet 40 the wind box progressively decreases in cross-sectional area to a minimum cross-sectional area at a point diametrically opposite the air inlet, thereby contributing to uniform air velocity conditions throughout the wind box. Integrally formed vanes or partitions 41 extending between the bottom and top of the base casting at spaced points serve as supporting partitions and also to form a circular series of passages directing the flow of air from the wind box into the plenum chamber 10a and annular throat 25. In accordance with my invention the vanes 41 have a special formation and arrangement which reduces the pressure drop from the inlet 40 to the throat 25. As shown in Figs. 2 and 3, the vanes have substantially parallel inclined outer and inner ends with their lower edge outwardly inclined and their upper edge following the converging curvature of the top wall of the base casting. The vanes are of narrow width with parallel sides terminating in rounded end portions. The vanes are arranged in two symmetrical groups at opposite sides of the center line of the air inlet 40 and base casting. Vanes 41a in front of the air inlet 40 have their longitudinal axes in alignment with the air inlet center line. The remaining vanes in each group have their outer edges symmetrically spaced, their longitudinal center lines tangential to the portion of a circle formed by the edge of the raised inner portion of the base casting opposite the air inlet, and their inner edges angularly spaced away from the air inlet relative to their outer edges. Each pair of vanes thus provides unsymmetrical converging sides of an air passage of inwardly decreasing cross-sectional area directed toward tht portion of the throat diametrically opposite the air inlet. The described vane arrangement has been found to result in a smaller pressure drop between the air inlet and throat than with all of the vanes radially arranged, for example.

With the carrier air entering the inlet 40 and divided into two streams, each passing through passages formed by a vane construction of the character described, it has been found desirable to locate a discharge opening for unpulverized material dropping through the throat at a point in the plenum chamber 10a diametrically opposite the air inlet. As shown, an opening 50 for this purpose is formed and so located in the bottom of the plenum chamber and connected by a discharge pipe 51 to an external receptacle 52 which is sealed by a gate 54 periodically opened by a lever 53 to remove the accumulated materials. The described direction of travel of the air between the vanes will tend to move any material falling through the throat at either side of the air inlet towards the common discharge openinp 50, so that the pulverizer will be substantially self-cleaning and obstruction of the air flow path avoided.

While in accordance with the provisions of the statutes I have illustrated and described the best form of my invention known to me, those skilled in the art will understand that changes may be made in the form of the apparatus and character of the carrier medium disclosed without departing from the spirit of the invention covered by my claims, and that certain features of my invention may sometimes be used to advantage without a corresponding use of other features. In the claims, the term "air" is used generically to cover any gaseous carrier medium suitable for removing pulverized material in the manner described.

I claim:

1. A pulverizer comprising grinding parts forming an annular grinding zone, means having an annular throat for the introduction of carrier air into said grinding zone, a wind box surrounding said throat, an air inlet symmetrically arranged relative to and opening into said wind box at one side thereof, and angularly spaced vanes defining the sides of a circular series of air passages between said wind box and throat, certain corresponding vanes at opposite sides of said air inlet being oppositely arranged with their longitudinal axes mainly substantially tangential to the axis of discharge of the portion of a circle concentric to said throat diametrically opposite said air inlet.

2. A pulverizer comprising grinding parts forming an annular grinding zone, means forming an annular throat for the introduction of carrier air into said grinding zone, a wind box surrounding said throat, an air inlet opening into said wind box, and angularly spaced vanes defining the sides of a circular series of air passages between said wind box and throat, certain corresponding air passages so defined at opposite sides of said air inlet being oppositely arranged in progressively different non-radial directions converging towards the portion of said throat away from said inlet opening.

3. A pulverizer comprising grinding parts forming an annular grinding zone, means forming an annular throat for the introduction of carrier air into said grinding zone, a wind box surrounding said throat and having a circumferential wall eccentrically arranged relative to said throat to form a chamber of progressively changing cross-sectional area, an air inlet symmetrically arranged relative to and opening into said wind box at its point of greatest cross-sectional area, and angularly spaced vanes defining the sides of a circular series of air passages between said wind box and throat, certain corresponding vanes at opposite sides of the axis of discharge of said air inlet being oppositely arranged at progressively different non-radial angles directed towards the portion of said throat diametrically opposite said air inlet.

4. A pulverizer comprising superposed grinding rings and a circular row of grinding balls forming an annular grinding zone, means including a hollow base section forming an annular throat for the introduction of carrier air past the inner side of said grinding zone, said base section surrounding said throat and having a circumferential wall eccentrically arranged relative to said throat to form a wind box of progressively changing cross-sectional area, an air inlet opening into said wind box at its point of greatest cross-sectional area, and angularly spaced vanes defining unsymmetrical sides of a circular series of air passages between said wind box and throat, said air passages being divided into similar oppositely arranged semi-circular groups at opposite sides of said air inlet, the air passages in each group being directed at progressively differ-

ent angles converging towards the portion of said throat diametrically opposite said air inlet.

5. A pulverizer comprising grinding parts forming an annular grinding zone, means forming an annular throat for the introduction of carrier air into said grinding zone and arranged to receive material dropping therefrom, a wind box surrounding said throat, an air inlet symmetrically arranged relative to and opening into said wind box at one side thereof, angularly spaced vanes defining the sides of a circular series of air passages between said wind box and throat, certain corresponding vanes at opposite sides of the axis of discharge of said air inlet being oppositely arranged at progressively different non-radial angles directed towards the portion of said throat diametrically opposite said air inlet, and a passage for the discharge of material opening into the bottom of said throat at a point substantially diametrically opposite said air inlet.

6. A pulverizer comprising grinding parts forming an annular grinding zone, means forming an annular throat for the introduction of carrier air into said grinding zone and arranged to receive material dropping therefrom, a wind box surrounding said throat and having a circumferential wall eccentrically arranged relative to said throat to form a chamber of progressively changing cross-sectional area, an air inlet symmetrically arranged relative to and opening into said wind box at its point of greatest cross-sectional area, angularly spaced vanes defining the sides of a circular series of air passages between said wind box and throat, certain corresponding air passages at opposite sides of the axis of discharge of said air inlet opening being oppositely arranged at corresponding progressively different angles directed towards the portion of said throat diametrically opposite said air inlet, and a passage for the discharge of material opening into the bottom of said throat at a point substantially diametrically opposite said air inlet.

JAMES C. HOBBS.

CERTIFICATE OF CORRECTION.

Patent No. 2,214,832. September 17, 1940.

JAMES C. HOBBS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 46, for "tht" read --the--; line 68, for "openinp" read --opening--; and second column, lines 23 and 24, claim 1, strike out the words "the axis of discharge of" and insert the same before "said", line 21, same claim; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of March, A. D. 1941.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)