

Jan. 2, 1934.

J. W. ARMOUR

1,941,923

BEATER ELEMENT FOR PULVERIZING APPARATUS

Filed Feb. 19, 1931

2 Sheets-Sheet 1

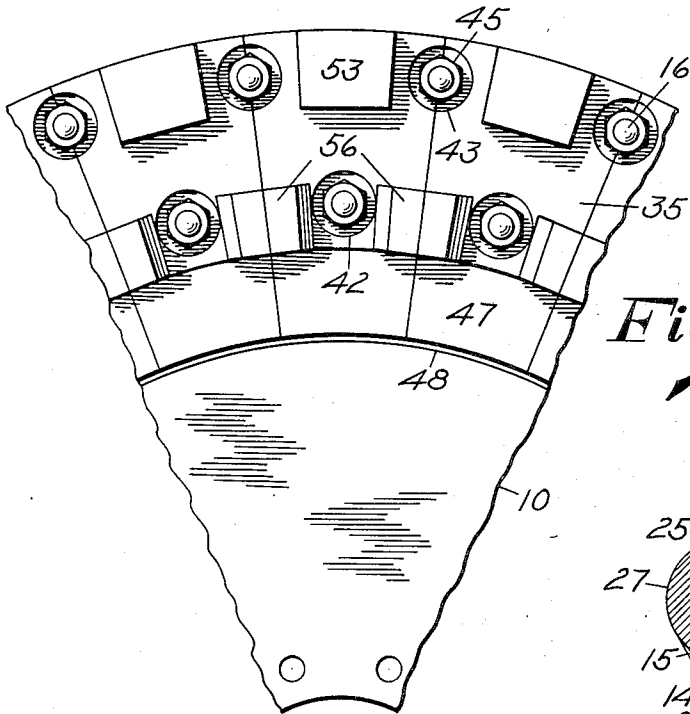


Fig. 1

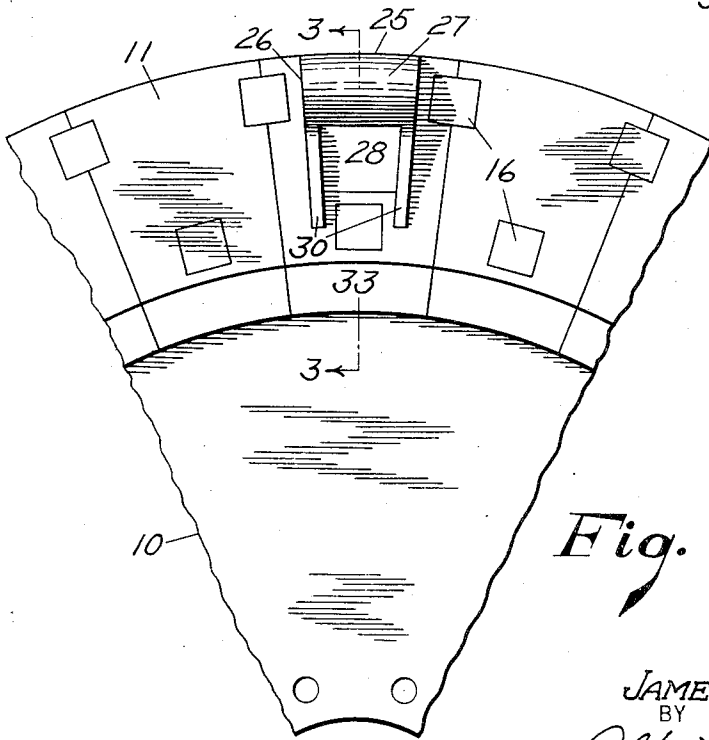


Fig. 2

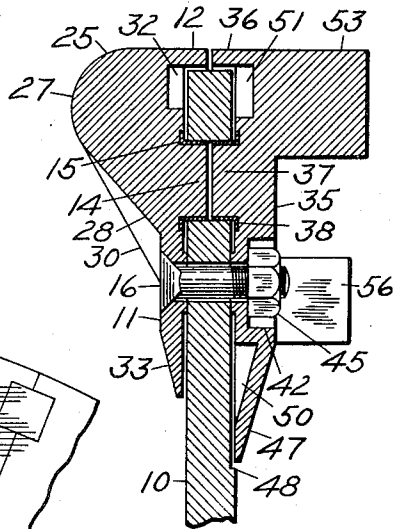


Fig. 3

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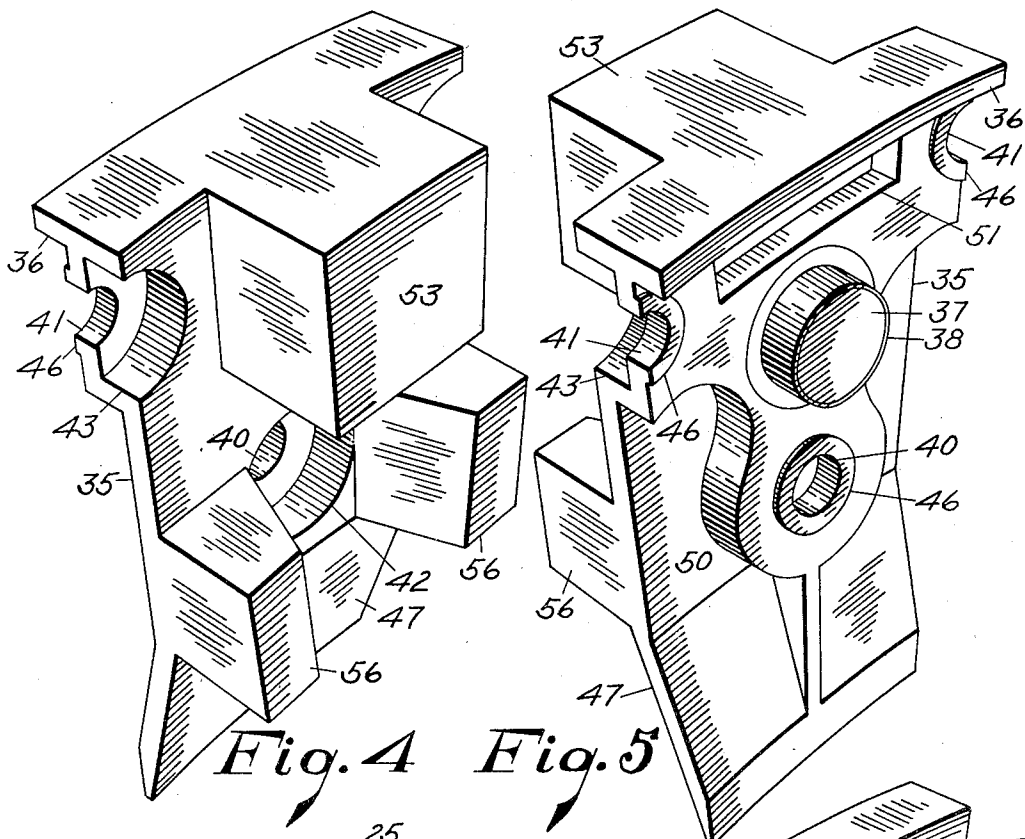


Fig. 4 Fig. 5

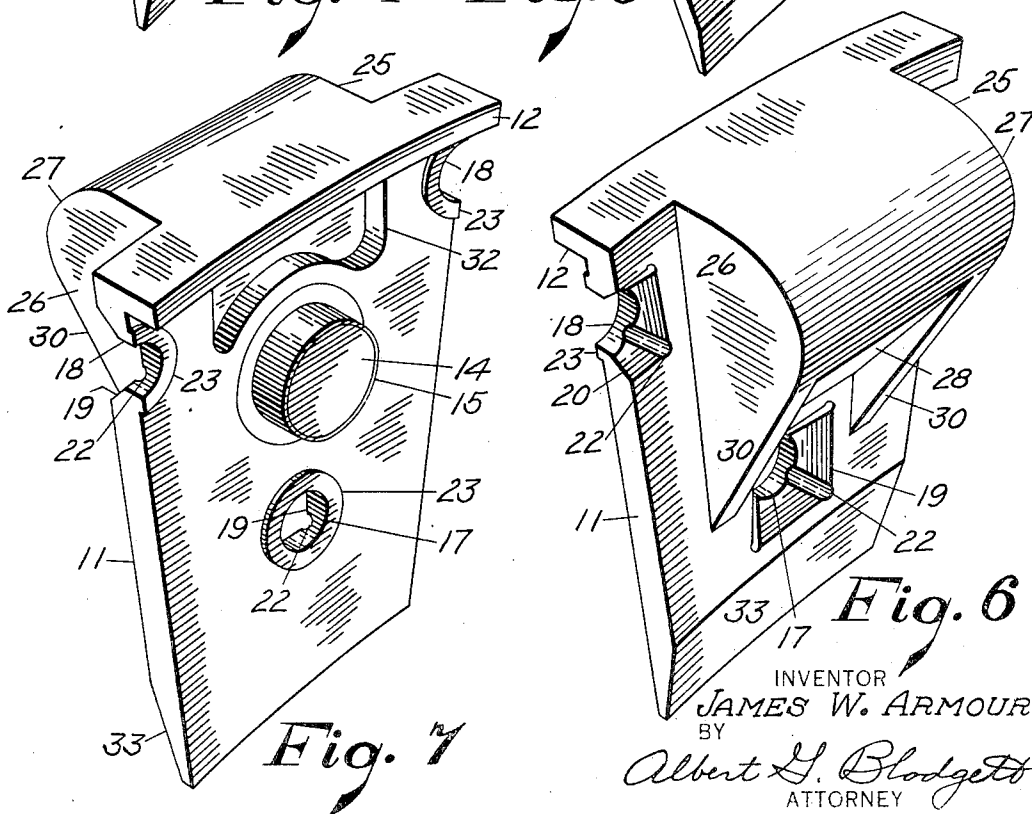


Fig. 6

Fig. 7

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BEATER ELEMENT FOR PULVERIZING APPARATUS

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2 Claims. (Cl. 83—11)

This invention relates to beater elements for pulverizing apparatus, and is an improvement over the construction disclosed in the patent to Craig, No. 1,714,080, dated May 21, 1929.

5 The apparatus shown in said prior patent comprises a rapidly rotatable disk mounted within a casing between an inlet opening and an outlet, and serving to divide the space within the casing into two pulverizing zones connected by an annular passage around the edge of the disk. 10 The outlet from the pulverizing chamber leads to a fan chamber having a peripheral discharge. Small segmental wear plates are mounted on both sides of the rotor disk adjacent to its periphery, in order to protect the disk from contact with the material being pulverized. A few of the wear plates on the inlet side of the rotor are provided with integral projections forming agitator pegs, which assist the flow of air through the machine and prevent excessive accumulation of material in the bottom of the casing. The plates on the outlet side of the rotor are formed with integral projections which serve as grinding pegs and perform most of the actual pulverizing of the material.

Machines of this type are frequently used in power plants to pulverize coal for combustion purposes. The space available for installation of the pulverizer is sometimes such as to render it desirable to provide the fan chamber discharge on the opposite side of the apparatus from the customary arrangement. This necessitates rotating the pulverizer disk in the opposite direction, in order that the fan may operate efficiently and the pulverized coal and air may enter the fan chamber discharge pipe properly. It has been found that the beater elements of the said prior patent will not operate satisfactorily when revolved in the reverse direction, for under these conditions the projecting pegs do not sufficiently protect the fastening bolts from wear, and they are rapidly destroyed by the abrasive action of the coal. It has therefore been considered necessary heretofore to manufacture both right hand and left hand beater elements for machines of this type, and to supply elements of the proper hand to go with the desired direction of rotation. This has not only added to the cost of manufacture, but it has also increased the possibility of mistake in constructing machines and in ordering repair parts.

It is accordingly one object of the invention to provide a beater element for a pulverizing apparatus of the type shown in the said Craig patent which will operate properly in either direction of

revolution without excessive wear on the fastening bolts, whereby all necessity for right and left hand elements is eliminated.

The agitator pegs disclosed in the said prior patent are massive projections integral with a comparatively thin supporting wear plate. These parts are ordinarily made of white cast iron, unannealed, and the extreme variation in thickness in a single casting has caused internal strains in the metal which have sometimes resulted in cracking of the plate between the bolt holes. Such a crack is extremely dangerous in a rotating part of a high speed pulverizing apparatus.

It is accordingly a further object of the invention to provide a massive metallic beater element and a comparatively thin wear plate integral therewith which will be free from the possibility of cracking caused by internal strains in the metal.

With these and other objects in view, as will be apparent to those skilled in the art, my invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings illustrating one embodiment of my invention and in which like reference numerals indicate like parts,

Fig. 1 is an elevation of a portion of a pulverizer rotor, viewed from the discharge side;

Fig. 2 is an elevation of the opposite side of the rotor shown in Fig. 1;

Fig. 3 is a slightly enlarged section on the line 3—3 of Fig. 2;

Fig. 4 is a perspective view of one of the unit cast wearing plates and pulverizing elements, as used in the second pulverizing zone;

Fig. 5 is a perspective view of the member shown in Fig. 4, looking from the opposite side thereof;

Fig. 6 is a perspective view of a unitary wear plate and agitator peg, as used in the first pulverizing zone; and

Fig. 7 is a perspective view of the member shown in Fig. 6, looking from the opposite side thereof.

The embodiment illustrated in the drawings comprises a flat circular rotor disk 10 which is identical with the disk disclosed in the patent to Craig No. 1,714,080 and is intended to be rotatably mounted in a pulverizing apparatus of the same general type as that shown in said patent. In order to protect this disk from the abrasive action of the material being pulverized, I provide a plurality of flat comparatively thin wear plates 11, made in segments and each shaped as a circular ring sector. These plates are mounted closely adjacent to each other on the peripheral portion of the rotor disk and on the side thereof

toward the inlet (not shown). The outer edge of each plate is provided with a laterally projecting flange 12 which overlies the periphery of the rotor disk and prevents any contact thereby with the material undergoing pulverization.

Each of the plates 11 is provided on its rear side, which comes next to the disk, with a cylindrical projection 14 which fits in a similarly shaped opening in the rotor disk and serves to locate the plate properly and hold it against centrifugal force. This projection 14 is preferably cast inside of a flanged ferrule 15, as described in said prior patent to Craig, to insure a smooth and accurate fit. The plates are held against the disk by means of plow bolts 16, which are preferably arranged in two circular rows. Each bolt in the inner row is located on the radial center line of one of the plates 11, and each bolt in the outer row is located on the joint between adjacent plates. In order to accommodate these bolts, each plate has a bolt hole 17 on its radial center line and a half bolt hole 18 on each side edge near the outer peripheral edge of the plate. These bolt holes 17 and 18 are countersunk at 19 and 20 respectively to receive the square pyramid shaped heads of the bolts which at assembly are flush with the surface of the plates. The corners of the countersunk portions are grooved at 22 to insure proper seating of the bolt heads. Raised portions or bosses 23 are provided at the inner ends of the bolt holes to contact with the disk and form a three-point support. These bosses prevent any bending stresses from reaching the plates as the bolts are tightened.

Certain of the plates 11 are provided on the exposed face with a laterally extending projection 25 which serves as an agitator peg and by sweeping through the lower portion of the casing prevents any accumulation of coarse material at this point. There are preferably only a small number of these pegs 25, so that tramp iron may be readily disposed of in the manner described in said prior patent.

The agitator peg 25 is located directly on the radial center line of the plate 11 and flush with the outer periphery of the plate. The side faces 26 of the peg are substantially radial and the outer surface of the peg is curved with a comparatively large radius at 27 and slopes gradually inwardly at 28 to the plate close to the bolt hole 17. A pair of ribs 30 form continuations of the side faces 26 of the peg and extend at each side of the bolt hole 17. These ribs 30 not only increase the area of the side faces and thus provide an additional fan action to assist the flow of air through the machine, but they also greatly strengthen the plate 11 between the bolt holes 17 and 18. There is therefore much less danger of the plate 11 cracking as a result of internal strains in the metal caused by the great difference in section between the massive peg and the thin plate. A recess 32 may be provided in the back of the plate between the locating projection 14 and the flange 12. This lightens the casting without affecting its wearing qualities and aids in obtaining more uniform cooling during the casting operation. The exposed face of the plate may be beveled at 33 adjacent its inner edge to avoid a ledge which might be struck by tramp metal.

On the other side of the disk 10 toward the outlet (not shown) I provide a second series of wear plates 35 which in certain respects are similar to the plates 11. Each plate 35 is likewise shaped as a circular ring sector and has a flange

36 which at assembly overlies the peripheral edge of the rotor disk. A cylindrical projection 37, preferably cast in a flanged ferrule 38, extends from the rear face of the plate and fits an opening in the disk, thereby serving to locate the plate properly on the disk. A bolt hole 40 is provided on the radial center line of the plate, and a half bolt hole 41 on each side edge near the outer peripheral edge of the plate. These bolt holes 40 and 41 are provided with cylindrical counterbores 42 and 43 respectively to receive the hexagonal nuts 45 of the plow bolts 16. Raised bosses 46 are formed at the inner ends of the bolt holes to provide a three-point contact with the disk. The exposed edge of the plate is beveled at 47 adjacent its inner edge to avoid a sharp internal corner at assembly, and the disk 10 is provided with a shoulder 48 close to the inner edge of the plates to prevent the material being pulverized from flowing beneath the plates and thus abrading the rotor. The rear face of each plate 35 is preferably recessed at 50 around the bolt holes and at 51 between the projection 37 and the flange 36, as shown particularly in Fig. 5, in order to reduce the weight of the casting as much as possible.

The exposed face of each plate 35 is provided with integral projecting pegs which cooperate with stationary pegs (not shown) to effect fine pulverization of the material delivered to the apparatus. One large peg 53 of substantially rectangular cross section is located on the radial center line of the plate with its outer face flush with the outer edge of the plate and its two side faces arranged in radial planes. This peg is directly between the bolt holes 41 and equally spaced from each. Hence in operation the pegs 53 will protect the bolts in the outer row from wear regardless of the direction of revolution. At the sides of the bolt hole 40 and spaced inwardly from the peg 53 I provide two smaller pegs 56 which are preferably arranged with their side faces flush with the edge of the plate.

At assembly, as shown in Fig. 1, each peg 56 is located closely adjacent to a peg 56 on the adjoining segment, and in effect these two adjacent small pegs form a single large peg. The pegs 53 form an outer annular row, with a bolt located between each pair of pegs, and the pegs 56 form an inner annular row, with a bolt likewise located between each pair of pegs. Each bolt has a peg arranged close to it on each side, so that it is well protected from abrasion regardless of the direction of revolution. The peg arrangement is symmetrical about the radial center line of the plate, and there is no need of right and left constructions.

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

1. A beater element for a pulverizing apparatus comprising a rotor wear plate shaped as a circular ring sector, an integral peg extending from one face of the plate near the outer peripheral edge thereof, and a pair of pegs extending from said face and spaced inwardly from the first peg toward the axis, all of said pegs being located in a symmetrical arrangement relative to the radial center line of the plate.

2. A beater element for a pulverizing apparatus comprising a rotor wear plate shaped as a circular ring sector, said plate having a bolt hole on its radial center line and a half bolt hole at each side edge near its outer periphery, a large peg projecting from the plate between said half bolt

holes, and a small peg projecting from the plate at each side of said first mentioned bolt hole, the small pegs being flush with the side edges of the plate, and the entire structure being symmetrical about its radial center line, the element being so constructed that when it is assembled with

other similar elements on a rotor disk the large pegs will form an outer annular row of pegs and each pair of small pegs on adjacent elements will form in effect a single large peg, said last mentioned pegs providing an inner annular row.

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