Aug. 12, 1930. W. A. WHITE 1,772,974

PULVERIZER

Filed July 11, 1929 2 Sheets-Sheet 1

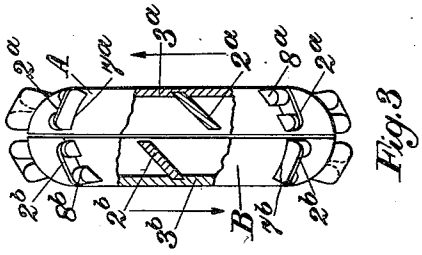


Fig. 3

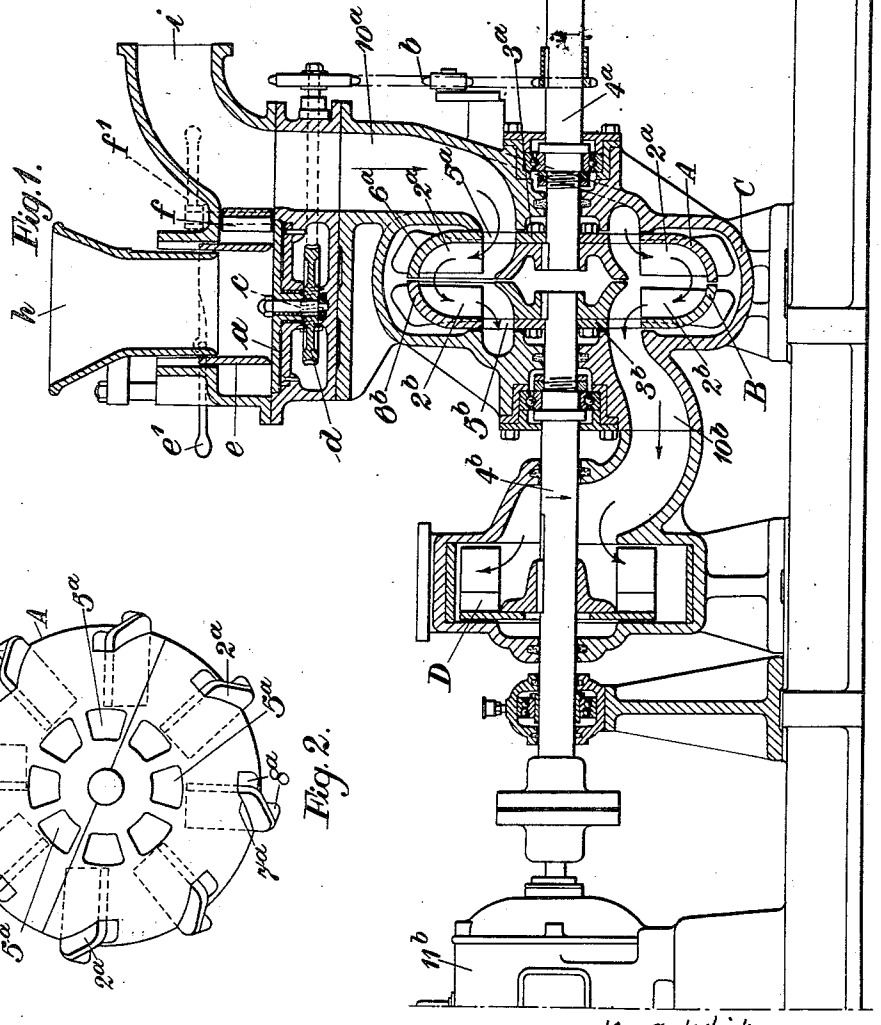


Fig. 1.

Fig. 2.

W. A. White
INVENTOR

By: Marks & Clerk
ATTYS.

Aug. 12, 1930. W. A. WHITE 1,772,974

PULVERIZER

Filed July 11, 1929 2 Sheets-Sheet 2

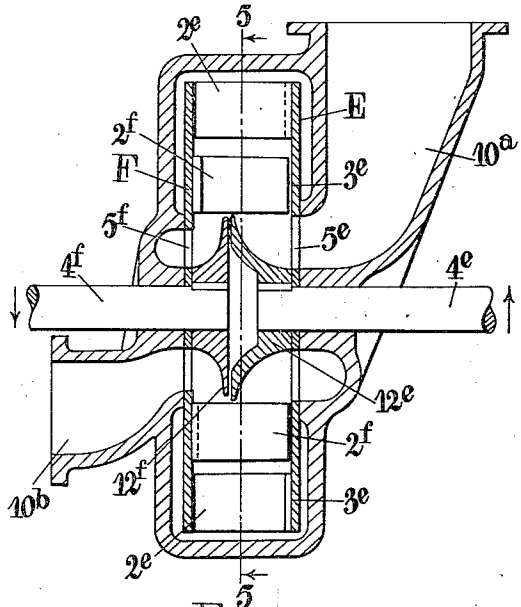


Fig. 4

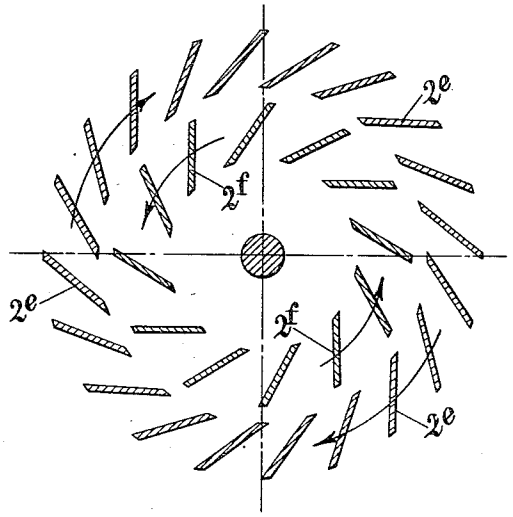


Fig. 5

W. A. White
INVENTOR

By: Marks & Clark
Attys.

Patented Aug. 12, 1930 1,772,974

UNITED STATES PATENT OFFICE

WILLIAM ALBERT WHITE, OF HEBBURN-ON-TYNE, ENGLAND

PULVERIZER

Application filed July 11, 1929, Serial No. 377,545, and in Great Britain August 21, 1928.

The invention relates to pulverizers and especially those for reducing coal to powder for land or marine power plants.

The main object of the invention is to improve the efficiency of such apparatus.

With this object, the invention consists in the combination of elements hereinafter described and particularly pointed out in the claims.

Referring to the accompanying diagrammatic drawings:—

Figure 1 shows an elevation for the most part in section of one form of the invention in which the two sets of blades are disposed at the same distance from the axis of rotation.

Figure 2 shows a side elevation of one of the blade-carrying elements and

Figure 3 an end elevation partly in section of the two blade-carrying elements in their relative working position;

Figure 4 shows a modified form of pulverizer in which one set of blades is disposed outside the other; while finally

Figure 5 shows a section through the blades taken on the line 5—5 of Figure 4.

Arrows in the different figures show the direction of rotation of the parts to which they relate.

In carrying the invention into effect according to the illustrative form shown in Figures 1, 2 and 3, the pulverizer itself consists of two juxtaposed co-axial shrouds, A, B, rotatable in opposite directions, and carrying respectively beater blades, 2^a, 2^b, disposed at the same radial distance from the axis of rotation.

The shrouds, A and B, are similar, corresponding parts in or associated with the two shrouds being denoted in the figures by the same numeral with the appropriate suffix "*a*" or "*b*."

The shroud, A, to be described by way of example, takes the form of a flat centre plate, 3^a, or the like mounted on a shaft or spindle, 4^a, and provided with apertures, 5^a, for the incoming material, the peripheral portion, 6^a, of the shroud being dished towards the juxtaposed shroud in such a way that the cross-section of the dished portion approximates to a quarter of a circle.

The beater blades, 2^a, themselves which take the form of flat plates or webs, project inwardly from their shrouds and are inclined away therefrom (see Figure 3) about a substantially radial axis in a direction opposite to the direction of rotation so as to throw the material against the juxtaposed shroud.

Preferably, the beater blades are renewable and for this purpose may be introduced radially through appropriately-angled slots, 7^a, in the peripheral part, 6^a, of the shroud and secured to lugs, 8^a, thereon, radial grooves, 9^a, being provided in the flat central part, 3^a, of the shroud to assist in positioning the blades.

In the case of the shroud, B, the apertures, 5^b, serve for the outgoing material.

Finally, the oppositely-running blade-carrying shrouds are enclosed in a suitable casing C, provided with the necessary ducts, 10^a, 10^b, respectively for the incoming and outgoing material.

The shafts or spindles, 4^a, 4^b, on which the two juxtaposed and oppositely-running shrouds are mounted are disposed with their axes horizontal and are separately driven by the electric motors, 11^a, 11^b, or alternatively, they may be geared together and driven from a single motor.

The coal to be pulverized is fed to the pulverizer by any appropriate means such as the well-known rotating table, indicated at *a*, and driven by a chain drive, *b*, and worm and wormwheel, *c* and *d*, from the pulverizer shaft, 4^a.

In association with the table, *a*, a sleeve, *e*, with adjusting handle, *e'*, and scoop, *f*, with adjusting handle, *f'*, are also provided, while the hopper receiving coal from the bin or the like is shown at *h*, and the hot-air inlet at *i*.

The coal enters through the apertures, 5^a, more or less towards the centre of the shroud, A, is pulverized by attrition and drawn off through the apertures, 5^b, more or less towards the centre of the shroud, B, by a fan, D, mounted as shown by way of example in Figure 1, on the shaft, 4^b, of the pulverizer, the general course of the coal through the apparatus being shown by arrows.

According to a modified form of the inven-

tion, (see Figures 4 and 5) the blades associated with the two shrouds, E and F, are at different radial distances from the axis of rotation.

With the same system of reference symbols as above, the shroud, E, to be described by way of example, comprises a flat plate, 3^e, the plane of which is disposed at right angles to the axis of rotation, this plate carrying a set of beater blades, 2^e, arranged equidistant in a ring and projecting towards the co-acting blade-carrying element or shroud, F. A working clearance is provided between the blade ends of each such set and the opposed blade-carrying element.

The beaters, 2^e, themselves consist of flat plates disposed in planes perpendicular to the shroud carrying them, the planes of the blades being non-radial (see Figure 5) so that, if produced, they do not pass through the axis of rotation of the blade-carrying elements.

The rings of beater blades on the two shrouds, E and F, are disposed one outside the other at different radial distances so that the material to be pulverized after passing through appropriate apertures, 5^e, near the centre of the shrouds, E, is directed radially outwards by a suitably shaped fitting, 12^e, keyed to the shaft, 4^e, and is thrown by the inner set of inclined blades, 2^f, radially outwards against the second set, 2^e, the inclination of the blades of the second set, 2^e, being such as to tend to throw the material back against those of the first set, 2^f.

To secure this action the inner edges of the beater blades of the inner set, 2^f, precede the outer edges as the beater element rotates, whereas in the outer set, 2^e, the inner edges of the beater blades follow the outer edges. (See Figure 5.)

The material thus pulverized is drawn off by a fan or otherwise as before through suitably shaped ducts including passages, 5^f, through the plate shroud of the second element and a directing fitting, 12^f, keyed to its shaft, 4^f.

As in the form of the invention above described, the two shafts, 4^e and 4^f, may be supplied with separate motors driving them in opposite directions or they may be geared together and driven from a single motor.

As opposed to the usual pulverizers now in use having only one rotating set of blades, a pulverizer constructed in accordance with the present invention for the same speed of revolution has an increased output and efficiency.

I wish it to be understood that variations may be made in the details of construction of the improved pulverizer without departing from the spirit of the invention, while it is applicable not only to the pulverizing of coal but of many other materials.

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

1. A pulverizer comprising in combination, a casing and disposed therein co-axial relatively-rotatable elements, each comprising a shroud with apertures near the axis thereof and mounted thereon a series of beater blades directed towards the other shroud, said series being so angled as to tend to throw the material to be pulverized from one series to the other and thus maintain the material in the zone of pulverization; together with feeding and withdrawal ducts in operative relation to the apertures in said shrouds and disposed on opposite sides of said casing.

2. A pulverizer as claimed in claim 1, in which each of said shrouds is in rigid association not only with said beater blades but also with a centrally-disposed directing member, said apertures through said shrouds being in operative juxtaposition to said directing member and at a distance from said axis less than the distance of said beater blades.

3. A pulverizer as claimed in claim 1, in which said shrouds are peripherally dished towards one another, said beater blades being included at least in part within said peripherally-dished portions.

4. The combination of a pulverizer shroud having slots and detachable beater blades carried by said shrouds and positioned in relation thereto by help of said slots.

5. The combination of a pulverizer shroud having slots and radially-disposed locating means; and detachable beater blades carried by said shrouds and positioned in relation thereto by help of said slots and said locating means.

6. A pulverizer comprising in combination, co-axial relatively-rotatable elements, each comprising an apertured shroud and carried thereby a series of beater blades, shafts on which said elements are respectively mounted, a duct leading material to be pulverized to one of said shrouds, a duct leading pulverized material away from the other of said shrouds, said ducts registering with said apertures and shaped directing means in rigid association with said shrouds and disposed nearer the axis of rotation than said apertures, said directing means conforming with said leading ducts.

7. A pulverizer comprising in combination, co-axial rotatable elements, each comprising a shroud and mounted thereon a series of beater blades, juxtaposed shafts arranged end to end and respectively carrying said shrouds together with oppositely-disposed shaped directing means mounted respectively on the adjacent ends of said shafts.

In testimony whereof I have signed my name to this specification.

WILLIAM ALBERT WHITE.