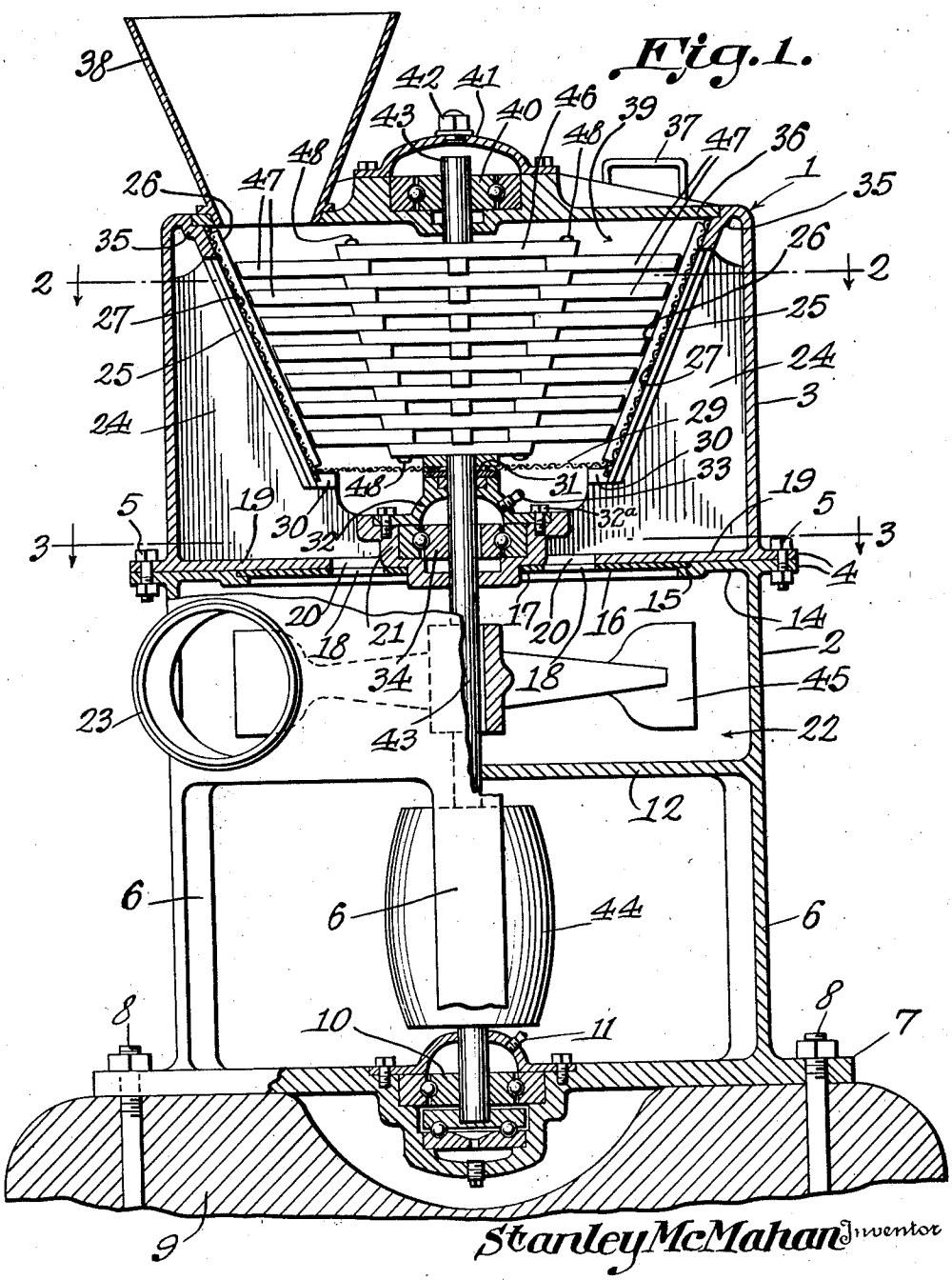
Oct. 23, 1934. S. McMAHAN 1,977,771

PULVERIZER

Filed Oct. 15, 1932 2 Sheets-Sheet 1

Fig. 1.



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Filed Oct. 15, 1932 2 Sheets-Sheet 2

Fig. 2.

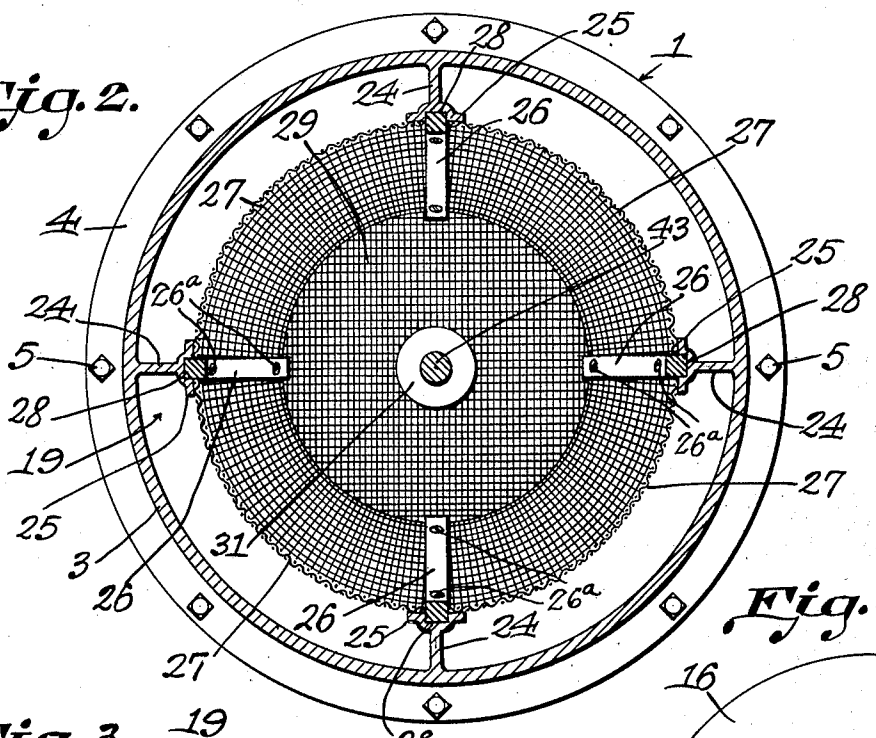


Fig. 3.

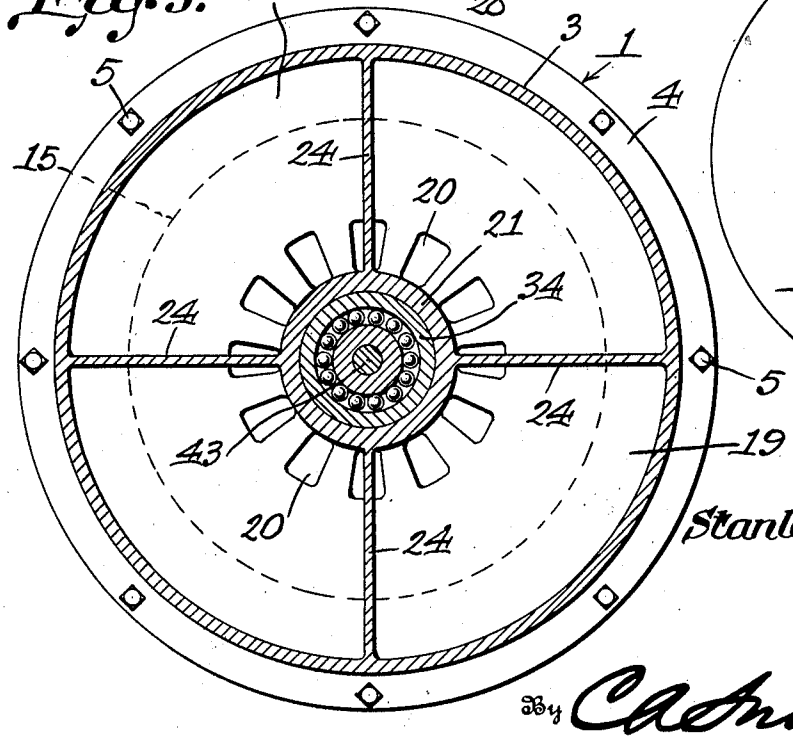
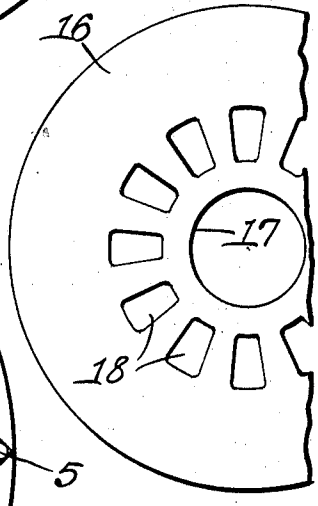


Fig. 4.



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PULVERIZER

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Application October 15, 1932, Serial No. 638,022

4 Claims. (Cl. 83—11)

The device forming the subject matter of this application is a hammer mill, adapted to be used for the grinding of hay, grain, corn on the ear, coal and similar substances, the machine being of use, in some forms, for grinding stone. The machine operates on the well known principle of rapidly moving steel hammers, which pass in close relation to a steel screen, there being, in the screen, numerous holes of a size suitable to the material to be ground. The material to be ground is inserted between the rapidly moving hammers, on the one hand, and the screen on the other hand.

One object of the invention is to provide a device of the class described, in which the shaft that carries the hammers is vertical, the hammers acting, in a horizontal direction, upon a screen, the axis of which is vertically disposed. By arranging the shaft vertically, and by having the hammers operate as described, the hammers can cooperate with the screen, around the entire circumference of the screen, whereas, when the shaft is disposed horizontally, the hammers working vertically, it is practicable to extend the screen no more than approximately half way around the rotor which carries the hammers. By arranging the shaft and the hammers as specified, a finely balanced grinding action is produced, less power is required to operate the machine, and the output per horse power unit will be increased.

Another object of the invention is to provide the screen, which is made in sections, with bars or ribs which project inwardly beyond the screen and form anvils, against which the hammers pulverize the material.

Another object of the invention is to provide a novel suction mechanism, preferably a fan, which is an integral part of the machine, the suction mechanism operating on the outside of the screen to remove the pulverized material, and to deliver the pulverized material to the place where the material is ejected from the machine.

A further object of the invention is to provide novel means interposed between the screen and the fan, to regulate the suction produced by the fan, as well as the pressure created by the fan for the ejection of the pulverized material, it being possible to regulate the suction and the pressure from zero to full suction and full pressure, the capacity of the machine being regulated accordingly, and power being saved.

It is within the province of the disclosure to improve generally and to enhance the utility of devices of that type to which the invention appertains.

With the above and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed, may be made within the scope of what is claimed, without departing from the spirit of the invention.

In the accompanying drawings:

Fig. 1 shows in vertical longitudinal section, a device constructed in accordance with the invention, parts being in elevation;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a plan of the suction and pressure regulator, parts being broken away.

The device forming the subject matter of this application preferably is made of metal throughout. It comprises a tubular, vertical casing 1, including a lower member 2 and an upper member 3, having cooperating flanges 4, held together, to unite the members 2 and 3 of the casing, by securing elements 5. The machine may be supported conveniently on legs 6, connected to the lower member 2, and joined to a base 7, which, in its turn, is secured by anchors 8 to a foundation 9. The lower member 2 of the casing 1 may be made in various ways, without departing from the spirit of the invention.

The base 7 carries an anti-friction journaling and thrust bearing 10, which can be lubricated by any appropriate means, indicated at 11. Across the lower member 2 extends a partition 12, and the lower member 2 has a top 14, provided with an annular seat 15, in which is placed, for rotary adjustment, a disk-like suction and pressure regulator 16, which is shown in Fig. 4. The regulator 16 has a central opening 17, and is provided with draft openings 18, arranged around the central opening 17.

The upper member 3 of the casing 1 has a bottom 19, disposed above the regulator 16, and holding the regulator in place for rotary adjustment. It can be seen in Fig. 3 that the bottom 19 of the upper member 3 has openings 20, corresponding to the openings 18 of the regulator 16, it being possible to adjust the regulator circumferentially, so that its openings will register more or less with the openings of the bottom 19. The bottom 19 carries a hollow hub 21, the lower portion of which is received in the opening 17 of

the regulator 16, so as to aid in journaling the regulator for rotary adjustment.

The partition 12, on the one hand, and the top 14, together with the regulator 16, on the other hand, cooperate to form a receiving and suction chamber 22, having a lateral outlet 23, located near to the periphery of the lower member 2.

Radial partitions 24 are connected to the hollow hub 21 to the bottom 19 of the upper member 3, and to the outer wall of the upper member 3. On the inner edges of the partitions 24, there are transversely enlarged heads 25, as shown in Fig. 2, these heads being provided on their inner surfaces with grooves 28, in which inwardly projecting ribs 26, of any suitable metal, are removably secured, at 26*a*. There may be any desired number of the ribs 26 and they are square in cross section, so that they may be reversed to present new, sharp edges to the material to be ground. Screen sections 27 extend between the ribs 26 and are supported on the heads 25. The screen sections 27 form the frustum of an inverted cone, as Figs. 1 and 2 will indicate. The bottom of the screen is marked by the numeral 29, and is supported, as shown at 30 in Fig. 1, on the partitions 24. It will be understood that the screen 27—29 may be constructed in various ways, as to mechanical details, without departing from the spirit of the invention. The bottom 29 of the screen has a bearing 31, seated in a hollow cap 32, the cap in its turn, being seated, and removably secured at 32*a*, in the hollow hub 21, and forming part of an anti-friction bearing 34.

There is an annular seat 35 in the top of the upper member 3 of the casing 1, and in this seat, a closure plate 36 is detachably secured, in any desired way, the closure plate having a handle 37. The closure plate carries a hopper 38, discharging into the pulverizing chamber 39 that exists within the screen 27—29. An anti-friction bearing 40 is carried by the closure plate 36 and is covered by a removable cap 41 having lubricating means 42.

A vertical shaft 43 is journaled for rotation in the bearings 10, 34 and 40, and extends through the partition 12. Any suitable means may be supplied for imparting rotation to the shaft 43. It is suggested that a pulley 44, shown in Fig. 1, be used, although the driving means for the shaft is to a considerable degree immaterial. A combined suction and blower fan 45 is secured to the shaft 43 and is disposed in the chamber 22. A rotor 46 is secured to the shaft 43 and is located in the pulverizing chamber 39. Horizontally swinging hammers 47 are pivoted at 48, at their inner ends, to the peripheral portion of the rotor 46, and the outer ends of the hammers move close enough to the ribs 26 to engage and pulverize the material, when the shaft 43 is rotated to carry the hammers 47 around in an orbit.

Although the fan wheel 45 is the preferred construction, some installations require the sacrificing of the advantages of the fan wheel in the interest of expediency. Under such circumstances, the fan wheel is omitted, and a separate exhaust mechanism (not shown) is connected to the outlet 23, the change being of so well-known a construction that the drawings have not been encumbered by a showing of it.

In practical operation, the shaft 43 is rotated by the pulley 44 or its equivalent. The fan 45 creates suction in the upper member 3 of the casing 1, on the outside of the screen 27—29, to aid in removing the pulverized material. The material is drawn downwardly by suction, through the openings 20 of the bottom 19, and the openings 18 of the regulator 16, the effective size of the openings 18 being changed as occasion may require, by adjusting the regulator 16 circumferentially. This adjustment also regulates the blast produced at the outlet 23, through which the pulverized material leaves the machine. The partitions 24 have the effect of aiding in producing a marked vertical draft.

The material to be pulverized is introduced into the chamber 39 through the hopper 38, and the swinging hammers 47 catch the material against the ribs 26 and bring about the pulverizing, the pulverized material passing through the screen 27—29, which regulates the size of the material.

Considered as a whole, the machine will be found thoroughly effective to carry out the objects stated in the opening portion of this specification.

The machine is adapted to be used, among other purposes, for pulveringing coal or other fuel, and feeding the pulverized material directly into a furnace, for burning. By using screens 27—29 having holes of proper dimensions, the size of the fuel can be regulated positively, and all of the fuel can be ground to a uniform degree of fineness, which can be varied positively to suit the use for which the pulverized fuel is intended.

The power consumption, per unit of material ground is greatly reduced, because of the vertical construction shown in the drawings and hereinbefore described. The ease with which ground fuel can escape, under both gravity and suction, and the reduction of unbalanced friction and friction of stock, as well as all other sorts of friction, make the machine peculiarly efficient.

The quantity of air passing through the machine can be positively governed, thereby making the proper relation of air to fuel or other material ground, absolutely correct at all times. This proportion must be maintained absolutely correct, for the most economical burning of any fuel. The machine is a grinder or pulverizer in which both the fineness of the material, after being pulverized, and the proportion of fuel to air, can be regulated positively.

Referring to Fig. 1, the device, broadly considered, comprises a casing 1, a foraminous receptacle 27—29 for the material to be pulverized, located within the casing 1, there being a space between the casing and the receptacle, about the receptacle, a vertical shaft 43 journaled in the casing, horizontal hammers 47 in the receptacle 27—29, means 48 for pivotally connecting the hammers with the shaft 43, and means 44 for rotating the shaft to cause the hammers to move in an orbit, entirely around the receptacle.

Having thus described the invention, what is claimed is:

1. A pulverizer of the class described comprising a casing, radial partitions in the casing and provided on their inner edges with transversely enlarged heads having grooves, ribs seated in the grooves and provided with cutting edges, the ribs being reversible in the grooves to present new cutting edges, screen sections extended between the ribs and supported on the heads, a shaft journaled in the casing, and hammers carried by the shaft and cooperating with the ribs and the screen sections.

2. A pulverizer of the class described, comprising a casing having a bottom provided with a hub, there being an outlet opening in the bottom, radial partitions joined to the wall of the casing and to the hub and provided in their inner edges with grooves, ribs seated in the grooves and provided

with cutting edges, the ribs being reversible in the grooves to present new cutting edges, screen sections extended between the ribs, a shaft journaled in the hub, and hammers carried by the shaft and cooperating with the ribs and the screen sections.

3. A pulverizer of the class described, comprising a casing made up of upper and lower members, means for joining the upper and lower members together detachably, the upper member having a bottom, and the lower member having a top, the top and the bottom having cooperating outlet openings, the bottom being provided with a hub, a regulator for the openings, journaled on the hub, the regulator being located between said bottom and said top, a foraminous receptacle in the upper member, a shaft journaled in the hub, and hammers carried by the shaft and cooperating with the foraminous receptacle.

4. A pulverizer of the class described comprising a casing including an upper member and a lower member, a removable closure plate on the upper member, means for joining the upper and the lower members together detachably, the upper member having a bottom, the lower member having a base and being provided with a transverse partition forming a receiving and suction chamber above the partition and forming a space below the partition and between the partition and the base, the lower member having an outlet for the chamber, a foraminous receptacle in the upper member, the bottom of the upper member having an opening establishing communication between the receptacle and the receiving and suction chamber, a shaft journaled in the base, in the closure plate, in the partition, and in the bottom of the upper member, a hammer carried by the shaft and cooperating with the foraminous receptacle, a suction and blast means carried by the shaft and located in the receiving and suction chamber, and means for rotating the shaft, said means being disposed in said space which exists below the partition.

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