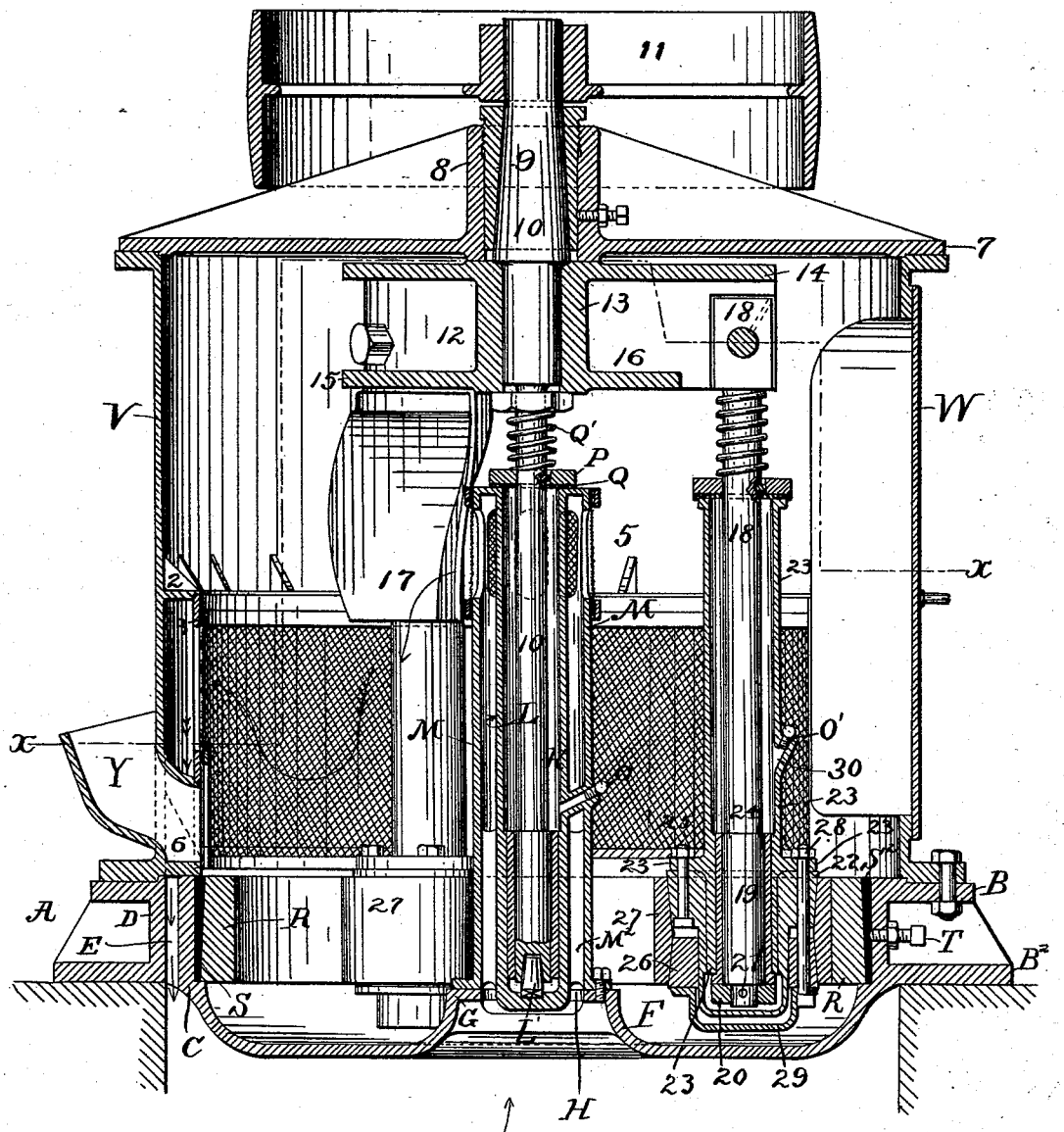
(No Model.) 3 Sheets—Sheet 1.

E. H. HURRY.

ROLLER PULVERIZING MILL.

No. 524,089. Patented Aug. 7, 1894.

Fig. 1.



WITNESSES:

W. H. Graham

E. L. Todd.

INVENTOR

Edward H. Hurry

BY

Thos. H. Dorsey

ATTORNEY

(No Model.) 3 Sheets—Sheet 2.

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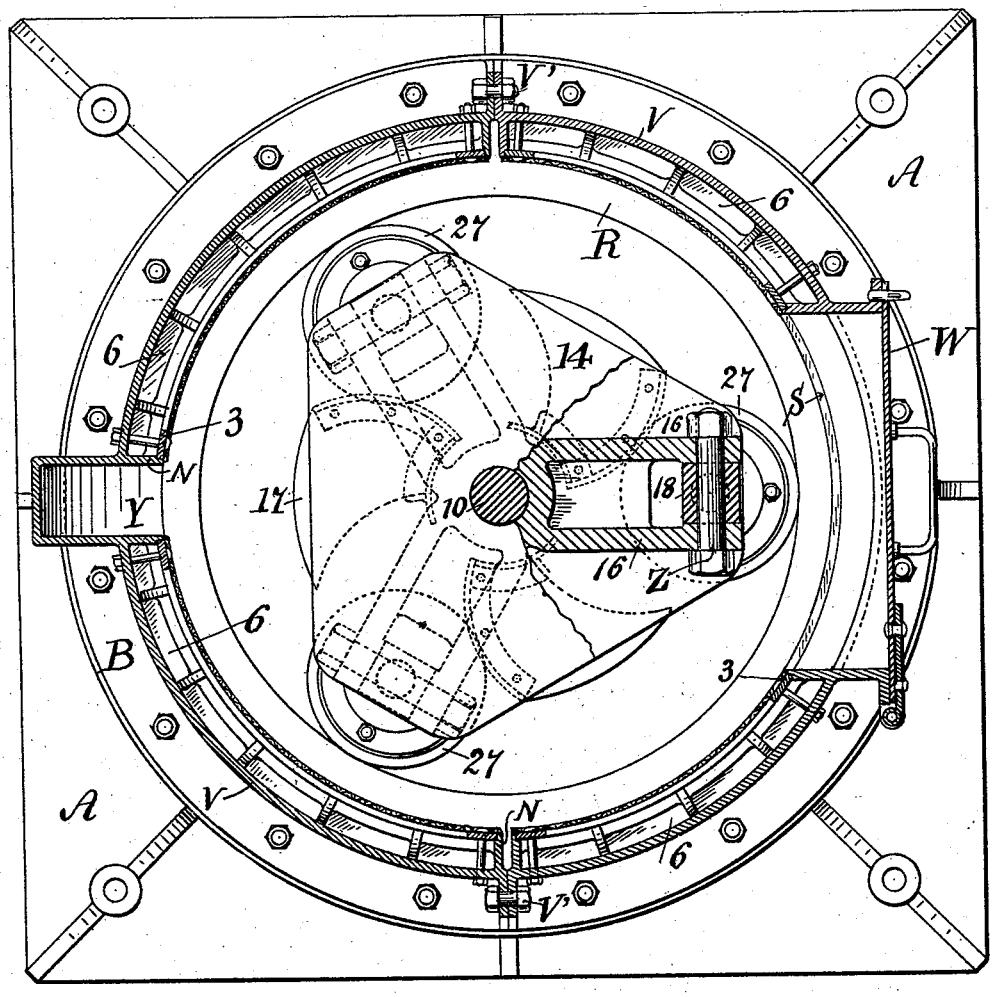
Fig. 2.



Witnesses
Chas. Hanimann, Del.
W. H. Graham.

Edward H. Hurry Inventor
By his Attorney
Chas. H. Forbes

(No Model.) 3 Sheets—Sheet 3.

E. H. HURRY.

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Fig. 3.

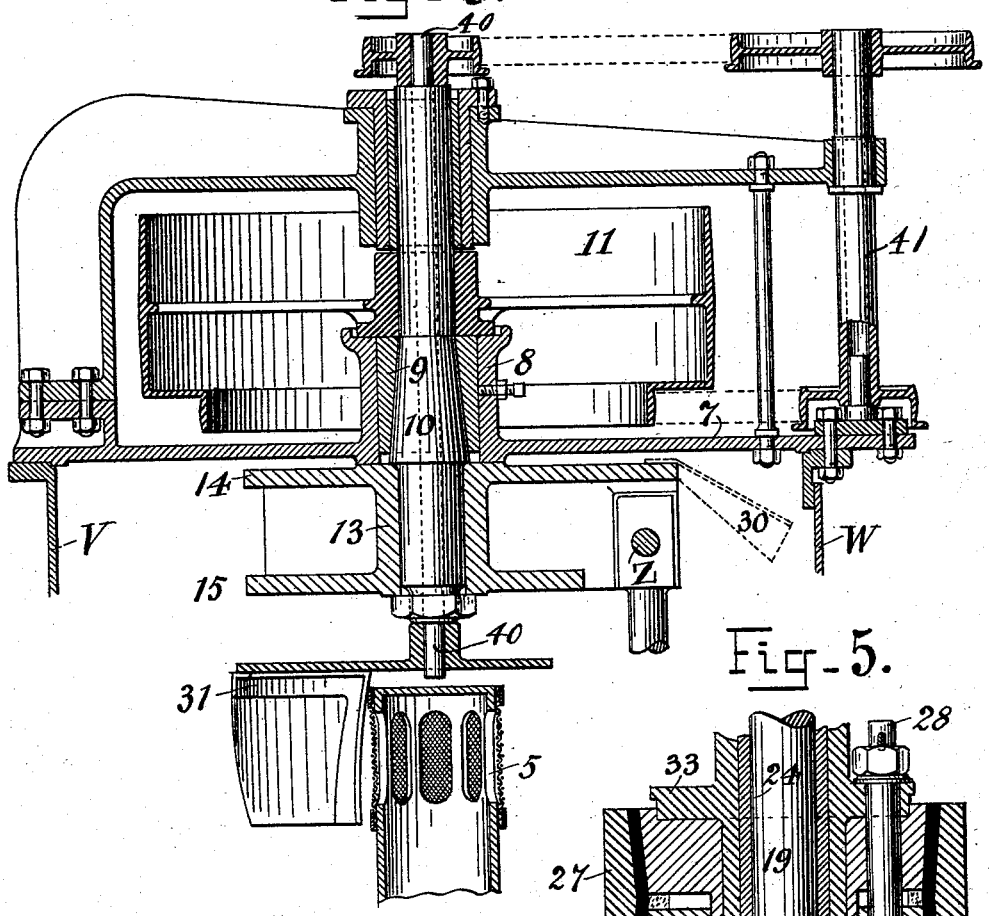
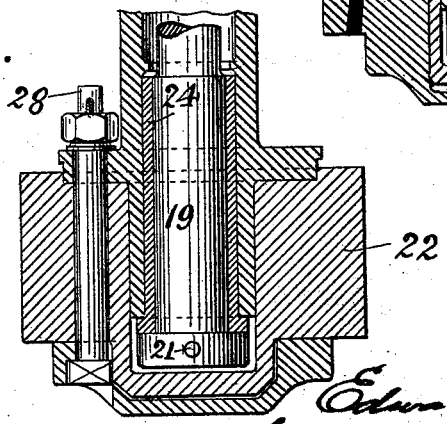


Fig. 5.

Fig. 4.



Witnesses
Chas. Hanimann, Del.
W. H. Graham.

Inventor
Edward H. Hurry
By his Attorney
Chas. N. Dorsey

UNITED STATES PATENT OFFICE.

EDWARD H. HURRY, OF NEW YORK, N. Y., ASSIGNOR TO THE STANDARD PORTLAND CEMENT COMPANY, OF SAME PLACE.

ROLLER PULVERIZING-MILL.

SPECIFICATION forming part of Letters Patent No. 524,089, dated August 7, 1894.

Application filed December 21, 1893. Serial No. 494,368. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. HURRY, a subject of the Queen of Great Britain, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Roller Pulverizing-Mills, of which the following is a specification.

This invention relates to certain improvements on the invention referred to in two United States Letters Patent Nos. respectively 277,134 and 325,804, granted to Frank A. Huntington, May 8, 1893, and September 8, 1885, the former patent showing the pioneer or earliest type of this class of machines in which the roller and shafts are suspended from a rotating frame above and free to swing thereon so that by the action of centrifugal force the rollers are projected against a circular stationary die or grinding surface, and the latter patent showing the same organization with the rollers turning loosely upon the suspended shafts, the latter being non-rotating.

The present invention includes the general features above referred to and consists in improvements in certain details by means of which the mill is more particularly adapted to the pulverization of dry materials, all of which I will first describe and subsequently in the claims point out the novel features.

In the accompanying drawings which form a part of this specification: Figure 1 represents a sectional elevation; Fig. 2 a plan view on the line *x*, *x*, Fig. 1. Fig. 3 represents a sectional view of the driving pulley with its shaft and connections for changing the speed of the fan attachment; Fig. 4 an enlarged sectional view of a roll with a solid operating surface and bottom wherein the shaft is inserted at the top, and Fig. 5 a roll similar to that shown in Fig. 1 with its tire secured by type-metal or other suitable alloy.

A represents the base plate constructed with upper and lower projecting flanges B, B^2, which are connected by vertical webs C, D, separated to form spaces E through which the ground material falls to the receptacle located beneath the mill. The central or depressed portion of the base plate, shown at F, forms an annular pan for the reception of the material to be pulverized, its central portion being constructed with a flange G and opening H. To this flange G two vertical pipes L and M of different diameters are attached, forming an annular space K. These pipes are united by webs M^2. The annular space K communicates with the receptacle beneath the mill and with the space within the mill through the gauze covered openings 5 as shown in Fig. 1. The lower end of the inner tube L is closed and supports a step box L′ which extends upward sufficiently to form a receptacle for a lubricant, a passage and plug for introducing the same being shown at *o*. To exclude the dirt and dust from this step box and bearing, a washer P is splined to the shaft 10 and a flexible washer Q revolves with it, these washers being pressed upon the end of the central pipe or casing by means of the coiled spring Q′.

A stuffing box or gland may be substituted if desired.

The inner circumference of the pan F is fitted with a grinding ring or surface R which rests upon an annular ledge S. This ring is made at its outside diameter somewhat smaller than the inside diameter of the pan and is adjusted to its true central position by wedges or other suitable means, molten zinc S^2 or other suitable material being poured into the space between the ring and pan to secure it as shown in Fig. 1. Set screws as shown at T may also be used to position the ring if desired, and as an additional safeguard for securing the same.

The case or housing V is made in two or more segments which are secured together by means of the flanges and bolts V′ as shown in Fig. 2, a door W being provided for access to the inside and also a spout Y for the introduction of the material to be ground. On the interior of the segments forming the case, are horizontal flanges 2, provided with vertical flanges N (Fig. 2), to which are secured the screen frames 3. These flanges 2, N, form boxes or pockets and are provided with openings 6 which register with the openings or passages E in the base plate. The case or housing is also provided with a cover 7 which may be bolted to the upper outwardly projecting flange of the housing, the bottom flange being similarly secured to the base

plate B as clearly shown in Fig. 1. The cover 7 is provided with a bearing for the main shaft 10 consisting of the boss 8 and adjustable bushing 9, the latter being tapered to correspond with and fit the shaft. The driving pulley 11 is keyed to the shaft, as is also the driving head 12 within the housing. The driving head consists of a central boss 13 with two projecting flanges 14, 15, united by the webs 16 which also form the cheek pieces between which the roll shafts 18 are suspended, the shafts 18 being constructed with flat faces to fit the inner surfaces of the cheek pieces, and provided with wrist pins or trunnions Z that pass through the cheek pieces and form the center of oscillation of the swinging shafts.

One of the difficulties heretofore experienced in the use of mills of this kind is that of discharging the material as fast as it is reduced to the required size, the natural draft not being found sufficient to secure this result. This is especially the case when the material is of a high specific gravity and it is not desired to reduce it to a great degree of fineness. Under such conditions a stronger draft is essential and which I obtain by the attachment of fan blades to the driving head as shown in Fig. 1. These fan blades 17 are secured to the under side of the driving head opposite the openings 5 in the central pipe M and are curved outwardly from the center and inclined backward and downward. They draw the air upward through the central pipe through the openings 5 and force it in the direction of the arrows over the material being ground and carrying with it such particles that have been sufficiently reduced. The receptacle beneath the mill being closed, the air circulates through the same and the mill, the ground material being removed from the receptacle by the well known screw conveyer (not shown).

When the material to be ground is of a hard or refractory nature or contains much moisture, I have found it necessary in practice to augment the rate of the air circulation by mounting the fans upon a shaft independent of the main shaft and revolving it at a higher rate of speed. This I accomplish by the arrangement of devices shown in Fig. 3 in which the fan is connected to a shaft 40 revolving within the main shaft 10 and securing its increased speed by means of the counter shaft 41 and connected pulleys of variable diameter, operated by means of belting (shown in dotted lines) from the main pulley 11. Another difficulty is found in grinding very hard and refractory material in that considerable heat is generated which is best dispelled by allowing fresh cool air to constantly enter the mill. In such cases the use of the central pipe may be dispensed with and holes be made in the cover 7 through which the air may have free ingress to the upper part of the mill, the fans 30 or 31 being used to create constant draft. In this instance the receptacle below the mill should be provided with a ventilating pipe to carry off the air, the pipe being connected with a settling chamber or dust separator to arrest such part of the material not gravitating to the receptacle. The lower end of each shaft is constructed with a journal 19 and collar 20, the latter being secured by a screw-thread and pins 21. The roll is supported by the collar 20 and revolves upon it and the journal 19. The rolls consist of a bucket-shaped hub 22 fitted with a sleeve 23 having a flange 33 to which the body of the roll is bolted by bolts 25, a journal bushing 24 being also provided, as shown in Fig. 1, and in the enlarged sectional views Figs. 4 and 5. The object of this construction is to connect the roll with its shaft through its top and thereby preserve a solid bottom surface.

Above the bushing 24 the sleeve 23 forms a receptacle for a lubricant which is introduced through the plug hole 30, the top of the sleeve being closed to prevent the admission of dirt or dust in a manner like that heretofore referred to with reference to the central pipe and the main shaft. The lower part of the roll is composed of a follower 26 which is adjustable and tightened within the tire 27 by means of the bolts 28. The periphery of each part of the roll body is tapered in opposite directions as shown in Fig. 1, the tire 27 being correspondingly tapered and thereby secured against displacement. A plate 29 is also secured to the bottom of the roll to protect the same from wear.

While a solid roll may be used as shown in Fig. 4, the construction shown in Figs. 1 and 5 also provides a solid bottom surface whereby leakage of the lubricant at the bottom of the roll is entirely prevented. The tire 27 may also be secured to the roll by means of type metal or other suitable alloy applied in a molten state between the parts, this being desirable when a tire having an unfinished interior surface is used, and when applied to the construction of the roll as shown in Fig. 5, the follower 26 may be subsequently set up to compensate for any shrinkage that may take place in the cooling of the type metal.

What is claimed is—

1. In a pulverizing mill, a casing within which the pulverization is effected; a closed receptacle for the pulverized material; discharge ducts for conveying such material from the interior of the casing to such receptacle; an air-circulating pipe communicating with said receptacle and with the interior of the casing; a fan located within the casing for causing an air-current to circulate through such receptacle, tube and casing-interior; and means for operating said fan, whereby all the products of pulverization are deposited in said receptacle, substantially as set forth.

2. In a pulverizing mill, the combination with the casing, of grinding rolls; a main shaft for driving said rolls; a ventilating fan located within the casing, and means independent of said shaft for operating said fan at a

greater speed than the shaft, substantially as set forth.

3. The combination with the roll-shaft, of a roll mounted thereon and composed of a cup-shape part having a beveled periphery; a tire surrounding said part and having its interior surface similarly beveled; and an annular, adjustable part for tightening the tire on the cup-shape part, substantially as set forth.

4. The combination with the roll-shaft, of a roll mounted thereon and composed of a cup-shape part having a beveled periphery; a tire surrounding said part and having the upper portion of its interior surface beveled in the same direction, and its lower portion beveled in the opposite direction; and an annular, adjustable part located within the lower portion of the tire and having its periphery beveled in the same direction as said tire-portion, substantially as set forth.

5. The combination with the roll-shaft, of a roll mounted thereon and composed of a cup-shape part having a beveled periphery; a tire surrounding said part and having its interior surface similarly beveled; an annular adjustable part within the tire; and a metallic filling between the tire and the other two parts, substantially as set forth.

6. The combination with a non-rotating roll-shaft, of a roll journaled thereon and provided with a sleeve fixed to the roll and extending up around said shaft; a cap or washer surrounding the shaft and closing the upper end of said sleeve; and a spring bearing upon said cup or washer to retain it in contact with the sleeve, substantially as set forth.

EDWARD H. HURRY.

Witnesses:
CHAS. W. FORBES,
V. J. GOETZ.