

June 17, 1924.

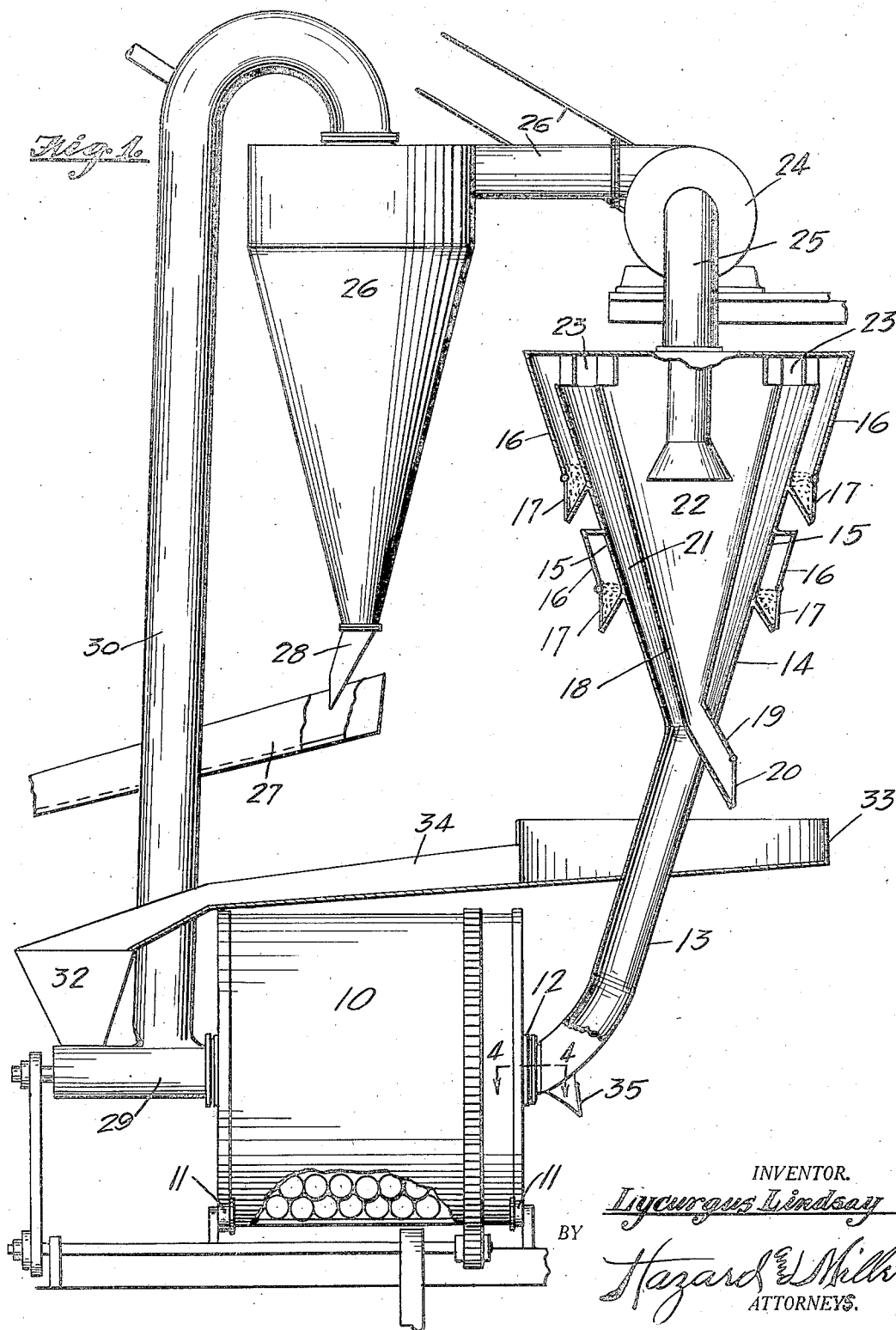
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L. LINDSAY

SEPARATOR

Filed Aug. 31, 1921

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*Fig. 2.*

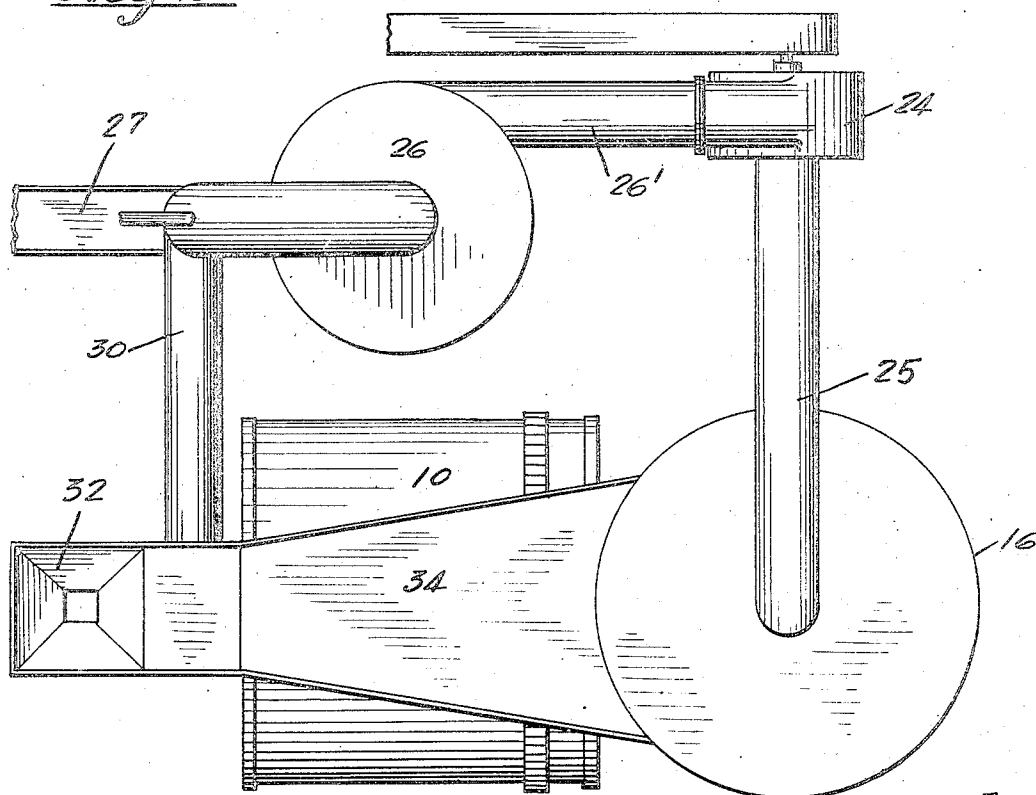


*Fig. 3.*

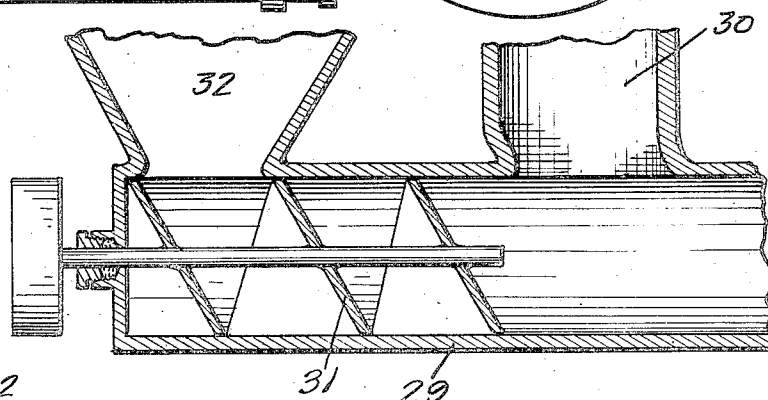
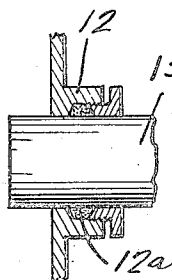


*Fig. 4.*



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## UNITED STATES PATENT OFFICE.

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## SEPARATOR.

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*To all whom it may concern:*

Be it known that I, LYCURGUS LINDSAY, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Separators, of which the following is a specification.

My invention relates to a separator that is particularly intended for use in connection with pulverizing and crushing machines, the principal object of my invention being to provide relatively simple and efficient means for rapidly removing, from the crushing and pulverizing machine, the finer particles of the pulverized material in order that the crushing and pulverizing members within the machines may operate to better advantage and more rapidly and efficiently perform their intended functions.

In certain types of pulverizing machines, for instance, in ball mills, the finer particles of pulverized material tend to overlies and form a packing for the relatively coarser particles of material and prevent them from being acted upon by the balls and crushing members, and it is the purpose of my invention to provide means whereby a blast of air is produced through the housing of the crushing and pulverizing machine for the purpose of removing therefrom the finer particles of pulverized material or those particles which have been crushed to the required degree of fineness and which, if left within the mill, would materially retard the crushing and pulverizing operations.

A further object of my invention is to provide means for effecting a separation of the relatively coarser particles of material that are drawn from the mill with the fine material, and to provide means for returning said coarser particles of material to the mill for further pulverization.

A further object of my invention is to provide a relatively simple form of separating apparatus that may be easily and cheaply produced and which may be readily associated with practically all forms of crushing and pulverizing machines wherein the material is crushed and pulverized within a closed chamber.

With the foregoing and other objects in view, my invention consists in certain novel

features of construction and arrangement of parts that will hereinafter be more fully described and claimed and illustrated in the accompanying drawings in which:

Fig. 1 is an elevational view of a separator of my improved construction with parts thereof in vertical section.

Fig. 2 is a plan view of my improved form of separator.

Fig. 3 is a section view of the conveyor that is utilized for returning the coarser particles of pulverized material to the housing of the pulverizer.

Fig. 4 is an enlarged detailed section taken on the line 4-4 of Fig. 1.

Referring by numerals to the accompanying drawings which illustrate a practical embodiment of my invention, 10 designates a crushing and pulverizing machine of the ball type and which is mounted for operation upon suitable bearings 11. One end of the housing of the pulverizing machine is provided with an outlet and connected thereto by a slip joint 12 is the lower end of a pipe 13 that leads upwardly to the lower end of a funnel shaped separator housing 14.

The wall of the separator housing 14 is provided with a series of material discharge openings 15, and leading downwardly therefrom, are discharge spouts 16, provided at their lower ends with outwardly opening flap valves 17.

Arranged within the housing 14, is a funnel shaped member 18 and leading downwardly from the lower end thereof through the wall of housing 14 is a discharge pipe 19, the lower end of which is closed by an outwardly opening flap valve 20. The chamber 21 between housing 14 and member 18 communicates with a chamber 22 in said member 21 through openings 23 that are formed through the upper portion of the wall of member 18.

Located at a convenient point above and to one side of separator 14 is a suction fan 24 and leading from the intake opening in the side thereof, downwardly through the top of separator housing 14 and into the central portion of chamber 22, is a pipe 25.

Leading from the discharge spout of the fan 24, to the upper end of a separator 26, preferably of the "cyclone" type, is a pipe

26', and leading from the lower end of said separator 26 into a suitable chute and hopper 27, is a discharge spout 28.

Leading from the upper end of the separator 26 downwardly to a horizontally disposed cylindrical housing 29 that leads into the side of the pulverizer housing 10, is a pipe 30.

Arranged for operation within the housing 29 is a spiral conveyor 31 that may be driven in any suitable manner and leading into the outer end of the spiral conveyor housing is a spout of hopper 32.

Arranged beneath the discharge spouts 16 and 19 of the separator 14, is a hopper 33, the bottom of which is inclined and leading from the lower end of the hopper downwardly to the hopper 32, is an inclined chute or trough 34.

Located in the lower portion of pipe 13 is an outwardly opening flap valve 35 that permits any relatively large or heavy objects to discharge before reaching the separator 14.

The operation of my improved separator is as follows: As the mill 10 is operated, fan 24 is driven at a high rate of speed and as a result, a suction of air is produced through the grinding and pulverizing chamber of the mill, through pipe 13, chamber 21, chamber 22, pipe 25, fan housing 24, pipe 26', the chamber within separator 26 and pipe 30 that leads from the housing of separator 26 to mill 10.

This suction of air is regulated so as to withdraw from the pulverizing chamber of the mill the finer particles of material and which latter after passing into the separator 26, will be separated from the air and discharged through spout 28 into trough or chute 27.

Obviously in thus outdrawing the finer particles of material from the pulverizer, there will be incorporated therewith a certain percentage of coarser particles of material and which latter must be further reduced in order to reach the required degree of fineness.

The relatively larger and heavier particles of material will be separated from the finer particles of material within the chambers 21 and 22 of the separator 14 and after passing into the discharge spouts 16 and 19 these heavier particles of material will pass the flap valves and discharge into the hopper 33.

From this hopper the relatively coarser particles of material will pass through trough 34 and hopper 32 into cylinder 29 and

the spiral conveyor operating in said cylinder will carry the coarser particles of material into the chamber within the mill.

Thus by maintaining a constant current of air through the reducing chamber of the pulverizer and grinding machine, the finer particles of pulverized material will be constantly drawn off and discharged at a suitable point and by thus constantly removing said finer particles of material the pulverizing or material engaging members are free to make direct contact with the coarser particles of material to crush and pulverize the same.

In other words, the constant removal of fine particles of pulverized material prevents the same from packing between and over the coarser particles of material and forming a cushion of dust or pulverulent material to materially retard the pulverizing operations within the mill.

A separator of my improved construction is comparatively simple, is applicable for use in connection with practically all forms of reducing and pulverizing machines and is very effective in performing its intended functions.

It will be understood that minor changes in the size, form and construction of the various parts of my improved separator may be made and substituted for those herein shown and described without departing from the spirit of my invention the scope of which is set forth in the appended claim.

I claim as my invention:

In combination, a pulverizer, a main separator including a conical housing in communication at its apex with the pulverizer, a conical-shaped member within the housing and disposed concentrically thereof, with valve control discharge openings formed in the periphery of the housing and in the apex of the conical member, a suction fan in communication with the main separator and extending into the conical member, a second separator in communication adjacent its top with the fan, a discharge spout at the apex of the second separator, a pipe communicating with the top of the second separator and with that end of the pulverizer opposite to the end which communicates with the first separator, and an inclined chute below the discharge opening in the apex of the conical member for conveying material to the last mentioned pipe.

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

L. LINDSAY.