

Feb. 14, 1933.

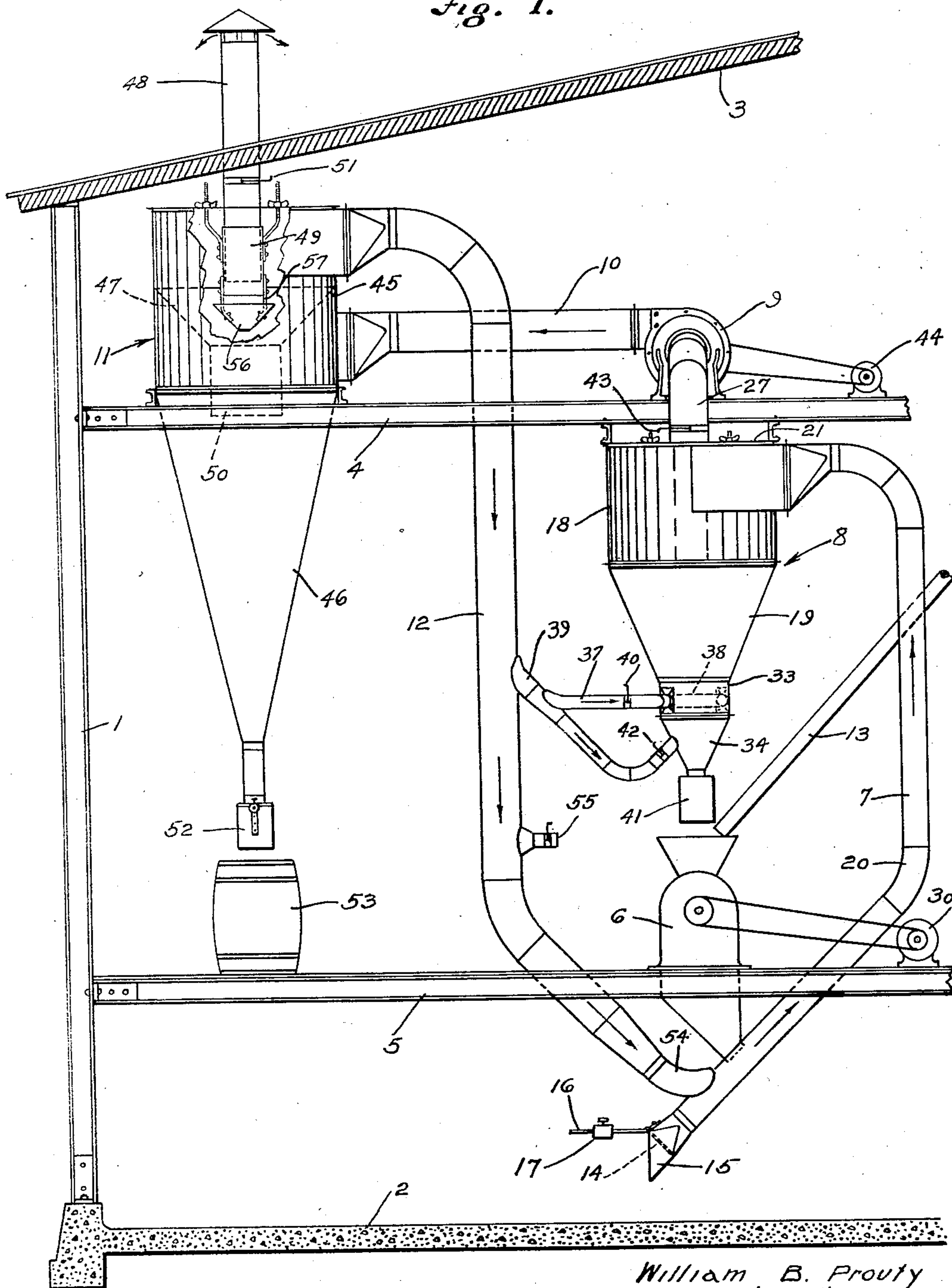
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1,897,144

DUST SEPARATOR AND COLLECTOR SYSTEM

Original Filed Dec. 7. 1925 2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

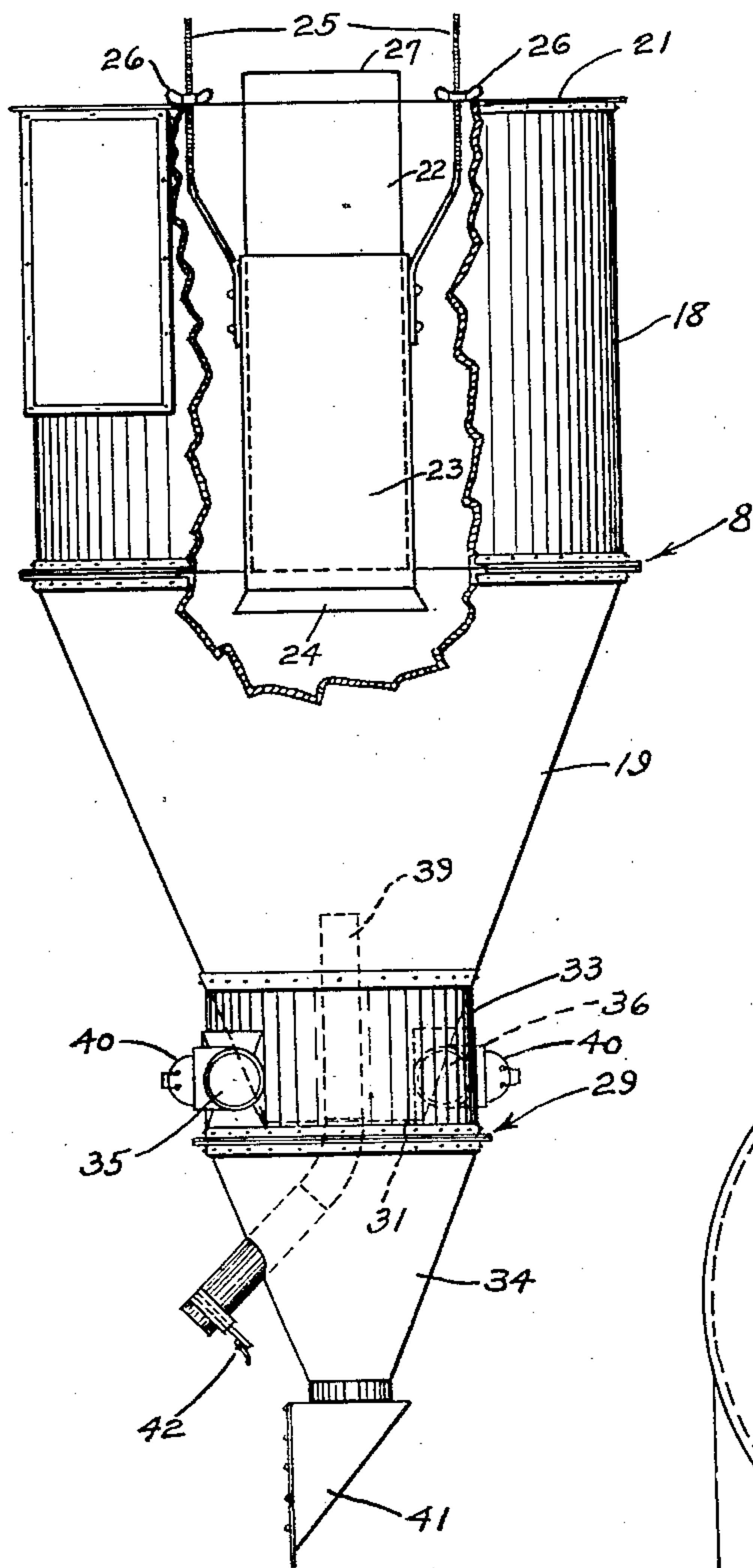


Fig. 4.

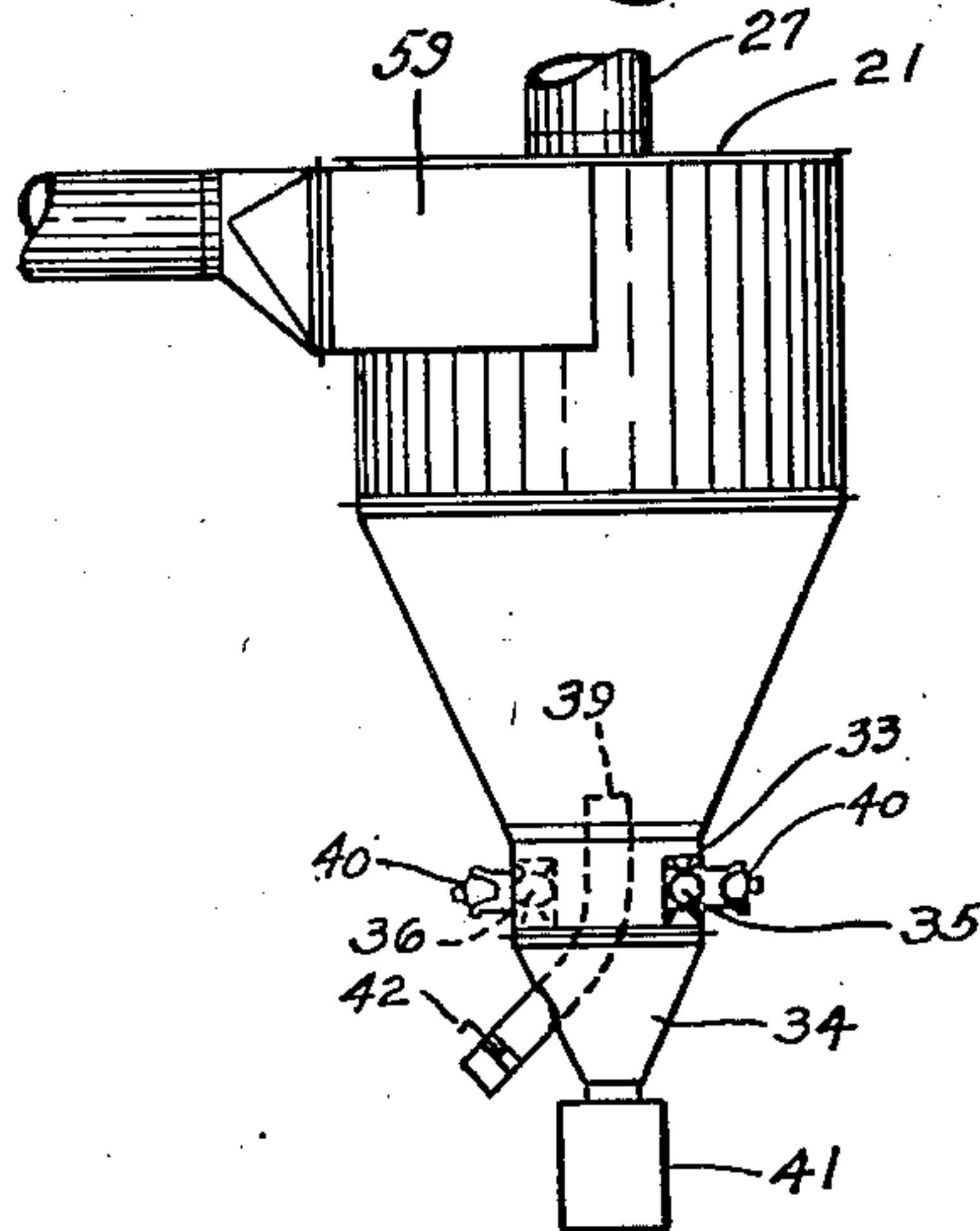
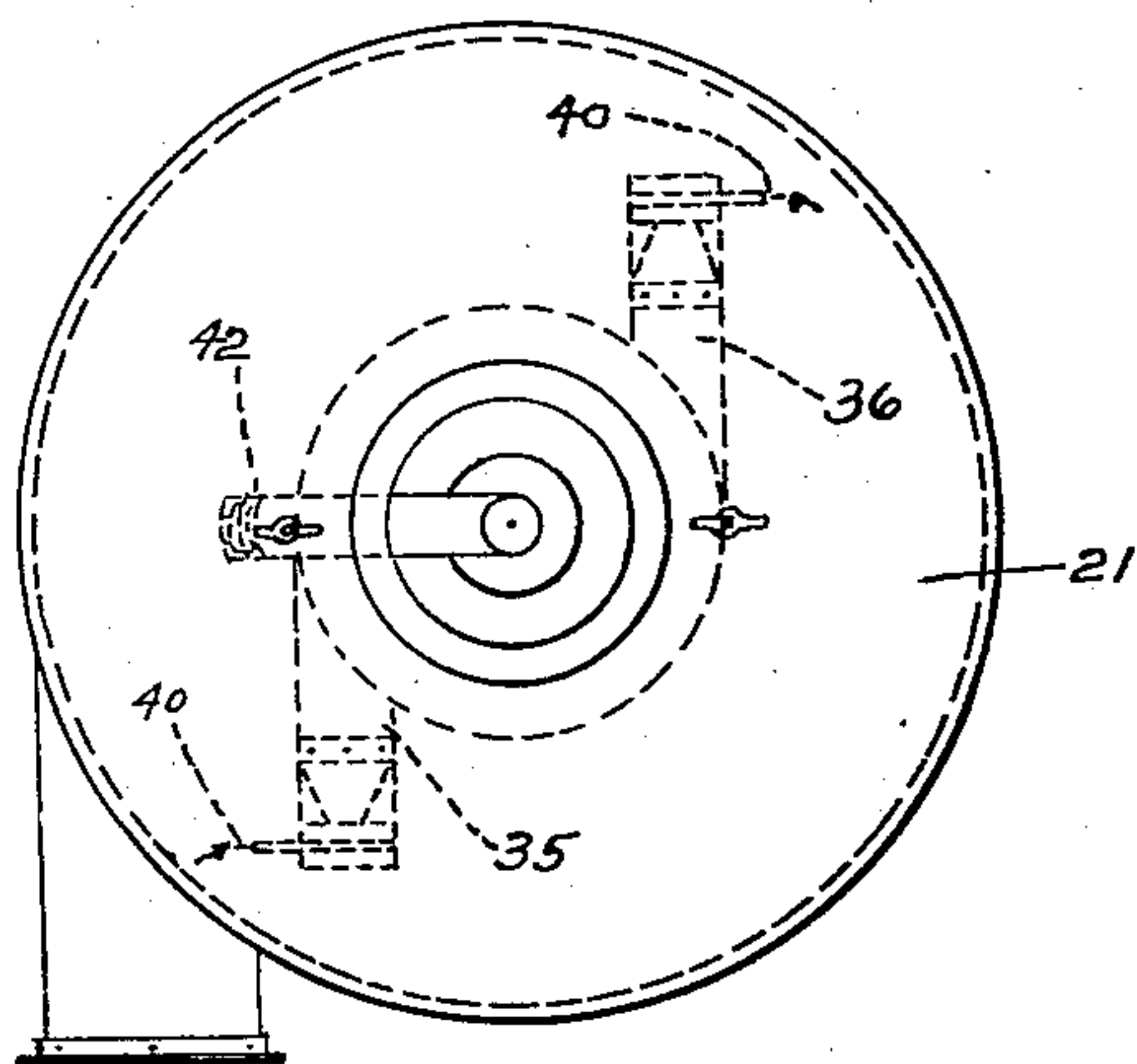


Fig. 3.



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## UNITED STATES PATENT OFFICE

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DUST SEPARATOR AND COLLECTOR SYSTEM

Application filed December 7, 1925, Serial No. 73,581. Renewed April 21, 1932.

This invention relates to dust separator systems and more particularly to mechanism for grinding or pulverizing material, separating and collecting the properly ground and returning the rejects to the mill.

One of the objects of the invention is the provision of new and improved mechanism for treating ground or pulverized material whereby that portion that is reduced to the required degree of fineness is separated from the coarser material and deposited in suitable receptacles, and the latter returned to be reground.

Another object of the invention is the provision of a new and improved separator provided with new and improved means for directing and controlling the air currents within said separator whereby the coarser material or rejects are freed of all adhering or accompanying pulverulent matter.

A still further object of the invention is the provision of a new and improved dust separator with new and improved mechanism for regulating and controlling the operation of the same.

A further object of the invention is the provision of a dust separator and collector system that is simple in construction, easily assembled and installed, that is efficient and economical in operation, and that is not likely to get out of order.

Other and further objects and advantages of the invention will appear from the following description, taken in connection with the accompanying drawings, in which

Fig. 1 is a vertical section of a building showing the system installed therein, in elevation;

Fig. 2 is a side elevation of the dust separator with parts broken away;

Fig. 3 is a plan view thereof; and

Fig. 4 is a side elevation of a modified form of the separator.

Referring now to the drawings, the reference character 1 designates a building in which the system is installed. This building is shown as comprising the foundation 2, the roof 3 and the floors or supports 4 and 5. The form or shape of the building is immaterial.

For simplicity of illustration and convenience in description, a simple form of the system comprising a single separator and a single collector is shown more or less diagrammatically on the drawings. As shown, the system comprises a mill 6 for grinding the material, a conveyer conduit or pipe 7 for conveying the ground material to the separator 8, a fan 9 for operating the system, a transfer conduit or pipe 10 for transferring the properly ground material to the collector 11, and a return conduit or pipe 12 for returning the air freed of the ground material to the conveyer conduit 7.

The raw material is supplied to the mill in any suitable manner as by means of the conduit 13 extending from a receptacle or hopper located above the same, as is usual in such constructions. The mill is operated in the usual manner by a motor or other power mechanism 30.

From the mill the ground material is conveyed by air through the conduit or pipe 7 to the separator 8 which is preferably located at a higher level than the mill, whereby the rejects or material not ground sufficiently fine may be returned by gravity to the mill to be reground.

The pipe 7 is so arranged that little if any of it occupies a horizontal position. The bends in the pipe are on broad curves whereby no opportunity is provided for permitting the ground material to accumulate and interfere with the operation of the device. Any material accumulating in the pipe 7 will slide down past any bend, as 20, in the pipe, to the lower end thereof and its weight will open the hinged gravity valve 14 and escape. The pipe is provided with triangular extensions 15 at each side to prevent the entrance of air into the conduit or pipe 7 when the valve 14 is opened to permit the discharge of the material, when for any reason it accumulates in the pipe. The valve is provided with a support 16 on which is slidably mounted a weight 17 which may be adjusted along the support to meet the requirements of the different material.

The separator 8 preferably comprises an upper casing or portion 18 preferably circu-



lar in cross-section, that shown being in the form of a cylinder, and a lower cone-shaped casing or portion 19. The casing 18 is provided with a closure 21 from the central portion of which depends a drum 22 which preferably extends downward in said cylindrical portion adjacent to its lower end. Preferably, though not necessarily, the drum 22 is provided with a telescopic section 23 which may be raised and lowered by any appropriate means as the screw-threaded rods 25 rigidly connected thereto and extending through said closure, the adjustment being made by the nuts 26 as best shown in Fig. 2. If desired, the lower end of the extension 23 may be flared as at 24. A conduit 27 is secured to the upper end of the drum and leads to the fan 9 which operates the air system.

The lower or cone-shaped casing 19 of the separator is open at its lower end as at 31, see Fig. 2, to permit the escape of the coarser material from said separator.

The pipe or conduit 7 is so arranged that the air will enter the casing 18 tangentially at the upper portion thereof, and will move in a circle about the drum 22 causing the material carried by the air to be thrown by centrifugal force to the outer portion of the rotating mass, and the same will gravitate to the bottom of the cone and pass through the opening 31.

If no air be admitted to the lower portion of the cone, the air exhausted through the pipe 27 and drum 22 from the central portion of the rotating mass will be comparatively free of the ground material. It has been found by experiment that if air be admitted into said cone at the lower portion thereof, a far greater percentage of the ground material may be caused to be carried along with the air exhausted into the pipe 27. By adjusting the air inlets, the material that is ground to the proper degree of fineness may be separated from the coarser, and the latter returned to be reground.

Suitable air inlets are provided for admitting air into the lower portion of the cone 19. In the form of the device selected to illustrate an embodiment of the invention, an auxiliary casing or air chamber 29 is employed for this purpose and is secured over the open lower end 31 of the cone 19, see Fig. 2. This casing is preferably of the same shape as the casing of the separator 8 and comprises an upper cylindrical casing 33 and a lower cone-shaped casing 34. One or more air inlets are provided in the cylindrical casing 33. Preferably, though not necessarily, these openings or inlets as 35 and 36 are arranged tangentially to the inner periphery of the cylindrical portion and are provided with valves or blast gates 40 for controlling the amount of air supplied to said casing.

The inlets 35 and 36 are preferably arranged above the lower end of the cone 19 and

are adapted to supply air from the room to the auxiliary casing 29 as shown in Fig. 4, or they may be supplied by air from the return pipe 12 through the pipes or conduits 37 and 38 which are connected to said inlets and to a pipe or conduit 39 which in turn is connected to said return pipe 12. The inlet fittings 35 and 36 are so arranged that the air delivered therethrough into the auxiliary casing 29 will revolve about the vertical axis of the separator in the same direction as the air in the separator casing 8. In other words, the air in the casing 29 will revolve about the lower end of the cone 19 in the same direction as the air in the cylindrical casing revolves about the drum 22, and the two revolving bodies of air cooperate to separate the properly ground from the coarser material. The fittings 35 and 36 are provided with valves 40 for controlling the amount of air flowing through the pipes 37 and 38. A discharge valve 41 of the usual construction is provided at the lower end of the cone-shaped member 34 of the auxiliary casing 29 through which the rejects or coarser material is discharged into the hopper of the mill 6.

If desired the air conduit 39 may be inserted through the auxiliary casing and extended axially upwardly through the opening 31 for delivering air into the cone 19. This conduit is provided with a valve 42 for regulating the amount of air admitted through said conduit. In the operation of the device one or more of the conduits 37, 38 and 39 may be employed to admit air to the auxiliary casing, the valves being adjusted to the required extent to properly separate the coarser from the properly ground material.

From the separator the air laden with the properly ground material is drawn through the pipe or conduit 27 into the fan 9 and forced thereby through the conduit or pipe 10 into the collector 11. The pipe 27 is preferably provided with a valve or blast gate 43 for controlling the flow of air therethrough. The fan 9 is operated in any suitable manner as by means of the motor 44.

The collector 11 may be any one of the commercial types of collectors now on the market. The form shown, however, is that illustrated and claimed in my copending application, Serial No. 73,582, filed December 7, 1925, which consists of an upper portion or casing 45 preferably circular in cross-section, and a lower cone-shaped casing 46. The casing 45 may be in the form of a cylinder, as shown, and is provided with a partition 47 which is preferably in the form of a funnel with its reduced delivery end 50 extending to or slightly below the lower end of the casing 45 and arranged axially of said casing. A breather pipe 48 having its lower end arranged axially within said cylindrical casing



45, provided with an adjustable extension 49 extending down into said funnel-shaped partition, extends upwardly through the closure for said collector and through the roof 3 of the building. If desired a deflector 56 preferably in the form of an inverted cone may be suspended by straps 57 from the extension 49. A valve or blast gate 51 is provided in the breather pipe 48 for regulating the effective size thereof.

The inlet fitting for the pipe 10 is below the partition 47 and the outlet fitting for the return pipe or conduit 12 is above said partition. The fittings are both so arranged that the air enters and leaves tangentially to the inner periphery of the cylindrical casing 45. They are so attached that they cooperate to cause the air to revolve in the same direction within the collector.

The lower end of the collector is provided with a gravity valve 52 through which the ground material escapes into a suitable receptacle 53.

The conduit or pipe 12 is connected with the lower extension of the pipe 7 and is preferably restricted in cross-section at the bend 54 thereby increasing the velocity of the air at that point to prevent the accumulation, at the bend, of any material that may be carried over from the collector.

If desired a neutral valve 55 may be provided in the pipe 12 below the pipe 39 for permitting the determination of the pressure of the air at that point. If the air is under pressure when it reaches the pipe 7 it will escape into the building through the mill and carry more or less of the pulverulent matter with it. If the air escapes through the valve 55, the operator adjusts one or more of the valves in the system until the device operates satisfactorily.

The form of separator shown in Fig. 4 differs from that shown in Fig. 1 in that the air chamber or casing 34 is adapted to be supplied with air directly from the room through the inlet ports 35 and 36 or through the valve 42 in the central pipe 39. It will be noted that the pipe fittings 59 in this figure will cause the air to revolve in the opposite direction from that in the construction shown in Fig. 2, but this is immaterial, it being merely a matter of convenience in any particular installation as to how these fittings are attached.

While I have shown the separator as being used in connection with a closed system, that is, a system in which the air is returned or used over and over, it is understood that it is equally as efficient in any type or system of air separation.

It is thought from the foregoing taken in connection with the accompanying drawings that the construction and operation of my device will be apparent to those skilled in the art, and that various changes in size,

shape, proportion and details of construction may be made without departing from the spirit and scope of the appended claims.

I claim as my invention:—

1. In a dust collector and separator system, a separator, a collector, a main conduit for conducting dust laden air tangentially into the upper portion of said separator for causing the same to rotate in one direction, a conduit for conducting air from said separator and delivering the same tangentially into said collector, a return conduit for conducting air from said collector to said main conduit, a shunt conduit for conducting air from said return conduit and delivering the same tangentially into said separator for causing the air therein to rotate in the same direction as that delivered by said main conduit, and means for introducing air axially into said separator.

2. In a dust collector and separator system, a separator, a collector, a main conduit for conducting dust laden air tangentially into the upper portion of said separator for causing the same to rotate in one direction, a conduit for conducting air from said separator and delivering the same tangentially into said collector, a return conduit for conducting air from said collector to said main conduit, a shunt conduit for conducting air from said return conduit and delivering the same tangentially into said separator, a conduit for conducting air from said return conduit and delivering the same axially into the lower portion of said separator, and means for controlling the flow of air through said last named conduit.

3. In a dust collector and separator system, a separator, a collector, a main conduit for conducting dust laden air into the upper portion of said separator, a conduit for conducting dust laden air from said separator to said collector, a fan in said conduit, a return conduit, and passages for conducting air from said return conduit tangentially and axially into said separator.

4. In a dust collector and separator system, a separator, a collector, a conduit for conducting dust laden air to said separator, a conduit for conducting air axially from said separator and delivering the same to said collector, a return conduit for said collector, means for introducing air both tangentially and axially into the lower portion of said separator, and means for controlling the flow of air through one of said last named conduits.

In testimony whereof I affix my signature.  
WILLIAM B. PROUTY.