April 12, 1932. T. J. STURTEVANT 1,853,942

AIR SEPARATOR

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Fig 1

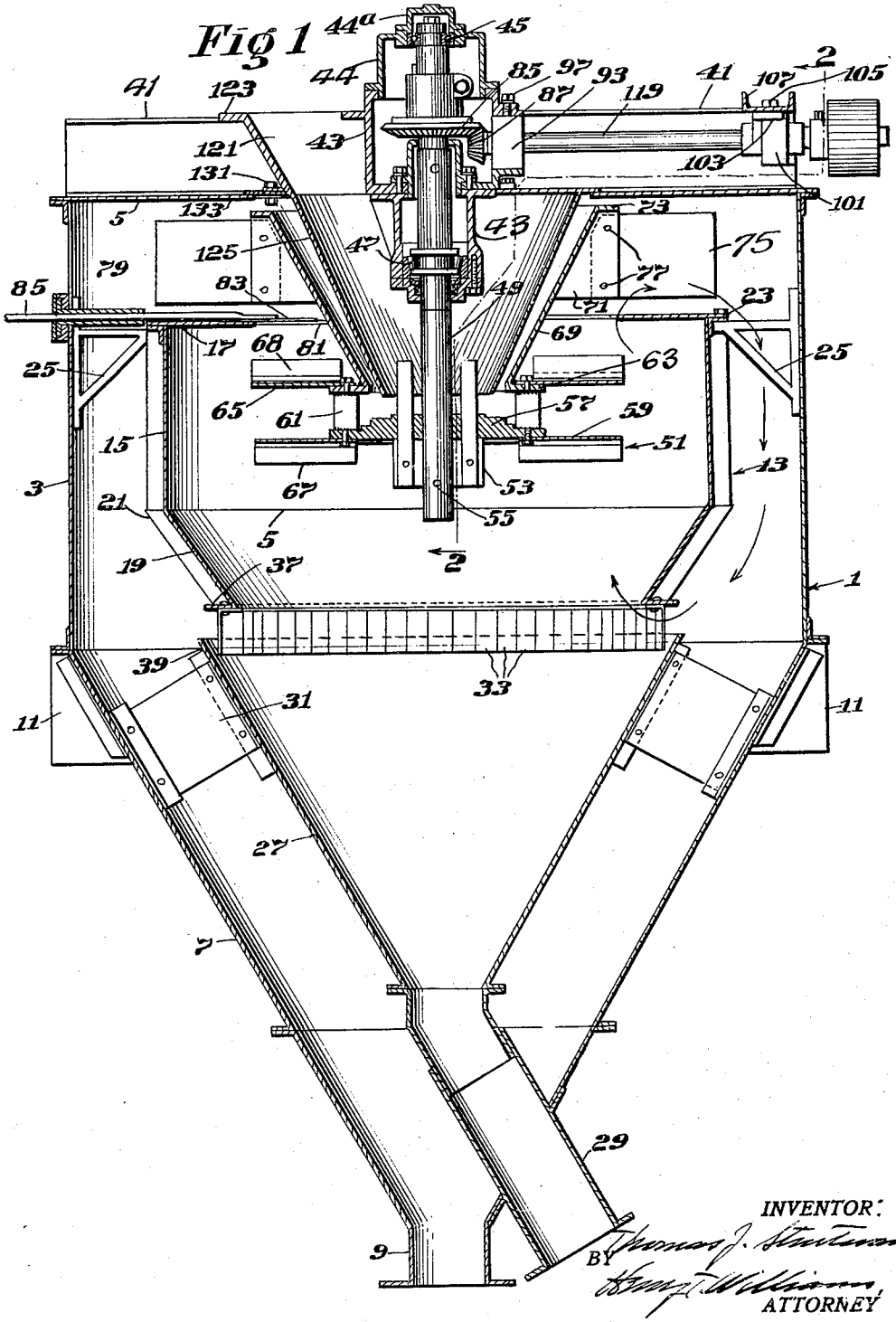

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Fig. 2

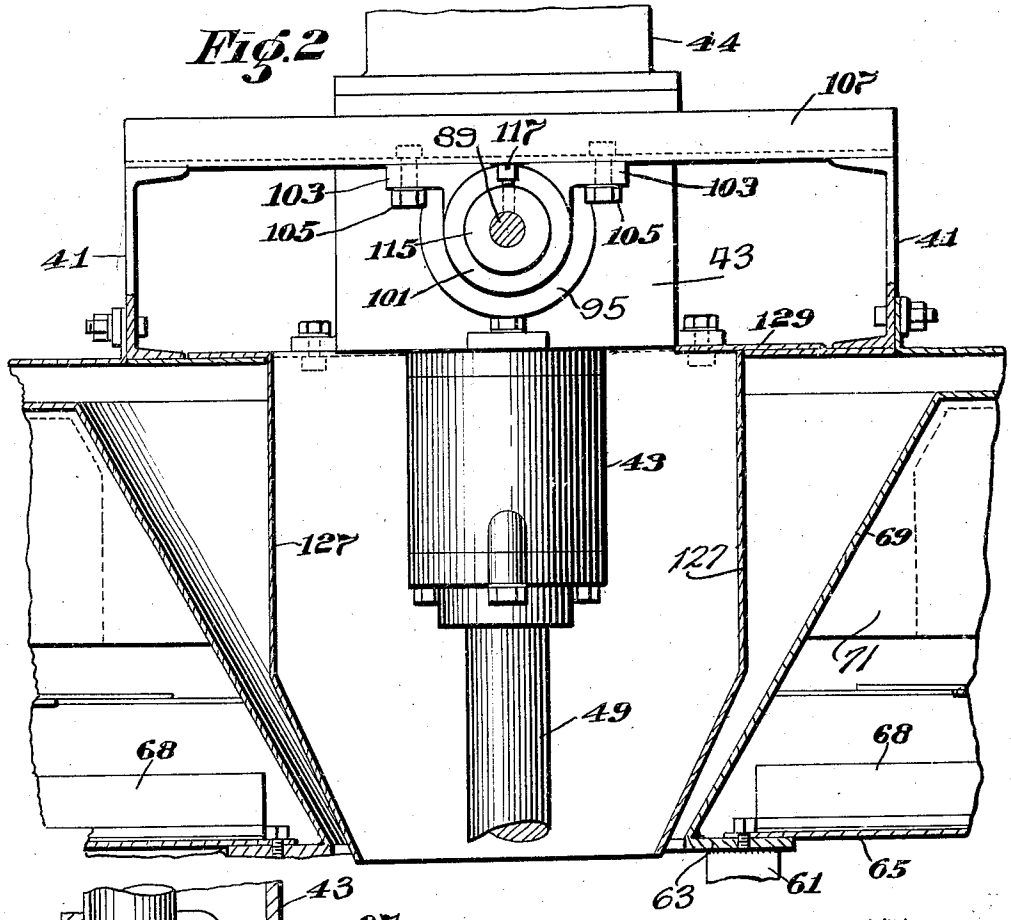
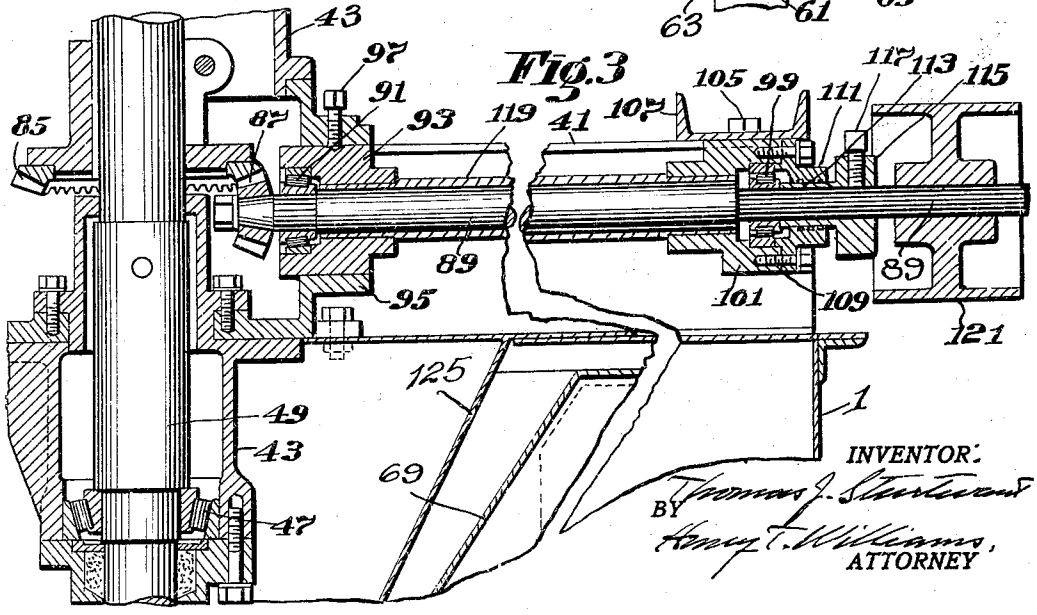


Fig. 3



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Patented Apr. 12, 1932 1,853,942

UNITED STATES PATENT OFFICE

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AIR SEPARATOR

Application filed April 2, 1930. Serial No. 441,072.

The invention to be hereinafter described relates to air separators for grading materials, its subject-matter having been divided from the inventions disclosed in a co-pending application filed by me August 14, 1928 now matured into United States Patent No. 1,769,721 dated July 1, 1930.

The invention is embodied in a separator of the type wherein the separation is accomplished by an air current moving upward in a separating chamber and downward in a settling chamber. The air current is induced by a fan and caused to circulate through the chambers, and in its course it passes through a space between the upper and lower shells forming the casing of the separating chamber. The materials to be graded are fed into the separating chamber and are received by a rotary distributor which throws the materials out across the rising air current under the influence of centrifugal force. The lighter particles are carried upward by the air current from the separating chamber over into the settling chamber where they gravitate downward and are delivered therefrom while the heavier particles gravitate down through the air current in the separating chamber and are separately delivered.

The fan and rotary distributor are carried by a vertical shaft which projects down through the hopper into the separating chamber. A purpose of the invention is to provide an improved driving mechanism for the fan shaft comprising units which are readily accessible and easily adjusted to take up wear on the parts and insure true running of the shafting and proper intermeshing of gears, thereby to avoid setting up objectionable vibration of the separator.

With the aforesaid and other purposes in view, the character of the invention may be best understood by reference to the following description of one good form thereof shown in the accompanying drawings, wherein:

Fig. 1 is a vertical section through an air separator embodying the invention;

Fig. 2 on an enlarged scale is a vertical section taken on line 6—6 of Fig. 1; and

Fig. 3 on an enlarged scale is a vertical section through the vertical and horizontal shafts, the gears thereon, and the bearings therefor.

Referring to the drawings, the separator shown therein as one good form of the invention, comprises an outer casing 1 (Fig. 1) consisting of a drum 3 having a head 5 at the upper end thereof and a cone 7 at the lower end thereof terminating in a discharge spout 9. This outer casing is provided with brackets 11 adapted to rest upon and be secured to suitable supporting beams.

Within and spaced from the outer casing is an inner casing 13 consisting of a drum 15 having a head 17 at the upper end thereof, and a conical shell 19 at the lower end thereof, said drum and shell being provided with angle iron stiffening ribs 21. Secured to the upper end of the drum 15 is an angle iron ring 23 resting upon and secured by bolts to brackets 25 secured to the outer casing.

Beneath and spaced from the shell 19 is a lower conical shell 27 communicating with a discharge spout 29 which extends through an opening in the cone 7 of the outer casing. The lower shell 27 is supported from the outer cone 7 by webs 31 secured to angle bars secured in turn to said shell and cone.

The space between the upper and lower shells of the inner casing serves as an inlet for the passage of air current from the settling chamber into the separating chamber. Located at this space are a series of laterally overlapping vanes 33 (Fig. 1), each having a triangular shaped flange at the upper end thereof as shown in my said Patent No. 1,769,721. These vanes are secured to a ring 37 welded to the lower end of the conical shell 19 and projecting out therefrom. The flanges of the vanes engage the under face of this ring and are secured thereto by rivets or bolts which extend through registering holes in the ring and vane flanges. The pivotal points of the vanes are adjacent the outer ends thereof so that the vanes may be adjusted to vary the spacing of their inner free ends without substantial variation in the spacing of the pivoted ends of the vanes. The vanes project down somewhat into the lower conical

shell 27, and the lower ends thereof are spaced slightly from said shell. The upper marginal portion 39 of said shell projects outward and upward beyond the lower ends of the vanes.

There are important advantages in this construction and arrangement of the vanes all as described in my said Patent No. 1,769,721.

At the top of the separator are a pair of beams or channels 41 (Figs. 1 and 2) supporting a housing 43 having a cover 44 with a cap 44*a*. Slidable in the cap is an upper side thrust ball bearing 45, and at the lower end of the housing is a combined end and side thrust roller bearing 47. Journalled in these bearings is a vertical shaft 49 carrying a rotary distributor 51 comprising a hub 53 supported on the shaft by a bolt 55. Mounted on said hub is a stepped plate 57 and bolted to said plate is a circular plate 59. Rising from and welded to the stepped plate are posts 61 supporting and welded to a ring 63 having a baffle or upper distributor plate 65 bolted thereto. These plates are respectively provided with air whirl promoting vanes 67 and 68. The weight of the parts urges the vertical shaft downward, thereby automatically to take up wear on the combined end and side thrust bearing and insure rotation of the shaft without vibration.

The fan comprises a large conical hub 69 encircling and spaced from the hopper and having its lower end welded to the baffle plate ring 63. Plates 71 of general triangular shape have their inner edges welded to the conical hub 69 and their upper edges welded to an outstanding flange 73 at the top of said hub. The fan blades 75 overlap the plates 71 and are detachably secured thereto by bolts 77 entered through pairs of registering holes in the blades and plates. The welded assembly of parts including the stepped plate 57, posts 61, ring 63, fan hub 69 and blade carrying plates 71 constitutes a simple, strong, effective unit. The fan blades are located in a chamber 79 between the outer and inner casing heads, and develop the whirling air current which circulates up through the separating chamber through an opening 81 in the inner casing head through the chamber 79 down in the settling chamber, and between the vanes 33 back into the separating chamber. To regulate the size of the opening 81, a valve may be provided desirably in the form of a series of overlapped plates 83 having arms 85 which extend through and beyond the outer casing where they are accessible for radial adjustment to vary the size of the opening 81. Since this valve is of a construction well understood in the art, it is unnecessary to show the same in detail herein.

To rotate the vertical shaft 49 which carries the distributor, baffle plate and fan, a bevel gear 85 is mounted on said shaft and meshes with a bevel pinion 87 on a horizontal shaft 89 (Fig. 3). The inner end of this shaft is journalled in a roller bearing 91 having an inner raceway on the shaft and an outer raceway in a cylindrical box 93 mounted in a boss 95 projecting out from the gear housing 43, said box being secured in its desired position of adjustment by a set screw 97. The outer end of the shaft is journalled in a roller bearing 99 having an inner raceway on the shaft and an outer raceway in a box 101 having ears 103 (Fig. 2) adjustably secured by bolts 105 to a transverse bar 107 mounted upon and bridging the channels 41 referred to. The box 101 has a head 109 (Fig. 3) provided with a boss 111 spaced somewhat from the shaft to receive a collar 113 having an outstanding flange 115 secured to the shaft by a set screw 117. The inner bearing box 93 is shrunk onto the inner reduced end of a sleeve 119 containing the shaft 89, and the outer bearing box 101 is shrunk onto the outer reduced end of said sleeve. Mounted on the shaft is a pulley 121 which may be driven from any suitable source of power.

This horizontal shaft and bearing construction has important advantages. The bearing boxes 93, 101 and sleeve 119 constitute a simple and effective unit. They assure proper alinement of the bearings without the necessity of providing ball and socket self-alining bearing boxes. In driving the gear by the pinion, there is a force tending to thrust the horizontal shaft axially away from the vertical shaft, but this is prevented by the roller bearings.

To make the adjustment for taking up any lost motion in the roller bearings, it is merely necessary to loosen the set screw 117 and then tap the collar flange 115 to slide the inner raceway of the outer roller bearing 99 somewhat along the shaft. This will shorten the distance between the raceways on the shaft and take up any lost motion in the roller bearings. Then the set screw 117 may be tightened to secure the collar 113 to the shaft.

To secure proper meshing of the bevel gears the bearing boxes and their connecting sleeve are adjusted as a unit and secured by tightening the set screw 97 for the inner box and the bolts 105 for the outer box. This adjustment is permitted by seating the bolts 105 in longitudinal slots (dotted lines Fig. 2) cut in either the ears 103 or the bar 107.

Since the roller bearing 91 is enclosed by the box 93 and the gear housing 43, and the roller bearing 99 is enclosed by the box 101, the head 109 and the sleeve 113, a desirable dust-proof construction is provided. Lubricant may be applied to the bearing 99, and will flow through the space between the horizontal shaft and the sleeve 119 to the bear-

ing 91, so that lubricant for both bearings may be applied at one point.

To conduct the materials to be graded into the separator, an upper hopper 121 (Fig. 1) is provided having a flange 123 resting upon and secured to the channels 41, and said hopper and the gear housing 43 may desirably be formed in one casting. Depending from and communicating with the upper hopper is a lower hopper 125 (Figs. 1 and 3) of general conical form having opposed flat sides 127 (Fig. 2). The mouth of the hopper is of general oblong form and has an outstanding flange 129 secured by bolts 131 to an outstanding flange 133 at the lower end of the upper hopper. The lower hopper flange 125 is of sufficient width to overlie the margin surrounding the opening in the outer casing head. The construction is such that the upper hopper 121, gear housing and the lower hopper 125 may be lifted from the separator up through the space between the channels 41 at the top of the separator.

It will be understood that the invention is not limited to the specific embodiment shown, and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In an air separator of the type in which a driven shaft is rotated by a driving shaft there being intermeshing toothed gears on said shafts, a unitary driving shaft bearing comprising a pair of spaced boxes each having a bearing, a shaft sleeve extending between and secured to said boxes, and separate means for releasably securing each of said boxes to a fixed support on the air separator, whereby on releasing said boxes the boxes, bearings and driving shaft may be adjusted longitudinally relative to the fixed support to secure proper intermeshing of said gears.

2. A unitary driving shaft bearing according to claim 1 in which the driven shaft is supported in a fixed housing, a fixed support for said housing, one of said driving shaft boxes being releasably secured to said housing and the other of said driving shaft boxes being releasably secured to the support for said housing.

3. In an air separator of the type having a driving shaft, a driven shaft and intermeshing gears between the inner ends of said shafts, a driving shaft bearing comprising a bearing box at each end of said shaft, an inner roller bearing having inner and outer raceways fixed in its box, an outer roller bearing having an outer raceway fixed in its box and an inner raceway slidably mounted on the driving shaft, means connecting the bearing boxes to hold said outer raceways in fixed relation, a collar on the driving shaft entering the outer bearing box through its outer face and engaging said slidable inner raceway, and releasable means for securing said collar to the driving shaft whereby on tapping the released collar the distance between the two raceways is reduced.

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