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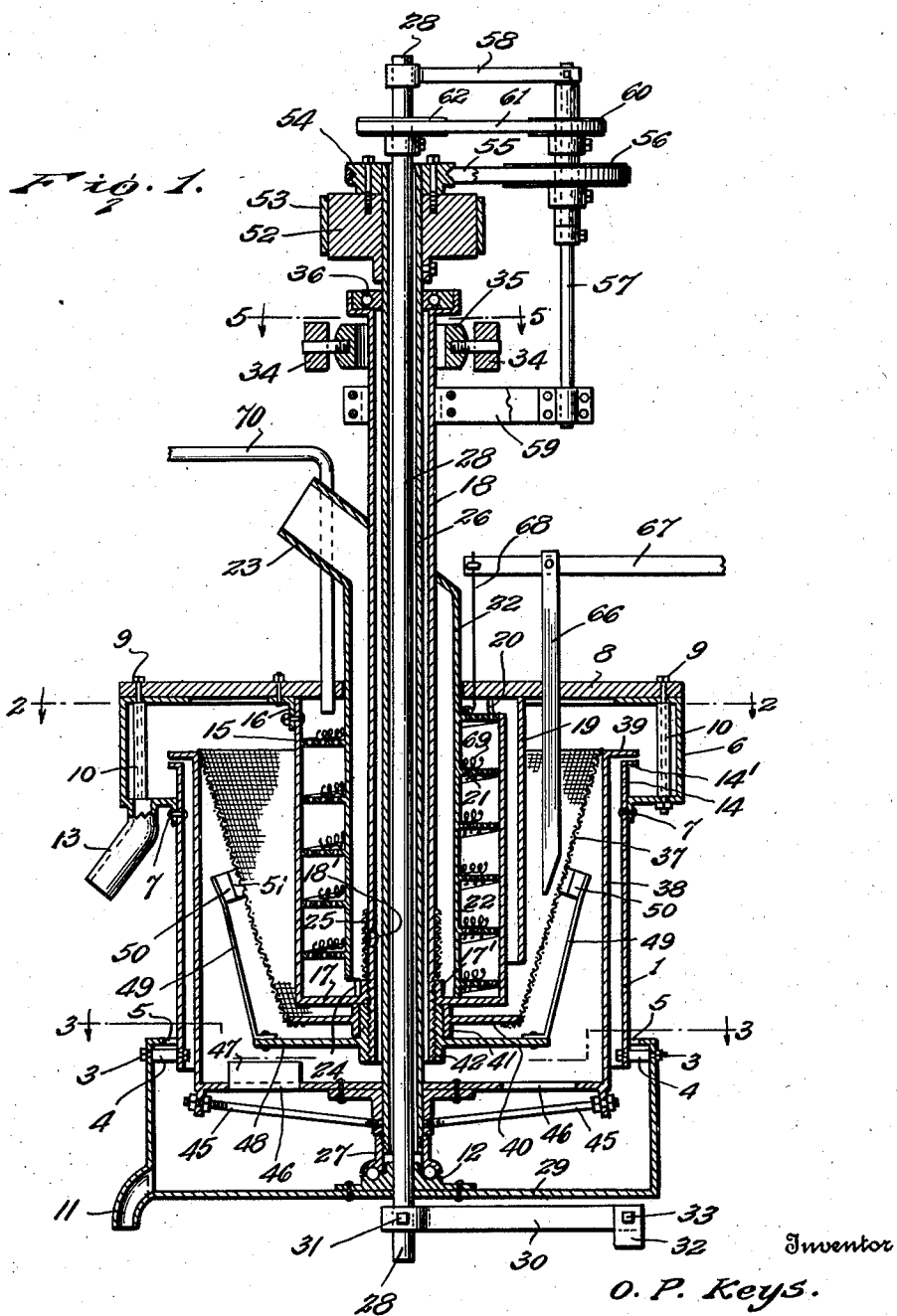
O. P. KEYS

2,190,072

GRAIN WASHER AND DRIER

Filed Nov. 13, 1937

2 Sheets-Sheet 1



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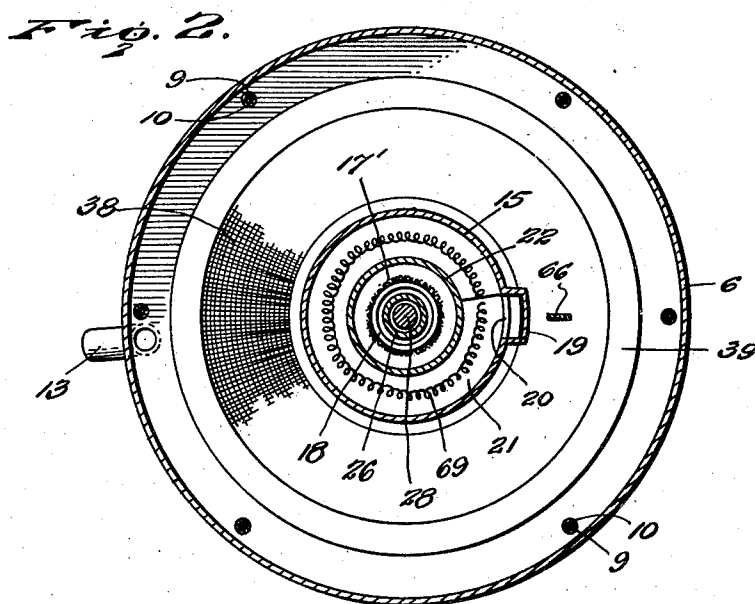
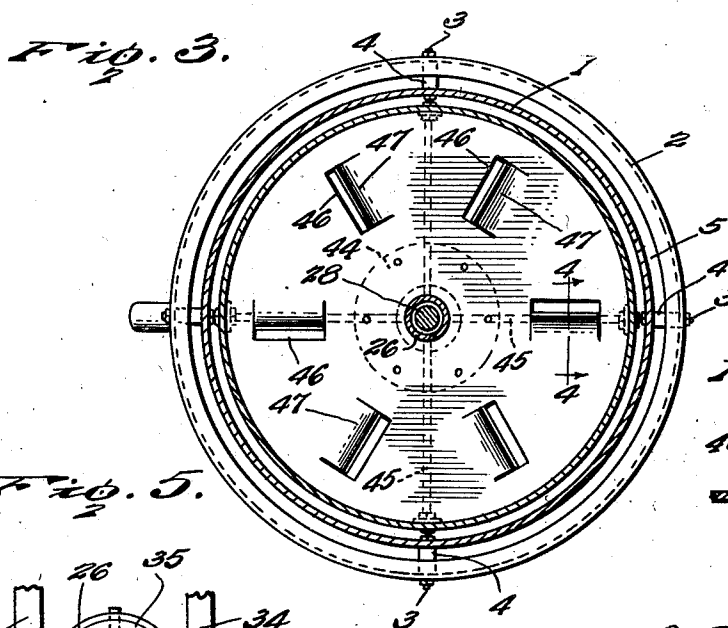
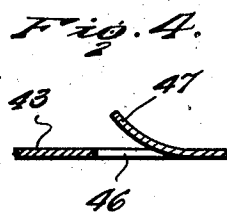
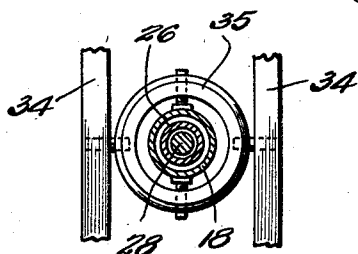
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GRAIN WASHER AND DRIER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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GRAIN WASHER AND DRIER

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Application November 13, 1937, Serial No. 174,434

6 Claims. (Cl. 83—28)

This invention relates to a grain washer and drier and it is one subject of the invention to provide a device of this character by use of which grain may be washed in order to remove dust and dirt therefrom and then thoroughly dried to remove all moisture and prevent the grain from becoming moldy and prepare it for grinding.

Another object of the invention is to provide improved means for conducting grain upwardly through a water and grain receiving chamber of the washing mechanism to a point at which the grain after being washed may be delivered to a rotary drier wherein all water will be removed from the grain before it is delivered through a discharge spout.

Another object of the invention is to so mount the washing mechanism and drying mechanism that the drying mechanism will be disposed about the washing mechanism and have rotary motion imparted to it at such speed that, when the washed grain is delivered into the lower portion of the drying mechanism, centrifugal force exerted by rotation of the dryer will serve not only to expel water from the grain but also serve to move the grain upwardly against walls of the dryer to a position in which it will be delivered into a trough leading to a discharge spout.

Another object of the invention is to provide means for imparting vibration to the centrifugal drier during rotation thereof and thus prevent the grain from being held too tightly against the walls of the drier by centrifugal force. It will thus be seen that the grain will be sufficiently free from the walls of the drier to permit it to move upwardly and be discharged into a trough surrounding the upper end of the drier and formed with a discharge spout.

It is another object of the invention to so mount the drier and the washer that they may have movement relative to each other, the washer being carried by a tubular casing serving not only as a means for actuating the washer but also constituting means for suspending the apparatus from an overhead support.

It is another object of the invention to provide the apparatus with a housing serving to enclose the centrifugal drier and the washing mechanism, the drier having a cup-like body or shell and the bottom of the shell being formed with openings which serve as outlets for water expelled from the grain by the centrifugal drier and also constituting means for permitting passage of air downwardly through the housing and the drier. It will thus be seen that the water

driven off from the grain will be drained out of the shell to the bottom of the housing for discharge through an outlet and circulation of air permitted through the drier to assist in the drying of the grain.

The invention is illustrated in the accompanying drawings, where

Figure 1 is a sectional view taken vertically through the improved grain washer and drier.

Figure 2 is a sectional view taken transversely through the apparatus along the line 2—2 of Figure 1.

Figure 3 is a sectional view taken along the line 3—3 of Figure 1.

Figure 4 is a fragmentary sectional view taken through the bottom of the casing or housing along the line 4—4 of Figure 3, and

Figure 5 is a fragmentary sectional view taken along the line 5—5 of Figure 1.

The housing 1 of this improved grain washer and drier is of cylindrical formation and may be of any desired depth and diameter. The enlarged lower portion 2 of the housing is secured by bolts 3 carrying spacers 4 serving to maintain this lower portion concentric to the body portion of the housing and provide an annular air passage 5. An upper portion of hood 6 of the body is secured by rivets 7 and carries a cross bar 8 secured by bolts 9 about which fit sleeves 10 serving as braces for the hood. The enlarged lower portion 2 of the casing constitutes a water receptacle and is provided with a water outlet 11 and carries a bearing 12 at its center. The hood 6 constitutes a grain trough surrounding the body of the casing and at one side thereon being provided with a grain outlet spout 13. The body portion of the housing projects upwardly above the bottom of the trough or hood to form a short inner peripheral wall 14 having a flange 14' about its upper edge. The body portion of the housing and the enlarged lower portion and hood thereof are preferably formed of sheet metal but the cross bar 8 is thicker and may be formed of wood or thick metal.

Within the housing there has been disposed washing mechanism having a cylindrical casing 15 which is disposed vertically and suspended from the cross bar 8 by a suitable number of brackets 16. This casing has a bottom 17 formed with a central collar 17' by means of which it is mounted in threaded engagement with a tubular hanger 18 by means of which the housing and the mechanism therein are suspended from an overhead support. At one side the casing

15 carries a vertically extending spout 19, the upper end of which communicates with an outlet 20 formed close to the upper end of the casing and the lower end of which terminates near the lower end of the casing. A spirally extending gangway or conveyor 21 formed of perforated metal fits within the casing 15 and is secured about a tubular column 22 constituting an inlet spout through which grain is fed into the washer. This spout 22 extends upwardly through the cross bar 11 about the tubular hanger 18 and has a diagonally extending neck 23 into which grain is to be poured so that it will flow downwardly through the tube or column and out through the opening 24 onto the bottom of the casing 15. A water passage 18' is formed in the hanger in upwardly spaced relation to the grain passage 24 and covered by screening 25 to prevent water in the casing from carrying grain into the hanger.

A hollow shaft 26 extends vertically through the hanger concentric thereto with its upper portion extending upwardly through and above the spout 22 and its lower portion extending downwardly beyond the hanger and carrying a bearing sleeve 27 which cooperates with the bearing member 12 to rotatably mount the tubular shaft. Through the hollow shaft 26 extends an inner shaft 28 which is preferably solid and passes through the bearing member 12 with its lower end projecting downwardly from the bottom 29 of the housing. This inner shaft 28 turns relative to the hollow shaft and below the housing carries an arm 30 which is recessed by a fastener 31. This arm extends radially of the housing and at its outer end carries a weight 32 which is secured to the arm by a bolt or other equivalent fastener 33. The arm and its weight swing in a circular path during rotation of the inner shaft and centrifugal force created by the weight imparts swinging movement in a circular path to the housing and the hanger, this being permitted due to the fact that the hanger is suspended from the beams 34 by a universal joint 35. The upper end of the hanger carries a bearing 36 for the hollow shaft 26. When the hollow shaft 26 is turned, rotary motion is to be imparted to an annular screen 37 which is of an inverted frusto-conical formation and disposed about the washer within a cup-shaped shell 38 with its upper marginal portion secured about the inner margin of the flange 39 of the shell which overhangs the flange 14' of the wall 14. The bottom 40 of the drier carries a sleeve 41 rotatably engaged about a collar 42 carried by the hanger 18 below the washer and the bottom 43 of the shell 38 is riveted to a collar 44 fitting snugly about the hollow shaft and rigidly held thereon by threaded ends of the bracing rods 45 which serve as set screws as well as braces. Therefore, when the shaft 26 is rotated, rotary motion will be imparted to the drier screen 37 and its shell while at the same time the weighted arm 32 carried by the rotating inner shaft imparts swinging movement in a circular path to the housing and the washer. The bottom of the shell is cut to form a number of openings 46 and blades 47 serving as wind scoops for drawing air downwardly through the drier. Arms 48 extend radially from the sleeve 41 and carry resilient vibrators 49 which extend upwardly therefrom and have heads 50 at their upper ends for striking against blocks 51 carried by the conical drier.

Above the beams 34 the tubular shaft carries a pulley wheel 52 about which passes a belt 53

leading from a suitable source of power. A smaller pulley 54 is formed integral with or suitably secured to the pulley 52, and about this pulley 54 engages a belt 55 which is trained about a pulley 56 carried by a counter-shaft 57. This counter-shaft is journaled in the bearing brackets 58 and 59 engaged about the inner shaft 28 and the tubular hanger 18, and above the pulley 56 the counter-shaft carries another pulley 60 about which is engaged a belt 61 serving to transmit rotary motion to the shaft 28 through the medium of a pulley 62. It will thus be seen that both the inner and outer shafts will be rotated but they may be turned at different rates of speed and the shaft 26 rotates at a higher speed than the inner shaft 28. During the rotation of the hollow shaft, the annular screen or drier turns with it and the weight 38 carried by the rotating inner shaft causes a force to be exerted which will impart swinging movement in a circular path to the entire apparatus, this swinging movement being permitted by the universal joint connection 35 between the tubular hanger 18 and the supporting beams 34. This swinging movement will also cause vibrating movement to be imparted to the spring arms or vibrators 49 and as the resilient arms or strips vibrate, the heads 50 thereof will have tapping engagement with the blocks 51 carried by side portions of the annular screen and cause grain to be lowered so that it moves easily upwardly upon the screen and over the flange 39 into the trough 6. It is to be understood that the blocks 51 may be omitted if so desired or a band encircling the screen provided for engagement by the heads of the vibrators. A bar or strip 66 which serves as an agitator and assists in preventing grain from adhering to the walls of the annular screen extends vertically in the drier and has its upper end portion extending through an opening formed in the cross beam 8 and secured to a supporting bar 67. This supporting bar also supports the upper end of a wire strand 68 which extends into the washer and is coiled to form an agitator 69 which rests upon and follows the spiral pathway 21. Water is fed into the washer through the water pipe 70.

When this grain washer and drier is in use, it is suspended from the overhead supporting beams 34 and the belt 53 engaged about the pulley 52 so that rotary motion will be imparted to the outer tubular shaft 26 and also transmitted to the inner shaft 28. The grain is fed into the neck 23 and passes downwardly through the spout 22 and out through the passage 24 onto the bottom of the washer casing 15. Water flows from the pipe 70 into the casing and downwardly through the perforated conveyor strip or pathway 21 and forms a body of water which overflows through the spillway or outlet 19'. Therefore, grain in the bottom of the casing will be immersed in water and dirt washed from it. The centrifugal force set up by the weight 32 causes swinging movement in a circular path to be imparted to the washer and the housing, this being permitted by the universal joint 35, and the grain in the bottom of the casing 15 will be moved upwardly along the spirally extending strip or pathway 21, during which time any dirt or dust adhering to it will be removed by the water flowing from the pipe 70. When the grain reaches the top of the washer casing 15, it passes out through the discharge openings 20 and downwardly through the spout 19 to the bottom of the drier. This drier is turning rapidly and the

centrifugal force causes the grain to move upwardly against the perforated walls or annular screen 37 thereof. Water will be expelled from the grain by the centrifugal force and drop to the bottom of the shell where it will pass through the openings 46, and the blades or scoops 5 will also serve to force air downwardly through the openings 46. It will thus be seen that a current of downwardly moving air will be created in the housing and through the perforated walls of the drier. Therefore, by the time the grain has reached the upper edge of the drier all moisture will have been removed and dry grain will pass from the drier over the flange 39 and into the trough 6 through which it will move to the discharge spout 13. Vibration of the resilient strips or arms 57 will cause their heads 58 to strike against the blocks 51 and if any of the grain has a tendency to tightly adhere to the walls of the screen instead of moving upwardly it will be loosened sufficiently to permit it to move upwardly. Vibration set up by the vibrators will also have a tendency to shake water from the grain and assist rapid drying of the grain. The strip 66 assists in movement of the grain upwardly to the open upper end of the drier and the spirally extending wire strand 69 serves to prevent slipping of the grain downwardly along the pathway.

Having thus described the invention, what is claimed as new is:

1. In a washer and drier, a vertically disposed receptacle, a hanger for said receptacle mounted for universal swinging movement whereby the receptacle may have movement in a circular path, means for delivering material into the receptacle at the bottom thereof, means for discharging water into the receptacle for passage downwardly through the material, means for moving the material upwardly in the receptacle to an outlet at the top thereof, a centrifugal drier surrounding said receptacle, means for imparting swinging movement to the receptacle and drier, a spout for conducting washed material downwardly from the outlet of the receptacle to the bottom of the centrifugal drier, and means for receiving washed and dried material from the centrifugal drier.

2. In a material washer and drier, a housing, a trough surrounding the upper end of said housing, a centrifugal drier mounted in said housing and having its upper portion overlapping said trough for discharging material into the trough, a casing disposed vertically in the housing centrally of the housing and centrifugal drier, an inner shaft extending vertically through the casing and the housing centrally thereof, an outer tubular shaft disposed about the inner shaft, the tubular shaft having its lower end rotatably mounted in the housing and the drier being carried by and turning with the tubular shaft, a tubular hanger for the casing and housing disposed about the tubular shaft and mounted for universal swinging movement, means for transmitting rotary movement from one shaft to the other, a weighted arm carried by the inner shaft for imparting swinging movement to the hanger material for delivering grain into said casing including a tube mounted about the tubular hanger and serving to conduct the material to the bottom of the casing, means for delivering water into the casing, and means in the casing for conducting the material upwardly through water and discharging the material through an

outlet at the top of the casing and into the centrifugal drier.

3. In a material washer and drier, a housing, a centrifugal drier in said housing, a discharge trough surrounding said housing in position to receive washed and dried material from the drier, a casing in said housing disposed concentric thereto and surrounded by the centrifugal drier, a support for said casing carried by said trough, an elevator in said casing extending spirally therein and adapted to convey material upwardly to an outlet at the top of the casing, means for conducting material from the outlet of the casing to the bottom of the centrifugal drier, an inner shaft, an outer shaft surrounding the inner shaft, a tubular hanger about the outer shaft, a mounting supporting the hanger for universal tilting movement, said shafts and said hanger extending vertically through the casing and housing centrally thereof, said inner shaft having its lower end journaled through the bottom of said housing and the outer shaft having said drier carried by and turning therewith, a weighted arm carried by the inner shaft under said housing for imparting swinging movement to the hanger and the housing in a circular path, means for transmitting rotary movement from one shaft to the other, means for delivering material into said casing, and means for delivering water into the casing.

4. In a material washer and drier, inner and outer shafts rotatably mounted concentric to each other, a tubular hanger about the outer shaft mounted for universal tilting movement, a housing secured about the lower portion of the hanger with said shafts and hanger extending through the housing concentric thereof and the lower end of the inner shaft protruding from the bottom of the housing, an arm extending from the lower end of said inner shaft radially of the housing and carrying a weight at its outer end for imparting swinging movement in a circular path to the housing during rotation of the shafts, means for transmitting rotary movement from one shaft to the other, a cylindrical material-receiving chamber disposed vertically in the housing about said hanger and having swinging movement with the hanger and the housing, said chamber being provided with an upper outlet, a rotatable centrifugal drier in the housing surrounding said casing and connected with the outer shaft to turn therewith, means for conducting material from the outlet of the casing to the bottom of the centrifugal drier, means within said casing for conducting material upwardly from the bottom of the casing through water therein to the outlet of the casing, and means for discharging water into the casing.

5. In a washer and drier, a vertically disposed housing, a vertically disposed cylindrical casing in the housing concentric thereto, a centrifugal drier in the housing rotatable therein and disposed about the casing, a tubular hanger suspended at its upper end by a universal joint and extending through the housing and casing centrally thereof in fixed engagement therewith and mounting the housing and the casing for swinging movement in a circular path, a rotary tubular shaft extending through said hanger and mounting the drier for rotary movement about the casing, a rotary inner shaft extending through the first shaft and having its lower end extending through the bottom of the casing, a weighted arm carried by the inner shaft for imparting swinging movement to the housing and

5 casing during rotation of the inner shaft, means
within the casing for conducting material up-
wardly therein to an outlet at the top of the cas-
ing during swinging movement of the housing
and the casing, means for delivering material to
the bottom of the casing, and means for dis-
charging water into the top of the casing.

6. In a washer and drier, a washing apparatus
including a casing and means for conveying ma-
10 terial upwardly in the casing to an outlet at the

top thereof, a hanger for said washer mounted
for universal swinging movement whereby the
washer has movement in a circular path, a ro-
tary drier surrounding said casing and rotata-
ble relative thereto and moving with the washer
during swinging thereof, means for imparting
rotary motion to said drier, and means for im-
parting swinging movement to the washing and
drying apparatus during rotation of the drier.

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