Sept. 2, 1947. A. F. PFINGSTEN ET AL 2,426,946

CENTRIFUGAL CLEANER FOR WINNOWING AND SCREENING GRAIN

Filed June 3, 1944 4 Sheets-Sheet 1

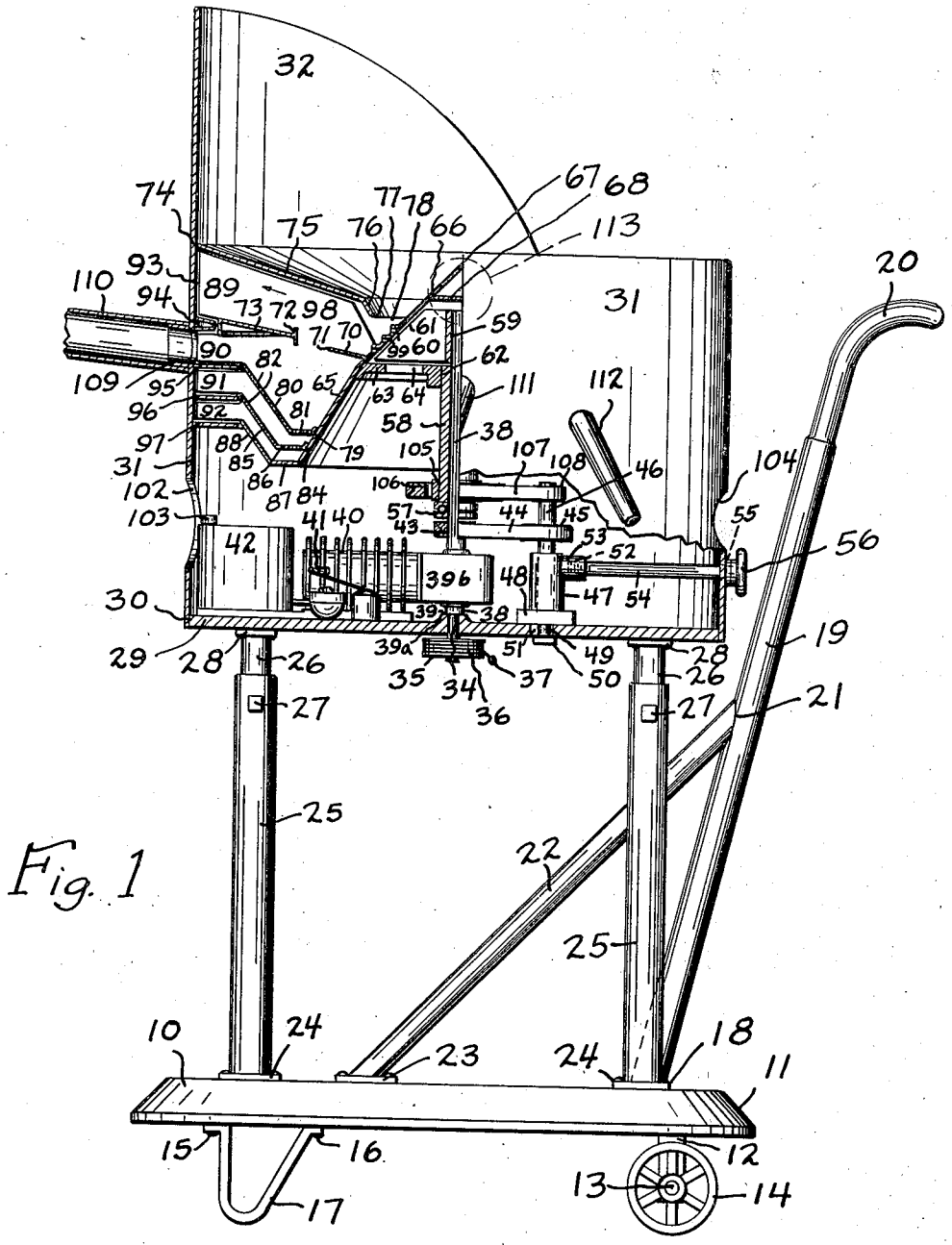


Fig. 1

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CENTRIFUGAL CLEANER FOR WINNOWING AND SCREENING GRAIN

Filed June 3, 1944 4 Sheets-Sheet 2

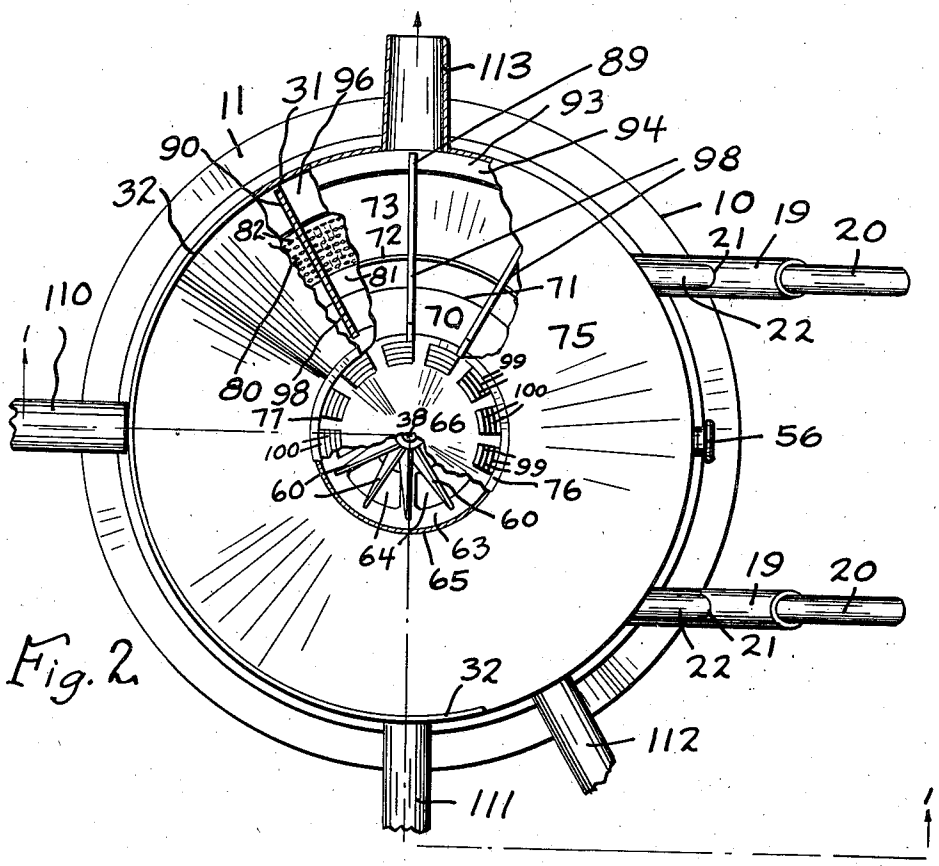


Fig. 2

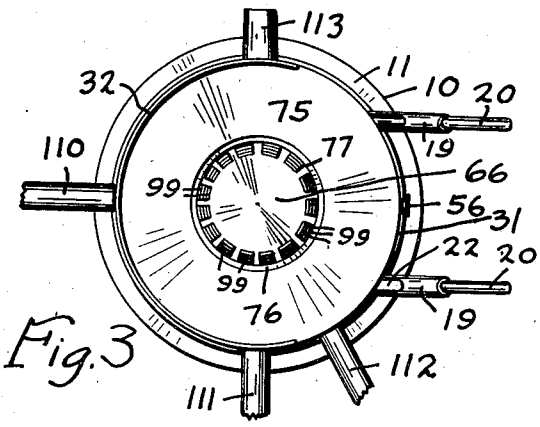


Fig. 3

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Filed June 3, 1944 4 Sheets-Sheet 3

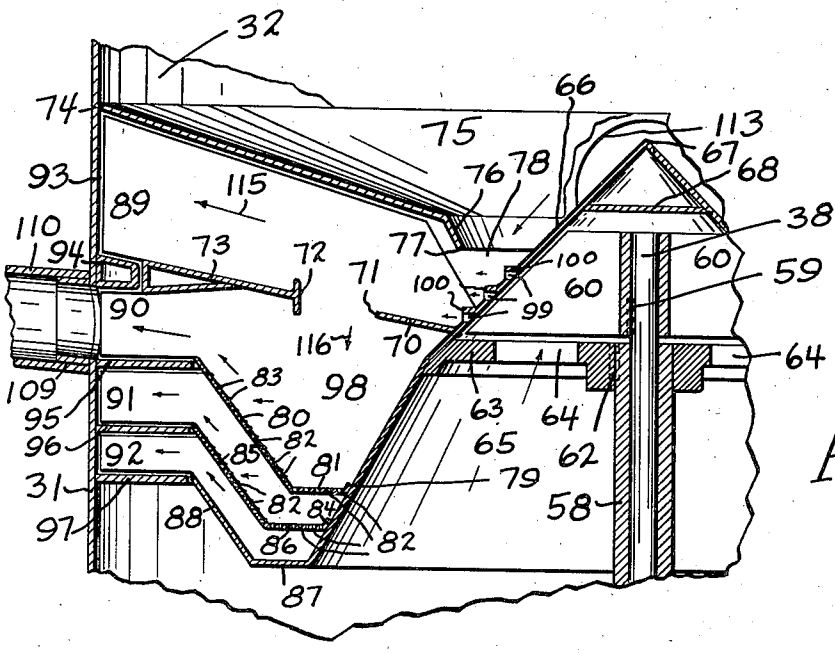


Fig. 4

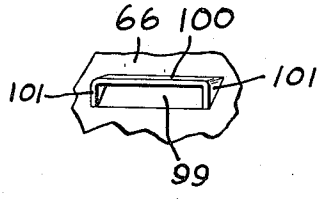


Fig. 5

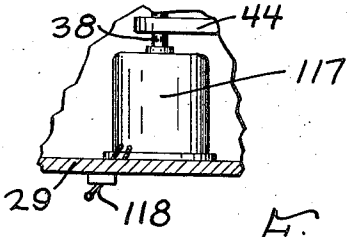


Fig. 6

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CENTRIFUGAL CLEANER FOR WINNOWING AND SCREENING GRAIN

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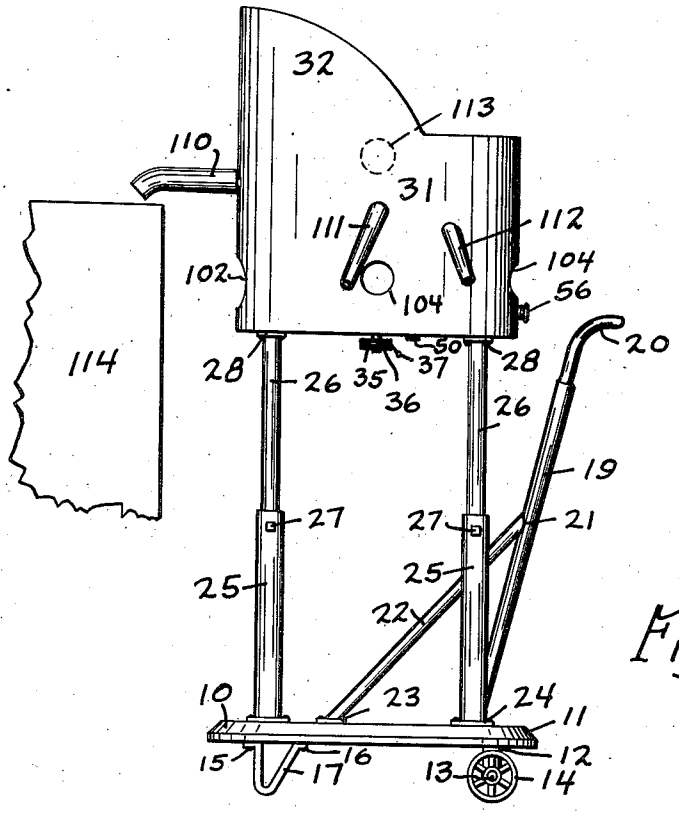


Fig. 7

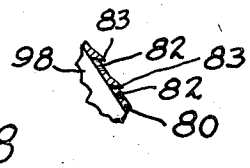


Fig. 8

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UNITED STATES PATENT OFFICE

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CENTRIFUGAL CLEANER FOR WINNOWING AND SCREENING GRAIN

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Application June 3, 1944, Serial No. 538,606

6 Claims. (Cl. 209—21)

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Our invention relates to a grain cleaner.

An object of our invention is to provide a grain cleaning machine, which will efficiently blow the straw, small weed particles, and other lighter portions out of the grain itself, and thence to deposit the cleaned grain at any desired location.

A further object of our invention is to provide an arrangement whereby smaller seeds such as mustard seed, etc., can be separated progressively from the principal seeds, and also deposited in desired locations.

A further object of our invention is to provide a portable arrangement which can be wheeled to any desired location, and so that the grain to be cleaned can be thrown into the machine, or carried into the same, and thence separated, and forcing the clean grain into the necessary receptacle, such as a wagon or the like.

A further object of our invention is to provide a small unit machine which will efficiently separate the chaff, straw, etc., from the grain through a combination of strongly impelled wind forces, combined with centrifugal forces.

A further object of our invention is to provide a machine of this character which can be raised or lowered to selected positions so as to deliver grain, or to receive grain accordingly.

A further object of our invention is to provide all of the above objects in a unit which can be driven by means of a small gasoline engine, or an electric motor, and which is simple in construction.

With these and other objects in view, our invention consists in the construction, arrangement, and combination of the various parts of our device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in our claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of the machine, being taken in section substantially along the lines 1—1 of Figure 2,

Figure 2 is a plan view of the machine with certain portions thereof being taken in fragmentary sections,

Figure 3 is a further plan view of the machine,

Figure 4 is an enlarged detail showing the blowing and centrifugally functioning arrangements,

Figure 5 is a detail of certain of the openings,

Figure 6 is a view of that modification wherein an electric motor is used to drive the unit,

Figure 7 is a side elevation of the unit in its fully raised position showing wherein the grain is delivered in such position, and

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Figure 8 is a detail of the small grain receiving openings.

Our invention contemplates the provision of a grain cleaner wherein a grain such as oats or the like can be shoveled or thrown into the machine from the storage bin, and thence is cleaned and separated in the machine from the straw, chaff, and other undesired particles, and thence directly delivered to the wagon, or similar unit. In other wards, instead of processing the grain through a cumbersome gravity process requiring a long time, as well as cumbersome apparatus, our invention efficiently cleans the grain as fast as it can be thrown into the machine, and thence carries it directly into the wagon. This eliminates a complete operational step, thereby requiring less manpower, eliminates extra handling and hauling of the grain, and provides many advantages clearly apparent.

We have used the character 10 to designate generally the base of the device which base can include the sloping sides 11, the base preferably being round, and attached to the base are the brackets 12 which carry the shaft 13 upon which are journalled a pair of wheels 14, and attached at 15 and 16 are a pair of supports 17 which extend downwardly to a level in line with the bottom of the wheels 14. Also secured to the base at 18 are a pair of rods 19 which extend at a slight angle from the vertical and terminate in the arcuate handles 20. Attached at 21 to the rods 19 are the bracing rods 22 which are attached to 23 to the base 10. Attached at 24 to the base 10 are four equally spaced pipes 25 in which are received an equal number of rods 26 which rods extend to the bottom of the pipes 25. Lock screws 27 are threadably engaged with the pipes 25, and are adapted to lock the rods 26 when the upper unit is placed in any desired position.

The rods 26 are attached at 28 to a circular base member 29, and attached at 30 to the base member 29 is a cylindrical sheet metal housing 31, which includes an integral grain deflecting upper portion 32 which extends substantially half way about the unit. Extending through the base at 33 is a shaft portion 34 which is attached to a pulley 35 about which is coiled a pull cord 36 terminating in the pull handle 37. The shaft portion 34 is an integral extension of the slightly larger shaft 38 having the shoulder at 39 where it rests upon the boss 39a. The shaft 38 extends into the crank case 39b which includes a crank arm which is driven by means of the gasoline engine cylinder 40, the character 41 designating the

spark plug of the engine and the character 42 designating the gasoline storage reservoir. The shaft 38 is attached to a pulley 43 over which passes the belt 44 which in turn drives a further pulley 45 which is attached to a stub shaft 46 which shaft 46 is rotatably mounted within a bearing 47 which bearing includes the base 48.

Attached to the base 48 is a stud 49 which terminates in the head 50, the stud 49 being adapted for slidable movement within the slot 51. Threadably engaged at 52 with the boss 53 which is an integral extension of the bearing 47, is a lengthened rod 54 which passes through the shell or housing 31 at 55 and terminates in the turning handle 56 attached thereto.

Also attached to the shaft 38 is a split ball bearing member 57, the lower portion of which is secured to the shaft, and resting upon the upper portion of the ball bearing member 57 is a hollow shaft 58 which is adapted to receive the shaft 38 and to revolve at a smaller speed than the inner shaft. The shaft 38 extends upwardly and is attached at 59 to a blowing fan unit which includes a series of equally spaced pitched blades 60 arranged radially about the shaft 38, the blades 60 including the sloping edges 61. Attached at 62 to the hollow shaft 58 is a circular frame 63 including a series of openings 64, and supported by the frame 63 and attached thereto, is a substantially frusto-conical member 65 which extends into the integral upwardly extending conical member 66 which terminates at the tip 67.

The integral members 65 and 66 are preferably made of relatively thin sheet metal, and attached within the cone 66 slightly above the top of the blades 60 is a flat plate 68.

Attached at 69 to the cone 66 is an annular circular thin plate 70 which is inclined at a slight angle from horizontal, being inclined upwardly toward its periphery.

Spaced a substantial distance from the edge 71 of the plate 70 is a ring shaped plate 72 which is attached to a further annular ring 73, the plate 72 being substantially vertical in cross section. Attached at 74 to the casing 31 is a frusto-conical member 75 which extends downwardly toward the cone 66 and which terminates in a further increased pitch frusto-conical portion 76 which terminates at 77 leaving a substantial opening at 78 between the edge 77 and the cone 66.

Attached at 79 to the member 65 is a further frusto-conical screen member 80 having a horizontal portion 81, the member 80 including a series of small openings 82 which openings are small enough so that the larger desired grain portions such as oats or the like will not pass therethrough, such openings having the slightly extended top portion 83 (see Figure 8) adapted to momentarily retard the small grain portions so that they will pass through these openings, and yet will not allow passage of the desired grain which is to be deposited in the wagon box, etc. Attached at 84 to the member 65 is a further frusto-conical screen 85 having similar openings 82, yet of smaller size than the upper openings. The member 85 includes the flat portion 86, and the portions 81 and 86 include openings of the same size as their respective adjacent openings 82. The member 65 extends into the portion 87 which extends into the frusto-conical member 88 which member 88 however, does not include any openings therein.

Attached to the cone member 66, and member 65 are a series of radially positioned impelling paddles 89 which include integral paddles 90, 91 and 92, the paddle portions 89 adapted to rotate within the channel 93, there being provided a filler member at 94 whereby an annular channel will be formed between the member 94 and the outer limits of the member 75. Similarly flat rings 95, 96 and 97 are attached to the casing 31 in spaced relation to correspondingly provide channels in which the respective paddle portions 90, 91 and 92 will travel.

It will be understood that the paddles are integral extensions of complete flat paddles which extend from the casing to the conical members, such paddles being generally indicated by the character 98, there being any desired number of such paddles requisite with the speed and capacity of the machine. The cone 66 includes a series of equally spaced openings 99 which are punched out of the cone itself and which include the substantially horizontal closed tops at 100 and the side as 101 (see Figure 5). These openings are positioned in groups of one below the other, such groups being arranged radially from the center of the cone as shown in Figures 2 and 3.

The casing 31 includes a large opening at 102 which allows manipulation of the gasoline reservoir cap 103 for filling purposes, and includes further openings 104 for allowing suction of air within the machine. Attached at 105 to the outer shaft 58 is a pulley 106 of relatively large diameter which is driven by means of a belt 107 which engages a smaller pulley 108 which is attached to the stub shaft 46.

Attached to the casing 31 at 109 is a discharge spout or tube 110 which communicates directly at one point with the channel formed between the members 94 and 95, and similarly further discharge spouts 111 and 112 are connected to the next succeeding lower channels respectively, the spout 111 being attached to the channel in which the paddles 91 revolve, and the spout 112 being connected to the channel in which the paddles 92 revolve. Communicating with the channel 93 is a much larger discharge pipe 113.

The machine operates in the following manner, First, it is transported to any desired location by tipping the machine on the wheels 14, and wheeling it, by grasping the handles 20, to the desired location. This location for instance, could be wherein the grain to be cleaned is shovelled from a storage bin directly into a wagon box, such wagon box being indicated by the character 114 in Figure 7. By merely lifting the casing 31 upwardly after loosening the lock screws 27, the unit can be positioned at the desired height and the lock screws retightened, such elevated position being shown in Figure 7. Next the pulley cord 36 is pulled, which starts the gasoline engine 40 which starts the machine in operation.

Next the handle 56 is turned which rotates the lengthened rod 54, the threadable engagement thereof with the boss 53 serving to draw the entire bearing 47 toward the right as viewed in Figure 1, thereby tightening both belts 44 and 107 against their engaging pulleys which then starts the upper screens of the machine in operation. This arrangement thereby provides means for first starting the engine in motion and thence gradually engaging the upper heavier portions and bringing them into motion.

The grain is then shovelled from the bin and thrown into the top of the casing 31, which grain passes downwardly along the inclined member 76 and between the cone 66 through the

opening 78. The deflecting shield 32 will deflect any grain which is carelessly thrown and centralizes it toward the center of the casing, it being assumed that the grain will be thrown from a position opposite to the shield.

The grain, together with the straw, chaff and lighter particles then travels down along the cone 66 and on to the plate 70. During this travel, the blades 60 are rotating at a comparatively high speed, the pitch of the blades being such that they will draw the air through the openings 64 and blow it radially trough the several openings 99. A positive draft of air is thus provided all around the cone which will effectively blow the straw, and other loose and lighter particles upwardly along the plate 70 and in the direction of the arrow 115 (see Figure 4). This effect, due to the draft created, and centrifugal force caused by the rotating paddles 89, will carry the straw about within the channel 93 and force it out of the spout 113 where it is blown out into the air.

It should be specifically noted that the straw, chaff and other particles being lighter, or having relatively larger exposed areas than the grain particles are positively carried out in this manner since the wind forces are much more effective over greater areas, whereby the combination of the blowing effect, and the centrifugal effect will carry the undesired straw portions out of the grain.

The heavier portions of the grain itself will pass downwardly in the same manner, about and over the openings 99, the formation of the tops of such openings assisting in the separation, the grain then falling to the plate 70 as explained above. The relative ratios between the pulleys 106 and 108 are such that the hollow shaft 58 which carries the framework 63 will rotate at a considerably reduced speed compared to the central shaft 38. As a result all of the rotating screen portions will rotate at a much lower speed than the blades 60. The grain, which is lodged on the plate 70 will be urged toward the rim 71 of the plate through centrifugal action of the whirling plate, and will then drop in the direction of the arrow 116 toward the bottom of the screen. Any grain portions which may have a tendency to fly outwardly a substantial distance beyond the edge 71 will strike against the annular plate 72 and will be deflected back into the screen, however, this will not usually occur since the rotation of the plate 70 will be at the desired speed to simply spill the grain over the edge 71 or slightly therebeyond.

By this time the grain should be completely free of straw, chaff and the other particles and is then ready for further screening and delivery. Assuming that the grain to be finally delivered to the wagon is oats, such larger oat particles will travel up along the screen 80, and the further such particles travel the greater the centrifugal effect since the higher portions of this screen, due to their radial distances from the center of the screen will travel at a greater linear speed, and correspondingly exerting a greater centrifugal force.

The oats will then be impelled outwardly in a positive manner up along the screen 80, and will be further whirled by means of the paddles 90 within the channel in which these paddles rotate, and will thence be ejected through the discharge spout 110 and into the wagon 114. The openings 82 within the screen 80 will not allow passage of the oats itself being of a reduced size,

whereby such oats will, due to the strong centrifugal forces, be carried upwardly as explained. However, smaller seed particles such as mustard seed, or the like, will pass through the openings 82, due to the fact that the openings will pass such sizes, and the projecting portions 83 will assist in entrapping the smaller sizes. The smaller seeds then pass through the screens 80 and downwardly against the next lower screen 85, the mustard seed then being impelled upwardly in the same way, and being carried around by the paddles 91 and discharged through the spout 111 where it is ejected to the ground or into any desired receptacle.

In the same manner the next smaller size of seeds will be entrapped through the smaller openings in the screen 85 which smaller size seeds will pass downwardly into the solid member 88, and will thence be centrifugally forced upwardly, and thence around by the paddles 92 and discharged through the further spout 112. The openings in the flat portions 81 and 86 will permit some of the seeds to pass directly by gravity downwardly to provide separation, or those seeds which might become momentarily retarded.

It should be noted that the respective paddle portions 89, 90, 91 and 92 will positively whirl the grain circularly about the central axis thereby forcing it to fly out by centrifugal action and as explained above.

Also, it should be noted that the plate 70 is of sufficient width in order to give the air blasts caused by the blades 60 sufficient time to blow out all of the straw and such material from the grain itself, and yet have restricted width in order that the speed of the centrifugally urged grain will not pass it out into the channel 93, however, since the edge 71 is considerably closer to the central axis of the machine, the grain particles will not have as great a velocity at this point than when on the screen itself, and as a result they will not have sufficient force to impel them too far outwardly, but substantially just over the edge 71 itself.

After use, the machine can be transported to any other location, can be adjusted as to height for a variety of purposes and in a variety of locations, where it can receive grain from different heights, and discharge it to lower receptacles and the like.

Figure 6 illustrates a modification wherein an electric motor 117 can be used which is mounted on the base 29 and which is controlled by means of a switch 118, the balance of the structure being substantially the same as described hereinabove.

It will now be seen that we have provided all of the advantages mentioned in the objects of our invention, with various other advantages being readily apparent.

Some changes may be made in the construction and arrangement of the parts of our invention without departing from the real spirit and purpose of our invention, and it is our intention to cover by our claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

We claim as our invention:

1. A centrifugal grain cleaner comprising a casing, a revolving vertically positioned substantially conical member mounted in said casing, said member having a plurality of openings, a blower member positioned within said member adapted to impel air outwardly through said openings, to impel straw particles radially away from said

member, an annular plate attached to said member for receiving straw and grain particles thereon, said plate having a peripheral edge whereby heavier grain particles will spill thereover, an annular straw receiving channel attached within said casing, radially positioned paddles travelling in said channel, said blower member including a plurality of pitched blades, a shaft attached thereto for rotating said blades, means for rotating said member and said paddles at a lower speed than said blades.

2. A centrifugal grain cleaner comprising a casing, a revolving vertically positioned substantially conical member mounted in said casing, said member having a plurality of openings, a blower member positioned within said member adapted to impel air outwardly through said openings, to impel straw particles radially away from said member, an annular plate attached to said member for receiving straw and grain particles thereon, said plate having a peripheral edge whereby heavier grain particles will spill thereover, an annular straw receiving channel attached within said casing, radially positioned paddles travelling in said channel, said blower member including a plurality of pitched blades, a shaft attached thereto for rotating said blades, means for rotating said member and said paddles at a lower speed than said blades, including a central shaft attached to said blades, a hollow shaft receiving said central shaft, said paddles and said member being attached to said hollow shaft, pulleys having reducing ratios attached between said hollow and said central shaft for reducing the speed of said hollow shaft.

3. A centrifugal grain cleaner comprising a casing, a revolving vertically positioned substantially conical member mounted in said casing, said member having a plurality of openings, a blower member positioned within said member adapted to impel air outwardly through said openings, to impel straw particles radially away from said member, an annular plate attached to said member for receiving straw and grain particles thereon, said plate having a peripheral edge whereby heavier grain particles will spill thereover, an annular straw receiving channel attached within said casing, radially positioned paddles travelling in said channel, said blower member including a plurality of pitched blades, a shaft attached thereto for rotating said blades, means for rotating said member and said paddles at a lower speed than said blades, including a central shaft attached to said blades, a hollow shaft receiving said central shaft, said paddles and said member being attached to said hollow shaft, pulleys having reducing ratios attached between said hollow and said central shaft for reducing the speed of said hollow shaft, annular screens attached to said hollow shaft, said annular screens including frusto-conical members having screen openings, paddles attached to said frusto-conical members, said paddles being radially arranged, channels attached to the casing in which said paddles travel, discharge spouts communicating with said channels for delivering grain particles impelled outwardly and upwardly along said frusto-conical members.

4. A centrifugal grain cleaner comprising a casing, a revolving vertically positioned substantially conical member mounted in said casing, said member having a plurality of openings, a blower member positioned within said member adapted to impel air outwardly through said openings, to impel straw particles radially away from said member, an annular plate attached to said member for receiving straw and grain particles thereon, said plate having a peripheral edge whereby heavier grain particles will spill thereover, an annular straw receiving channel attached within said casing, radially positioned paddles travelling in said channel, said blower member including a plurality of pitched blades, a shaft attached thereto for rotating said blades, means for rotating said member and said paddles at a lower speed than said blades, including a central shaft attached to said blades, a hollow shaft receiving said central shaft, said paddles and said member being attached to said hollow shaft, pulleys having reducing ratios attached between said hollow and said central shaft for reducing the speed of said hollow shaft, annular screens attached to said hollow shaft, said annular screens including frusto-conical members having screening openings, paddles attached to said frusto-conical members said paddles being radially arranged, channels attached to the casing in which said paddles travel, discharge spouts communicating with said channels for delivering grain particles impelled outwardly and upwardly along each of said lower frusto-conical members, said frusto-conical members having progressively smaller screening openings than the one above it, for passing progressively smaller grain particles therethrough.

5. A centrifugal grain cleaner comprising a casing, a revolving vertically positioned substantially conical member mounted in said casing, said member having a plurality of openings, a blower member positioned within said member adapted to impel air outwardly through said openings, to impel straw particles radially away from said member, an annular plate attached to said member for receiving straw and grain particles thereon, said plate having a peripheral edge whereby heavier grain particles will spill thereover, an annular straw receiving channel attached within said casing, radially positioned paddles travelling in said channel, said blower member including a plurality of pitched blades, a shaft attached thereto for rotating said blades, means for rotating said member and said paddles at a lower speed than said blades, including a central shaft attached to said blades, a hollow shaft receiving said central shaft, said paddles and said member being attached to said hollow shaft, pulleys having reducing ratios attached between said hollow and said central shaft for reducing the speed of said hollow shaft, annular screens attached to said hollow shaft, said annular screens including frusto-conical members having screening openings, paddles attached to said frusto-conical members, said paddles being radially arranged, channels attached to the casing in which said paddles travel, discharge spouts communicating with said channels for delivering grain particles impelled outwardly and upwardly along said frusto-conical members, each of said lower frusto-conical members having progressively smaller screening openings than the one above it, for passing progressively smaller grain particles therethrough, means for adjustably securing said casing at different heights.

6. A centrifugal grain cleaner comprising a casing, a revolving vertically positioned substantially conical member mounted in said casing, said member having a plurality of openings, a blower member positioned within said member adapted to impel air outwardly through said openings, to impel straw particles radially away from said

member, an annular plate attached to said member for receiving straw and grain particles thereon, said plate having a peripheral edge whereby heavier grain particles will spill thereover, an annular straw receiving channel attached within said casing, radially positioned paddles travelling in said channel, said blower member including a plurality of pitched blades, a shaft attached thereto for rotating said blades, means for rotating said member and said paddles at a lower speed than said blades, including a central shaft attached to said blades, a hollow shaft receiving said central shaft, said paddles and said member being attached to said hollow shaft, pulleys having reducing ratios attached between said hollow and said central shaft for reducing the speed of said hollow shaft, annular screens attached to said hollow shaft, said annular screens including frusto-conical members having screening openings, paddles attached to said frusto-conical members, said paddles being radially arranged, channels attached to the casing in which said paddles travel, discharge spouts communicating with said channels for delivering grain particles impelled outwardly and upwardly along said frusto-conical members, each of said lower frusto-conical members having progressively smaller screening openings than the one above it, for passing progressively smaller grain particles therethrough, means for adjustably securing said casing at different heights, a base supporting said casing, wheels secured to said base, handles attached to the base whereby said centrifugal grain cleaner can be transported to desired locations.

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