July 3, 1923.

1,460,463

O. W. WILLIAMS

GRAIN SEPARATOR

Filed Oct. 31, 1921

2 Sheets-Sheet 1

Fig. 1

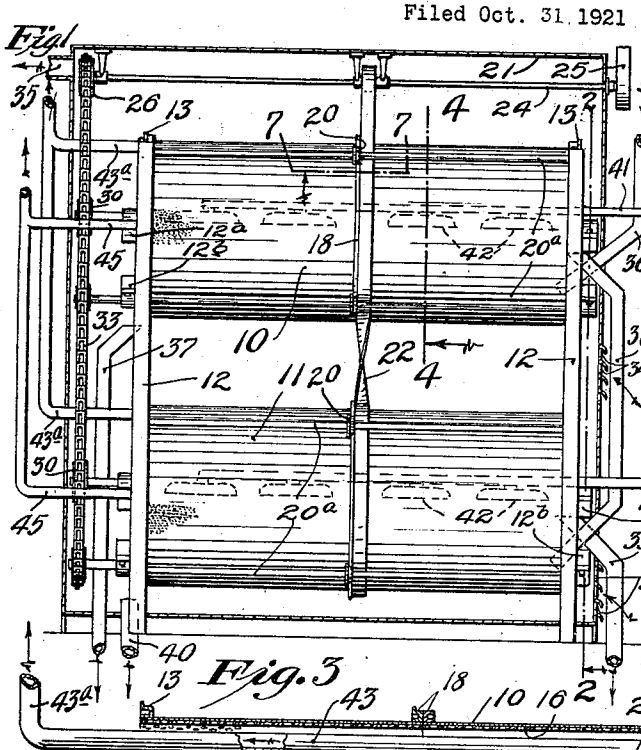


Fig. 2

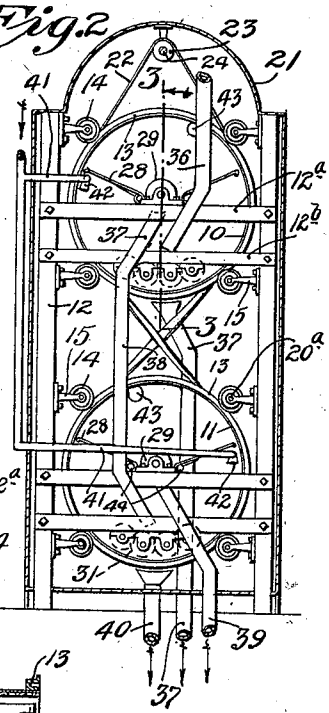


Fig. 3

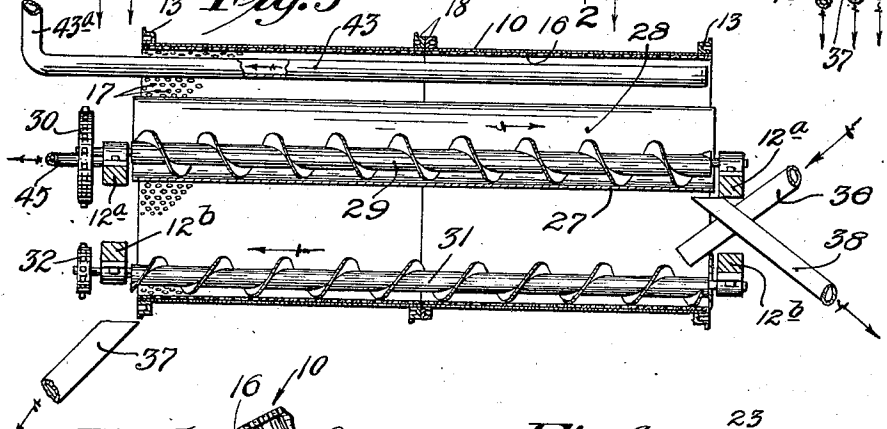


Fig. 5

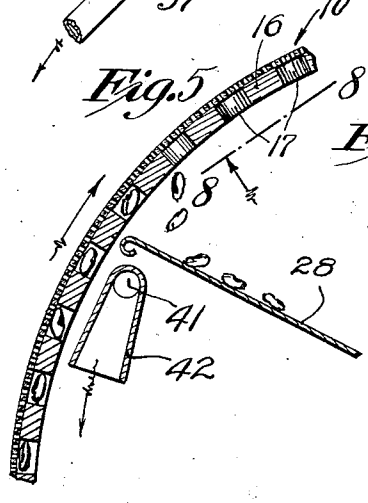
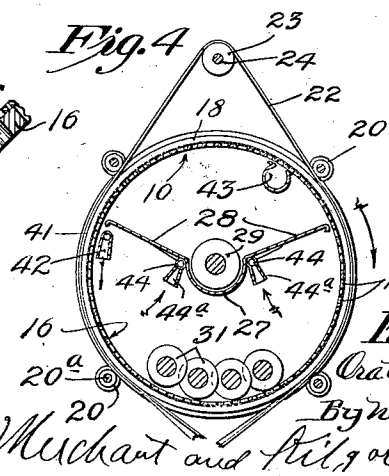


Fig. 6



Fig. 4



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July 3, 1923.

1,460,463

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2 Sheets-Sheet 2

Fig. 9

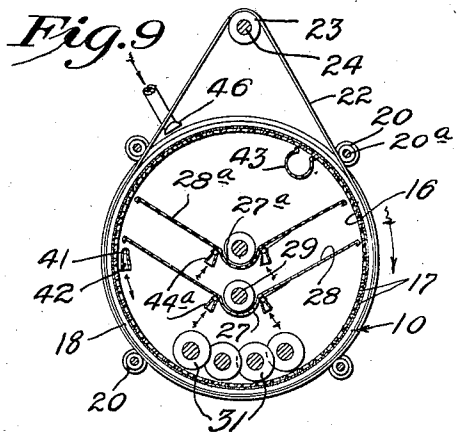


Fig. 8

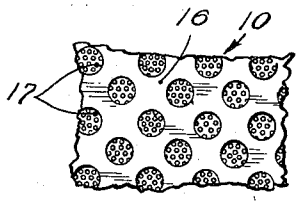
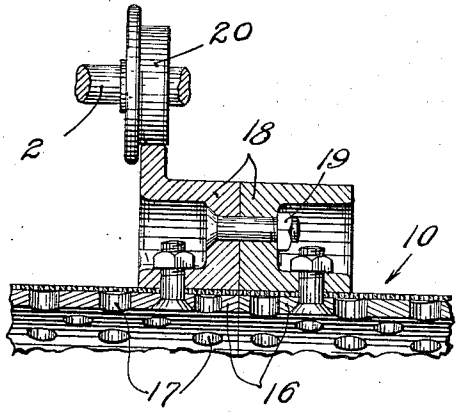


Fig. 7



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Patented July 3, 1923. 1,460,463

UNITED STATES PATENT OFFICE.

ORA WOOD WILLIAMS, OF MINNEAPOLIS, MINNESOTA.

GRAIN SEPARATOR.

Application filed October 31, 1921. Serial No. 511,727.

To all whom it may concern:

Be it known that I, ORA WOOD WILLIAMS, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Grain Separators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to machines for the separation of materials of various different sizes, but has for its particular object the provision of an improved grain separator especially adapted for separation of commingled grains, such as are generally known as succotash and which consists of wheat and oats with the customarily commingled small grains such as seeds, chaff, dirt and the like.

The machine involves one or more rotary drums having internal pockets and associated with various different devices, which co-operate to execute the desired separations.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a side elevation of the machine with the enclosing casing in vertical section;

Fig. 2 is a transverse vertical section taken approximately on the line 2—2 of Fig. 1;

Fig. 3 is a large section taken approximately on the line 3—3 of Fig. 2;

Fig. 4 is a vertical section taken approximately on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged fragmentary section taken on the same line as Fig. 4, and being a section of the upper drum;

Fig. 6 is a section corresponding to Fig. 5 but showing a section of the lower drum;

Fig. 7 is an enlarged fragmentary section taken approximately on the line 7—7 of Fig. 1;

Fig. 8 is a fragmentary view showing a portion of the upper separating drum, looking at the interior thereof or at a portion of the drum found in the vicinity of the line marked 8—8 on Fig. 5; and

Fig. 9 is a view corresponding to Fig. 4 but illustrating a somewhat modified construction.

The machine illustrated employs two separating cylinders or drums 10 and 11 located one over the other, open at both ends and rotatably mounted on a framework 12 by means of flanged annular rims 13 outstanding from the ends of said drums and running against flanged circumferentially spaced guide rollers 14 journaled to bearing brackets 15 suitably secured to the framework 12.

As preferably constructed, each drum 10—11 comprises a thin perforated outer metallic shell and an interior shell lining 16, which latter is also preferably of metal and is provided with pocket-forming perforations 17. The outer shells of said drum have fine perforations, as best shown in Figs. 7 and 8, so that the bottoms of the pockets 17 are closed against the passage of large materials that are formed with perforations that will pass air, dust and small particles.

When the drums are to be of considerable length, they are preferably divided or made up of sections, the sections at their abutting ends being provided with outstanding rigidly secured annular flanges 18 adapted to be rigidly but detachably connected by nut-equipped bolts 19, as best shown in Fig. 7. Also, in such arrangement, one of the flanges 18 will preferably be constructed to run against additional guide rollers or wheels 20 suitably journaled to the frame 12. Preferably, the drum-guiding rollers 20 and 14 are journaled on cross shafts 20^a that are directly secured to or journaled in the bearing brackets 15.

The drums described are enclosed within a main casing 21. The two drums 10 and 11 are arranged to be rotated in opposite directions by a crossed belt 22 that runs against the same, as best shown in Figs. 1 and 2, and is driven by a small pulley 23 carried by a countershaft 24 journaled in bearings on the top of the casing 21 and provided at its outer end with a pulley, over which latter runs a power-driven belt 25. At its opposite end, the shaft 24 has a sprocket 26 for a purpose which will presently appear.

Within each drum is an axially disposed

collecting trough 27, which has opposite inclined collecting plates 28, which latter terminate close to the interiors of the respective drums. These gathering troughs and plates are secured to and supported by transverse bars 12^a of the main frame.

Working in the collecting troughs 27 are spiral conveyors 29, the shafts of which are journaled in suitable bearings on the frame bars 12^a and, at one end, are provided with sprockets 30. Working close to the bottoms of the two drums are spiral conveyors 31 arranged in groups and the shafts of which are journaled in suitable bearings on transverse bars 12^b of the main frame, and, at one end, are provided with sprockets 32. A sprocket chain 33 runs over the sprockets 26, 30 and 32 and transmits rotary motion to the spiral conveyors 29 and 31. Obviously, any suitable driving connections may be employed for rotating said spiral conveyors.

The casing 21 is made substantially airtight except for air intake passages 34 and an air outtake pipe 35, which latter will be connected to the inlet of a fan or to other means for producing suction or partial vacuum within the casing.

The commingled grain will be delivered to the first or upper drum 10 through a supply spout 36 and material will be delivered from the discharge end of said upper drum into and through a discharge spout 37. An intermediate or transverse spout 38 receives from the delivery end of the upper collecting trough 27 and delivers to the lower portion of the receiving end of the lower drum 11. The delivery end of the lower collecting trough 27 discharges into a discharge spout 39 and the delivery end of said lower drum discharges into a discharge spout 40.

The upper drum 10 will be rotated in the direction of the arrows marked on Figs. 4 and 5, while the lower drum 11 will be rotated in the opposite direction. Located close to the rising side of each drum, just below the overlying collecting plate 28, are blower pipes 41 that are connected to a source of air pressure, such as a fan, compressed air tank or the like, not shown. Within the drums, these blower pipes 41 are provided with depending blast nozzles 42 that direct a downward blast over the interior surface of the upwardly moving surfaces of the sides of the drums.

Extended longitudinally of and through the drums 10 and 11 are suction troughs or tubes 43 with longitudinal openings located immediately adjacent to the inner perforated surfaces of the drums. These suction spouts have extended tubes 43^a connected to any suitable source of suction or partial vacuum. The inner ends of the suction troughs 43 should be closed, so that all air drawn into the same must come through the perforations and pockets of the drums in a direction from the exteriors to the interiors of the drums.

Preferably, the drums are also provided below their collecting plates 28 and adjacent to their collecting troughs 27 with suction tubes 44 having intake nozzles 44^a. These suction tubes 44 are also connected by tubes 45 to a common source of suction or partial vacuum. The pockets 16 of the upper or first drum are large enough to receive wheat kernels but not of sufficient diameter to receive and hold longer particles, such as oats. The pockets in the lower drum, however, are much smaller than those in the upper drum. They are not large enough to receive wheat kernels, but large enough to receive small seeds, cockle, wild peas and the like.

Operation.

The operation of the machine will be described in connection with its use for the separation of wheat and oats and commingled mixtures, generally known as "succotash." This commingled stock or succotash will be delivered into the receiving end of the first or upper drum 10 through the supply spout 36 and, under rotation of said drum, the wheat kernels will get into the pockets 16 and will be carried upward thereby to points above the gathering plates 28 and will finally be dropped onto the gathering plate and directed into the gathering spout 27.

The oats, being long, will not get completely into the pockets of the upper drum and, hence, will fall by gravity and, moreover, will be blown backward by the air blast from the nozzles 42, so that they will be kept always below the gathering plates 28 and will finally be discharged by the spiral conveyors 31 of the upper drum into the discharge spout 37, by which it will be carried from the machine.

The partial vacuum maintained in the casing 21, around the drums, will continuously draw light dust and like fine particles from the casing and out through the suction pipe 35. Also, dust and light particles will be drawn from the drums through the nozzles 44^a and suction pipes 44.

As the pockets and perforated surfaces of the drums pass the open suction troughs or tubes 43, air will be drawn inward through said perforations, thereby cleaning the same, once for each rotation of the drum. It will, of course, be understood that the suction produced in the suction troughs 43 is much stronger than the suction exerted in the opposite or outward direction by the partial vacuum maintained in the casing.

The wheat commingled with small seeds, such as cockle and wild peas, will be delivered from the upper collecting trough 27 into the transfer spout 38, and by the latter

will be delivered into the receiving end of the lower drum 11. Under rotation of this lower drum, the cockle, wild peas and the like will get into the pockets of said drum and will be carried upward and deposited onto the gathering plate 28 and from thence will be directed into the lower gathering trough 27; but as the wheat cannot get into the pockets of the lower drum, it will remain in the lower portion of the drum and, by the conveyors 31 of the lower drum, will be delivered out of said lower drum into the discharge spout 40. The wheat delivered into said spout 40 will be cleaned wheat, free from dirt, dust, cockle, wild peas, oats and the like.

From the above, it may be noted that, in the upper drum, the wheat and certain small seeds are taken from the oats and carried off as tailings, while in the lower drum, the cockle, wild peas and the like are taken from the wheat and the clean wheat is carried off as tailings at the delivery end of said lower drum.

The above described operations make it possible to very rapidly and effectually remove all foreign substances from wheat and to collect both wheat and oats separately in clean condition.

Fig. 9 illustrates a modified form of the separator in which, to increase the capacity of the drum, there are located two collecting troughs with their co-operating gathering plates and conveyors. The lower gathering trough 27, gathering plates 28 and conveyor 29 correspond in construction and arrangement to the same elements in the machine already described. However, the overlying or second gathering trough 27^a has gathering plates 28^a that are perforated or in the form of a screen, preferably a mesh provided with what is known as a buckwheat screen. These perforated gathering plates will therefore pass small seeds, cockle, wild peas and the like, but will not permit the good wheat to pass therethrough.

With this arrangement, the oats will be carried off as tailings from the delivery end of the drum, clean wheat will be collected in the upper collecting spout 27^a and cockle, wild peas and the like will be collected in the lower collecting spout 27.

In some cases, the drum may be rotated at such high velocity that the materials will tend to cling to the interior of the drum and, in some instances, the partial vacuum maintained in the casing may be quite high, tending to produce such clinging. To insure release of the wheat, cockle, wild peas and the like, which may be carried above the perforated upper collecting plate 28^a, a blast tube 46, having an open side, may be arranged to blow directly against the perforated surface of the drum substantially as shown in Fig. 9.

What I claim is:

1. A separator of the kind described comprising a rotary drum provided with internal pockets, said pockets having perforate bottoms, and an air tube arranged to blow a downward blast against the interior of the drum on the rising side thereof approximately parallel to the inner surface of the drum.

2. A separator of the kind described comprising a rotary drum provided with internal pockets, said pockets having perforate bottoms, a collecting trough within said drum and having an oblique collecting plate onto which will fall the material carried upward by said pockets, and an air tube arranged to blow a downward blast against the interior of the drum on the rising side thereof approximately parallel to the inner surface of the drum.

3. A separator of the kind described comprising a rotary drum provided with internal pockets, said pockets having perforate bottoms, an air tube arranged to blow a downward blast against the interior of the drum on the rising side thereof approximately parallel to the inner surface of the drum, and an air suction tube leading from the interior of said drum.

4. A separator of the kind described comprising a rotary drum provided with internal pockets, said pockets having perforate bottoms, a collecting trough within said drum and having an oblique collecting plate onto which will fall the material carried upward by said pockets, an air tube arranged to blow a downward blast against the interior of the drum on the rising side thereof approximately parallel to the inner surface of the drum, and an air suction tube leading from the interior of said drum.

5. The structure defined in claim 1 in further combination with a casing for the drum, and means for maintaining a partial vacuum in the casing.

6. The structure defined in claim 3 in further combination with means for blowing a blast of air against the exterior of the drum between the air tube and the air suction tube.

7. A separator of the kind described comprising a rotary drum provided with internal pockets, a collecting plate, means for moving material deposited on the collecting plate from said pockets, and a suction trough above the collecting plate and arranged to remove material from said pockets at a predetermined point.

8. The structure defined in claim 7 in which the collecting plate is perforated.

9. The structure defined in claim 7 in further combination with a suction tube below the collecting plate.

10. The structure defined in claim 1 in which the pockets are perforated and in

further combination with a suction trough above the collecting plate, and means for blowing a blast of air into the drum through said pockets on the rising side of the drum between the collecting plate and the suction trough.

11. A separator of the kind described comprising a rotary drum provided with internal pockets, upper and lower collecting plates, means for removing material deposited on the collecting plates from said pockets, and a suction trough above the collecting plate and arranged to remove material from said pockets at a predetermined point.

12. The structure defined in claim 11 in which the collecting plates are perforated.

13. The structure defined in claim 11 in further combination with a suction tube between the collecting plates, and a suction tube below the lower collecting plate.

In testimony whereof I affix my signature.

ORA WOOD WILLIAMS.