March 12, 1929. H. MJOLSNESS 1,705,302

GRAIN SEPARATOR AND RECLEANING DEVICE

Filed Oct. 2, 1925 5 Sheets-Sheet 1

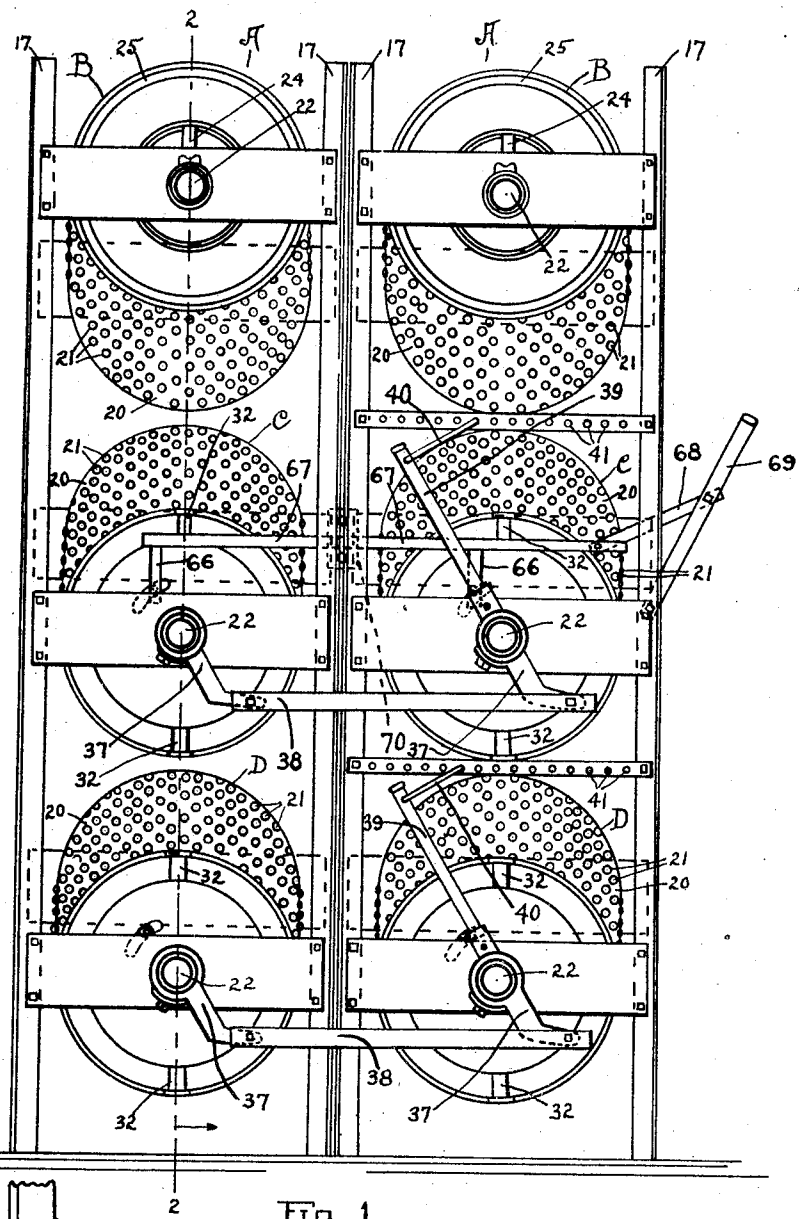


Fig. 1

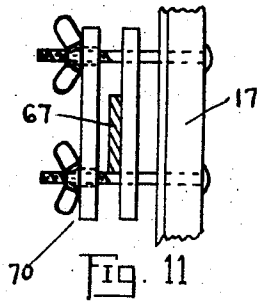


Fig. 11

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GRAIN SEPARATOR AND RECLEANING DEVICE

Filed Oct. 2, 1925 5 Sheets-Sheet 2

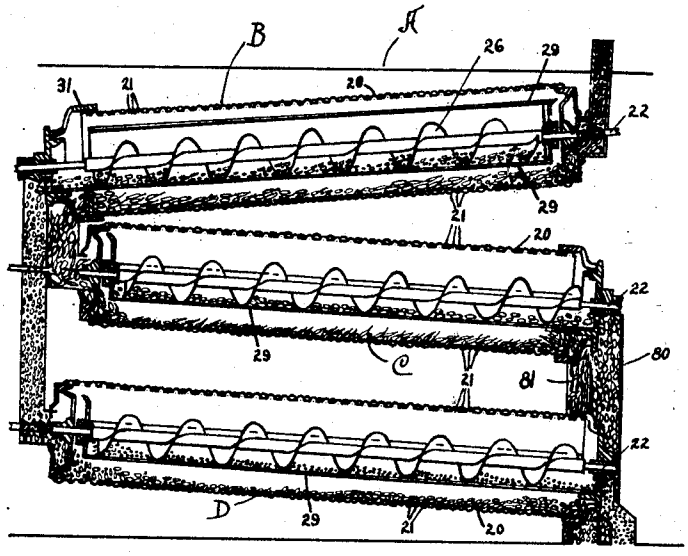


Fig. 2

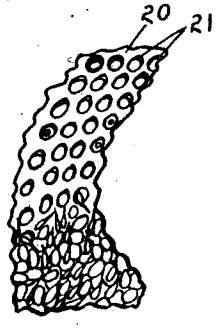


Fig. 4

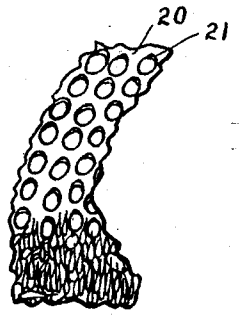


Fig. 5

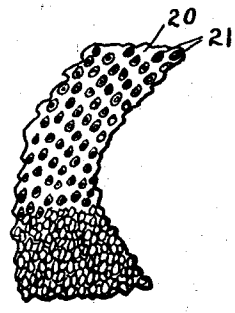


Fig. 6

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GRAIN SEPARATOR AND RECLEANING DEVICE

Filed Oct. 2, 1925 5 Sheets-Sheet 3

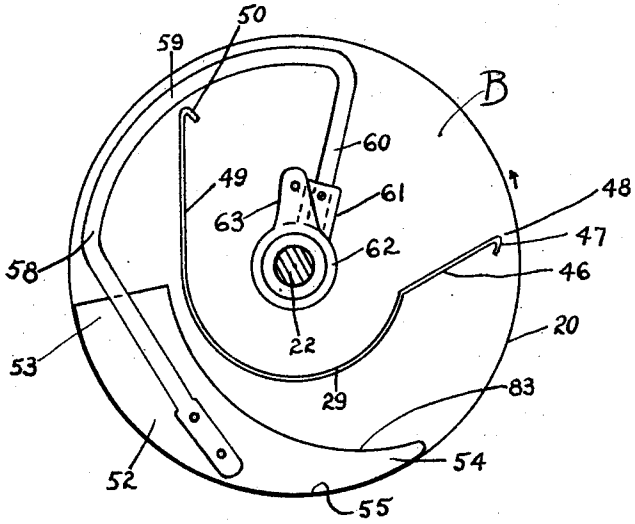


Fig. 8

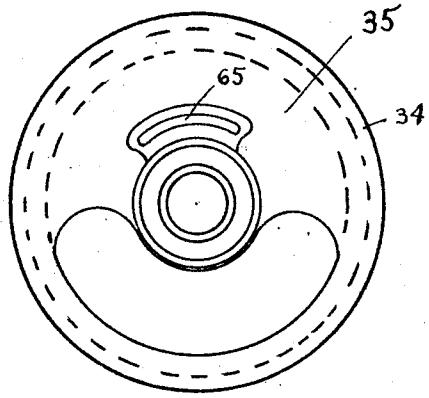


Fig. 9

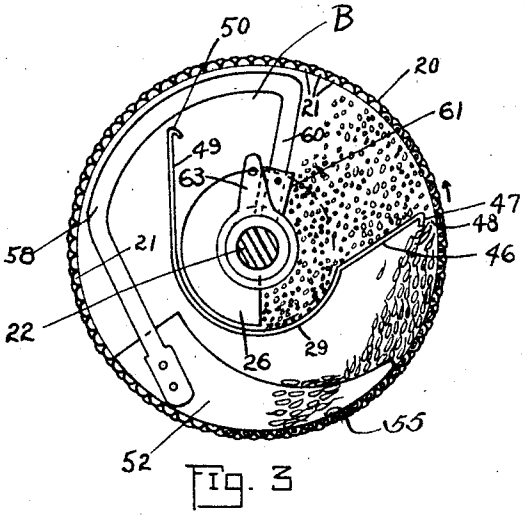


Fig. 3

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March 12, 1929. H. MJOLSNESS 1,705,302

GRAIN SEPARATOR AND RECLEANING DEVICE

Filed Oct. 2, 1925 5 Sheets-Sheet 4

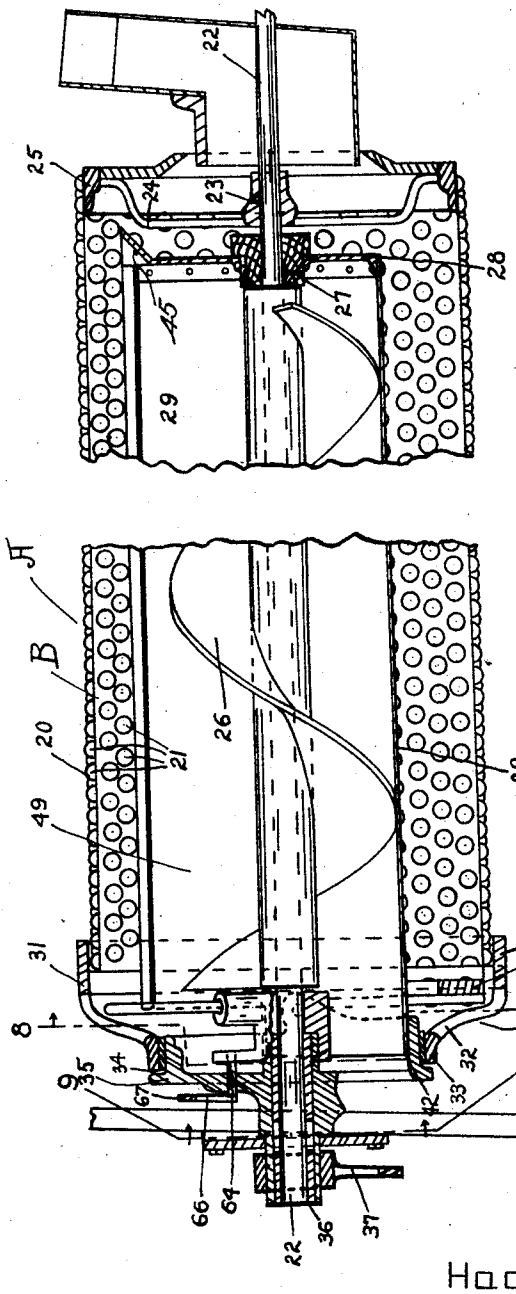


Fig. 7

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GRAIN SEPARATOR AND RECLEANING DEVICE

Filed Oct. 2, 1925 5 Sheets-Sheet 5

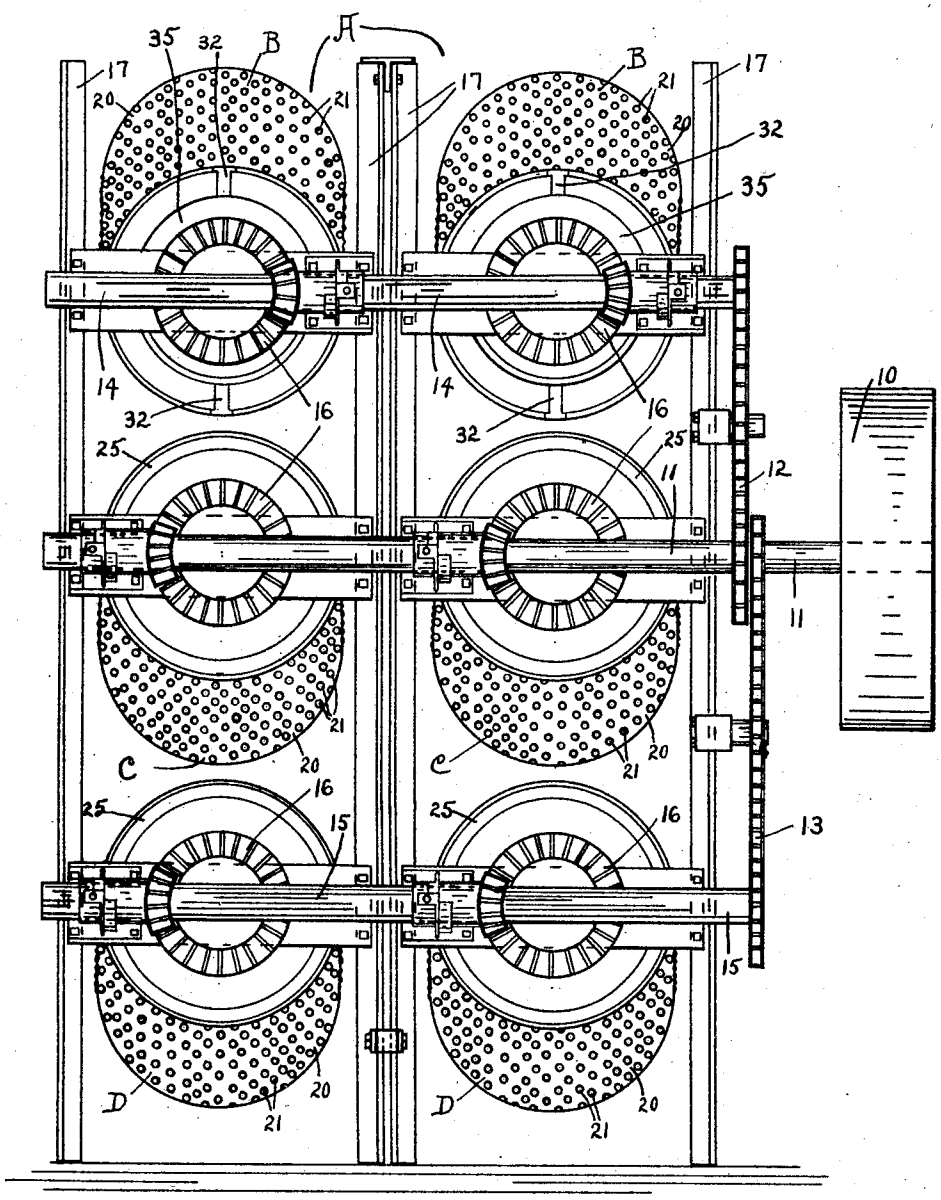


Fig. 10

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Patented Mar. 12, 1929. 1,705,302

UNITED STATES PATENT OFFICE.

HAAKON MJOLSNESS, OF MINNEAPOLIS, MINNESOTA.

GRAIN SEPARATOR AND RECLEANING DEVICE.

Application filed October 2, 1925. Serial No. 60,035.

My invention relates to grain separators and is adapted to provide a simple device for separating grain of different sizes, such as oats, wheat, barley and other similar grains, together with smaller grains, so as to thoroughly clean and separate the same.

A feature of my invention resides in providing a separator wherein the same is adapted to operate in units so that the grain may be passed from one cylinder to another and so that separations and cleaning of the grain may take place in each cylinder. A unit ordinarily comprises a top cylinder in which the first separation is made and with two or more cylinders positioned below the top cylinder of practically the same construction as the top cylinder, and adapted to operate to make the desired separation of the grain passing through the unit.

A feature of my invention resides in a separator for grain in which the operation is very rapid. This permits more grain to be passed through the separating unit than has ordinarily been accomplished in the same time, and at the same time to provide such a construction as to not impair the separating qualities of my grain separator. I have found that the operation of my machine is quite to the contrary, that even though I run and operate the machine very rapidly, yet the separation is more complete and more thorough than has been heretofore accomplished, in so far as I know.

It is also a feature of my invention to provide means for banking the grain within the cylinders of the unit in a manner so that the weight of the grain holds the smaller seeds and grain in the indentations of the cylinders, prevents the grain from whipping about and causes it to be carried by the indentations of the separating cylinders to elevate the same into the separating trough, and in this manner the small grain and the foreign particles are separated from the larger grain and a thorough separation and cleaning of the grain is accomplished. Thus I provide a retarding means to hold the grain at a predetermined level in the saparating cylinders, which is a very important part of my invention.

It is a feature of my invention to provide means for operating the retarders and the troughs collectively or separately while my separator is in operation, which permits the adjustment of these parts so as to accomplish the best results which can be apprehended most advantageously while the machine is in operation. It may be readily appreciated that this adjustment of either the trough or the retarders is most effective while the machine is in operation by those experienced in handling the separation of grains and the cleaning of the same, and this permits the operator to more carefully adjust these parts to the position so as to give the most effective results. The invention includes means for collectively operating the troughs or retarders in the cylinders.

A further feature of my invention resides in providing suitable bearing means to permit the cylinders to be placed at the most desirable angles in relation to each other so that the parts will operate freely.

I provide in my invention a unit wherein the lower cylinders extend approximately at the same inclining angle while the cylinder superimposed over these cylinders extends in the opposite angle in a manner to permit the grain to travel from the superimposed cylinder to the cylinders positioned below the same. This formation of my machine provides a unit construction wherein the cylinders are arranged in the most advantageous way to take up the smallest amount of space for each unit, and to permit one unit to be used separately or to allow several units to be connected together where the occasion offers, to provide the grain separator and recleaning device which is adapted to operate in the most efficient manner and to clean the largest amount of grain in the smallest amount of time, as has been accomplished heretofore, in so far as I know.

These features and objects, together with other details and formation of construction will be more fully and carefully pointed out in the following specification and claims:

In the drawings forming part of my specification;

Figure 1 is a front view of my grain separator and cleaning device, illustrating two of the units thereof connected together.

Figure 2 is a section on the line 2—2 of Figure 1, diagrammatically illustrating the operation of the units of my grain separator and cleaning device.

Figure 3 is a cross section illustrating diagrammatically the operation of one of the cylinders to show the separation and clean-

ing of the grain when the cylinder is in operation showing the position of the receiving trough and the retarder.

Figure 4 illustrates diagrammatically a detail showing the operation of the separation in the first cylinder.

Figure 5 is a detail showing diagrammatically the operation in the second cylinder.

Figure 6 is a detail showing diagrammatically the operation in the third cylinder of the units.

Figure 7 is a longitudinal cross section in enlarged formation to one of the cylinders of my units on the grain separator and cleaning device.

Figure 8 is a cross section on the line 8—8 of Figure 7.

Figure 9 is an end view on the line 9—9 of Figure 7 of the end plate on each of the cylinders.

Figure 10 illustrates an end view showing the driving means for the units of my separator and cleaner.

Figure 11 is a detail of a clamp.

In the drawings A represents my grain separator and cleaning device which made up in a unit with several cylinders, such as B, C and D. These cylinders are arranged in a manner to operate together so that, in fact they operate in unison, being driven by the pulley 10 which operates the shaft 11, and by means of the chain drive 12 and 13, the shafts 14 and 15 are operated which in turn operate the gear 16 at each cylinder to operate the respective cylinders B, C and D.

Each unit A of my separator is practically identical and can be connected together in any suitable manner as is illustrated in the drawings by being placed adjacent each other, such as is illustrated in Figure 1 and in Figure 10, the upright 17 of the units being bolted together in any suitable manner. These upright members 17 form the sides of the frame of the unit A.

As a matter of convenience in the describing of my units I will describe one of the cylinders, such as B, and as each of the cylinders are practically identical and operate in the same manner this will fully set forth the construction of each cylinder B, C and D in a general manner.

The body of the cylinder B is formed of sheet material which has its entire surface indented in the body 20 of the cylinder B, with the indentations 21. These indentations form the pockets for the grain to lodge into and as the suface of the body 20 of the cylinder B is entirely made up of these indentations throughout its length and over its entire circular cylindrical surface, the grain can be carried in these indentations throughout the entire length of the body 20 of the cylinder B. The cylinder B is placed at a slight inclined angle, as illustrated in the drawings in the unit A, and this permits the grain to travel from the receiving end to the discharging end of the cylinder, partly by gravity and partly by the rotation of the cylinder.

The cylinder B is carried by the operating shaft 22. On the receiving end of the cylinder B a suitable shaft engaging bearing 23 is provided which is keyed in a suitable manner to the shaft 22 and extending from this bearing are the spoke members 24 which support the rim 25 on their outer end to which the end of the cylinder 20 is attached to support the same on one end. This provides the receiving end of the cylinder B of my grain separator and cleaning device A.

At the receiving end of the cylinder B of my device, the upper end of the trough which surrounds the bottom portion of the screw propeller 26 which is mounted upon the shaft 22, adapted to rotate therewith, is carried by the bearing 27 while this end of the trough 28 is closed. The bearing 27 is secured in the end 28 of the trough 29 and is adapted to be held stationary and form a bearing on the shaft 22 for the upper end of the trough 29. The trough is adapted to remain stationary when set but is adjustable within the cylinder B in a manner which will be hereinafter described.

At the discharge end of the cylinder B, the body portion 20 of the cylinder is attached to the end member 30 which is formed with a rim 31 to which the end of the cylinder 20 is attached. The member 30 is provided with spokes 32 which connect the rim 31 with a bearing ring 33 which is adapted to be supported freely rotatable upon the bearing flange 34 of the end plate 35.

The end plate 35 is provided with a shaft engaging portion 36 which fits over the end of the shaft 22 and in which the end of the shaft 22 is adapted to rotate. The end plate 35 is held stationary against rotation by the members 37 which are connected together by the link 38 and by the lever arm 39 which is secured to one of the members 37 and which is held stationary by the link 40 engaging in one of the openings 41 to hold the lever 39 together with the end plate 35 in a set adjusted position.

The discharge end 42 of the trough 29 is secured to the end plate 35 by any suitable means which securely fasten the discharge end of the trough 29 to hold it against free rotation in the cylinder B. This construction also permits the cylinder B to operate and rotate so that the body portion 20 with the indentations in the same will rotate by the bearing 23 with the shaft 22 which is keyed to the same at the receiving end of the cylinder, and by the rotatable supporting

member 30 on the discharge end of the cylinder, which engages against the bearing collar 34 and is free to rotate thereon in operation.

The trough 29 is formed with an angular projecting portion 45 at the receiving end of the cylinder B formed integral with the end 28 of the trough. This projects in a manner so as to take in the upper or receiving end of the indentations of the body 20 of the cylinder B. The rear end of the trough extends practically through the entire end of the indented cylinder 20 so that it is obvious that the trough 29 operates through the entire length of the cylinder B. This is quite important in my invention as it increases the efficiency and operation of my separator.

The trough 29 is formed with a grain receiving shelf 46, extending angularly from one side of the trough 29 and longitudinally of the entire trough. The outer end of the shelf is bent inward to form the edge 47, extending downward from the shelf and back away from, but in close proximity to the inner surface of the cylinder body 20. The edge 47 together with the inner surface of the cylinder 20, which is in close proximity thereto, forms a narrow slot-like opening 48 through which the grain is carried in the rotation of the cylinder B in the direction of the arrow in Figure 8 of the drawings. Only such grain is carried up through the slot 48 which will lodge in the indentations 21 of the cylinder body 20. As soon as these grains are carried above the shelf 46 they are adapted to fall by gravity into the trough 29.

On the opposite side to the shelf 46 I provide an upwardly extending side 49 which extends longitudinally along the trough practically throughout the entire length of the same. This side 49 is formed with an inwardly extending end or edge 50 which is also placed or extended in comparatively close relation to the inner surface of the cylinder wall 20. In this manner grain which is carried by the cylinder B in the indentations 21 is caused to strike against the guard 49 in the rapid operation of the cylinder if it is carried over the center of the same. Only the lighter and smaller grain goes far enough to strike very high upon the guard 49, and the separation is so complete and thorough that the grain is cleaned and separated very thoroughly.

The peculiar formation and operation of my indented cylinder 20 with the guard 29, and the particular formation and shape of the grain receiving shelf 46, together with the guard 49, and the positioning of the edges 47 and the edge 50 of the guard, permit me to operate my grain separating device and cleaner very rapidly. In so far as I know these cylinders have an entirely new operation and construction together with the arrangement of parts and thus the operation and effectiveness of my separator is complete.

An important feature of my invention resides in a retarder for the grain which I have positioned adjustably at the discharge end of the cylinder B. This retarder 52 is very similar in shape to a half-crescent formation with a body portion 53 which is wide and comes in close proximity to the lower portion of the trough 29, while the pointed end 54 of the same is adapted to extend towards the grain shelf 46. The arcuate edge 55 of the retarder 52 is positioned and held very close to the inner surface of the cylinder wall 20 in a manner so that the retarder 52 can hold and bank up the grain to prevent it from sliding out of the discharge end 56 of the cylinder B.

The retarder 52 is supported by the arm 58 which is secured thereto and which is bent in a manner to form a portion 59, adapted to extend over the edge 50 of the trough 29, and is formed with an inwardly extending portion 60 which engages in the pockets 61 of the collar 62. The collar 62 is supported on the shaft 22. By means of the lock 63 which projects from the collar 62 which is connected to the rod 64, which extends through the slot 65 in the plate 35, and which connects with the lever 66, the retarder 52 can be rotated about the inner surface of the cylinder 20 to change the position of the same in relation to the trough 29.

When the retarders are adapted to be operated in unison in the unit A, as illustrated in Figure 1 of the drawings, the levers 66 are connected to the link 67 which is connected by the link 68 to the operating lever 69. Thus by operating the lever 69 the retarders in the respective cylinders can be operated in unison while the unit A is in operation. This permits the easy adjustment of the retarders so as to operate most efficiently. A suitable clamp 70 is adapted to engage the link 67 to hold the same set in a rigid position when the retarders are set in the position to operate most efficiently. Before the lever 69 is operated the clamp 70 is released to permit the link 67 to operate freely to move the connecting arms or links 66. When the units A are connected together and in operation, it is quite important that the retarders 52 be operated in unison so that the separation is the same in all of the units.

Each unit A which consists of the separating cylinders B, C and D, form a complete operating unit to separate the grain as it passes through the unit, as is illustrated in Figures 4, 5 and 6 diagramatically. Figure 4 shows a portion of the first cylinder, such as B, which separates the small seeds

and the like, from the larger seeds, such as oats and the like, and any foreign matter is inclined to be carried by indents into the trough 29 in the operation of the unit A. Then in Figure 5 the second cylinder, such as C, illustrates the separation of the large wheat from the oats. The large wheat or oats traveling over the retarder 52 and out of the discharge end of the cylinder B, directly into the receiving end of the cylinder C which communicates directly with the indented cylinder portion 20 of the cylinder B. As the cylinder C operates, the large wheat is separated from the oats, as illustrated diagrammatically in Figure 5, thus providing a recleaning cylinder for the oats in C. At the discharge end of the cylinder C, the wheat is carried out of the trough 80, while the oats is carried over the retarder in the cylinder C and into the spout 81. The operation of my unit A is so thorough as to practically deliver pure oats out of the cylinder C from and over the retarder end out of the spout 81, while the trough in the cylinder C delivers the wheat, a practically clean separated grain.

The operation of the cylinder D is illustrated diagrammatically in a portion of the indented cylinder 20 which shows the cockle—wild pea and fine seed into the trough of the cylinder D and out of the discharge end of the same, while the clean wheat, free from foreign material, is delivered over the retarder 52 at the discharge end of the cylinder D. Obviously as many recleaning and reseparating cylinders as may be desired may be employed in my unit, but for all ordinary purposes two cylinders extending in the same inclined direction, so as to extend approximately parallel to each other, positioned directly below the upper cylinder B, are sufficient to cause the separation and cleaning that may be desired. It is to be noted that the cylinder B extends in the opposite direction or inclined to the cylinders C and D. This permits the making of the unit A in a compact formation and is quite important in my invention. It is very desirable that the separators be made compact.

I have stated that each cylinder B, C and D of the units A are identical in general construction, each having the trough 29 carried within the same about the screw conveying member on the shaft 22. In many cases it is very desirable to have more than one unit A in the operation of my separator and I have made up my separator units in a manner so that they can be readily connected, side by side to the number of units that may be desired and thus permit a large amount of grain to be separated at one time. In carrying out my invention it is quite important that these units can be connected to each other and that I provide means such as the levers 39 and 69 which operate the troughs of the respective cylinders and units in unison, together with the respective retarders in each cylinder. This permits a uniform separation of the grain.

An important feature of the invention resides in the retarding means which holds the grain banked in the cylinder extending longitudinally along practically the full length of the same, and thus permitting the banked up grain to hold the smaller seeds and the foreign matter weighted down by the seeds on top, which naturally would tend to be the larger seeds, as the smaller seeds and foreign matter would travel toward the bottom of the cylinder, and find its way into the indents 21, and owing to the operation of the cylinder 20 be carried up into the trough 29. Without my retarding means the grain would jump around and travel in a thin layer along the bottom of the cylinder 20 and out of the discharge end without being properly separated. Therefore, my retarder is of very primary importance and is adapted to be adjustable into the position desired so as to raise or lower the upper edge 83 in relation to the channel in the cylinder at the bottom of the same, and by this adjusting means through the lever 69, I can adjust each retarder into the desired position. The arm 59 permits the retarder to operate readily over the top edge 50 of the guard 49 and when the trough 29 is adjusted about the axis of the shaft 22, the relative position of the retarder 52 can also be adjusted in accordance therewith.

The adjustment of the troughs 29 in each of the cylinders of the units and the retarders 52 are regulated in proportion to the speed at which the cylinders B, C and D are rotating and according to the grain which is being separated. By means of the adjustment of these parts and the particular formation of the same, I am able to obtain a very fine adjustment of each cylinder so that the separation and recleaning of the grain is practically perfect, in fact, government tests which have been made of my machine show that the efficiency of the same has been very high in comparison with other devices which have been used heretofore for the separation of grain. It is evident that the retarders and the troughs can be operated separately if it is desired, so that these elements can be fitted in each cylinder as may be required, to perform the necessary functions in the operation of the units. In the diagrammatic illustration in Figure 3 the operation is illustrated in the separation of the grain which shows the grain being carred up by the rotation of the cylinders in the direction of the arrow indicated in the drawings which has a tendency to draw the grain up the side wall of the cylinder 20, and B clearly illustrates the necessity of

adjusting the point 54 of the retarder 52 into the proper position so as to not bank the grain too high and yet hold the grain back sufficiently so that it will fill the bottom part of the cylinder and permit the smaller grain to be elevated and discharged on to the grain receiving shelf 46 and into the trough 29. While if for any reason the cylinder 20 is being operated very rapidly the grain carried up by the indentations 21 of the cylinder 20 extends over the axis or center of the cylinder, then the guard 49 functions to catch the same and hold it from extending over on to the other side and back into the lower portion of the cylinder. This illustration will clearly set forth the action of my cylinders, together with the position of the trough and the relation of the retarder therein. The adjustment of the trough and the retarder separately or collectively permits the successful operation of my machine, while the position of the cylinders in the respective angles and in the place illustrated super-imposed above each other, permits me to provide a very compact unit to operate in a very swift manner.

In accordance with the patent statutes I have described the principles of operation of my separator and recleaning device, and while the drawings illustrate a particular formation of the same, I desire to have it understood that these illustrations are only suggestive of a particular manner in which my invention can be carried out and I desire to have it understood that the invention can be applied to other uses and carried out by other means than those herein illustrated within the scope of the following claims.

I claim:

1. A grain separator comprising, a cylinder, a shaft for operating said cylinder, a separating conveyer co-axially mounted relative to said shaft and directly driven thereby, said conveyer mounted on said shaft and an imperforate retarder in said cylinder transversely disposed to the longitudinal axis of said cylinder for holding the grain at a predetermined level therein while the separator is in operation.

2. A grain separator including, a grain cylinder, a conveyor arranged within said cylinder in a manner to receive the grain to be separated by said cylinder in the operation thereof by circumferentially elevating the grain in the rotation of said cylinder, a trough in which said conveyer is is adapted to operate and an imperforate retarder in said cylinder transversely disposed to the longitudinal axis of said cylinder adapted to bank the grain at a predetermined level in a manner to cause the grain on top to sweep the grain below into the indents of the operating cylinder.

3. A separating and recleaning device for grain including, a cylinder having a surface formed with indentations throughout the surface thereof to receive the kernels of grain, a conveyer trough extending through said cylinder, a conveyer therein and a grain retarder adjustable relative to said trough and disposed at right angles to the longitudinal axis of said trough at one end thereof adapted to hold the grain at a predetermined level in a manner to cause the weight of the grain in its banked position by the retarder, to hold the grain at the bottom of the cylinder in said indents, while the cylinder is rotated to carry the grain up to the separating conveyer trough.

4. A grain separator and recleaning device including, a separating trough in said separator a grain receiving cylinder having means for carrying grain in the surface thereof, to raise the same to said separating trough and an independently adjustable retarding means disposed in and substantially at right angles to the longitudinal axis of said cylinder adapted to hold the grain at a predetermined level in said cylinder for the purpose specified.

5. A grain separator and recleaning device including, a cylinder having a shaft for carrying the same, a screw conveyer extending through said cylinder on said shaft, a grain receiving trough about the lower side of said conveyer, a grain receiving shelf on one side of said trough and a guard on the other side thereof, means for holding said trough adjustable and stationary in said cylinder, and a retarder adjustably positioned at the discharge end of said cylinder having means for adjusting the same concentrically about said trough in a manner to bank the grain beneath the trough so that it may be properly separated in the operation of said cylinder.

6. A grain separating cylinder including, means for supporting said cylinder at an inclined angle, a cylindrical indented body portion formed in said cylinder, the indents of which are adapted to receive the grain, a trough adjustably positioned within said cylinder, a conveyer extending through said trough and an adjustable retarder positioned at the discharge end of said cylinder, adapted to be adjusted in relation to either said trough or said cylinder to facilitate the adjustment of the same to accomplish the most efficient separation of the grain passing through said cylinder.

7. A grain separator comprising, a series of grain receiving cylinders positioned one above the other, the upper-most cylinder extending in an inclined position, while the lower cylinders extend in an oppositely inclined position in a manner so that the grain can pass from one cylinder to the other by gravity and rotary action of the cylinders, and grain separating means within each of the cylinders including an axially positioned

conveyor and trough, and a retarder adjustably positioned in relation to said trough and cylinder to permit the separation and recleaning of grain which passes through said separator.

8. A grain separator and reclaiming device including units having several cylinders which are connected in a manner to cause grain to pass from one cylinder to the other, means for attaching several units together adjacent each other, each cylinder in each of the units being provided with grain separating and recleaning means, including an adjustable retarder, an adjustable trough and means for adjusting the troughs of the different units in unison, and means for adjusting the retarders of the different units in unison whereby a uniform separation and recleaning of grain is accomplished in said device.

9. A grain separating and reseparating and cleaning device, including a unit of cylinders super-imposed one above the other, the upper cylinder extending in one inclined position, while the remaining cylinders extend in the same inclined position, and grain separating means within each cylinder including a concentrically adjustable grain retarder, a trough adjustable with relation to said retarder, and an indented surface formed on the inside of each of said cylinders whereby the grain is banked by said retarder in the indented cylinder, and carried into the conveyer to be separated.

10. A grain separating device including a cylinder, a conveyor located within said cylinder, a trough adjacent said conveyor and a tapered retarder adjustable concentrically within said cylinder, said retarder being adapted to vary the depth of the grain in the bottom portion of said cylinder and to cause the underneath grain to be carried by the cylinder to the conveyor.

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