April 17, 1928. 1,666,370

D. W. DETWILER

GRAIN CLEANER

Filed May 27, 1927 4 Sheets-Sheet 1

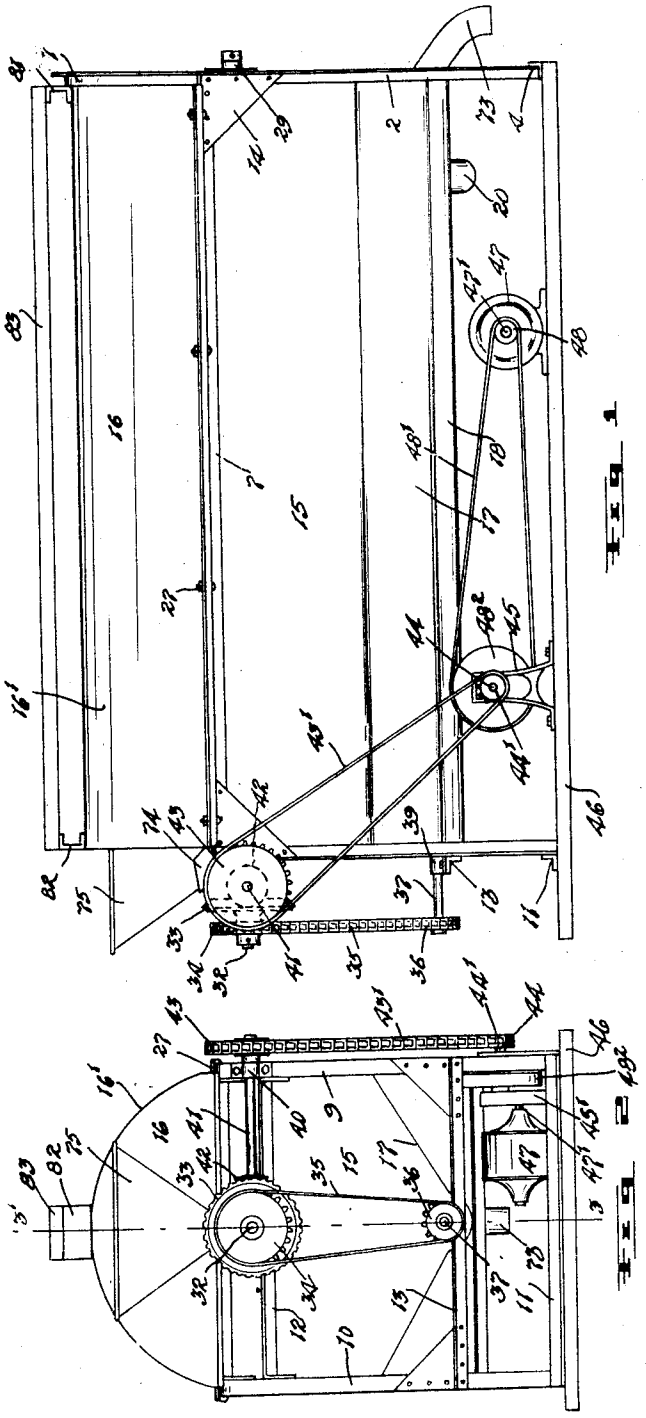


Fig. 1

Fig. 2

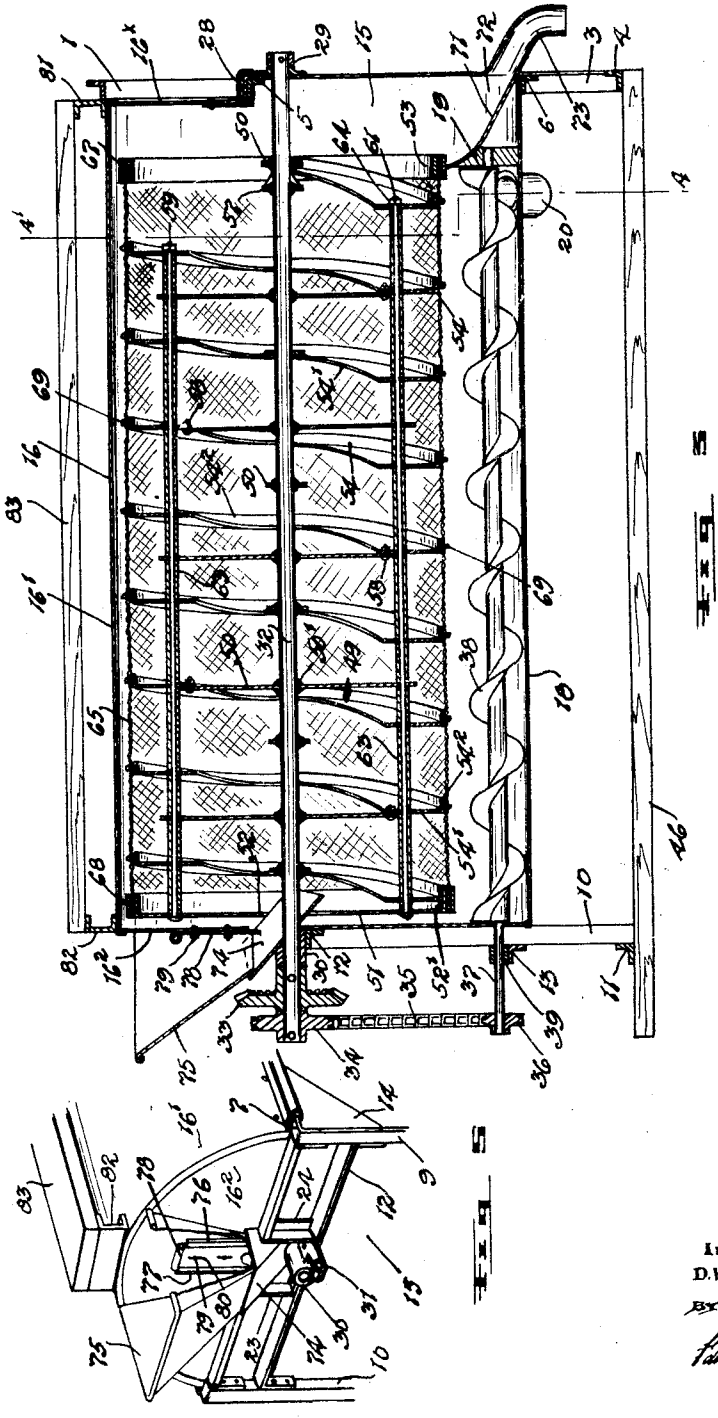
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GRAIN CLEANER

Filed May 27, 1927 4 Sheets-Sheet 2



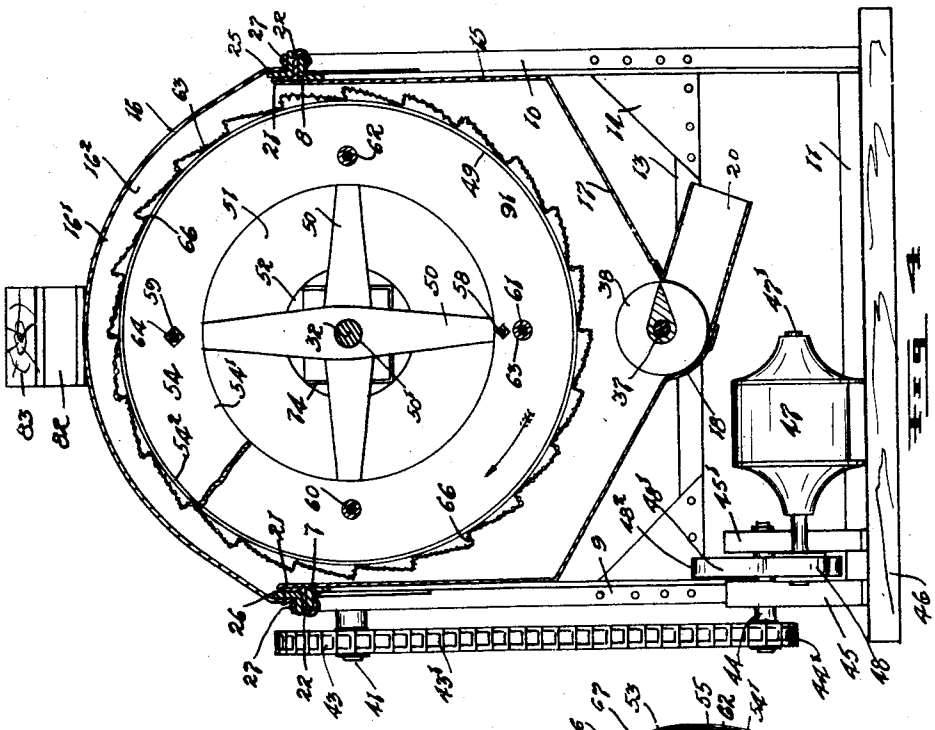
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GRAIN CLEANER

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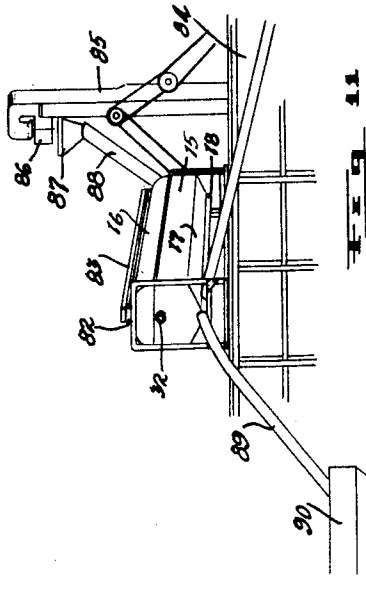


FIG. 11.

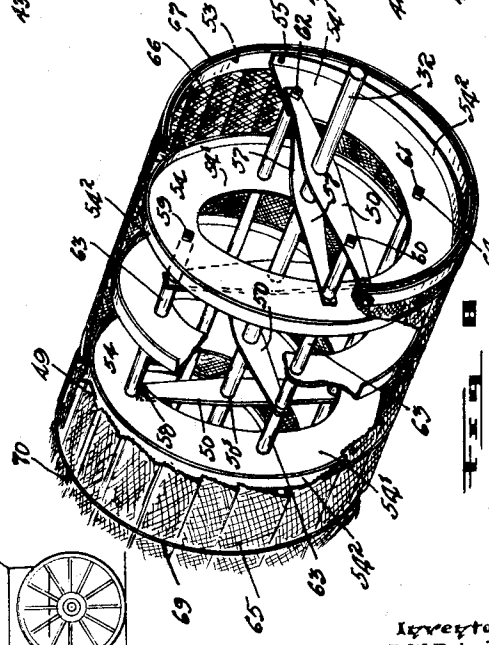


FIG. 8.

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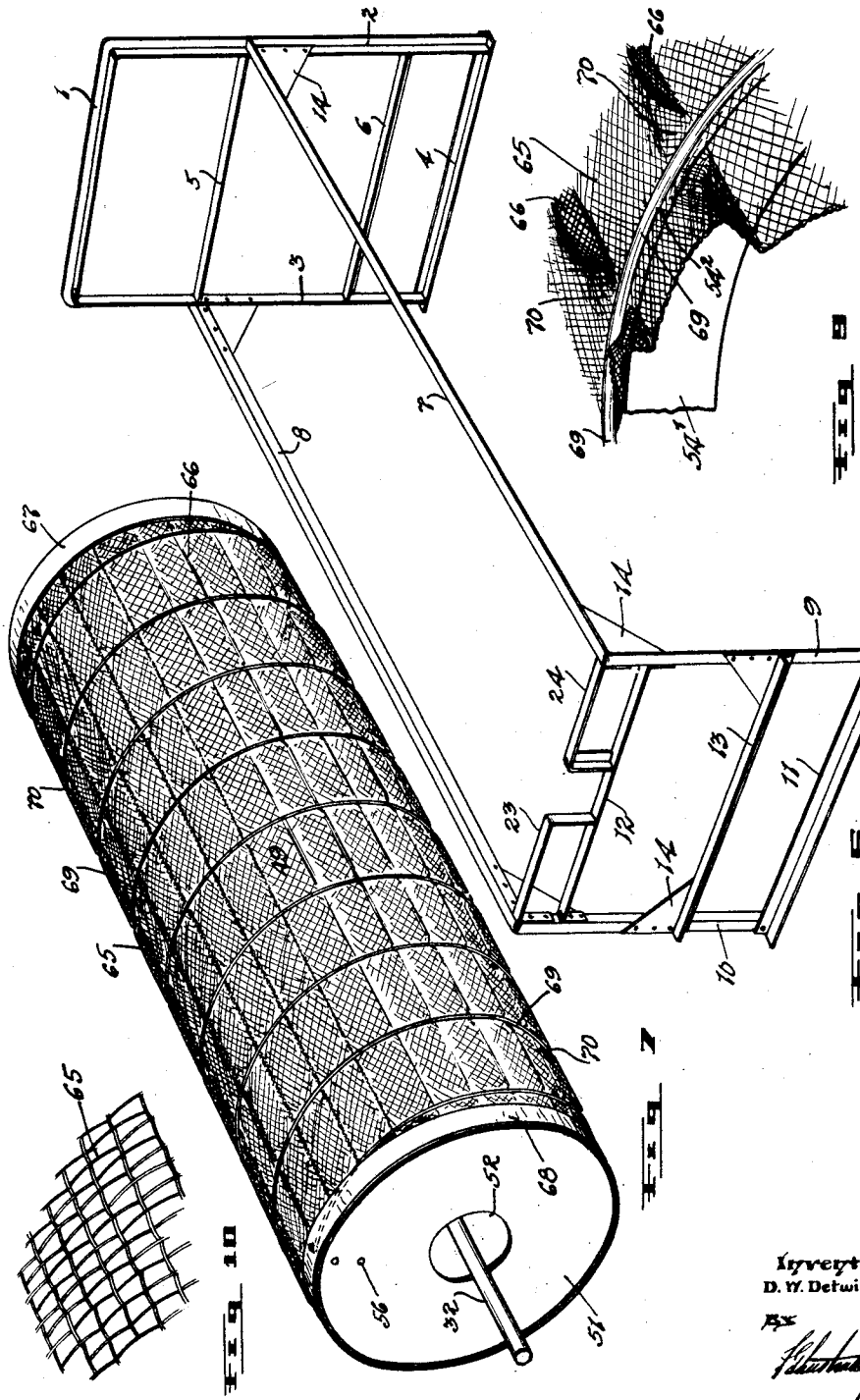


Fig. 8

Fig. 6

Fig. 7

Fig. 10

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UNITED STATES PATENT OFFICE.

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GRAIN CLEANER.

Application filed May 27, 1927. Serial No. 194,752.

The invention relates to improvements in grain cleaners and an object of the invention is to provide a machine of large capacity which will effectively separate desirable grain seeds from undesirable seeds, such as wheat, oats, rye, corn from any impurities such as wild oats, weed seeds, dust and so forth.

A further object is to provide a machine which can be used as a stationary machine such as on a farm or at an elevator or which can be readily mounted on the customary portable separating machine to receive the grain discharged from the discharge spout of the separator in which case, the grain is recleaned as soon as it is threshed and can thereafter be delivered to the customary wagon.

A further object is to provide a machine which will handle a comparatively large volume of grain in a relatively short period of time and will effectively separate it in passage through the machine, the desired grains being conveniently collected and discharged at one point and the undesirable material at another point.

A further object is to construct an all metal machine having the various parts arranged so that they can be readily assembled and such that the machine will stand up for an indefinite period to the work for which it is designed.

A still further object is to provide a machine embodying a casing and a rotary, wire meshed, cylindrical screen mounted in the casing which is adapted to separate the grains fed thereinto and which is provided with an internal helical flange adapted in the rotation of the screen to feed the grain in a spiralling path therethrough thereby causing the grain to traverse a comparatively long screening area in a relatively short machine.

A still further object of the invention is to provide a rotary cylindrical screen having a stepped surface which provides ledges for catching the grain and carrying it up in the rotation of the screen and in so doing causing certain of the undesirable seeds to be headed across the interior of the screen and passed out through the openings at the under side thereof.

A still further object is to provide a novel and desirable means for fastening the screen firmly in place so that there is no possibility of the screen sagging or becoming otherwise distorted.

A further object is to provide a particularly rigid rotary screen structure which can be readily assembled and which will in no way obstruct the free passage of the grain therethrough.

With the above more important and other minor objects in view which will become more apparent as the description proceeds, the invention consists essentially in the arrangement and construction of parts hereinafter more particularly described, reference being had to the accompanying drawings, in which:—

Fig. 1 is a side view of the machine.

Fig. 2 is a front end view thereof.

Fig. 3 is an enlarged detailed vertical sectional view through the machine, the section being taken in the plane denoted by the line 3—3′ Figure 2.

Fig. 4 is a vertical sectional view at 4—4′ Figure 3.

Fig. 5 is a perspective view of a portion of the front end of the machine, parts being broken away to expose construction.

Fig. 6 is a perspective view of the main frame of the machine.

Fig. 7 is a perspective view of the rotary, cylindrical, wire mesh screen.

Fig. 8 is an enlarged detailed perspective view of one end of the rotary, wire mesh screen, parts being broken away to expose internal construction.

Fig. 9 is an enlarged detailed perspective view of a portion of the screen showing the manner in which the spiralling fastening wire is applied.

Fig. 10 is an enlarged detailed perspective view of a portion of the wire mesh screen showing the shape of the meshes best used when wild oats, weed seeds and other foreign material are to be separated from wheat.

Fig. 11 is a perspective view showing the machine applied to a separator.

In the drawings, like characters of reference indicate corresponding parts in the several figures.

The main frame of the machine as best shown in Figure 6 is formed for the greater

part from angle iron bars suitably riveted or spot welded together and braced at the corners. The rear end of the frame comprises an angle bar 1 having the ends bent down to provide legs 2 and 3, the lower ends of the legs being connected by a base bar 4. Parallel upper and lower cross bars 5 and 6 extend between the legs, these being utilized for a purpose later described.

To the legs 2 and 3 I permanently connect the rear ends of a pair of side bars 7 and 8 and the front ends of these latter bars are turned down to provide front legs 9 and 10. A base bar 11 connects the lower ends of the legs and upper and lower cross bars 12 and 13 extend also therebetween, the cross bar 12 being positioned somewhat down from the side bars. Suitable angle plates 14 reinforce the frame at desired points.

The main frame shown in Figure 4 carries a sheet metal casing comprising a lower stationary section 15 and an upper section 16 which can be removed when desired. The lower section of the casing presents vertical side and end walls and has the bottom thereof hopper-shaped as indicated at 17 and feeding to a longitudinally extending semicircular trough 18, the rear end of which is closed by a bearing block 19 adjoining which is a downwardly inclining discharge spout 20. The forward end of the trough is closed by the forward end plate of the casing.

The side walls of the lower section 15 have their upper edges bent to provide an upstanding flange 21 and a horizontal flange 22, the horizontal flange seating in each instance on the upper face of the frame side bar and having the outer edge thereof bent down to underlie the flange. The forward end wall of the bottom section of the casing is similarly secured to angle bars 23 and 24 at the front end of the frame, said bars being shaped as shown best in Figure 6. The rear end of the bottom section of the casing is passed up over the bar 5 of the frame and turned inwardly under the upper flange thereof, such structure being best shown in Figure 3.

The upper section 16 of the casing is in the form of a cover which can be readily dismounted as desired and it is formed from a curved sheet metal body plate 16′ and two end plates 16^{x} and 16^{2}, the end plates being suitably attached to the body plate. The edges of the body plate are bent into an angle iron shape as best shown in Figure 4 and are spot welded, riveted or otherwise fastened to angle bars 25 and 26, these angle bars being seated on the out turned flanges 22 of the lower section of the casing and butting the up turned flanges 21 thereof.

Suitably spaced bolts 27 fasten the casing sections together, these passing through the angle bars 25, 26, and associated parts. The rear end of the upper section of the casing is bent in a peculiar manner shown in Figure 3 to reinforce the same and provide a channel 28 which receives the metal covered angle iron 5 of the frame. The front end of the casing cover overlies the cross bars 23 and 24.

To the rear end of the lower section of the casing, I spot weld or otherwise permanently fasten a bearing 29 and to the bar 12 I secure permanently as by riveting a further bearing 30, such latter bearing being aligned with that 29 and being provided with an extension which carries another bearing 31 positioned at right angles to that 30. The bearings 29 and 30 receive rotatably a shaft 32, this shaft carrying a cylindrical, rotary, wire mesh screen, the details of which will be later described.

To the forward end of the shaft, I secure a bevel wheel 33 and a chain wheel 34, the chain wheel being connected by a chain 35 to a chain wheel 36 secured to the forward ends of a worm shaft 37, the worm shaft having the worm 38 thereof operating in the trough 18 and the worm shaft being carried by the bearing block 19 and a bearing 39 secured to the frame cross bar 13. The chain wheel 34 is somewhat larger than that 36, such resulting in the driving of the worm at a higher speed than the shaft.

To the leg 9 I fasten a bearing 40 which is horizontally aligned with the bearing 31 and these two bearings carry a cross shaft 41, the cross shaft being fitted at the inner end with a bevel pinion 42 meshing with the bevel gear 33 and at the outer end with a chain wheel 43. The chain wheel 43 is connected by a driving chain 43′ to a relatively small chain wheel 44′ carried by a counter shaft 44, the counter shaft being rotatably mounted in suitable bearing brackets 45 and 45′ fastened to underlying sills 46 on which the machine frame is mounted.

An electric motor 47 of any approved design is also mounted on the sills and the drive shaft 47′ thereof is fitted with a relatively small pulley 48 which is connected by a belt 48′ to a comparatively large pulley 48^{2} secured to the shaft 44 between the bearing brackets. Obviously the motor when operated will drive the worm and the shaft 32, the worm turning in a direction which will pass any material deposited in the trough to the discharge spout 20.

Within the casing and on the shaft 32, I mount the rotary, wire mesh, cylindrical screen 49 which effects the separation of the grain. This cylindrical screen is constructed in detail in the manner now described.

To the shaft 32, I permanently fasten as by spot welding a plurality of suitably spaced similar radially disposed arms or spokes 50 of predetermined length and alternated in position and which are actually

formed from heavy gauge sheet metal strips having tapered ends and centrally apertured as indicated at 50′ to receive the shaft. These arms are arranged in alternated sets, that is to say, there is one set extending say vertically and the other set horizontally.

I provide also a metallic head or end 51 which is positioned concentric to the shaft within the front end of the casing and is centrally apertured to provide a feed inlet opening 52 and is provided with a peripheral inturned flange 52′. Within the casing at the other end of the shaft and concentric to the shaft, I locate an inner ring 53, the external diameter of which is the same as the external diameter of the flange of the head 51.

Between the head and the ring I locate a helical flange 54, the vertical web 54′ of which is comparatively deep and is used for grain conveying purposes and the horizontal flange 54^2 of which is comparatively narrow and is used as a support for the wire mesh screen. The spiral is a slow spiral, that is to say, it is directed substantially at right angles to the longitudinal axis of the shaft.

The distances between the adjacent convolutions of the spiralling flange are herein shown as equal and one end of the spiralling flange is permanently fastened at 55 (see Figure 8) to the ring 53 whilst the other end thereof enters the flange 52′ and is permanently attached such as by bolts 56 (see Figure 7) to the head 51, the bolts passing through the vertical web of the spiralling flange. The arm 50 at the rear end of the machine (see Figure 8) has one end connected to the vertical web 54′ of the helical flange and the other end connected to the ring 53. All the remaining arms with the exception of an angularly disposed arm 57 adjacent the latter end arm 50 have one end permanently fastened as indicated at 58 to the vertical web of the helical flange and the other end terminating centrally between adjacent convolutions of the helical flange.

I provide four comparatively long bolts 59, 60, 61 and 62 which extend longitudinally within the screen and pass through the vertical webs of the helical flanges, through the free ends of the arms and through the head 51 and on these bolts between the webs 54′ and between the arms and the said webs, I mount spacing sleeves 63. The heads of the bolts are outside the plate 51 and the opposite ends thereof are provided with nuts 64. Obviously upon the nuts being tightened up, the arms and web 54′ are rigidly held in spaced position. This makes a very light yet strong structure which can be quickly put together and which will give ample support for the cylindrical wire mesh screen utilized. The angularly disposed arm 57 previously mentioned is attached by the bolt 62 to the web 54′ and by the bolt 60 to the said web, the arrangement being as best shown in Figure 8.

Having so assembled the supporting structure for the screen, I then wrap the wire mesh screen 65 around the spiralling flange and around the flange 52′ and the ring 53, the screen being carried between the flange 52′ and the ring by the horizontal web 54^2 of the helical flange. Prior to putting the screen in place, I crimp it to provide interior longitudinally extending steps or ledges 66 positioned radial to the shaft 32. After the screen has been placed in position on the flanges and ring, it presents a saw toothed cross section as best appearing in Figure 4.

The ends of the screen are fastened by utilizing outer rings 67 and 68 receiving the ends of the screen and riveted or bolted through the screen to the ring 53 and the flange 52′ respectively. The screen is fastened to the convolutions of the spiralling flange by utilizing a helical member surrounding the screen and clamping the screen to the web 54^2. In the present instance, this clamping member is in the form of a spiralling wire band 69 which passes in a spiralling direction around the screen outside the horizontal web 54^2 and is pulled tight and has the one end jammed and fastened between the ring 68 and the flange 52′ and the other end jammed and fastened between the ring 67 and the ring 53. The steps formed in the wire mesh screen are knocked out as indicated at 70 (see Figure 9) at the points where the wire crosses and the somewhat V-shaped pockets so formed in the screen at these points positively prevent any lateral shifting of the wire.

The mesh of the screen is as best shown in Figure 10 where it will be noticed that the openings are rectangular, such type of opening being specially desirable where wild oats are to be separated say from wheat. The major axis of the opening extends circumferentially of the applied screen.

At the rear end of the machine I locate a transversely extending collecting plate 71 which underlies the rear end of the cylindrical screen and is adapted to catch and gather the grains discharged through the rear open end of the screen and which forms with the end plate of the casing a hopper 72 from which the discharge spout 73 leads.

Between the down turned ends of the bars 23 and 24, I insert an inclined chute 74, the casing end plate at this point being cut to admit the chute. The inner end of the chute passes through the opening 52 of the head 51 whilst the upper end thereof is substantially horizontal and receives the lower end of a feed hopper 75 suitably fastened to the

plate 16^2, the plate 16^2 forming the rear wall of the hopper. The said plate 16^2 carries a pair of guides 76 and 77 which slidably support a gate 78 which controls the amount of mixed grains feeding to the chute from the hopper. Any suitable means is provided to permit of the adjusting of the gate, such being herein shown as adjusting bolts 79 carried by the plate 16^2 and passing through vertical slots 80 formed in the gate. Obviously by manipulating the bolts, one can adjust and then fasten the gate in a selected position. The top of the casing is provided at the ends with spacing pieces 81 and 82 which support a top board 83.

I might point out that it is very important that the wire mesh screen employed be effectively held in order to prevent any possibility of the screen sagging or being otherwise distorted as obviously such would vary the size of the openings and would effect the screening value of the machine as a whole. By having the convolutions of the spiralling flange relatively close together and clamping the screen thereto, I avoid any possibility of distortion. A wire mesh screen is obviously very desirable for the reason that practically the entire area is valuable for screening purposes.

In Figure 11 of the drawings, I have shown my machine as mounted on top of the customary thrasher 84 and here the elevator 85 delivers the threshed grain to the weigher 86 and into a hopper 87 having a spout 88. Ordinarily this spout leads to a wagon but in this instance, it leads to the hopper 75 of my machine. The grain cleaned by the machine instead of being delivered through the spout 73 is discharged through the spout 89 which is shown as discharging into the customary wagon 90 used for hauling the grain away to the elevator or bins. I have also shown the machine in Figure 11 as having the shaft 32 thereof driven by the thrasher instead of by the electric motor shown in the other figures.

When the machine is in use, the grain to be cleaned is fed through the hopper 75 into the interior of the wire mesh screen which is rotated by the driving of the shaft 32. The grain will be fed by the web 54' from one end of the cylindrical screen to the other and in passing the length thereof, will, of necessity, pass over substantially the entire area of the screen so that when it is delivered from the other end into the discharge spout 73, all impurities smaller than the mesh of the screen will have passed therethrough and the grain will be cleaned of all small impurities. The impurities will obviously be caught in the hopper shaped bottom of the casing and will be delivered by it to the trough where they will be conveyed by the worm to the discharge spout 20.

The machine as shown is particularly valuable for separating wild oats from the desired grain or grains. By providng the internal ledges or steps 66 and driving the cylindrical screen in the direction of the applied arrow Figure 4, I find that the mixed grains and impurities are pocketed at the under side of the machine and carried up by the steps. A separation will of course be effected at all times through the screen but as the steps, in turning, approach the top of the machine, the grain lodged thereon will be thrown off the steps. I find that wild oats so carried up by the steps will be projected angularly across the interior of the screen falling head on so that they pass freely end on through the meshes of the screen at the under side in a location adjoining the reference numeral 91 Figure 4. At this point, there is very little other grain as the rotary action of the cylindrical screen carries the bulk of grain away from this point and in a direction as indicated by the applied arrow. Accordingly there is nothing obstructing the free passage of the oats through the screen. I might remark that one end of oats is heavier than the other so that they naturally fall with the heavy end down and this results in them passing through the screen in a direction more or less at right angles to the surface of the screen.

It is very easy at any time to inspect the interior of the machine as such can be readily done by undoing the bolts 27 and removing the upper cover section 16.

What I claim as my invention is:—

1. In a grain cleaning machine, the combination with a casing, of a rotatably mounted and driven shaft therein, a helical flange mounted concentric to the shaft and spaced therefrom and directed substantially at right angles to the longitudinal axis thereof, means for rigidly supporting the flange from the shaft to cause the same to rotate therewith, a cylindrical wire mesh screen enveloping the flange and clamped thereto and means for feeding grain into one end of the screen.

2. In a grain cleaning machine, the combination with a casing, of a rotatably mounted and driven shaft therein, a helical flange mounted concentrically to the shaft and spaced therefrom and having a clamping web and directed substantially at right angles to the longitudinal axis of the shaft, means for rigidly supporting the flange from the shaft to cause it to rotate therewith, a cylindrical wire mesh screen enveloping the flange and clamped to the web thereof and means for feeding grain into one end of the screen.

3. In a grain cleaning machine, the combination with a casing, of a rotatably mounted and driven shaft therein, a helical flange mounted concentrically to the shaft and spaced therefrom and having a clamping web and directed substantially at right an-

gles to the longitudinal axis of the shaft, means for rigidly supporting the flange from the shaft to cause it to rotate therewith, a cylindrical wire mesh screen enveloping the flange and bearing on the web, a helical member surrounding the screen, said screen being clamped between the helical member and the clamping web and means for feeding grain into one end of the screen.

4. In a grain cleaner, the combination with a casing, of a shaft journaled centrally thereof, spokes extending radially from said shaft at intervals, a helical flange supported from the outer ends of the spokes and extending substantially at right angles to the axis of the shaft, a cylindrical wire mesh screen surrounding the flange and adapted to rotate therewith, a helical band on the outside of the screen and cooperating with the flange to clamp the screen between it and the flange, means to collect the screened material from one end of the screen, and means to collect and carry away the screenings from beneath it.

5. In a grain cleaner, the combination with a casing, of a shaft journaled centrally thereof, spokes extending radially from said shaft at intervals, a helical flange supported from the outer ends of the spokes and extending substantially at right angles to the axis of the shaft, a cylindrical wire mesh screen surrounding the flange and adapted to rotate therewith, a helical band on the outer side of the screen and cooperating with the flange to clamp the screen between it and the flange, means anchoring the ends of the band to the screen, means preventing lateral displacement of the convolutions of the band, means to collect the screened material from one end of the screen and means to collect and carry away the screenings from beneath it.

6. In a grain cleaner, the combination with a casing, of a driven rotatably mounted shaft therein, a helical flange mounted concentric to the shaft and spaced therefrom and directed substantially at right angles to the longitudinal axis thereof, means for rigidly supporting the flange from the shaft to cause the same to rotate therewith, a cylindrical wire mesh screen enveloping the flange, a helical member surrounding the screen, said screen being clamped between the helical member and the flange, means preventing lateral displacement of the convolutions of the helical member and means for feeding grain into one end of the screen.

7. In a grain cleaner, a cylindrical, rotary, wire mesh screen, a helical flange within and supporting the screen, said flange presenting a clamping web in contact with the screen and an inwardly directed grain feeding web and an outer tensioned flexible clamping member continuously and uniformly clamping the screen to the clamping web substantially throughout the full length of the web.

8. In a grain cleaner, a cylindrical, rotary, wire mesh screen, a helical flange within and supporting the screen, said flange presenting a horizontal web in contact with the screen and a vertical grain feeding web within the screen and a flexible tensioned exteriorly applied spiralling band enveloping the screen and continuously and uniformly clamping the screen between said band and the horizontal flange.

9. In a grain cleaning machine, a rotary, cylindrical, wire mesh screen longitudinally crimped to provide internal, suitably spaced, longitudinally extending, grain gathering steps, a helical grain feeding flange extending longitudinally within and in contact with the screen, said flange being directed substantially at right angles to the longitudinal axis of the screen and a helical band surrounding the screen, said screen being clamped between the helical band and the flange and said band being prevented from lateral displacement by forming a spiralling exterior depression in the screen at the point of application of the band.

10. In a grain cleaning machine, in combination, a rotatably mounted and driven shaft, a helical flange mounted concentric to the shaft and spaced therefrom and directed substantially at right angles to the longitudinal axis thereof, means for supporting the flange from the shaft to cause the same to rotate therewith, a cylindrical wire mesh screen enveloping the flange, an outer tensioned flexible clamping member continuously and uniformly clamping the screen to the flange throughout the full length of the flange, and internal tie members connecting and spacing the convolutions of the flange.

11. In a grain cleaning machine, in combination, a rotatably mounted and driven shiaft, a helical flange mounted concentric to the shaft and spaced therefrom and embodying a clamping web and an inwardly extending grain feeding web, means for rigidly supporting the flange from the shaft to cause it to rotate therewith, a cylindrical screen enveloping the flange and bearing on the clamping web, means clamping the screen to the latter web and longitudinally extending tie members connecting and spacing the convolutions of the feeding web of the flange.

12. In a grain cleaning machine, in combination, a rotatably mounted and driven shaft, a helical flange mounted concentric to the shaft and spaced therefrom and embodying a clamping web and an inwardly extending grain feeding web, means for rigidly supporting the flange from the shaft to cause it to rotate therewith, a cylindrical screen enveloping the flange and bearing on

the clamping web, means clamping the screen to the latter web, longitudinally extending, suitably spaced bolts passing through the convolutions of the feeding web and spacing members mounted on the bolts between the convolutions of said latter web.

13. In combination a cylindrical wire mesh screen, and a supporting spiralling member and a tensioned flexible clamping member between which the screen is continuously and uniformly clamped.

14. In combination a wire mesh screen, an inner supporting spiralling member having its convolutions engaging the inner surfaces of the screen, an outer member wrapped spirally around the outer surface of the screen and having its convolutions directly opposed to the convolutions of the inner member, said outer member being drawn tightly around the screen and secured in place under sufficient tension to maintain both members in continuous uniform clamping engagement with the interposed portion of the screen.

15. In combination a wire mesh screen, an inner supporting spiralling member having its convolutions engaging the inner surfaces of the screen, an outer member wrapped spirally around the outer surface of the screen and having its convolutions directly opposed to the convolutions of the inner member, said outer member being drawn tightly around the screen to hold both members in continuous uniform clamping engagement with the interposed portion of the screen and means anchoring the terminals of the outer member to hold said member in place and to maintain the tension developed by the wrapping operation.

Signed at Winnipeg this 18th day of May, 1927.

DANIEL WEBSTER DETWILER.