

June 15, 1948.

W. J. PETERSON

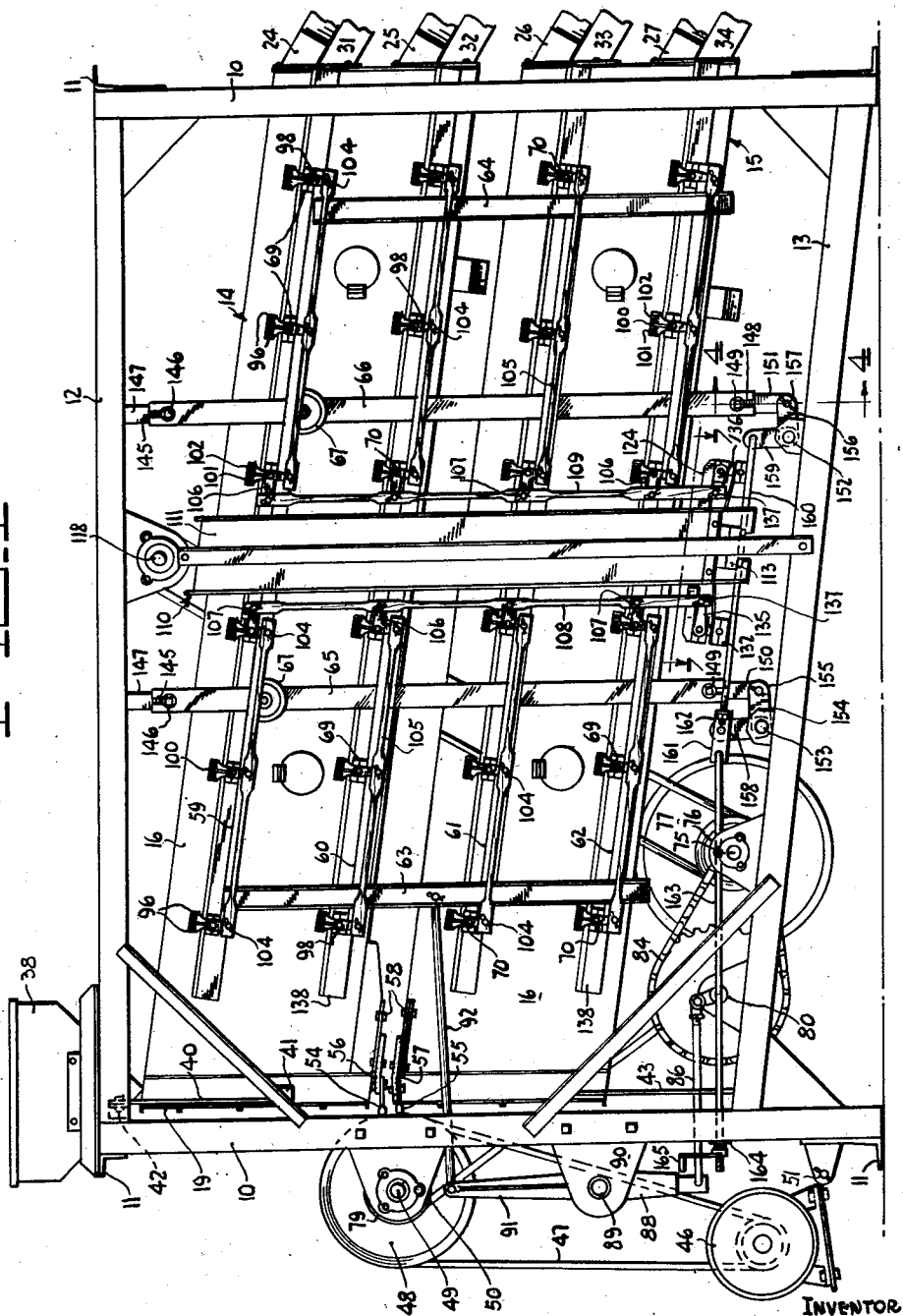
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SCREEN CLEARING MECHANISM FOR GRAIN AND SEED SIZING MACHINES

Filed April 11, 1945

5 Sheets-Sheet 1

FIG. 1



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June 15, 1948.

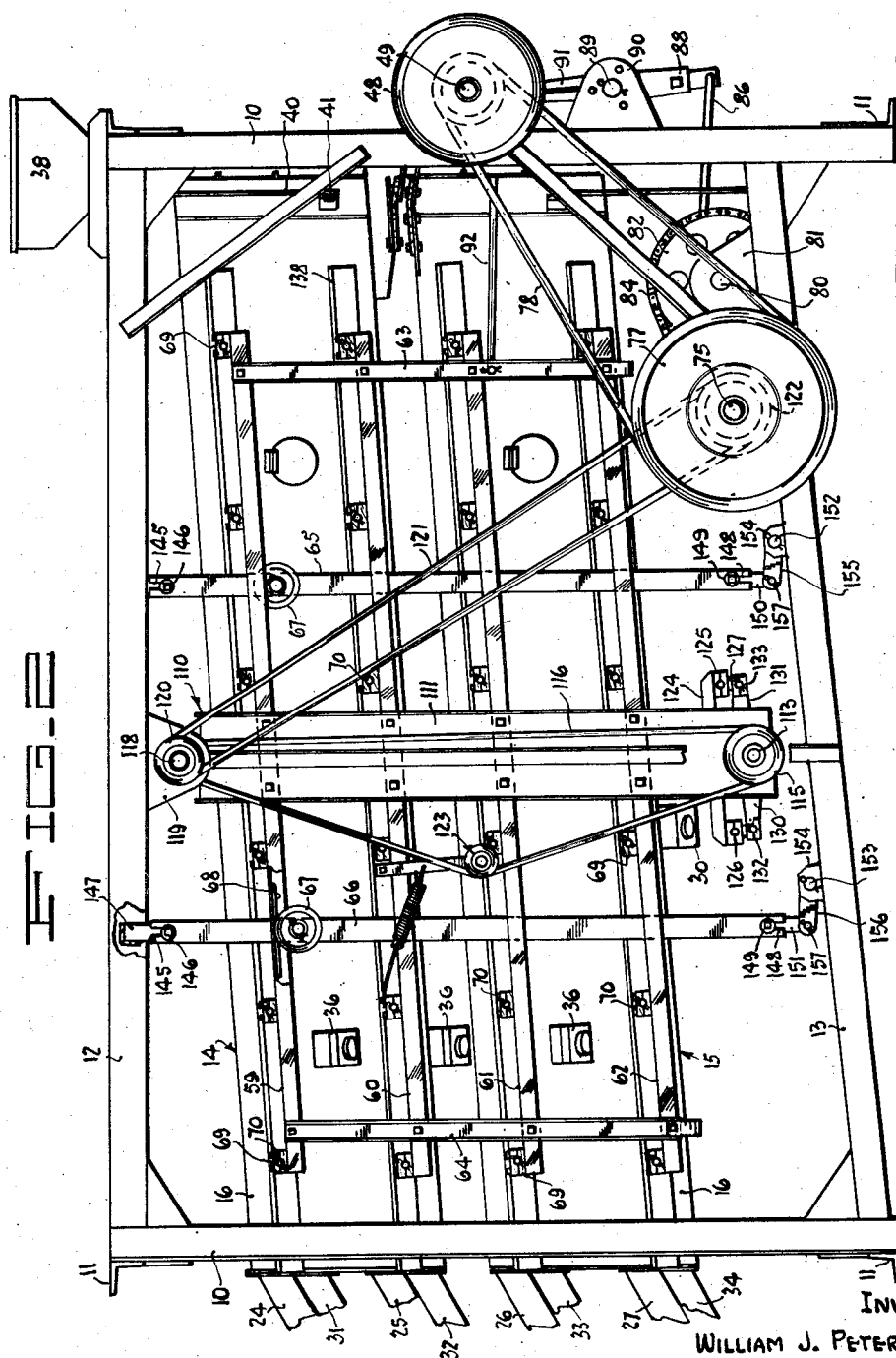
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SCREEN CLEARING MECHANISM FOR GRAIN AND SEED SIZING MACHINES

Filed April 11, 1945

5 Sheets-Sheet 2



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June 15, 1948.

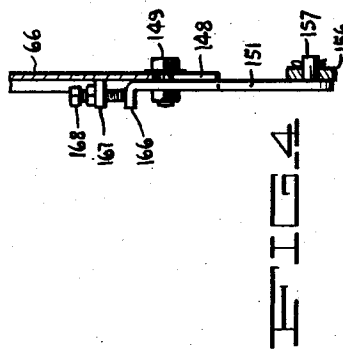
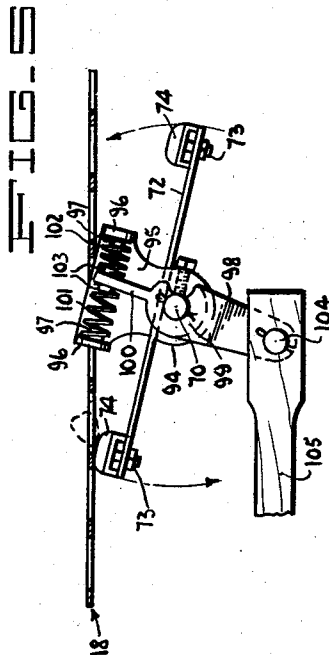
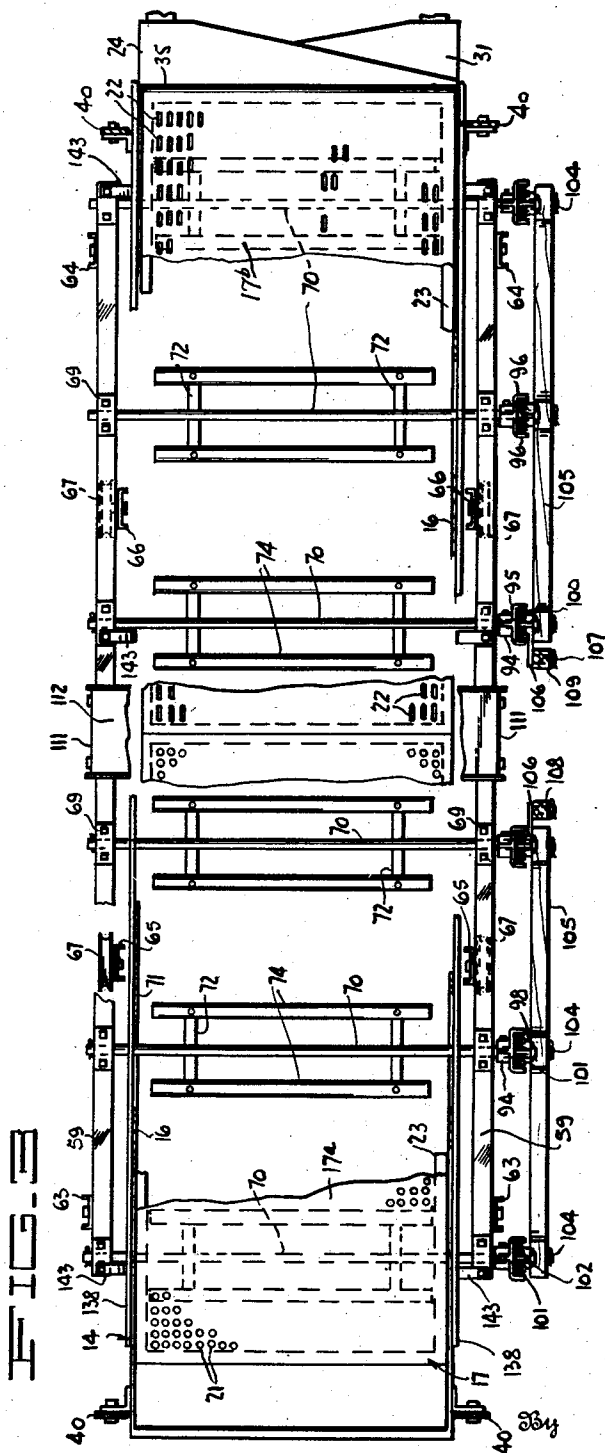
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SCREEN CLEARING MECHANISM FOR GRAIN AND SEED SIZING MACHINES

Filed April 11, 1945

5 Sheets-Sheet 3



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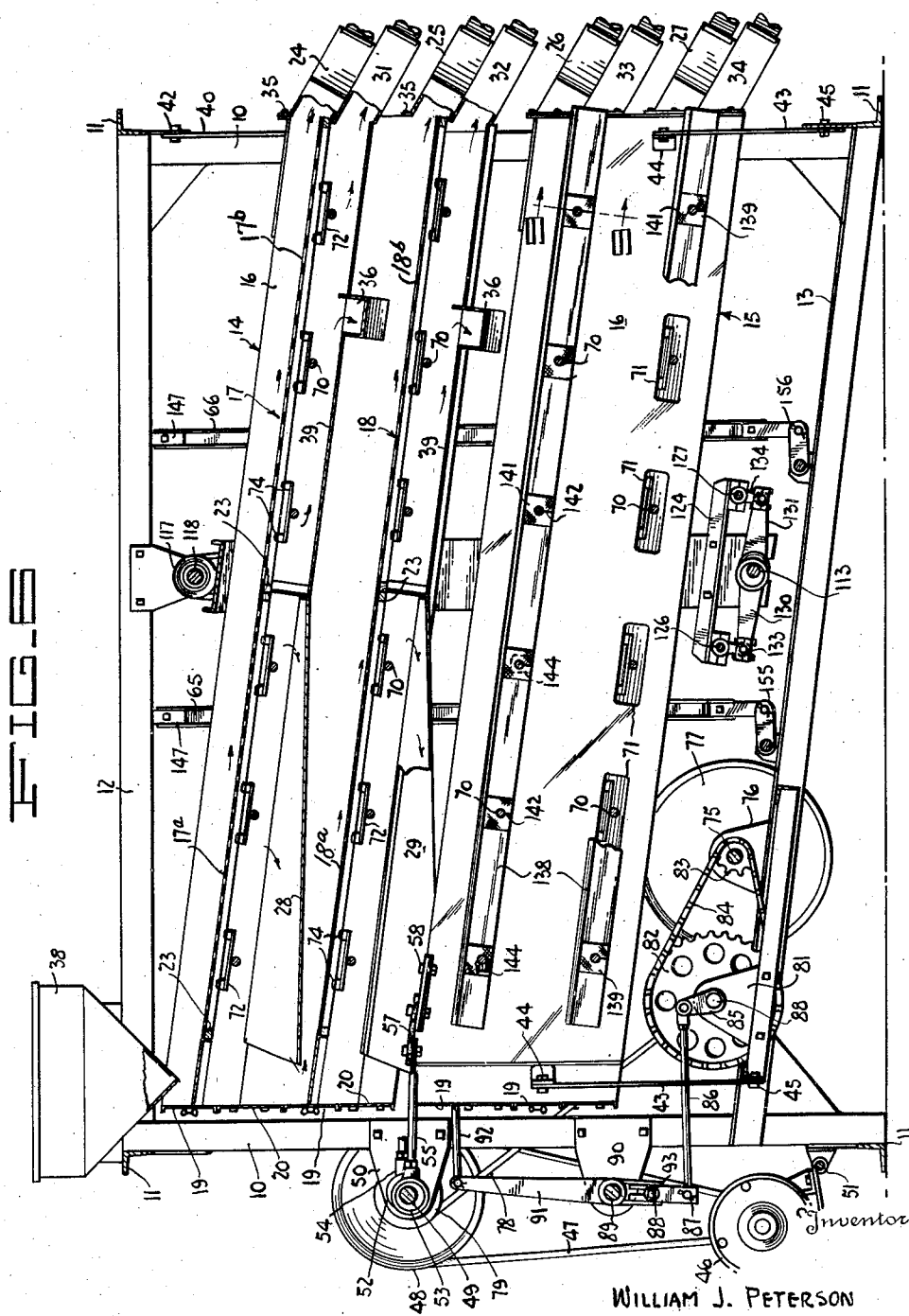
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SCREEN CLEARING MECHANISM FOR GRAIN AND SEED SIZING MACHINES

Filed April 11, 1945

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June 15, 1948.

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SCREEN CLEARING MECHANISM FOR GRAIN AND SEED SIZING MACHINES

Filed April 11, 1945

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FIG. 7

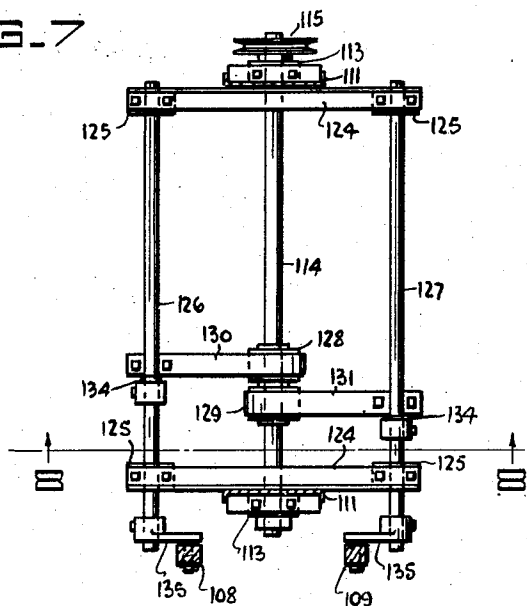


FIG. 8

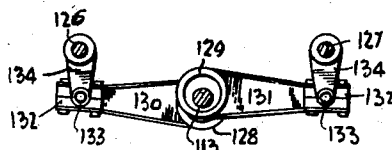
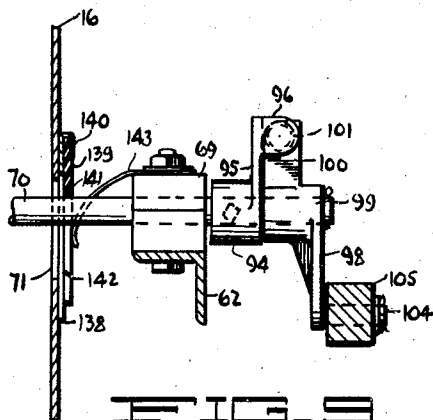


FIG. 9



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UNITED STATES PATENT OFFICE

2,443,543

SCREEN CLEARING MECHANISM FOR GRAIN
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Application April 11, 1945, Serial No. 587,717

4 Claims. (Cl. 209—382)

1

This invention relates to improvements in machines for sizing grains or seed, and particularly for separating seed corn into a number of closely and doubly dimensioned sizes to facilitate its planting.

The invention has particular reference to that type of such machines wherein a plurality of perforated screens are assembled in shoes and the whole vibrated both to travel the material over the screens and to cause the material to bounce about thereon and so come into sizing and separating contact with the openings in the screens. As its primary object my invention aims to generally improve such machines to facilitate and improve their operation.

Another and important object is to provide an improved fully adjustable screen clearing or cleaning mechanism by which the screens may be kept clear of all lodged kernels or particles and so that the machine may operate at all times at full capacity. This has long been a problem in this field, since the screens in making closely sized separations have a pronounced tendency to clog up, due to the lodgement of particles in the openings, and unless this is effectively counteracted it is apparent that the efficiency of the machine will diminish rapidly. In accordance with my invention I provide a mechanism wherein the undersides of the machine are continually wiped and at the same time upwardly tapped or struck by wiper bars which are not only power actuated or traveled to wipe and contact all areas of the screens, but are also power vibrated or oscillated to upwardly tap the screen and so dislodge any kernels or particles from the openings. In connection with the latter feature of my invention, that of power oscillating the cleaning bars, I also embody shock absorption means of such nature as to protect the screens from hard blows and to allow the wiper bars to clear kernels or particles falling through the screens and so prevent any injury to the seed or grain.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

Fig. 1 is a side elevation of my improved machine.

Fig. 2 is a similar view but looking at the other side of the machine.

Fig. 3 is an enlarged plan view of a part of the machine and with portions of the upper screen removed.

Fig. 4 is an enlarged fragmentary vertical sectional view along the line 4—4 in Fig. 1.

2

Fig. 5 is an enlarged fragmentary detail view of one wiper element and a part of its actuating mechanism.

Fig. 6 is a vertical longitudinal sectional view through the machine but only the uppermost screens being shown in section, while the shoe carrying the lower screen is shown in elevation.

Fig. 7 is an enlarged fragmentary sectional view along the line 7—7 in Fig. 1 showing the essential and drive mechanism for the wiper structure.

Fig. 8 is a detail sectional view along the line 8—8 in Fig. 7.

Fig. 9 is an enlarged fragmentary sectional view substantially along the line 9—9 in Fig. 6 but also showing adjacent parts of the wiper operating mechanism.

Referring now more particularly and by reference characters to the drawing, my machine as shown therein comprises a main frame or framework having upright corner posts 10 rigidly joined by cross bars 11 at upper and lower ends and connected at upper ends by horizontal upper frame bars 12. Lower bars 13 connect lower end portions of the posts 10 and slope endwise as best seen in Fig. 1, the lowest ends of said bars being located at the delivery end of the machine as a whole.

Supported by and within this framework are upper and lower shoes, designated generally at 14 and 15, which are arranged in superimposed relation and which also slope in the direction of the delivery end of the machine. The shoes 14 and 15 are substantially identical in construction and each comprises a box-like elongated frame having sides 16, rigidly connected together as will later appear, and said sides have suitable guideways in which spaced upper and lower screens 17 and 18 are supported one above the other. Since the specific screen mounting forms no part of my present invention it is not detailed herein, it being merely noted that the screens 17 and 18 may be slipped endwise into the shoes between the sides 16 thereof and removed therefrom at will. For this purpose the higher or feed ends of the shoes are provided with removable end plates 19 (Fig. 6) aligned with the screens and which may be removed when the screens are being changed. Other permanently mounted end plates 20 secure the shoe sides 16 together at this end.

For corn grading each screen 17 and 18 is made in two sections, one section indicated at 17^a and 18^a for each screen having a screen plate punched with round holes 21 (Fig. 3) for

making width classifications of the corn, and the other sections, indicated at 17^b—18^b, having screen plates punched with elongated holes or slots 22 (Fig. 3) for making thickness classifications. Each screen section has a separate rectangular frame 23 to which the perforated plates are fastened.

The screen arrangement and gathering means for the various classifications of the corn as here shown are largely conventional and will accordingly be only briefly described. The round holed screens 17^a—18^a are arranged to receive the corn first and the corn rejected by these screens is caused to travel down lengthwise over the corresponding slotted screens 17^b—18^b. A hopper 38 is provided as the feed means for the upper screen. The corn rejected by the screens is taken off through delivery spouts 24, 25, 26 and 27 respectively. The throughs from the uppermost screen 17^a are carried back to the head end of the screen 18^a next below by a return pan 28 disposed below the uppermost screen and which slopes back in the direction of the feed end of the machine. In turn the throughs from screen 18^a are collected by another return pan 29 and carried back to the head of the upper round holed screen in the lower shoe 15 and the action is repeated therein until the lower round holed screen is reached. The throughs from this screen are delivered in the usual manner from a laterally extending trough 30 (Fig. 2) attached to the lower shoe.

The throughs from the slotted screens 17^b—18^b in both shoes are collected on bottom plates indicated generally at 39 and separately delivered from the ends of the shoes by spouts 31, 32, 33 and 34. All of these end spouts are conveniently fastened, as indicated at 35, across the ends of the shoes at proper levels to receive the various grades of corn, and serve also to tie the sides 16 of the shoes together.

As seen in Fig. 6 the throughs from the upper end portions of the upper three slotted screens 17^b—18^b may be collected by laterally discharging troughs 36 and delivered separately from the corn emerging from the spouts 31 to 34. Thus the screens 17^b—18^b may, by using slots of different width at upper and lower end portions, each make three separate classifications. As a result, the four layer or four deck machine here shown is seen to make no less than twelve size classifications of the corn. I do not, however, limit the application of my present invention to this specific screen arrangement since it may be varied according to the kind and class of grain or seed being sized.

To progress or travel the corn or seed over the screens and to cause it to bound about thereon as required for proper operation of the machine I provide means for shaking or vibrating the shoes 14 and 15 as will now be described.

The upper shoe 14 is supported for lengthwise swinging movements by flexible metal straps or hangers 40, one at each corner, and lower ends of these straps are secured at 41 to the shoe sides 16. The upper ends of the straps are secured at 42 to the upper part of the main frame. The lower shoe 15 is similarly supported at each corner by straps 43 secured at upper ends at 44 to its sides 16 and secured at lower ends at 45 to the lower part of the frame. Thus the shoes may be vibrated or swung lengthwise independently of each other.

The shoes are thus operated, and the entire machine powered, by any suitable prime mover or

power source, such as an electric motor 46, belted as at 47 to a pulley 48 on a main drive shaft 49. Said drive shaft 49 is journaled in bearings 50 supported on the corner posts 13 at the feed end of the machine, and the motor is pivotally hung at 51 on the frame to keep the belt 47 taut.

The drive shaft 49 carries near each end a pair of eccentrics indicated in Fig. 6 at 52—53 which reciprocate eccentric arms or pitmans 54—55 adapted to be respectively connected to adjacent corners of the upper and lower shoes 14 and 15. As one way of connecting these parts I show the pitmans 54—55 as connected to flexible straps 56 and 57 which are in turn bolted as at 58 to the shoes. The arrangement is obviously such that the rotation of the drive shaft 49 and the eccentrics 52—53 thereon will swing the shoes 14 and 15 back and forth through a limited range, and with the eccentrics located oppositely as here shown with respect to the axis of the shaft 49, the shoes will move in opposite directions. The speed of this movement is such that a pronounced vibration of the screens and the seed or corn thereon results, and I have found that a rate of vibration of 400 per minute, and a range of one-half inch gives good results for most purposes.

My present invention relates to the screen wiping and clearing mechanism now to be described. For the four screen layer or four deck machine herein shown I provide at each side thereof a carrier frame comprising four parallel and vertically spaced bearing or carrying bars 59, 60, 61 and 62 secured together rigidly by upright bars 63—64 connecting their ends. The bars 59 through 62 are located parallel with and below the level of the respective screens 17—18 within the two shoes 14 and 15 and, of course, slope toward the delivery end of the machine. The grid-like rectangular frames thus formed at each side of the shoes, are supported for reciprocating movements lengthwise of the shoes and parallel with the screens by two upright supporting bars or support members 65 and 66 at each side of the machine and which are spaced apart lengthwise thereof. Near upper ends these bars 65 and 66 carry peripherally grooved pulleys or rollers 67 over which the uppermost bearing bars 59 ride and these pulleys are located at proper and different levels so as to support and guide the carrier frame for movements in the desired sloping, longitudinal plane. As seen in Fig. 9 the bars 59—62 are made from angle irons and to guide the frame on the pulleys 67 and hold it thereon short sections of rod 68 are welded inside the angle of the upper bar 59 (Fig. 2) to ride the grooves of the pulleys.

The manner in which the supporting bars 65 and 66 are themselves supported will be described later.

Each of the bearing bars 59, 60, 61 and 62 at each side of the shoes carries six, more or less, spaced bearings, designated throughout at 69, and in each aligned pair of said bearings on the opposite sides of the frame a wiper or rocker shaft 70 is journaled. There are, accordingly, twenty-four of the shafts 70 in the machine here shown and they are supported by the bearings transversely beneath the respective screens 17—18, with three of the shafts located beneath each round holed and each slotted screen. To pass the shafts the sides 16 of the shoes 14 and 15 are provided with openings 71 and these openings are not only elongated in the direction of the

length of the machine to permit the shafts to move back and forth with the carrier frames but are so wide vertically as to permit substantial up and down adjustments of the shafts as will presently appear. Note Fig. 6. Within the shoes 14 and 15 the shafts 70 are provided each with a pair of rigidly fastened cross-arms 72 and secured across the ends thereof, as by means of bolts 73 (Fig. 5), are screen-clearing or wiper bars 74 which extend parallel with the shafts and crosswise with respect to the screens. Preferably these wiper bars 74 are of rubber or other resilient material and they are of such length as to substantially completely span the screens crosswise. The entire carrier frame including the wiper shafts and bars are power travelled to cause the bars to wipe undersides of the frame as will now be described.

A main countershaft 75 is journaled in bearing bracket 76 crosswise of the lower frame bars 73 and carries a pulley 77 which is connected by a belt 78 to a pulley 79 on the drive shaft 49. A crankshaft 80 is journaled in bearing brackets 81 in the lower part of the frame parallel with the countershaft 75 and these shafts carry aligned sprockets 82 and 83 (Fig. 6) over which is trained a sprocket chain 84. The arrangement is such that the crankshaft 80 is driven by the motor 46 but at a relatively slow speed. A crank 85 on the crankshaft 80 operates a connecting rod 86 which extends out to the feed end of the machine and is pivotally connected at 87 to the lower end of a crank arm 88. This crank arm 88 is secured to a rock shaft 89 journaled well below the drive shaft 49 in bearing brackets 90 secured to the adjacent frame corner posts 10. Said shaft 89 also carries or operates upwardly extending crank levers 91 aligned with the adjacent end bars 63 of the wiper carrier frame and the respective crank arms at each side of the frame are connected to said bars 63 by link rods 92. It will be readily apparent that the aforesaid rotation of the crankshaft 80 will cause the crank levers 91 to oscillate in upright longitudinal planes and this movement will be transmitted to the carrier frame through the link rods 92 causing said frame to reciprocate with respect to the shoes 14 and 15. In so doing the carrier frame travels on the pulleys 67 being guided thereby so that the wiper bars 74 travel back and forth paths parallel with the screens, and the amplitude of this movement, or stroke, is such that the wiper bars will collectively wipe or cover the full length of the screen's undersurfaces. The stroke is adjustable by the length adjustment of the crank arm 88 as indicated at 93. The movement of the wiper mechanism is, of course, slow relative to the frequency of vibration of the shoes, due to the speed reduction readily apparent in the drive mechanism.

The wiper bars are also vibrated or oscillated as they travel so that they tap the undersides of the screens and for this purpose I provide a power driven rocking mechanism which will next be described. At one side of the machine, that viewed in Fig. 1, the shafts 70 extend beyond their bearings 69 and are each provided on this extended end with a collar 94 secured to the shaft. Extending upwardly from each collar, as best shown in Figs. 5 and 9, is a web 95 which carries spaced outwardly turned ears 96 provided on their proximate surfaces with spring locating bosses 97. Also mounted on this end of each shaft 70 and outwardly of the collars 94 is a crank or rocker arm 98 which depends

from the shaft and is loose thereon but is held against outward displacement by a cotter pin 99. Each rocker crank 98 has a finger 100 which extends upwardly between the ears 96 and is centered therebetween by expansion coil springs 101—102 braced between opposite sides of the finger and the respective ears. Said springs are centered and held in place by the aforesaid bosses 97 and similar parts 103 on the finger 100. The springs 101—102 thus arranged form a double acting and shock absorbing resilient lost motion connection between the rocker cranks 98 and the shafts 70, allowing movement of the cranks to oscillate the shafts but permitting limited independent movements of the shafts in opposite directions relative to said cranks. The purpose of these resilient connections and importance thereof will presently be pointed out.

The rocker cranks 98 have outwardly turned pins 104 on their lower ends and three adjacent cranks of each layer, or those operating the wiping and clearing bars of each screen 17—18, are connected by connecting bars or beams 105 which may well be of oil impregnated wood and provided with bearing apertures to receive said pins. The adjacent ends of the two vertical tiers of such connecting bars, i. e., those operating respectively the wipers for the screens 17—18, are spaced apart and the cranks 98 connected to these ends take the form of bell cranks having also arms 106 which are turned toward each other, as seen in Fig. 1. These arms 106 are also provided with pins 107 and they are connected by two upright operating pitman bars 108—109 so that up and down movements of these bars will be translated to back and forth or longitudinal movements of the connecting bars 105 to oscillate the rocker shafts 70. Obviously the two vertical tiers of rocker assemblies are independently operative by the bars 108—109, the lower ends of which depend below the lower shoe 15 for operating thereat. The bars 108—109 may also be of oil impregnated wood.

Arranged between the pitman bars 108—109 is an inverted U-shaped bridge frame 110 having upright sides 111 which are secured to the bearing bars 59, 60, 61 and 62 at each side of the shoes and which has a top portion 112 connecting these sides. This frame 110 accordingly moves as a unit with the carrier frame as the wiping action takes place. The lower ends of the frame sides 111 depend below the lower shoe 15 and carry bearings 113 in which an eccentric shaft 114 is journaled and supported crosswise beneath the shoe. This shaft 114 is driven by means of a pulley 115 on one end over which is trained a belt 116 leading upwardly and over a pulley 117 carried by a jackshaft 118 journaled in bearing brackets 119. Said brackets 119 are hung from the upper frame bars 12 supporting the shaft 118 crosswise of the machine and above the upper shoe. The shaft 118 also carries another pulley 120 and a belt 121 leads therefrom to a pulley 122 on the main countershaft 75 which is, as aforesaid, driven by the motor 46. To keep the belt 116 taut and compensate for the travel of pulley 115 with respect to pulley 118 as the wiper frame moves back and forth, I provide a swingably supported and spring actuated tightener pulley 123 (Fig. 2) in usual manner. Bearing hanger bars 124 are secured to the lower ends of the bridge frame sides 111 about the eccentric shaft 114 and at their ends carry bearings 125 in which are journaled actuating shafts 126 and 127 extending at one end out ad-

7
jacent the lower ends of the rocker actuating pitman bars 108—109. Eccentrics 128 and 129 on the shaft 114 (Figs. 7 and 8) are provided with oppositely directed arms 130—131 having bearings 132 at their ends for pivotally engaging pins 133 at the lower ends of cranks 134 secured to and depended from the respective shafts 126 and 127. The rotation of the shaft 114 will thus be seen to oscillate the shafts 126 and 127 and the ends thereof are provided with cranks 135—136 (Fig. 1) which are pivotally connected at 137 to the pitman bars 108—109 so that such oscillation of the shafts will move these bars alternately up and down. As aforesaid this movement of bars 108—109 is translated to vibrating or rocking movements of the wiper bars 74 about the axes of the shafts 70.

To keep the openings 71 in the shoes closed at all times during the movements of the wiper rocked shafts 70 I provide for each row of said openings, on each side of the machine, an elongated closure or stop strip 138 wide and long enough to completely close said openings. To accommodate the shafts 70 the strips 138 are provided at appropriate points with flexible retainers in the form of pieces 139 of rubber belting or similar material held on the strips by turning their upper edges over upper edges of the pieces as indicated at 140. (Fig. 9 particularly.) Said rubber belting pieces 139 have centrally located apertures 141 to pass the shafts 70 and are split from these apertures downwardly as shown at 142 (Fig. 6) so that they may be spread apart to slip over the shafts. When properly positioned the strips 138 fit against the sides 16 of the shoes and they are held thereagainst by springs 143 secured to the bearings 69 and turned inwardly and downwardly to bear against the strips. Obviously then, the strips may be pulled upwardly and removed when required but when put in place they will slide back and forth along the sides of the shoe as the back and forth wiping action takes place. Behind or inside of the belting retainers or pieces 139 the strips are, of course, themselves cut away as at 144 (Fig. 6) to clear the shafts. The strips serve to prevent the escape of material from the openings 71.

The carrier frame supporting bars 65 and 66 are arranged for up and down adjustments in the following manner. At upper ends the bars are slotted or notched at 145 to accommodate bolts 146 in arms 147 which are rigidly secured to and depended from the top of the main frame. It will be noted (Figs. 3 and 6) that the bars 65 and 66 are channel-shaped in cross section and the arms 147 are disposed in the channels to hold the parts against twisting out of alignment. At lower ends the bars are also downwardly notched at 148 to accommodate bolts 149 which are secured to flat link bars 150 and 151 and depend from the bars 65 and 66 respectively. Disposed transversely beneath said bars are supporting shafts 152 and 153 journaled in bearings 154 secured to the lower frame bars 13 and upon these shafts are rigidly secured supporting cranks 155—156 to the lower ends of which the link bars 150 and 151 are respectively pivotally attached, as designated at 157. It will thus be readily appreciated that, by oscillating the shafts 152 and 153, the cranks 155—156 may be moved in vertical planes to raise and lower the supporting bars 65 and 66 and thus correspondingly adjust the entire carrier frame and wiper structure bodily.

Adjacent one end the supporting shafts 152

and 153 are provided with upwardly turned levers 158 and 159 and to the lever nearest the delivery end of the machine there is pivotally attached a link rod 160. To the other lever 153 there is pivotally pinned a strap 161 having one end turned and apertured to pass the end of the link rod 160 upon which is threaded a nut 162 by which the effective length of the rod, and hence the relative distance between upper ends of the levers 158 and 159, may be adjusted. To the other end of the strap 161 there is pivoted an adjusting rod 163 which leads therefrom out through an apertured bracket plate 164 secured to the adjacent corner post 10. This end of the rod 163 is threaded and screwed thereon is a hand crank 165. By turning this crank the rod 163 may be lengthened or paid out to allow the supporting shafts 152 and 153 to turn in a direction for bodily lowering the wiper mechanism, while by oppositely turning the crank the shafts will be turned to lift said mechanism. The weight of the mechanism will, of course, hold the crank against the plate 164.

At one side of the machine the link bars 150 and 151 are each turned inwardly at upper ends 158 (Fig. 4) and immediately thereabove the supporting bars 65 and 66 are provided with tapped inwardly turned lugs 167 in which are threaded set screws 168. By turning these set screws 168 downwardly against the ends 166 it will be evident that the supporting bars 65 and 66, and the entire wiper mechanism, may be raised and lowered at one side and with respect to the other.

Operation

The general operation of the machine has been described and it will be understood that the corn or other material will be caused to travel over the various screens as the shoes 14 and 15 are vibrated by the eccentrics 52 and 53. In such travel the particles have a pronounced tendency to become lodged in the screen openings and to counteract this the wiper bars 74 are caused to move back and forth beneath the screens by the reciprocating travel of the wiper carrier frame including the frames at each side of the shoe. This reciprocating movement is caused by the crank lever 91 as has been described. At the same time the wiper bars 74 are oscillated or rocked back and forth in longitudinal vertical planes causing them to intermittently upwardly tap the undersides of the screens and so upwardly dislodge any kernels or particles from the screen openings. Thus by the combination of the wiping and tapping actions of the bars 74, both power driven, it will be evident that the screens can be kept clear at all times.

Turning now to more specific but important features of my invention it will be evident that the springs 101 and 102 not only provide a shock absorption effect such that wear on the wiper strips and screens is reduced but furthermore that the independence of movement of the shafts 70 and the wiper bars 74 with reference to the power actuated rocking means enable the bars to clear any falling kernels or particles which may be encountered. In other words, the wiper bars may clear any such kernels without crushing or injuring the same, by virtue of this resilient connection.

Inasmuch as the wipers must operate close to the screens for best effect they must be lowered out of the way when the screens are being moved endwise for replacement and this may be readily

accomplished by turning the hand crank 165 to lower the entire wiper mechanism as a body. Also by adjustment of this crank the wipers may be raised or lowered to vary their distance below the screens and so regulate the intensity with which they tap or hammer thereon. An adequate range of movement vertically is provided for these purposes by the width of the openings 71 through which the shafts 70 pass.

The entire wiper assembly may also be tilted lengthwise or in a horizontal vertical plane with respect to the screens by adjusting the nut 162 to vary the relative angular positions of the supporting cranks 155 and 156. Thus the wipers may be adjusted to bear evenly on the full length of the screens, or to strike one end or the other with greater intensity as may be required. Similarly the entire wiper mechanism may be tilted laterally or in a transverse vertical plane with respect to the screens by adjustment of the set screws 168 to raise or lower one side. The wiper bars may thus be readily leveled as required to evenly contact the full width of the screens.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. Screen clearing mechanism for the screen of a sizing machine, comprising in combination, a wiping device rockably supported beneath the screen crosswise thereof and including a shaft and wiper bars connected thereto the latter being disposed transversely of the direction of motion of the screen, power actuated means connected to the shaft to oscillate the same and rock the wiper bars alternately upward toward the screen, and power actuated means for moving the wiping device bodily back and forth lengthwise with respect to the screen and in substantially continuous contact therewith.

2. In a material sizing machine of the character described including a screen assembly, wiper mechanism for clearing the screens of lodged particles of material, comprising wiper members positioned beneath the screens, a frame assembly at each side of the screen assembly and supporting the wipers, means for oscillating the wipers to cause them to tap the undersides of the screens, rollers supported alongside the screen assembly, the said frame assemblies being supported on said rollers for reciprocating movements with respect to the screens, and means for moving the frame assemblies on the rollers to

move the wipers back and forth beneath the screens.

3. In a material sizing machine of the character described including a screen assembly, wiper mechanism for clearing the screens of lodged particles of material, comprising wiper members positioned beneath the screens, a frame assembly at each side of the screen assembly and supporting the wipers, means for oscillating the wipers to cause them to tap the undersides of the screens, rollers supported alongside the screen assembly, the said frame assemblies being supported on said rollers for reciprocating movements with respect to the screens, means for moving the frame assemblies on the rollers to move the wipers back and forth beneath the screens, and the said rollers being supported for independent and simultaneous up and down adjustments with respect to the screen assembly for adjusting the wiper members with respect to the screen.

4. In a material sizing machine of the character described including a screen assembly, wiper mechanism for clearing the screens of lodged particles of material, comprising wiper members positioned beneath the screens, a frame assembly positioned at each side of the screen assembly and operatively supporting the wipers, support members adjacent said frame assemblies, rollers on said support members and engaging and supporting the frame assemblies for reciprocating movements to carry the wipers back and forth beneath the screens, means for reciprocating said frame assemblies, and means for both selectively and simultaneously vertically adjusting said support members to adjust the wipers with respect to the screens in two angularly related planes.

WILLIAM J. PETERSON.

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