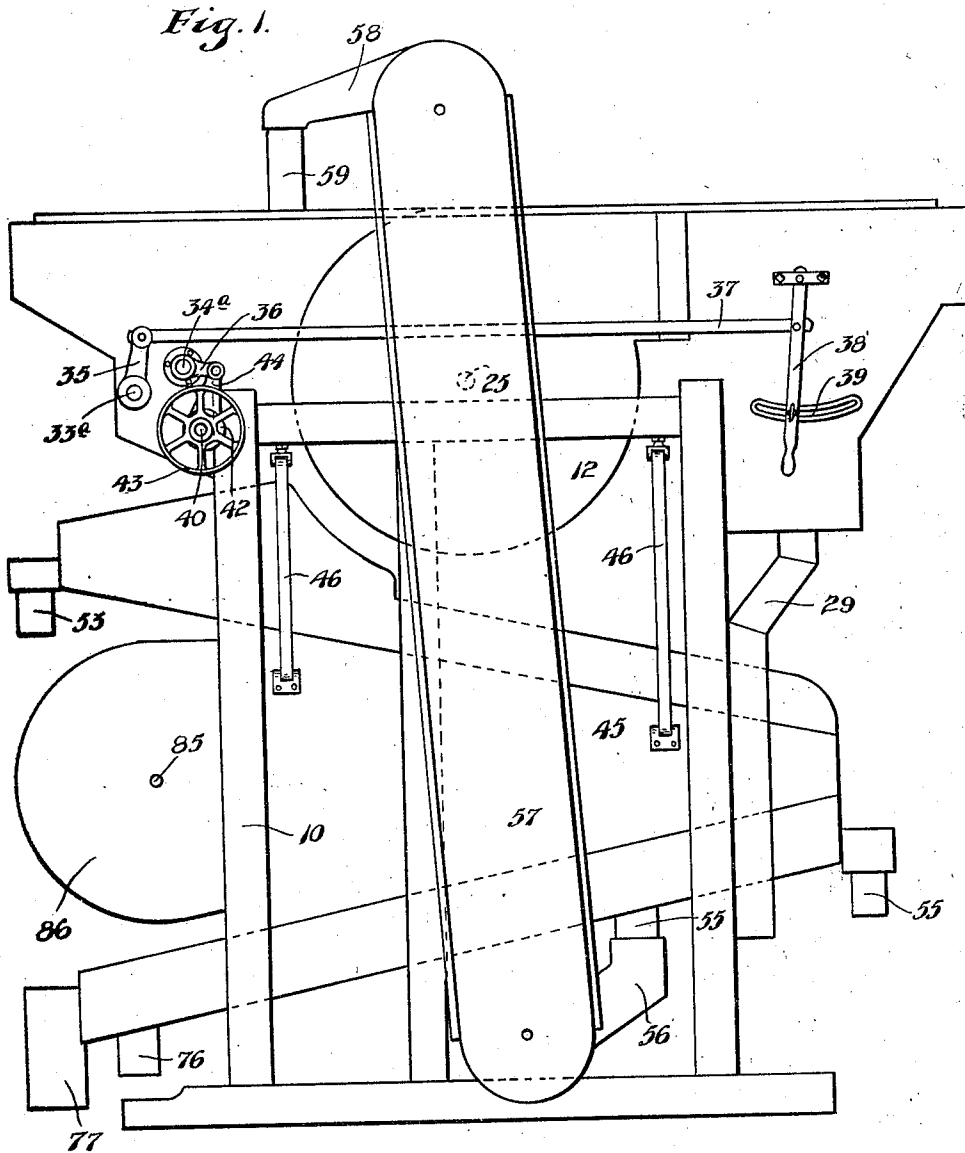


N. G. EK.
GRAIN SEPARATOR.
APPLICATION FILED SEPT. 29, 1917.

1,341,791.

Patented June 1, 1920.
4 SHEETS—SHEET 1.



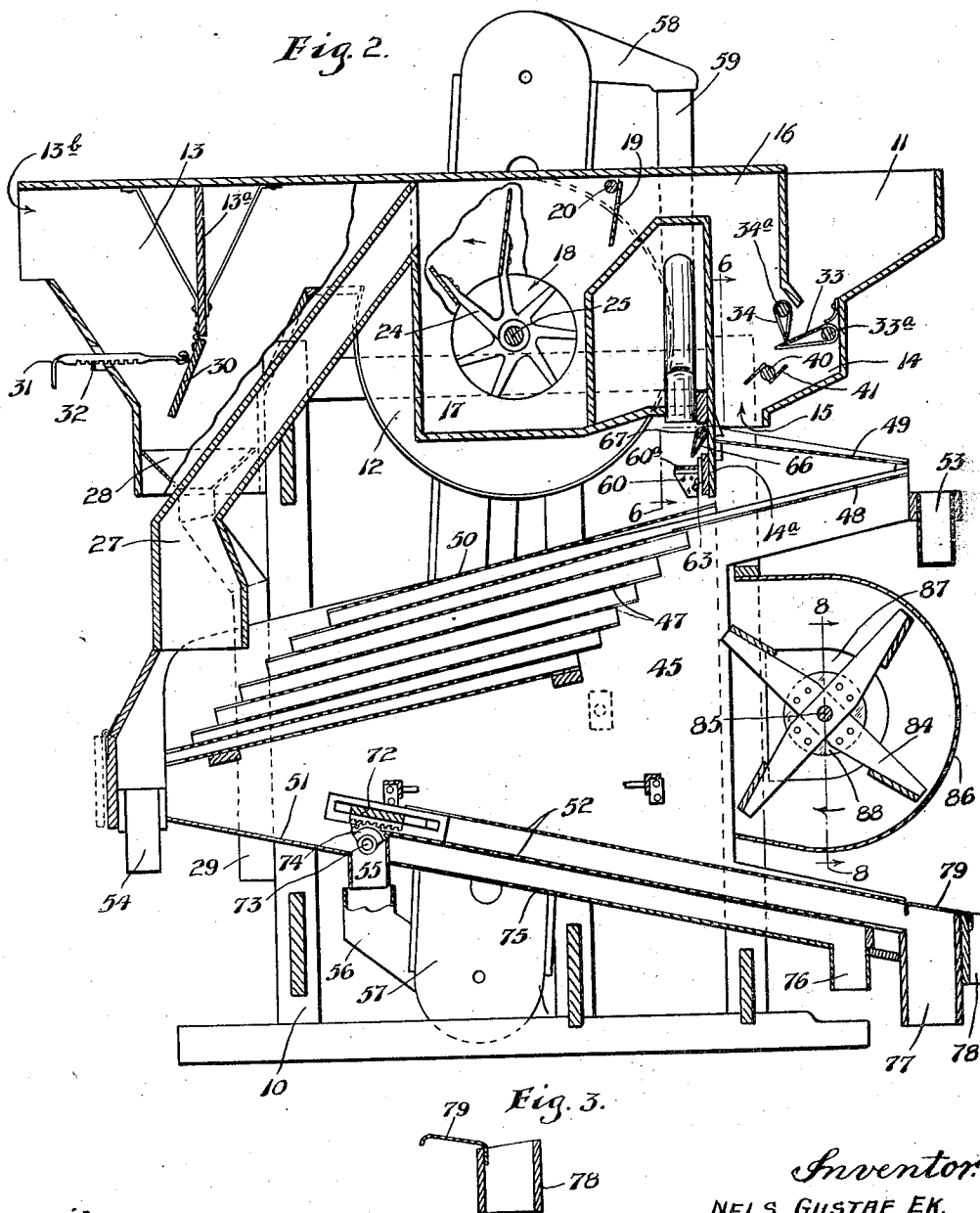
Witnesses.
H. L. Opsahl.
E. C. Wells

Inventor.
NELS GUSTAF EK.
By his Attorneys.
William Merchant

1,341,791.

N. G. EK.
GRAIN SEPARATOR.
APPLICATION FILED SEPT. 29, 1917.

Patented June 1, 1920.
4 SHEETS—SHEET 2.



Witnesses.
H. L. Opsahl.
E. C. Wells

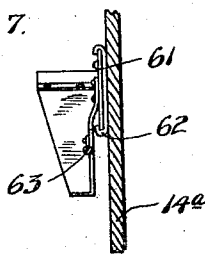
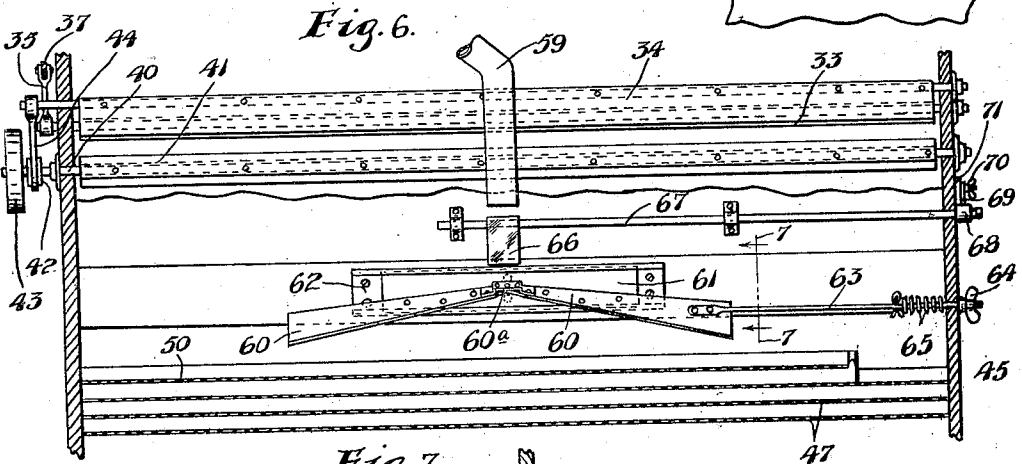
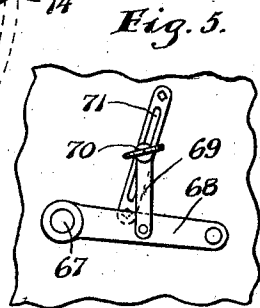
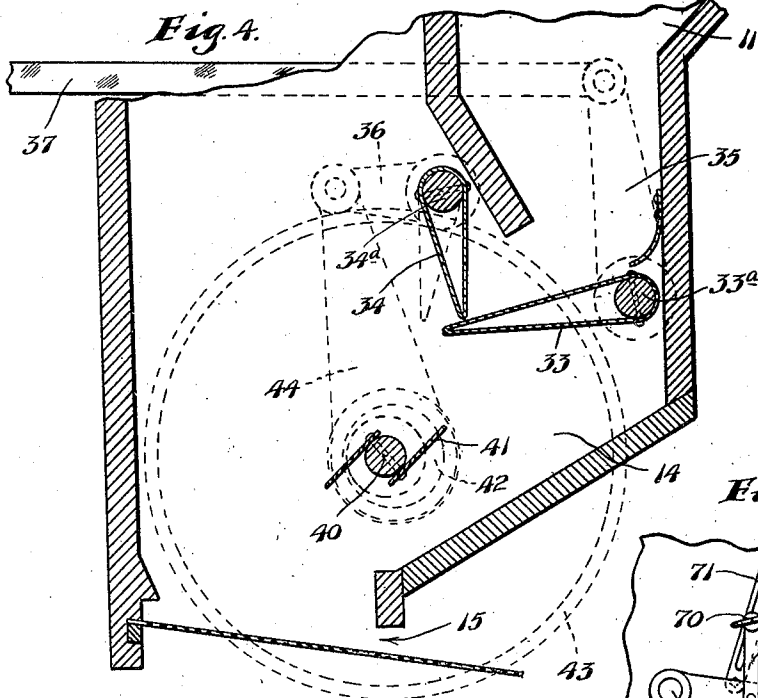
Inventor:
NELS GUSTAF EK.
By his Attorneys
Williamson & Merchant

1,341,791.

N. G. EK.
GRAIN SEPARATOR.
APPLICATION FILED SEPT. 29, 1917.

Patented June 1, 1920.

4 SHEETS—SHEET 3.



Witnesses,
H. L. Opsahl,
E. C. Wells

Inventor,
NELS GUSTAF EK.
By his Attorneys,
Williamson & Mediant

1,341,791.

N. G. EK.
GRAIN SEPARATOR.
APPLICATION FILED SEPT. 29, 1917.

Patented June 1, 1920.
4 SHEETS—SHEET 4.

Fig. 9.

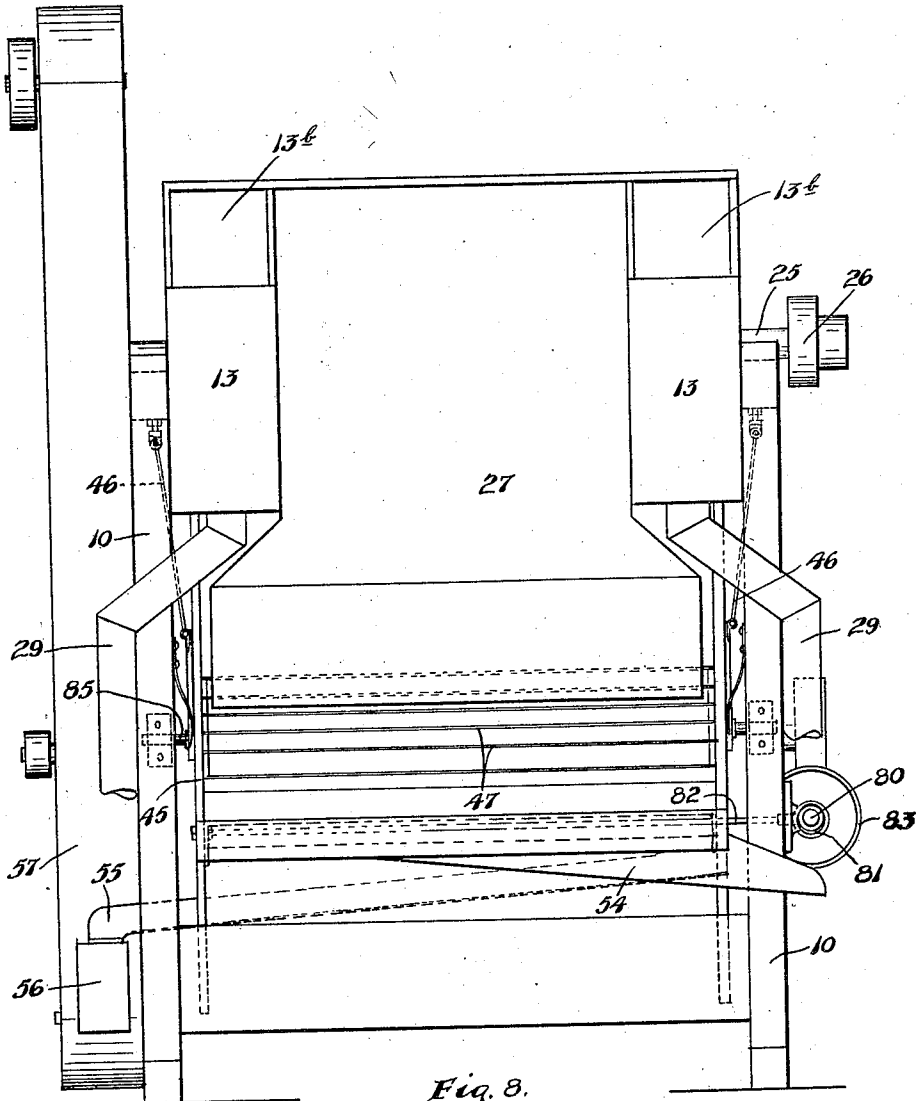
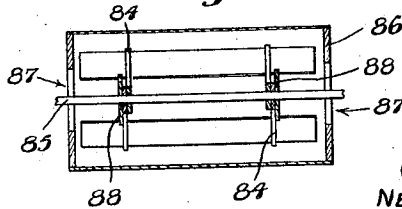


Fig. 8.



Witnesses.
H. L. Opsahl.
E. G. Wells

Inventor.
NELS GUSTAF EK.
By his Attorneys
William M. Merchant

UNITED STATES PATENT OFFICE.

NELS G. EK, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO FOSSTON-CARPENTER COMPANY, OF ST. PAUL, MINNESOTA, A CORPORATION OF MINNESOTA.

GRAIN-SEPARATOR.

1,341,791.

Specification of Letters Patent.

Patented June 1, 1920.

Application filed September 29, 1917. Serial No. 193,937.

To all whom it may concern:

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

My invention relates to grain cleaners or separators of the type used in terminal country and farm elevators, and like places where comparatively large machines of high capacity are required, and has for its object to simplify the construction and improve the operation thereof:

Primarily, my improved machine is designed for the cleaning of wheat by the separation therefrom, not only of chaff, dirt and dust, but also of all foreign grain, such as oats and the many smaller seeds that are generally found mixed with the wheat.

In my improved machine, the high efficiency is obtained, partly by an improved manner of using the air and partly by improved arrangement of sieves and cooperating mechanical devices. Also, the invention involves, as a highly important feature, novel redistributing means.

In the accompanying drawings which illustrate a commercial form of the machine, like characters indicate like parts throughout the several views.

Referring to the drawings:

Figure 1 is a side elevation of the improved machine;

Fig. 2 is a vertical section taken centrally through the machine from front to rear, some parts being broken away;

Fig. 3 is a fragmentary detail showing in section the extra wheat spout and its cooperating supplemental deck removed from the machine;

Fig. 4 is a fragmentary view in vertical section showing portions of the feed hopper, feed chamber and cooperating feed devices;

Fig. 5 is a detail in side elevation showing the means for adjusting said feed devices;

Fig. 6 is a transverse vertical section taken approximately on the irregular line 6—6 of Fig. 2;

Fig. 7 is an enlarged section on the line 7—7 of Fig. 6;

Fig. 8 is a transverse section taken on the line 8—8 of Fig. 2; and

Fig. 9 is an end elevation of the machine looking at the same from the left toward the right in respect to Fig. 2.

A suitable framework 10, at its upper portion, supports a feed hopper 11, an upper fan casing 12 and laterally spaced dust collecting chambers 13, all of which parts are fixed structures. The hopper 11 has a discharge opening in its bottom that leads into a so-called grain spreading chamber 14. This chamber 14 has an air intake port 15 in its bottom and it is connected by air trunk 16 to an air chamber 17 which, in turn, is connected to one side of the fan case 12 by a port 18. In the delivery portion of the air trunk 16 is a suction regulating damper 19 (see particularly Fig. 2), the shaft 20 of which projects at one end and is provided with means, not shown, whereby it may be set in different positions, to vary the force of the suction of the air drawn through the port 15 and through the air trunk 16.

Working within the fan casing 12 is a fan head 24, the shaft 25 of which projects at one end and is provided with a pulley 26, by means of which it may be driven.

A dust leg 27 leads upward and is connected to the upper portion of the air chamber 17. The purpose of this so-called dust leg will be hereinafter noted. The fan casing 12, on opposite sides of the leg 27, has tangential discharge ports that are connected to the dust connecting chambers 13. In the dust collecting chambers 13 are depending deflecting plates 13^a, and beyond the same, said chambers are provided with air discharge ports 13^b. In the bottoms of the chambers 13 are hopper-like heads 28 which have depending discharge spouts 29. Deflectors 30 are hinged to the lower edges of the deflecting boards 13^a and these are adapted to be set in different adjustments by notched latch bars 31 pivotally attached thereto and engageable with detents 32 in the walls of the respective chambers 13.

Just below the discharge opening in the bottom of the feed hopper 11, is an adjustable feed gate 33 and a vibratory feed gate

34, the former of which is arranged to be set somewhere in the vicinity of a horizontal position, while the latter is arranged to vibrate somewhere in the vicinity of a vertical position. These gates 33 and 34 have shafts 33^a and 34^a, respectively, that project at one side of the grain spreading chamber 14. The projecting end of the shaft 33^a is provided with an arm 35 and the projecting end of the shaft 34^a is provided with an arm 36 (see particularly Figs. 1 and 4). The arm 35 is connected by a link 37 and an adjusting lever 38 pivoted to the exterior of the chamber 13 and adapted to be set in different positions, by means of a segment 39 and cooperating clamp.

Working within the grain spreading chamber 14 below the feed gates 33 and 34, is a rotary so-called grain spreader, which, as shown, comprises a shaft 40 and blades 41 thereon (see Figs. 2 and 4). The shaft 40 is journaled in suitable bearings on the sides of the chamber 14 and at one end, projects and is provided with an eccentric 42 and a pulley 43 (see Fig. 6). The eccentric 42 is connected by a short connecting rod 44 to the arm 36 of shaft 34^a of the vibratory feed gate 34.

Working within the framework 10 below the portion above described, is a large sieve shoe 45 which is mounted for vibratory movement, either transversely or longitudinally of the machine. As shown, the said shoe is mounted for transverse or lateral vibrations being hung from the upper portion of the framework by four links 46 (see Figs. 1 and 9).

The shoe 45 carries a gang of sieves 47, an imperforate deck 48, a scalping sieve 49, a repeat sieve 50, a lower imperforate deck 51, a double or multiple screening sieve 52, and certain other parts which will be hereinafter noted. The scalping sieve 49 overlies the imperforate deck 48 and is in position to receive from the port 15 and to deliver to a transversely inclined scalping spout 53 which is also carried by the upper portion of the shoe 45. The deck 48 delivers to the uppermost member of the gang of sieves 47, the said delivery being below the repeat sieve 50. The gang of sieves 47 deliver to a transversely oblique tailing spout 54, also carried by the shoe 45. The deck 51 delivers to a spout 55 that is carried by the shoe 45, and, in turn, delivers to a repeat spout 56. The repeat spout 56 delivers to an elevator 57 of the usual or well known construction, and which is secured to one side of the framework 10. The elevator 57, at its upper end, has a discharge spout 58 that delivers to a repeat delivery spout 59 that extends downward therefrom, through one wall of the fixed superstructure and terminates in a position over the upper transversely central portion of the repeat sieve

50 (see particularly Figs. 2 and 6). The repeat spout 59 delivers onto the upper central portion of a grain distributor which is of novel construction, and preferably comprises as follows, attention being directed particularly to Figs. 2, 6 and 7.

The main element of the distributor is in the form of a distributing plate 60 which is secured to a slide 61 mounted to move transversely of the machine in a flanged keeper 62 shown as supported to a depending wall 14^a of the chamber 14. The distributing plate 60 has its highest portion at its center and in a horizontal direction, has its greatest width at its high portion, to wit, at its high portion 60^a. Preferably, this high portion 60^a is flat and approximately horizontal for a short distance. In both directions from the high portions 60^a to laterally projecting flanges of the plates 60 are progressively decreased in horizontal width, for a purpose which will hereinafter appear.

For the purpose of adjusting the distributing plate 60 transversely of the machine, an adjusting rod 63 is connected thereto and extended through one side of the shoe 45 (see Fig. 6). The projecting end of the rod 63 is provided with an adjusting nut 64 which serves to move the same in one direction against the tension of the operating spring 65.

Just above the high central portion 60^a of the distributing plate 60 is an adjustable deflecting blade 66 which is secured on one end of a rock shaft 67 mounted in suitable bearings on the depending wall 14^a, and at one end extends through one side of the shoe 45. The projecting end of the shaft 67 has an arm 68 which, as shown, (see Fig. 5) is pivoted a link 69, which, by a bar or clamping screw 70, is adapted to be adjustably secured to a slotted guide 71.

Overlying the repeat spout 55 is an adjustable so-called repeat board 72 (see Fig. 2). This repeat board may be of the usual construction and arranged to be adjusted in the customary way by a cooperating rack 73 and gear segment 74. Underlying the lower screen sieve 52 and carried by the shoe 45 is an inclined imperforate deck 75 which delivers to the discharge spout 76. The said lower sieve 52 delivers to a clean grain spout 77 also carried by the shoe. An auxiliary clean grain spout 78 is preferably also attached to the spout 77. For certain purposes, a detachable imperforate deck section 79 may be applied to the shoe, as shown in Figs. 2 and 3, to cause the upper screen 52 to deliver to the said auxiliary spout 78.

Vibratory motion may be imparted to the shoe 45 in various different ways, but, as shown, in Fig. 9, it is accomplished as follows:

The numeral 80 indicates a shaft journaled on one side of the frame 10 and pro-

vided with an eccentric 81 which is connected to the shoe by a connecting rod 82. Shaft 80 is also shown as provided with a pulley 83, by means of which it may be driven.

5 For blowing a blast of air between the sieves of the gang 47, a suitable fan 84 is provided. The shaft 85 of this fan is journaled in suitable bearings on the frame 10. The casing 86 for the fan 84 is secured to the frame 10 and is open at that side that faces toward the gang of sieves 47. This casing 86 has air intake passages 87 (see particularly Figs. 2 and 8). It will be noted that the arms of the fan 84 are located considerably inward of the ends of the blades thereof, which feature, in itself, however, is the ordinary arrangement. Secured to the arms of the fan and to the shaft 85 thereof are air deflecting disks 88 which prevent the air entering in opposite directions from the passages 87, from being centralized at the center of the fan casing, and by deflecting the same, cause the same to be evenly distributed so that the intensity of the blast on the sieves will be approximately equal at all points transversely thereof.

Operation: When the machine is in action, the volume of the feed is regulated by the distance that the adjustable gate 33 is set from the lower edge of the vibratory or agitating gate 34. The grain fed from the hopper will fall directly onto the rotary spreader 40-41, and, by the same, will be scattered in the form of a shower, thereby accomplishing two important results, to wit, first it gives a chance for the air which is drawn upward through the air trunk 16 to carry off the light dust and other light forms of materials, and in the second place, it produces an even distribution of the grain onto the scalping sieve 49. The air trunk 16 serves as a suction duct through which the grain is fed to the sieve 49, and, by the suction or upwardly moving draft of air, the light foreign materials will be carried into the air chamber 17. Straws and light dust, for example, will be thus removed. The fan draws in the air and these foreign materials and then discharges the same through the dust collecting chamber 13 where the heavier foreign materials are precipitated through the spout 54, while the air will be discharged through the ports 13^b.

The grain, including wheat and oats and some small seeds which are delivered onto the scalping sieve 49 will pass therethrough and onto the deck 48, while the larger and heavier foreign materials, such as heavy chaff, sticks, and the like, will be scalped off and delivered to the spout 53. Thus a very good initial cleaning of the grain is effected before it is delivered to the gang of sieves 47. By the gang of sieves 47 the oats will be tailed off and delivered to the spout 54 while the wheat will pass through the

said sieves. The clean wheat will drop either onto the upper sieve 52 or onto the tailing board 72. Any wheat or other material which drops onto the board 72 will be delivered onto the lower screen sieve 52. By the action of the sieves 52, when the deck 79 is removed, the clean wheat will all be delivered to the spout 77, while the small seeds will pass through both sieves, onto deck 75 and from thence to the spout 76. The upper screen sieve 52 is preferably of slightly coarser mesh than the lower sieve 52, so that when the bridge 79 is in position, as shown in Fig. 2, the larger and more perfect wheat, such as is suitable for seeding, will be delivered over into the auxiliary spout 78, while the smaller clean wheat will be delivered to the spout 77.

During the above noted separating action, the blast from the fan 84 is delivered through the falling grain and between the sieves 47, and at the same time, a suction is produced over the delivery ends of the said sieves 47 and the dust and light materials from the grain will be carried, thereby through dust leg 27 into air chamber 17 and from thence, through fan case and out through dust collecting chamber 13.

The proportion of air that will be drawn through air trunk 16 or suction duct 16 and through dust leg 27, may be regulated by adjustments of the damper 19.

In the operation of the separators of this character, some commingled wheat and oats will pass through the lower portions of the sieves 47 and onto the deck 51, and this mixed stock should be and is returned to the machine for re-separation, or in other words, for recleaning. By means of the spouts 55 and 56, the elevator 57 and so-called redistributing spout 59, the mixed stock is returned to the so-called recleaning sieve 50, and by means of this sieve 50, most of the oats of the return stock will be carried directly off while the wheat will pass through the said sieve 50 and thence through the gang of sieves 47. The recleaning sieve 50, therefore, relieves the sieves 47 of nearly all of the work of separating the oats from the wheat of the returned stock.

The returned stock from repeat spout 59 will fall onto the upper widest portion of the distributing plate 60, and as it runs in two opposite streams down the inclined surfaces thereof, will be distributed over the upper surface of the repeat sieve 50. This distribution is further facilitated by the fact that the distributing plate is made narrower and narrower toward its ends. The spreading action is also regulated to a considerable extent by adjustment of the deflecting blade 66. Obviously, the farther forward the said blade 66 is projected, the greater will be the amount of grain that will be immediately thrown upon the central upper por-

tion of the sieve 50. Transverse adjustments of the distributing plate are desirable in order to centralize the stream of grain and cause the same to be properly and evenly distributed on the upper portion of the sieve 50.

What I claim is:

1. In a machine of the character described, the combination with a vibratory shoe and a gang of separating sieves, of a hopper and cooperating devices for delivering the stock therefrom to the top member of said gang of sieves, a repeat sieve carried by said shoe and arranged above the top member of said gang of sieves, and means for catching a portion of the stock that passes through the delivery end portions of said gang of sieves and delivering the same directly to the head of said repeat sieve.

2. In a machine of the character described, the combination with a vibratory shoe and a gang of separating sieves, of a hopper and cooperating devices for delivering the stock therefrom to the top member of said gang of sieves, a repeat sieve carried by said shoe and arranged above the top member of said gang of sieves, means for catching a portion of the stock that passes through the delivery end portions of said gang of sieves and delivering the same directly to the head of said repeat sieve, and means for producing a forced blast of air through the stock as it passes from said hopper to said gang of sieves.

3. In a machine of the character described, the combination with a vibratory shoe and a gang of separating sieves, of a hopper and cooperating devices for delivering the stock therefrom to the top member of said gang of sieves, a repeat sieve carried by said shoe and arranged above the top member of said gang of sieves, means for catching a portion of the stock that passes through the delivery end portions of said gang of sieves and delivering the same directly to the head of said repeat sieve, means for producing a forced blast of air through the stock as it passes from said hopper to said gang of sieves, and means for blowing a blast of air against said gang of sieves.

4. In a machine of the character described, the combination with a vibratory shoe and a gang of separating sieves, of a hopper and cooperating devices for delivering the stock therefrom to the top member of said gang of sieves, a repeat sieve carried by said shoe and arranged above the top member of said gang of sieves, means for catching a portion of the stock that passes through the delivery end portions of said gang of sieves and delivering the same directly to the head of said repeat sieve, means for producing a forced blast of air through the stock as it passes from said hopper to

said gang of sieves, means for blowing a blast of air against said gang of sieves, and means for producing a suction of air over the delivery end portions of said gang of sieves.

5. In a machine of the character described, the combination with a vibratory shoe and a gang of separating sieves, of a hopper and cooperating devices for delivering the stock therefrom to the top member of said gang of sieves, a repeat sieve carried by said shoe and arranged above the top member of said gang of sieves, means for catching a portion of the stock that passes through the delivery end portions of said gang of sieves and delivering the same directly to the head of said repeat sieve, and a distributor operative to distribute the returned stock over the head of said repeat sieve.

6. In a machine of the character described, the combination with a vibratory shoe and a gang of separating sieves, of a hopper and cooperating devices for delivering the stock therefrom to the top member of said gang of sieves, a repeat sieve carried by said shoe and arranged above the top member of said gang of sieves, means for catching a portion of the stock that passes through the delivery end portions of said gang of sieves and delivering the same directly to the head of said repeat sieve, and a distributor operative to distribute the returned stock over the head of said repeat sieve, said distributor being adjustable transversely of the machine.

7. In a machine of the character described, the combination with a vibratory shoe and a gang of separating sieves, of a hopper and cooperating devices for delivering the stock therefrom to the top member of said gang of sieves, a repeat sieve carried by said shoe and arranged above the top member of said gang of sieves, means for catching a portion of the stock that passes through the delivery end portions of said gang of sieves and delivering the same directly to the head of said repeat sieve, and a distributor operative to distribute the returned stock over the head of said repeat sieve, said distributor comprising a distributing plate having its highest portion at its center and having decreasing horizontal width toward both ends.

8. In a machine of the character described, the combination with a vibratory shoe and a gang of separating sieves, of a hopper and cooperating devices for delivering the stock therefrom to the top member of said gang of sieves, a repeat sieve carried by said shoe and arranged above the top member of said gang of sieves, means for catching a portion of the stock that passes through the delivery end portions of said gang of sieves and delivering the same di-

70

75

80

85

90

95

100

105

110

115

120

125

130

rectly to the head of said repeat sieve, a distributor operative to distribute the returned stock over the head of said repeat sieve, said distributor comprising a distributing plate having its highest portion at its center and having decreasing horizontal width toward both ends, and an adjustable deflecting blade overlying the central portion of said distributing plate.

9. In a machine of the character described, the combination with a sieve-equipped shoe of means for redistributing a part of the stock to the head of said shoe, said means comprising a distributing plate having a relatively high and relatively wide central portion and having decreasing horizontal width toward its ends.

10. In a machine of the character described, the combination with a sieve-equipped shoe, of means for redistributing a part of the stock to the head of said shoe, said means comprising a distributing plate having a relatively high and relatively wide

central portion and having decreasing horizontal width toward its ends, a slide supporting said distributing plate and mounted to move transversely of the machine, and an adjusting device for moving and setting said slide in different positions.

11. In a machine of the character described, the combination with a sieve-equipped shoe, of means for redistributing a part of the stock to the head of said shoe, said means comprising a distributing plate having a relatively high and relatively wide central portion and having decreasing horizontal width toward its ends, and an adjustable deflecting blade set above the high central portion of said distributing plate.

In testimony whereof I affix my signature in presence of two witnesses.

NELS G. EK.

Witnesses:

BERNICE G. BAUMANN,
HARRY D. KILGORE.