

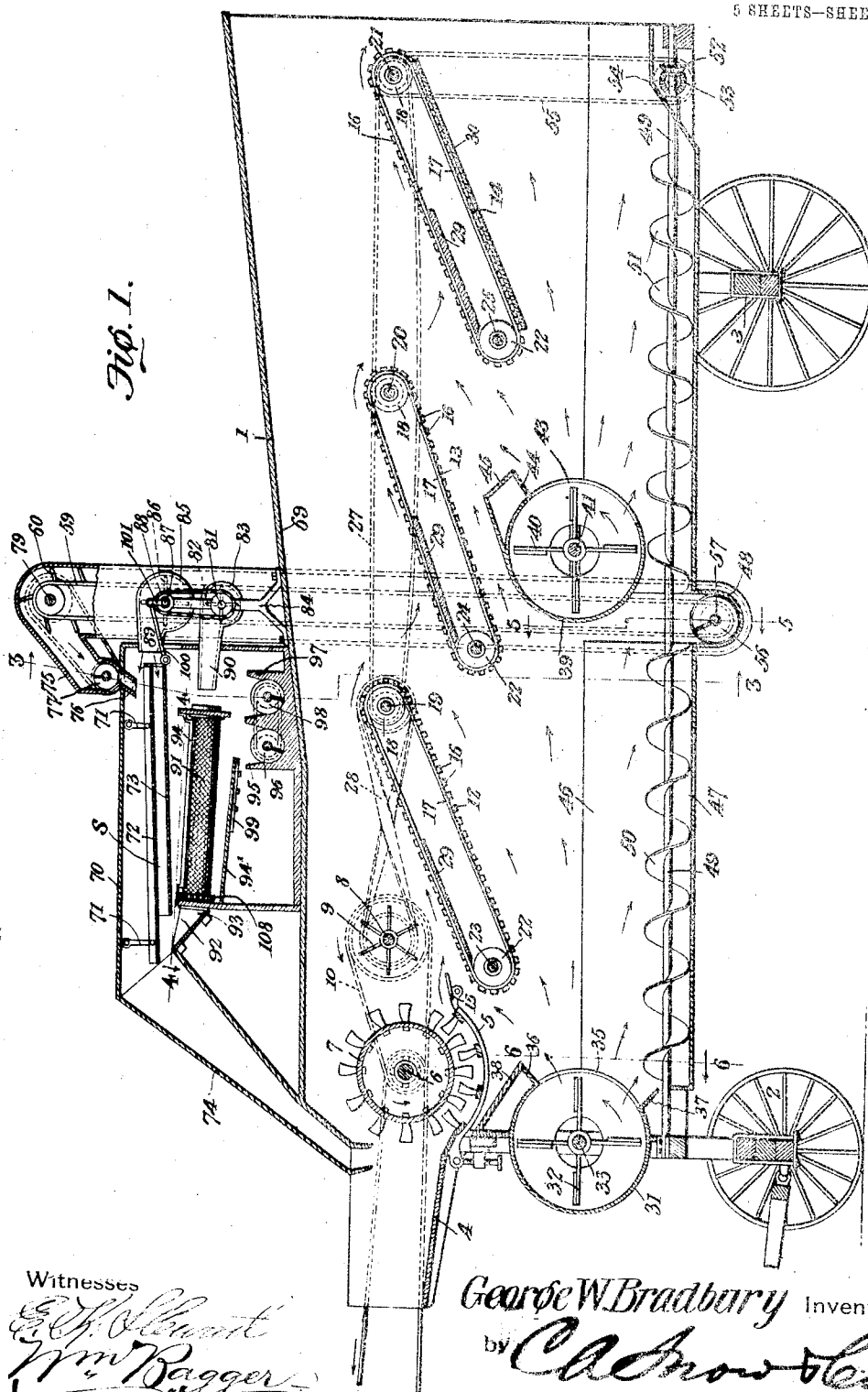
No. 826,988.

PATENTED JULY 24, 1906.

G. W. BRADBURY.
GRAIN SEPARATOR.

APPLICATION FILED JUNE 8, 1905.

5 SHEETS—SHEET 1.



Witnesses

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5 SHEETS—SHEET 2.

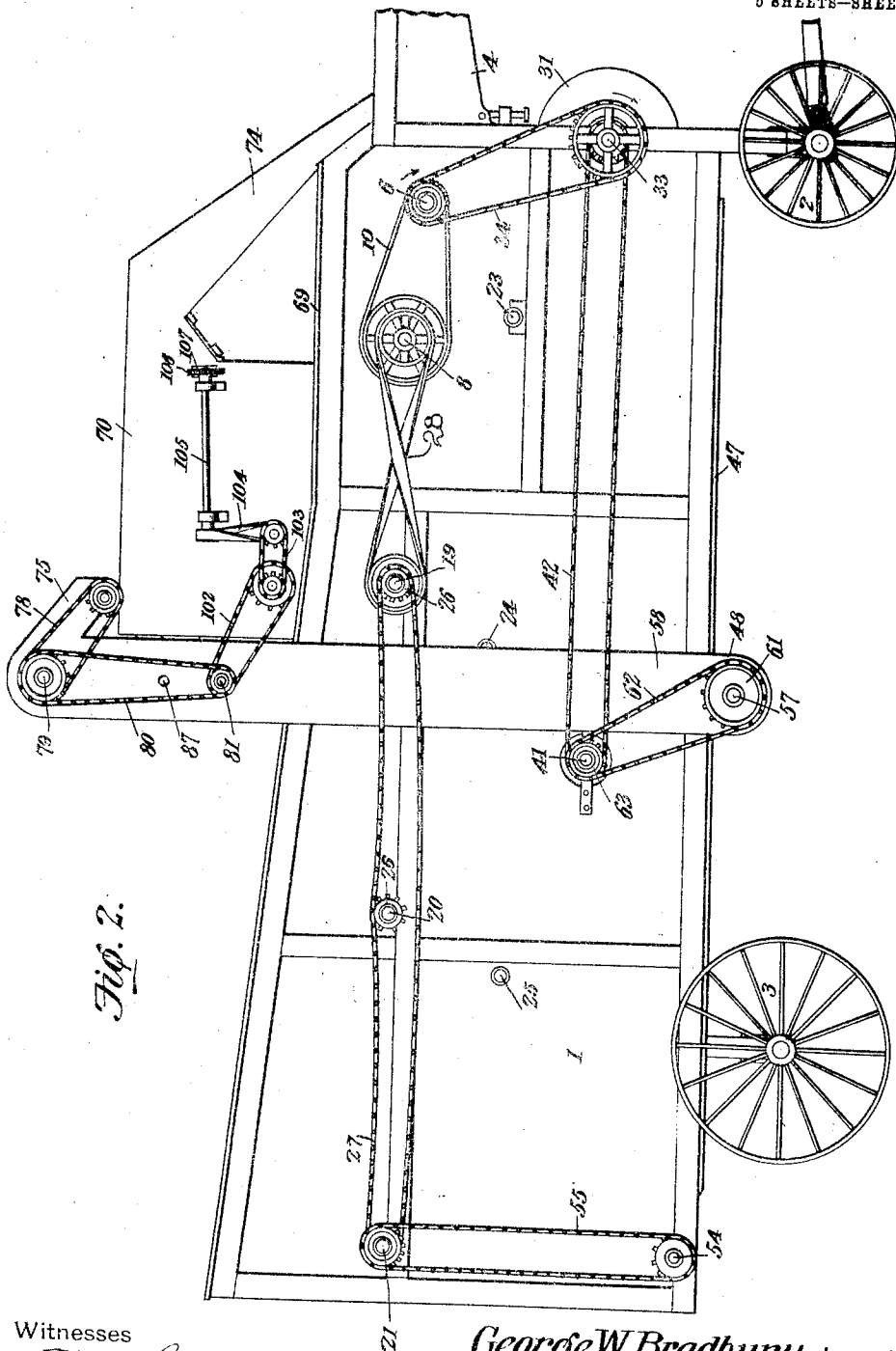


Fig. 2.

Witnesses

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5 SHEETS—SHEET 3

Fig. 3.

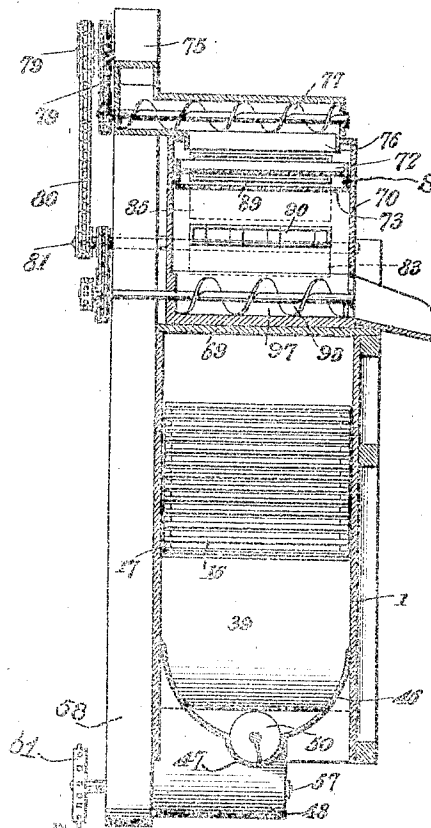
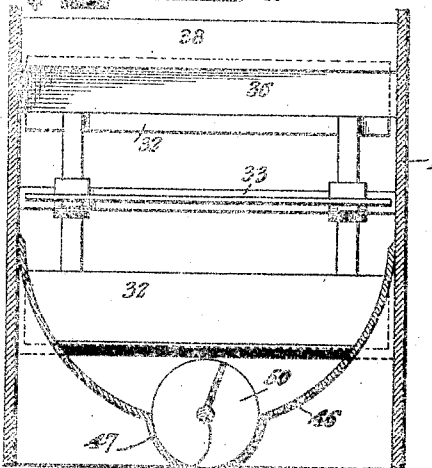


Fig. 6.



Witnesses

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5 SHEETS—SHEET 4.

Fig. 4.

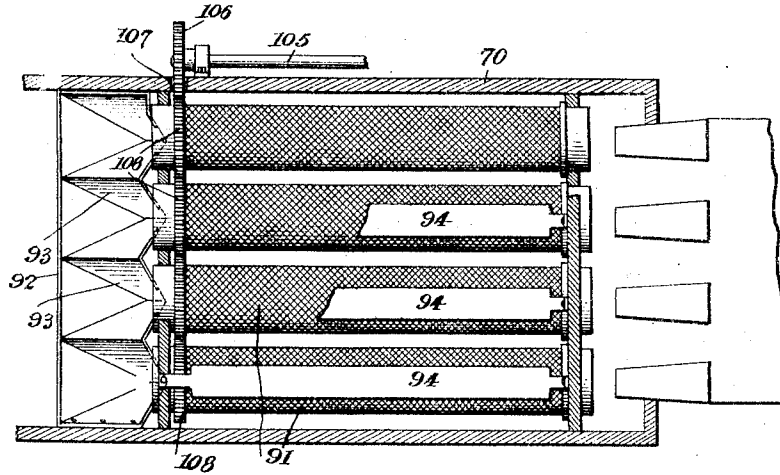
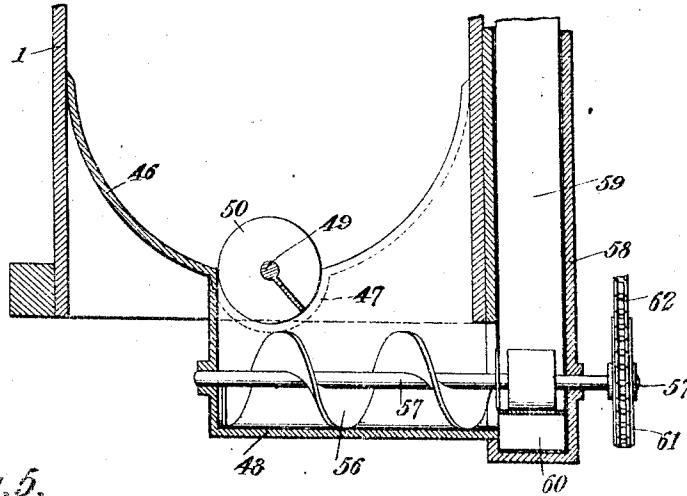


Fig. 5.



Witnesses

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5 SHEETS—SHEET 5.

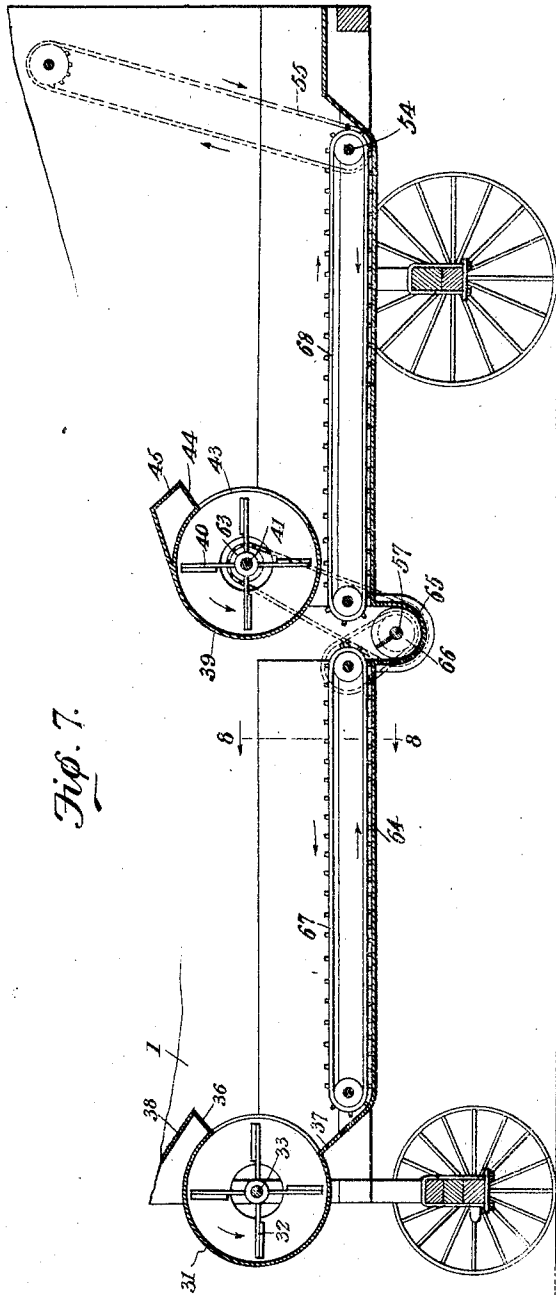


Fig. 7.

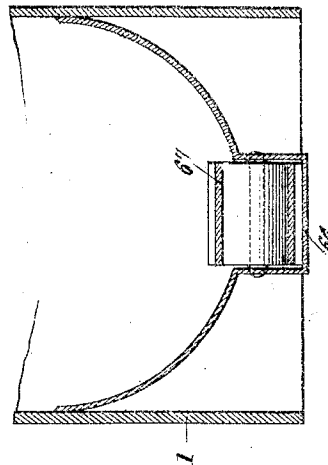


Fig. 8.

Witnesses

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UNITED STATES PATENT OFFICE.

GEORGE W. BRADBURY, OF WALLA WALLA, WASHINGTON.

GRAIN-SEPARATOR.

No. 826,988.

Specification of Letters Patent.

Patented July 24, 1906.

Application filed June 8, 1905. Serial No. 284,314.

To all whom it may concern:

Be it known that I, GEORGE W. BRADBURY, a citizen of the United States, residing at Walla Walla, in the county of Wallawalla and State of Washington, have invented a new and useful Grain-Separator, of which the following is a specification.

This invention relates to machines for threshing and separating grain; and it has for its object to simplify and improve the construction and operation of this class of machines.

Another and special object of the invention is to accomplish the separation of the grain and valuable matter from the straw, chaff, and lighter particles in a very thorough and efficient manner in the separating part of the machine—that is to say, before the grain is subjected to the action of the cleaning mechanism—the purpose being to produce a well-cleaned product by the separating mechanism alone, and thus to enable power to be saved in the operation of the cleaning mechanism.

Another object of the invention is to dispense with oscillatory, vibratory, and reciprocatory mechanisms, such as shaking-screens and the like, whereby a degree of vibration is set up which is injurious to the mechanism of machines of the ordinary types.

With these and other ends in view, which will readily appear as the nature of the invention is better understood, the present invention may be described as consisting in maintaining within a suitably-constructed casing an air-current discharging at the tail end of the casing and of sufficient velocity and volume to constitute a distinct layer or stratum of air in motion upon which the straw, chaff, and lighter particles will practically be floated through the length of the casing until discharged at the tail end of the casing.

The invention further consists in maintaining above said stratum or air-current a plurality of carriers, such as inclined raddles overlapping one another and adapted to support the straw and lighter particles, to agitate and tear the same asunder, to divide the upper from the lower part of the casing in which the air-current is maintained, and to permit the grain and heavy particles to be separated from the straw and light particles and to settle upon the bottom of the casing, where means are provided for disposing of the grain.

The invention further consists in the com-

bination, with the threshing and separating mechanisms, of an improved cleaning or fanning mechanism which is supported upon the forward part of the deck of the casing and to which the separated grain is conveyed by an elevating mechanism.

The invention further consists in the improved construction and novel arrangement and combination of parts, which will be hereinafter fully described, and particularly pointed out in the claims.

In the accompanying drawings has been illustrated a simple and preferred form of the invention, it being, however, understood that no limitation is necessarily made to the precise structural details therein exhibited, but that the right is reserved to any changes, alterations, and modifications to which recourse may be had within the scope of the invention and without departing from the spirit or sacrificing the efficiency of the same.

In said drawings, Figure 1 is a longitudinal sectional view of a grain-separator constructed and equipped in accordance with the principles of the invention. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical transverse sectional view taken on the plane indicated by the line 3 3 in Fig. 1. Fig. 4 is a horizontal sectional view taken on the plane indicated by the line 4 4 in Fig. 1. Fig. 5 is a detail sectional view taken on the line 5 5 in Fig. 1. Fig. 6 is a sectional detail view taken on the plane indicated by the line 6 6 in Fig. 1. Fig. 7 is a longitudinal sectional view of the lower part of a machine embodying a modified construction. Fig. 8 is a transverse sectional detail view taken on the plane indicated by the line 8 8 in Fig. 7.

Corresponding parts in the several figures are indicated throughout by similar characters of reference.

A casing 1 of appropriate form and construction is supported upon front and rear trucks 2 and 3, whereby it may be conveniently transported from place to place, and this casing constitutes the body of the machine. At the front end of the casing is the feed-table 4, the concave 5, and a shaft 6, carrying the cylinder 7, all of which are of ordinary construction. Slightly in rear of the cylinder-carrying shaft is a shaft 8, carrying a beater 9, which is driven by means of a belt 10 from the shaft carrying the cylinder, so as to rotate in the same direction as the latter.

In the upper part of the casing are disposed a plurality of inclined carriers or rad-

dles. In Fig. 1 of the drawings three such raddles have been shown, designated, respectively, 12, 13, and 14; but it is to be understood that any desired number of such raddles may be used, according to the size and proportions of the machine. The forward raddles 12 is disposed under the beater 9 and with its forward end extended beneath the delivery-board 15 of the concave, so that material delivered between the cylinder and the concave and subjected to the beating and loosening action of the beater 9 will be deposited upon the lower end of said raddles, which latter is of a width corresponding with the width of the casing. Each of the raddles is preferably composed of slats 16, mounted upon flexible members, such as belts 17, which latter are supported by pulleys 18 upon the upper shafts 19, 20, and 21 and pulleys 22 upon the lower shafts 23, 24, and 25. The several supporting-shafts of the raddles are journaled in the sides of the casing, and each shaft is provided at one end with a sprocket-wheel 26, the several sprocket-wheels being connected by a chain 27, whereby the several raddles are properly driven. The shaft 19 of the first raddles 12 is driven by means of a twisted belt 28 from the shaft 8 of the beater 9.

In the manufacture of the raddles I prefer to employ steel slats, although, of course, any material may be used, said slats being suitably spaced apart to permit grain and bits of ears having grain attached thereto to pass between the slats. The lower half (or thereabouts) of the upper lead of each raddles is supported upon an inclined slide or supporting member 29. The entire lower lead of the rearmost raddles (here designated 14) is likewise supported upon an inclined supporting member or slide 30.

It has been already stated that the several raddles are disposed in the upper part of the casing. It may, further, be stated that the receiving end of each raddles is overlapped by the delivery end of the preceding one, so that material passing over the raddles will be deposited upon the next one or will be intercepted by the latter without dropping into the lower part of the casing, in which an air-current is maintained, as will be presently described.

At the front end of the casing beneath the cylinder and the concave and well to the front of the latter is supported a fan-casing 31, containing a fan 32, which is supported upon a shaft 33, driven direct from the cylinder-shaft 6 by means of a belt or band 34. The rear part of the fan-casing has a mouth 35 of large area, said mouth being equal to one-fourth of the perimeter of the fan-casing, or even more, if desired, the upper and lower edges of said mouth being provided with flaring flanges 36 and 37, the former of which is connected by a deflector 38 with the front

part of the casing of the separator. The deflector 38 is needed for the purpose of conveying grain which passes between the bars of the concave in a rearward direction in the machine and out of the range of the blades of the fan 32, whereby such grain would be liable to be crushed or injured. The flanges 36 and 37 also permit the air, which is set in motion by the fan and which is discharged through the mouth 35, to be disseminated through the casing within limits which are circumscribed in the manner to be hereinafter set forth.

In some machines a single fan arranged as herein described may be sufficient for the purposes of the invention. At other times, and especially in large machines, it may be found desirable to provide additional or auxiliary means for forcing air through the casing of the machine, especially at the rear end of the latter, or for reinforcing the "blast," as it might be termed. This object may be accomplished in various ways. In the drawings has been illustrated an additional or auxiliary fan-casing 39, supported about midway in the machine and containing a fan 40, mounted upon a shaft 41, which has been shown as being driven by means of a link belt 42 from the shaft 33 of the fan 32. This auxiliary fan-casing has a rearwardly-opening mouth 43, which is also of large area, and it is provided at the upper edge of said mouth with an upwardly and rearwardly inclined flange 44. An inverted-V-shaped deflector 45 is also provided, one edge of said deflector being connected with the free edge of the flange 44 and the other edge with the upper portion of the fan-casing 39. The latter has been shown as arranged directly beneath the raddles 13, which occupies a position intermediate the ends of the casing and intermediate the raddles 12 and 14; but it is to be understood that not only may the location of the auxiliary fan-casing 39 and its related parts be changed within the scope of the invention, but any desired number of such auxiliary fan-casings may be employed.

The bottom 46 of the casing 1 has been shown as being approximately semicylindrical in shape and provided with a centrally-disposed longitudinal trough 47 of semicircular cross-section, which is intersected about centrally of the casing by a subjacent transversely-disposed trough 48, communicating therewith. The ends of the casing are provided with bearings for a shaft 49, carrying right and left hand spiral conveyers 50 and 51, which by the rotation of the shaft will carry material settling in the trough 47 from the front and rear ends of the main casing in the direction of the transverse intersecting trough 48, into which all such material is delivered. The shaft 49 has been shown as provided near its rear end with a bevel-gear 52, meshing with a bevel-gear 53 upon a

transversely-disposed shaft 54, which is driven by means of a link belt 55 from the shaft 21, which supports the upper end of the rear raddle 14. The transverse trough 48 contains a spiral conveyer 56, the shaft of which, 57, extends into the casing 58 of an elevator or conveyer, including an endless web or band 59, carrying a plurality of buckets or slats 60 of ordinary construction. The shaft 57 has been shown as carrying a sprocket-wheel 61, connected by a link belt 62 with a sprocket-wheel 63 upon the fan-carrying shaft 41; but it is obvious that it may be driven in any other convenient manner—for instance, direct from the shaft 33 of the front or main fan.

It will be seen that by the mechanism herein described the grain which is separated from the straw is carried to the central portion of the casing and delivered into a transversely-disposed conveyer-trough, from whence it passes to an elevator, whereby it is conveyed to cleaning mechanism to be hereinafter described. It is desired to be understood, however, that although the herein-described mechanism for conveying the grain will be preferred, owing to its simplicity of construction and ease of operation, other well-known and approved mechanism may be substituted—such as illustrated, for instance, in Figs. 7 and 8 of the drawings, where the casing has been shown as provided with a flat bottom 64, intersected by an approximately centrally disposed trough or depression 65, in which is supported a spiral conveyer, (here designated 66.) For the purpose of conveying the grain to the trough 65 a pair of drapers 67 and 68 have been shown, said drapers being operable in the direction of the middle of the casing, as will be readily seen and understood. These drapers may be operated in any suitable and convenient manner from the fan-shaft, from the raddles, or from any other movable parts of the machine.

Upon the forward part of the deck 69 of the machine-casing is supported the recleaning mechanism whereby the grain separated from the straw is separated from dust, chaff, and other worthless material, which, in spite of the effective work of the separating mechanism proper, may still be associated therewith.

The cleaning mechanism is arranged within the casing 70, which, as stated, is supported upon the front part of the deck 69, and it comprises, primarily, a shaking-shoe suspended by links 71 beneath the roof of the casing 70 and comprising a chaffing-screen 72 and an imperforate plate 73, supported beneath and spaced from said screen. The shoe S, comprising the screen 72 and plate 73, is slightly tilted or inclined in a forward direction, and the screen is of a mesh which will admit of the passage of grain, cockle, and the like, while chaff and unthreshed grain, including ears or portions of ears to which grain is still

adhering, will fall over the front edge of the screen and into a chute or spout 74, whereby it is conveyed to the feed-table in front of the cylinder to be rethreshed. The shoe S is fed from the spout 75 of the elevator-casing 58, said spout being extended obliquely to one side and provided with a discharge opening or mouth 76, which is of a width approximately equal to the width of the shoe and within which is disposed a screw conveyer 77, whereby the grain coming from the elevator will be spread transversely over the upper or receiving end of the shoe, so that it will be effectively operated upon. This spreading device is obviously important, inasmuch as without its presence or spreading or scattering means of some kind the grain would be delivered in bulk onto the cleaning-shoe and much of the effectiveness of the latter would be lost.

The shaft of the screw conveyer 77 has been shown as driven, by means of a link belt 78, from the shaft 79, which supports the upper end of the elevator-belt 59. Motion is also communicated from said shaft 79 by means of a belt 80 to the shaft 81 of a fan 82 in a casing or housing 83, which is supported adjacent to the elevator-casing 58 transversely upon the deck of the machine. The stand 84, which supports the fan-casing 83, also supports a fan-casing 85, containing a fan 86, the shaft of which, 87, is driven by a belt 88 from the fan-shaft 81. The fan casing or housing 85 has a spout or mouth 89, which extends through the rear part of the casing 70 in alinement with the rear end of the shaking-shoe S. The housing 83 of the fan 82 has a plurality of discharge spouts or funnels 90 extending through the rear wall of the casing 70 in alinement with a plurality of rotary screens 91, suitably supported for rotation beneath the shaking-shoe S, said cylinders being inclined in a downward and rearward direction. The mesh of these cylinders is such as to prevent the passage of staple grain, while small grains, cockle, and the like may pass therethrough. At the upper or front ends of the cylindrical screens 91 is disposed a transverse feed-trough 92, receiving the discharge from the imperforate plate 73 of the shoe and provided with a plurality of corrugations 93, constituting feed-spouts, which are extended into the upper ends of the rotary screens, which are thereby supplied. Adjacent to each screen is supported a scraper 94, the function of which is to push back by actual contact such grains as may protrude through the meshing of the screens and which exhibit a tendency to lodge therein and to interfere with their operation. The material discharged through the cylindrical screens drops upon a rearwardly-inclined chute 94', discharging into a trough 95, containing a spiral conveyer 96, whereby the material is discharged at one side of the cas-

ing into a suitable receptacle, such as a box or a suitably-supported bag. The material discharged over the rear ends of the inclined cylindrical screens 91 passes into a trough 97, adjacent to and parallel with the trough 95 and containing a spiral conveyer 98, whereby it is eventually discharged at one side of the casing, where it is taken care of, as usual, the material discharged through the conveyer-trough 97 being the cleaned grain.

Supported beneath the inclined chute or board 94' is a slide 99, which may be moved over the trough 95, so that the material passing through the cylindrical screens will be discharged into the conveyer-trough 97, as will be readily understood.

The shaking-shoe is driven by a pitman 100, connected with a crank 101 upon the fan-shaft 87. The shaft of one of the conveyers 98 is driven by a belt 102 from the fan-shaft 81, and the shaft of the conveyer 96 is driven by a belt 103 from the shaft of the conveyer 98. A twisted belt 104 transmits motion from the shaft of the conveyer 96 to a shaft 105, supported longitudinally in suitable bearings upon the outside of the casing 70, and the shaft 105 has a spur-wheel 106 operating through a slot 107 in said casing and engaging one of a series of intermeshing spur-gears 108, mounted exteriorly upon the cylindrical screens 91, which are thereby rotated.

In nearly all threshing-machines and grain-separators there is provision for conveying the threshed material rearwardly through the casing and for meanwhile keeping said material in a state of agitation or commotion, which is designed to facilitate the separation of the grain and heavy particles from the straw and light and comparatively worthless particles, the latter being conveyed to the straw-pile at the tail end of the machine, while the grain and heavy materials which have been separated during the passage through the machine are delivered apart from the straw. The material discharged by the threshing mechanism is usually carried through the machine-casing by mechanical means, which are objectionable, owing to the power required to drive them and to the obstructions which they present to the proper separation of the grain. In other machines air currents or blasts are employed to operate upon the material while passing rearwardly through the casing for the purpose of agitating and partly supporting or floating the same, so that the mechanical devices may be considered in the light of auxiliary means to prevent the straw from settling and to serve as screens for the separation of the grain. Under the present invention the raddles disposed throughout the length of the machine may be considered in the light of screens and supporting members; but it is desired to be especially observed that said

raddles are disposed altogether in the upper part of the casing of the machine, while the means for setting the air in motion are disposed altogether beneath the raddles. It will thus be seen that when the machine is in operation the entire lower part of the casing is occupied by or filled with a stratum of air moving with great velocity in a rearward direction toward the discharge end of the machine. This moving stratum of air is of considerable volume, and being prevented from expanding downwardly and laterally by the bottom and the sides of the casing it is free to expand only in an upward direction—that is to say, through, between, and over the raddles. The latter therefore may not be properly described as "straw-carriers," but more properly as "screen-partitions," through and between which grain may gravitate, while the straw is practically floated through the machine-casing upon the air-current and is discharged at the tail end of the machine, preferably upon a stacker of ordinary construction, which, however, is not shown.

The material delivered from the cylinder and concave under the influence of the beater 9 upon the first raddle will strike the board or slide 29 with some degree of force, which is effective in dislodging grain from ears or parts of ears to which they still adhere. The slides 29 of the several raddles are effective for the same purpose, while the slide 30 under the rearmost raddle is extremely important and effective in intercepting grain which might otherwise be blown out at the tail end of the machine, such grain being conveyed by the raddle 14 in a forward direction and delivered into the lower part of the casing.

An extremely-important feature of the present invention is that under the construction and arrangement of parts herein described only the grain and heavy particles will be capable of settling in the lower part of the casing, all straw, chaff, and light particles being carried upon the upwardly-expanding and rearwardly-directed air-current to a point of final discharge at the rear end of the casing, which is unobstructed and of larger cross-sectional area than any intermediate part of the casing, owing to the rear part of the deck being inclined upwardly, as shown. This is important in order to permit the rearwardly-moving air-current to expand upwardly, thus blowing the light stuff out of the machine, while not interfering with the settling of the grain by gravity. This may be said to constitute the leading feature of the present invention, inasmuch as the separation is thereby rendered so thorough and effective as to be practically complete, the subsequent cleaning operation being necessary mainly for the purpose of eliminating dust and small seeds, such as cockle, millet, and the like, together with

such broken heads as still have grain adhering thereto and which require to be returned in front of the cylinder for rethreshing. The grain separated from the straw by this simple mechanism will be found to be practically free from straw and chaff.

The cleaning mechanism has been located upon the deck of the machine rather than at the tail end for the purpose of placing no obstruction whatever in the way of the discharge of straw, chaff, and the like. The grain is distributed in the manner described upon the shaking-shoe containing the chaffing-screen, the grain passing through the latter and ears weighted with grain passing over the screen and through the chute 74 to the threshing mechanism. The grain passes over the bottom plate 73 of the shoe to the trough 92 and is delivered by the feeders formed in the latter into the upper end of the cylindrical screens, through which an air-current is set up by the fan 82 through the funnels or spouts 90 of the fan-casing 83. Dust and impurities will be effectively removed or separated from the grain by the air-currents set up by the fans 82 and 86, while the grades of grain or seed may be separated by the cylindrical screens 91. When this latter separation is not desired, the material passing through the cylindrical screens, as well as the overtail from the latter, may be directed into the trough 97 by adjusting the slide 99 astride the trough 95.

From the foregoing description, taken in connection with the drawings hereto annexed, the operation and advantages of this invention will be readily understood by those skilled in the art to which it appertains. The construction is simple, and the machine has been found to be thoroughly effective in practical operation for the purpose for which it is intended.

Having thus described the invention, what is claimed is—

1. A grain-separator comprising rearwardly-expanded body-casing having at its rear an opening of greater cross-sectional area than any intermediate portion of the

casing, a trough-shaped floor located in said casing and extending longitudinally thereof, said floor having along its central longitudinal axis a depression, conveyers operating in said depression and adapted to move the grain from the ends of the separator to the middle thereof, a transversely-extending conveyer adapted to convey the grain from the middle of the floor in a lateral direction and outside of said casing, a vertically-arranged conveyer adapted to elevate the grain on top of said casing, a superimposed casing located upon the said body-casing, a grain-screening apparatus located within the last said casing and upon which the said grain is deposited, a fan operating in conjunction with said grain-screening mechanism, a series of rotating screens located below the said grain-screening mechanism, the grain passing from the said grain-screening mechanism entering the said rotating screens, and a means for forcing a blast of air up the rotating screens in the opposite direction from that taken by the grain.

2. In a separator the combination with a rearwardly-expanded body-casing having an opening in its rear end of greater cross-sectional area than of any intermediate portion of the casing; of a plurality of raddles disposed within the casing and above the bottom thereof, a trough disposed longitudinally within the bottom of the casing, there being an uninterrupted air-space between said trough and the raddles and extending to the rear opening of the body-casing, and means within said air-space for setting in motion the air contained therein and directing it upward between the raddles, downward upon the conveyer, and rearwardly through the opening.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

GEORGE W. BRADBURY.

Witnesses:

J. H. JOCHUM, Jr.,
L. L. MORRILL.