

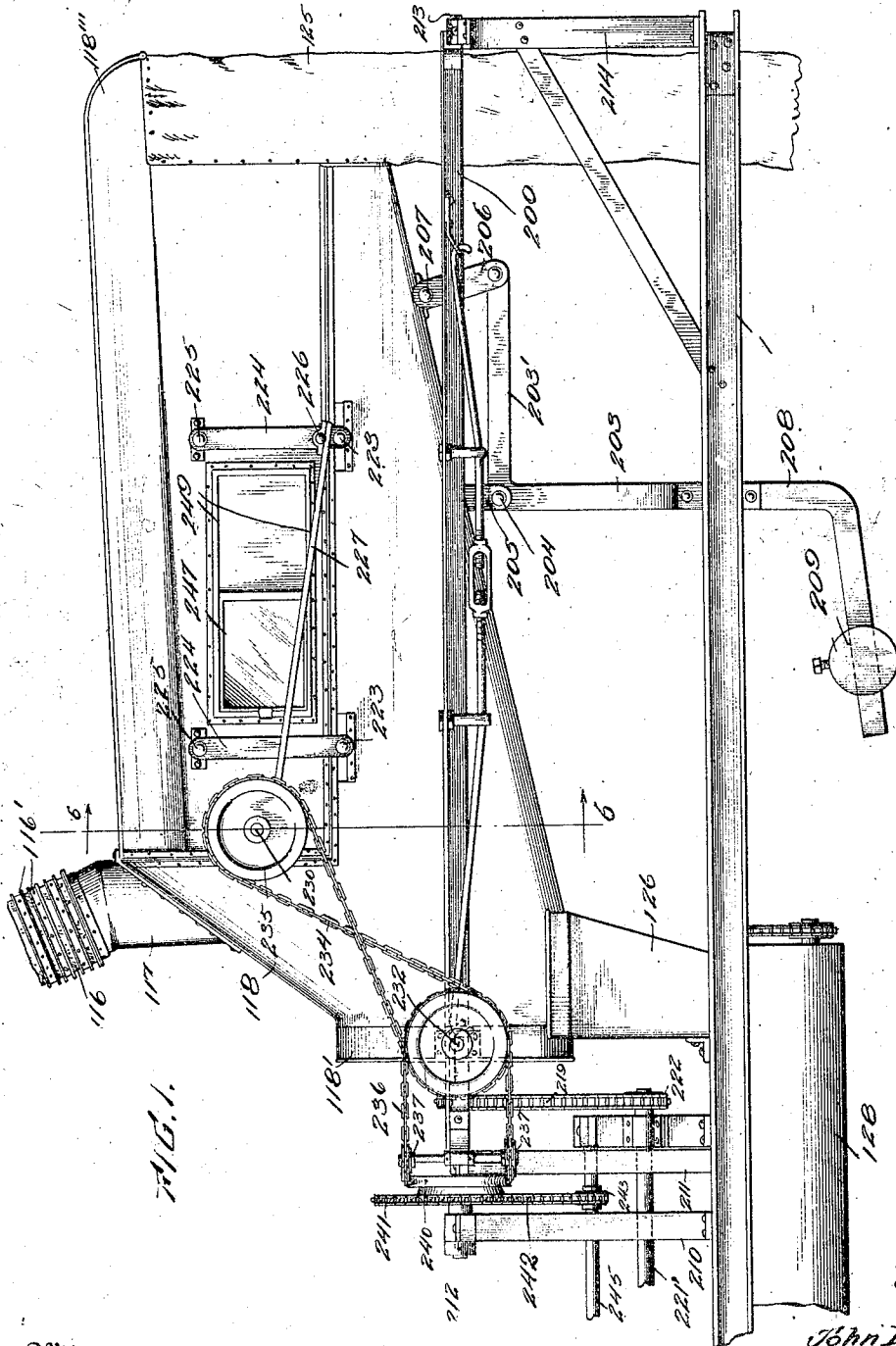
J. D. JONES.
GRAIN SEPARATOR.

APPLICATION FILED JAN. 25, 1915. RENEWED MAR. 8, 1917.

1,249,966.

Patented Dec. 11, 1917.

4 SHEETS—SHEET 1.



Inventor

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Witnesses

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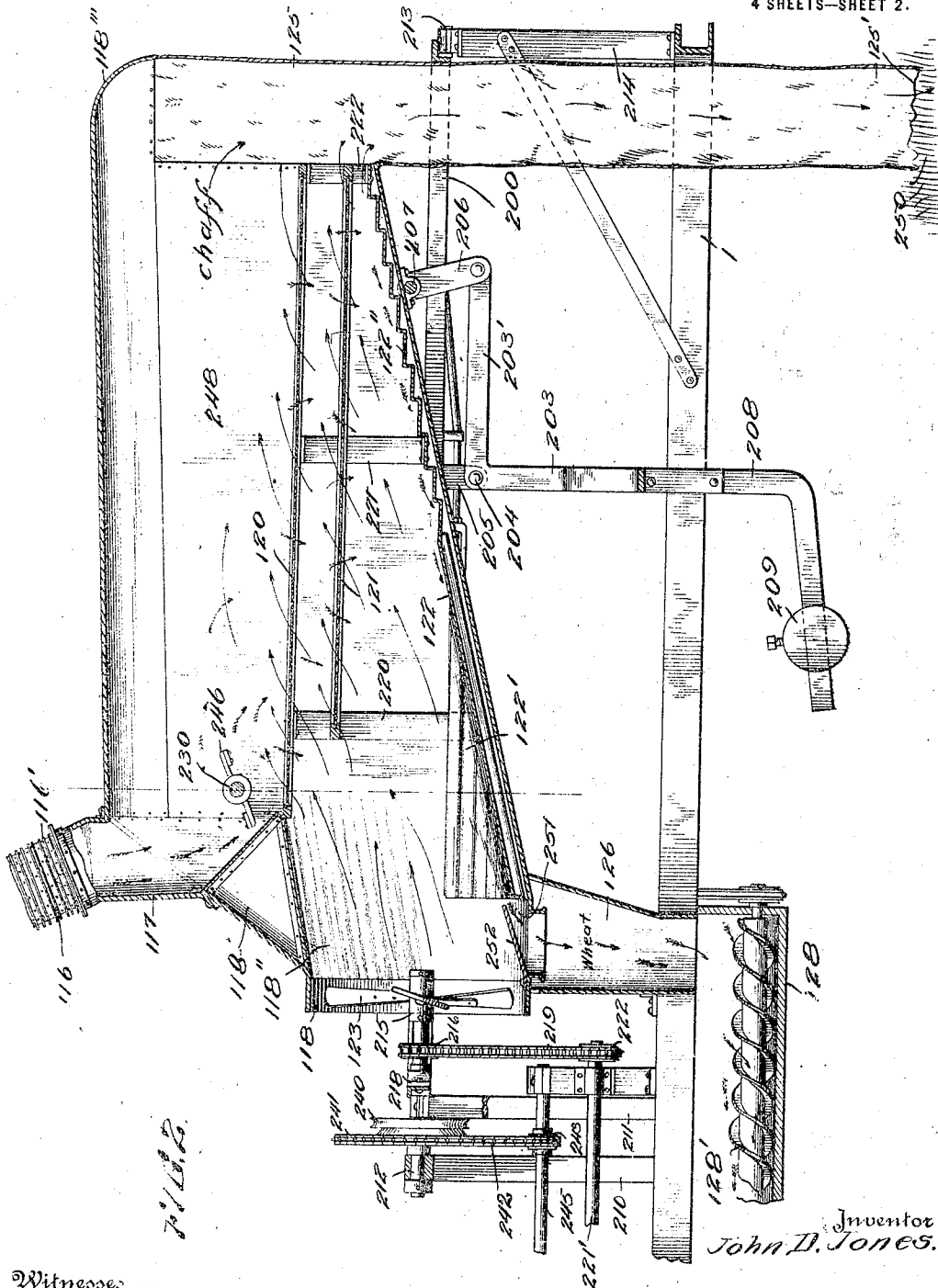
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Witnesses
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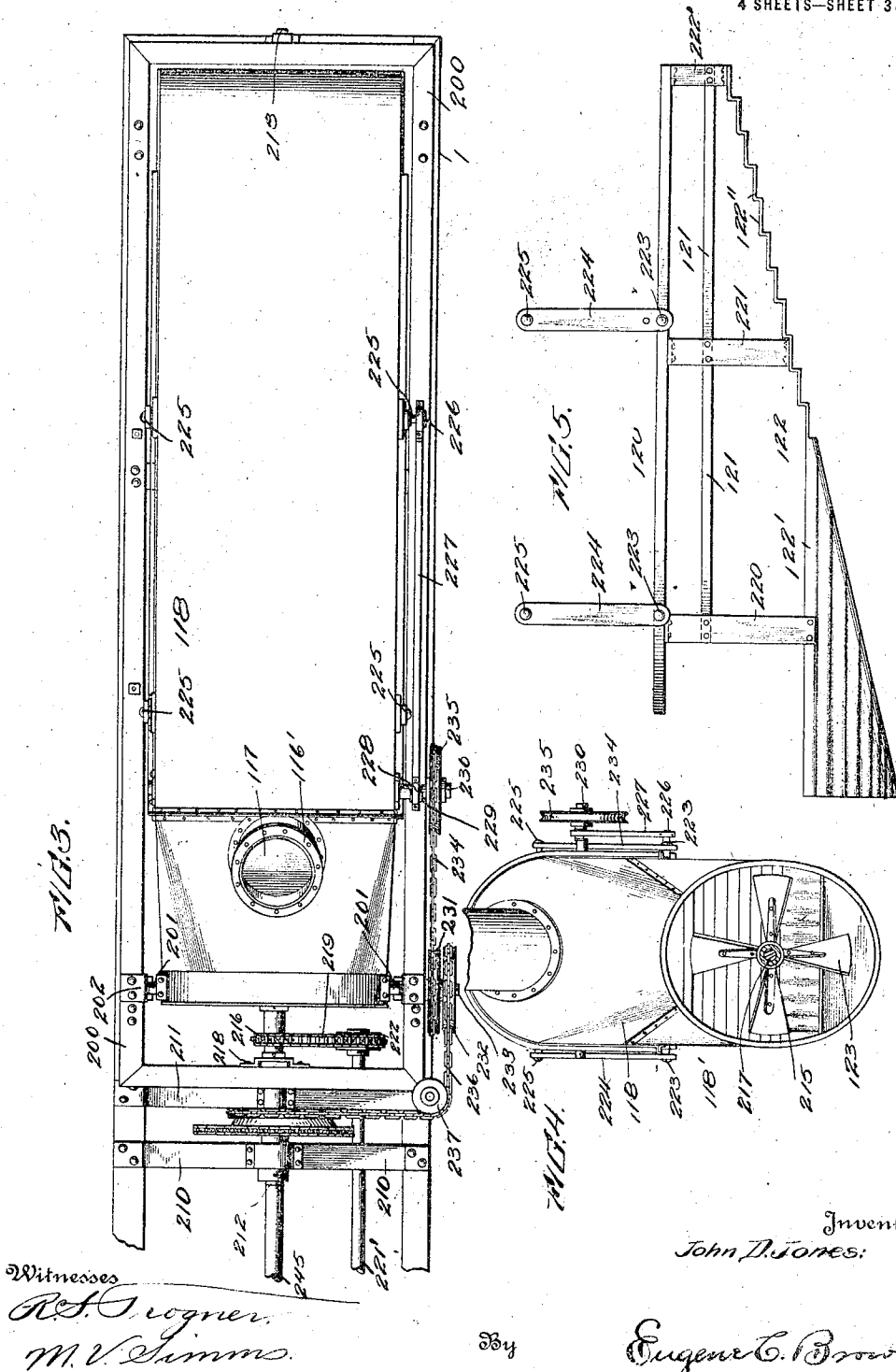
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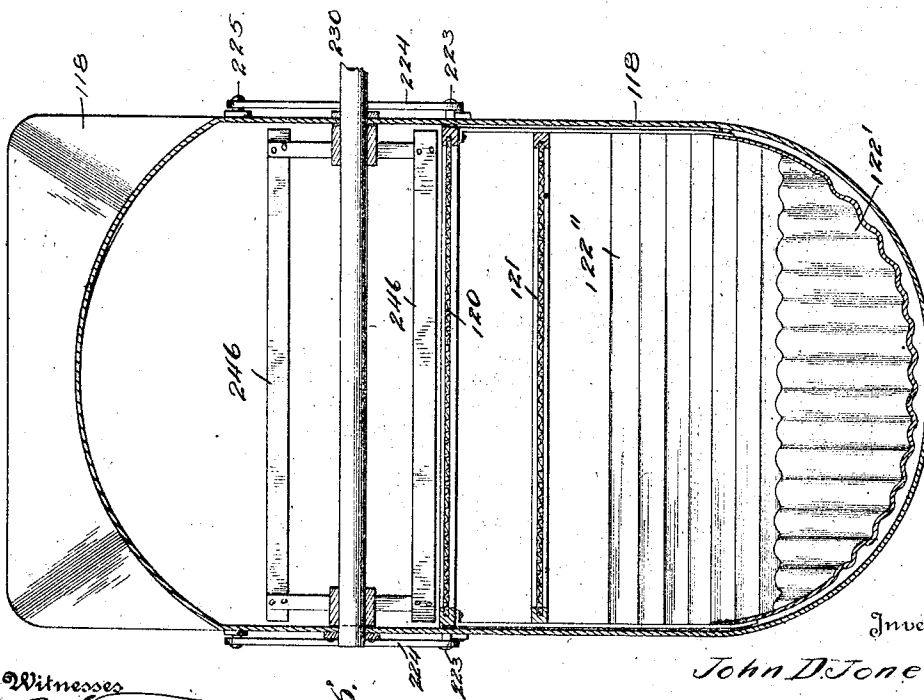
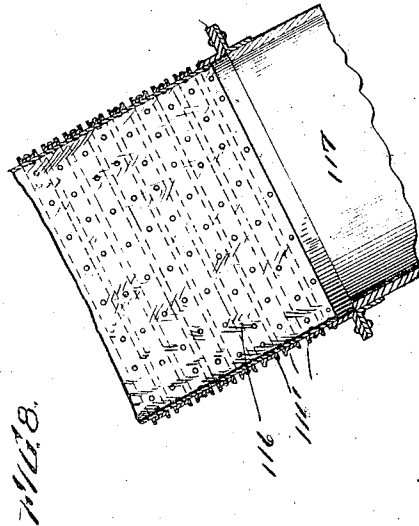
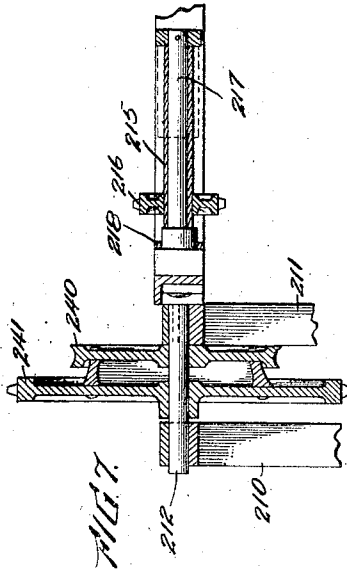
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Witnesses
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Fig. 6.

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UNITED STATES PATENT OFFICE.

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GRAIN-SEPARATOR.

1,249,966.

Specification of Letters Patent.

Patented Dec. 11, 1917.

Application filed January 25, 1915, Serial No. 4,321. Renewed March 2, 1917. Serial No. 153,400.

To all whom it may concern:

Be it known that I, JOHN D. JONES, a citizen of the United States, residing at Walla Walla, in the county of Walla Walla and State of Washington, have invented certain new and useful Improvements in Grain-Separators, of which the following is a specification.

This invention relates to grain separators for threshing machines and especially to mechanism for agitating or shaking the separators and for maintaining the same in a horizontal position irrespective of the changes in position of the supporting carrier or platform.

The grain winnowers or separators forming a part of threshing machines are usually provided with shaking screens which are required to be maintained in a substantially horizontal position in order to operate efficiently. The platform or body of the threshing machine tilts first in one direction and then in the other direction in passing over uneven or hilly ground and one of the purposes of my present invention is to provide a leveling mechanism which will automatically respond instantly to any changes in the position of the supports and without interfering with the operation of the shaking screens. One of the objects of my invention is to provide a leveling mechanism which will maintain the casing of the grain operator horizontal both longitudinally and transversely and be under the control of a single pendulum or governor. Another purpose of my invention is to provide an agitator or shaking device which is entirely independent of the leveling mechanism. The cooperation of these two devices maintain the grain separator in constant agitation and always in a horizontal position so that the separator constantly operates at its highest efficiency.

The grain is ordinarily separated from the chaff by means of sieves or screens which are reciprocated or shaken to cause the grain to fall through the meshes of the sieves and these are usually associated with a blower which forces a current of air through or along the sieves to carry off the chaff. The difficulties which have heretofore been encountered in apparatus of this kind have been due mainly to a failure to properly apply the air currents to the screens or sieves both as to direction and as to distribution. These air currents have

usually been applied by means of a rotary fan which set up circulatory currents in the cleaner casing which were not only inefficient because of their tendency to form eddies and counter-currents, but also because of the very uneven distribution of the air passing through the sieves. Moreover a certain proportion of the air was actually detrimental because it passed over through the sieves in a downward direction.

In order to properly act upon the combined grain and chaff resting upon the sieves, the air currents should be applied invariably in an upward direction so that it will constantly tend to lift the mixture, permitting the grain to drop back through the sieve and causing the chaff to move outwardly toward the discharge end. Again I have discovered that the separating action takes place more efficiently if the air passing through the cleaner is under a certain amount of back pressure and to this end I change the course of the air passing from the discharge end and cause it to traverse a downward channel having an exit which is slightly choked or restricted.

One of the purposes of this invention is to so control the air currents generated by the blower fan, that the spiral or rotary tendency is broken up or nullified and the resulting blast of air moves uniformly through the cleaner and is distributed over the entire surfaces of the sieves or screens in an upward direction and consequently acts upon the layer of mixed grain and chaff in an efficient manner, exerting a constant lifting force. Another object of my invention is to obviate any eddy currents or deleterious counter-currents. I have also provided means for causing the air passing through the outlet end of the cleaner to traverse a confined channel in a reverse direction so that the blower creates a pressure in the cleaner casing which assists in causing a uniform blow of the air blast.

In the accompanying drawings, Figure 1 is a side elevation of an apparatus embodying my invention; Figs. 2 and 3 are vertical longitudinal section and top plan views respectively; Fig. 4 is a front end elevation; Fig. 5 is a detail view of the screening mechanism; Fig. 6 is a vertical section on the line 6-6 of Fig. 1; Fig. 7 is an enlarged detail view, partly in section of the front pivot and support for the separator frame and the stub shaft for the fan blower; and Fig. 8, is

an enlarged fragmentary sectional view of the flexible spout connected to the hopper.

The tubular casing 118 of the grain separator and cleaner is substantially oval in section throughout the larger end, the bottom sloping upwardly from the fan end to the discharge end and being flattened in the upper portion. The casing is provided with a grain inlet hopper 117 and contains the separating screens, and is pivotally secured at one end to the frame 200, by means of bearing pins or trunnions 201, which rest in the socket plates 202, on the frame. The opposite end of the casing is carried by the yoke 203, the arms of which are pivoted at 204, in lugs 205 secured to the sides of the frame, the yoke arms having extensions bent to form a bell crank lever and carrying at their ends, links 206 pivotally connected at 207 to the casing. The yoke is provided with a depending pendulum arm 208 which may be angular in shape as shown, and carries an adjustable weight 209, which counterbalances the casing.

The frame 200 is preferably composed of angle bars and is carried at its forward end by a stub-shaft 212, mounted in bearings in the yoke standards 210 and 211, and at its rear end by a pivot stud 213, carried in a bearing on the standard 214, the standards being secured to the platform 1 of the thrasher. Said stub-shaft 212 and stud 213 form end trunnions for the frame.

The fan-blower 123, is carried by a sleeve 215, which also carries the sprocket wheel 216, and is revoluble on the stub shaft 217, held by a strap 218, which is bolted to the end frame bar. This arrangement permits the sleeve 215, carrying the fan and pulley to be slipped off of the shaft without unbolting the stub shaft from the frame. The driving chain 219, may be separately connected by the gear 222 and shaft 221' to the engine drive so that the fan may be operated independently of the shaking device.

The end pivotal connections permit the frame 200 to oscillate laterally in the standards 210, 211 and 214, and thereby enables the weighted pendulum 208, to maintain the frame in a horizontal position irrespective of the main platform 1, in either direction transversely of the frame 200. Again, the trunnions 201, upon which the casing 118 is pivotally mounted in the frame 200, at its forward end, permit the rear end of the casing to be raised and lowered by the movements of the bell crank arms 203, 203', under the action of the pendulum 209, swinging upon the pivot 204.

The operation of the leveling mechanism in maintaining the casing horizontal at all times will be understood from the foregoing description of the parts. If the platform 1 of the threshing machine tilts in a manner to throw the right-hand end of the cleaner

casing downwardly, the pendulum arm 208, will also swing toward the right, thereby rotating the bell crank arms 203, 203' on the pivots 204, raising the links 206, and lifting the rear end of the casing sufficiently to maintain it in a horizontal position. If the machine tilts in the opposite direction, thus lowering the front end of the casing, the pendulum will instantly swing toward the left, and lower the outer end of the arm 203', thereby carrying the link 206, downwardly, and with it the rear end of the casing, which will maintain the casing in a horizontal position.

If the machine tilts laterally of the casing, the pendulum swings in the same direction and acting through the connecting studs 204 and brackets 205, turns the entire frame 200 laterally on the end pivots 212 and 213, and as the casing is carried in the frame by the trunnions 201, the casing is also maintained horizontal. It will thus be seen that the single pendulum 209, acting through the arms 203, 203' and links 206, raises or lowers the rear end of the casing with respect to the frame when the machine tilts longitudinally of the casing and also by the reason of its connection with the frame at the side brackets 205, it oscillates the frame and casing together on the pivots or trunnions 212 and 213, in the end bearings to compensate for any lateral tilting of the thrasher. I am thus enabled to control the tilting movements in all directions by means of a single pendulum lever, which not only greatly simplifies the leveling mechanism but also renders it exceedingly sensitive and causes it to respond to a tilting movement of the machine in any direction and to instantly transmit a compensating movement to the casing, thereby maintaining it in the normal horizontal position so that the screens will operate at their greatest efficiency.

Inasmuch as the shaft 217, upon which the sleeve 215, carrying the blower fan 123, is journaled, is secured to the frame 1, in alignment with the pivot shaft 212, the fan is fixed in position relative to the frame 200, while the casing 118, is free to swing vertically in the frame upon the trunnions 201. The efficiency of the blower is enhanced by making the casing fit about the fan as closely as possible. If the opening were circular, it is evident that the casing would engage and bind the fan blades at the top and bottom whenever the casing was raised or lowered on the trunnions 201, under the action of the pendulum. I therefore make the flange 118', surrounding the fan opening, elliptical with the longer axis vertical, as shown in Fig. 4, so that while the fan fits comparatively closely at the sides, there is a slight space at the top and bottom to permit the vertical oscillation of the casing.

The threshed grain, mixed with the chaff, 130

is conveyed from the threshing cylinder through suitable channels and passes from the spout 116, into the hopper 117 as indicated by the short arrows in Fig. 2. The spout is flexible to accommodate itself to the movements of the casing and is usually made of canvas. To keep it distended so that it will offer a free unobstructed channel for the material passing therethrough, I may surround the spout with a series of spaced rings or hoops 116', riveted or otherwise fastened to the canvas.

For the purpose of separating the grain from the chaff, it is necessary to provide screens that are constantly agitated. I provide an upper screen 120, a lower screen 121 and an agitating receiving pan 122, which are connected by supports 220, 221, 222', bolted to the marginal frame of the upper screen, the entire agitating mechanism being suspended by means of studs 223 passing through slots in the sides of the casing to links or hangers 224, pivoted at 225 to the opposite sides of the casing.

For the purpose of reciprocating the screens I connect one of the links at 226 to a connecting rod 227, having a strap 228, surrounding a cam 229, on the shaft 230. The latter may be driven in any suitable manner, which will permit the casing 119, to oscillate vertically under the leveling action of the pendulum. With this in view, I mount gears 231 and 232, upon the same sleeve carried by a stub-shaft 233, fixed to the frame 200, in alinement with the trunnions 201, and connect the gear 231 by a chain 234, with a gear 235 on the shaft 230. The gear 232 is driven by sprocket chain 236, passing over idlers 237, carried by the frame, to the sheave 240, which is secured to the gear 241, carried by the stub shaft 212. The gear 241 is connected by sprocket chain 242, to the gear 243 on the shaft 245, which transmits power from the engine through the series of gears and sprockets, interconnected as above described, to the reciprocatory screen mechanism.

It will be observed that the reciprocation of the frame and casing may continue during any of the movements of the leveling mechanism so that the operation of the grain separator is uninterrupted and inasmuch as the pendulum governor counteracts any tendency of the casing to follow the tilting movements of the threshing machine and keeps it horizontal at all times, the cleaner is constantly maintained at its greatest efficiency regardless of the unevenness of the ground which is being traversed.

The reciprocatory screening mechanism is shown in Figs. 2, 5 and 6. In order that the masses of mixed grain and chaff which are received in rapid succession in the hopper 117, may be separated and scattered over the top screen 120, and not clog the front

end of the screen, I mount a rotary beater 246 on the shaft 230, which is rotated as previously described, and the arms, of which constantly stir the incoming masses and toss or scatter the contents over the screen and also loosen the mixture so that the blast of air currents from the fan 123, indicated by the long tailless arrows, may easily separate the grain and blow the chaff toward the discharge end of the casing. The screening operation may be observed through the glass window 247, and access to the screening and separating channel 248 may be had at any time by sliding the window in its guides 249.

Each of the screens or sieves extends across the casing from one wall to the other and terminates at the outlet end. The top screen 120, begins at the juncture of the lower sides of the hopper 117, with the casing, and it preferably slopes slightly toward the outlet. The space between the screen 120 and the upper wall of the casing forms the main chaff channel 248. Below the screen 120 is located an intermediate screen 121, which is preferably horizontal and has its forward end terminate several inches back of the front end of the top screen. The bottom pan 122, is preferably dish or channel-shaped at the forward end to facilitate the discharge of the grain by concentrating it in the center. The pan, which forms a grain chute below the screens, becomes gradually of less curvature and is flat at the rear upper end. The forward end of the pan preferably extends in front of the screens and slants upwardly, so that the space between the pan and the lower screen tapers or wedges toward the chaff outlet end of the cleaner.

The upper or rear portion of the pan is stepped to form ledges 122'', separated by vertical risers which prevent the grain from being blown out with the chaff as it is shaken down from one ledge to the next; and the lower or forward portion 122' is provided with longitudinal corrugations, which not only form grain channels but assist in breaking up any rotary action of the air currents. To further destroy any rotary tendency of the air currents and cause the air to form a substantially uniform blast into the casing, I may corrugate the upper wall of the fan chamber as indicated at 118''. It will be observed that the pan 122 is suspended slightly above the bottom of the casing so that it may be reciprocated thereover, the shaking of the screens and pan being independent of the casing.

The rear end of the casing is turned downward at 118''' and to this chaff discharge end I secure a chute 125, which is preferably made of canvas or other flexible material. This flexible chaff discharge chute receives the chaff and straw discharged by

the air currents from the screens and pan and is preferably of such a length that its lower end 125' is closely adjacent to or contacts with the stubble, indicated at 250, as it passes over the fields so that the discharge is somewhat retarded or choked, thereby preventing a sudden discharge of the air pressure in the cleaner.

The discharge will be somewhat choked or retarded even if the downwardly turned discharge chute terminates considerably above the grain. The cleaned grain passes from the lower front end of the pan 122, through the opening 251, under the plate 252, and through the grain-outlet 126, into the conveyor 128, having a worm or screw 128' which carries the grain to the elevator.

The operation of my cleaner will be understood from the foregoing description of the separate parts. The threshed grain is carried up by an elevator and deposited in successive bucket loads into the spout 117 of the cleaner, each bucket load coming into the path of the beater arms 246, which loosen and scatter it over the top sieve 120. The air currents from the fan move inwardly in a substantially uniform blast, any tendency to rotate being destroyed by the longitudinal ribs of the corrugations. As the air strikes the inclined bottom of the agitator pan 122, it is deflected upwardly through the sieves, the wedge shape of the space between the pan and the sieves, assisting in causing the air currents to pass upwardly through the sieves even to their outer ends. For the purpose of creating a stronger draft or blast at the forward end of the top screen where the bucket loads are first deposited to thereby concentrate a greater lifting power at this point, I leave the forward end of the top screen unobstructed by making the forward end of the lower screen terminate several inches back of the top screen. The air blast lifts the mixed grain and chaff, assisted by the beater, permitting the grain to fall back upon the screen and the shaking of the latter by the reciprocating mechanism, causes the grain to pass through the sieves successively, being received by the agitator pan 122 and finally passing out through the opening 251. In order to guard against the possibility of any of the grain being blown out of the smooth surface of the pan, I provide the upper end thereof with steps 122'' separated by risers against which such grain is arrested and by the reciprocation of the pan, is caused to move downward to the grain discharge 251.

The manner in which the several parts of my invention cooperate to more effectively separate and clean the grain will be appreciated by those familiar with harvesting and threshing machinery. The arrangement of sieves and the corrugated walls

cause the air-blast to move upwardly with uniformity and exert a maximum lifting force which is effectively distributed and properly directed. The casing is shaped to avoid any obstructions, which would cause counter-currents, and, as above stated, the rotary movement of the air issuing from the fan is broken up or nullified. I have also greatly enhanced the efficiency and uniformity of action of the air-blast by causing the outgoing currents to traverse a return channel which results in checking a sudden discharge and creating a pressure within the cleaner casing, this action being further enhanced by extending the discharge chute down to the tops of the stubble.

In order that the screening operation shall be efficient, it is absolutely necessary that the sieves remain level or horizontal and not partake of the tilting movements of the platform of the machine caused by the unevenness of the ground over which it moves. It follows, therefore, that the screening mechanism should be independently movable relatively to the machine platform. My invention above described, provides such an independent screening apparatus together with means which respond instantly to any tilting movement and effects the proper compensating movement to the screen supports which insures a horizontal position at all times. Moreover such leveling action does not interfere with the constant action of the agitating mechanism and of the blower. The interaction and cooperation of these several features result in producing a uniformly efficient action of the apparatus.

I have described in detail the construction shown in the accompanying drawings for the purpose of clearly disclosing an embodiment of my invention, but I am aware the various changes and modifications may be made within the scope of my claims and without departing from the spirit of my invention.

I claim:—

1. A grain separator, comprising a supporting frame, a casing laterally pivoted in said frame adjacent one end, a reciprocatory screen mounted in said casing, and means for actuating said screen connected to said frame concentric with the casing pivots, whereby the screen may be reciprocated independently of the pivotal movement of the casing.

2. A grain separator, comprising a supporting frame, a casing laterally pivoted in said frame adjacent one end, a reciprocatory screen mounted in said casing, a stirring device rotatably mounted above the screen, and means for actuating said screen and said stirring device, connected to said frame concentric with the casing pivots, whereby the screen may be reciprocated and said

stirring device rotated independently of the pivotal movement of the casing.

3. A grain separator, comprising fixed supports, a horizontally disposed frame pivoted at opposite ends in said supports, a casing laterally pivoted in said frame adjacent one end, a reciprocatory screen mounted in said casing, means for reciprocating said screen connected to said frame concentric with the casing pivots, and a pendulum pivoted to said frame and supporting said casing at its end distant from the pivots, whereby the movements of the pendulum will compensate for any tilting of the supports and maintain both the frame and the casing in normal horizontal position.

4. A grain separator, comprising a screen casing, a frame carrying said casing and provided upon either end with fixed shafts or trunnions, supports carrying bearings in which said shafts are journaled, and leveling means for maintaining said frame in horizontal position irrespective of any tilting of said supports about the axis of said trunnions.

5. A grain separator, comprising supports, a frame pivoted at its ends in said supports, a horizontally disposed casing laterally pivoted in said frame adjacent one end, a screen movably mounted in said casing, and a pendulum pivotally connected to said frame and to said casing whereby the movements of the pendulum due to the tilting of said supports maintain both the frame and the casing in horizontal position.

6. A grain separator, comprising a frame provided upon opposite ends with fixed studs or trunnions, supports having bearings for said trunnions, a casing pivotally secured adjacent one end to said frame, mechanism for raising and lowering the casing connected to the opposite end thereof, and a pendulum actuator controlling said mechanism.

7. A grain separator, comprising supports provided with bearings, a frame pivotally mounted at its opposite ends in said bearings, a casing pivotally secured adjacent one end to the side members of said frame, lever mechanism pivotally connected to the opposite end of the casing and to the frame adapted to raise and lower the casing upon its pivots, and a pendulum connected to said lever mechanism for maintaining said casing level by rocking the frame upon its end bearings to compensate for sidewise tilting and by operating said lever mechanism to raise or lower one end of the casing with respect to the frame to compensate for longitudinal tilting.

8. A grain separator or cleaner, comprising supports provided with bearings, a frame having stub shafts or trunnions projecting from its opposite ends and journaled in said bearings, a casing having pivotal

connection adjacent one end with the side members of said frame, and lever mechanism pivotally secured to said frame and having one arm provided with a depending pendulum and another arm supporting the opposite end of the casing, whereby the pendulum controls both the sidewise tilting movement of the frame in said bearings and the vertical movement of the casing upon its pivotal connection with the frame.

9. A grain separator, comprising a casing, a reciprocatory sieve or screen mounted therein, a blower, means for deflecting the air currents from said blower upon the lower side of said screen, and means for nullifying the rotary action of said air currents.

10. A grain separator, comprising a casing, a reciprocatory sieve or screen mounted therein, a blower, means for deflecting the air currents from said blower upon the lower side of said screen, means for nullifying the rotary action of said air currents, and means for retarding the flow of air discharged from the casing.

11. A grain separator, comprising a casing, a sieve or screen movably mounted therein, an inclined chute below said sieve having longitudinal grooves forming channels for the grain, and a blower to cause an air blast to pass over said chute and upwardly through the sieve, said grooves protecting the grain from the rotary action of the blast.

12. A grain separator, comprising a casing, reciprocatory upper and lower sieves mounted therein, the forward end of the upper sieve being in advance of the corresponding end of the lower sieve, a blower, means for causing the air blast created by said blower to pass upwardly through said sieves, and means for nullifying the rotary action of said air blast.

13. A grain separator, comprising a casing, reciprocatory upper and lower sieves mounted therein, the forward end of the upper sieve being in advance of the corresponding end of the lower sieve, a blower, means for causing the air blast created by said blower to pass upwardly through said sieves, and means against which the air blast is directed for causing the air discharged from the casing to traverse a downward return path.

14. A grain separator, comprising a casing, reciprocatory upper and lower sieves mounted therein, the forward end of the upper sieve being in advance of the corresponding end of the lower sieve, a blower, means for causing the air blast created by said blower to pass upwardly through said sieves, and a chute for the air discharged from the casing, forming a confined channel and adapted to terminate adjacent the stubble of the field being harvested.

15. A grain separator, comprising a

frame, a casing mounted therein, upper and lower sieves movably mounted therein, the forward end of the upper sieve being in advance of the corresponding end of the lower sieve, a blower, means for causing the air blast created by the blower to pass upwardly through said sieves, and a downwardly directed chute for the air discharged from the casing, forming a confined channel and adapted to terminate below the frame.

16. A grain separator, comprising a casing having inlet and discharge openings, a blower within the casing adjacent the inlet, reciprocatory grain separating mechanism comprising a plurality of sieves and a receiving pan supported transversely within the casing, and spaced in vertical alinement, the pan slanting upwardly and dished or channel-shape at its lower forward end, and flattened at its upper rear end, means for directing the air currents upwardly through the sieves, and a discharge chute connected to the outlet end of the casing.

17. A grain separator, comprising a casing having air inlet and discharge openings, a blower rotatably mounted within the casing adjacent said air inlet, a grain spout leading into the top of the casing, a sieve within the casing and extending from the bottom of said spout to said discharge opening, the rear end of the upper wall of the casing being turned downwardly to form a hood over the discharge opening, and means for directing the air blast from said blower upwardly through said sieve and against said hood.

18. A grain separator, comprising a casing having air inlet and discharge openings, a blower rotatably mounted within the casing adjacent said air inlet, a grain spout leading into the top of the casing, a sieve within the casing and extending from the bottom of said spout to said discharge opening, the rear end of the upper wall of the casing being turned downwardly to form a hood over the discharge opening, means for directing the air blast from said blower upwardly through said sieve and against said hood, and a chute secured to said hood and forming a confined channel for the discharge air currents.

19. A grain separator, comprising a casing having air inlet and discharge openings, a blower rotatably mounted within the casing adjacent said air inlet, a grain spout leading into the top of the casing, a sieve within the casing and extending from the bottom of said spout to said discharge opening, a sieve below said first named sieve hav-

ing its forward end in the rear thereof, the rear end of the upper wall of the casing being turned downwardly to form a hood over the discharge opening, and means for directing the air currents from said blower upwardly through the sieves and a portion thereof between the separated forward ends of the sieves.

20. A grain separator, comprising a casing having air inlet and discharge openings, a blower rotatably mounted within the casing adjacent said air inlet, a grain spout leading into the top of the casing and forming an offset, the front end of the casing extending from the bottom of the spout to the air inlet, a sieve within the casing and extending from the bottom of said spout to said discharge opening, a sieve below said first-named sieve, having its forward end in the rear of said top sieve, the rear end of the upper wall of the casing being turned downwardly to form a hood over the discharge opening, and means for directing the air currents from said blower upwardly through the sieves and a portion thereof between the separated forward ends of the sieves.

21. A grain separator, comprising a casing having inlet and discharge openings, a blower within the casing adjacent the inlet, reciprocatory grain separating mechanism comprising a sieve and a receiving pan supported within the casing and in spaced vertical alinement, the pan slanting upwardly and provided at its rear upper end with horizontal steps and separating vertical risers.

22. A grain separator, comprising fixed supports, a horizontally disposed frame pivoted at opposite ends in said supports, a casing laterally pivoted in said frame adjacent one end and having inlet and discharge openings, a reciprocatory screen mounted in said casing, leveling means for maintaining said frame and said casing in horizontal position irrespective of any tilting of said supports, and a blower within the casing adjacent the inlet and mounted in alinement with the pivots of the frame and of the casing, whereby the operation of the fan is not affected by the action of said leveling means.

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

JOHN D. JONES.

Witnesses:

EUGENE C. BROWN,
H. HARTIG.