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D. J. DAVIDSON.

PURIFIER, SEPARATOR, AND GRADER.

No. 543,927. Patented Aug. 6, 1895.

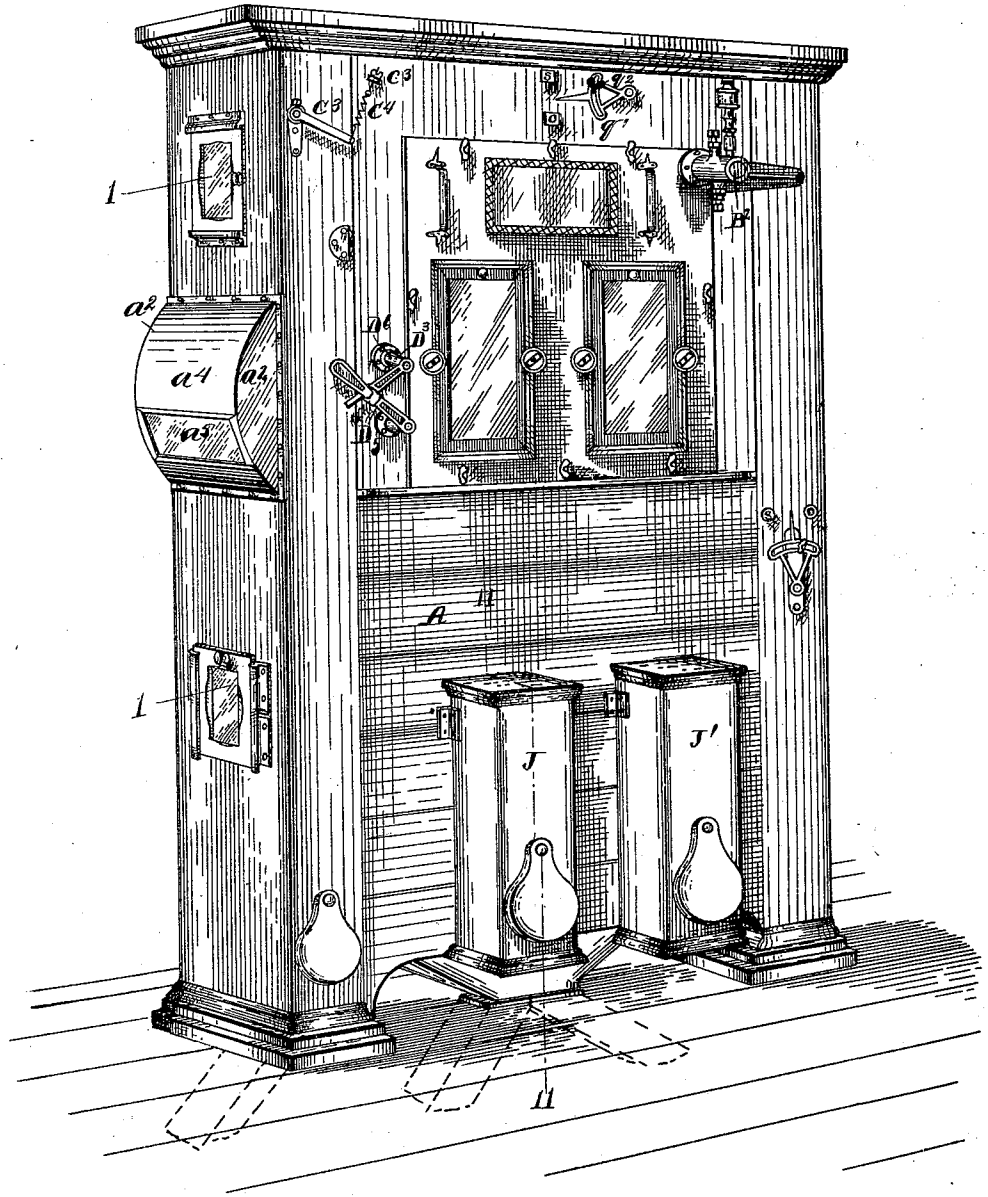

Fig. 1.

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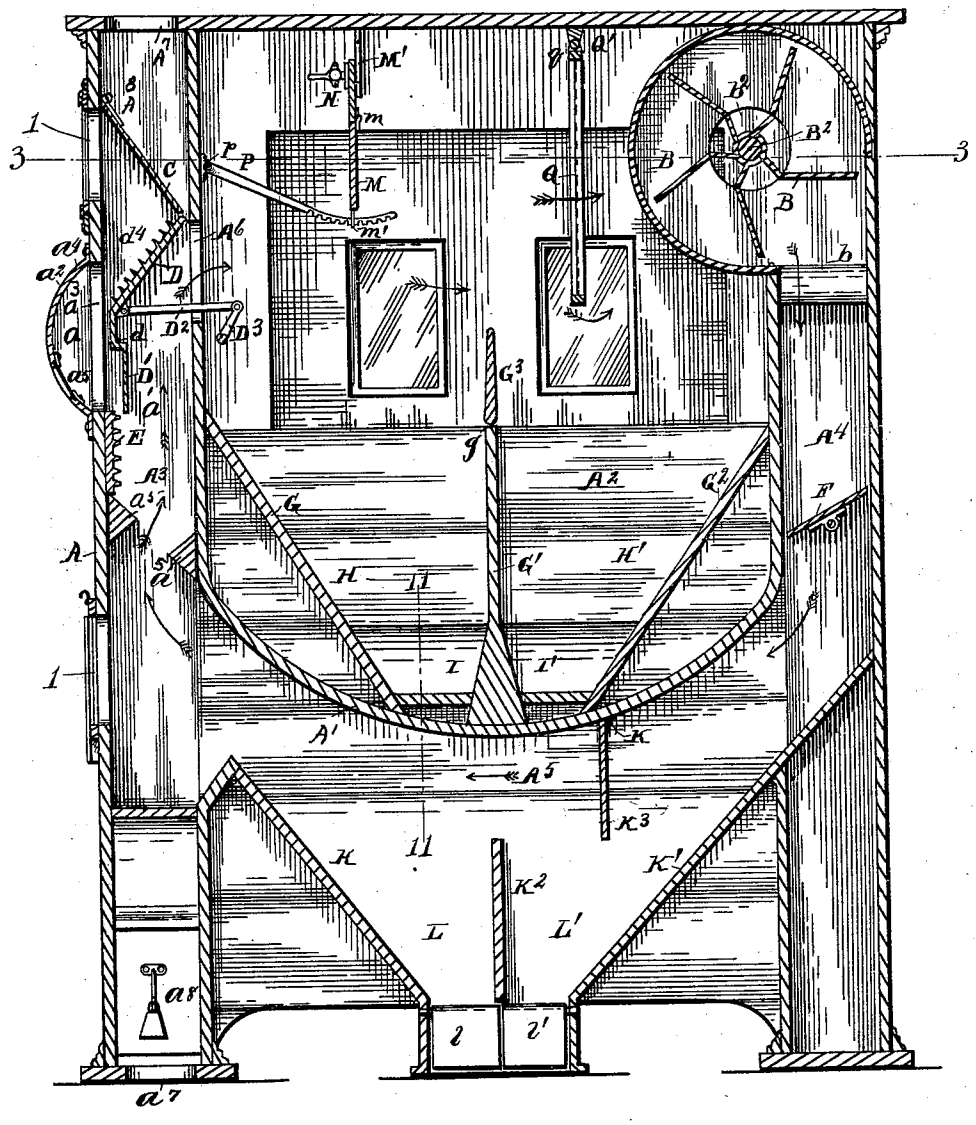

Fig. 2.

WITNESSES

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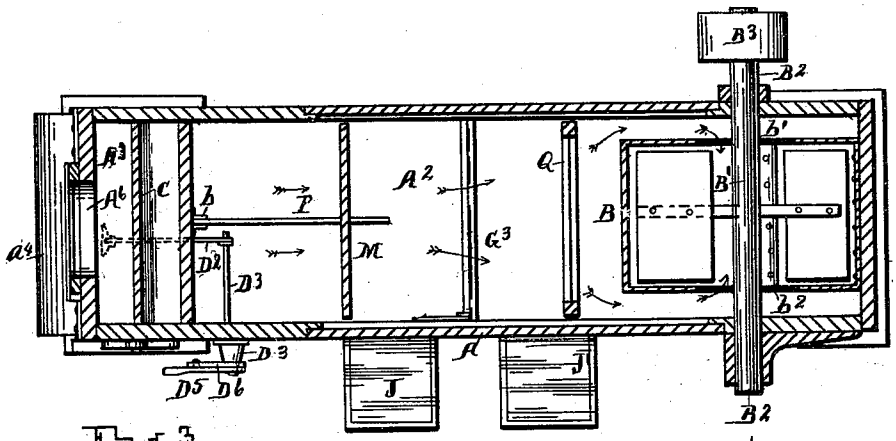

Fig. 3.

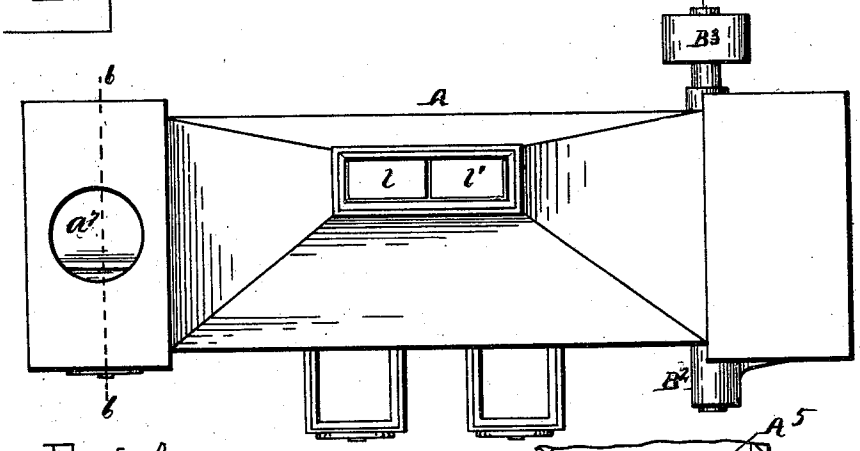

Fig. 4.

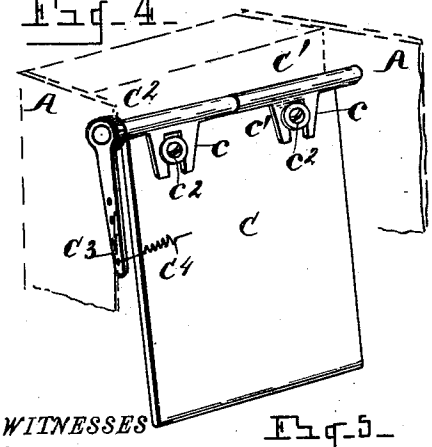

Fig. 5.

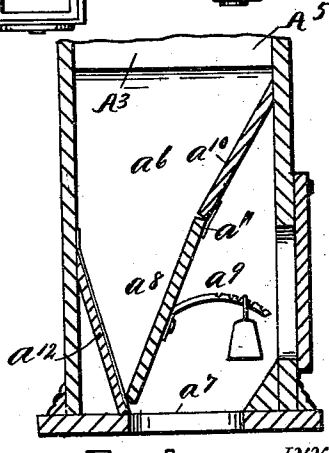

Fig. 6.

WITNESSES

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No. 543,927. Patented Aug. 6, 1895.

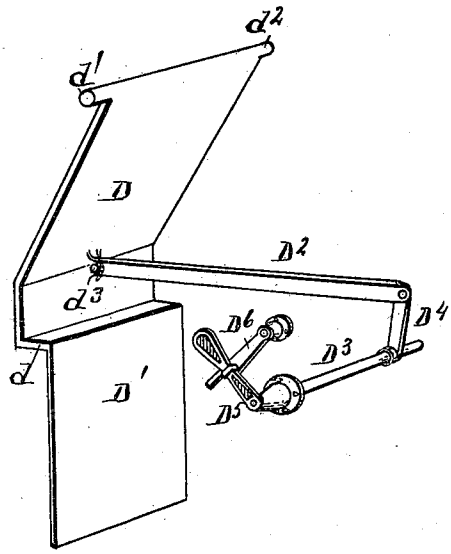

Fig. 7.

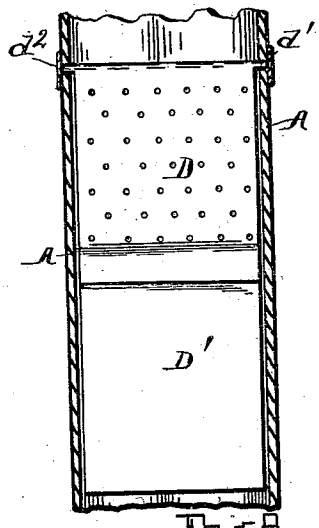

Fig. 8.

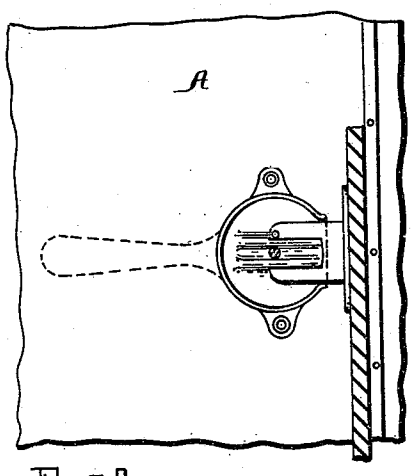

Fig. 9.

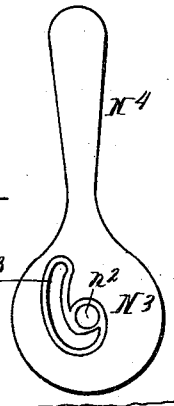

Fig. 10.

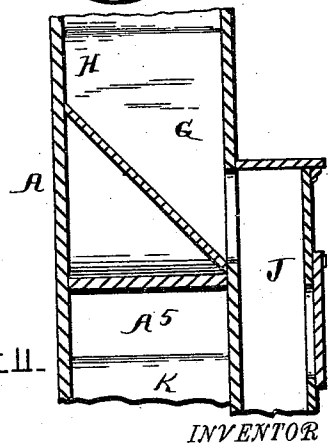

Fig. 11.

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UNITED STATES PATENT OFFICE.

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PURIFIER, SEPARATOR, AND GRADER.

SPECIFICATION forming part of Letters Patent No. 543,927, dated August 6, 1895.

Application filed October 16, 1894. Serial No. 526,099. (No model.)

To all whom it may concern.

Be it known that I, DAVID J. DAVIDSON, a citizen of the United States, residing at Port Huron, county of St. Clair, State of Michigan, have invented a certain new and useful Improvement in a Purifier, Separator, and Grader; and I 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, reference being had to the accompanying drawings, which form a part of this specification.

My invention has for its object certain new and useful improvements in a purifier, separator, and grader, and is more particularly designed as an improvement upon a device of this class for which United States Letters Patent were granted to me June 12, 1894, No. 521,402.

My present invention has in view certain modifications and improvements to secure the greatest efficiency in the operation of such a machine; and to this end my present invention consists in the construction, combination, and arrangement of devices and appliances hereinafter specified and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a view in perspective showing the exterior of my improved machine. Fig. 2 is a vertical section of the same. Fig. 3 is a horizontal section on the line 3 3, Fig. 2. Fig. 4 is an inverted plan view of the machine. Fig. 5 is a detail view of the feed-controlling valve. Fig. 6 is a vertical section of the base of the vertical trunk into which the stock is fed on the line 6 6, Fig. 4. Fig. 7 is a detail view in perspective of the scattering-plate. Fig. 8 is a front view of the same. Fig. 9 is a detail view of the mechanism for adjusting the diaphragm M. Fig. 10 is a view of the eccentric lever employed in connection therewith. Fig. 11 is a detail sectional view on the line 11 11, Figs. 1 and 2.

I carry out my invention as follows:

A represents an inclosing-case, provided therein with essentially a U-shaped partition A′, dividing the interior of the case into an air-chamber A^2, and into a vertical air-trunk A^3, and a vertical air-trunk A^4 on the opposite side of the case, and an air-trunk A^5 beneath the partition A′, connecting the two vertical air-trunks A^3 A^4 on the opposite sides of the machine.

B is a fan case within the case A, communicating with the air-trunk A^4, as shown at *b*, and its sides communicating with the chamber A^2, as shown in Fig. 3, at *b′* and b^2. B′ is a fan within said case.

B^2 is the fan-shaft, and B^3 the driving-pulley.

A^6 is an opening in the partition A′ through which the air-trunk A^3 communicates with the air-chamber A^2. The air-trunk A^3 at the side of the machine opposite the fan is provided with a feed-inlet A^7. Toward the upper end of the air-trunk A^3 at a suitable distance below the feed-inlet A^7, I locate a feed-controlling valve C, its upper end being jointedly connected with the case in any suitable manner. Thus, for example, as shown in detail in Fig. 5, the valve C may be provided at its upper edge with pivoting-bars C′ C^2, preferably separate and independent the one from the other and each provided with bifurcated fingers *c* and *c′*, between which a set-screw c^2 may be engaged in the valve C to bind the respective pivoting-bars upon said valve.

As so constructed the pivoting-bars may be adjusted laterally upon the valve as may be required and also longitudinally of the valve. The outer extremities of the pivoting-bars are journaled in the case A, adjacent portions of the case being indicated in Fig. 5 in dotted lines. Upon the outer end of one of said bars, as upon the outer end of bar C^2, is engaged an operating-handle C^3 on the outside of the case. A spring C^4 connects the free end of said handle with the case A, to which any suitable tension may be given, the spring tending to close the valve C. The valve C extends in an angular direction across the upper end of the trunk A^3, forming thereabove a feed-hopper or stock-chamber A^8. It will be seen that the weight of the stock in the chamber A^8 will tend to open the valve C. By adjusting the tension of the spring C^4, it will be understood more or less weight of stock will be required in the chamber A^8 to

open the valve C. The spring C^4 may be provided with any suitable tension-adjusting device, as a thumb-screw c^3, on one side thereof.

Beneath the valve C, I locate a scattering-plate D having a hinged or jointed connection with the case at its upper end and extended across the trunk A^3 on an incline, the scattering-plate being jointed or hinged to the case on the side of the trunk A^3 opposite that on which the valve C is hinged, so as to direct the grain as it falls thereupon in the opposite direction. The upper end of the scattering-plate is hinged to the case preferably a little above the top of the opening A^6, as shown, the scattering-plate extending on an incline downward over said orifice. The scattering-plate is provided at its lower end with a lip D′, preferably having an offset toward the air-chamber A^2, as shown at *d*. This lip may extend downward within the trunk A^3 any required distance, the same being spaced from the two adjacent walls of the trunk A^3 so as to form passage-ways on either side thereof, as indicated at *a* and *a′*.

The case A in front of the lower end of the scattering-plate and its lip-plate D′ is preferably bulged, as shown at a^2. This may be done by cutting away the case A, as shown at a^3, and engaging over the cut-away portion a metallic casing a^4, in which I prefer to set or engage an observation-glass a^5. This bulge a^2 performs, it will be seen, several important offices—viz., to maintain the desired area of the passage-way between it and the scattering-plate, while also the lower half thereof acts as a stock-deflector. The plate D and its lip D′ are made adjustable within the trunk A^3. I prefer to construct the scattering-plate D and lip D′ of an integral casting having pivotal lugs d' d^2 at the upper end of the scattering-plate by which it is jointedly engaged in the case.

Engaged with the scattering-plate is an operating-lever D^2 having a jointed connection with the scattering-plate, as shown at d^3. With the opposite end of the lever D^2 is engaged an operating-bar D^3, having a link connection D^4 therewith, the bar D^3 extending to the outside of the case and provided with an operating-handle D^5.

D^6 is a locking-arm engaged at one end with the case and at its opposite end engaging the operating-handle D^5 in any suitable manner to hold the handle in a given position.

It will be readily seen that any desired adjustment can thus be readily given to the scattering-plate D and its depending lip D′, so as to divide the space on each side thereof, as may be required.

The scattering-plate is provided on its surface with teeth d^4. Within the trunk A^3, beneath the case a^4, I locate an additional scattering-plate E, having teeth *e* thereupon, this latter scattering-plate serving to separate and scour the grain passing through the channel *a* into the trunk A^3 beneath the lip D′. The trunk A^3 is also preferably provided with deflecting devices a^5 to deflect the grain toward the center of the trunk A^3 and also serving to break the velocity of the fall of the stock.

In the operation of the device a current of air is discharged from the fan-case into the trunk A^4, the air-current passing thence through the air-trunk A^5 into the air-trunk A^3, the air then passing from the trunk A^3 into the chamber A^2, from which chamber it re-enters the fan-case. Thus a continuous air-current is formed in the operation of the machine, the air-current being discharged from the fan and re-entering the fan. As the grain descends within the air-trunk A^3 the air ascending the trunk A^3 strikes the stock therebeneath, commingles thoroughly therewith, separating therefrom the lighter impurities or lighter portions of the stock, the lighter impurities or portions thereof being carried with the current into the chamber A^2. The heavier grade of the stock falls by gravity to the base of the trunk A^3, the primary separation of the stock being made at the base of the air-trunk A^3. The air-trunk A^5 enters the trunk A^3 a suitable distance above the base of the trunk A^3, forming in effect a dead-air chamber a^6 at the base of the trunk A^3 into which dead-air chamber the heavier portion of the stock falls. At the base of the trunk A^3 is a discharge-orifice a^7 and thereabove a controlling-valve a^8, preferably having a weighted arm a^9, the valve a^8 being hinged to an inclined plate a^{10}, as shown at a^{11}. A slant-board a^{12} directs the stock to the base of the valve a^8. It will be perceived that the weight of stock at the bottom of the air-trunk A^3, when the weight thereof is sufficient, will open the valve a^8 and allow the stock to be discharged through the orifice a^7. The air-trunk A^3 is preferably provided with hand-holes and suitable covers therefor, as shown at the numerals 1, one such hand-hole being located adjacent to the feed-controlling valve C, another at the base of the air-trunk A^3, and another intermediate the extremities of the air-trunk A^3, adjacent to the communication of the trunk A^5 therewith.

F denotes a valve within the trunk A^4 for controlling the air-current discharged into the trunks A^5 and A^3. Within the trunk A^2 are located separating devices. Below the orifice A^6, I locate a cant-board G, then a dividing-wall G′, and an additional cant-board G^2, the two cant-boards G and G^2, inclined from the opposite sides of the chamber A^2 downward to the partition A′. The division-wall G′ rises vertically at about the center of the chamber A^2, intermediate the cant-boards G and G^2, its base being spaced from the lower edges of the said cant-boards, as shown more particularly in Fig. 2. At the top of the wall G′ is a wing G^3, preferably having a hinged engagement with the wall G′, as shown at *g*. Between the lower ends of the cant-board G and the division-wall G′ is formed a dead-air chamber H. Another dead-air

chamber H′ is formed between the lower ends of the wall G′ and the cant-board G^2. Conduits J J′ communicate with said dead-air chambers, respectively, at the base of said chambers, through which are discharged deposits made in said dead-air chambers. Said dead-air chambers are preferably provided each with a slant-board I to direct the deposit in each of said chambers into its corresponding conduit.

The base of the air-trunk A^5 is preferably formed with downwardly and inwardly inclined walls K K′, having therebetween a vertical wall K^2. Between the inclined wall K′ and the vertical wall K^2, I prefer to suspend from the partition A′ a diaphragm of any suitable construction, as shown at K^3, which may or may not be hinged at its upper end, the same being provided, however, as shown, with a hinged joint *k*, whereby it may be adjusted, as desired. By this diaphragm the air-current is obviously deflected thereunder if made solid, or if made foraminous the force of that portion of the air-current passing therebeneath is diminished. Between the walls K and K^2 is formed a dead-air chamber L, and between the walls K′ and K^2 is formed an additional dead-air chamber L′. These dead-air chambers are provided with discharge-openings *l* and *l*′.

Within the chamber A^2 and above the opening A^6 I suspend from the upper wall of said chamber a diaphragm M. This diaphragm I prefer to make vertically adjustable. To this end I construct the case A with a depending support M′. Adjacent to said support I locate an eccentric latch or fastening N. To this end the fastening may be provided with a bracket N′, secured to the inner face of the casing A, as by screws, at *n* and *n*′. This bracket is provided with a sliding latch or bar N^2, whereby, as the handle N^4 is manipulated, the latch will be moved to and fro.

The latch N^2, it will be seen, is constructed to hold the diaphragm M between the latch and the support M′, and to permit the diaphragm M being vertically adjusted, as may be required. I also desire that the lower portion of said diaphragm should be laterally adjustable. To this end the diaphragm M may be formed in two parts hinged together, as shown at *m*. To hold the diaphragm in a laterally-adjusted position I locate above the orifice A^6 a toothed bar P, having a hinged engagement, as shown at *p*, upon the inner wall of the trunk A^8. The lower end of the diaphragm is provided with a loop engaging the toothed portion of the bar P, as shown at *m*′. By this construction, it will be perceived, said diaphragm may be moved laterally and held in a given position of adjustment. This diaphragm M being suspended over and in the vicinity of the orifice A^6 may be adjusted to direct the air-current at its entrance into the chamber A^2 more or less downward, as may be desired.

Toward the opposite side of the chamber A^2, in the vicinity of the fan-case, I prefer to locate an additional diaphragm Q, depending from the upper surface of the case, as from a bracket Q′, with which bracket said diaphragm has a jointed engagement, as shown at *q*. Thus it will be understood that the diaphragms M Q and the wing G^3 may all be adjusted laterally while the diaphragm M may also be adjusted vertically, by which means the air-current within the chamber A^2 may be diverted and controlled, as may be required. The diaphragms and the wing G^3 may be made in any suitable manner. The diaphragm Q is preferably made foraminous. Obviously the air-current in the chamber A^2 will be in a direction toward the fan. The chamber A^2 is also in the nature of an expansion-chamber. In consequence of this fact and of the provision of the separating devices, heretofore explained, located within the chamber A^2, separations will be made within said chamber, one separation being made into the dead-air chamber H and the other into the chamber H′. I do not limit myself to providing simply two such dead-air chambers within the expansion-chamber A^2, as any desired number of such dead-air chambers may be provided within the scope of my invention by adding additional diaphragms, cant-boards, and dividing-walls.

The pivot-pin of the joint *q* may be provided exterior to the frame with a quadrant *q*′, by which the diaphragm Q may be adjusted, as required, a set-screw q^2 holding said quadrant in any given position. The wing G^3 may be held in any given position of adjustment in any suitable manner.

This construction forms an improved continuous air-belt purifier, separator, and grader. The various dead-air or settling chambers may communicate with chutes (indicated in dotted lines, Fig. 1) for withdrawing the separations from said chambers.

It will be evident by the construction of the controlling-valve a^8, with its weighted arm, that the valve will automatically close and open just in proportion to the weight of stock thereabove. This will effectually prevent any air-current entering the trunk A^3 through the feeding-inlet and passing downward through said trunk, as the valve a^8 is effectually closed, except as opened just sufficiently for the stock to be discharged therethrough.

What I claim as my invention is—

1. In a continuous air belt purifier, separator and grader, the combination with a fan and fan case, of an air chamber communicating with the interior of the fan case, separating devices located in said air chamber, a vertical air trunk communicating with said air chamber, an air passage leading from the fan into said vertical air trunk separate from said air chamber, said vertical air trunk provided with a feed opening at its upper end, with a feed controlling valve beneath said opening, with an adjustable scattering plate, and with an adjustable depending lip pivoted at its up-

per end to have an oscillatory movement, substantially as and for the purpose described.

2. In a continuous air belt purifier, separator and grader, the combination with a fan and fan case, of an air chamber communicating with the interior of the fan case, separating devices located in said air chamber, a vertical air trunk communicating with said air chamber, an air passage leading from the fan into the vertical air trunk separate from said air chamber, an adjustable scattering plate provided with a depending lip located within said vertical air trunk, and means connected with said scattering plate for adjusting said plate and lip, substantially as set forth.

3. In a continuous air belt purifier, separator and grader, the combination with a fan and fan casing, of an air chamber communicating with the interior of said fan casing, separating devices located in said chamber, a vertical air trunk communicating with said air chamber, an air passage leading from the fan into said vertical air trunk separate from said air chamber, an adjustable scattering plate D and lip D′ located in said vertical air trunk, an additional scattering plate E below the scattering plate D, deflecting devices located in said air trunk, a feed opening in the top of said vertical air trunk, an automatic feed controlling valve located in said air trunk below said opening, a discharge opening in the base of said air trunk, and an automatic discharge controlling valve located in said trunk above the discharge opening, substantially as set forth.

4. In a continuous air belt purifier, separator and grader, the combination of a fan and a fan casing, an air chamber communicating with the interior of the fan casing, a vertical air trunk communicating with said air chamber and bulged intermediate its extremities, an air passage leading from the fan into said vertical trunk separate from said air chamber, an adjustable scattering plate D, and lip D′ located in said vertical air trunk adjacent to the bulged portion thereof, an additional scattering plate E below the bulged portion of the vertical trunk, a feed opening in the top of said vertical air trunk, an automatic feed controlling valve located in the air trunk below said opening, a discharge opening in the base of said vertical trunk, an automatic discharge controlling valve located in said trunk above the discharge opening, and separating devices located in said air chamber, the bulged portion of said vertical trunk providing a passage way in front of the scattering plate D and lip D′ and serving as a deflector, substantially as set forth.

In testimony whereof I sign this specification in the presence of two witnesses.

DAVID J. DAVIDSON.

Witnesses:
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M. A. MARTIN.