(No Model.) 2 Sheets—Sheet 1.

J. L. WILLFORD.

MIDDLINGS PURIFIER.

No. 328,269. Patented Oct. 13, 1885.

Fig. 1.

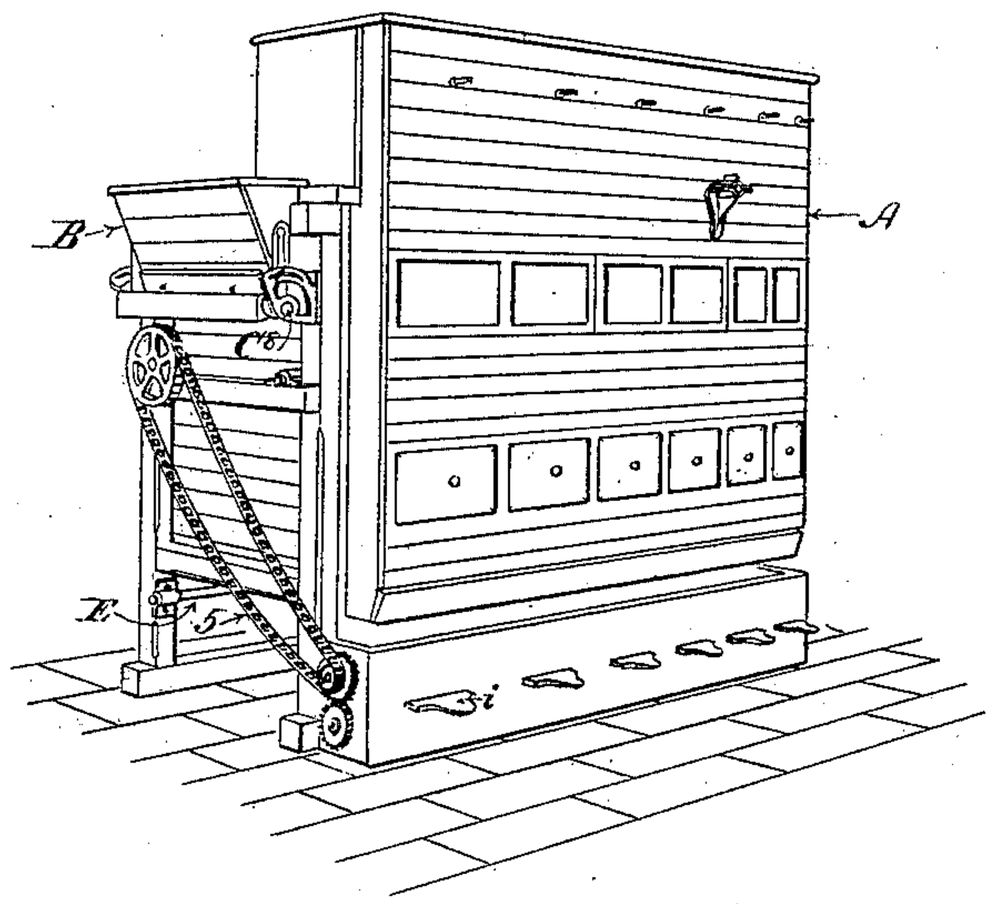


Fig. 2.

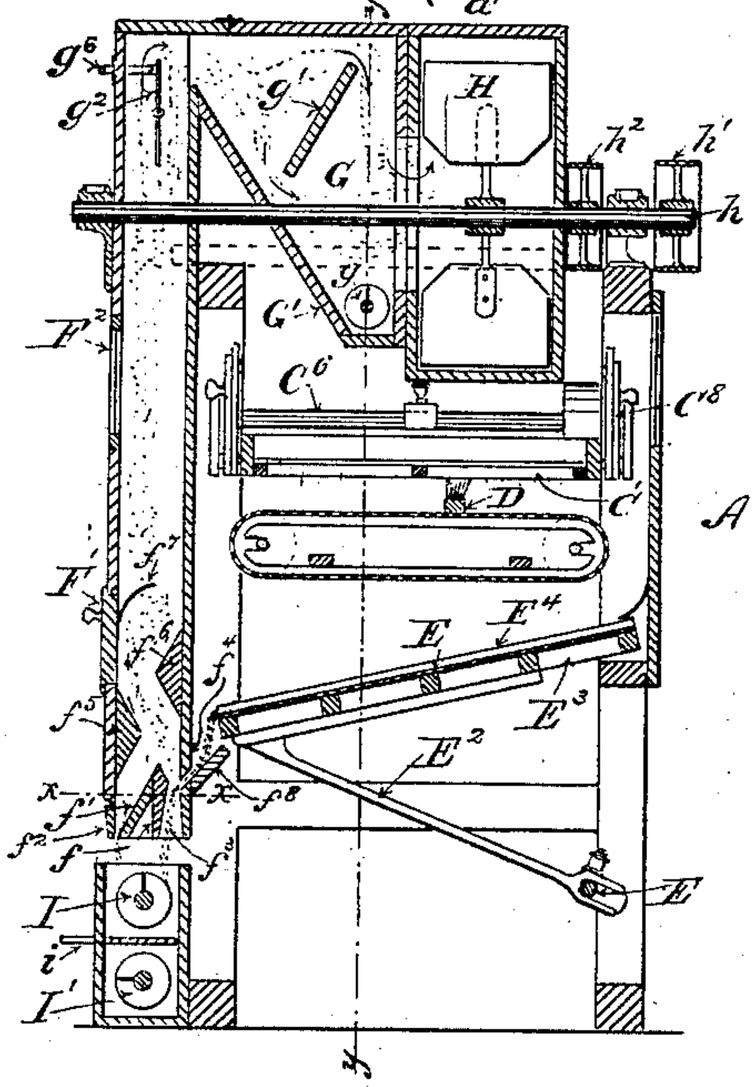


Fig. 3.

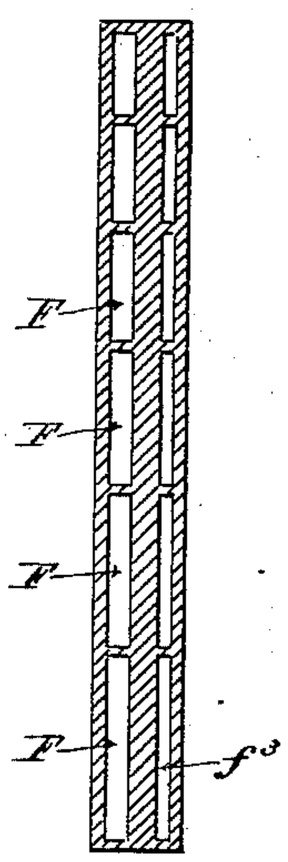
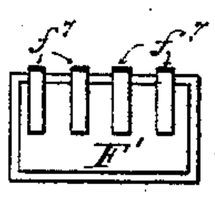


Fig. 6.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

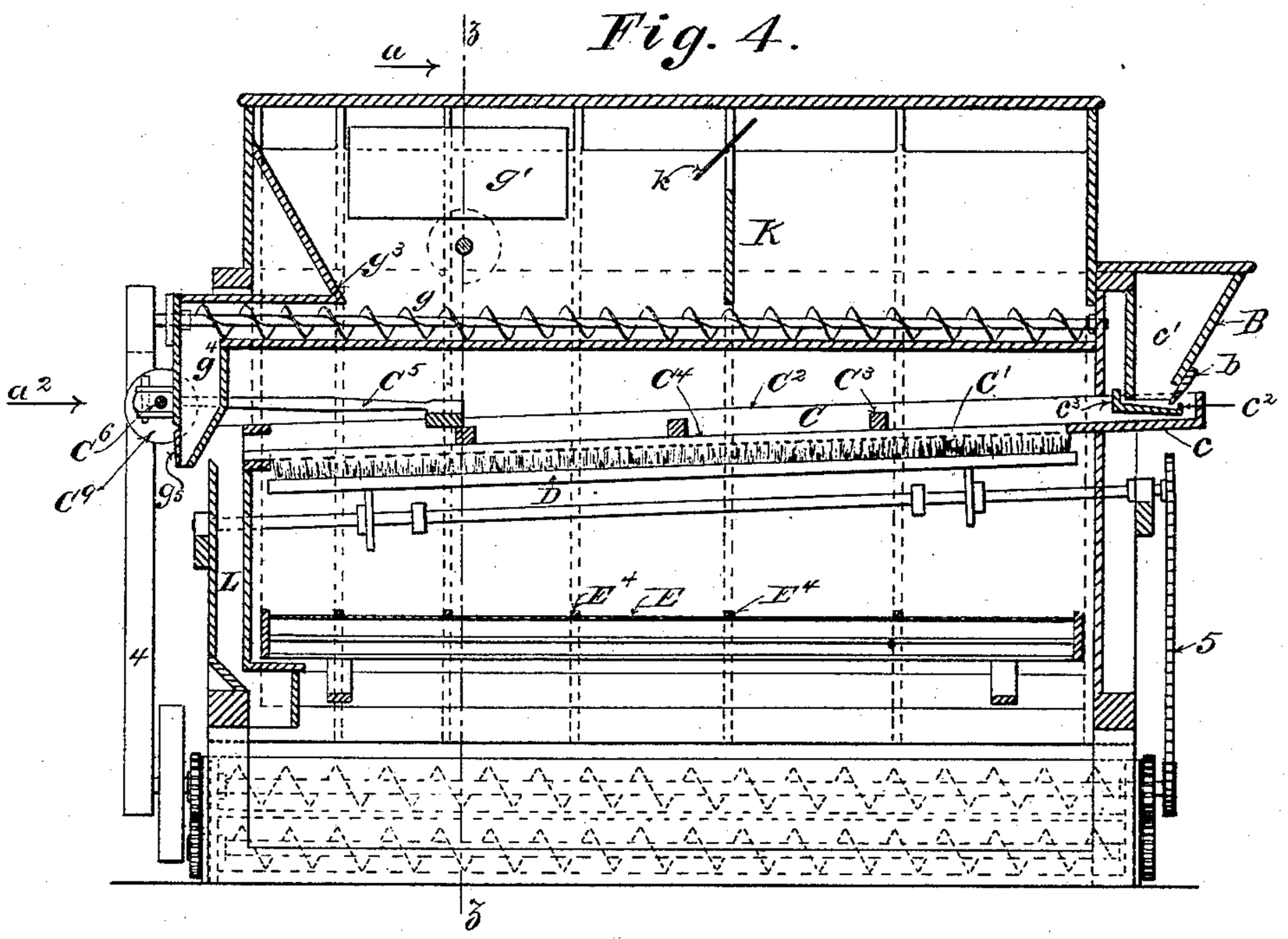


Fig. 7.

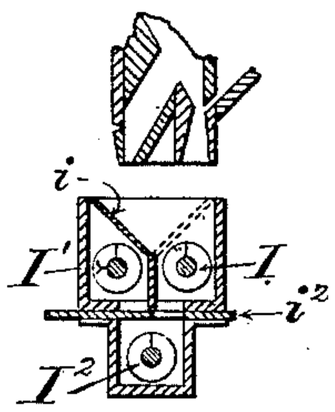


Fig. 5.

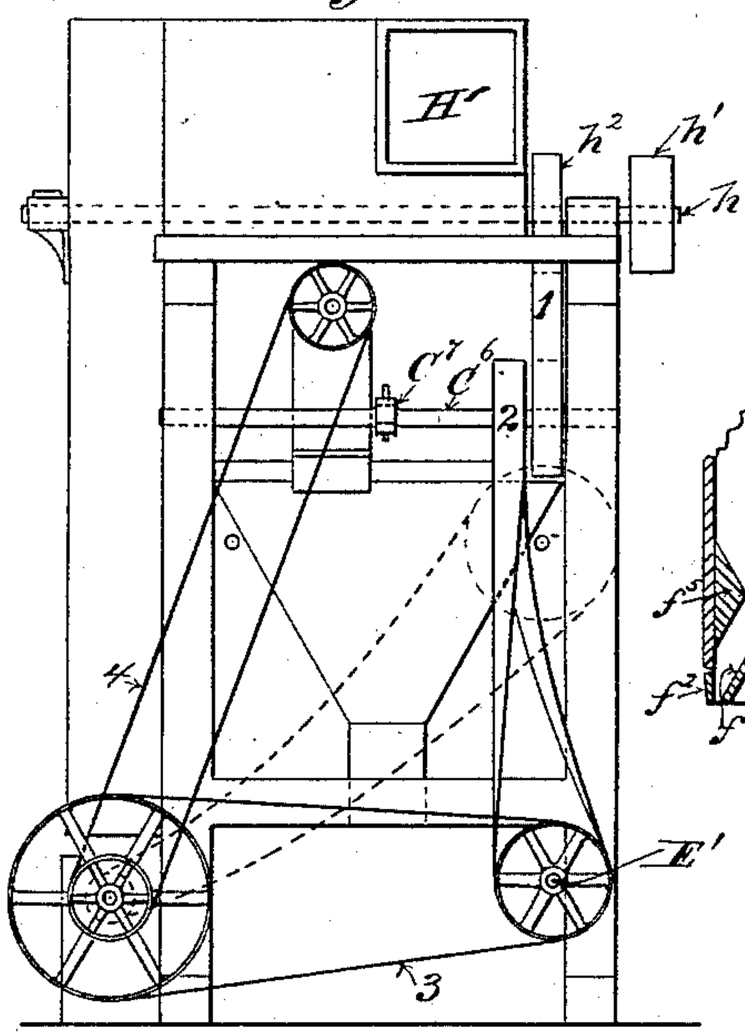
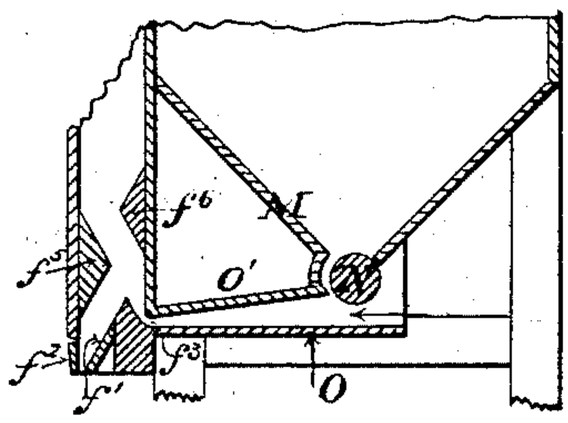


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOSEPH L. WILLFORD, OF MINNEAPOLIS, MINNESOTA.

MIDDLINGS-PURIFIER.

SPECIFICATION forming part of Letters Patent No. 328,269, dated October 13, 1885.

Application filed May 1, 1885. Serial No. 164,129. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. WILLFORD, 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 Middlings-Purifiers, of which the following is a specification.

My invention relates to machines for purifying middlings; and it consists, generally, in the construction and combination of devices, hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a perspective view of my machine. Fig. 2 is a vertical transverse section on line *z z* of Fig. 4, looking in the direction of arrow *a*. Fig. 3 is a section on line *x x*, Fig. 2, showing the lower part of the trunks. Fig. 4 is a vertical longitudinal section on line *y y*, Fig. 2, looking in the direction of arrow *a'*. Fig. 5 is an end elevation looking in the direction of arrow a^2, Fig. 4. Fig. 6 is a detail of the deflecting-fingers. Fig. 7 shows the preferred construction and arrangement of conveyers. Fig. 8 is a modification.

A is the main supporting frame or casing of the machine.

B is the feed-hopper, having sliding valve *b*.

C is a longitudinally-reciprocating sieve. The frame of the sieve consists, preferably, of the side bars, C^2, cross-bars C^3, and longitudinal bars C^4, and it is supported upon suitable hangers, C^8. To the under side of the frame is secured the cloth C'. This cloth is of several grades, the finest grade being at the feed end and the coarsest at the tail end. The first or finest grade extends to a point about opposite to the division between the first and second trunks, hereinafter described, the second to the division between the second and third trunks, and so on. At the forward or feed end the sieve-frame is provided with the blank *c*, which extends under the feed-hopper. Secured in the frame, below the feed-hopper, is the feed-board *c'*, having an inclined upper surface, and provided with the upwardly-extending projections, c^2 c^3. As the sieve is reciprocated the material feeds from the hopper over the inclined surface of feed-board *c'*, and over the projection c^2. The projection c^2 makes it possible to raise the slide *b* to a considerable extent, and thereby to leave a large opening under slide *b* and over projection c^2, through which any dough-balls may pass without clogging the valve, while the rate of feed is not increased. The sieve is reciprocated from shaft c^6 by pitman c^5 and eccentric c^7.

D is a brush beneath the sieve, arranged to travel across its under surface.

Below the sieve is the frame E^3, inclined toward the side of the machine. This frame is covered by a smooth, preferably zinc, surface, E. Dividing-strips E^4 are preferably arranged opposite the divisions between the trunks, hereinafter described. This frame is transversely reciprocated by means of pitman E^2 and eccentric on shaft E', and forms a chute for the material that passes through the sieve.

Arranged along the side of the machine the full length of the chute E are the series of trunks F. Across these trunks, at their lower ends, are the dividing-boards *f f'*. The inner wall of the trunk is preferably slightly thinner at its lower end by being chamfered off on the inside. The board *f* is also preferably chamfered off toward both edges, the longer chamfer being toward the lower edge. An upwardly-tapering opening, f^3, is formed between the board *f* and the wall of the trunk. The board *f'* is arranged with an inclined surface toward the wall of the trunk. The outer wall of the trunk is shorter than the other walls, and to its lower edge is hinged a strip forming a flap-valve, f^2, which is adapted to close against the lower edge of the board *f'*. Opposite the throat of the opening f^3 is a narrow slit, f^4, in the wall of the trunk extending the full width thereof. An inclined board, f^8, delivers through this opening into the trunk in a thin sheet the material passing from the chute E.

f^5 and f^6 are blocks in the shape of triangular prisms, located in the lower part of the trunk, on opposite sides thereof. The lower surface of block f^5 is substantially parallel with the inclined face of board *f'*, and its upper surface with the lower surface of block f^6. These blocks are so located as to direct into and through valve f^2 the material that falls after the current has become expanded in the larger part of the trunk, as hereinafter described. At their upper ends the trunks all

open into the chamber G, having the inclined wall G′ and conveyer *g* in the lower part thereof.

H is a fan located in a casing communicating with chamber G. This fan is preferably located near the tail end of the machine, opposite the trunks, through which the strongest upward air-current is required. To break the force of the current directly opposite the fan, I prefer to locate in the chamber G, opposite the opening into the fan-casing, a deflecting-board, *g′*, and to regulate the air-current in each trunk, I prefer to arrange a butterfly-valve, g^2, in each trunk, and provide it with a stem, g^6, extending through the wall of the trunk, by which it may be opened or closed.

F′ are removable doors, opening into each trunk of the series, and upon the inner surfaces of these doors I place the deflecting-fingers f^7, which extend into the trunk. These fingers break the current of air passing up the trunk, and also aid in separating the heavier material from the lighter.

F^2 are windows in the trunks, through which the material passing up in the trunks may be inspected, by which to determine what amount of suction the material will stand without waste.

If the middlings are not thoroughly dusted when they go to the machine it is desirable to shut off the blast from one or more of the trunks nearest the feed end of the machine, and to use these sections for dusting the flour from the middlings. For this purpose I provide one or more transverse partitions, K, in the chamber G, and a valve or valves, *k*. When the valve *k* is open, there is an upward air-current through all of the trunks. When the valve *k* is closed, the trunks between partition K and the feed end of the machine are cut off from the fan, and all the material that passes into these trunks will fall through into the conveyers below.

I I′ are spiral conveyers, located one over the other, directly beneath the trunks. The material from the upper conveyer may be made to pass into the lower conveyer through any one of the slides *i*.

The conveyer *g* in chamber G is surrounded for a short distance near the exit end by a tube, g^3, through which the material is forced from the chamber into a pocket or trap, g^4, provided with a valve, g^5. I find that without the tube g^3 the suction is so great that the valve g^5 will not be opened by the light shorts in the pocket g^4. This tube and the conveyer therein break the force of the suction on the valve, so that the valve readily opens under the weight of the material in the pocket and permits its discharge therefrom.

In Fig. 5 H′ represents the exit from the fan-casing.

The following is the arrangement of belts and gearing shown for operating the machine, though I do not confine myself to this exact arrangement. Power is communicated to fan-shaft *h* through pulley *h′*. A belt, 1, over pulley h^2 on shaft *h* to pulley on shaft C^6, gives power to that shaft, by which the screen is reciprocated. Belt 2 from this shaft rotates shaft E′, which moves the transverse chute E. From shaft E′ belt 3 drives a pulley on the shaft of conveyer I. The conveyers are geared together, and from the opposite end chain-belt 5 drives the shaft that moves the traveling-brush. Belt 4, from pulley on conveyer-shaft, drives the conveyer *g*.

Fig. 7 shows the preferred arrangement of conveyers. In this figure I I′ are spiral conveyers arranged side by side below the trunks F F. To the partition between the conveyer-troughs is hinged the cut-off valve *i′*. When this cut-off is in a vertical position, the material from one opening in the trunk will fall into one conveyer and that from the other opening will fall into the other.

I^2 is a conveyer located below the conveyers I I′. A slide, i^2, having an opening through it, is arranged over the lower conveyer. This slide may be set so that its opening will register with either of the openings in the conveyer-troughs, or so that both those openings will be closed.

The operation of the machine is as follows: The material is fed from the hopper B by reciprocation of screen C, and passes on to the screen in a thin sheet. The material that passes through the first grade of the screen is conveyed by the chute E in a thin sheet into the first trunk of the series, that which passes through the second grade is conveyed into the second trunk, and so on throughout the series, there being preferably a trunk to receive each grade of material from the screen. The material entering the throat of the trunk falls into a strong upward current of air, and as this material is in a thin sheet the air passes through every part thereof, and carries up all of the light material into the trunk, while the heavier material falls into the conveyer below. The portion of the trunk immediately above the throat between the blocks f^5 and f^6 is of considerably greater capacity than the throat, and the part above the blocks is of about five times the capacity of the throat. As the air-current passes above the throat it is considerably weakened by becoming expanded, and it is again weakened when it reaches the part of the trunk that is above the blocks f^5 f^6. The heavier and better part of the middlings carried up out of the throat of the trunk by the air-current will gravitate toward the lower end of the trunk as soon as the suction becomes too weak to hold it. This material will, owing to the shape of the trunk, fall onto the surface of the block *f′* and pass out through the valve f^2 into the conveyer. The deflecting-fingers f^7 are struck by the material in its upward course, and they divide the middlings and aid in separating the lighter material from the heavier. The shorts and impurities are carried from the trunk into the chamber G. Here the current is considerably expanded and the shorts fall into the bottom of the

chamber, from which they are removed by the conveyer *g*. The dirt, dust, and lightest particles pass along with the air-current into the fan-chamber and out through the opening H′. The material that passes over the tail of screen C falls into a spout, L.

I do not confine myself to the construction of the screen-frame described, nor to the described form of graded sieve, as other graded sieves—such as a graded rotating bolt—may be substituted with good results.

In Fig. 8 a modified arrangement of trunk and means for conveying the material from the screen to the trunk is shown. As shown in this figure, a hopper, M, is arranged below the screen and is provided with a feed-roll, N. O is a horizontal board arranged below the feed-roll N and extending below the inner wall of the trunk F and upwardly-curved below the trunk, where it joins the upper edge of board *f*′. O′ is a board arranged above board O and slightly inclined to form the narrow opening or throat f^3 opening into the trunk F. As the material passes from the hopper M it falls into the air-current passing between the boards O O′, and is carried by this current into the trunk F. After passing the throat f^3 the current is expanded and weakened, and the heavy material falls out through the valve f^2 into a conveyer below.

I claim as my invention—

1. The combination, with the longitudinally-reciprocating graded sieve C, of the transversely-traveling brush D, transversely-reciprocating chute E, trunks F F, and means for producing an upward air-current in said trunks, all substantially as described.

2. The trunk F, having opening f^4, boards *f f*′, valve f^2, blocks f^5 f^6, and deflecting-fingers f^7, in combination with means for producing an upward air-current through said trunk, as and for the purpose described.

3. The combination, with the sieve C and chute E, of the series of trunks F, each having the upwardly-tapering air-passage f^3, valve f^2, the triangular blocks f^5 f^6, arranged within and upon opposite sides of said trunks, spiral conveyers located below said trunks, the chamber G, and fan H, all substantially as described.

4. The combination, with the trunks F and fan H, of the chamber G, having partition K and valve *k*, as and for the purpose set forth.

5. The combination of the chamber G, having conveyer *g*, tube g^3, pocket g^4, and valve g^5, with the series of trunks F, opening into said chamber, and the fan H, all arranged as described, and for the purpose set forth.

6. The combination, with the trunk F, having opening f^3 and valve f^2, of the conveyers I I′ and the hinged plate *i*′, all arranged substantially as described.

7. The combination of the conveyers I, I′, and I², with the hinged plate *i*′ and the slide i^2, all substantially as described.

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