

W. H. FORMAN & M. F. WILLIAMS.

Middlings-Separator.

No. 213,328

Patented Mar. 18, 1879.

Fig. 1.

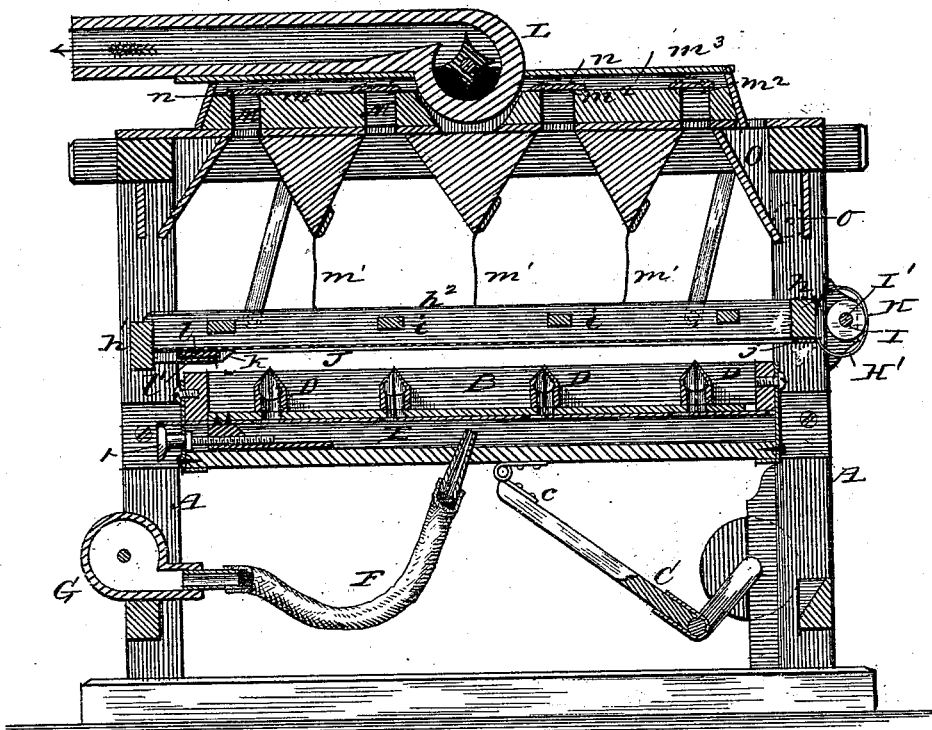
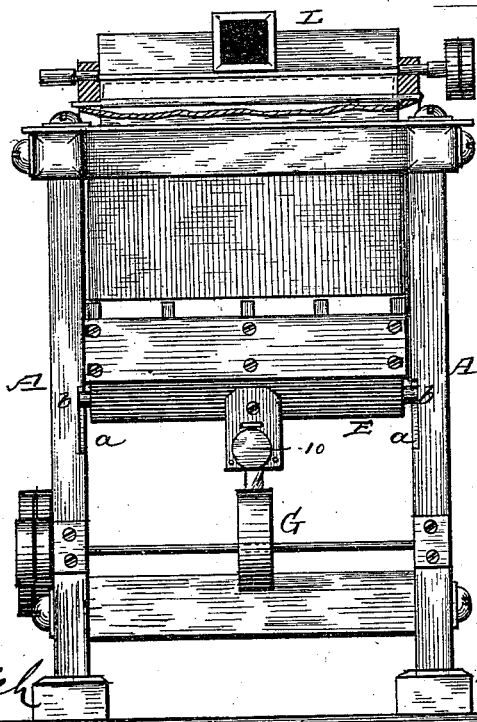


Fig. 2.



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Fig. 3.

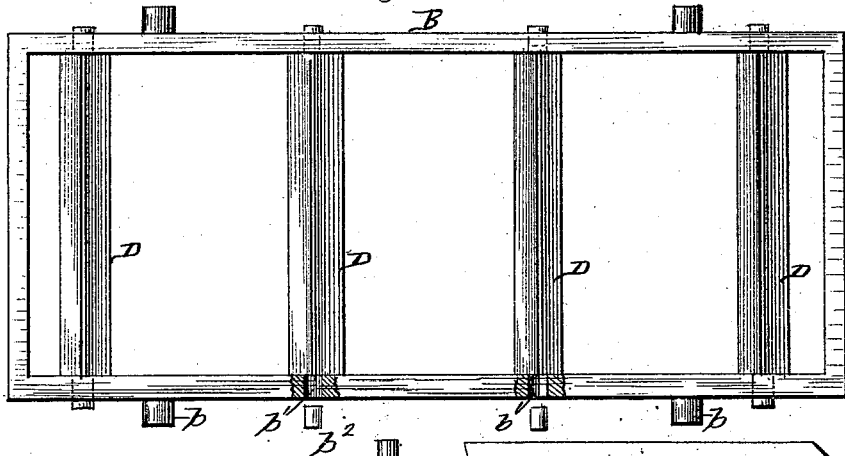


Fig. 4.

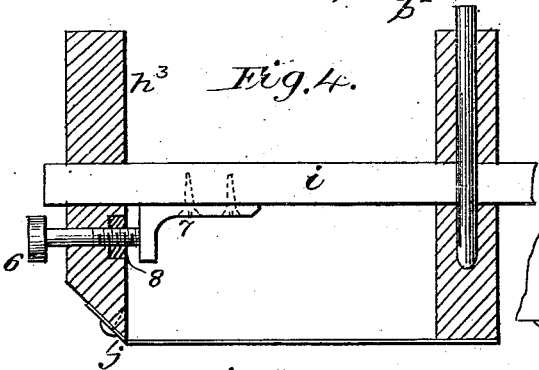


Fig. 5.

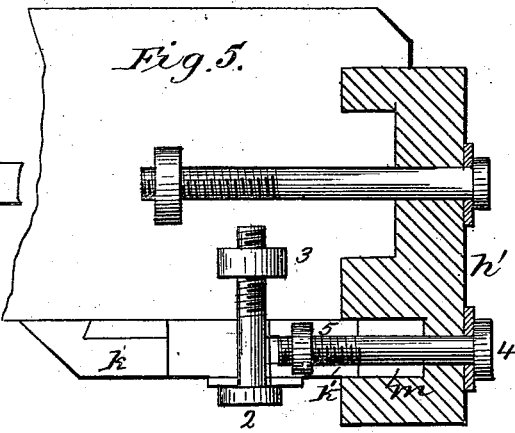


Fig. 6.

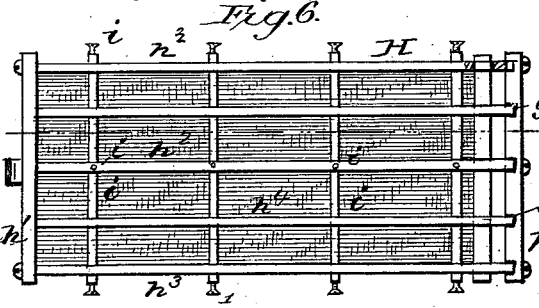


Fig. 7.

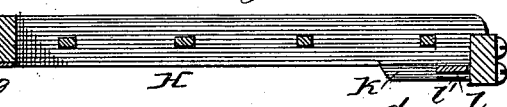


Fig. 8.

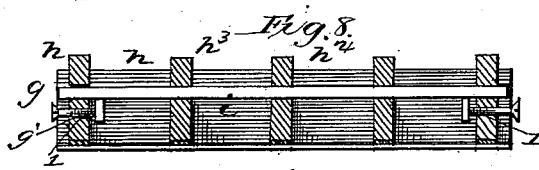


Fig. 10.

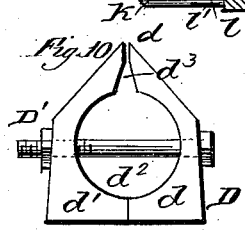
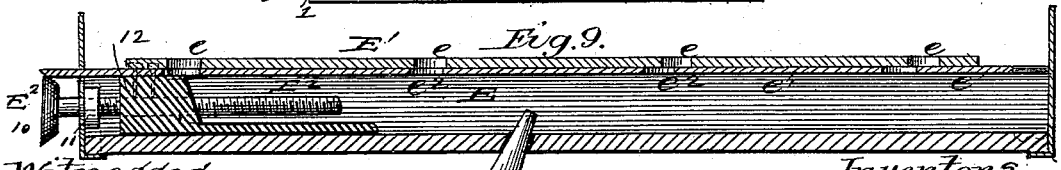


Fig. 9.



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## IMPROVEMENT IN MIDLINGS-SEPARATORS.

Specification forming part of Letters Patent No. **213,328**, dated March 18, 1879; application filed January 10, 1879.

*To all whom it may concern:*

Be it known that we, WILLIAM H. FORMAN and MILTON F. WILLIAMS, of the city and county of St. Louis, and State of Missouri, have invented certain new and useful Improvements in Middlings-Separators; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being made to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a longitudinal sectional view of our improved separator. Fig. 2 is an end view of the same. Fig. 3 is a top or plan view of the air-trunk frame. Figs. 4 and 5 are detail views of the shaker-frame. Fig. 6 is a top or plan view of the shaker; Figs. 7 and 8, sectional views of the same; Fig. 9, a longitudinal section of the air-trunk and the valve-plates for regulating the air-currents and producing a variable blast; Fig. 10, detail view of the air-tube.

This invention relates to improvements in the class of middlings-separators in which air-tubes are arranged to reciprocate under a screen for concentrating a narrow blast of air upon the screen for keeping the meshes clean and raising the light substances to the top of the material, where they are acted upon by a suction-blast; and the invention consists in the arrangement under a screen of a reciprocating frame provided with an air-trunk and a series of slotted air-tubes communicating therewith, and supported in the sides of said frame, in combination with a blast-fan and a flexible tube connecting said air-trunk and blast-fan.

It also consists in an air-tube composed of two longitudinal parts having an enlarged base adjustably secured together, whereby the tube can be smoothed and treated with shellac on the inside thereof, and the width of the longitudinal slot therein more accurately adjusted.

It further consists in the combination, with adjustable air-blast tubes, of the frame in which said tube or tubes are mounted, provided with side openings communicating with the ends of the tube or tubes and plugs for closing said openings, by which they can be readily cleaned in case they become fouled or clogged with dust.

It further consists in a novel arrangement of devices for producing a variable or increasing draft of air through the screen from head to tail, or vice versa, as may be desired.

It further consists in a novel arrangement of parts for dividing and concentrating the air-currents above the screen, whereby the material carried up by the air-currents is drawn directly to the suction-fan and discharged out of or away from the machine.

It further consists in a novel construction of shaker-frame, in combination with the eccentric for operating the same, by which a uniform transmission of the motion of the eccentric to every part of the shaker-frame is directly effected, thereby greatly increasing its efficiency.

It further consists in the side rails of a reciprocating shaker-frame having their lower outer edges beveled off, whereby the bolting-cloth can be taken off or put on the machine without taking the frame from the machine.

It further consists in a novel arrangement of devices for adjusting or tightening the bolting-cloth length wise when it has become slack from use without removing and relaying the cloth.

It finally consists in a novel arrangement of devices for adjusting or tightening the bolting-cloth transversely, all as will be hereinafter fully described.

To enable others skilled in the art to make and use our improved machine, we will now proceed to describe the exact manner in which it is carried out.

In the drawings, A represents the frame of our improved machine, upon which the several movable parts thereof are mounted. B represents a rectangular frame, mounted on the side rails, *a a*, of the frame A, and under the screen, by means of the rollers *b b*, said frame B receiving a longitudinal reciprocating movement through the medium of the crank-shaft C and connecting-rod *c*.

Mounted in the frame B at equal distances apart is a series of air-tubes, D, communicating with a longitudinal air-trunk, E, centrally arranged in said frame, and connected with a blast-fan, G, by a flexible tube, F.

The upper sides of the air-tubes D are dressed down to an angle of about forty-five de-

grees, and through the apex thereof a longitudinal slot,  $d$ , is formed. These air-tubes are made of wood, and composed of two longitudinal parts,  $d^1 d^1$ , having longitudinal semicircular slots  $d^2 d^2$  and upper bevel-faces,  $d^3 d^3$ , which form, when connected together, a circular opening, having an inverted-V-shaped mouth communicating with the longitudinal slot  $d$ , and by means of which the air-currents are concentrated, and consequently accelerated through the slot  $d$ .

The parts  $d^1 d^1$  of the tube have the greatest width at the base, so that when secured together at said point the slot or opening  $d$  at the top of the tube will be too large, and the width thereof is reduced to the proper gage, or to regulate the size thereof, as desired, by means of a screw or screws,  $D'$ , passing transversely through the parts  $d^1 d^1$  of the tube, all as clearly shown in Fig. 5.

By the above-described construction of tubes they can be more easily smoothed and treated with shellac on the inside, and the width of the slot therein more accurately adjusted than the common tubes formed in one piece.

The frame B is provided with side openings,  $b^1$ , communicating with the ends of the tubes  $D$ , by means of which said tubes can be easily and readily cleaned in case they become fouled or clogged with dust, the side openings being closed by plugs  $b^2$  when the machine is in operation.

The relative distance apart of the air-tubes in the frame B corresponds substantially to the extent of the reciprocating movement given said frame, so that all parts of the screen are equally exposed or subjected to the action of the air-currents from said tubes; and by the employment of a series of said tubes a more frequent application of the blast to any given point on the screen is obtained, thus greatly increasing its efficiency.

$E^1$  represents the top plate of the air-trunk E, provided with a series of holes,  $e$ ; and  $e^1$  is a sliding or movable valve-plate provided with a series of holes,  $e^2$ , corresponding in size with the holes in plate  $E^1$ , but placed at variable distances apart, as shown in Fig. 9.

$E^2$  represents an adjusting-screw, operated by the wheel 10, and 11 a collar on said screw, secured, in any desired manner, to the end of the air-trunk, and 12 a nut engaging with the screw, and secured to the movable or sliding valve-plate. The arrangement of the holes in the two plates  $E^1 e^1$  are such that when the openings at either end of valve-plate and trunk-plate coincide, as shown in Fig. 9, there will be a constantly-increasing difference between the series of openings or holes toward the other end, and by means of the adjusting-screw the point of coincidence and the direction of the difference between the openings can be reversed, so that the air passing to the air-tubes can be so regulated as to produce an increasing draft through the screen from head to tail thereof, or vice versa, as may be deemed expedient.

M represents a series of converging chambers arranged above the screen, the inclined plates  $m$ , forming said chambers, having secured to their lower ends pieces of flexible material  $m^1$ , reaching down to the screen beneath, thereby dividing the space above it into a number of compartments for concentrating the air-currents passing through the screen. The flexible material, while extending down to the screen, permits the material to pass over the screen without interruption. Each of the converging chambers is provided at its apex with an opening,  $m^2$ , communicating directly with the air-space  $m^3$  above, leading directly to the suction-fan L, and these openings are covered by valves  $n$ , adjustable in any desired manner, for regulating and controlling the air-currents passing through said openings.

Heretofore it has been customary to place these openings in the inclined upper sides forming the converging chambers, thus forming what is termed "settling chambers or pockets." These chambers or boxes are objectionable, for the reason that the dust accumulating in them becomes sour and musty, and, as they are never quite tight, more or less of this dust is worked out by the action of the machine, and becomes mixed with the fresh middlings on the screen. Said chambers or pockets also afford hiding and breeding places for meal-worms and various kinds of insects.

By our improved arrangement of parts as above described the dust is drawn directly to the suction-fan, and from thence discharged entirely away from the machine, and thus entirely obviating the above defects.

O represents the feed-hopper, from which the middlings are fed onto the screen beneath by means of a feed-roller,  $o$ , in the usual manner.

H represents our improved shaker-frame, operated in the usual manner by an eccentric, I, mounted on shaft I', and working in the strap H', connected to one end of the shaker-frame. This shaker-frame is composed of the end rails,  $h h^1$ , centrally secured to the longitudinal central rail,  $h^2$ , of the frame.

The end rails are provided on their inner sides with transverse grooves or slots  $g$ , to receive the tenoned ends of the side and intermediate rails,  $h^3 h^3$ , of the frame, whereby said rails are adapted to be adjusted laterally, for a purpose hereinafter fully explained.

The side rails are also adjustably secured in any desired position by the screw-rods 1, passing through the slots  $g'$  in the end rails, and engaging with the tenoned ends of said side rails,  $h^3$ .

$i$  represents cross-pieces or rails, which pass transversely through the side and intermediate rails, and also through the central rail,  $h^2$ , and to said central rail the cross-pieces or rails  $i$  are secured by the pins  $i'$ , or other equivalent means, all as clearly shown in Fig. 6.

The bolting-cloth J is attached to the under side of the end rail,  $h$ , and side, intermediate, and central rails by the strips  $j$ , said side rails

being beveled off on their lower outer edges, as shown in Fig. 4, so that the cloth can be put on or taken off without removing the shaker from the machine.

The bolting-cloth at the tail end of the shaker is also secured to the under side of the transverse bar *l*, after passing over the same, by a strip, *l'*, said bar and strip resting in the grooves *h'* of the slotted end plates or strips *k*. The plates or strips *k* are adjustably secured to the under side of the side and central rails of the shaker-frame by the screw-rods 2, passing through the slots in said plates or strips, and engaging with the screw-nuts 3, set in said side and central rails, as clearly shown in Fig. 5. These end plates or strips *k* are adjustable lengthwise by the screw-rods 4, passing through the end rail, *h'*, and engaging with screw-nuts 5, set in said end plates or strips, as clearly shown in Fig. 5; and by turning the screw-rods 4 said end plates or strips will be drawn lengthwise into the recesses *m* in end rail, *h'*, thereby tightening or adjusting the bolting-cloth lengthwise or longitudinally, while the transverse rail, *l*, being secured in the grooved plates *k*, permits the cloth to be easily and readily removed from it or secured thereto. The cloth is adjusted or tightened transversely by means of the side rails, *h<sup>3</sup>*, which are adapted to be adjusted or moved laterally on the cross-pieces or rails *i* by means of the screw-rods 6, engaging with the angle-irons 7, secured to the under side of said cross-pieces or rails *i*. The bolting-cloth being fastened to the side rails, when the screw-bolts are run through the screw-nuts 8, set in the side rails against the angle-irons on the cross pieces or rails *i*, said side rails will be forced outward or away from the stationary central rail *h<sup>2</sup>*, thus stretching the cloth transversely or laterally.

By our improved construction of shaker-frame all the adjustable parts are accessible from the outside of the machine, and by having the end rails, *h h'*, and cross-pieces or rails *i* secured to the central rail a uniform transmission of the motion of the eccentric to every part of the shaker is effected, thereby greatly increasing its efficiency.

The operation of our improved machine is as follows: The middlings are fed on the head of the shaker by any of the usual and well-known methods, and the shaker vibrated or reciprocated through the medium of the eccentric. A reciprocating motion is also given to the reciprocating frame B, and a current of air from the blast-fan through the flexible tube into the air-trunk, and thence into the transverse tubes, will be forced through the slots therein, concentrating the blasts of air against the screen above, thus keeping the meshes clean, and raising the lighter substances to the top of the material, where they are subjected to the action of a suction-blast produced by fan L, thereby removing the light impuri-

ties, the middlings being bolted through the screen, while the coarser particles are carried over the tail of the screen.

We are aware that a reciprocating air-trunk carrying a series of transverse perforated air-tubes, said air-trunk sliding upon its stationary bottom, extending from one end to the other of the machine, all arranged under a reciprocating screen, and through which air is drawn by a suction-blast, also a slotted air-tube connected to a blast-fan by a flexible tube, and arranged to reciprocate under a screen for keeping the meshes clear, and raising the lighter substances above the material to be drawn off by a suction-blast, and also bars or rods to which the bolting-cloth is attached and operated by screw attachments, whereby the bolting-cloth is adapted to be adjusted both lengthwise and transversely on the shaker-frame, are old, and none of which do we desire to claim, broadly, as our invention; but,

Having thus fully described our invention, what we do claim, and desire to secure by Letters Patent, is—

1. In a middlings-separator, a reciprocating frame, B, arranged under a screen, and provided with an air-trunk, E, and a series of slotted air-tubes, D, supported in the sides of said frame, and communicating with said air-trunk, in combination with a blast-fan, G, and flexible tube F, connecting said blast-fan and air-trunk, substantially as and for the purpose herein shown and described.

2. The herein-described air-tube D, consisting of the two longitudinal parts *d<sup>1</sup> d<sup>1</sup>*, having an enlarged base and adjustably connected together, whereby a longitudinal slot, *d*, is formed therein, substantially as and for the purpose specified.

3. The combination, with the adjustable air-blast tubes D, of a supporting-frame provided with side openings *b<sup>1</sup>* communicating with said air-tubes and plugs *b* for closing said openings, substantially as and for the purpose herein shown and described.

4. In a middlings-separator, the combination of the plate *E<sup>1</sup>*, having holes or openings *e*, and a movable or adjustable valve-plate, *e<sup>1</sup>*, having holes or openings *e<sup>2</sup>*, arranged relatively thereto, as described, whereby the openings can be varied to produce an increasing draft through the screen from head to tail, or vice versa, substantially as specified.

5. In a middlings-separator, the combination, with the screen and suction-fan, of a longitudinal and horizontal air trunk or space, *m<sup>3</sup>*, a series of converging chambers, M, provided with opening at their apex communicating with said air trunk or space, and controlled by regulating-valves *n*, and the inclined plates forming said chambers, provided with pieces of flexible material suspended therefrom and extending down to the screen, and forming compartments above the screen without inter-