2 Sheets—Sheet 1.

W. A. REIMERS & J. BIERBAUER.

Middlings-Separators.

No. 211,785. Patented Jan. 28, 1879.

Fig. 2.

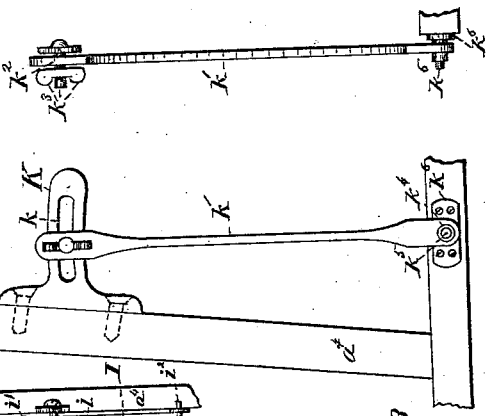


Fig. 3.

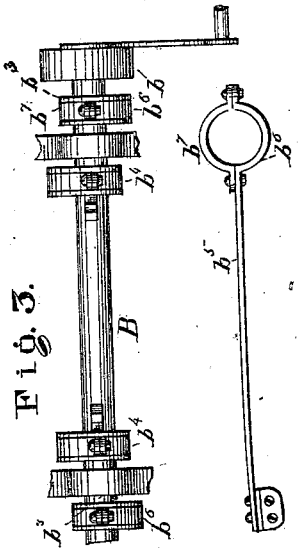


Fig. 1, a.

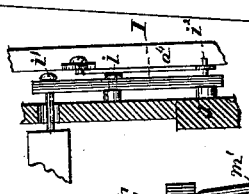
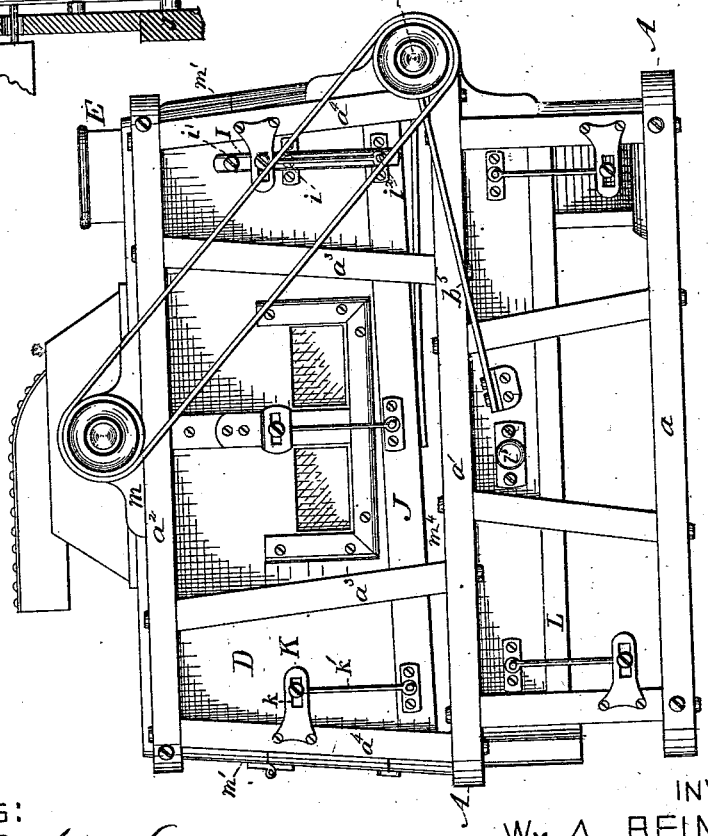


Fig. 1.



WITNESSES:

Robt. R. Cooke.

Mamie E. Stallings.

INVENTORS

WM. A. REIMERS,

J. BIERBAUR,

BY A. H. Beadle & Co.,

ATTYS.

2 Sheets—Sheet 2.

W. A. REIMERS & J. BIERBAUER.

Middlings-Separators.

No. 211,785. Patented Jan. 28, 1879.

Fig. 5.

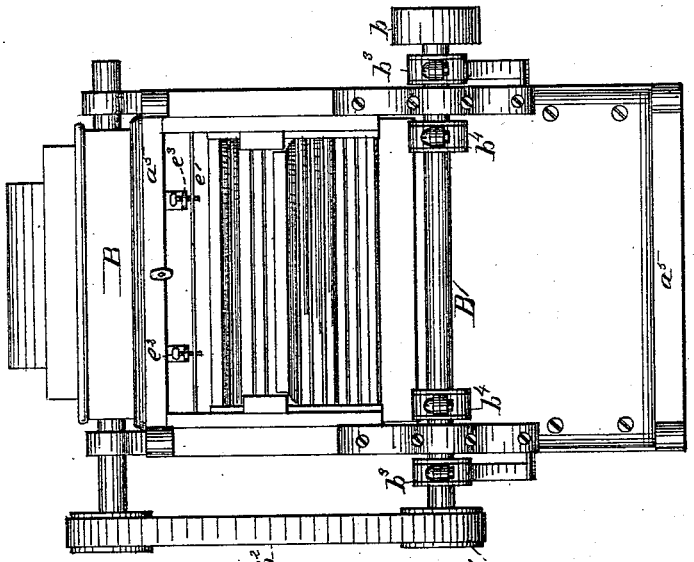


Fig. 4.

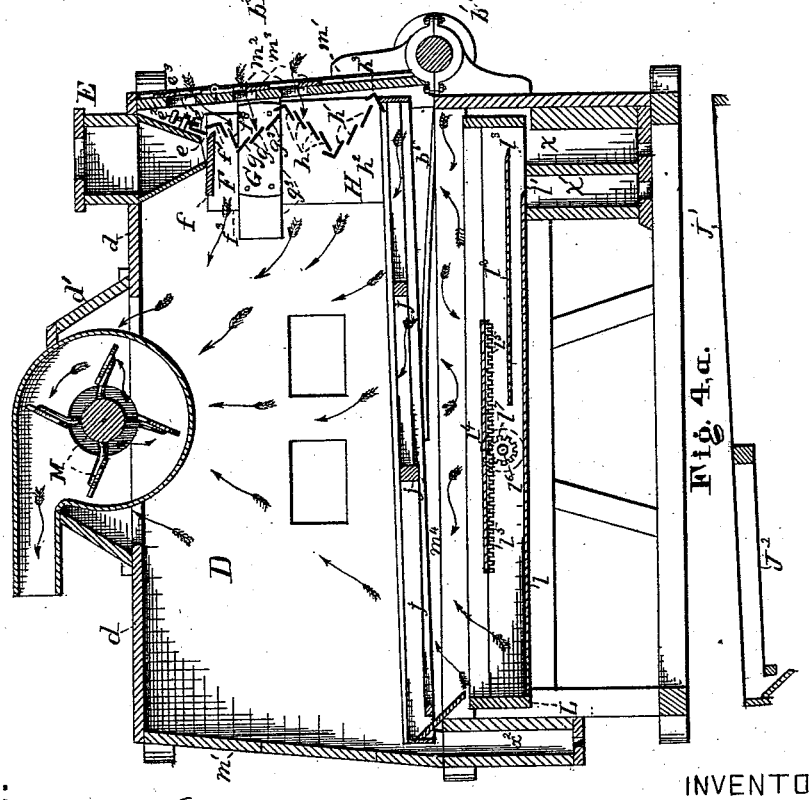


Fig. 4, a.

WITNESSES:

Robert R. Cooke.

Mamie A. Stallings.

INVENTORS:

WM. A. REIMERS,

J. BIERBAUER

BY

A. W. Beadle & Co

ATTYS.

UNITED STATES PATENT OFFICE.

WILLIAM A. REIMERS AND JACOB BIERBAUER, OF MANKATO, MINNESOTA.

IMPROVEMENT IN MIDDLINGS-SEPARATORS.

Specification forming part of Letters Patent No. **211,785**, dated January 28, 1879; application filed September 1, 1877.

To all whom it may concern:

Be it known that we, WM. A. REIMERS and JACOB BIERBAUER, of Mankato, Minnesota, have invented certain new and useful Improvements in Middlings-Purifiers; and we do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

This invention relates to that class of middling-purifiers in which an air-current is employed; and it consists, mainly, in certain details of construction, fully described hereinafter, by means of which certain marked advantages, hereinafter referred to, are obtained in the operation of the machine.

In the drawings, Figure 1 represents a side elevation of our improved machine; Fig. 1ª, a detail view of the lever-operating part of the feeder; Fig. 2, detail views of the springs supporting the shakers; Fig. 3, detail views of the main shaft and eccentric-straps, by means of which attachment is made with the shaker; Fig. 4, a central vertical longitudinal elevation of the entire machine, and Fig. 5 a front end elevation of the same with the casing-boards removed.

To enable others skilled in the art to make and use our machine, we will now proceed to describe fully its construction and manner of operation.

For convenience and clearness of description, the machine will be referred to under separate heads, as follows: first, the frame-work and actuating mechanism; second, the feeding mechanism; third, the upper shaker; fourth, the lower shaker; and, fifth, the fan.

1. *The frame-work and actuating mechanism.*—A A, Fig. 1, represent the frame-work of the sides of the machine, consisting of the lower, middle, and upper longitudinal beams, a a^1 a^2, and the vertical or nearly vertical standards a^3 a^3 a^4 a^4. a^5 a^5, Fig. 5, represent upper and lower transverse beams, by means of which the frame-work of the sides are united together. B, Figs. 1 and 3, represents the main shaft, suitably supported in proper bearings attached to the frame-work at one end of the machine, which is provided at one extremity with the pulley b, or other proper means, for receiving power from any suitable source, and at the other with a pulley, b^1, adapted by a belt, b^2, or other proper connections, to convey motion to the fan-shaft, as shown. b^3 b^3 represent eccentric-sleeves, keyed or otherwise suitably secured to the shaft B at points outside of the bearings, as shown. b^4 b^4 represent similar eccentrics, which are secured to the shaft in a similar manner, but on the opposite side of the same, at points inside of the bearings, as shown. By means of this arrangement of eccentrics the shaft is properly balanced, and hence its revolutions are uniform and without unequal strain. b^5 b^5 represents eccentric-straps, consisting of an elastic metal bar united at one end, either directly or through intermediate means, to the shaker, and provided at the other with the semicircular termination b^6, adapted, in connection with the corresponding clasp b^7 and proper fastening-screws, to inclose the eccentric-sleeve, as shown.

The operation of these parts will be readily understood. The frame-work properly supports the main shaft, and the latter, when in action, communicates motion by means of its eccentrics to the eccentric-straps and the shakers attached thereto.

2. *The feeding mechanism.*—D D, Figs. 1 and 4, represent the side boards of the upper part of the machine, which are securely attached to the frame-work, as shown, in any proper manner. d d, Fig. 4, represent top boards, and d' the fan-box, hereinafter referred to. E, Fig. 4, represents the hopper, consisting of a box, which may be of any proper size and form, but which is preferably constructed as shown in the drawings—that is, with its upper part in the form of a hollow parallelopiped, and its lower part in the form of an inverted pyramid with rectangular base. f represents an inclined feeding-board, hereinafter more fully referred to, which is located beneath the lower opening in the hopper, as shown. This feeding-board serves to support the contents of the hopper, in part, and also, by means of its reciprocating movements, to gradually feed the same to the system of inclined slats, hereinafter referred to.

e represents a longitudinal opening in the front side of the hopper, and e^1 a gate or board, having adjusting-screws e^2 e^2, held in threaded irons e^3, attached to the front of the hopper, as shown. By means of this gate and its adjust-

ing-screws the size of the opening in the front of the hopper may be readily changed, according to the necessities of the case.

F, Fig. 4, represents what may be termed the "first or upper feeder," consisting of the inclined feeding-board *f*, before referred to, and the slats f^1 f^2, as shown. These are united to and held in proper position by suitable end pieces f^3, of rectangular form, which are adapted to slide in a forward-and-backward direction upon proper ways, as shown. If desired, these end pieces may be provided with small rollers, for the purpose of reducing the friction of the movement.

The feeding-board *f*, it will be observed, is adapted to discharge its contents upon the upper slat, f^1, the front edge of the former, over which the middlings pass, being in rear of the vertical plane, in which lies the front extension of the angular slat f^1. The slat f^1 is adapted to discharge its contents upon the lower slat, f^2, its rear edge overhanging the front edge of the latter, as shown. The mechanism for giving this feeder a reciprocating movement will be hereinafter referred to.

G represents the middle feeder, consisting of the inclined slats *g* g^1 g^2, united to and held in proper position by suitable end pieces g^3, which are fastened to the sides of the machine in such manner as to secure the feeder rigidly in a fixed position. The slat *g*, it will be observed, is adapted to receive the middlings from the slat f^2, above it, and deliver them successively to the slats g^1 g^2, below it.

H represents the lower feeder, consisting of a double series of slats, *h* h^1, oppositely inclined, as shown, which are united to and held in place by proper end pieces h^2, as shown. This feeder rests upon the upper shaker, and is carried with it in its movements.

The first series, *h*, of the slats, it will be observed, is adapted to receive the middlings from the slat g^2, and to deliver them to the series h^1 below.

h^3 represents a slat, which may form a portion of the lower feeder, or be separate therefrom, as may be preferred, by means of which the middlings are properly directed to the upper shaker.

The mechanism for giving the upper feeder its reciprocating movement will now be described.

I I, Figs. 1 and 1^a, represent bars or levers, one of which is secured to the machine on each side, near its front end, by means of a pivot-stud, *i*, of any proper form. i^1 represents a stud or screw projecting through a slotted opening in the side of the machine, by means of which the upper feeder is securely connected to the upper end of the bar I. i^2 represents a stud or screw by means of which the lower end of the bar I is connected to the upper shaker.

It will be observed that the pivot *i*, upon which this bar oscillates, is not located in the center, the portion below being longer than that above.

By means of this arrangement the upper feeder receives less movement than the shaker, the latter being preferably about three-eighths of an inch, and the former about one-fourth of an inch.

The middle feeder, as before stated, is fixed to the sides of the machine, and consequently has no movement. The lower feeder being carried by the upper shaker has consequently precisely the same movement that it has.

The operation of these parts will be readily understood. The middlings are delivered from the hopper to the feeding-board, and from it to the first slat of the upper feeder in greater or less quantities, according to the position of the adjustable gate. From the upper feeder the middlings are delivered to the middle feeder, and from it to the lower feeder and shaker. As the middle feeder is without movement, its slats may be set, if desired, at a sharper angle than those of the other feeders to insure the perfect delivery of the middlings.

3. *The upper shaker.*—J, Fig. 1, represents the outer frame of the upper shaker, and *j j*, Fig. 4, the transverse and longitudinal cross-beams. j^1, Fig. 4^a, represents the upper bolting-cloth, which covers the entire upper surface of the frame, and j^2 the lower bolting-cloth, extending from the tail end of the machine to about the center of the same, an intervening space being left between the two, preferably of about one and one-half inch.

The lower bolting-cloth may be attached to a different frame, if desired, which should be properly united to the main frame, so as to move with it.

K K, Figs. 1 and 2, represent brackets of proper form, secured to the sides of the machine at suitable points, which are provided with the longitudinal slots *k k*, as shown.

k^1 k^1 represent spring bars or rods, having at one end a threaded eye, k^2, adapted to receive the threaded portion of the set-screw k^3, held in the slot *k*, and at the other the eye k^4, adapted to receive the stud k^5, projecting from the bracket k^6 upon the shaker, as shown.

By means of this construction the shaker is properly supported at suitable points, and is capable of adjustment, so its sides may be held in horizontal planes, and so also that its incline may be varied for the purpose of hastening or retarding the movement of the middlings at any desired point.

It will be observed that the upper ends of the bars k^1 are held in a fixed position by means of the set-screws, and that hence the necessary play for the vibrations of the shaker is permitted only by the yielding of the elastic material of the rods. The shaker is thus held suspended by spring-bars, by means of which its movements are made uniform and constant without lost motion, and the main shaft consequently is relieved to some extent from strain.

The shaker receives movement from the shaft B by means of the eccentric-straps b^5, before described, which are rigidly secured at

the inner ends to the lower side of the frame, as shown. These eccentric-straps are springs also. By means of their employment rigid connections are made at each end, and positive movements are obtained without lost motion.

The operation of these parts will be readily understood. Motion having been communicated to the shaft B, the shaker, which is suspended upon the spring-bars, is caused, by means of the intermediate connections described, to vibrate, for the purpose of operating properly upon the middlings. By means of the slotted brackets and the adjustable set-screws, the position of the shaker may be readily varied, according to the necessities of the case.

It will be understood that by properly adjusting these supporting-bars the vertical position of the shaker may be readily varied; hence one end may be raised to cause the middlings to flow more rapidly, or one end lowered to produce the opposite effect; or one side may be raised to throw the middlings to the other, if desired.

The middlings being delivered to the shaker by the feeding mechanism pass over its surface in the usual well-known manner, the fine particles falling through the meshes to the lower shaker below, and the coarser particles passing over the tail end to the discharging-spout, as shown.

4. *The lower shaker.*—L represents the outer frame-work of the lower shaker, and *l*, Fig. 4, an inclined bottom piece of zinc, which covers the entire surface, with the exception of a transverse discharge-opening, l^1, as shown. l^2 represents a division board or plate, located above the bottom piece *l*, which extends about to the center of the machine, and is provided with a transverse discharge-opening, l^3, as shown. l^4 represents a loose board or plate, located above the board l^1, which is adapted to slide upon proper ways, as shown. l^5 represents ratchet-bars attached thereto, and l^6 a shaft having proper pinions l^7, adapted to engage with the rack-bars, as shown. l^8, Fig. 1, represents a crank or other proper means for revolving the shaft l^6 when it is desired to change the position of the board l^3. The shaker itself, as a whole, receives movement from the main shaft B in the same manner as the upper shaker.

The operation is as follows: The finer material, which passes through the bolting-cloth at the upper end of the upper shaker, is received upon the adjustable board l^4 and the permanent board l^2 of the lower shaker, and by them conveyed to the discharge-spout *x* as finished middlings. The coarser materials, which pass through the bolting-cloth at the lower end of the upper shaker, are conveyed to the discharge-spout x^1 as returns.

By adjusting the loose board, the division between returns and finished middlings may be made at any proper point in the upper shaker.

5. *The fan.*—M represents the fan, of any proper construction, having the shaft supported in proper bearings *m*. *d'* represents the fan-box, before referred to, which is provided with the discharge-spout, opening toward the tail of the machine. m^1 m^1 represent the front and rear ends of the machine, which are tightly closed, with the exception of proper doors for inspecting the interior, and also proper openings m^2 m^2 in the front end for permitting the entrance of air. m^3 m^3 represent gates or valves, by means of which the amount of air admitted may be determined. m^4 m^4 represent longitudinal openings in the sides of the machine, by means of which air is admitted beneath the upper shaker.

The operation will be readily understood. The fan having been set in motion, air is drawn in through the openings in the front end of the machine, for the purpose of removing the lighter impurities from the descending stream of middlings. Air also is drawn in under the upper shaker, and up through the same, for the purpose of carrying off the lighter impurities, and also lightening up the material, and preventing it from becoming clogged.

From the foregoing description the operation of the machine, as a whole, will be readily understood.

The middlings having been spouted into the hopper, and the machine having been set in motion, the former will be delivered by the feeding-board in a greater or less quantity, according to the position of the gate, upon the system of slats. As it falls from one to another of these, in a thin stream, it is acted upon by the air-current entering the front end of the machine, and the lighter impurities are consequently removed before the upper shaker is reached.

The amount of middlings passing over the feeders may be readily increased or diminished, according to the necessities of the case, and so may the amount of air entering the front end of the machine.

As the feeding-slats are arranged in series inclined at opposite angles, it follows that the stream of middlings passing over these is constantly changed in direction, and hence every part of the same is thoroughly exposed to the action of the air-blast. From the feeding-slats the middlings from which the lighter particles have been removed are delivered to the upper shaker. The finer particles, falling through the upper end of this shaker down upon the upper divisions of the lower shaker, are conveyed away to the discharge-spout *x* as finished middlings. The coarser particles, passing through the lower end of the upper shaker, fall upon the lower division of the lower shaker, and are conveyed to the discharge-spout x^1 as returns. The heavier impurities are conveyed over the tail end of the shaker to the spout x^2, as shown. The air, entering the sides of the machine below the lower shaker, serves to

carry off any light impurities that may remain, and also to lighten up the flour and prevent it from clogging.

Some of the advantages of the described construction are as follows: The construction of the parts is very simple, and yet the machine is very effective in operation. The friction between the moving parts is slight, so that little power is required to run the machine and the wear is not great. The main shaft being balanced, no unequal strain is produced. Rigid connections being made between the moving parts, the movements are positive and all noise and jar in operation are avoided.

By means of the adjustment described the machine is under complete control of the miller at all times in its minutest details.

By giving the upper feeder less movement than the lower the material is spread into a thinner sheet, and hence more perfect results are obtained.

I do not limit myself to any particular size of machine or any special material; but the main portion of the machine is made of wood. The slats are wood covered with zinc, and the actuating parts are metal.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the movable feed-board F, the fixed system of slats, J, and the movable system of slats, H, as described, the former having less movement than the latter, as and for the purpose described.

2. The combination of the upper system of slats, F, with the lower system of slats, H, the former having less movement than the latter, for the purpose of enabling the lower system to spread more thinly the material acted upon.

3. A system of feeding-slats, substantially as described, arranged in a continuous line in planes oppositely inclined, as and for the purpose described.

4. In combination with the bearing of the shaft B and the shaft, the balanced eccentrics b^3 b^4, located on the shaft on each side of the bearing, as described.

5. In combination with the shaft B, the balanced eccentrics b^3 b^4, the elastic strap b^8, and shakers J L, supported by the elastic bars k^1, as described.

6. In combination with a shaker and a slotted bracket, K, the elastic suspension-bar k^1, rigidly fixed at each end against lateral movement, as and for the purpose described.

7. The lower shaker, L, having the two permanent divisions l l^2, the latter projecting beyond the former, and the adjustable cut-off plate l^4, arranged above plate l^2, as set forth.

This specification signed and witnessed this 18th day of August, 1877.

WILLIAM A. REIMERS.
JACOB BIERBAUER.

Witnesses:
CHARLES OTTO,
THEODORE NIEHOFF.