(No Model.) 3 Sheets—Sheet 1.

O. M. MORSE.

FLOUR BOLT.

No. 456,584. Patented July 28, 1891.

Fig. 1.

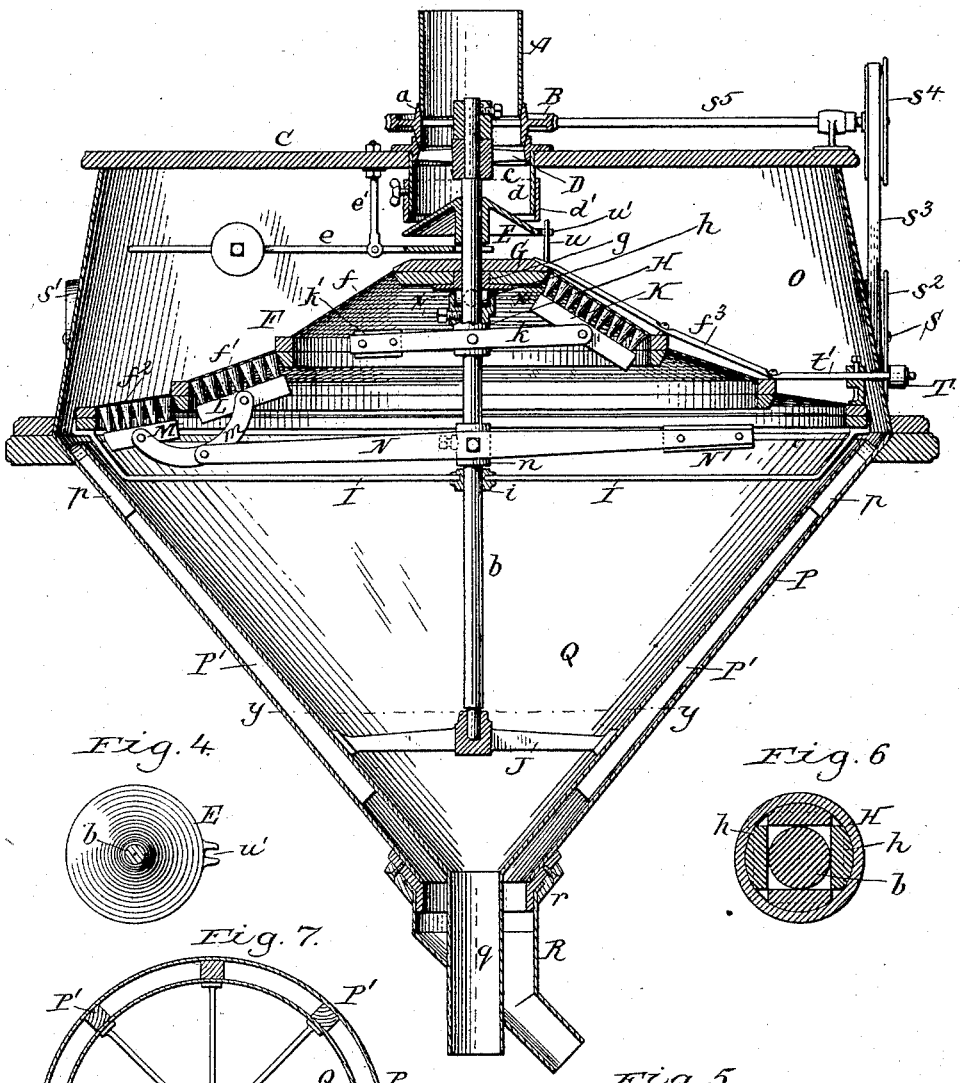


Fig. 4.

Fig. 6.

Fig. 7.

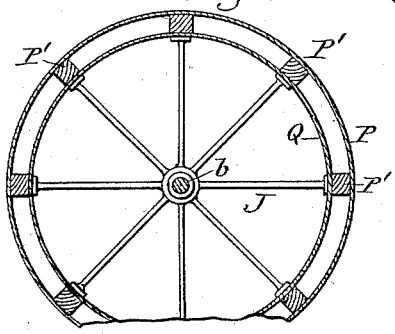
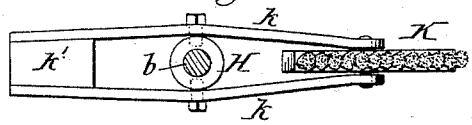


Fig. 5.



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(No Model.) 3 Sheets—Sheet 2.

O. M. MORSE.

FLOUR BOLT.

No. 456,584. Patented July 28, 1891.

Fig. 2.

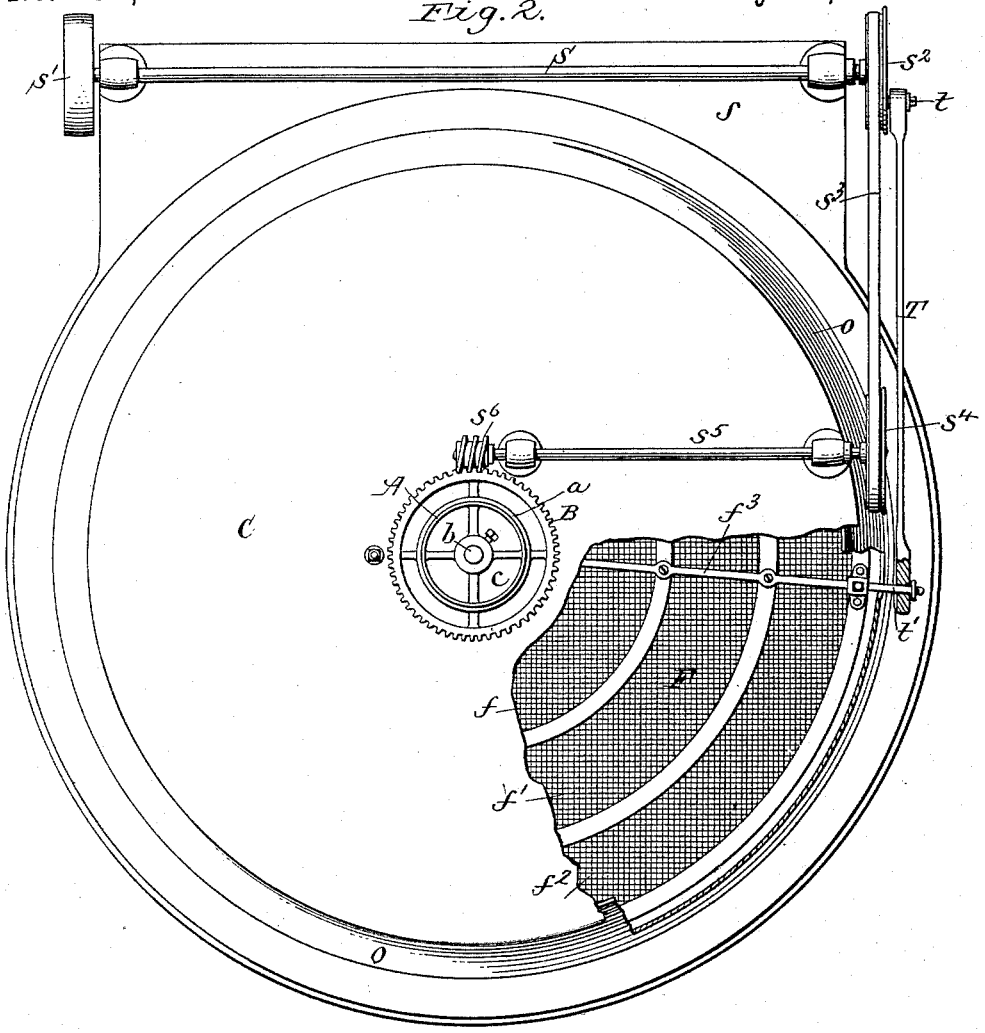
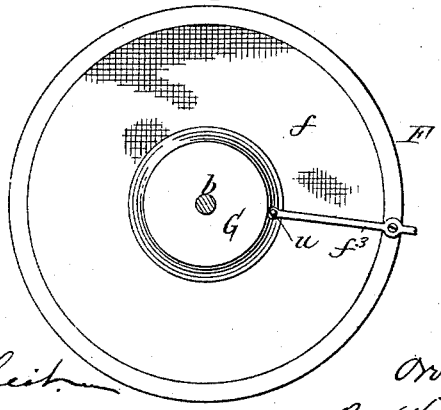


Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

O. M. MORSE.

FLOUR BOLT.

No. 456,584. Patented July 28, 1891.

Fig. 8.

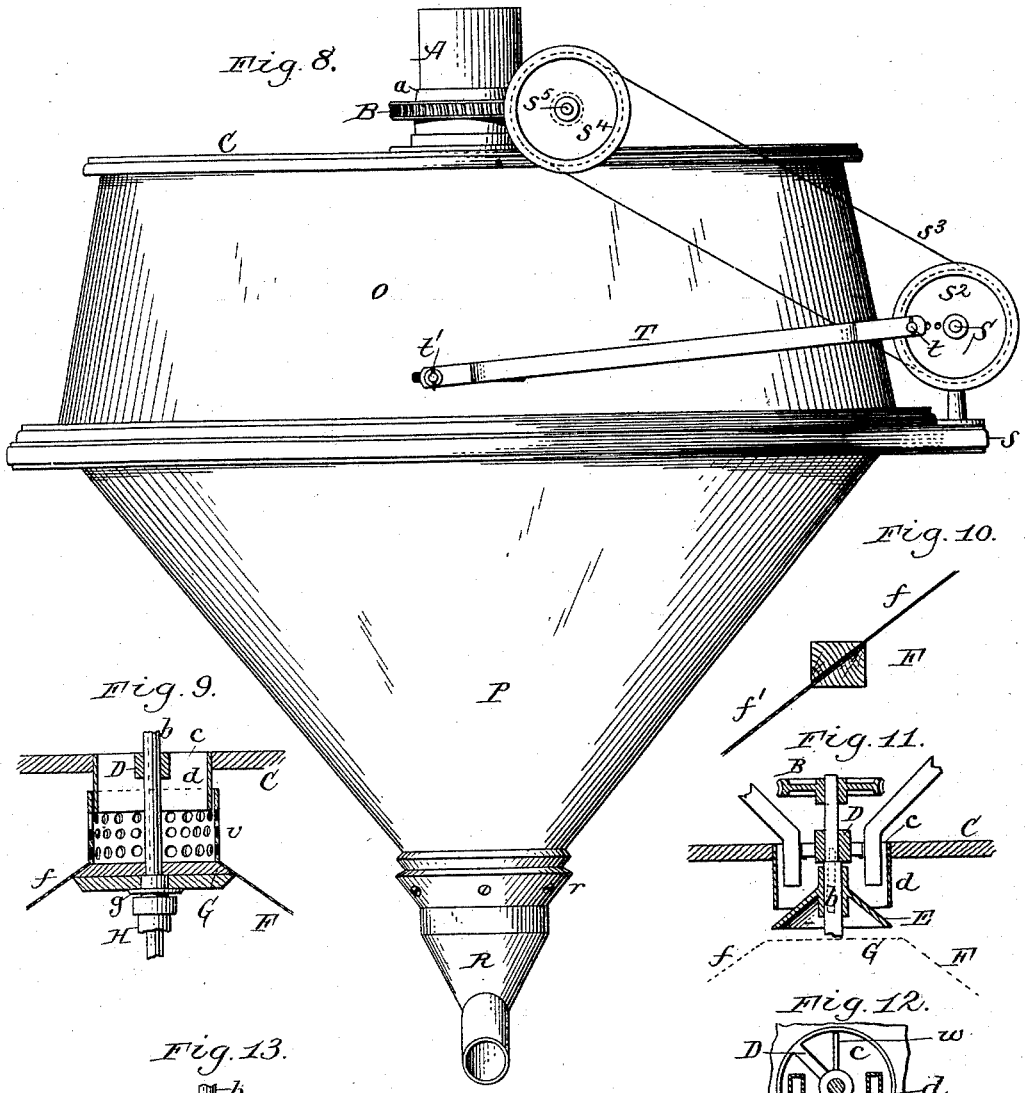


Fig. 10.

Fig. 9.

Fig. 11.

Fig. 12.

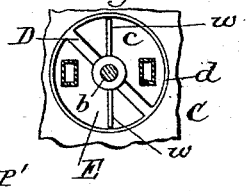


Fig. 13.

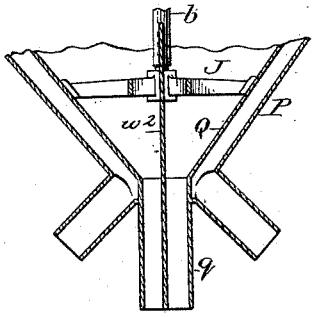
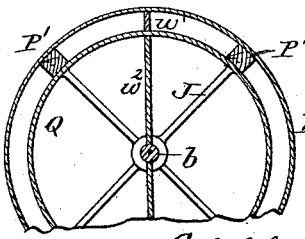


Fig. 14.



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UNITED STATES PATENT OFFICE.

ORVILLE M. MORSE, OF JACKSON, MICHIGAN, ASSIGNOR TO THE KNICKERBOCKER COMPANY, OF SAME PLACE.

FLOUR-BOLT.

SPECIFICATION forming part of Letters Patent No. 456,584, dated July 28, 1891.

Application filed July 24, 1889. Serial No. 318,560. (No model.)

To all whom it may concern:

Be it known that I, ORVILLE M. MORSE, a citizen of the United States, residing at Jackson, in the county of Jackson and State of Michigan, have invented new and useful Improvements in Flour-Bolts, of which the following is a specification.

This invention relates to that class of flour-bolts in which a circular screen is employed, which receives the material to be separated at its center and discharges the tailings at its periphery.

The object of the invention is to improve the feed mechanism, so as to deliver the material uniformly upon the screen in a circular stream; also, to improve the construction of the screen, so as to increase the separating capacity thereof, and in other respects; also, to provide means for keeping its meshes clear, and finally to provide proper devices for collecting and discharging the tailings and the separated material.

In the accompanying drawings, consisting of three sheets, Figure 1 is a sectional elevation of my improved flour-bolt. Fig. 2 is a top plan view thereof with a portion of the deck broken away to expose the screen. Fig. 3 is a top plan of the central portion of the screen. Fig. 4 is a top plan of the feed-cone. Fig. 5 is a top plan view of the upper brush on an enlarged scale. Fig. 6 is a sectional top plan, on an enlarged scale, of the central screen-support, taken in line $x x$, Fig. 1. Fig. 7 is a horizontal section of the receiving-hoppers in line $y y$, Fig. 1. Fig. 8 is a side elevation of the machine at right angles to Fig. 1. Fig. 9 is a sectional elevation showing a modified construction of the feed device. Fig. 10 is a vertical section showing a modified form of the screen-frames. Fig. 11 is a sectional elevation showing a modified construction of the feed device. Fig. 12 is a top plan view thereof. Fig. 13 is a vertical section showing a modified construction of the discharge-spouts. Fig. 14 is a fragmentary horizontal section of the receiving-hoppers, showing a modified construction thereof.

Like letters of reference refer to like parts in the several figures.

A represents the feed-spout, which is secured to the ceiling or in any other suitable way, and which conducts the material to be separated to the machine.

B is a horizontal worm-wheel, which is arranged at the lower end of the feed-spout and secured to the upper end of a vertical shaft b for rotating the same. This worm-wheel is provided between its hub and its rim with an upright annular flange a, which projects both upwardly and downwardly from the arms of the wheel. The lower end of the feed-spout enters the upper portion of the flange a and delivers the material through the spaces between the arms of the wheel.

C is the deck or top plate of the case of the machine, provided at its center with an opening c, which is arranged underneath the feed-spout and worm-wheel.

D is a bridge-tree secured across the opening c immediately underneath the worm-wheel, which latter enters, with the lower portion of its flange a, the upper rim of the bridge-tree D.

d is a collar, which is fitted into the opening c below the bridge-tree, and which depends from the deck into the machine toward the feed-cone E, which is arranged immediately underneath this collar.

The bridge-tree D forms the bearing for the upper end of the shaft b and supports the latter below the worm-wheel B.

The feed-spout, the worm-wheel, the bridge-tree, and the collar form a passage by which the material to be separated is delivered upon the feed-cone E. This cone, as shown in the drawings, is mounted loosely upon the shaft b and does not take part in the rotation thereof, but is capable of being raised and lowered on the shaft to adjust the annular space between the lower edge of the collar d and the feed-cone, through which the material is fed into the machine. The vertical movement of the feed-cone is controlled automatically by a weighted lever e, which engages under the feed-cone, and which is pivoted to a hanger e', attached to the deck C. As the material in the feed-spout accumulates, the weight of the material depresses the feed-cone and increases the feed. When the quantity in the feed-spout decreases, the weighted lever

raises the feed-cone and decreases the thickness of the stream, so that an annular stream of greater or less but uniform thickness all around the feed-cone is delivered at all times, although the quantity of material which is delivered into the feed-spout may vary. It is obvious that a spring may be substituted for the weighted lever for controlling the position of the feed-cone. The collar d may be provided with a vertically-adjustable telescopic extension d' for regulating the position of the lower edge with reference to the feed-cone.

F represents the circular screen, which is arranged below the feed-cone and around the central shaft b. The screen is elevated at the center and descends toward the periphery, preferably with gradually-decreasing pitch, so that the material does not gather speed as it passes over the screen, but maintains as nearly as possible a uniform velocity from the center to the circumference. As shown in the drawings, the screen is composed of three concentric conical sections f f' f^2, which are each composed of two annular frames of wood covered with bolting-cloth and connected by radial braces f^3. The inner and upper section f is provided with a central head G, which surrounds the shaft b, and which is provided in its under side with a bushing g, in which the shaft turns.

H represents a socket or recessed collar, which is secured to the shaft below the head G, and which supports the screen by means of anti-friction rollers h, which are placed in the socket around the shaft b, and upon which the bushing g rests. These friction-rollers are preferably used because it is difficult to oil the contact-surfaces underneath the head G. The lower ring of the upper section f rests upon the top ring of the next following section f', and the lower ring of that section rests upon the top ring of the marginal section f^2, the different sections of the screen being secured together by screws or by other suitable means, so that they can be readily taken apart when it is desired to change them for sections covered with bolting-cloth of different mesh. The peripheral portion of the screen is supported or centered upon the shaft b by arms I, which connect the marginal frame of the screen with a hub i, which fits snugly around the shaft and in which the shaft turns.

J represents a bridge-tree, which is secured within the casing of the machine and in which the lower end of the shaft rests.

The screen is kept clear by brushes, which are connected with the shaft so as to rotate therewith and which bear against the under sides of the screen-sections. In order to enable the brushes to adapt themselves to the angle of the cloth in each screen-section and to the inequalities of the cloth, they are mounted in the following manner:

K represents the brush which sweeps the under side of the top section f of the screen. This brush is pivoted to arms k, which are in turn pivoted to opposite sides of the socket H, and which carry on the opposite side of the pivots a weight k', which tends to raise the brush and hold it against the under side of the screen.

L and M represent the brushes which sweep the lower screen-sections f' f^2. These brushes are pivoted to the ends of the duplex lever m, which is in turn pivoted between levers M. The latter straddle the shaft b and a hub n, secured to the same, to which hub the levers N are pivoted.

N′ represents a weight attached to the opposite ends of the levers N and whereby the brushes L and M are raised and held against the under sides of their respective screen-sections.

O represents the upper portion of the peripheral wall of the casing, extending from the deck C downwardly with a gradually-increasing diameter and terminating opposite the periphery of the circular screen.

P represents a hopper, which forms the lower portion of the peripheral wall of the casing.

Q represents an inner hopper, which is arranged concentric with the outer hopper P, and which has its top edge arranged inwardly of the marginal edge of the screen, so that it receives all the material which passes through the meshes of the screen, while the tailings escaping from the periphery of the screen pass beyond the top edge of the inner hopper and into the outer hopper P. The outer edge of the inner hopper is supported on the outer hopper and held at the proper distance from the same by stay-strips p, which are fastened between the two hoppers, and which have their top ends beveled to prevent the material from lodging on the same. The majority of these strips are short; but some of them (marked P′) extend downwardly between the two hoppers below the bridge-tree J for the purpose of supporting the lower portion of the inner hopper, to which this bridge-tree is attached. The inner hopper is provided with a round discharge-spout q, which extends downwardly through the inclined bottom of a swiveled discharge-spout R. The latter is attached to the outer hopper P by means of a collar r, which confines an outwardly-projecting flange formed on the upper edge of the swiveled spout. This spout, being swiveled concentric with the inner spout q, can be turned so as to discharge the material in any desired direction.

S represents the horizontal driving-shaft of the machine, which is arranged above an extension s of the frame of the machine and journaled in bearings secured to this extension. Power is supplied to the shaft S by a pulley s' or any other suitable means, and the power is transmitted from the shaft to the vertical brush-shaft b and to the screen in the following manner:

s^2 represents a crank-wheel, which is se-

cured to one end of the horizontal shaft S, and which serves at the same time as a pulley.

s^3 is an endless belt, which runs around the pulley s^2 and around a pulley s^4, which is secured to a counter-shaft s^5, journaled upon the deck C of the machine and provided at its opposite end with a worm s^6. The latter meshes with the worm-wheel B and turns the same, and thus rotates the shaft b, to which the brushes are attached.

T represents a connecting-rod, which connects the wrist-pin t of the crank-wheel s^2 with a pin t', projecting from the periphery of the screen, so as to produce a horizontal reciprocating motion in the screen. This motion is curvilinear, concentric with the brush-shaft b, and the eye in the connecting-rod, in which the pin t' engages, is made flaring for the purpose of allowing the pin the necessary play in the eye, as shown in Fig. 2.

The crank-wheel may be provided with several holes at different distances from its center, in either of which the crank-pin is secured. By changing the pin from one hole to another the throw of the screen can be increased or reduced. The feed-cone receives an oscillating or curvilinear reciprocating motion concentric with the brush-shaft by means of a pin u, which projects upwardly from the top of the screen and engages in a fork, loop, or notch u', projecting from the base of the feed-cone.

The material to be separated passes from the feed-spout through the openings between the arms of the worm-wheel B and through the openings between the arms of the bridge-tree D and through the collar d upon the feed-cone, from which it flows in an annular stream upon the center of the screen. It then flows over the screen from the center to the circumference thereof, the fine material passing through the meshes of the cloth and dropping into the inner hopper Q, from which it is discharged through the spout q, while the coarse material passes over the peripheral edge of the screen and drops into the outer hopper P, from which it is discharged through the swivel-spout R. The oscillatory movement of the feed-cone prevents the material from clogging in the collar d and superposed parts. The oscillation of the screen produces a zig-zag motion of the material over the cloth, whereby the material is rolled over at each reversal of the movement, and the heavier particles are caused to descend and arrange themselves next to the cloth, while the lighter particles are floated and worked to the top of the layer of material. In passing from one screen-section to the section next below, the material drops over the annular edge of the lower ring of the upper screen-section. This descent of the material over the annular edge of the raised shelf formed by the lower edge of each section to the cloth of the next lower section causes the heavier particles to reach the cloth first and materially aids in effecting the desired separation.

While my improved machine may be used for separating various kinds of material, it is especially desirable for scalping the breaks from roller-mills and for grading and dusting middlings.

When the machine is used for scalping, the screen is covered with wire-cloth, and when it is used for grading or dusting middlings it is covered with bolting-silk.

When the machine is used for treating middlings, the feed-cone may be omitted and a perforated collar v may be secured to the upper head G of the screen, so as to surround the depending collar d and receive the material therefrom, as represented in Fig. 9. The material accumulates in this perforated collar and issues through the perforations thereof all around the head G of the screen. This construction of the feed mechanism is desirable for fine material, such as middlings, but is not so desirable for coarse material.

The machine may be adapted to operate simultaneously upon two or more different grades of material by dividing the feed device and the receptacles for the separated materials in such a manner as to keep the materials to be treated and the products of their separation separate from each other. To this end the feed-cone may be divided by upright partitions w into two parts, as represented in Figs. 11 and 12, each of which receives a separate grade of material from a separate feed-spout, and the receiving-hoppers may be divided below the screen by partitions w' w^2 into a corresponding number of parts, as represented in Figs. 13 and 14, each of which discharges the material which it receives through a separate discharge-spout. This enables the same machine to be used for scalping a number of breaks simultaneously in a small mill.

When the machine is used for treating two or more different grades of material simultaneously, the feed-cone can only have an oscillatory movement; but when the machine is used for one kind of material only at a time the feed-cone can have a rotary movement with the brush-shaft. The mechanism which has been described for rotating the brush-shaft produces a continuous rotary movement of the latter; but it is obvious that an intermittent rotary movement may be imparted to the brush-shaft by a ratchet mechanism.

Instead of constructing the adjacent rings of the screen-sections of square or four-sided cross-section, as represented in Fig. 1, they may be constructed of angular cross-section, as represented in Fig. 10.

By applying the power to the brush-shaft above the inclosing casing the machine can be suspended from the ceiling, and the lower portion of the machine is left unobstructed, so that the discharge-spouts are accessible from all sides.

I claim as my invention—

1. The combination, with the circular sepa-

rating-screen inclined from its center toward its periphery, with a pitch decreasing toward the periphery, of a central feed device, substantially as set forth.

2. The combination, with a circular separating-screen, of a central rotating shaft, a weighted arm pivoted to the shaft, and a brush pivoted to said arm and bearing against the under side of the screen, substantially as set forth.

3. The combination, with a circular separating-screen, of a central rotating shaft, a weighted arm pivoted to the shaft, a lever pivoted to the weighted arm, and brushes pivoted to said lever on opposite sides of its pivot, substantially as set forth.

4. The combination, with a circular separating-screen and mechanism whereby a horizontal oscillating motion is imparted to the screen, of a central feed-tube, and a feed-cone connected with the screen and receiving an oscillating motion from the screen, substantially as set forth.

5. The combination, with a circular separating-screen provided with an upwardly-projecting pin, of a central feed-tube, and a feed-cone provided with a fork which receives said pin, substantially as set forth.

6. The combination, with the central shaft provided with a supporting collar or socket, of a circular screen surrounding said shaft and supported upon said collar or socket, substantially as set forth.

7. The combination, with the central shaft and a supporting-socket secured thereto and provided with anti-friction rollers, of a circular screen resting upon said rollers, substantially as set forth.

8. The combination, with the central shaft and a supporting socket or collar secured thereto, of a circular screen supported with its central portion upon said collar or socket, and a hub surrounding said shaft and connected with the marginal portion of the screen by arms, whereby the marginal portion of the screen is centered upon the shaft, substantially as set forth.

9. The combination, with a circular screen and a central shaft carrying a cleaner, of an inclosing casing provided with a central feed-opening, a bridge-tree secured across said opening, a driving-wheel secured to the shaft above said bridge-tree, and a feed-spout arranged above said driving-wheel, substantially as set forth.

Witness my hand this 13th day of July, 1889.

ORVILLE M. MORSE.

Witnesses:
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SAM. H. CAMP.