F. M. COLE.

SEPARATING MACHINE.

APPLICATION FILED JULY 20, 1911.

1,008,697. **Patented Nov. 14, 1911.**

3 SHEETS—SHEET 1.

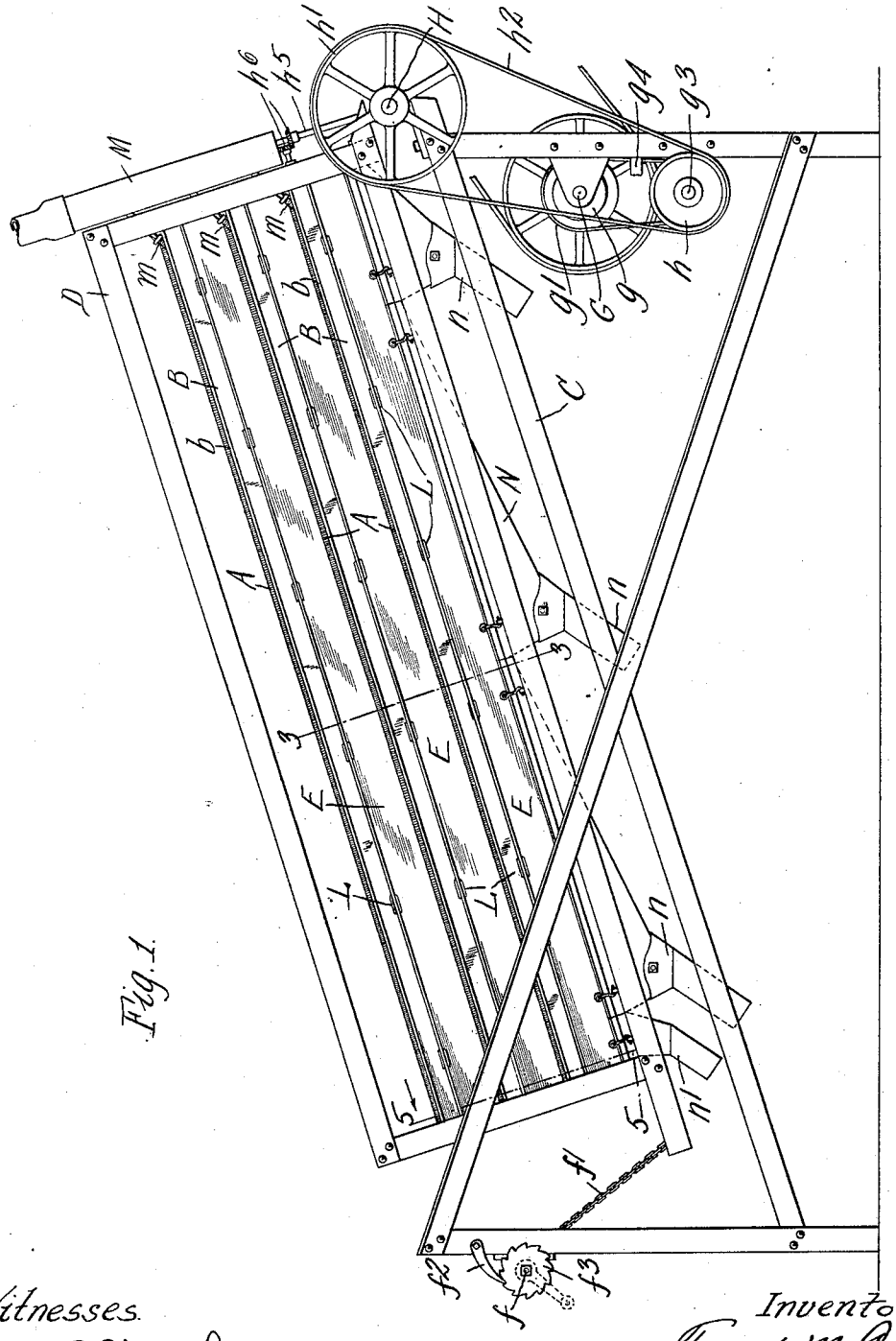

Fig. 1.

Witnesses.

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3 SHEETS—SHEET 2.

Fig. 2.

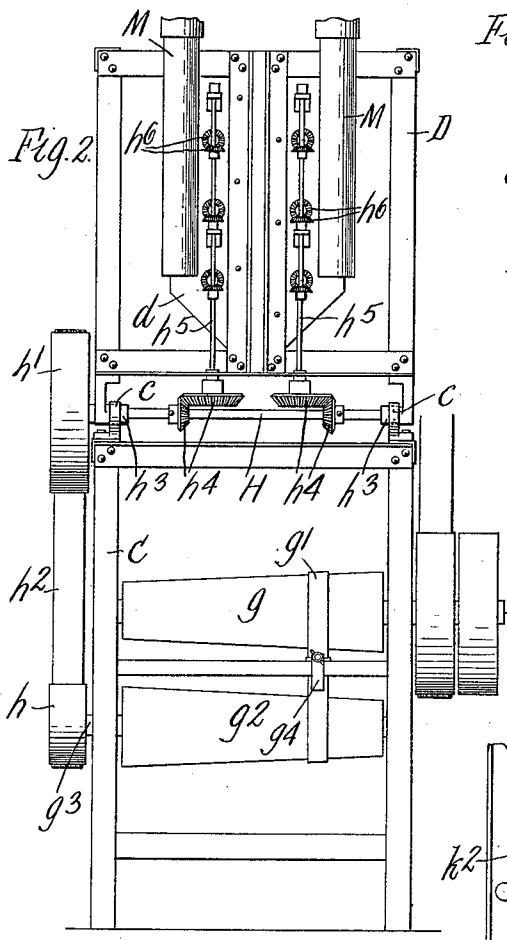


Fig. 3.

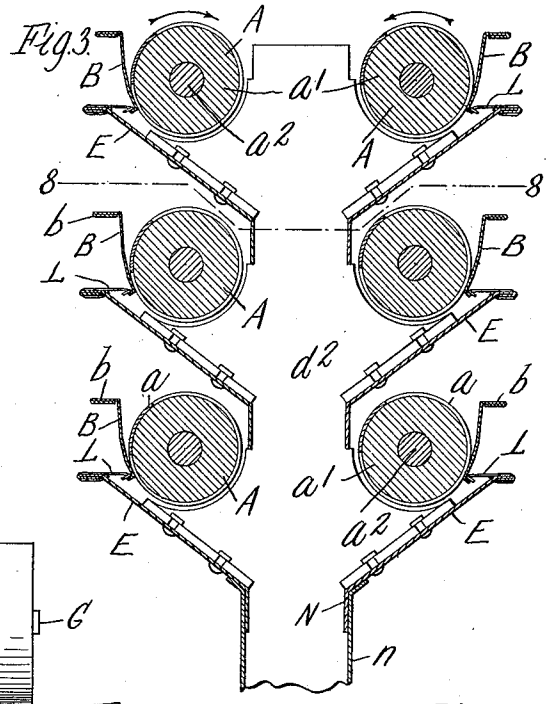


Fig. 4.

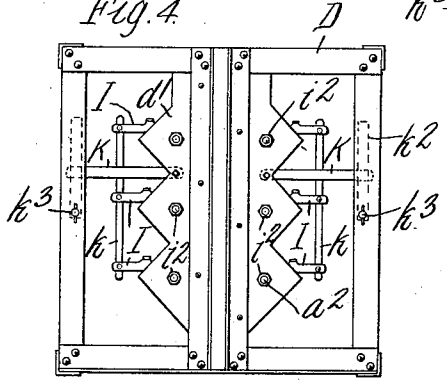


Fig. 5.

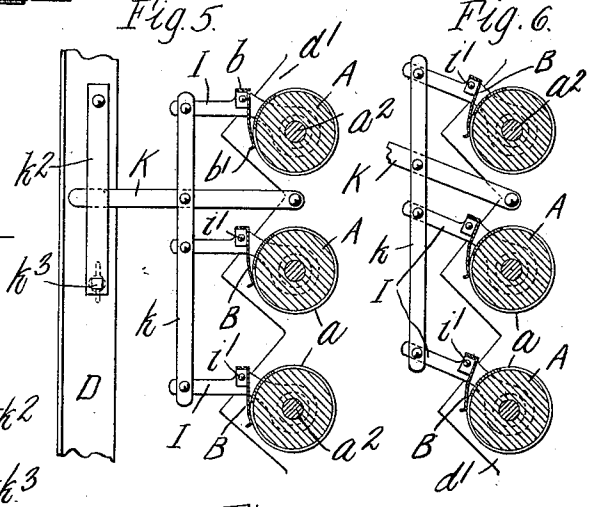
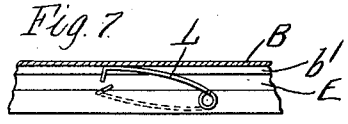


Fig. 6.

Fig. 7.



Witnesses.

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3 SHEETS—SHEET 3.

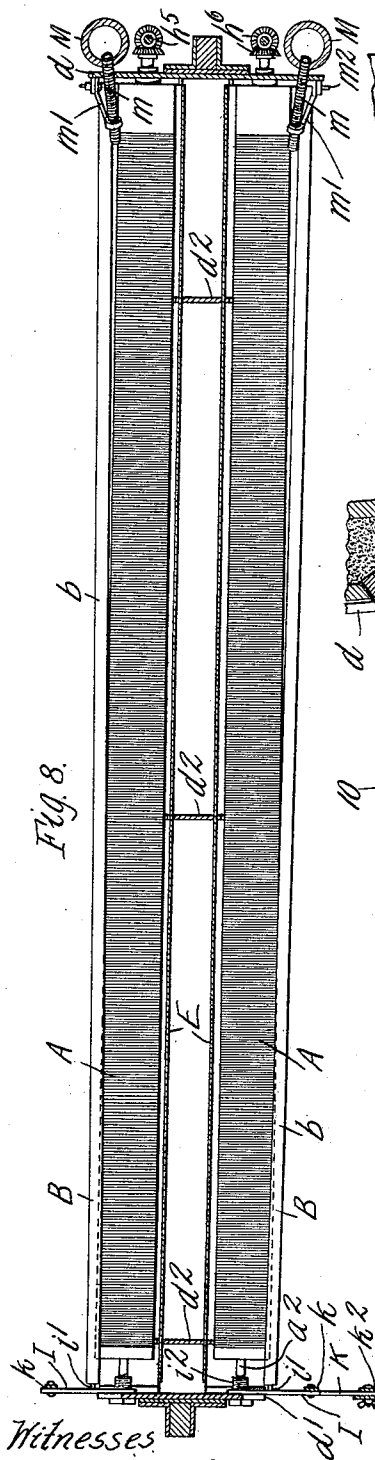

Fig. 8.

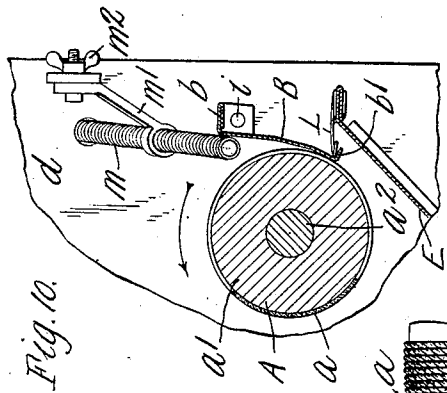

Fig. 10.

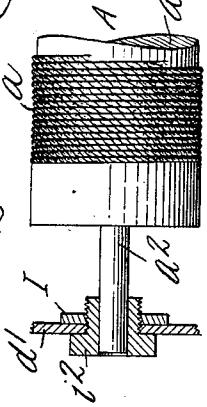

Fig. 12.

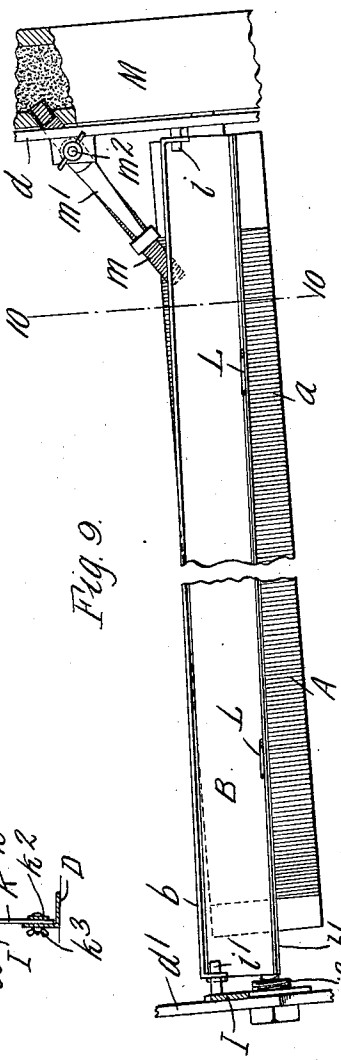

Fig. 9.

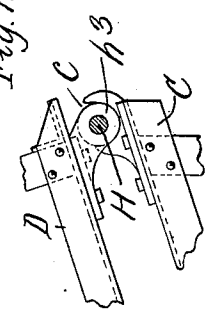

Fig. 11.

Witnesses
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UNITED STATES PATENT OFFICE.

FRANK M. COLE, OF BUFFALO, NEW YORK, ASSIGNOR OF ONE-HALF TO MILLARD F. TALLMAGE, OF BUFFALO, NEW YORK.

SEPARATING-MACHINE.

1,008,697. Specification of Letters Patent. **Patented Nov. 14, 1911.**

Application filed July 20, 1911. Serial No. 639,521.

To all whom it may concern:

Be it known that I, FRANK M. COLE, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Separating-Machines, of which the following is a specification.

This invention relates to that type of machines for separating different particles of material, in which a stream of material moves lengthwise alongside of a rotary roll to which some of the particles cling so as to be carried over by the roll and separated from the other particles. The separation is probably due to a difference in the shape or in the character of the surface of the particles, those particles which are approximately round or have comparatively smooth surfaces traveling lengthwise along the side of the roll without clinging thereto, while those particles which are more oblong, flat or irregular, or which have rough surfaces, cling to and are carried over by the roll.

The machine is primarily intended for separating small seeds or grains, for instance, clover seed, grass seed and the seeds of weeds commingled therewith, but it can be used for separating particles of other material.

One object of the invention is to produce a separating roll for machines of this sort which is more efficient and certain in action than the rolls heretofore employed.

Another object of the invention is to produce an improved separating machine of this character which is efficient and certain in operation and has a large separating capacity, which can be readily adapted to the requirements of the particles to be separated, and which is of simple and comparatively inexpensive construction.

In the accompanying drawings, consisting of three sheets: Figure 1 is a side elevation of a separating machine embodying the invention. Fig. 2 is an elevation of the feed end of the machine. Fig. 3 is a fragmentary transverse sectional elevation, on an enlarged scale, on line 3—3, Fig. 1. Fig. 4 is an elevation of the rear end of the frame in which the separating rolls are supported. Fig. 5 is a fragmentary transverse sectional elevation, on an enlarged scale, on line 5—5, Fig. 1, showing the adjusting mechanism for the trough bars. Fig. 6 is a similar view showing a different adjustment of the trough bars. Fig. 7 is a fragmentary sectional plan view on a still larger scale, showing one of the pressure springs for the trough bars. Fig. 8 is a fragmentary sectional plan view of the machine on a reduced scale, on line 8—8, Fig. 3. Fig. 9 is a fragmentary side elevation thereof, partly in section. Fig. 10 is a fragmentary transverse sectional elevation on an enlarged scale, on line 10—10, Fig. 9. Fig. 11 is a sectional elevation, on an enlarged scale, of the hinge bearing for the adjustable roll supporting frame. Fig. 12 is a fragmentary elevation, partly in section, on an enlarged scale, of one of the separating rolls and the bearing therefor.

Like reference characters refer to like parts in the several figures.

A represents a rotary inclined separating roll and B a bar, strip or other device which is arranged parallel with the roll at one side thereof so as to form with the roll a trough or valley through which a stream of material is caused to flow by reason of the rotation of the roll and the inclination of the valley. The roll is driven so that its surface turns upwardly away from the bar B, as indicated by the arrows in Figs. 3 and 10, and as the material travels through the inclined valley in contact with the roll the more irregular shaped or rougher surfaced particles cling to the surface of the roll A and are carried upwardly over the roll to the opposite side thereof from the trough bar B and then drop off or are dislodged from the surface of the roll by engagement with the lower edge of the trough bar, which bears against the surface of the roll.

The separating roll has a covering *a* consisting of a cord, string or twine of fibrous material, wound helically on the roll and extending nearly from end to end thereof. This cord covering forms a continuous shallow helical furrow which, together with the roughness caused by the twisted strands of the cord, produce a surface of such a nature that the irregular-shaped or rough-surfaced seeds or particles will cling thereto, while the approximately round or smooth-surfaced particles will not cling thereto. Rolls with surfaces of this character have proven to be very effective in separating small seeds or grains of the sort mentioned, and are superior to rolls having a covering of cloth or woven fabric. The longitudinal seam at

the meeting edges of the usual cloth covering forms a ridge or a crack into which the seeds are liable to be wedged, either of which causes an irregular and uncertain action of the roll. Where a seamless cloth-covering is employed it is practically impossible to make it so tight on the roll as to be free from wrinkles or loose portions. The cord-wound roll has no longitudinal seams, breaks or ridges, and a surface which is uniform throughout can be produced at small expense. The cord-covered roll is preferably treated with a thin solution of some suitable material, such as asphaltum, which prevents a nap from being raised on the surface in the use of the roll. The body of the roll may consist, as shown in Figs. 3 and 10, of wood a' with a central metal shaft a^2, or it can be of any suitable construction.

The trough bar preferably consists of a strip of sheet metal, bent into shape best shown in Figs. 3 and 10 so that the bar is slightly concaved transversely and has stiffening flanges b b' at its upper and lower edges. This construction permits the bar to twist so that one end can be adjusted higher on the roll than the other, as shown in Figs. 5, 6 and 9, while the lower edge of the bar will nevertheless be held against and conform to the surface of the roll throughout the length of the bar.

In the machine shown in the drawings, there are six separating rolls with their associated trough bars arranged in a novel manner for the purpose of increasing the capacity of the machine, but each roll with its trough bar forms an independent separating unit, and any number, one or more, of the separating units may be used, depending upon the desired capacity of the machine. The rolls are arranged in opposite vertical sets or tiers, and are journaled at their ends in a frame D which is hinged at the head or feed end of the machine at c in any convenient way to a suitable stationary or main frame C, so that the free or tail end of the frame D can be adjusted vertically to change the inclination of the separating rolls. Both the main frame of the machine and the hinged frame D may be of any suitable construction, the hinged frame being, however, preferably provided at the head and tail ends thereof with upright plates d d' in which the rolls are journaled, and with intermediate partition plates d^2, which divide the machine into separate chambers or compartments for the different grades of material. The end and partition plates are connected by shields or aprons E, one of which extends longitudinally beneath each roll. These shields incline downwardly and inwardly and direct the material which is carried over by the rolls into the space between the two vertical tiers of rolls, the shields preventing the material separated by one roll from falling onto the next roll below.

The free end of the frame D can be raised and lowered to change the inclination of the separating rolls, by any suitable means, such, for instance, as a shaft f journaled on the main frame C and a chain f' which is attached to the tail end of the frame D and is adapted to be wound on the shaft f. The shaft is turned by a crank and is held in any desired position by a dog f^2 and a ratchet wheel f^3. By changing the inclination of the rolls the rate of flow of the streams of material through the troughs can be regulated to best suit the material being operated upon.

The separating rolls may be driven by any suitable mechanism. The drive mechanism shown in Figs. 1 and 2 comprises a main drive shaft G which is journaled on the main frame and is provided with a conical pulley g connected by a belt g' to an oppositely arranged conical pulley g^2 on a shaft g^3. The belt g' is adapted to be adjusted lengthwise of the conical pulleys for changing the speed of rotation of the shaft g^3 by a suitable belt shifter g^4 which can be placed so as to hold the belt g' in a position to rotate the shaft g^3 at the desired speed. The shaft g^3 is connected by pulleys h h' and a belt h^2 to a shaft H which is journaled concentrically with the pivotal axis of the hinged frame D, for instance, in bearings h^3 on said frame. This shaft is connected by bevel gears h^4 to upright shafts h^5 which are journaled on the hinged frame D and are connected by bevel gears h^6 to the separating rolls.

The driving mechanism described enables the speed of rotation of the separating rolls to be easily controlled by adjusting the belt g' on the conical pulleys and since the shaft H is concentric with the pivotal axis of the hinged frame, this frame can be adjusted to any position with regard to the main frame, without necessitating any adjustment of the driving mechanism.

The separating action of the rolls depends to a large degree on the position of the trough bars, relative to the rolls, and the trough bars are therefore mounted, preferably as presently explained, so that they can be adjusted to regulate the separating action as may be found necessary. In the construction shown, each trough bar for this purpose has one end pivoted at i to the end plate d of the frame D, and the other end is pivoted at i' to a supporting arm or lever I which is pivoted to swing about the axis of the separating roll with which the trough bar cooperates, preferably on a screw-threaded bushing i^2 which is screwed into the end plate d' of the frame D and serves as the bearing for the adjacent end of the separating roll. The arm I is provided with an

internally threaded end portion which is adapted to turn on the threaded bushing i^2. By raising and lowering the free end of the supporting arm the end of the trough bar connected therewith is adjusted nearer to or farther from the crest of the roll. The free ends of the arms I for the several trough bars in each vertical row are preferably connected so as to be simultaneously operated, for instance, by a vertical connecting rod k pivotally attached to each of the arms I, Figs. 5 and 6, and to an operating lever K. The lever K is pivoted on the end plate d' of the frame D and the free end thereof is adapted to be moved up and down and to be held in any desired position by a clamp bar k^2, Figs. 5 and 8, operated by a thumb screw k^3, or other holding device.

The lower edge of each trough bar, which is adapted to swing toward and from the separating roll by reason of the pivotal connection $i\ i'$ for the bar, is held yieldingly against the surface of the roll by suitable springs L located at intervals along the bar. Bent wire springs are shown which are secured to the adjacent shield or apron E with their free ends engaging the trough bar. The lower edge of the bar is thus held throughout its length in contact with the roll but the entire edge or any portion thereof is adapted to yield, so that if the roll is not perfectly cylindrical or is not journaled exactly parallel with the trough bar, the bar can yield to accommodate the irregularity and so always maintain a perfect contact with the surface of the roll.

The material is fed to each separating roll at its upper end and if the trough bar is parallel with the axis of the roll or at the same distance throughout its length from the crest of the roll, the stream of material will be thickest at the head end of the roll and more material will be separated at this portion than at the other portions of the roll. This can be prevented and the separation made more nearly uniform throughout the length of the roll by adjusting the trough bar as shown in Fig. 9, so that its tail end will be higher than its head end relative to the axis of the roll. By means of the same adjustments, the machine may be used to separate a material into several different grades or kinds of particles, each grade being deposited at various distances, from the head end of the roll into the different compartments into which the machine is divided. The trough bar constructed as described is adapted to twist and permit such adjustment without causing the edge of the bar to spring away from the roll. Each trough bar ordinarily stands with its upper edge nearly over its lower edge or nearly perpendicular, which throws the weight of the stream of material largely upon the roll. This insures a more active agitation and separation of the material than if the trough bar were inclined considerably away from the roll so as to throw the principal weight of the material on the stationary bar instead of on the revolving roll. The trough bar could be of different construction and mounted in other ways permitting the described adjustments thereof. While the bar is preferably pivoted for the reason stated, this is not absolutely essential. While it is ordinarily sufficient for one end only of the bar to be adjustable toward and from the crest of the roll by means of the lever I, as explained, yet, if desired, both ends of the bar can be mounted so as to be adjusted in this way.

Any suitable means may be used for feeding the material to the upper portions of the separating rolls. In the construction shown, M M represent the main feed tubes or spouts which are arranged vertically at the head end of the machine, one tube being provided for each vertical row of separating rolls, and each tube is provided with branch spouts m for delivering the material into the valleys between the rolls and the trough bars, at the upper ends thereof. The branch spouts are preferably made so that their lower ends can be adjusted up or down to regulate the supply of material to the troughs. Since the material in the trough will choke or stop the feed spout when the level thereof rises to the top of the discharge opening of the spout, the depth of the material in the trough can be regulated by raising or lowering the discharge end of the spout. The branch spouts may be constructed in any suitable manner to permit their lower ends to be raised and lowered, flexible tubes made of closely coiled wire being preferably employed, as shown in the drawings. Each branch spout may be held in the desired position by any suitable means, such, for example, as a pivoted arm m' having one end attached to the discharge end of the spout, and which can be clamped in different positions on the upper end piece d of the frame D by a thumb screw m^2.

The material will only flow from the feed spouts so long as the stream of material is caused to move downwardly through the troughs by the action of the separating rolls. If the machine is stopped the material accumulating in the troughs will choke the discharge openings of the spouts and stop the feeding of the material, the described construction thus operating automatically to feed the material when the rolls are in operation and to stop the feed whenever the rolls are stopped, thereby preventing waste of the material.

A discharge trough or hopper N for the tailings or particles which are carried over by the rolls is arranged longitudinally between the opposite tiers of rolls and is pro-

vided at different points along its length with discharge spouts n adapted to deliver the tailings into suitable receptacles placed beneath them. The tailings separated by different portions of the rolls A, and which differ in grade, are thus kept separate. The partition plates d^2 coöperate with discharge spouts n in separating the different grades of material. The material which remains in the troughs without being carried over the rolls is finally discharged at the ends of the roll into the discharge hopper n' at the tail end of the machine.

The cord-covered separating roll described is not restricted in application to a machine organized as hereinbefore described but is adapted for use on machines of various different constructions in which the separation is effected by a roll which rotates in contact with a stream of particles moving along one side of the roll so as to carry the particles which cling thereto over the roll away from the stream.

I claim as my invention:

1. In a separating machine of the character described, the combination of a rotary separating roll having a surface consisting of a narrow strip of fibrous material wound helically around the roll, and means for holding the material to be separated against one side of the roll and permitting the material to travel lengthwise along the roll, said roll being turned in a direction such that its surface moves upwardly away from said holding means, substantially as set forth.

2. In a separating machine of the character described, the combination of a rotary separating roll having a helically wound cord covering, and means which coöperate with said roll to form a valley along one side of the roll in which a stream of material flows lengthwise along the roll, said roll being turned in a direction such that its surface moves upwardly away from said holding means, substantially as set forth.

3. In a separating machine, the combination of an inclined separating roll, means for holding a stream of material against the roll and permitting the material to flow lengthwise along the roll, and means for turning the roll in a direction upwardly away from the stream of material, said roll having a helically wound cord covering, substantially as set forth.

4. In a separating machine, the combination of an inclined separating roll having a helically wound cord covering, a bar arranged along one side of the roll and forming therewith a valley in which a stream of material flows lengthwise along the roll, and means for turning the roll in a direction upwardly away from the bar, substantially as set forth.

5. In a separating machine, the combination of a separating roll, a bar arranged alongside of the roll and forming therewith a valley for a stream of material, means for turning the roll in a direction upwardly away from the bar, means for adjusting one end of the bar around the roll toward and from the crest thereof to place the bar at an inclination to the axis of the roll, said bar being flexible and adapted to twist, whereby it is held in contact throughout its length with the surface of the roll, substantially as set forth.

6. In a separating machine, the combination of a separating roll, a flexible bar arranged alongside of the roll and forming therewith a valley for a stream of material, means for turning the roll in a direction upwardly away from the bar, and means for yieldingly pressing one edge of said bar against said roll, substantially as set forth.

7. In a separating machine, the combination of a separating roll, a flexible bar arranged alongside of the roll and forming therewith a valley for a stream of material, means for turning the roll in a direction upwardly away from the bar, said bar being pivoted to permit its lower edge to move toward and from said roll, and means for yieldingly pressing the lower edge of said bar against said roll, substantially at set forth.

8. In a separating machine, the combination of a separating roll, a flexible bar arranged alongside of the roll and forming therewith a valley for a stream of material, means for turning the roll in a direction upwardly away from the bar, means for adjusting the bar around the roll toward and from the crest thereof, said bar being flexible and adapted to twist, and means for pressing one edge of the bar yieldingly against said roll, substantially as set forth.

9. In a separating machine, the combination of a separating roll, a bar arranged alongside of the roll and forming therewith a valley for a stream of material, means for turning the roll in a direction upwardly away from the bar, said bar consisting of a strip of thin material having stiffening edge flanges, substantially as set forth.

10. In a separating machine, the combination of a plurality of separating rolls, a bar arranged alongside of each roll and forming therewith a valley for a stream of material, means for turning the rolls in a direction upwardly away from the bars, and a common means for simultaneously adjusting the several bars at an inclination to the axes of the rolls, substantially as set forth.

11. In a separating machine, the combination of a separating roll, a bar arranged alongside of the roll and forming therewith a valley for a stream of material, means for turning the roll in a direction upwardly away from the bar, and means for adjusting

the bar on the roll with one end thereof higher than the other relative to the axis of the roll, said bar being capable of twisting to conform to the surface of the roll when so adjusted, substantially as set forth.

12. In a separating machine, the combination of a plurality of separating rolls, a bar arranged alongside of each roll and forming therewith a valley for a stream of material, supporting arms to which said bars are attached and which are pivoted concentrically with said rolls, and adjusting means connected to a plurality of said supporting arms for simultaneously adjusting a plurality of said bars, substantially as set forth.

13. In a separating machine, the combination of two vertical sets of parallel separating rolls, bars arranged along the opposite outer sides of said rolls and forming therewith valleys for streams of material, means for feeding the material to the valleys, means for turning the rolls in a direction upwardly away from the bars, and a discharge hopper arranged beneath the space between the two vertical sets of rolls for receiving the tailings from the several rolls, substantially as set forth.

14. In a separating machine, the combination of a series of separating rolls, a bar arranged alongside of each roll and forming therewith a valley for a stream of material, supporting arms for said bars pivoted concentrically with said rolls, a frame in which said rolls are journaled and which is adjustable to change the inclination of the rolls together with the bars, and adjusting means connected to the supporting arms for the several bars for simultaneously adjusting the several bars relative to the rolls, substantially as set forth.

Witness my hand, this 15th day of July, 1911.

FRANK M. COLE.

Witnesses:
F. E. PROCHNOW,
C. B. HORNBECK.