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E. A. MUELLER.

GRAIN SEPARATOR AND GRADER.

No. 359,514. Patented Mar. 15, 1887.

Fig. 2.

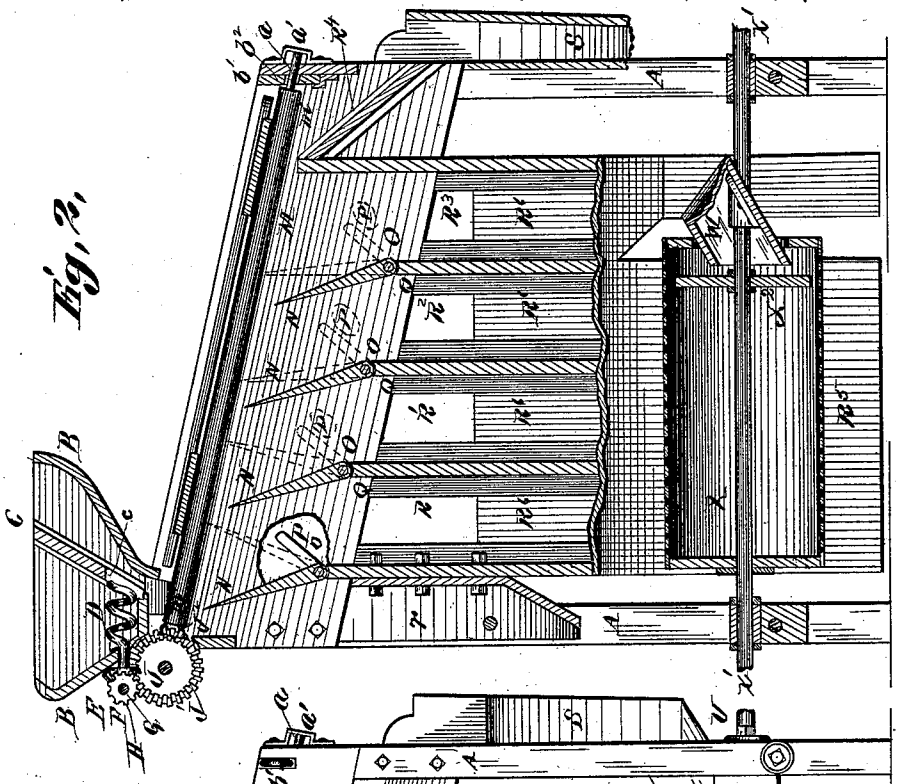
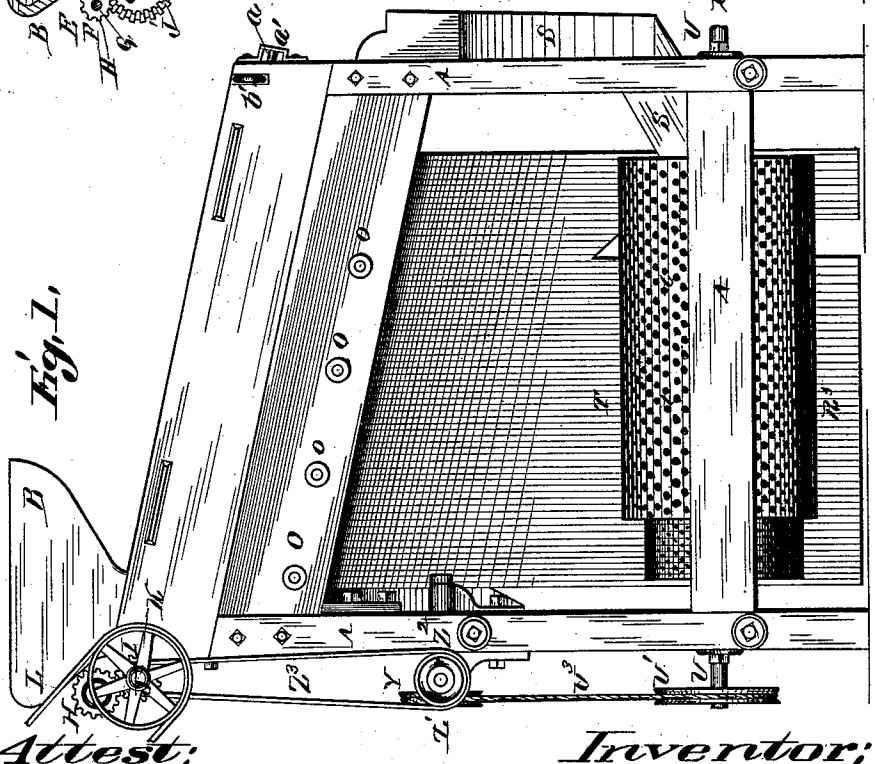


Fig. 1.



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Fig. 4.

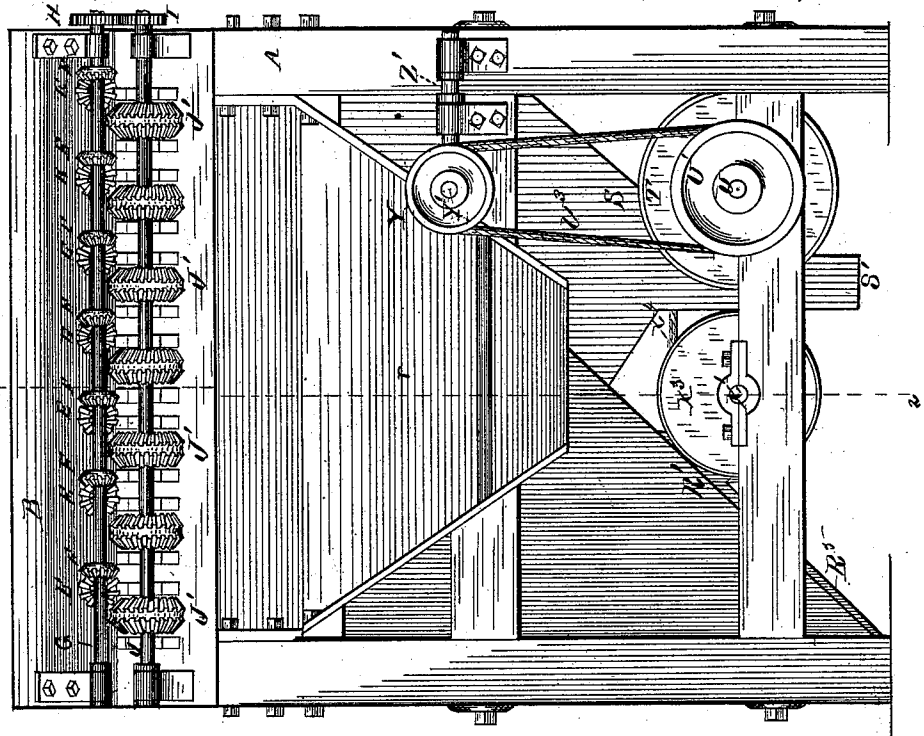
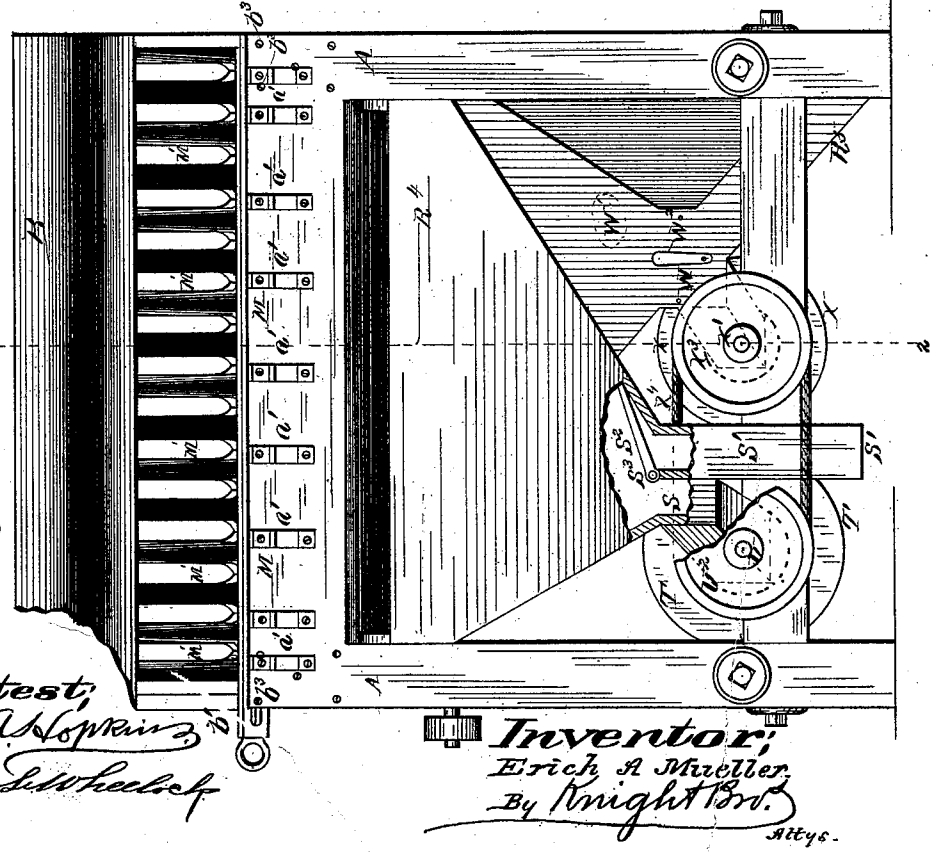


Fig. 3.



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Fig. 5.

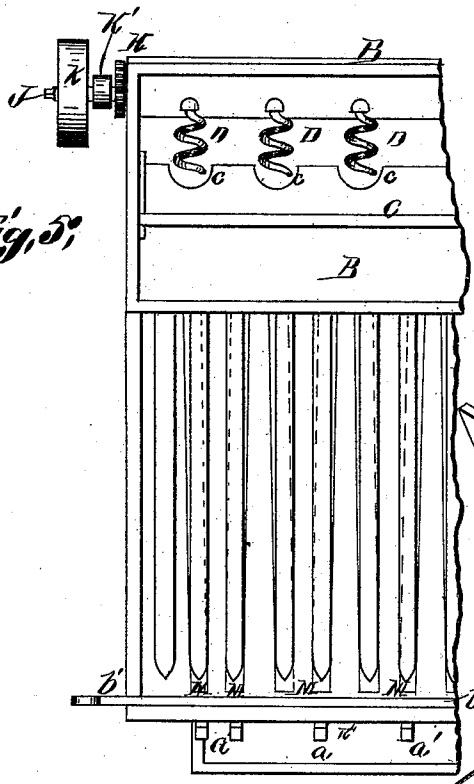


Fig. 6.

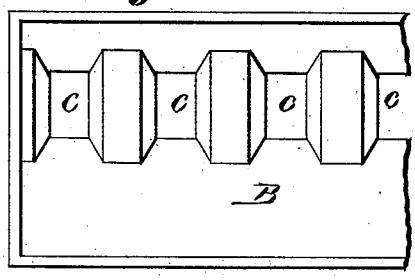


Fig. 7.

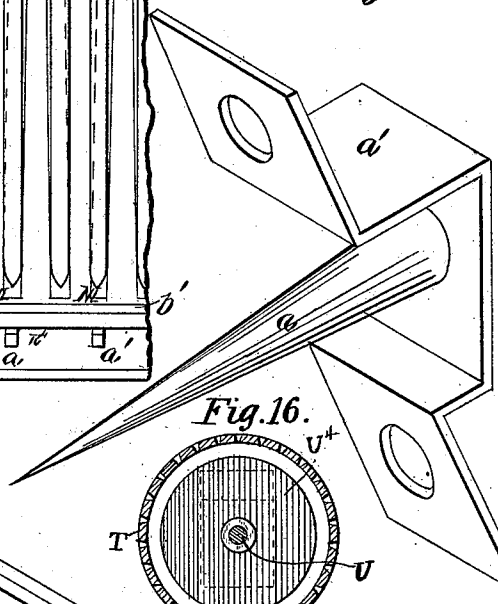


Fig. 11.

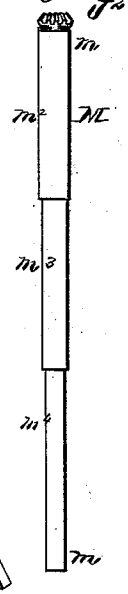


Fig. 16.

Fig. 8.

Fig. 9.

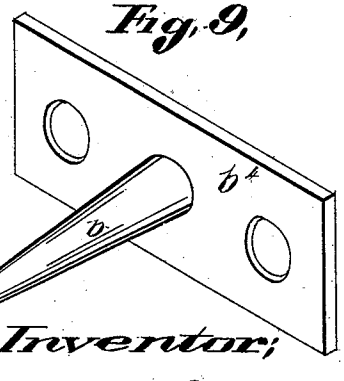
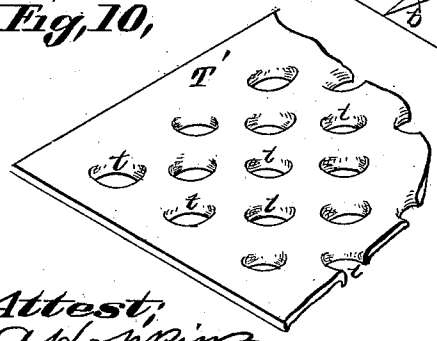


Fig. 10.



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Fig. 13.

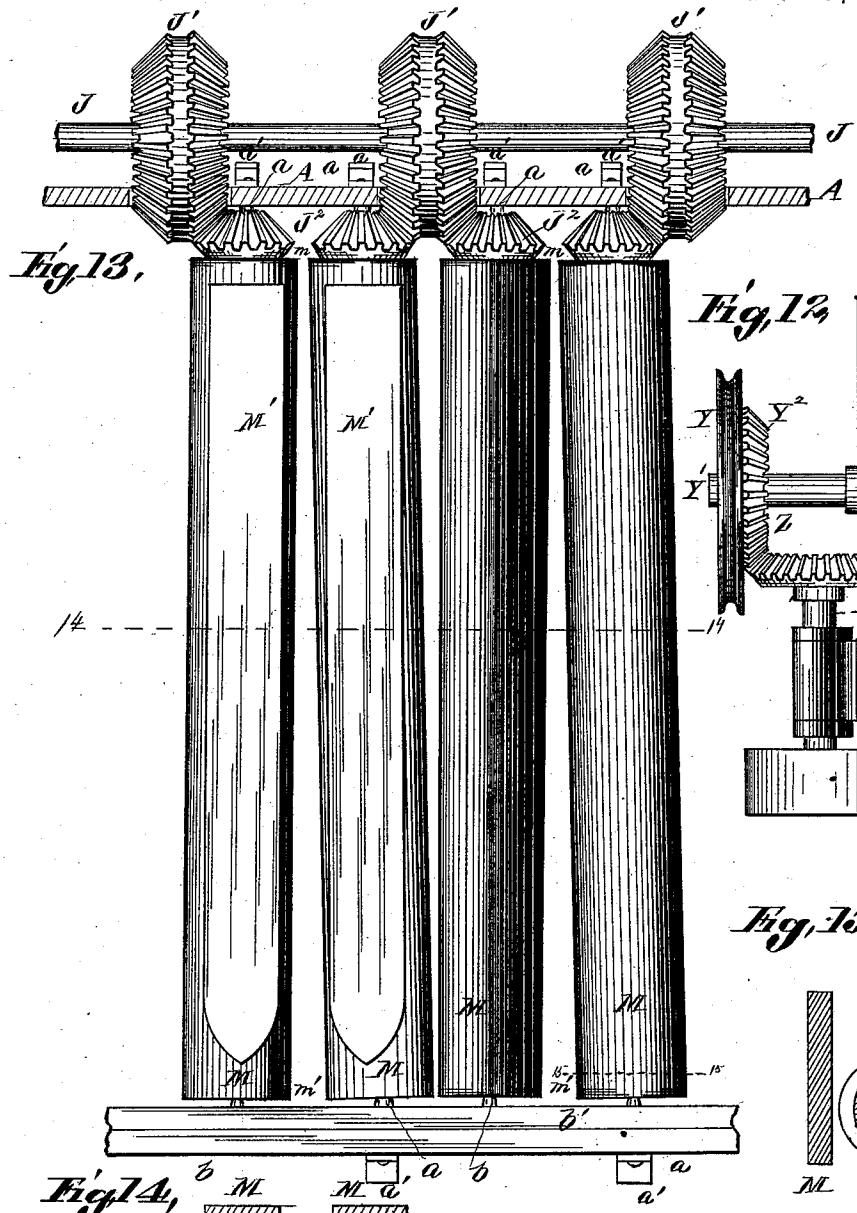


Fig. 12.

Fig. 15.

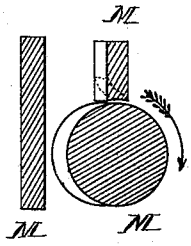
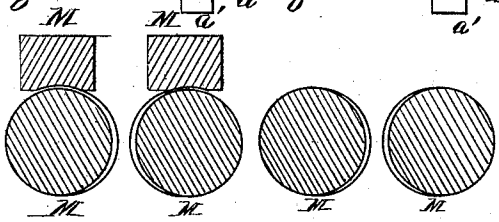


Fig. 14.



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UNITED STATES PATENT OFFICE.

ERICH A. MUELLER, OF ST. LOUIS, MISSOURI.

GRAIN SEPARATOR AND GRADER.

SPECIFICATION forming part of Letters Patent No. 359,514, dated March 15, 1887.

Application filed February 1, 1886. Serial No. 190,482. (No model.)

To all whom it may concern:

Be it known that I, ERICH A. MUELLER, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Grain Separator and Grader, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a side view of my improved grain separator and grader. Fig. 2 is a vertical longitudinal section thereof at 2 2, Figs. 3 and 4. Fig. 3 is a front view of the same. Fig. 4 is a rear view of the same. Fig. 5 is a detail top view of the same. Fig. 6 is a detail top view of one form of hopper. Fig. 7 is a perspective view of a roller-bearing. Fig. 8 is a detail perspective view showing the bearing used at the lower ends of the sorting-rollers. Fig. 9 is a perspective view of one of the adjustable roller-bearings. Fig. 10 is a perspective view of a piece of the perforate metal plate of which the surface of the sorting-drum is made. Fig. 11 shows a modification of a sorting-roller. Fig. 12 is an enlarged detail top view of a part of the gearing. Fig. 13 is an enlarged detail view showing two pairs of the sorting-rollers in top view. Fig. 14 is a transverse section at 14 14, Fig. 13, and Fig. 15 is a modification thereof. Fig. 16 is a cross-section of the large riddle, showing the disk therein.

The machine is used, primarily, for separating and sorting grain; but it may be used for sorting coffee, nuts, shot, and various other things.

A is the frame of the machine, which may consist of wood or metal, and be of any suitable construction to give support to the working parts.

B is a hopper into which the material is fed.

C is a division running from end to end of the hopper, and having small holes *c* for the passage of the coffee-beans or other material.

D are feed-spirals shaped like a corkscrew, extending transversely of the hopper and conveying the material to the discharge-holes *c*. The shafts of the feed-spirals D have at the outer ends bevel-gear-wheels E, each of which engages a similar wheel, F, on a shaft, G, running beside the hopper and turned by a spur-wheel, H, upon it, which engages with a spur-wheel, I, upon the shaft J, which latter shaft is rotated by a belt, L, on the pulley K, or by any other suitable means.

Beneath each of the small holes or slots *c* is a pair of inclined rollers, M M, upon which the coffee falls. The rollers M are so close together at the upper end, *m*, where the material falls upon them, that nothing as large as a coffee-grain will pass between them; but they diverge gradually from this point, so that as the coffee travels down the groove between the rollers the small coffee first drops through the space, and then that of next smaller size, and so on to the larger, which drops through the space near the ends *m'*. The tailings are discharged over the lower ends, *m'*, of rollers M, outside of the machine.

M' are boards which are supported over the rollers, and prevent the escape of the grain sidewise from the channels. The sides of the rollers in each pair contiguous to each other move upward, so as to agitate the coffee and prevent it jamming between them.

N N are a number of adjustable cant-boards with acute upper edges extending transversely to the rollers and from side to side of the machine. The cant-boards N are attached to shafts O, extending through the sides of the machine and carrying handles P, by which the upper edges of the cant-boards may be adjusted. Each cant-board forms the upward extension of a partition, Q, said partitions forming the space within the outer walls of the machine into the compartments R R' R^2 R^3, which receive different sizes of coffee.

The dust and small impurities which drop through the groove at *m* (where it is too narrow to allow the passage of grain) are discharged through a spout, *r*. The smaller coffee drops into the compartment R nearest to the hopper, and the next size into the next, R', and so on. These compartments communicate with an inclined chute, R^5, which discharges the graded material at one side of the machine. The discharge-openings are closed by slide or other valves, R^6. The largest-sized grains drop into a hopper, R^4, which discharges its contents by a chute, S, into the interior of a cylindrical riddle, T, which has its surfaces T' made of perforate metal, *t* being the perforations. A part of the surface T' is shown in Fig. 10. It will be seen that the perfora-

tions *t* are rounded or flaring at the inner sides, so that the coffee-berries will not lodge in them, nor will they form an impediment to the mass of berries passing over them.

The purpose of the rotary riddle or sieve is to separate the round berries from the flat berries, the round berries passing through the holes and the flat berries (having the same thickness and greater breadth) remaining in the riddle, from which they may be removed from time to time, or from the end of which they may be allowed to flow out as the riddle rotates. The rotary riddle is supported on a shaft, U, which passes through the bottom of the chute S. The shaft U carries a disk, U^4, Fig. 16, near the place of entrance of the coffee, which is smaller in diameter than the interior of the riddle, so as to leave an annular space outside the periphery of the disk, through which the coffee passes. The construction and arrangement of this disk is precisely the same as that of the disk X^2. (Shown in Fig. 2.)

The chute S has a branch, S′, leading directly to the outside of the machine.

S^2 is a valve turning on a pivot, S^3, at the dividing-point of the chute to close either branch, and thereby cause the grain to escape through the other or open branch.

The grains next in size to the largest fall into the compartment R^3, and may be made to discharge outside the machine, if desired, as before described, (by opening the valve R^6;) or they may be discharged through a chute, W, (see Fig. 3,) into one end of the rotary riddle X, which is constructed and operated in a manner similar to the riddle T, except that the holes through which the round grains of berries pass are made smaller than those *t* of said riddle T.

W′ is a deflecting-valve, constructed similarly to valve S^2, and located, as shown by dotted lines in Fig. 3, so as to deflect the coffee either into the chute W or the outlet-chute R^5. The valve is swung over to either side by a handle, W^2, attached to its axis.

The riddle X is supported on a shaft, X′. The shaft X′ carries a disk, X^2, (see Fig. 2,) between whose periphery and the sides of the rotary riddle is an annular space, through which the coffee passes.

X^3 is a pulley on shaft X′, which is connected by a belt, X^4, with a pulley, U^2, upon the shaft U of the rotary riddle T. The pulley U′ upon the shaft U is connected by a belt, U^3, with a pulley, Y, on a shaft, Y′. This shaft carries a bevel-wheel, Y^2, which is engaged by a bevel-wheel, Z, on the short shaft Z′, as shown in Fig. 12. This shaft carries a pulley, Z^2, connected by a belt, Z^3, with the pulley K′ (see Fig. 5) on the shaft J. Thus it will be seen that the rotary riddles are actuated by the shaft J by the described intermediate gearing.

J′ are bevel-wheels upon the shaft J, which engage bevel-wheels J^2 on the separating-rollers M to cause the rotation of said rollers. The rollers have countersunk sockets at the centers of their ends, which receive centers *a* *b*, on which the rollers have their bearings. Each center *a* is on a bracket, *a*′, fixed to the end of the frame. Each alternate roll has bearings on the fixed centers *a* at both ends, (so that these rollers are not adjustable at either end.) On the other hand, the intermediate rollers are adjustable at the lower ends, *m*′, while turning on fixed centers *a* at their upper ends. To give means for the equal adjustments of these rollers, the centers *b* are all fixed to a movable bearing-rail, *b*′. This rail has slots b^2, through which the lower centers, *a*, project. The rail *b*′ is fixed to the frame by screws b^3, as in Fig. 3, or in any other suitable manner.

At Fig. 6 is shown a hopper, such as may be used in sorting nuts, where the articles are comparatively large, and where feed-screws would not be required. It will be of course understood that the rollers in each pair may be set any desired distance asunder, as the centers *a* and *b* may be changed in position, as they are secured to the case and bar by brackets *a*′ b^4, as in Figs. 7 and 9, and screws. The bevel-wheels J′ can also be adjusted endwise upon the shaft J.

At Fig. 11 is shown a roller having cylindrical parts m^2 m^3 m^4, decreasing in diameter toward the lower end, so that they may be set parallel in pairs and would act in the same manner as rollers of equal diameter from end to end set at an inclination to each other, as before described.

In place of making the rollers cylindrical, or like that shown in Fig. 11, they may be made tapering evenly from the upper to the lower end and set parallel to each other in the machine.

I have described the rollers as placed in pairs, both rollers revolving and in opposite directions to each other, and this I regard as very much the preferable construction; but I do not confine myself strictly thereto, for one of the rollers might remain at rest and it still would be an operative device; or, in place of one of the rollers, a simple fixed strip or board, M, might be used, as seen in section in Fig. 15, the strip and roller being nearer together at the upper end than the lower, for the purpose described.

I claim as my invention—

1. In combination with the frame of a separator and grader, a feed-hopper having a division provided with a series of holes, a series of feed-spirals arranged opposite said series of holes, and suitable mechanism for operating the same, substantially as and for the purpose set forth.

2. In a separator and grader, the combination, with the frame and the casing, of a series of separating-rollers arranged with gradually-widening spaces between them, the partitions beneath said rollers, and with said

casing forming compartments, and a cant-board above each partition, whereby the material falling between the rollers and entering each compartment is separated as regards its size, substantially as set forth.

3. In combination, in a separating and grading machine, a rotary riddle, a chute having two branches—one for delivering the largest-sized grains into said riddle and the other for delivering to the outside of the machine—and a valve located between the two branches, substantially as and for the purpose set forth.

4. The combination, with the casing of a separating and grading machine and the partitions forming therewith compartments, of a rotary riddle communicating with one of said compartments for further separating the partially-separated material, and suitable mechanism whereby said riddle is rotated, as set forth.

5. In combination, in a separating and grading machine, a series of separating-rollers, each alternate one being adjustable, and a movable bearing-rail provided with suitable bearings for the latter, by means of which their adjustment is accomplished, substantially as set forth.

6. In combination with the frame and separating-rollers, the bearing-centers therefor, each alternate one being stationary, and a movable bearing-rail, on which the remaining centers are fixed, substantially as set forth.

7. In combination with the frame and the separating-rollers of a separating and grading machine, a movable bearing-rail provided with slots, bearing-centers on said rail, and bearing-centers secured to the frame of the machine and projecting through said slots, substantially as and for the purpose set forth.

8. In combination, in a separating and grading machine, stationary strips and rotatable rollers arranged alternately in pairs, and each pair increasing in distance asunder toward the lower end, substantially as and for the purpose set forth.

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Witnesses:
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GUST. F. OELLERNORMER.