J. KING.

BEAN GRADING MACHINE.

APPLICATION FILED JUNE 8, 1916.

1,316,165.

Patented Sept. 16, 1919.

4 SHEETS—SHEET 1.

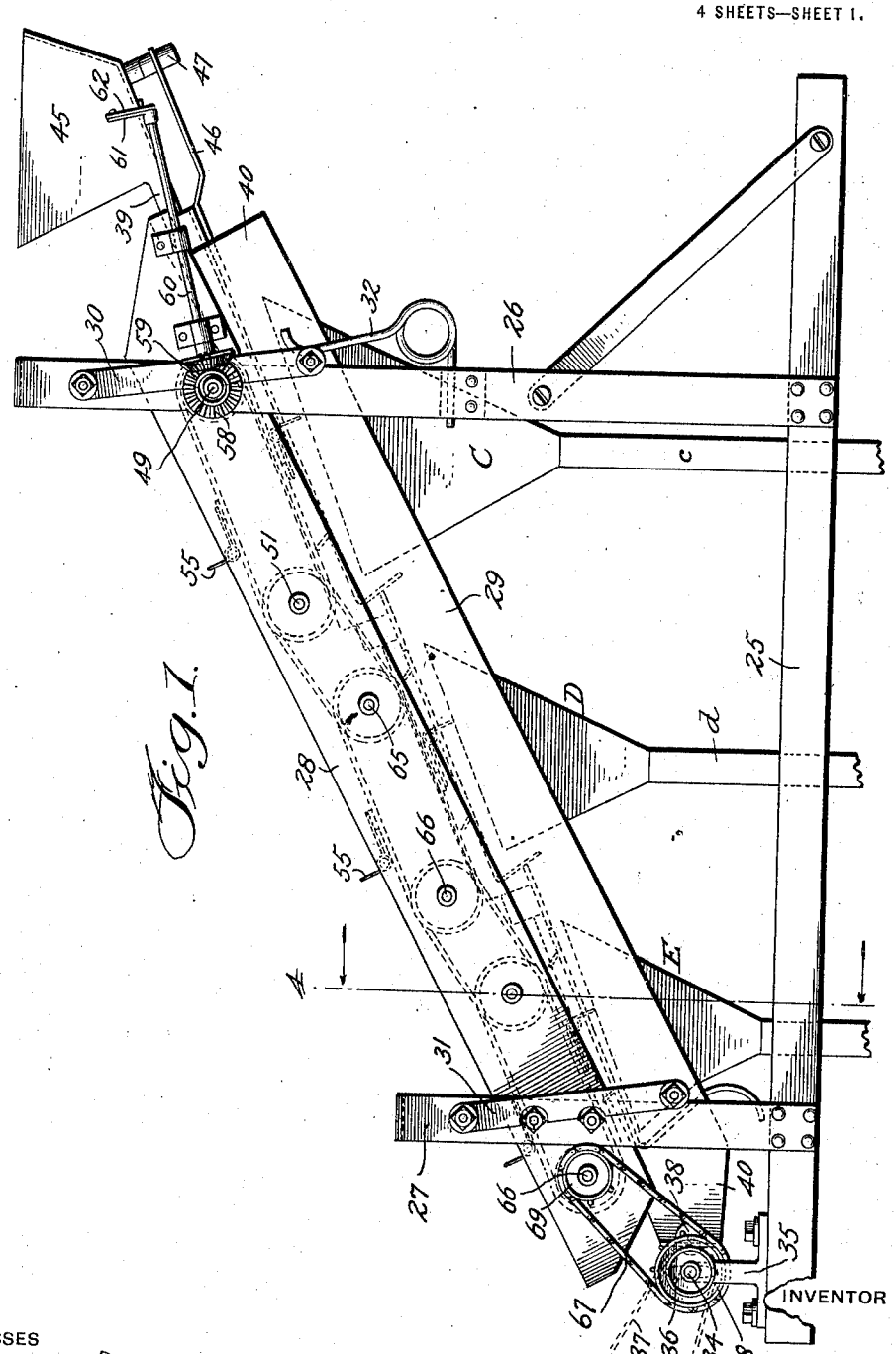


Fig. 1.

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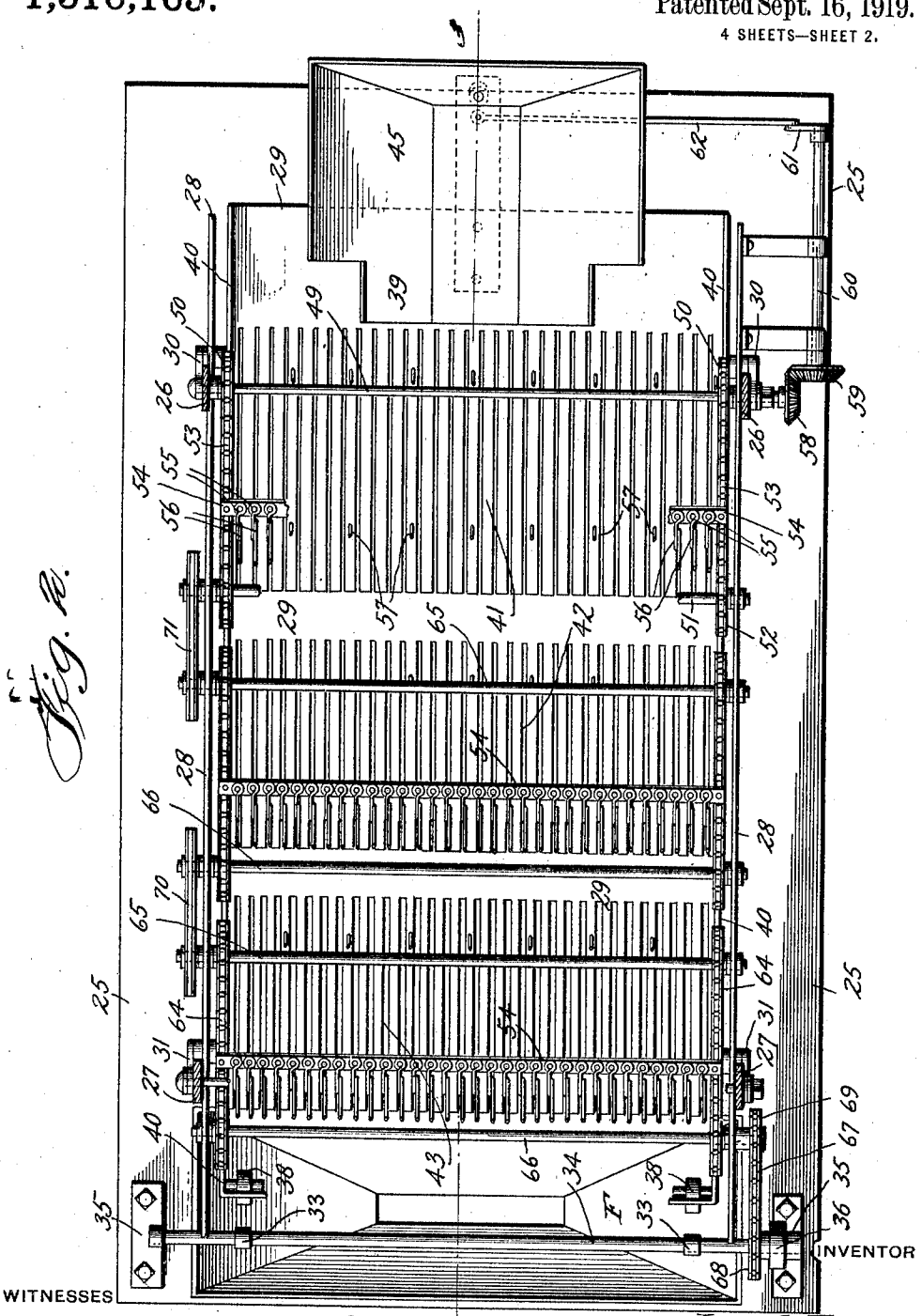


Fig. 2.

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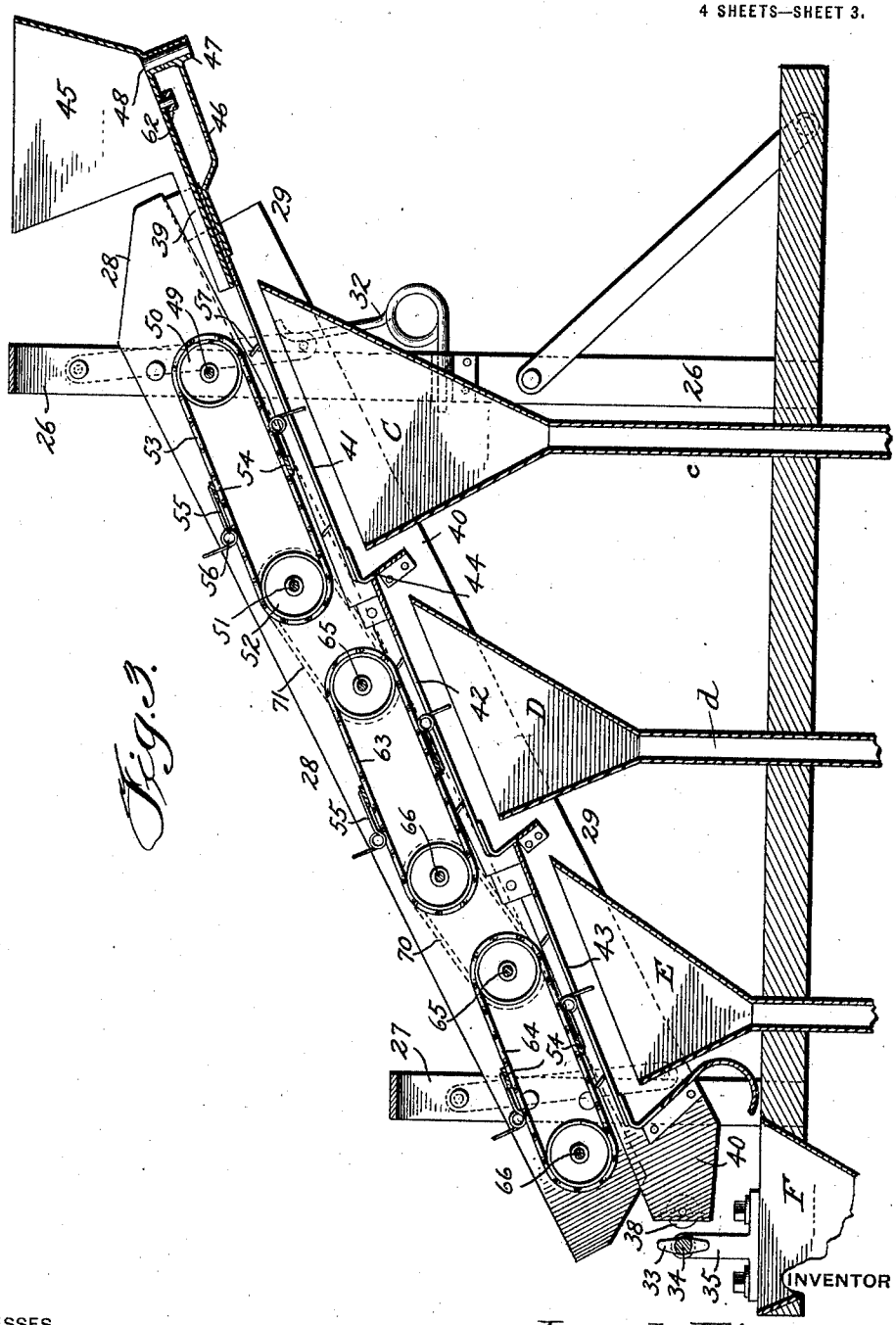


Fig. 3.

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4 SHEETS—SHEET 4.

Fig. 4.

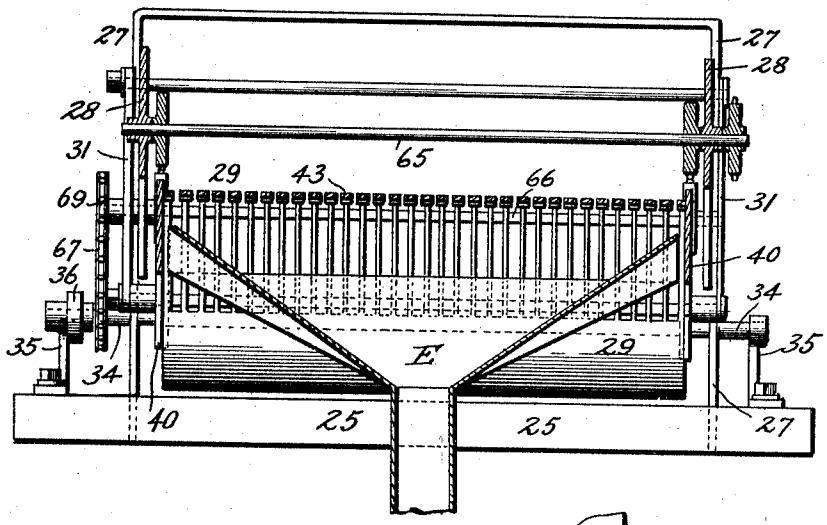


Fig. 5.

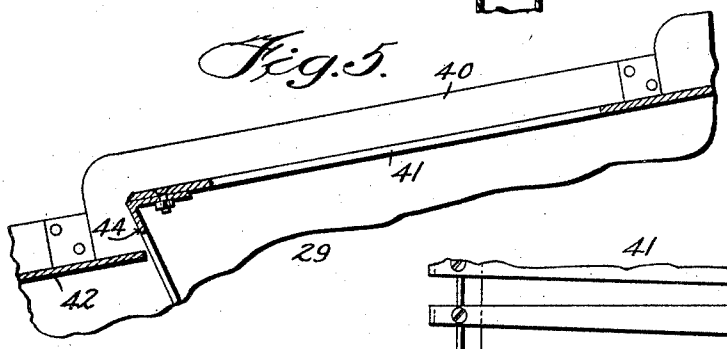


Fig. 6.

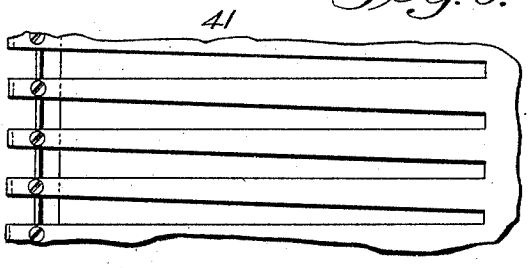
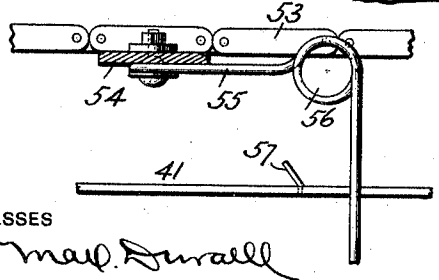


Fig. 7.



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UNITED STATES PATENT OFFICE.

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BEAN-GRADING MACHINE.

1,316,165. Specification of Letters Patent. Patented Sept. 16, 1919.

Original application filed March 25, 1916, Serial No. 86,657. Divided and this application filed June 8, 1916. Serial No. 102,534.

To all whom it may concern:

Be it known that I, JOSEPH KING, a citizen of the United States, residing at Mexico, in the county of Oswego and State of New York, have invented certain new and useful Improvements in Bean-Grading Machines, of which the following is a specification.

This invention relates to a machine for automatically grading vegetables, particularly, string-beans and the like preparatory, in the case of string-beans, to snipping or cutting off the ends thereof, and comprises generally a mechanism into which the material to be treated is fed in bulk and then graded according to size, the several sizes being carried away and distributed to receptacles, or, if desired, each size delivered direct to a cutting or snipping machine.

Among the principal objects of the invention is the provision of a reliable mechanism of simple construction by means of which the material to be acted on, such as stringbeans, may be quickly and accurately graded according to size and the various sizes afterward delivered by chutes or other means to storing receptacles, snipping machines or wherever desired.

Another object of the invention is to provide a grading machine with means for maintaining a continuous shaking motion of the separate screens; means on said screens for alining beans, and means movable longitudinally of such screen for operating in connection with said alining means, and also for entering the spaces between the bars of the screens to prevent the beans wedging or becoming lodged therein.

A further object is to provide a mechanism for traversing the primary receiving hopper and delivering chute over the first screen to distribute thereon the beans to be graded.

These principal objects and details of construction will be fully set forth in the following specification, pointed out in the appended claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the complete machine;

Fig. 2 is a top plan view of the same;

Fig. 3 is a vertical longitudinal sectional view of the machine on line 3—3 of Fig. 2;

Fig. 4 is a transverse sectional view of the same on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged detail view in section of one of the grading screens;

Fig. 6 is a plan view of a portion of a grading screen showing a modification thereof;

Fig. 7 is an enlarged detail view of one of the resilient fingers of the traveling rake that prevent the beans from becoming lodged between pairs of grading screen bars.

Upon the base plate 25 are secured near each end two upright standards 26 and 27, the standards 26 extending to a greater height than those 27. Bolted against the inner sides of the standards 26 and 27 on each side of the base plate 25 is a side plate 28 that assists in maintaining the standards rigidly in position. These plates 28 extend downwardly at an angle from near the upper ends of the standards 26 to the standards 27 and between said plates at the bottom thereof is a shaking frame 29. The shaking frame 29 and side plates 28 are inclined downwardly as described, to insure quick and proper feeding of the material through the mechanism. Swinging links 30 on each side of the machine connect the upper ends of the shaking frame to the standards 26, while similar links 31 support the lower ends of the shaking frame from the standards 27. The shaking frame 29 suspended by these links tends normally to swing downwardly and is assisted by the tension of springs 32, one of which is attached to each standard 26 and has its free end bearing against the lower end of the links 30, or its connection to the shaking frame.

The shaking frame is moved in an opposite or upward direction by means of double cams 33 of any approved shape mounted upon a horizontal transverse shaft 34 journaled in bearings 35 on the base plate 25. A belt wheel 36 and belt 37 from a motor transmits rotation to the shaft 34 and the cams 33 thereon, which cams being double, strike the shaking frame near the lower end of which they are placed, twice in each revolution and impart a short vibrating movement thereto, the rapidity of which will depend on the speed of the shaft 34. If desired, anti-friction wheels 38 are journaled on the lower end of the shaking frame for the cams to bear upon.

The shaking frame 29 is formed of two

cheek plates 40 lying parallel to each other and to the side plates 28 from the inner faces of which latter plates they are spaced a short distance. Extending across the shaking frame between the two plates 40 are a plurality of flat screens, lying in different but parallel planes, three being shown in the drawings and indicated by 41, 42 and 43. The screens which are placed in consecutive order from end to end of the shaking frame, may each be made of a single plate extending across the frame and bolted to the cheek plate 40, or they may be made of a series of plates or individual bars mounted on suitable supports and connected to said cheek plates. In any case the inclination of the screens is less than the general inclination of the shaking frames, so that a step 44 is provided between the bottom of one screen and the top of the next for a purpose to be described later.

Each screen comprises a plurality of longitudinal bars spaced apart, those of the screen 41 at the upper end of the shaking frame being closest together, each succeeding screen having wider spaces between the bars than the screen in advance thereof.

Projecting into the upper end of the shaking frame above the first screen 41 is a chute 39 that leads from a hopper 45 open at the side facing the shaking frame and into which the material to be graded is dumped in bulk. Supporting the hopper 45 and the chute 39 so that the latter may slowly traverse the screen 41, while distributing material thereto, is a bracket 46 projecting upwardly at an angle from the underside of the screen 41. This bracket has a bearing 47 on its upper end for a pintle or stub shaft 48 depending from the underside of the hopper. Means hereinafter described connect with the underside of the hopper to cause the chute to oscillate across the screen 41.

Placed transversely of the machine near the upper end of the shaking frame 29 is a shaft 49 mounted to rotate in journals on standards 26. Fixed to the shaft near each side plate 28 and on the inner sides thereof are sprocket wheels 50, these sprocket wheels being near the higher end of the screen 41. Above the lower end of the screen 41 and journaled in the side plates 28 is a second shaft 51 on which are two sprocket wheels 52 similar to the sprocket wheels 50 and in alinement therewith. A sprocket chain or belt 53 embraces each pair of sprocket wheels 50—52, the lower stretches of which chains are parallel with the screen 41 and run a short distance above it. Fastened to each sprocket chain 53 is a cross bar 54, secured on which are a number of spring fingers 55. These fingers project backwardly relative to the direction of rotation of the sprocket chain for a short distance and are then bent into loops to form spring coils as at 56, each finger terminating a short distance from the coil at right-angles to the backwardly extending portion. These fingers move with the chains 53 and as they approach the screens 41, the free end of each finger 55 will enter between two of the gratings or bars of said screen and loosen any beans that may be wedged or lodged therein, either forcing them through into the hopper C below or lifting them upon the screen again. There are preferably two bars 54 and their attached fingers 55 on the chains 53 so disposed that as one set of fingers is about to leave the screen at its lower end, the other set will be in position at the upper end to begin operation. The spaces between the screen bars are continued downwardly through the step portion 44 of the screen to permit the terminations of the fingers 55 to readily pass therethrough. Pins 57 project upwardly from the slats of the screen 41 for the purpose of turning the beans in line with the spaces between the bars should any beans be crosswise of the screen; so that if of proper size, they will pass through the screen spaces into the hopper below.

On one end of the shaft 49 is keyed a beveled gear wheel 58 which engages a bevel wheel 59 on a shaft 60 turning in bearings affixed to the adjacent side plate 28 of the machine. The shaft 60 extends upwardly beyond the end of the side plate 28 and is provided at its upper end near the center line of the hopper with a crank 61, pivoted to which is one end on a link 62, the other end being pivoted to the underside of the hopper 45. Rotation of the shaft 49 through the connections described will cause the hopper 45 and its chute 39 to swing on the pintle 48 and thereby carry the chute laterally over the upper end of the screen 41. Above the screens 42 and 43 are similar sprocket chains 63 and 64 respectively, extending around suitable sprocket wheels on shafts 65 and 66 journaled in the side plates 28. Movement is imparted to the several sprocket chains by means of a drive chain 67 extending around a sprocket wheel 68 on the shaft 34 and a like wheel 69 upon the lowermost shaft 66 journaled in the side plates 28. Connecting chains 70 and 71 convey motion in the well-known manner from one set of the raking chains to the next higher.

Preferably the spaces between the pairs of bars in the screens 41, 42 and 43 through which the beans are dropped, have parallel sides, but if desired, these sides may be made slightly wider at their lower ends as shown in Fig. 6. When so made, the beans are less liable to become wedged between the bars.

The beans that are passing through the several screens 41, 42 and 43 drop into the hoppers C, D, and E respectively, while those too large to pass through the lower-

most screen fall from the end thereof into the hopper F. From the hoppers, the various sizes of beans pass by way of chutes leading therefrom to suitable receptacles.

The operation of the machine is as follows:

The material to be graded, which in the present instance I shall speak of as string-beans, is fed in bulk into the hopper 45 at the upper end of the grading machine, and from said hopper, the beans travel along the chute 38 and fall thence upon the first of the grading screens 41. Even distribution of the beans upon the screen 41 is effected by the lateral vibrating motion of the hopper and chute through the crank 61 on the shaft 60 connected to the hopper and chute by the link 62. The grading screens 41—42 and 43 mounted in the shaker frame 29 are made to swing in one direction by the short quick strokes of the constantly rotating cams 33 on the lower end of the shaking frame 29, the return movement being due to gravity and the force of springs 32. By this means, the beans upon the various screens gradually work downwardly, and engaging the upwardly projecting pins 57 are caused to lie more or less regularly in lines parallel to the direction of the shaker frame. The alinement of the beans on the screens is assisted by the endless belts 53, 63, and 64 and fingers 55 carried thereby which form traveling rakes that pass slowly over the screens and between the bars thereof and loosen any beans that become wedged or lodged therein and also tend to straighten the beans and aline them with the bars. Such beans as pass through the screen 41 enter the hopper C and from thence are distributed through the chute *c*. Beans too large to pass through the screen 41, fall from the end thereof onto the second screen 42, the spaces between the bars of which are a little wider than in screen 41 and therefore will permit larger beans to pass through and fall into the hopper D from which they are carried off through the chute *d*. This operation is continued until all the beans have been graded. Those too large to pass between the bars of the last screen fall from the end thereof into the hopper F.

What I claim is:

1. In a device of the character described, the combination of a shaking frame consisting of cheek plates, flat screens carried by said cheek plates, each screen having longitudinally extending slots therein, said shaking frame slanting downwardly toward its forward end, said flat screens being progressively lowered one below the plane of the screen thereabove in a step by step arrangement toward the lower end of the shaking frame, the size of the slots increasing in size from the upper to the lower screen, upstanding pins carried by said screens beside the slots, whereby beans sliding down the screens will be turned to move longitudinal to fall through said slots, according to the size of the beans and the screens upon which the same are carried, receiving means below said shaking frame, means for reciprocating the shaking frame.

2. In a device of the character described, the combination of a shaking frame including slotted screens whereby beans deposited on said screens may fall through said receiving means below said screens, of means for preventing the beans from clogging within said slots including chains moving longitudinally above the screens, said chains having cross bars thereon, spring fingers fixed upon said cross bars and extending in the same direction as said chains, said fingers having coils at their outer ends and terminating in depending extensions passing through said slots, whereby as the chains move the extensions will move through said slots to remove beans which may be clogged therein, while the provision of the coils will prevent injury to said extension.

3. In a device of the class described, the combination of a shaking frame having receiving means therebelow, of a feed means including a hopper provided with a chute leading therefrom above and communicating with the upper end of said shaking frame, a bracket fixed upon said shaking frame and having a bearing at its outer end, a stub shaft carried by said hopper and said bearing for pivotally supporting said hopper upon said bearing, a link pivotally connected to said hopper and means for reciprocating said link, whereby the hopper will be swung for oscillating said chute, thus causing beans to be thrown from said chute back and forth across the entire upper width of said shaking frame.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH KING.

Witnesses:
GILBERT T. YOUNG,
HELEN P. CHADWICK.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."