(No Model.) 4 Sheets—Sheet 1.

J. H. KNICKERBOCKER.

GRAIN CLEANER AND SEPARATOR.

No. 306,160. Patented Oct. 7, 1884.

Fig. 1.

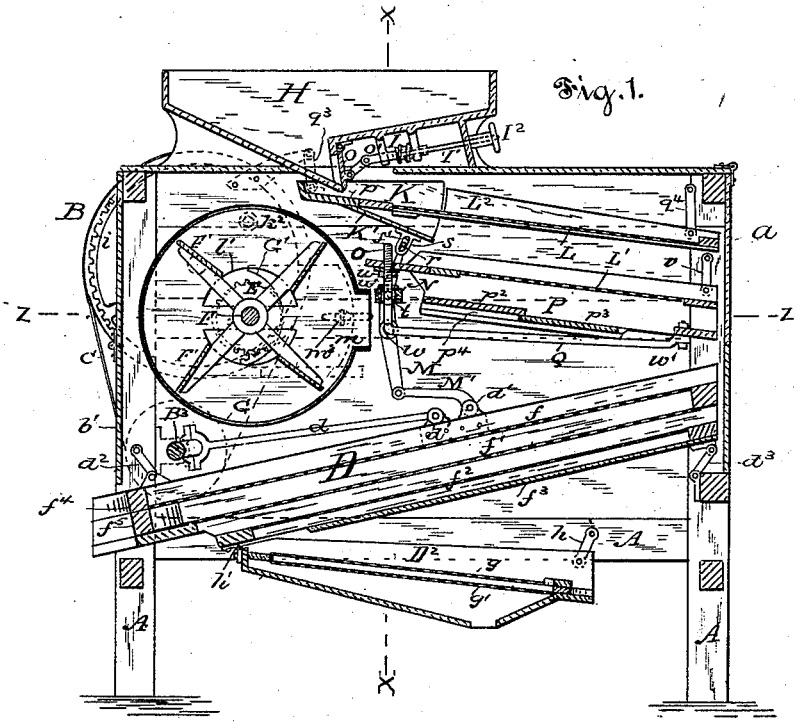
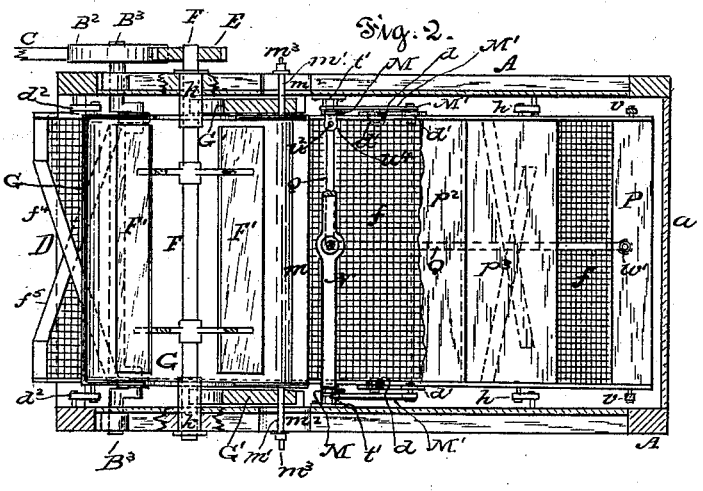


Fig. 2.



WITNESSES:

John J. Bordman.

Hamilton Ruddick

INVENTOR

John H. Knickerbocker

BY

Isaac L. Stover.

ATTORNEY

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4 Sheets—Sheet 2.

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Fig. 3.

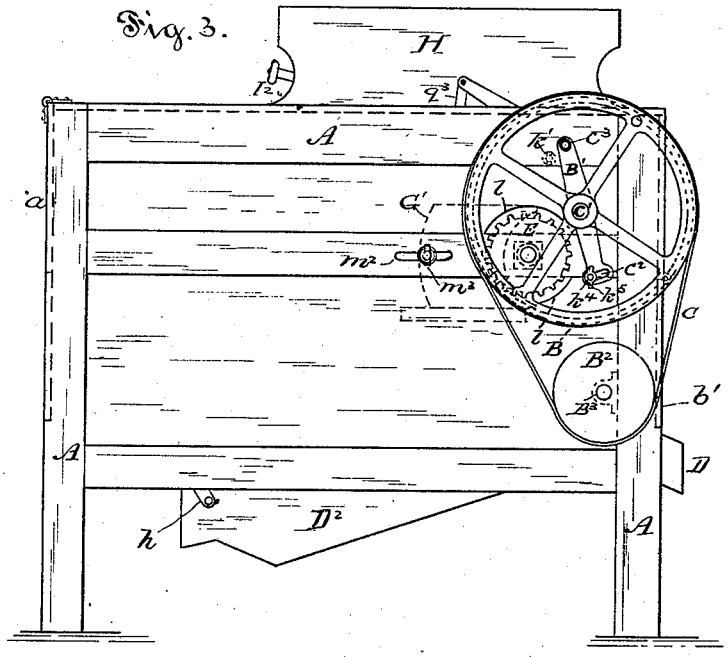
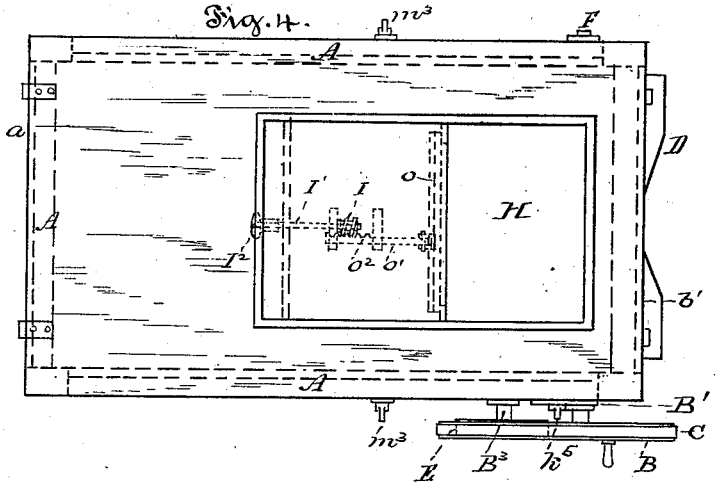


Fig. 4.



WITNESSES:

John J. Bordman.

Hamilton Ruddick

INVENTOR

John H. Knickerbocker.

BY

Isaac S. Storer.

ATTORNEY

(No Model.) 4 Sheets—Sheet 3.

J. H. KNICKERBOCKER.

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Fig. 5.

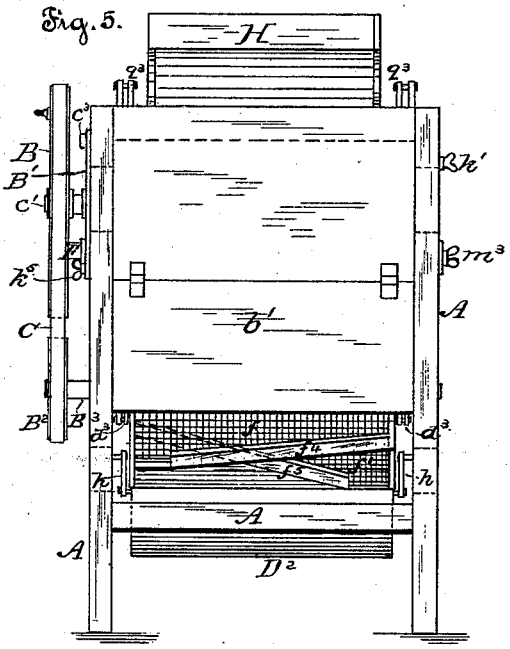
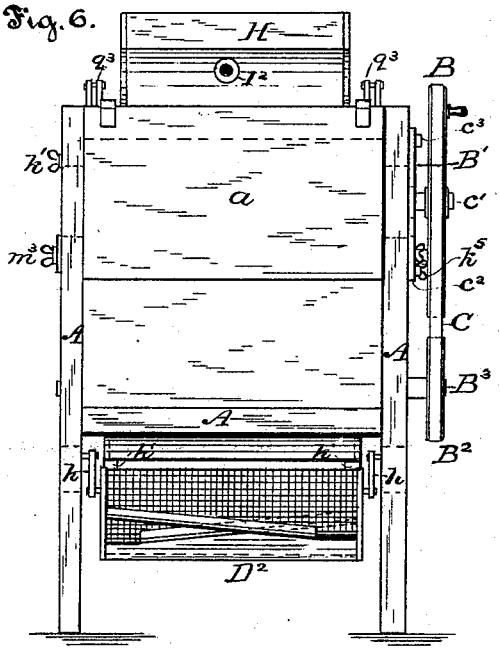


Fig. 6.



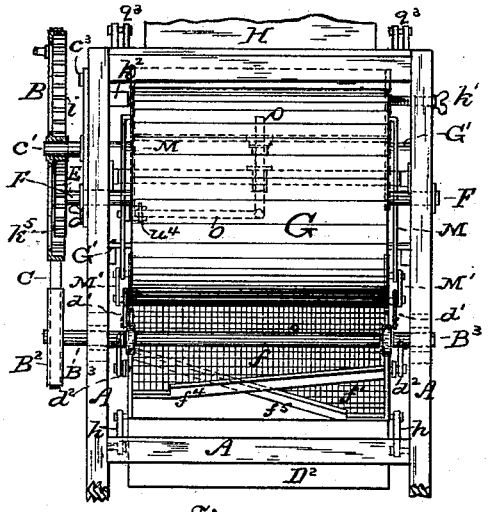


Fig. 7.

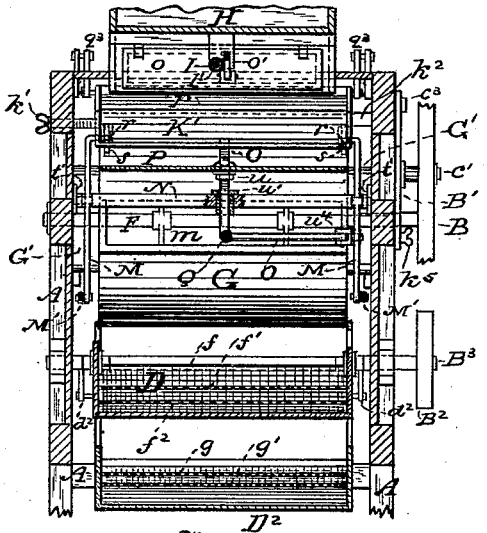


Fig. 8.

WITNESSES:

John J. Bordman

H Ruddick

INVENTOR

John H. Knickerbocker.

BY

Isaac L. Stover.

ATTORNEY

(No Model.)

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J. H. KNICKERBOCKER.

GRAIN CLEANER AND SEPARATOR.

No. 306,160. Patented Oct. 7, 1884.

Fig. 9.

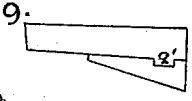


Fig. 10.

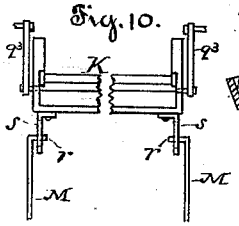


Fig. 11.

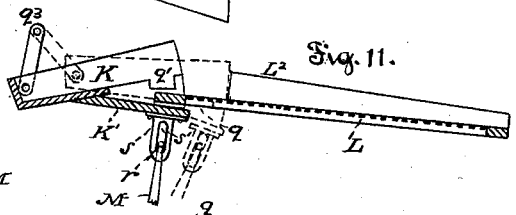


Fig. 12.

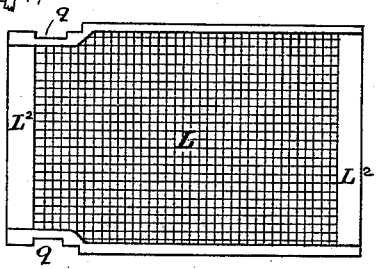


Fig. 13.

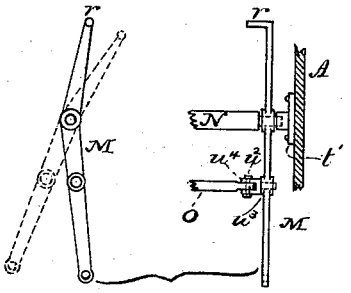
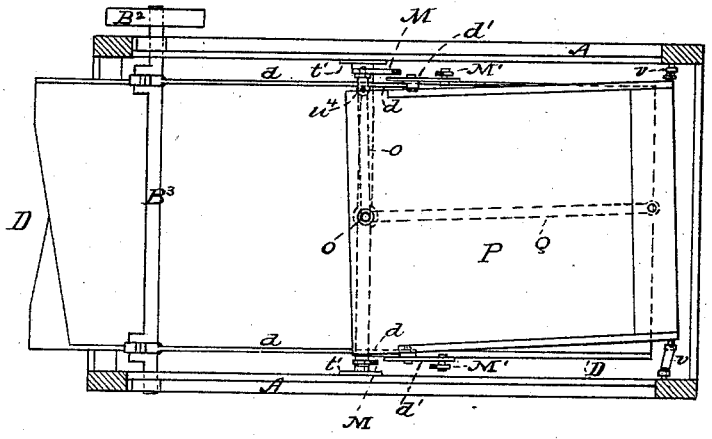


Fig. 14.



WITNESSES:

John J. Bordman
H Ruddick

INVENTOR

John H. Knickerbocker.

BY

Isaac L. Stover.

ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN H. KNICKERBOCKER, OF LAFAYETTE, INDIANA.

GRAIN CLEANER AND SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 306,160, dated October 7, 1884.

Application filed March 5, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. KNICKERBOCKER, a citizen of the United States of North America, and a resident of Lafayette, county of Tippecanoe, State of Indiana, have invented a new and useful Improvement in Grain Cleaners and Separators, of which the following is a specification.

The invention consists of novel devices for causing the even distribution of the grain over the screen-surface, devices for increasing the separating power or capacity of the screens, and novel devices for imparting motion to the various parts, all of which will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of a grain cleaner and separator embodying my improved devices. Fig. 2 is a horizontal cross-section of the same on line *z z*, Fig. 1. Fig. 3 is a side elevation. Fig. 4 is a plan view. Fig. 5 is a front end elevation. Fig. 6 is a rear end elevation. Fig. 7 is a partly sectional front elevation with parts broken away to exhibit other parts. Fig. 8 is a sectional elevation on line *x x*, Fig. 1. Figs. 9, 10, 11, 12, and 13 show certain details of parts of my improved devices. Fig. 14 is a diagram illustrating the lateral movement of a shoe.

In the drawings, A represents the frame of my improved grain cleaner and separator with sides constructed of boards in the usual manner. At one end is a door, *a*, so hinged and arranged that it can be turned up and folded back on the top of the machine, if desired, when the said machine is in use. At the other end the machine is provided with a hinged door, *b'*, through which access may be had to the various parts within, and said door may be either opened or closed while the machine is in operation. Thus the screens and internal mechanism of the machine are entirely protected from the weather. The driving pulley or wheel B is keyed or otherwise secured on a stud, *c'*, which projects outward from the yoked shifting-bar B', that is provided with a terminal yoke, c^2, and swings from a bolt or pin, c^3, fixed in a side of the machine. A belt, C, transmits power from this pulley B to the pulley B^2, that is keyed on the end of the crank-shaft B^3, which extends from side to side across the front and lower part of the machine. Pitmen *d d* connect the crank-shaft B^3 with lugs *d'*, secured on the shoe D, which latter is suspended in the lower part of the machine on hinged supports or hangers d^2 d^3, respectively, that are designed to be equal in length to the throw of the crank B^3, which drives the pitmen. These hinged supports d^2 d^3, one end of each being stationary and the other capable of oscillating in the arc of a circle whose chord is equal to its radius, cause the shoe D to be alternately elevated and depressed in a very perceptible manner during each half revolution of the crank-shaft B^3, and the rapidity of this movement produces the same operative effect as if the said shoe were elevated and depressed perpendicularly a like distance in the same time. Moreover the supports or hangers d^2 are fixed to the top of the shoe D, while the supports d^3 are fixed to the under side of said shoe, thus giving to the opposite ends of said shoe, when the machine is in operation, directly opposite motions at one and the same time, making one end rise and the other end descend in the arc of a circle at the same instant, and these opposite vertical motions, combined with the horizontal motion imparted at the same time by the crank-shaft B^3, keeps the screens $f f' f^2$, which are fixed in the shoe D, in a state of continual agitation, whereby grains of different sizes may be most effectually separated in passing over the said several screens. The shoe D is inclined downward from the rear to the front of the machine, and the several screens fixed therein are designed to increase in fineness from above downward, and guide-strips f^4 f^5, respectively, are so arranged diagonally upon them that the grain passing over each screen may be deposited in a separate place. Beneath the lower screen, f^2, is fixed a guide-board, f^3, which conducts the grain falling thereon upon the screens *g g'* in the shoe D^2, by which the grain is further separated. The shoe D^2 is suspended at one end by hangers *h*, and at the other end it is fastened to the shoe D by the hinges *h'*.

This arrangement of separating screens in

the two above-mentioned shoes has the advantage of better distributing the weight of the screens and of the grain operated upon, and to impart more moderate agitation to the lower screens, *g g'*, for the better separation of the smaller grains passing over them. The concave surface of the rim of the driving-wheel B is provided with teeth or cogs *i* that gear into the pinion E, which is keyed on the end of the fan-shaft F, and thus drives the fan F' that is inclosed in the casing or drum G within the machine-frame. The journal-boxes *k k* of the fan-shaft F project inward, as shown in Fig. 2, through the sides of the machine-frame, and into the ends of drum G, which they support, and said drum G being thus supported can be turned at pleasure, and the air-blast be thereby driven in any desired direction. Said drum G may be held in any required position by means of a thumb-screw, *k'*, at one end, and a lug, k^2, at the opposite end thereof. In the position shown in Figs. 1 and 3, the cog-wheel or pinion E is in gear with the driving-wheel B, and a screw, k^4, projecting from the machine-frame through the yoke c^2, and provided with a thumb-nut, k^5, holds the wheels thus geared, and when it is desired to stop the motion of the fan F', the said wheels are thrown out of gear by loosening said thumb-nut and moving the lower end of the shifting-bar B' toward the rear end of the machine and securing it there by tightening said nut.

When the device is in operation, air is drawn by the motion of the fan F' through the openings *l* in the side of the machine-frame, and into the axial openings *l'* in the drum G, and expelled through the opening *m*, which extends the entire length of the drum G. The supply of air is regulated by means of slides or regulators G' that are inserted between the sides of the machine and the ends of the drum G. From each slide G' a bolt, *m'*, projects outward through a slot, m^2, in the machine-frame, and has on its end a thumb-nut, m^3, by the turning of which the said slide may be adjusted and held.

In operating this machine the grain is conducted from the hopper H by means of the door *o*, to which is securely attached a rod, *o'*, provided with side cogs or teeth, o^2, as shown in Fig. 4, fitting the grooves or threads of the worm I, which is fixed on the inner end of a rod, I', that has a hand-wheel, I^2, on its outer end, said rods *o'* I' being provided with suitable bearings or supports, as indicated in the drawings. By turning the hand-wheel I^2 the door *o* may be opened to the desired extent, and the grain will then fall upon the smooth extended surface *p* of the shoe K. This surface *p* is designed to be sufficiently extended to permit all oats, sticks, straws, and other elongated or large foreign substances to fall or turn upon their sides before they reach the screen L, so that they will roll and slide over said screen and off at the end thereof, while the grain falls through it upon the screen L', and, passing through the latter, falls upon the guide-boards p^2 p^3, and is directed by them to the higher and rear end of the screens *f f' f²*, arranged in the shoe D, all the time exposed to the air-blast from the fan F'. These guide-boards p^2 p^3 are arranged with special reference to the air-blast from the fan F', the guide-board p^2 being stationary, while the guide-board p^3 slides beneath in groove p^4, so when a full air-blast is required the guide-board p^3 is moved along the groove p^4 until it is entirely beneath the board p^2, otherwise the opening at the end of said guide-boards would be so contracted that the full blast would blow the grain passing through screen L' over the rear end of the screen *f*. When but little or no blast of air is required, the board p^3 should be moved as far as possible toward the rear end of the machine, and by this means the grain from the screen L' is made to fall upon the higher ends of the screens *f f' f²*, so that their entire surfaces are made effective for cleaning and separating the grain. When a blast of intermediate or moderate power is required, the guide-board p^3 may be adjusted accordingly. The frame L^2 of the screen L is reduced in width, as illustrated in Fig. 13, and has formed in opposite sides mortises *q q*, that it may be readily engaged or coupled with the shoe K, the tongues *q' q'* on either side of the said shoe being made to enter said mortises, and thereby hold the screen L in position when in use. By elevating the rear end of the shoe K, or by lowering the front of the frame L^2, the two are disengaged from each other, and the said frame L^2 and attached screen L may be withdrawn. The screen L is designed to be used only for separating oats, sticks, straw, and other rubbish from wheat and smaller grains. When there is much chaff in the grain, or when larger grain than wheat is to be cleaned, said screen should be removed. Said shoe K and screen and frame L L^2 are supported in position by hangers q^3 q^4, placed at their extreme ends, respectively, so that when said screen is in position the said shoe and screen are prevented from separating by their own weights operating at their points of connection. When the screen L and frame L^2 are withdrawn, the shoe K is supported by the hangers q^3 and the rods M. The shoe K has attached to it, and forming an integral part thereof, a downward and rearward inclined plane, K', to the under side of which are secured lugs *s*, having vertical slots *s'*. The vertical rods M, connected with the lugs *d'* of the shoe D by horizontal rods M', have studs or fingers *r* projecting inward from their upper extremities, as shown in Figs. 1, 8, 10, 11, and 13, which studs or fingers engage in the slots *s'* of the lugs *s*. Thus when the machine is in operation, the motion of the crank-shaft B^3 is transmitted through the said intermediate connections to impart reciprocal longitudinal motion to the shoe K and its attached screen. The

lugs *s* are slotted for the purpose of allowing the rear end of the shoe K to be raised, so that the screen and frame L L^2 may be removed, and so that the shoe K and screen and frame L L^2 may hang movably suspended from the hangers q^3 q^4. At the points *t* cylindrical holes are drilled through the rods or levers M. Through these holes (not shown) the ends of the stationary horizontal rod N pass, and are held firmly in place by and in suitable metallic plates, *t'*, fastened to the sides of the machine. These rods M are levers, of which the rod N is the fulcrum. A rod, O, bent at right angles, has its perpendicular arm passed upward through the enlarged center of the rod N, and is supported and held in position thereby the cylindrical flanged nut *u'*, while the horizontal arm of said rod O that is parallel with the rod N, is connected by means of the forked swivel u^4 with the rod or lever M. The forked end of the swivel u^4 is movably secured, so as to form a joint, by pin u^2 on the rod O, while the other end of the swivel u^4, cylindrical in form, is inserted into the corresponding hole made through a boss, u^3, on the lever M, as shown in Figs. 8 and 13, so that said swivel can turn slightly on its own axis and be moved in and out in the direction of its length, and thus prevent the parts from binding and being subject to strain when the machine is in operation. The shoe P, containing the screen L', is supported at the rear end by the hangers *v*, and in front by the nut *u* on the rod O. By simply turning this adjusting-nut *u* the front end of the shoe P may be elevated or lowered, and thus the inclination of the screen L' may be regulated at pleasure. A rod, Q, welded to the rod O at its elbow *w*, and firmly bolted at its other end to the shoe P at the point *w'*, conveys, in combination with the rod O to the shoe P, the reciprocating motion imparted to the rod O by the lever M, and thus gives to the said shoe P a reciprocating lateral or transverse motion.

In Fig 13 is indicated the normal position of the lever M, to which the rod O is connected, and the manner in which it moves upon its fulcrum, the rod N; and in Figs. 2 and 4, respectively, are indicated the extreme positions taken by the rods O and Q when the machine is in operation. The said rods O and Q, and the shoe P, the moving mechanism, and the object to be moved having fixed positions relative to each other, save that the inclination of the shoe P may be varied, have, practically, a common center at the nut *u'*; hence the power lost or wasted by the means or mechanisms usually employed for giving lateral reciprocation to screens of grain-cleaners is avoided.

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

1. In a grain cleaner and separator, the combination, with the shoe K, connected removable screen L, frame L^2, and means for imparting longitudinal motion thereto, of the shoe P, means for imparting lateral motion thereto, and movable guide-board p^3, substantially as and for the purposes as set forth.

2. In a grain cleaner and separator, the combination, with the shoe K, frame L^2, and removable screen L, of the hangers q^3 q^4, slotted lugs *s*, rods M, provided with fingers *r*, rods N and M', lugs *d'*, pitmen *d d*, and crank-shaft B^3, substantially as herein shown and described, whereby longitudinal reciprocation is imparted to said shoe and screen, as set forth.

3. In a grain cleaner and separator of the character herein described, the combination of the crank-shaft B^3, rods N O Q, nut *u'*, and intermediate power-transmitting connections, with the shoe P, the rods O and Q and shoe P having fixed positions relatively to each other and practically a common center of movement at the said nut *u'*, as set forth.

4. In a grain cleaner and separator constructed substantially as herein specified, the combination, with the shoe D, provided with and supported by hangers or hinged supports d^2 d^3, adapted for opposite vertical motions at one and the same time, and synchronously with the longitudinal movement of said shoe, of the connected shoe D^2, provided with hangers *h*, adapted to be moved both perpendicularly and horizontally by the motion of the shoe D, all constructed, arranged, and operating substantially as set forth.

In testimony that I claim the foregoing as my invention, I have signed my name, in presence of two witnesses, this 29th day of September, 1883.

JOHN H. KNICKERBOCKER.

Witnesses:
AMBROW K. AHOLTZ,
WM. BALL.