No. 744,696. PATENTED NOV. 17, 1903.

H. J. SILVIS & H. WHITE.

GRAIN SEPARATOR.

APPLICATION FILED JULY 20, 1901.

NO MODEL. 3 SHEETS—SHEET 1.

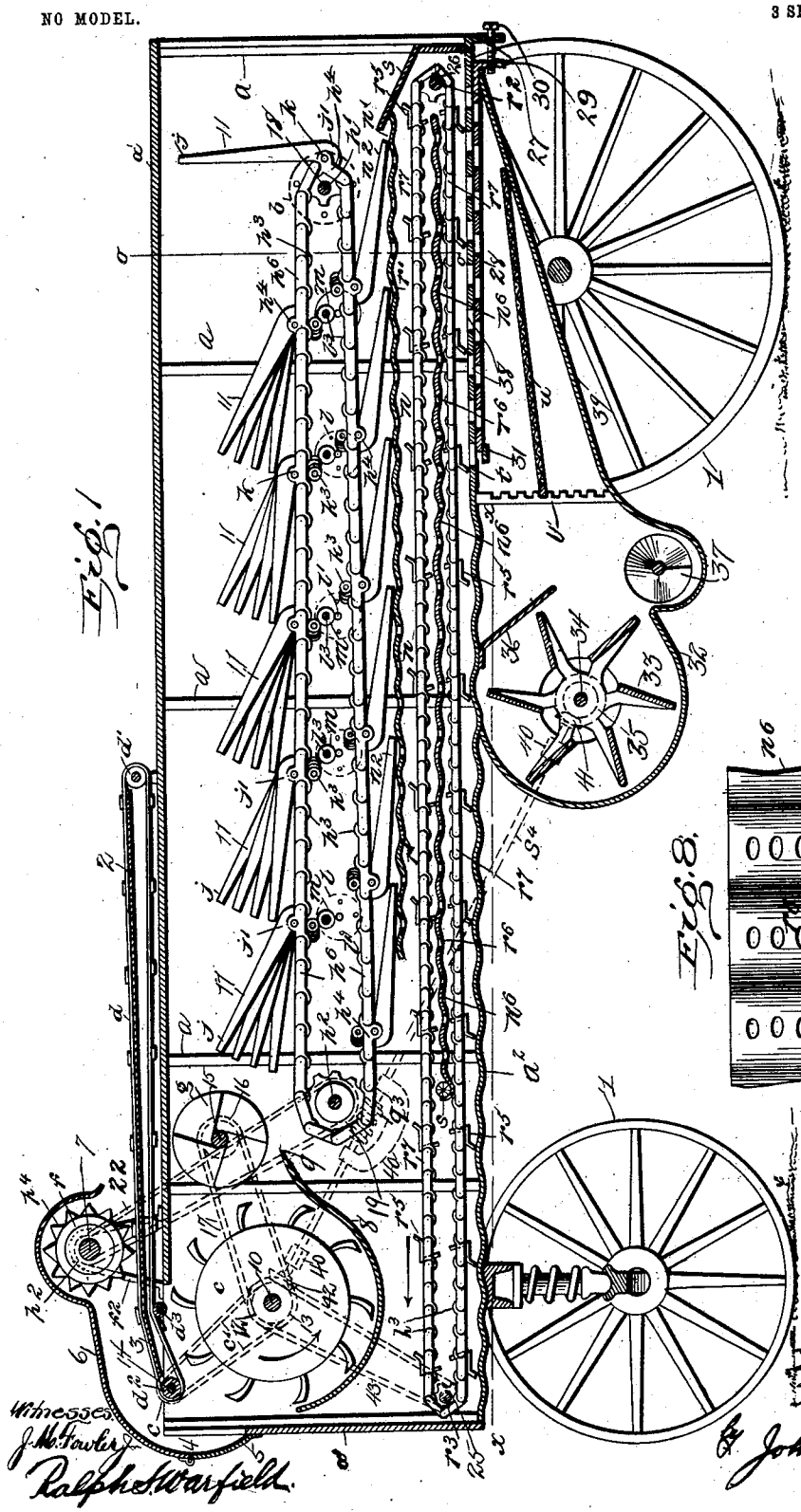


Fig. 1.



Fig. 9.

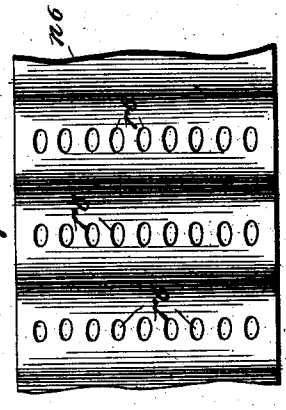


Fig. 8.

Witnesses
J. McFowler
Ralph Stanfield.

Inventors
Harry J. Silvis
Henry White.
By John H. Cook
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.

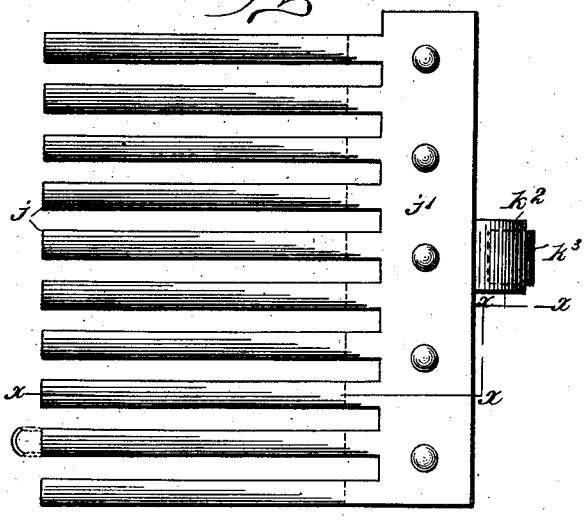


Fig. 4.

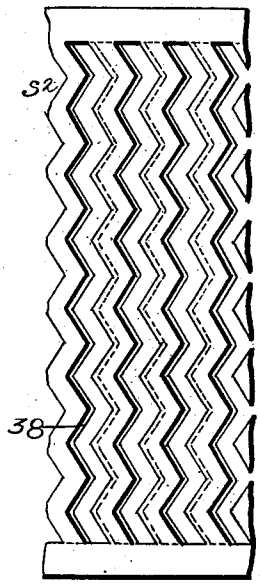


Fig. 3.

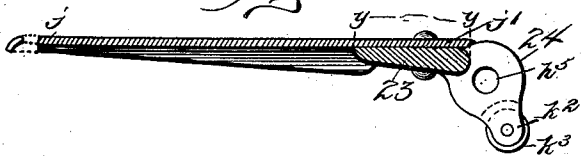


Fig. 5.

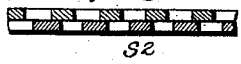


Fig. 6.

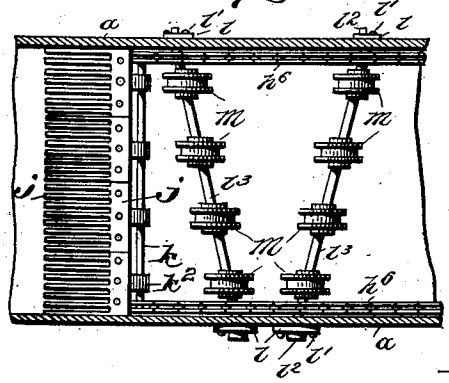


Fig. 7.

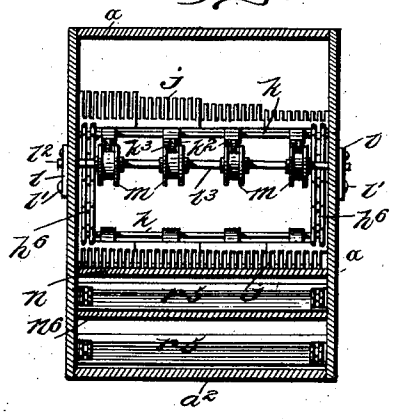
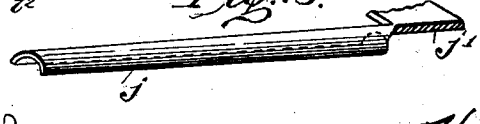


Fig. 13.



Witnesses.
J. M. Fowler Jr.
Ralph Swayfield.

Inventors
Harry J. Silvis
Henry White
by John H. Cass Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 744,696. PATENTED NOV. 17, 1903.

H. J. SILVIS & H. WHITE.

GRAIN SEPARATOR

APPLICATION FILED JULY 20, 1901.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 10

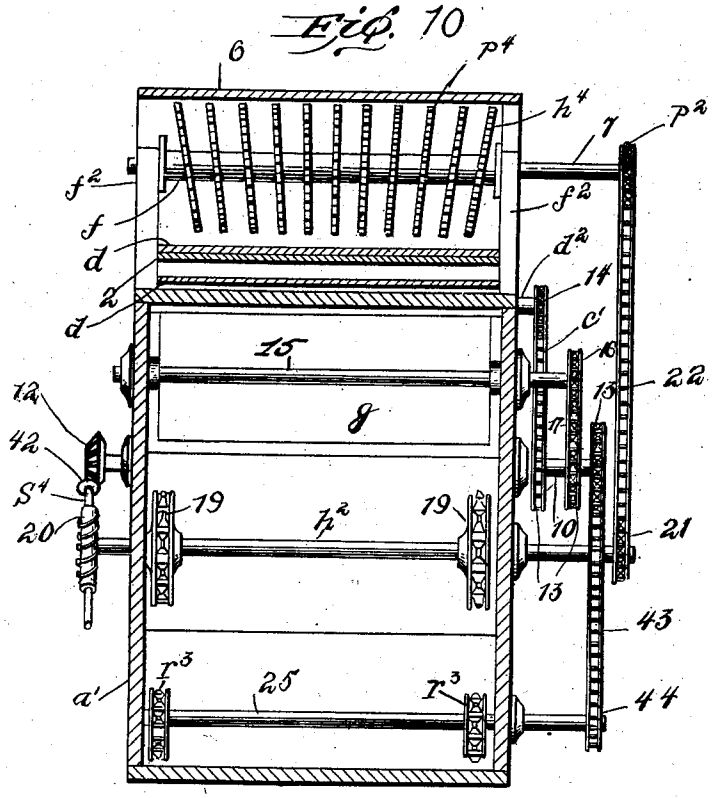


Fig. 11

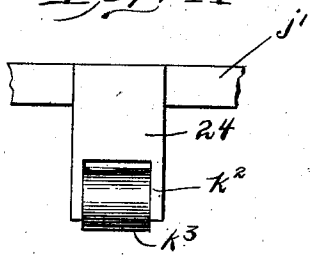
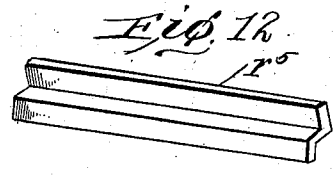


Fig. 12



Witnesses:
J. McFowler Jr.
Ralph Murfield

Inventors.
Harry J. Silvis and
Henry White.
by John H. Cross their Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 744,696. Patented November 17, 1903.

UNITED STATES PATENT OFFICE.

HARRY J. SILVIS, OF MANSFIELD, AND HENRY WHITE, OF MARION, OHIO, ASSIGNORS OF ONE-FOURTH TO ZACHARIAH TAYLOR SILVIS, OF GREENSBURG, PENNSYLVANIA.

GRAIN-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 744,696, dated November 17, 1903.

Application filed July 20, 1901. Serial No. 69,142. (No model.)

To all whom it may concern:

Be it known that we, HARRY J. SILVIS, a resident of Mansfield, in the county of Richland, and HENRY WHITE, a resident of Marion, in the county of Marion, State of Ohio, citizens of the United States, (whose post-office addresses are Mansfield, Ohio, and Marion, Ohio,) have invented new and useful Improvements in Separators, of which the following is a specification.

Our invention relates to improvements in grain-separators; and it consists, primarily, in the provision of a series of successively-operating beaters traveling in conjunction with a conveyer composed of Z-shaped slats or bars, the object being to push and draw the grain over a corrugated and perforated surface.

Further objects are to construct a device which will separate, clean, and scour grains of all kinds without the use of crank-shafts, thereby reducing the vibration of the mechanism; secondly, to reduce the size and weight of devices of this nature and at the same time increasing the capacity and durability thereof; thirdly, to provide a simple means of constructing a separator of metal; fourthly, to provide means whereby a continuous and positive feeding of the grain to the separator is effected, and, fifthly, to obviate the use of belts in transmitting motion to the various parts of the mechanism.

Our invention further consists in certain other novel details of construction and combinations of parts, which will be particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in side elevation of our invention, the casing thereof being shown in section. Fig. 2 is a detail top plan view of one of the traveling beaters. Fig. 3 is a sectional side elevation of the parts shown in Fig. 2. Fig. 4 is a detail top plan view of the adjustable screen. Fig. 5 is a detail sectional view, in side elevation, of the adjustable screen. Fig. 6 is a sectional view of our invention, the cover of the casing being removed. Fig. 7 is a vertical section on the line *o o* of Fig. 1. Fig. 8 is a top plan view of a portion of the corrugated screen. Fig. 9 is a vertical section thereof. Fig. 10 is a vertical cross-section through Fig. 1, portions of the mechanism being omitted. Fig. 11 is a detail view of the lug on the traveling beaters. Fig. 12 is a detail view of one of the Z-shaped bars r^5, and Fig. 13 is a detail view showing the arch shape of the fingers *j*.

The frame *a* is rectangular in form and is constructed of angle-iron of any suitable size. The framework is then covered and inclosed with sheet metal *a'*, forming the sides and top of a casing, the sheet metal secured by rivets or other suitable means to the framework. The casing and framework are mounted on wheels 1 1 in any suitable way, the manner shown being the preferred form.

Extending some distance on top of the casing is a supporting-plate 2, downwardly inclined at one end 3 above an aperture 4 in the casing. This plate is suitably retained in place in any desired manner. Rollers d' d^2 are journaled in suitable supports at either end of the plate 2, and extending around the rollers and encircling the plate, which acts as a support therefor, is the feeding-belt *d* of any approved construction. An idler-roller d^3, suitably journaled on the upper edges of the sides of the casing, is located beneath plate 2, over which idler the belt *d* is adapted to travel, the idler operating to guide and tighten the belt.

Supported on an offset 5 on the casing is a hinged cover 6, adapted to inclose the aperture 4 in the casing. Beneath the cover and suitably journaled in supports f^2 f^2 is a shaft 7, upon which is mounted the breaking-roller *f*, the periphery of which is provided with a plurality of serrated knives p^4, projecting at varied angles to each other. This roller is located just over the traveling feed-belt *d* and is adapted to cut and spread the grain on the feed-belt to prevent it from bunching. A sprocket-wheel p^2 is secured on the shaft 7.

Located and supported within the casing is a trough 8, provided with a projecting lip 9. A drum or cylinder *c* is mounted on a shaft 10, journaled in bearings in the sides of the casing, and this shaft and drum are mounted directly over the trough 8. A plurality of arms curved in the direction opposite to the direction of rotation of the drum project ra-

dially from the periphery thereof and operate to throw the grain and straw which falls into the trough out onto the traveling beaters 11 11, hereinafter described.

The shaft 10 of the cylinder *c* is provided with a bevel gear-wheel 12 and sprocket-wheels 13. A chain *c'* passes over one of these sprockets 13 and over a similar sprocket-wheel 14 on roller d^2, whereby the feed-belt *d* is given its motion. The trough 8 is just below the aperture 4 in the casing, through which the grain and straw are delivered onto the drum or cylinder *c*, which carries it down into the trough and then forces it out onto the projecting lip. Above this lip and with but a narrow space intervening is located a rotating beater *g*, mounted upon a shaft 15, the ends of which are received in bearings in the sides of the casing. A sprocket-wheel 16 on shaft 15 receives thereon a sprocket-chain 17, which also passes over a sprocket-wheel 13 on the shaft 10, thereby revolving beater *g*.

The rotation of the beater *g* tends to throw the grain and straw upon the traveling beaters 11. Shafts h^2 *h'* are journaled in bearings in the sides of the casing. Large sprocket-wheels 19 19 are secured on the shaft h^2 near the ends thereof, and worm-wheel 20 and sprocket-wheel 21 are secured on the shaft at points outside the two sprocket-wheels. A drive-chain 22 passes over sprocket-wheel 21 and over the sprocket-wheel p^2 on shaft 7, whereby to rotate the breaker-roller *f*.

The shaft *h'* is located on the same horizontal plane as is shaft h^2, and mounted on shaft *h'* and near either end thereof are two small sprocket-wheels 18. Chains composed of links h^6, connected to one another in any approved manner, pass over sprocket wheels 18 19 on shafts *h' h²*, respectively. The links h^6 are provided at one end thereof with lips h^3, and certain of the links are also provided with semicircular lugs h^4, the lugs being apertured to receive the end of a shaft *k*. The links which have the lugs h^4 formed thereon are spaced apart a sufficient distance to allow the fore ends *j* of one set of traveling beaters 11 to rest upon the rear ends *j'* of the preceding set of traveling beaters, the beaters being journaled or mounted on the shafts *k*. In other words, the links carrying the lugs h^4 are spaced apart an approximate distance equal to the length of the traveling beaters. These beaters consist of a plurality of metallic-fingered plates, the fingers of which are concavo-convex in cross-section, tapering from front to rear in a constantly-increasing arc of a circle, (shown in Figs. 2, 3, and 13,) affording a strong projection. The fingers on each beater merge into an integral flat body portion *j'*, which is secured to a strong supporting cross-bar 23 in any approved manner—as by means of rivets, for instance. These cross-bars 23 serve as a reinforce and support to the beaters proper. Integral with each of these cross-bars 23 is a lug 24, provided with an aperture h^5, through which shaft *k* passes. The end k^2 of the lug 24 is longitudinally slotted in the arc of a circle, as shown in dotted lines in Fig. 3, and within this slot is received a roller k^3, journaled in the walls of the slot. I have shown a series of four traveling beaters mounted on a single shaft *k;* but there may be either a smaller or larger number, according to the width of the casing *a'*. The shafts *k* may also be mounted to extend at an acute angle to the direction of movement instead of at right angles thereto and to the sprocket-chains.

Mounted diagonally in the sides of the casing *a'* are a number of shafts l^3, which shafts extend between the traveling sprocket-chains carrying the beaters 11 11 and nearer the upper than the lower chains. The ends of these shafts are received in adjustable bearings, whereby the shafts may be moved in circle toward or away from the upper chains. These bearings consist of circular plates *l*, rotatably secured at their centers to the sides of the casing by means of bolts or other securing means *l'*. Eccentrically located in these circular plates are the bearings l^2, in which are held the ends of the shafts l^3. Thus it will be seen that by rotating the circular plate *l* the positions of the shafts l^3, eccentrically carried by the plates, may be altered and changed. Rotatably mounted upon each of the shafts l^3 are a series of rollers *m*, which may be circumferentially grooved, as shown. The rollers k^3 in the ends of the lugs 24 of the traveling beaters are adapted to impinge against the rollers *m*, and owing to the motion of the chain the rollers k^3 override the rollers *m;* but in so doing the fingered plates with which the rollers k^3 are connected are caused to rock on shaft *k*, thereby giving the beaters an oscillatory or swinging motion in the arc of a circle. The rollers *m* are spaced apart on shafts l^3 sufficient distances to permit of the contact of the rollers k^3 therewith, and since the rollers *m* are located on the shafts l^3, extending diagonally to the direction of motion of the traveling sprocket-chains and beaters, it will be seen that the rollers k^3 contact with rollers *m* successively and not simultaneously. The adjustability of the shafts l^3 permits the rollers *m* to be engaged by the several rollers k^3, located on a single shaft *k*, at greater or lesser intervals, as desired. Thus when the roller k^3 on the first one of the series of beaters located on a single shaft *k* first engages one of the rollers *m* on the shaft l^3 the remaining beaters on the shaft *k* are horizontal, their fore ends resting upon the rear ends of the preceding series; but as the first roller k^3 proceeds to override roller *m* the next one of the series of rollers k^3 engages its respective roller *m*, and so on until the majority or all of the beaters are at some point in their arc of oscillatory movement. This motion serves to beat up the grain and straw deposited upon the traveling beaters, which form an oscillatory floor therefor.

Located beneath the traveling sprocket or beater chains is a corrugated and perforated plate n, extending some distance beyond the discharge end of the beater-chains, which drops the threshed grain and straw upon the plate n, which plate is secured at one end to an inclined support s. The grain and straw being discharged upon the corrugated table n are spread thereupon by the ends j of the beaters 11, which drop by gravity thereon and are drawn thereover by the movement of the sprocket-chains, thus drawing the grain over the table n, scouring and cleaning it, and finally causing its separation from the straw and chaff by drawing the grain to the perforations r' in the corrugated table.

Beneath the table n are a pair of traveling sprocket-chains, composed of links r^7, having lips h^3. The chains pass over sprocket-wheels r^2 r^3, secured upon shafts 25 26, supported in the sides of the casing a' at either end thereof. Equidistantly located on these traveling-chains and intersecting the horizontal plane thereof are Z-shaped bars r^5, secured to the lips h^3 of the links r^7 of the chains.

Supported in any convenient manner between the members of the traveling table is a second perforated corrugated table n^6, upon which the ends of the bars r^5 are adapted to bear. The grain falling through the apertures of the table n rests upon the second stationary table n^6, where it is again scoured, cleaned, and spread and drawn over the surface of the table n^6 by the ends of the Z-shaped bars r^5 until the grain falls through the perforations r^6 in table n^6 to and upon the bottom a^2 of the casing, which is corrugated for a portion of its distance. The remainder of the bottom is slotted in a zigzag manner, as shown in Fig. 4, and is provided at one end with a depending lug 27, an adjustable sliding member 28, comprising zigzag plates and correspondingly-shaped intervening spaces adapted to register with the spaces and plates of the bottom of the separator. This sliding member 28 is provided with a depending lug 29, and an adjusting-screw 30 is received in an aperture in lug 27 and a threaded aperture in the lug 29, whereby to regulate the size of the opening through which the grain is to fall. The free end of the sliding member is supported upon a bar 31.

An irregularly-shaped frame 32 depends from the casing a', and within the chamber thus formed is a rotatable fan 33, secured on a shaft 34. This shaft 34 is driven by any suitable means and has secured thereon a bevel gear-wheel 35. A deflector-plate 36 extends into the chamber in front of the fan. In the lowest part of the chamber an auger conveyer 37 of any approved construction is located and operated by any suitable means.

A pair of vertical notched bars u' are located in the depending chamber and a screen u is provided, the edge of which is received in any of the notches in the vertical bars u', the free end of the screen resting upon the inclined wall of the frame 32 and being directly beneath the adjustable sliding member 28.

The grain which has been separated from the straw and has fallen upon the corrugated portion of the bottom of the casing a' is drawn over the corrugated bottom by the ends of the Z-shaped bars r^5 until it reaches the zigzag openings 38, graduated in size by the adjustable sliding member 28. The grain falls through the openings and upon the adjustable screen u, where any chaff remaining with the grain is separated therefrom. It is not necessary, however, to use the screen, and in case it is not used the grain will fall upon the inclined portion 39 of the wall of the chamber, whence it will roll down to the auger 37, being subjected to the action of a blast of air from the fan 33 during the descent from the openings 38 to the auger.

A rotatable rod S^4, suitably supported in bearings 40 40, has at one end a bevel-gear 41, meshing with the bevel-gear 35 on shaft 34. The opposite end of rod S^4 likewise carries the bevel-gear 42, meshing with bevel gear-wheel 12 on shaft 10, thereby giving motion to shaft 10, which shaft carries the three sprocket-wheels 13, over which run sprocket-chains c' and 17 to the sprocket-wheels 14 and 16 on shafts d^2 and 15, respectively, as heretofore described. A third sprocket-chain 43, passing over a sprocket-wheel 13 on shaft 10, extends around a sprocket-wheel 44 on shaft 25, thereby giving motion to shaft 25 and to the traveling sprocket-chains carrying the Z-shaped bars r^5.

Located intermediate the length of rod S^4 is a worm-gear g^3, meshing with a worm-wheel 20 on shaft h^2, thereby giving motion to the sprocket-chains carrying the traveling beaters 11 11, and a sprocket 21 on this shaft h^2 is connected with a similar sprocket p^2 on shaft 7 by means of chain 22, thereby giving motion to the cutters on the breaker-wheel f.

By means of the above construction the separator can be composed entirely of metal, making it of minimum weight. All motion is transmitted by means of sprocket-chains, sprocket-wheels, an inclined shaft, and gears. It will also be observed that the separating and cleaning of all kinds of grains are accomplished without the use of crank-shafts, thus reducing the vibration of mechanism to a minimum.

It is evident that many changes might be made in the form and arrangement of the several parts described without departing from the spirit and scope of our invention, and hence we do not wish to limit ourselves to the exact construction herein set forth; but,

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A separator comprising a continuously-operating feeding means, a breaker located

above the feeding means, the breaker adapted to separate and spread the material carried on the feeding means, a plurality of series of traveling beaters comprising fingered plates, traveling mechanism, shafts carried thereby, a series of beaters journaled on each shaft, each beater provided with a depending lug, adjustable shafts arranged at an angle to the direction in which the traveling mechanism moves, means on the diagonal shafts against which means the lugs are adapted to successively impinge, and means for screening, separating, cleansing and scouring the fed material.

2. A separator comprising feeding mechanism, a plurality of traveling beaters to which the material is fed, traveling mechanism, shafts secured to the traveling mechanism, the beaters journaled on the shafts, lugs on the beaters, a series of shafts supported at angles to one another, antifriction means mounted on the shafts, the lugs adapted to impinge against the antifriction devices carried on the diagonal shafts whereby to agitate the beaters, a corrugated, perforated table located beneath the traveling mechanism, onto which table the material is discharged, the beaters adapted to bear thereon to clean and scour the material, a second corrugated and perforated table located beneath the first-named table, traveling mechanism passing above the second table, bars located transversely to the plane of and carried by the traveling mechanism, the bars adapted to bear upon the second table to further clean and scour the material, a corrugated bottom over which the material is drawn, the bottom having apertures formed therein through which the material drops, means for regulating the size of the apertures and means for finally subjecting the material to a blast of air.

3. In a separator, a feeding mechanism in combination with a traveling mechanism, shafts carried by the traveling mechanism, a series of beaters mounted on each shaft, lugs formed on each beater, rollers journaled in the ends of the lugs, shafts located at an angle to the plane of movement of the traveling mechanism and with each other, the alternate shafts being parallel with each other, antifriction devices mounted on the shafts, the rollers adapted to engage the antifriction devices on one shaft successively whereby a successive oscillatory motion is given to the series of beaters on each shaft.

4. In a separator, the combination with a feeding means, of a plurality of traveling sprocket-chains, lugs formed in certain of the links of the chains, bars received in apertures in the lugs, beaters mounted on the bars, depending lugs secured to the beaters, rollers journaled in the lower ends of the depending lugs, shafts located at angles to one another and to the direction of travel of the sprocket-chains, rollers mounted on the diagonal shafts, the rollers in the lugs adapted to impinge and override the rollers on the shafts thereby rocking the beaters.

5. In a separator, the combination with a feeding means, of a plurality of traveling sprocket-chains, lugs formed in certain of the links of the chains, bars received in apertures in the lugs, beaters mounted on the bars, depending lugs secured to the beaters, rollers journaled in the lower ends of the depending lugs, shafts located at angles to one another and to the direction of travel of the sprocket-chains, rollers mounted on the diagonal shafts, the rollers in the lugs adapted to impinge and override the rollers on the shafts thereby rocking the beaters, and a corrugated perforated table over which the beaters are adapted to drag.

6. A separator comprising a feeding mechanism, a series of traveling beaters adapted to agitate the material fed thereto, a corrugated perforated table beneath the traveling beaters, upon which table the material is discharged by the beaters, the beaters adapted to drag over the table to spread and clean the material thereon, a second corrugated perforated table located beneath the first-named table, and traveling bars, the ends of which are adapted to drag over the second table whereby to further clean and separate the material.

7. A separator comprising a feeding mechanism, a series of traveling beaters adapted to agitate the material fed thereto, a corrugated perforated table beneath the traveling beaters, upon which table the material is discharged by the beaters, the beaters adapted to drag over the table to spread and clean the material thereon, a second corrugated perforated table located beneath the first-named table, sprocket-chains passing around the second-named table, and Z-shaped bars carried by the sprocket-chain, the ends of the bars adapted to drag over the second-named table to further clean and separate the material.

8. A separator comprising a series of traveling beaters, a corrugated perforated table over which the beaters are adapted to drag, a second corrugated perforated table located beneath the first-named table, sprocket-chains adapted to pass around the second-named table, Z-shaped bars carried by the sprocket-chains, the ends of the Z-shaped bars adapted to drag over the second-named table, a bottom, one portion of which is corrugated and the remaining portion of which is perforated, the ends of the Z-shaped bars adapted to drag over the corrugated portion of the bottom whereby to draw any material thereon toward the perforated portion thereof, and slidable means whereby the size of the perforations in the bottom may be adjusted.

9. In a separator, the combination with a shaft, of a plurality of traveling beaters secured thereon, each beater comprising a plate, the plate provided with a plurality of fingers, a member to which the plate is secured, a

slotted boss or projection depending from the member, a roller received within the slot in the boss, and means adapted to be successively engaged by the rollers whereby the beaters on each shaft are operated successively.

10. A separator comprising a casing, provided with an aperture, a movable cover located above the aperture, a feed-belt discharging into the aperture, a breaker-wheel located above the feed-belt and beneath the cover, a toothed cylinder upon which the material is discharged from the feed-belt, a trough above which the cylinder rotates, a series of traveling beaters, a rotary beater discharging the material from the trough upon the traveling beaters, the traveling beaters adapted to agitate the material thereon, a perforated corrugated table upon which the material is discharged by the traveling beaters, the beaters adapted to drag over and spread the material upon the table, a second corrugated perforated table located beneath the first-named table, means for spreading the material which falls through the apertures in the first-named table upon the second table, the bottom of the casing provided with a corrugated portion upon which the material falls from the second-named table, the casing provided with an apertured portion, the means for spreading the material on the second table operating to draw the material falling on the corrugated bottom of the casing over the apertures therein, and means for adjusting the size of the apertures.

11. In a separator, the combination with a shaft, of a plurality of traveling beaters secured thereon, each beater comprising a plate, a plurality of fingers extending therefrom and adapted to beat or thresh the grain, a body portion to which the plate is secured, a lug depending from the body portion provided with a slot, a roller journaled in the slot and means with which the rollers engage whereby to cause the operation of the beaters.

12. In a separator, a series of traveling beaters, each comprising a supporting member, a finger-plate secured thereto, each finger being formed in an approximately hollow half-conical shape, a slotted projection depending from the supporting member, and a roller received in the slot.

13. A separator comprising a feeding mechanism, a series of traveling beaters, adjustable shafts located beneath the beaters, the shafts set at an angle to each other and to the direction of motion of the traveling beaters, the ends of the beaters adapted to engage and override the adjustable shafts.

14. A separator comprising a feeding mechanism and a series of traveling beaters, shafts located beneath the beaters, the ends of the shafts supported eccentrically in rotatable plates, the plates secured to the sides of the separator, the ends of the beaters adapted to engage and override the shafts whereby to agitate the beaters.

15. A separator comprising a series of traveling beaters, a screen beneath the beaters, the beaters adapted to drag their ends thereover, a second screen located beneath the first-named screen, an endless traveling means encircling the latter screen, and double-edged bars carried by the said traveling means and adapted to drag over the second screen.

16. A separator comprising a series of traveling beaters, a screen beneath the beaters, the beaters adapted to drag their ends thereover, a second screen located beneath the first-named screen, an endless traveling means encircling the latter screen, and double-edged bars carried by the said traveling means and adapted to drag over the second screen, and a floor beneath said second screen, the opposite edges of the bars adapted to drag over the floor of the separator.

17. In a grain-separator, the combination with a traveling means, of bars carried by the links, beaters mounted on the bars, a plurality of shafts located at an angle to the direction of travel of the beaters, the beaters provided with rollers adapted to intermittently engage the shafts to oscillate the beaters in a direction diverging from that of their direction of travel.

Signed by us at Mansfield, county of Richland, and State of Ohio, this 5th day of July, 1901.

HARRY J. SILVIS.
HENRY WHITE.

Witnesses:
E. F. McCLINTON,
D. C. GAIBLER.