C. A. TORRENCE.

GRAIN SEPARATOR.

APPLICATION FILED FEB. 9, 1907.

910,973.

Patented Jan. 26, 1909.

4 SHEETS—SHEET 1.

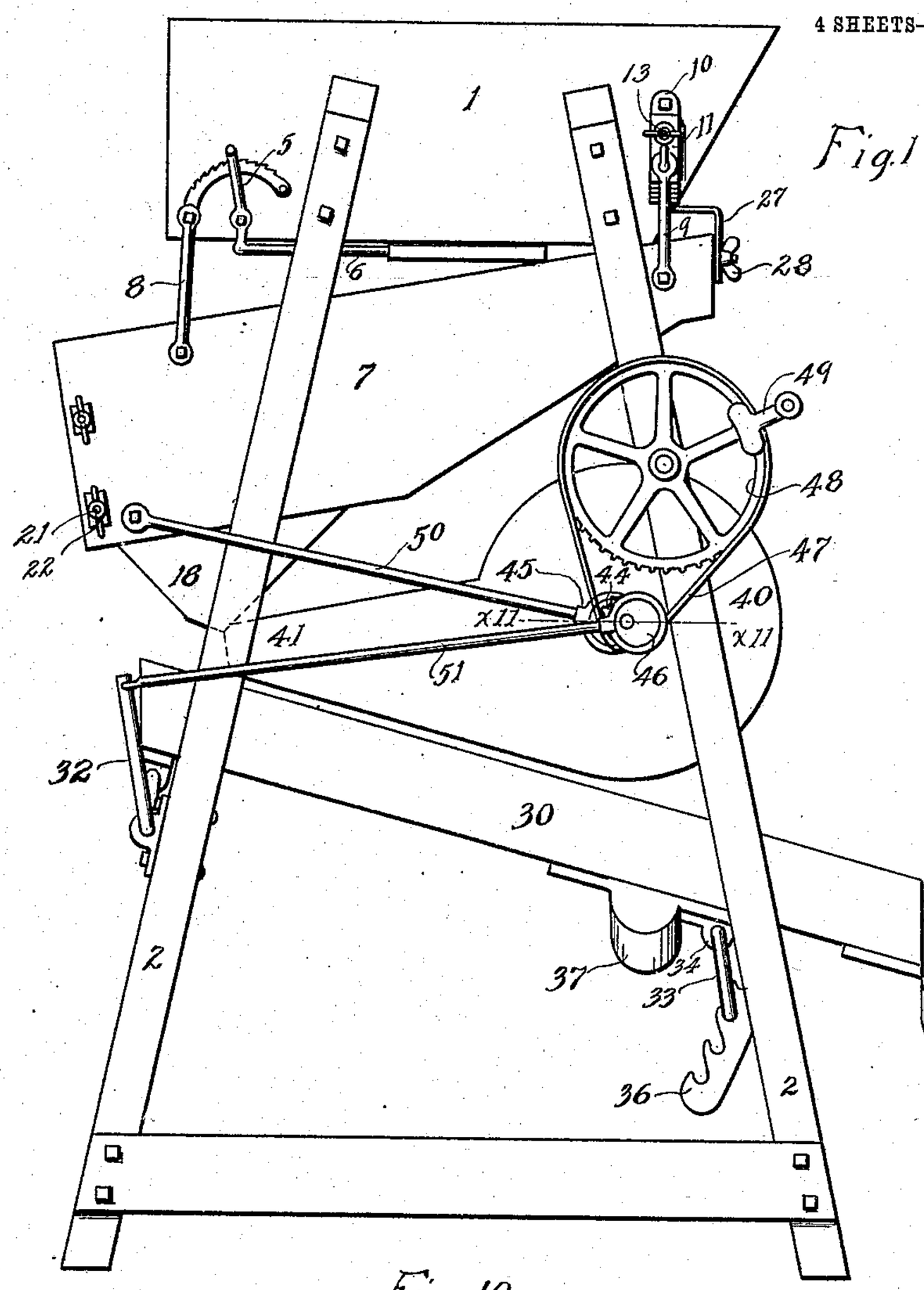

Fig. 1

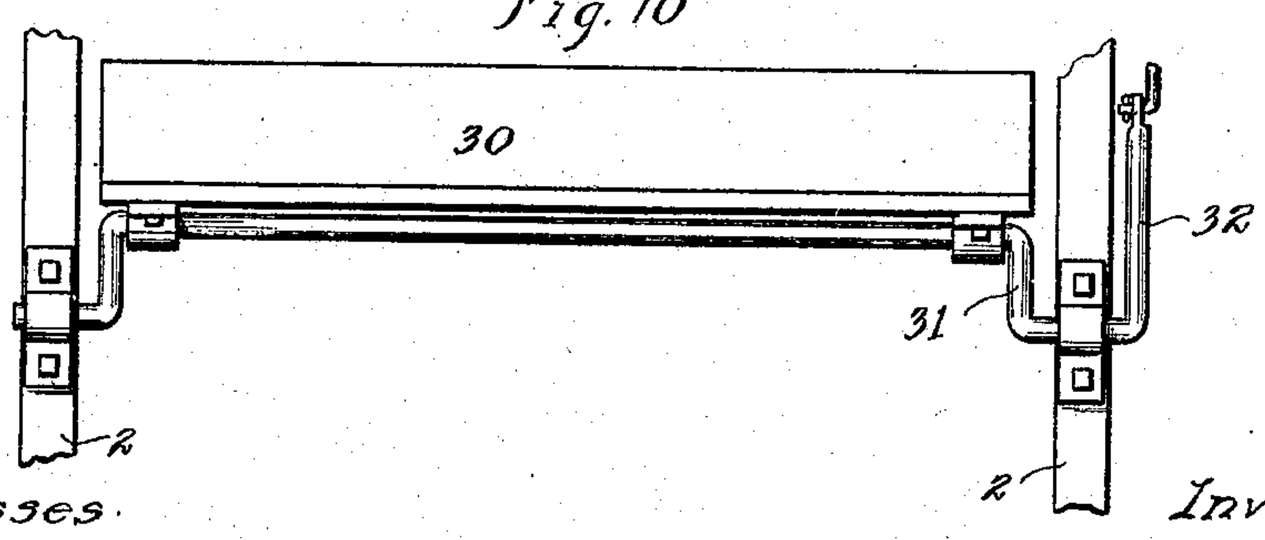

Fig. 10

Witnesses.

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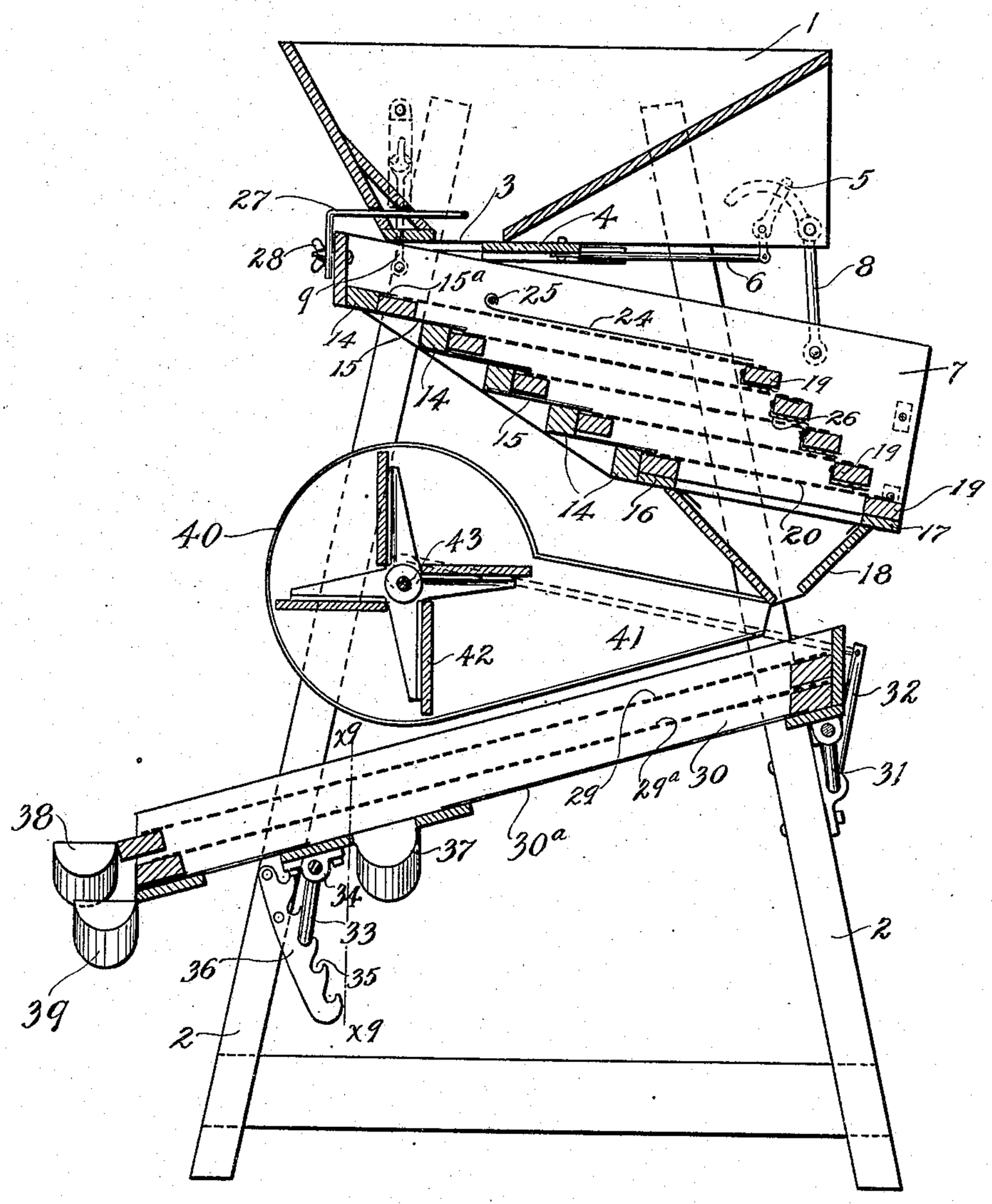
4 SHEETS—SHEET 2.

Fig. 2



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4 SHEETS—SHEET 3.

Fig. 3

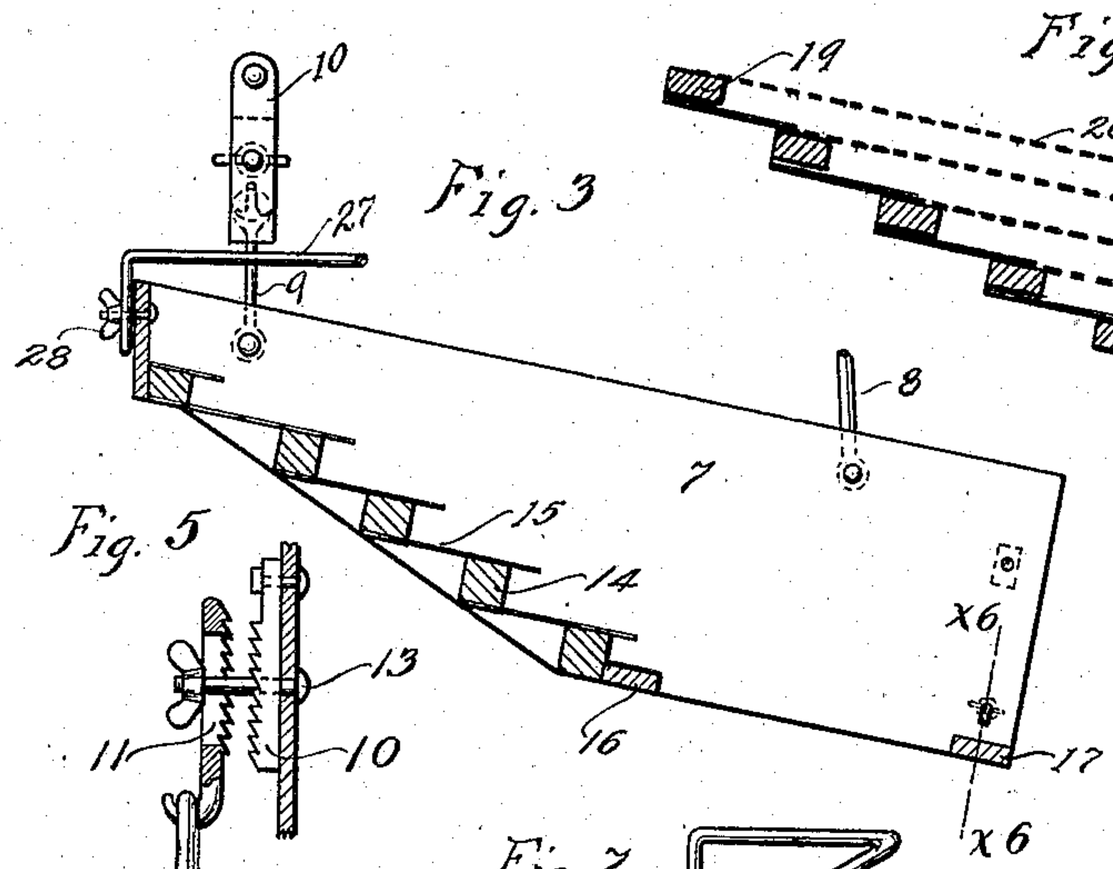


Fig. 4

Fig. 5

Fig. 6

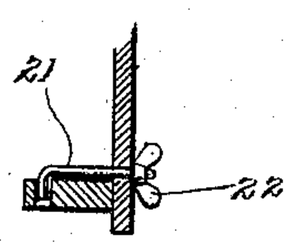


Fig. 7

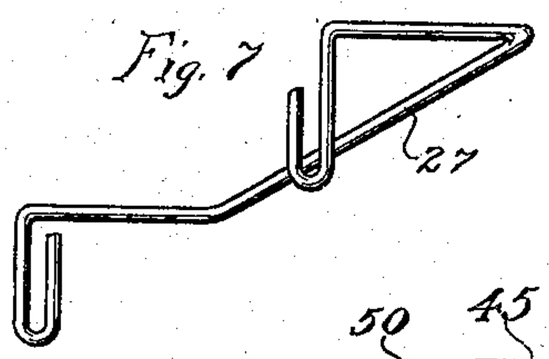


Fig. 11

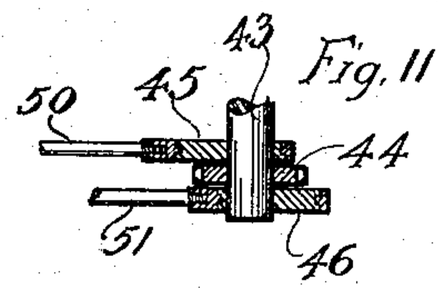


Fig. 8

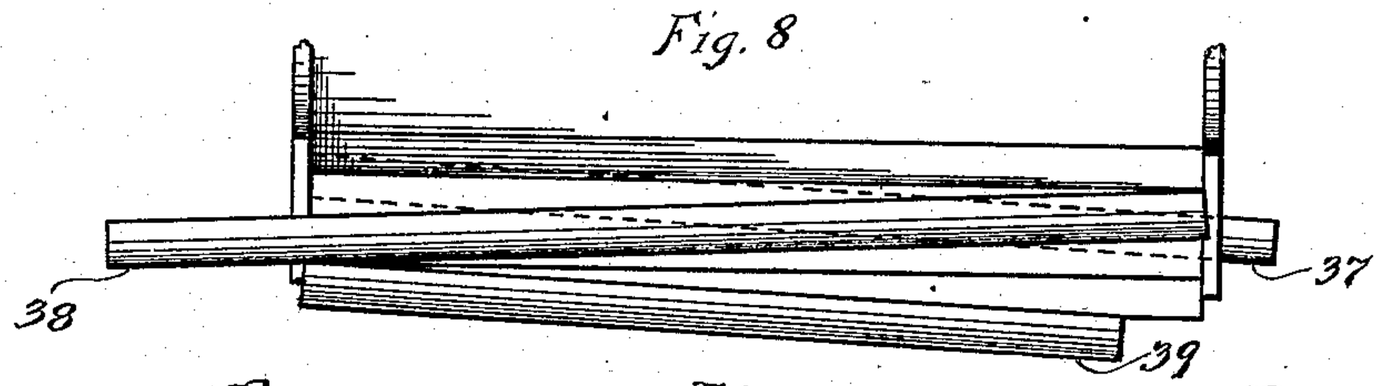
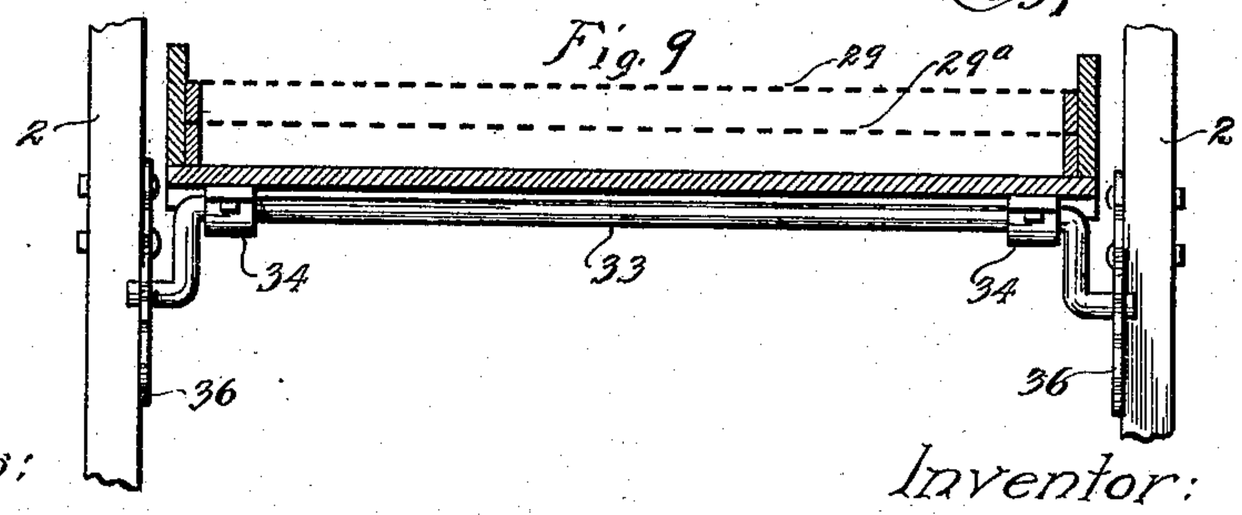


Fig. 9



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4 SHEETS—SHEET 4.

Fig. 12

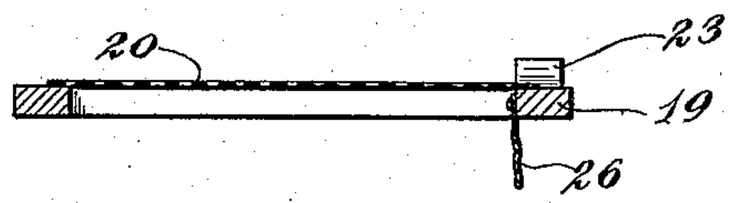
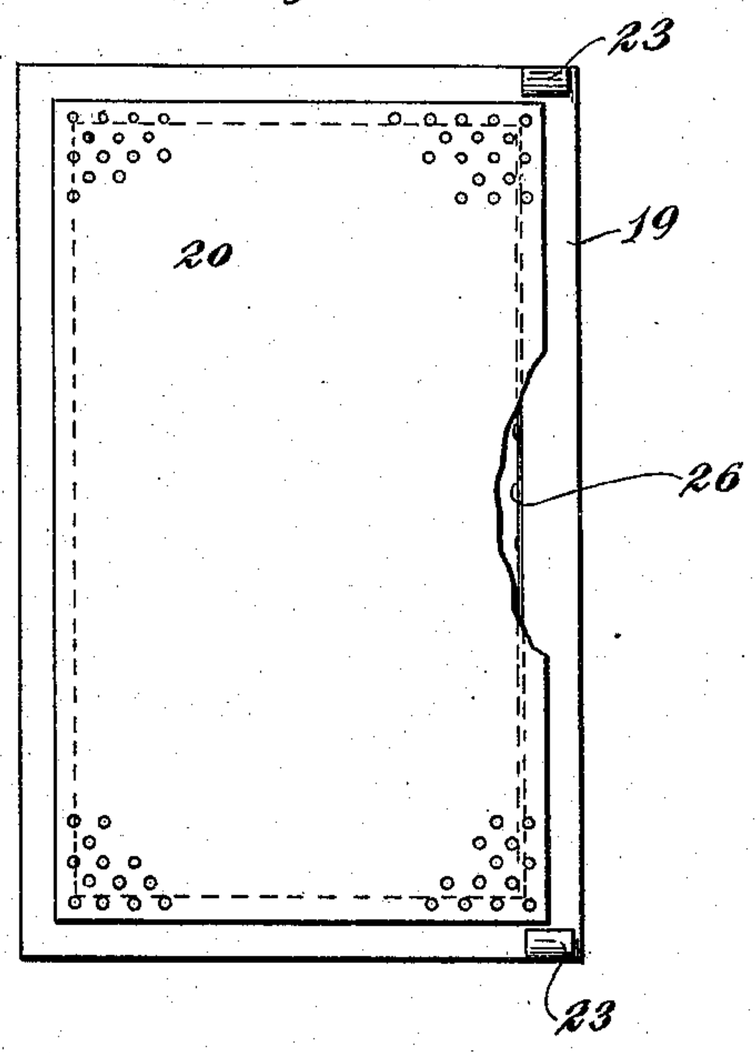


Fig. 13



Witnesses:

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UNITED STATES PATENT OFFICE.

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GRAIN-SEPARATOR.

No. 910,973. Specification of Letters Patent. Patented Jan. 26, 1909.

Application filed February 9, 1907. Serial No. 356,597.

To all whom it may concern:

Be it known that I, CHARLES A. TORRENCE, a citizen of the United States, residing at Crookston, in the county of Polk and State of Minnesota, have invented certain new and useful Improvements in Grain-Separators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to grain separators of the kind wherein vibrating sieves or screens are employed in connection with a fan for producing a blast, and has for its object to simplify the construction and improve the action of the same.

To the above ends the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a view in side elevation, showing the improved machine. Fig. 2 is a view in vertical section taken centrally through the improved machine. Fig. 3 is a detail in vertical section, showing the upper sieve supporting shoe of the machine removed from working position. Fig. 4 is a detail in vertical section, showing a gang of sieves removed from the upper shoe. Fig. 5 is a detail in front elevation, with some parts sectioned, showing one of the adjustable hangers for supporting the upper sieve shoe. Fig. 6 is a detail in section on the line x^6 x^6 of Fig. 3. Fig. 7 is a perspective view of an agitator which is carried by the upper shoe and works within the grain supply hopper. Fig. 8 is a detail in elevation, with parts broken away, looking at the delivery end of the lower vibratory shoe of the machine. Fig. 9 is a detail in transverse vertical section taken on the line x^9 x^9 of Fig. 2. Fig. 10 is a front elevation, showing the lower sieve shoe and front supporting connection therefor. Fig. 11 is a detail in horizontal section taken on the line x^{11} x^{11} of Fig. 1. Fig. 12 is a transverse section taken through the central portion of one of the sieves; and Fig. 13 is a plan view of one of the sieves.

An elevated grain supply hopper 1 is supported by a frame work 2 and is provided in its bottom with a discharge passage 3 that is adapted to be opened and closed by a sliding gate 4. This gate 4 is mounted to slide in suitable guides on the lower edges of the sides of said hopper and is adapted to be adjusted by means of a lever 5 that is connected thereto by a rod 6.

The upper sieve shoe 7 is mounted just below the hopper 1 and is supported from the sides of the latter by a pair of front links 8 and rear links 9, which links are pivotally connected to the said hopper and shoe. The upper ends of the rear links 9, instead of being directly pivoted to the sides of the hopper 1, are adjustably supported therefrom by means of a pair of ratchet toothed bars 10 and 11, the former of which is rigidly secured to the adjacent side of the hopper 1, and the latter of which has a hooked lower end to which the upper end of the link 9 is directly pivoted. The bar 11 is adjustably secured to the bar 10 by a nutted bolt 13 passed through the said two bars, said bar having a slot through which said bolt is passed.

The shoe 7 is provided with an obliquely spaced series of transversely extended bars 14, and with a corresponding series of obliquely spaced slightly inclined imperforate deck sections 15. Each imperforate deck section 15 is secured to the bottom of an overlying bar 14 and to the top of an underlying bar 14, and projects forward beyond the latter. Just forward and below the top of the lowermost bar 14 is a transverse sieve supporting slat 16 rigidly secured to the sides of the shoe 7, and to the lowermost forward portions of the sides of said shoe 7 is rigidly secured a similar sieve supporting slat 17. Carried by the shoe 7 and extending below the opening between the sides of the shoe 7 and the supporting slats 16 and 17 thereof is a discharge hopper 18.

The shoe 7 carries a gang of sieves made up of individual rectangular sieve frames 19 and sieve surfaces 20, which latter are preferably in the form of perforated zinc plates having round perforations and secured at their edges to the upper faces of the receiving rectangular frames 19. The lowermost sieve frame 19 rests upon the supporting slats 16 and 17, and the upper edge thereof projects under the forward edge of the lowermost imperforate deck 15. Each of the other sieve frames 19 rests directly upon an underlying

sieve frame, and its upper transverse bar rests directly upon an underlying imperforate deck 15. Also, it will be noted, the upper transverse bar of each of said frames 19, except the uppermost thereof, projects under the forwardly projecting edge of the overlying imperforate deck section 15. The transverse bar of the uppermost frame 19 projects under the forwardly projecting edge of an imperforate deck section 15[a] that is directly secured to the upper surface of the uppermost transverse bar 14.

The forward transverse bar of the lowermost sieve frame 19 is clamped to the sides of the shoe 7, preferably, as shown, by means of hook bolts 21 provided, as shown, with thumb nuts 22, see particularly Fig. 6. When the thumb nut 22 is loosened, the hooked end of the bolt 21 may, of course, be readily removed from its seat in the frame 19, thereby allowing the ready removal of said frame. All of the sieve frames 19, except the uppermost, are provided at the sides of their lower edges with raised bosses or lock lugs 23 that engage the lower portions of the overlying sieve frames 19 and thus coöperate with the deck sections 15 and 15[a] to lock the several sieves in their operative positions in the shoe 7.

The numeral 24 indicates a flexible rider, such as an oil cloth, which overlies the upper sieve 20 and, as shown, is attached at its upper edge to a transverse rod 25 carried by the sides of the shoe 7.

The numeral 26 indicates short flexible riders that are attached to the forward edges of the transverse lower bars of all of the sieve frames 19 except the lowermost thereof. These short riders 26 assist in guiding the grain and holding the same flat upon the sieve surfaces while passing under the respective sieve frames.

It is important to note that the sieve surfaces 20 from top toward the bottom are successively shorter in the direction of the travel of the stock thereover. This is believed to be broadly a novel feature and the importance thereof will be considered later on in the description of the operation.

To the upper rear end of the shoe 7 is secured a grain agitator preferably in the form of a bail-like wire or rod 27, the downturned prongs of which are secured to the transverse rear bar of said shoe 7, preferably by nutted bolts 28. The parallel side portions of this bail 27 work through suitable passsges in the hopper 1, and the transverse portion thereof is arranged to vibrate directly over the discharge passage 3 of said hopper, to thereby agitate the grain in the vicinity of and insure free feed thereof through the said passage 3.

Grain delivered through the sieves of the upper shoe is directed by the discharge hopper 18 onto the upper or receiving end of an inclined sieve 29 that is carried by a lower shoe 30. The upper or front end of said shoe 30 is supported from suitable bearings on the frame-work 2 by means of a bail-like crank shaft 31 having at one end a crank arm 32. A bail-like crank shaft 33 is pivoted to suitable bearings 34 on the bottom of the shoe 30 forward of its rear lower end. The ends of this crank shaft or bail 33 are adapted to be engaged with any of a series of notches or seats 35 formed in bearing racks or bars 36 rigidly secured to the sides of the frame-work 2. The two crank shafts or bails 31—33 support the shoe 30 with freedom for vibratory movements from front toward the rear of the machine, and vice versa. The inclination of the shoe 30 and, hence, of the sieve 29, may be varied by vertical adjustments of the lower or rear end of said shoe, which adjustments may, of course, be accomplished by engagements of the bail 33 with different seats or notches 35 of the supporting racks or bars 36. The several seats 35 in the bars 36 are located on a slightly curved line that is approximately concentric to the axis of the pivotal connection between the crank shaft 31 and the upper end of the lower sieve shoe. Otherwise stated, the said seats 35 are approximately equi-distant from the axis of the said connection. This construction is important because under the several adjustments of the lower supporting crank or bail 33, the said crank or bail is held to vibrate within the same angular zone in respect to the said lower shoe. The screen 29 is preferably provided with long and narrow meshes. By increasing the inclination of the said screen, the horizontal extension of the meshes thereof is decreased and, furthermore, the stock will be more rapidly delivered over said screen, so that the said screen is made to perform the function of a screen having shorter perforations in the direction of the travel of the stock set at a less inclination or pitch. This adjustment of said shoe, therefore, very greatly increases the range of action of the screen and makes one screen perform the work of several. For some work, however, it is desirable to have a second screen 29[a] located below the screen 29, and the shoe 20 is provided with an imperforate inclined bottom 30[a]. The inclined shoe bottom 30[a] opens into a depending transversely inclined discharge spout 37 which is carried by said shoe, while the screens 29 and 29[a] deliver, respectively, to reversely inclined delivery spouts 38 and 39 also carried by the said shoe 30.

Supported by the framework 2 above the shoe 30 and below the shoe 7, is a fan, the case 40 of which is provided with a discharge spout 41 that directs the blast of air directly through the stream of grain as it passes from the shoe hopper 18 to the upper or receiving end of the shoe 30. Working within the case 40 is a fan head 42 carried by a shaft 43

that is mounted in suitable bearings on the framework 2 and is provided at one end with a sprocket 44 and with a pair of oppositely set eccentrics 45 and 46. A sprocket chain 47 runs over the sprocket 44 and over a loose sprocket 48 mounted in a suitable bearing on the framework 2 and provided with a crank 49 by means of which it may be driven to impart motion to the fan shaft and head.

Reverse vibratory movements are imparted to the sieve shoes 7 and 30 through connecting rods 50 and 51. The connecting rod 50 is pivotally connected to the upper shoe 7 and has a strap that works on the eccentric 45, while the connecting rod 51 is pivotally connected to the arm 32 of the crank shaft 31 and is provided with an eccentric strap that works on the eccentric 46.

The action of the machine above described in separating what is usually designated as succotash, to-wit, commingled wheat and oats, is substantially as follows: The oats, being relatively long, will tend to pass or slide over the rounded perforations of the sieves 20 and, hence, to pass as tailings from the lower ends of the said sieves, while the wheat, being more nearly round or relatively thick and short, will tend to pass through the round perforations of said sieves. Some oats will pass through the uppermost sieves 20, but by each sieve some oats is eliminated from the mass or body of wheat, while the wheat will pass through all of the said sieves and into the hopper 18. It is, of course, evident, that the longer a sieve over which the oats travels, the greater is the chance of the same going through the perforations of said sieve. Hence, the chance which the oats has to go through the perforations of the sieves 20 is very greatly reduced by making the sieves which are successively lower, successively shorter and shorter. It will be noted that the fan is not arranged to deliver air through the upper bank of sieves, but, on the contrary, that the air is confined and delivered only through the grain which falls from the hopper 18 onto the upper end of the upper sieve of the lower shoe. The air does not, therefore, interfere with or in any wise affect the separation which takes place in the upper bank of sieves.

The wheat which has been freed of oats but which may contain more or less small seeds or foreign materials is delivered from the shoe hopper 18 through the blast from the fan and onto the screen 29 of the shoe 30. Dust and very small light material will be blown from the wheat by the blast from the fan. Cleaned wheat will be delivered over the screen 29 into the spout 38, while second grade stock, such as broken and shriveled wheat will be delivered over the screen 29[a] into the spout 39. Small seeds, such as flax seed or mustard seed, for example, will be delivered onto the deck 30[a] and into the spout 37.

What I claim is:

1. In a machine of the kind described, the combination with a vibratory shoe, of a gang of individual sieve frames, each having its own perforated sieve surface, the said sieve frames having direct interlocking engagement with said shoe and with each other, and being arranged one on top of the other but overlapped in the direction of the travel of the stock, substantially as described.

2. In a machine of the kind described, the combination with a vibratory shoe having the cross bars and overlapping deck sections, and a gang of individual sieves adapted to interlock with said deck sections, means for detachably securing the lowermost sieve to said shoe, and means for interlocking the forwardly projecting ends of upper sieves with underlying sieves, substantially as described.

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

CHARLES A. TORRENCE.

Witnesses:
GEO. F. CARPENTER,
CLARA BJOLAND.