

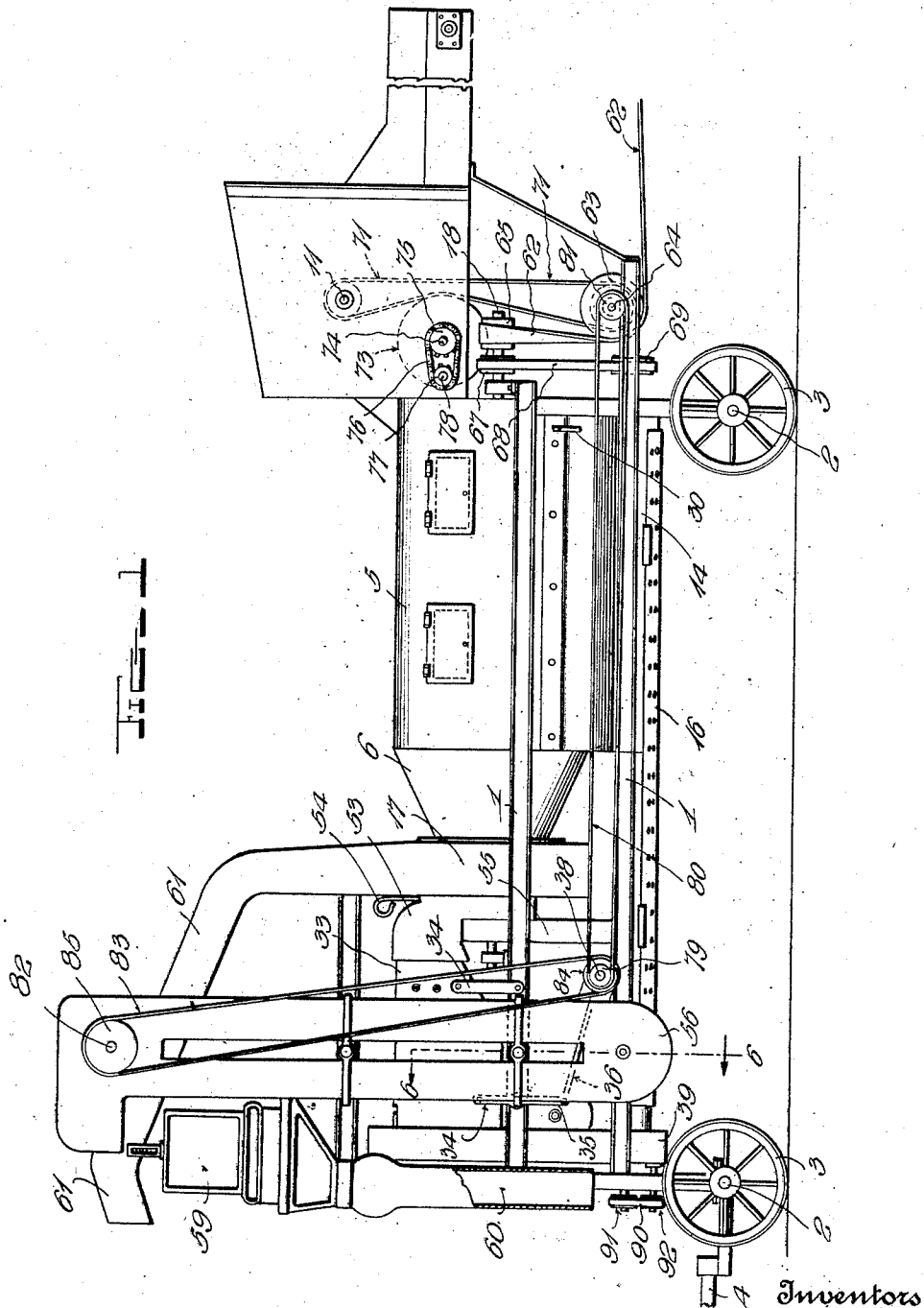
April 21, 1925.

1,534,426

H. L. STRONG ET AL
CENTRIFUGAL THRASHING MACHINE

Filed March 11, 1924

4 Sheets-Sheet 1



Witness

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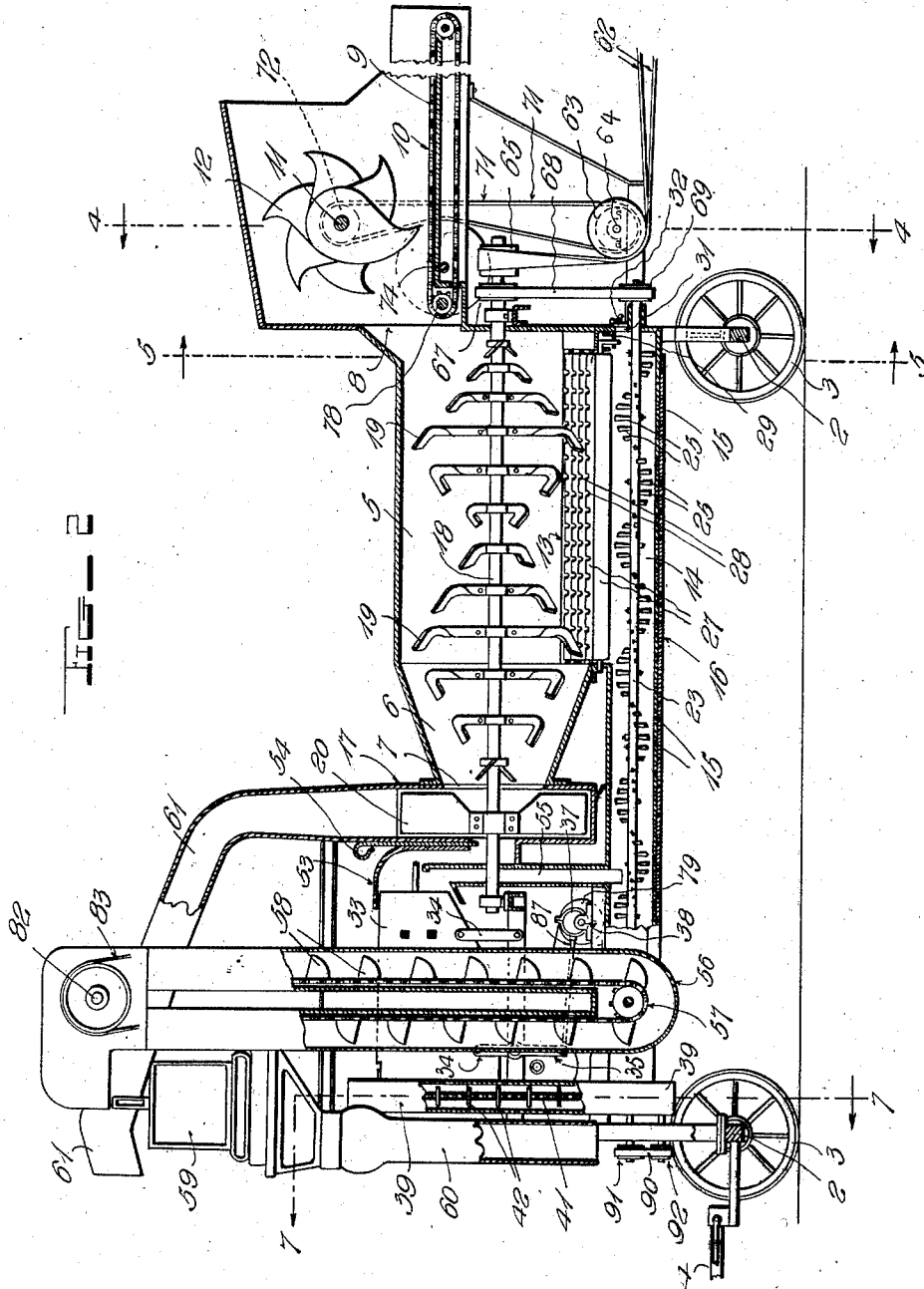
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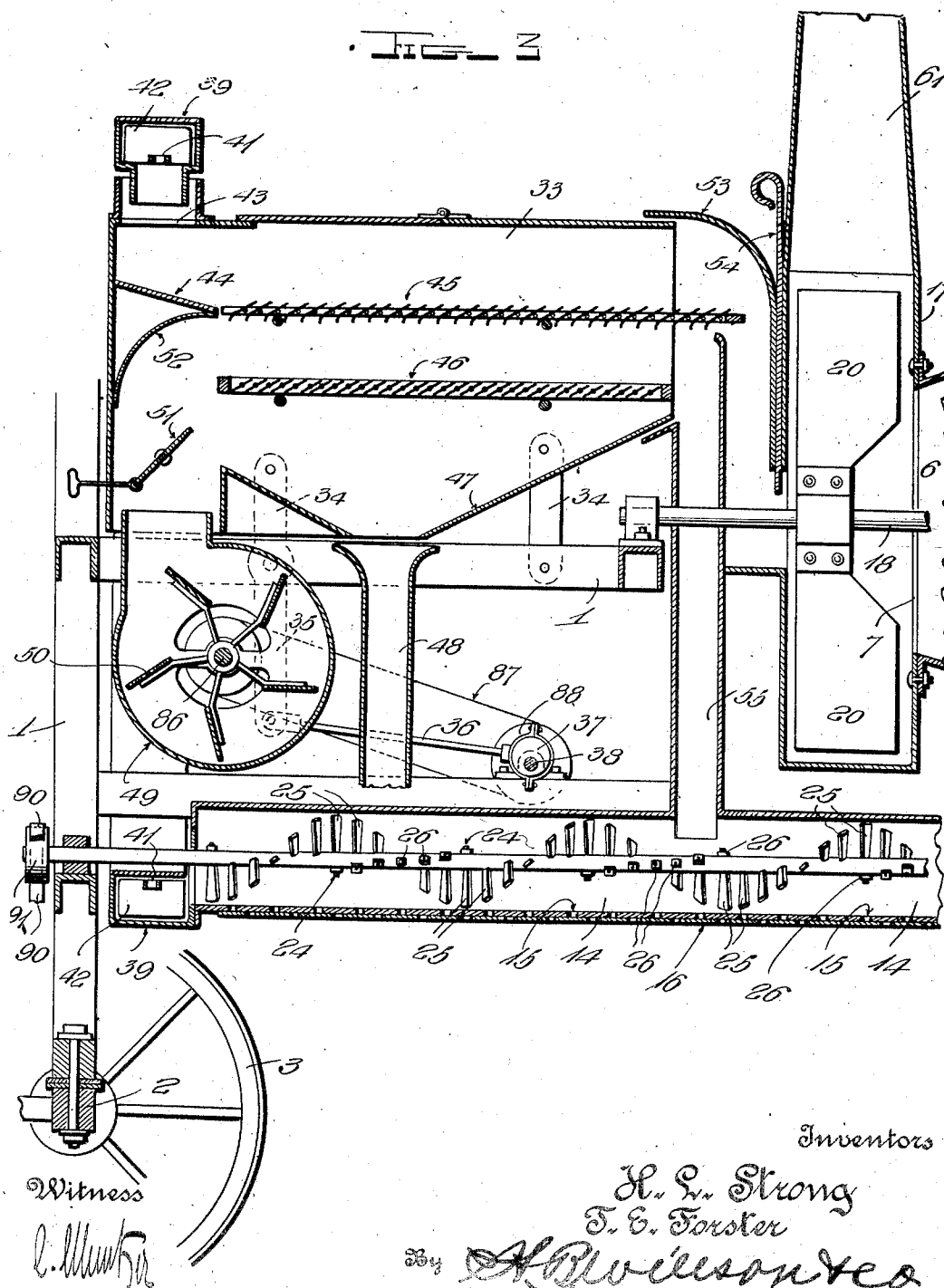
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FIG. 4

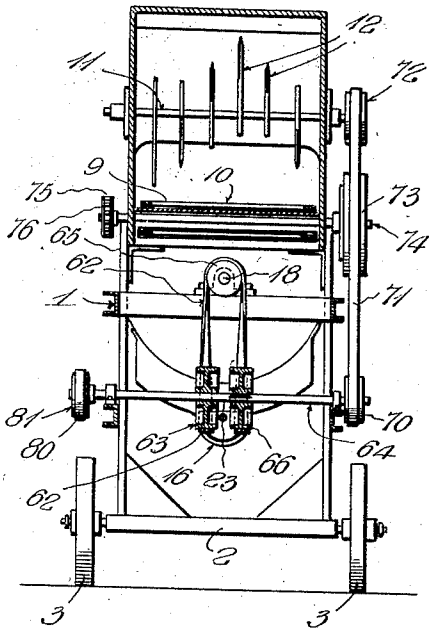


FIG. 5

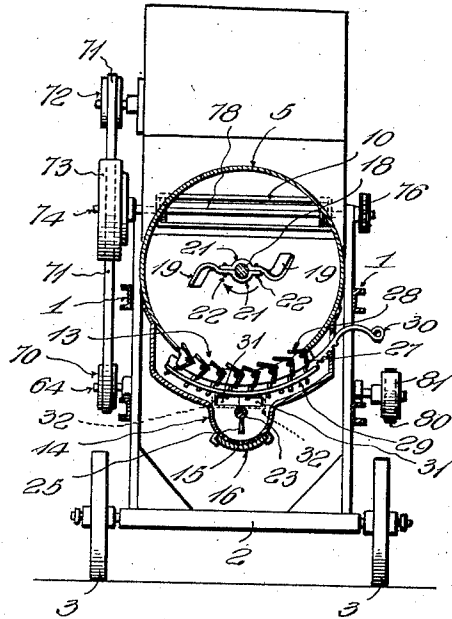


FIG. 6

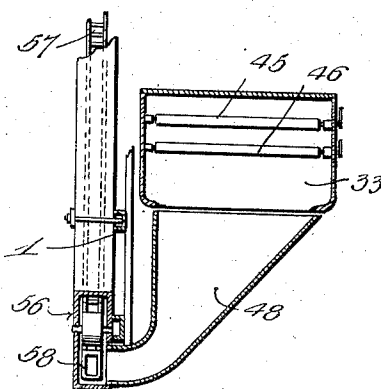


FIG. 7

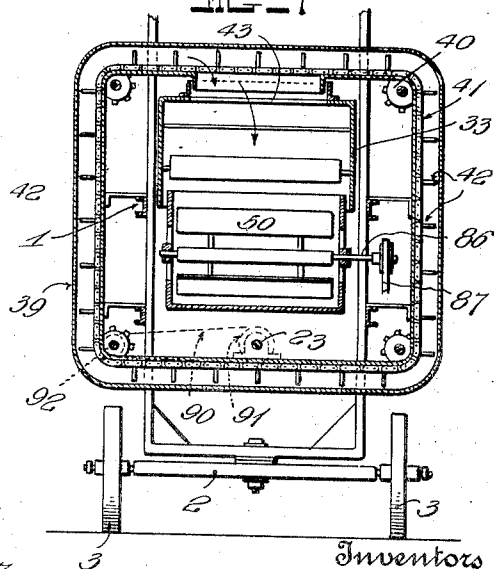


FIG. 10



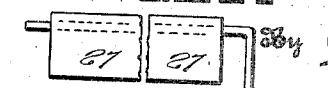
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FIG. 8



FIG. 9



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UNITED STATES PATENT OFFICE.

HOMER L. STRONG AND THOMAS E. FORSTER, OF WICHITA, KANSAS.

CENTRIFUGAL THRASHING MACHINE.

Application filed March 11, 1924. Serial No. 698,535.

To all whom it may concern:

Be it known that we, HOMER L. STRONG and THOMAS E. FORSTER, citizens of the United States, residing at Wichita, in the county of Sedgwick and State of Kansas, have invented certain new and useful Improvements in Centrifugal Thrashing Machines; and we do 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.

This invention relates to the art of thrashing and is an improved thrashing machine in which centrifugal force is utilized in a scientific way to perform the thrashing operation.

The improved machine has been carefully designed so that the cost of its production may be such that every individual farmer may own one the same as he owns his individual harvester, tractor, and the like, and can thresh his grain whenever ready, without being obliged to wait his turn for a community or professional thresher. The machine has comparatively few working parts and is constructed in such a manner that very little power is necessary to operate it or to move it from one place to another, and furthermore, it may be very successfully operated with a minimum amount of labor. Moreover, the parts of the machine are arranged compactly so that the machine is comparatively small. The advantage for this is that it may be conveniently housed or stored away in a comparatively small space.

The machine is remarkably efficient, as the mechanism is designed so as to thoroughly thresh the grain without cracking it, and so as to scour or polish it and separate all dirt, dust or chaff from it. By the construction employed, this is accomplished without waste of grain, that is to say, without permitting any of the threshed grain to be thrown onto the stack with the straw and chaff. Although, the novelty contained in the improved machine is particularly set forth and defined by the appended claims, yet it will be pointed out that the machine includes a cleaning mechanism which is constructed and arranged so as to not only separate chaff and dust from the threshed grain but also to separate unthreshed or only partially threshed grain from the fully threshed grain and to convey such un-

threshed or partially threshed grain back to a portion of the machine in which it will be scoured and fully threshed. In addition to this, the improved machine has an uniquely constructed rotatable means for threshing the grain by centrifugal action, and also a uniquely constructed spiral conveyor operating in a conveyor conduit for moving the threshed grain along the conduit and at the same time causing the grain to be thoroughly scoured and polished. Then too, power is applied to the machine in a unique way, so that unthreshed grain will only be fed into the threshing chamber while the centrifugal threshing means disposed therein is maintained at a proper thrashing speed.

In more fully describing the invention hereinafter, reference will be made to the accompanying drawings, which form a part of this specification.

In these drawings:—

Figure 1 is a side elevation of a thrashing machine constructed in accordance with the principles of the invention;

Figure 2 is a view showing the machine partly in vertical, longitudinal section;

Figure 3 is a vertical longitudinal sectional view of the rear end portion of the machine, illustrating particularly the cleaning mechanism, said view being drawn on an enlarged scale;

Figures 4, 5, 6 and 7 are transverse sectional views of portions of the machine, Figs. 4, 5 and 7 being taken respectively on the planes indicated by the lines 4—4, 5—5 and 7—7 of Fig. 2, and Fig. 6 being taken on the plane indicated by the line 6—6 of Fig. 1;

Figure 8 is a plan view of one of the grain deflecting bars which is mounted at the bottom of the thrashing chamber;

Figure 9 is a side elevation of the bar illustrated in Fig. 8; and

Figure 10 is a transverse sectional view of the bar taken substantially on the plane indicated by the line 10—10 of Fig. 8.

As illustrated in the drawings, the machine is preferably mounted upon a framework, portions of which are indicated by the numerals 1. This framework includes a pair of axles 2 carrying supporting wheels 3 to permit the machine to be easily moved from place to place. At one end, the framework is provided with a draft tongue 4.

Upon the framework of the machine,

there is suitably mounted a horizontally disposed thrashing chamber 5. This is preferably substantially cylindrical throughout the greater portion of its length, but its rear end is preferably of conical shape as indicated at 6 and is provided with a straw and chaff outlet 7. The front end of the chamber 5 has an unthreshed grain inlet 8. This is disposed at the upper portion of this end of the chamber in somewhat of an offset relation from the longitudinal axis of the chamber. A platform 9 with hopped sides extends forwardly from the front end of the thrashing chamber 5, and mounted so as to operate longitudinally over this platform is an endless slat conveyor 10 by which the unthreshed grain is conveyed and fed into the thrashing chamber through the inlet 8. Extending transversely between the hopped sides of the platform 9 and arranged above the conveyor 10 is a shaft 11 carrying a plurality of hand cutter knives 12.

The bottom of the thrashing chamber 5 is provided with a threshed grain outlet. This is preferably in the form of a comparatively wide longitudinally extending opening 13. This threshed grain outlet leads into the upper side of the front end portion of a conveyor conduit 14, which is arranged below the thrashing chamber 5 and extends a considerable distance beyond the rear end of the same. The bottom of this conduit 14 is perforated as indicated at 15, and the perforations thereof are opened or closed at will by the longitudinal adjustment of a perforated plate 16 which is slidably mounted upon the bottom of the conduit.

The smaller rear end of the cone-shaped section 6 of the thrashing chamber 5 is secured to a fan housing 17, and extending through the central portion of this housing and axially through the thrashing chamber 5 is a rotatably mounted shaft 18. This shaft 18 carries in the thrashing chamber 5 a plurality of arms 19 which are arranged spirally along the shaft and extend radially therefrom. The shaft 18 also carries a suction fan 20 disposed within the fan housing 17.

The arms 19 with which the shaft 18 is provided, are arranged in pairs, so that the arms of each pair extend radially in opposite directions from the shaft. The inner ends of each pair of arms 19 extend or pass around opposite sides of the shaft 18 and overlap as indicated at 21 in Fig. 5, and securing elements 22 pass through these overlapping ends and secure the arms of each pair together and clamp them to the shaft 18. The outer ends of the arms 19 are inclined toward the rear end of the thrashing chamber 5 and laterally in a direction opposite to the direction toward

which the shaft 18 revolves. The purpose of this particular construction is hereinafter more fully explained.

Extending axially through the conduit 14 is a shaft 23. This shaft is provided with a series of diametrically extending apertures which are arranged spirally along the length of the same. In these apertures, the studs 24 which extend from the ends of the blades 25 are fitted. Nuts 26 are threaded upon the free ends of the studs 24 to securely clamp the blades in place upon the shaft 23. The blades 25 being arranged in a spiral series along the shaft 23, are pitched at such an angle that they will move any grain falling into the conduit 14 longitudinally along the same toward the rear end thereof.

In the opening 13 formed in the bottom of the thrashing chamber 5, there is mounted a plurality of grain deflector bars 27. These bars 27 which are preferably formed of angle iron, extend longitudinally of the thrashing chamber and are pivoted at their opposite ends adjacent their angle portions in any suitable manner, so that they may be adjusted to different angles. The bars 27, as clearly shown in Fig. 5, are transversely overlapped in the direction of rotation of the shaft 18 and arms 19, and are preferably provided along one of their overlapping edges with a series of grooved notches 28, forming passages for the threshed grain from the chamber 5 into the conduit 14. By adjusting the angles of the bars 27 provision is made to permit proper passage of the threshed grain from the thrashing chamber 5 into the conduit 14, depending upon the character of the grain being threshed. It of course is preferable to adjust all of the grain deflector bars 27 simultaneously, so that a shifting spacer bar 29 is connected to all of said bars and this bar is provided with an operating handle 30.

The front end of the conveyor conduit 14 is provided with an air opening or passage 31, and the amount of air passing through this passage is controlled by proper adjustment of a pair of slides or shutters 32. These are particularly shown in Fig. 5. In this view, the right hand slide is illustrated as being closed, while the left hand slide is illustrated as being partly open.

At the rear end of the machine, back of the fan housing 17, a shaker shoe 33 is mounted for longitudinal reciprocation. By preference, links 34 are employed to mount the shaker shoe to certain of the bars forming part of the framework of the machine. The rearmost links 34 extend downwardly below their pivots with said bars to form arms 35, to the ends of which pitman rods 36 are connected. These pitman rods 36

are operated by eccentrics 37 mounted upon the opposite ends of a suitable mounted transversely extending cross shaft 38.

The conduit 14 communicates at its rear end with the lower portion of a substantially square or rectangular shaped conduit 39. Sprocket wheels 40 are mounted at the corners of this conduit, and a sprocket chain 41 passes around the sprocket wheels 40 and through the conduit. This chain 41 is provided with a series of steel elevator flights 42, so that the grain which is fed into the bottom portion of the conduit 39 from the conduit 14 is carried and raised by the elevator flights 42 to a position above the inlet 43 of the shaker shoe 33 and dumped into the shaker shoe.

The grain delivered into the shaker shoe 33 first drops onto an inclined spreader board 44, from there it passes onto an adjustable chaffer 45 and the grain that passes through the chaffer 45 drops onto an adjustable sieve 46, and then whatever grain that passes through the sieve 46 falls onto the hoppers bottom 47 of the shaker shoe and into a chute 48.

Mounted in any suitable manner at the rear end of the machine beneath the shaker shoe 33 is a housing 49, in which a blower fan 50 is mounted. This fan 50 discharges into the bottom of the shaker shoe 33 at the rear end thereof, and the air which is forced into and through the shaker shoe 33 by the fan 50 is properly distributed or given the proper course by a manually adjustable air deflector board or damper 51, and also by a curved baffle 52 mounted beneath the spreader or fall board 44.

A conduit 53 has its upper end portion arranged so as to receive any chaff, dust, light matter or the like from the forward end of the shaker shoe 33. This conduit leads into the rear side of the fan housing 17. The fan 20 in the housing 17, not only creates a current of air through the thrashing chamber 5, but also a current of air through the shaker shoe 33, and an adjustable slide 54 is provided in the conduit 53 as a means to obtain the proper air current in the shaker shoe 33.

Another conduit 55 leads from the forward end of the shaker shoe 33 to an intermediate portion of the conduit 14. The conduit 55 has its upper end positioned so as to receive any unthreshed or partly threshed grain too large to pass through the sieve 46 which falls over the forward end of the sieve.

The spout 48 leads into the lower portion of the conduit 56 for an endless elevator 57 provided with a plurality of steel scoops or buckets 58 which scoop up the grain and raise and then dump it into an automatic weigher 59. From the weigher 59, the grain is discharged into a loading spout 60 by

which it may be directed into a wagon body, a sack or other receptacle.

The straw and chaff which passes into the fan housing 17 from the thrashing chamber 5 and the shaker shoe 33 through the conduit 53 is discharged by the fan 20 into a stacker spout 61 communicating with the top of the fan housing 17 and arranged in an elevated position upon one side of the machine.

Power is supplied to the machine from a farm tractor, traction engine, or the like, by means of a belt 62. This belt 62 is preferably passed under a pulley 63 arranged loosely on a suitably mounted shaft 64 extending transversely across the front of the machine. The belt then passes around a pulley 65 fixed upon the forward end of the shaft 18 on which the thrashing arms 19 are mounted. After passing around the pulley 65, the belt 62 passes under a pulley 66 fixed upon the shaft 64. It will therefore be seen that power from the tractor or the like will be imparted directly to the shaft on which the thrashing arms 19 are mounted.

On the shaft 18 adjacent the pulley 65, there is another pulley 67. A belt 68 passes around this pulley 67 and around a pulley 69 fixed upon the shaft 23. By this connection, power is supplied to the shaft 23 from the shaft 18.

On one end of the shaft 64 there is a pulley 70, around which passes a belt 71. This belt 71 also passes around a pulley 72 fixed upon one end of the shaft 11 upon which the band cutters 12 are mounted, and one stretch of the belt 71 passes around a pulley 73 forming a part of an automatic centrifugal clutch, which is mounted upon a shaft 74 passing transversely across the hoppers sides of the platform 9. The shaft 74 carries a sprocket wheel 75 connected by a sprocket chain 76 to a sprocket wheel 77 upon the shaft 78 which drives the slat conveyor 10. By the means just described, it will be seen that power given to the shaft 64 will be continuously imparted to the shaft 11 on which the band cutters 9 and 12 are mounted, and that power will also be given to drive the conveyor 10, and to the pulley 73. This pulley 73, as hereinbefore mentioned, constitutes part of a centrifugal clutch, that is, it will only drive the shaft 74 when driven at or above a certain speed by the belt 71. Thus, in case the material in the thrashing chamber becomes clogged, or there is a reduction of the speed of the thrashing means below the proper thrashing speed, the centrifugal clutch will operate to allow movement of the feed conveyor 10 to cease.

In order to drive the eccentrics 37 which effect a reciprocation of the shaker shoe 33, the shaft 38 upon which said eccentrics are

mounted is provided with a pulley 79 around which passes a belt 80, which also passes around a pulley 81 fixed upon the other end of the shaft 64. Power from the shaft 38 is transmitted to the driving shaft 82 of the elevator 57 by means of a belt 83 passing around a pulley 84 arranged on the shaft 38 and a pulley 85 fixed upon the shaft 82. Power from the shaft 38 is also transmitted to the shaft 86 of the blower fan 50 by a belt 87 passing around a pulley 88 on the shaft 38 and a pulley 89 on the shaft 86.

In addition to the above described belt, there is a belt 90 which passes around a pulley 91 arranged on the conveyor shaft 23 and a pulley 92 upon the shaft upon which one of the sprocket wheels 40 of the cleaner elevator is mounted. By this means, power is supplied to the cleaner elevator from the shaft of the spiral conveyor arranged in the conduit 14.

The machine may be easily operated by one or more persons, and in operating it, the unthreshed grain is placed or thrown upon the conveyor 10. This conveys it into the thrashing chamber 5 and as it passes under the band cutters 12, the bands around the sheaves will be cut and the stalks will be evenly distributed across the conveyor.

While the machine is in operation, the suction fan 20 will suck a light current of air through the opening 31 in the front end of the conduit 14. This air will pass upwardly from the conduit 14 through the opening 13 in the bottom of the thrashing chamber 5 into the thrashing chamber and rearwardly through the same. At the same time, the fan 20 will assist the fan 50 in causing a current of air to pass through the shaker shoe 33.

When the unthreshed grain enters the thrashing chamber 5, it will be whirled around in the thrashing chamber, passing from one arm to the next succeeding arm, until the end of the thrashing chamber is reached. The rapid whirling of the grain causes a separation of the grain from the straw, and since the inside of the thrashing chamber 5 is entirely smooth and no beating whatsoever takes place, the grain that is threshed will not be cracked or damaged. The stalks of grain are whirled rather rapidly around the thrashing chamber by the arms 19, so that by the time they reach the rear end of the thrashing chamber, there will be a complete separation of the particles of grain from the straw. The construction of the outer ends of the arms 19 is such that each arm whirls the stalks of grain a few revolutions and then allows it to slip off to be whirled by the next succeeding arm.

The straw and chaff which is separated from the particles of grain by centrifugal action in the thrashing chamber 5 passes through the straw and chaff outlet at the rear

end of the thrashing chamber, and the fan 20 discharges such material into the spout 61 causing it to be stacked upon the ground.

The threshed grain drops by gravity to the bottom of the thrashing chamber 5 and passes through the grooved notches 28 formed in the grain deflector bars 27 and between the grain deflector bars 27 if they are adjusted at an angle to permit this, into the forward end of the conduit 14. The spiral conveyor in the conduit 14 causes the grain to travel rearwardly through the conduit until it falls into the conduit 39. The conveyor in the conduit 14 is operated, that is to say, it is timed to operate at a speed to cause the grain to pass through the conduit rather rapidly. The grain in passing through the conduit 14 is agitated or given such a motion that the particles will be rubbed together and rubbed against the blades 25 and the walls of the conduit 14 so as to effect a scouring or polishing of the grain.

After passing into the conduit 39, the grain will be elevated and discharged into the shaker shoe 33. Upon entering the shaker shoe 33, it will first fall onto the board 44 and be spread out. From there, it will pass onto the adjustable chaffer 45, and this will in conjunction with the current of air passing through the shaker shoe, separate any chaff, dirt or light matter that there may be with the grain. This matter will pass into the conduit 53 and from there into the fan housing 17 and be discharged by the fan 20 into the stacker spout 61.

The grain that passes through the chaffer 45 falls upon the adjustable sieve 46. This is considerably finer than the chaffer 45, so that it operates to separate the thoroughly threshed grain from unthreshed grain or only partly threshed grain. The thoroughly threshed grain passes through the sieve 46 and falls upon the hopped bottom 47 of the shaker shoe, but the partly threshed or unthreshed grain travels towards the front end of the sieve 46 and drops into the spout or conduit 55 which leads into an intermediate part of the conduit 14, so that this grain is again scoured and cleaned, and the operation of course will be repeated until all of the grain will be thoroughly threshed, scoured and cleaned.

From the chute 48, the threshed grain passes into the conduit 56, and the elevator 57 in such conduit raises it and dumps it into the automatic weigher 59, from which it is dumped or discharged into the loading spout 60 to be directed into a wagon, sack or other suitable receptacle.

From the foregoing description, it is believed that the construction, principle of operation, uses and advantages of the invention will be readily understood, so that further explanation will be unnecessary. How-

ever, it will be again pointed out that the improved machine has comparatively few parts and is of comparatively simple construction, that it may be produced at a small cost, so that it is possible every individual farmer may own one and can thresh his grain whenever ready without being obliged to wait his turn for a community thresher. Furthermore, very little power will be required to successfully operate the machine, and thrashing can be done with a minimum amount of labor.

It is obvious that many changes in construction may be made to the machine without departing from the principles of the invention or sacrificing any of the advantages thereof, so that the appended claims which define the novelty contained in the invention are worded in order to contemplate and cover various modifications.

What is claimed is:

1. In a thrashing machine, the combination of a thrashing chamber having an unthreshed grain inlet at its front and a straw and chaff outlet in its rear end, said chamber also having a threshed grain outlet, rotary thrashing means mounted in said chamber, a grain cleaning device positioned in rear of said chamber, means to convey the threshed grain from the threshed grain outlet of said chamber to said device, the front of said device having a chaff outlet, a fan housing positioned between said chamber and said device and having inlets communicating with the straw and chaff outlet of said chamber and the chaff outlet of said device, and a suction fan mounted in said housing.

2. A machine constructed as defined by claim 1, and further provided with a blower fan discharging into the rear end of the cleaning device to assist in separating the chaff from the grain and to direct the chaff toward the chaff outlet of said device.

3. A machine constructed as defined in claim 1, and further provided with a blower fan discharging into the rear end of the cleaning device to assist in separating the chaff from the grain and to direct the chaff toward the chaff outlet of said device, an air deflector mounted within said device to direct the current of air from said blower fan therethrough, and means for adjusting said deflector.

4. In a thrashing machine, the combination of a thrashing chamber having an unthreshed grain inlet at its front and a straw and chaff outlet at its rear end, said chamber also having a threshed grain outlet, rotary thrashing means mounted in said chamber, a grain cleaning device positioned in rear of said chamber, means to convey the threshed grain from the threshed grain outlet of said chamber to said device, said device having separate scoured grain, unscoured grain and chaff outlets, the chaff

outlet of said device being disposed at the front thereof, a fan housing positioned between said chamber and said device and having inlets communicating with the straw and chaff outlet of said chamber and the chaff outlet of said device, and a suction fan mounted in said housing.

5. In a centrifugal thrashing machine, the combination of a horizontal thrashing chamber having an unthreshed grain inlet at its front end, a straw and chaff outlet at its rear end, and a threshed grain outlet at its bottom, means disposed within said chamber for thrashing the grain by centrifugal action and at the same time conveying the straw and chaff toward and into said straw and chaff outlet, a horizontal conveyor conduit located beneath said chamber to receive threshed grain therefrom, the front end of said conduit being provided with an air inlet to permit air to enter and pass upwardly through the threshed grain outlet of said chamber into the latter and through the same, and a conveyor mounted in said conduit to move the grain through the same.

6. A machine containing the combination of parts set forth in claim 5, and in addition thereof, shutter means at the air inlet of the conveyor conduit to control the amount of air admitted.

7. In a centrifugal thrashing machine, the combination of a horizontal thrashing chamber having an unthreshed grain inlet at one end, a straw and chaff outlet at its other end and a threshed grain outlet extending longitudinally along its bottom, rotatable means disposed in said chamber to thresh the grain by centrifugal action and at the same time to convey the straw and chaff toward and into said straw and chaff outlet, means beneath said chamber to receive the threshed grain therefrom, and a plurality of longitudinally extending grain deflector bars arranged in the threshed grain outlet of said chamber, said bars being transversely overlapped in the direction of rotation of said rotatable thrashing means, whereby to prevent the straw and chaff from passing through said threshed grain outlet.

8. A machine constructed as defined by claim 7, in which the grain deflector bars are provided along one of their edges with series of notches forming passages for the threshed grain.

9. In a centrifugal thrashing machine, the combination of a horizontal thrashing chamber having an unthreshed grain inlet at its front end, a straw and chaff outlet at its rear end and a threshed grain outlet at its bottom, a rotatable shaft extending axially through said chamber, and a plurality of radially extending arms arranged in spiral formation along said shaft, the outer ends of said arms being inclined rearwardly toward the rear end of said chamber and

- laterally in an opposite direction from the direction toward which said shaft rotates, whereby said arms thresh the grain entirely by the action of centrifugal force and convey the straw and chaff through said chamber toward and into the straw and chaff outlet thereof.
10. A machine constructed as defined by claim 9, in which the thrashing chamber is substantially cylindrical for the greater portion of its length and is smooth on the inside.
11. In a centrifugal thrashing machine, the combination of a horizontal thrashing chamber having an unthreshed grain inlet at one end, a straw and chaff outlet at its other end and a threshed grain outlet at its bottom, means disposed in said chamber for thrashing the grain and for conveying the straw and chaff toward and into said straw and chaff outlet, a horizontal conveyor conduit located beneath said chamber to receive threshed grain therefrom, a conveyor disposed in said conduit to move the grain therealong, the bottom of said conduit being perforated to provide an outlet for said small seeds and the like, and adjustable means to open and close the apertures in the bottom of said conduit as desired.
- In testimony whereof we have hereunto affixed our signatures.
- HOMER L. STRONG.
THOMAS E. FORSTER.