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THRASHING MACHINE

Filed March 15, 1928 2 Sheets-Sheet 1

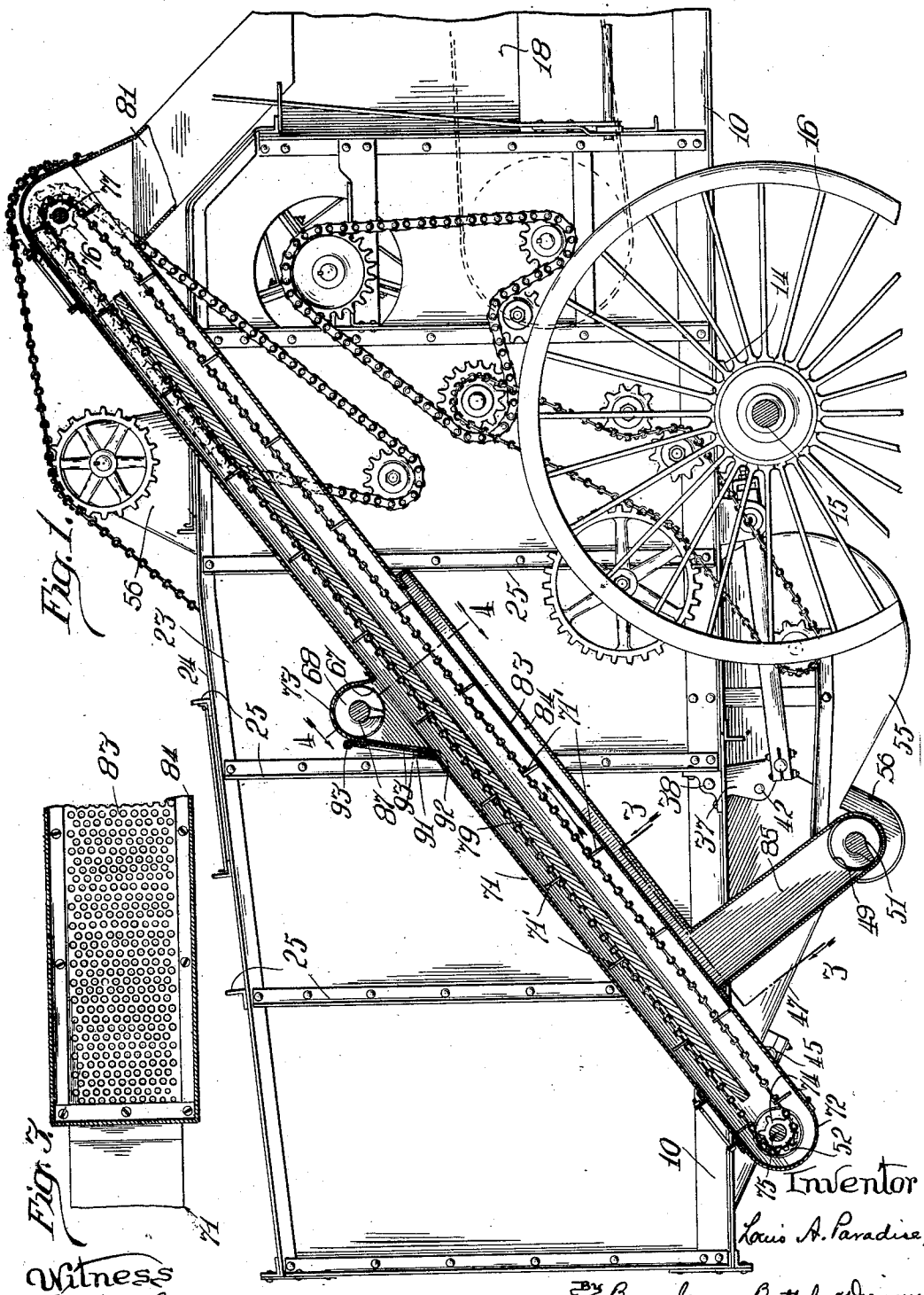


Fig. 1.

Fig. 3.

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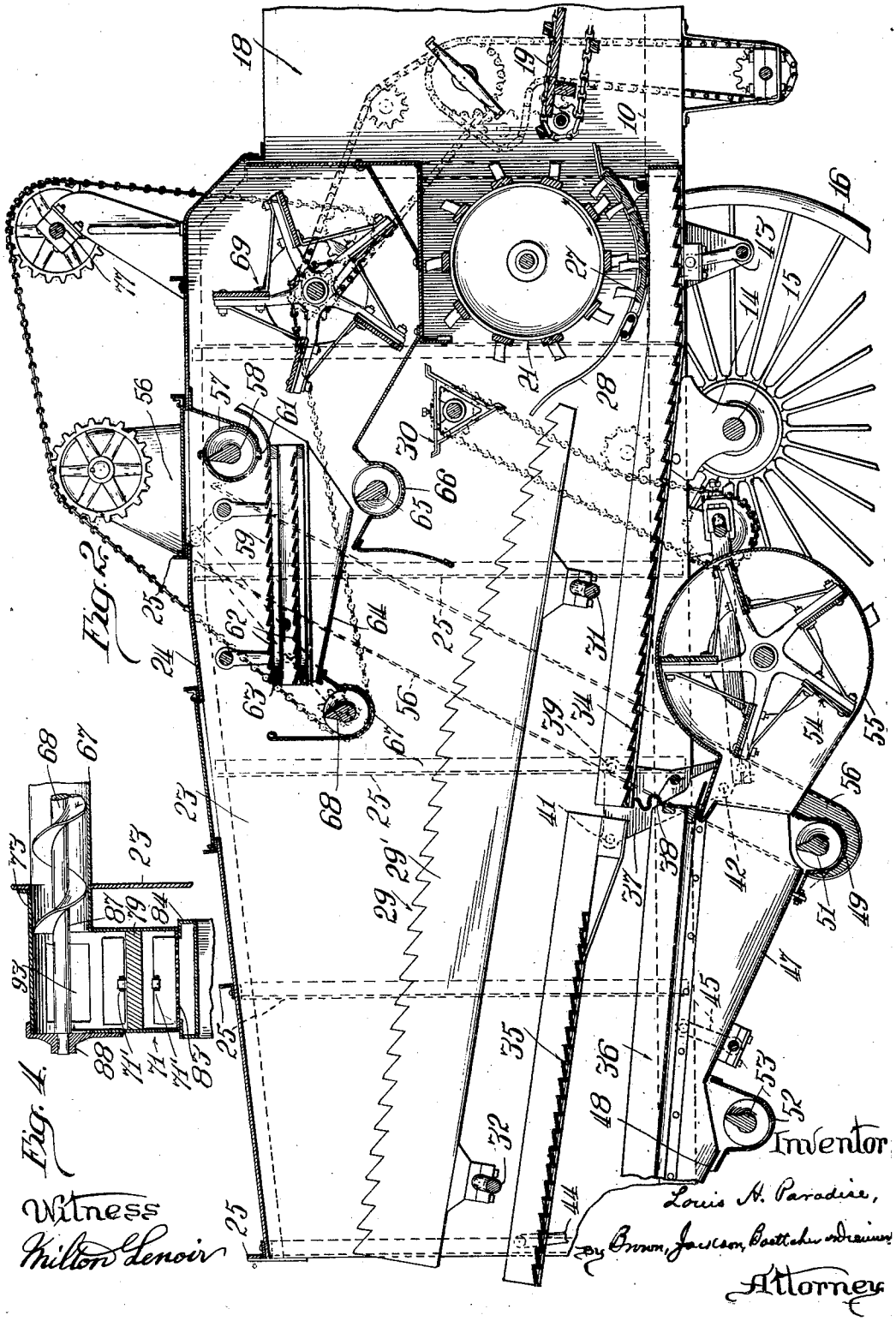


Fig. 2.

Fig. 4.

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UNITED STATES PATENT OFFICE

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THRASHING MACHINE

Application filed March 15, 1928. Serial No. 261,722.

The present invention relates to thrashing machines, and embodies improvements upon the construction of thrashing machine disclosed in my copending application, Serial No. 193,129, filed May 21st, 1927.

In this copending application there are disclosed certain improvements pertaining to the handling and rethrashing of the tailings and unthrashed heads, whereby a greater thrashing efficiency is obtained. Such improvements have particular application to combined harvesters and thrashers, which, as is well known, are field machines designed to cut and thrash the grain in one continuous operation. The present invention has also been devised primarily for this type of machine, to the end of compensating for the unfavorable conditions under which these machines operate. As illustrative of such conditions, the machine frequently travels over rough or sloping ground which tips the machine either laterally or fore and aft. This results in the tipping of the separating shoes to an undesired degree, causing the grain and unthrashed heads to work over to the sides of the shoes or to feed improperly along the shoes, either of which conditions will adversely affect the normal separating functions of the shoes. Furthermore, owing to the fact that this type of machine is constantly turning and traveling in different directions in its movement in the field, it is subject to the unfavorable action of any existing wind, which, in the different directions of travel of the machine, will blow crosswise thereof and other angles adverse to the most efficient operation of the machine.

The construction shown in my copending application embodies features devised to prevent the objectionable loss of grain frequently occurring in this type of machine, the principal feature being an arrangement whereby the tailings from both separating shoes are carried back directly to the thrashing cylinder, and an arrangement whereby these tailings are passed over a separating screen for intercepting from such tailings all completely thrashed grain so that this grain does not have to go through the thrasher cylinder a second time. This saves the needless operation of passing any completely thrashed grain through the cylinder a repeated number of times, and avoids the possibility of such grain being cracked by the cylinder.

One of the particular features of the present invention resides in conveying this completely thrashed grain, which has been intercepted from the tailings, directly to the second shoe or recleaner. I have found that under practically all conditions this intercepted grain is sufficiently clean so that it does not have to be passed through both shoes. The small amount of chaff and other light refuse which is sifted out from the tailings along with the intercepted grain can be removed from the grain with adequate efficiency in the second cleaning shoe. Thus, by passing this intercepted grain directly to the second shoe, instead of having this grain pass through the first shoe in transit to the second shoe, there is avoided the possibility of the first shoe being overloaded and consequently operating with decreased separating efficiency, particularly when the machine is operating under abnormal or adverse conditions.

Another feature of the invention resides in the construction of the tailings auger of the second shoe and its relation to the tailings elevator, whereby the possibility of the tailings straw carried by the elevator becoming wound around and choking said auger is effectively avoided.

Inasmuch as the present method of handling the tailings and the grain intercepted therefrom has its principal utility in a combined harvester and thrasher of the general construction disclosed in the aforesaid copending application, I shall describe the invention in such embodiment, but it will be understood that this method of handling the tailings and intercepted grain is also applicable to other types of thrashing machines as well.

Referring to the accompanying drawings illustrating such embodiment:

Fig. 1 is an elevational view of the thrashing portion of one of these machines, viewed from the harvesting side thereof, and show-

ing the tailings elevator and the separating screen in section.

Fig. 2 is a longitudinal sectional view of the thrashing portion of the machine.

Fig. 3 is a detailed sectional view of the separating screen, taken approximately on the plane of the line 3—3 of Fig. 1, and

Fig. 4 is a transverse fragmentary sectional view through the tailings elevator and through the adjacent portion of the tailings auger of the second shoe, taken approximately on the plane of the line 4—4 of Fig. 1.

Combined harvesters and thrashers are typically constructed with a main frame, on which is supported the thrashing mechanism, and an outwardly projecting harvester frame, on which is supported the harvester mechanism for cutting the grain. This main frame is represented by the two laterally spaced frame bars 10 which are supported at their front ends on a suitable steering wheel, and which are supported at their rear ends on bearings or brackets 14 which receive an axle 15 on which rear wheels 16 are mounted. The details of the harvester portion of the machine constitute no part of the present invention, and accordingly have not been shown. It will suffice to say that the harvester frame is usually supported by a wheel mounted adjacent the outer end of said frame, and that the grain is cut by a conventional form of sickle bar cutting mechanism, a rotating reel being provided for presenting the standing grain to such cutting mechanism. The cut grain falls upon a laterally extending conveyor which carries it into the main portion of the machine where the grain is dumped through the open side of a feeding hopper fragmentarily illustrated at 18. Traveling in the bottom of this hopper is a main feeding conveyor 19 (Fig. 2) which conducts the grain to the thrashing cylinder 21. This thrashing cylinder, and the other operating parts of the thrashing mechanism, are enclosed in a case consisting of side panels 23 and top panels 24 reenforced by angle bars 25 which are secured at their lower ends to the side frame bars 10.

The constructon of the operating parts of the thrashing mechanism, and the arrangement of the power transmitting drives have been described in detail in the above-mentioned co-pending application, and for any of these details attention is directed to such application. In the present application I shall only refer briefly to the main operating parts of the thrashing mechanism, omitting reference to these power transmitting connections.

The thrasher cylinder 21 is of any preferred construction, operating in conjunction with a toothed concave 27 as is typical of these thrashers. From the discharge side of the cylinder the straw is thrown up over a grating consisting of a series of closely spaced spring fingers 28. As the straw passes off this grating on to the straw walker 29, it is engaged by a rotating picker or beater 30 which assists in the thrashing and separating process. The straw walker 29 consists of a plurality of longitudinally extending plates or bars 29′, the upper edges of which are toothed to give a progressive feeding action to the straw. This straw walker is given an oscillatory throwing motion through its mounting on cranks formed in two shafts 31 and 32, one of which is driven. The oscillatory motion of the straw walker feeds the straw progressively back toward the open rear end of the casing, and in such feeding action agitates the straw for the separation of the grain therefrom.

Extending under the thrasher cylinder and under the rear portion of the straw walker is a grain pan or tray 34; and extending below the outer or rear end of the straw walker is a similar grain pan or tray 35. The bottoms of these grain pans have stepped surfaces designed to impart a progressive feeding motion to the grain in the oscillation of such pans, the inner pan 34 being arranged to feed the grain dropped thereon towards its rear edge, and the outer pan 35 being designed to feed the grain dropped thereon towards its front edge. The grain discharged from the continuous edges of both pans falls upon the inner end of a separating shoe 36. The two pans and the shoe are given oscillatory motion through power driven rockers 37 disposed at each side of these elements. These rockers are pivoted at 38 to the frame of the machine and have pivotal connection at their upper ends to the grain pans 34 and 35, at pivot points 39 and 41. The lower portion of each rocker has pivotal connection with the shoe 36 at 42. The front end of the grain pan 34 extends under the concave 27 of the thrashing cylinder to receive the grain discharged directly from the cylinder, and this end of such grain pan has swinging support on links 43. The rear end of the outer grain pan 35 has similar swinging support on links 44, and the rear portion of the shoe 36 has swinging support on links 45.

The shoe comprises the usual separating screen, through which the grain sifts down into a grain chute 47. The tailings from the end of the screen fall into a similar tailings chute 48. These chutes constitute a part of the shoe and oscillate therewith, the grain chute discharging into a trough 49 in which rotates a grain auger 51, and the tailings chute 48 discharging into a trough 52 in which rotates a tailings auger 53. A fan 54 is disposed forwardly of the shoe and has the outlet opening of its housing 55 discharging into the end of the grain chute 47. The fan projects a blast of air below and up through the shoe to blow the chaff and other light particles out through the open rear end of the

casing. Such blast of air also assists in moving the unthrashed heads rearwardly along the shoe to the tailings end thereof.

The grain discharged down through the chute 47 into the auger 51 is conveyed laterally thereby toward the stubbleward side of the machine where it is dumped into the lower boot end of an elevator 56. This elevator extends upwardly to the top of the machine and discharges the grain into a transversely extending trough or tube 57 in which rotates a grain auger 58. The latter, in turn, conveys the grain across the width of a secondary or upper shoe 59 disposed above the straw walker 29, the grain being distributed through a slot-like opening 61 in the bottom of the trough.

The upper shoe 59 may consist of any suitable arrangement of riddles or screens 62 mounted in an oscillating frame 63. A grain chute 64 slopes downwardly and forwardly below this upper shoe and discharges the grain sifting therethrough down into a grain auger 65 rotating in a trough or tube 66. The tailings end of this upper shoe discharges into a trough 67 in which revolves a tailings auger 68. A blast fan 69, which is suitably cased in above the thrashing cylinder, discharges a blast of air below and up through the shoe 59. This air blast sweeps any light refuse back to the discharge end of the casing, and assists in moving unthrashed heads and other tailings along the shoe to the tailings end thereof. The grain which is discharged into the auger 65 constitutes the completely thrashed and cleaned grain, and this grain is conveyed laterally by the auger to the stubbleward side of the machine where it is discharged into a suitable grain spout for delivery to a wagon, storage tank, or other grain receiving means.

Referring now to the method of handling the tailings, which, as before remarked, constitutes one of the principal features of this and of the copending application, it will be seen from Fig. 1 that the tailings from both shoes are conveyed by their respective augers 53 and 68 to the harvester side of the machine where they are discharged into an elevator 71. The trough or tube 52 of the lower tailings auger opens into the lower boot end 72 of the elevator, and the trough or tube 67 of the upper tailings auger dumps into the elevator through a hood portion 73 secured over an opening in the upper wall of the elevator. The sprocket wheel 74, around which the lower end of the conveyor 71′ passes, is keyed to a shaft 75, which may consist of an extending end portion of the tailings auger 53. At the upper end of the elevator the conveyor passes around a sprocket wheel 76 which is secured to a driving shaft 77. The conveyor is driven in the direction indicated, the upper stretch of the conveyor passing down along an intermediate partition 79 upon which is discharged the tailings from the upper shoe. These tailings are conveyed down around the lower end of the elevator where the tailings from the lower shoe are picked up, the tailings from both shoes being thence conveyed upwardly along the bottom wall of the elevator to a discharge opening in the upper end of the elevator. This discharge opening communicates with a chute 81 which extends down into the feed hopper 18 and dumps the tailings upon the feeding conveyor 19 leading to the thrashing cylinder. It will thus be seen that while the machine is in operation all of the tailings from both shoes are being returned continuously to the thrasher cylinder for a repetition of the thrashing and separating cycle. Ordinarily, under favorable operating conditions, these tailings will consist principally of unthrashed heads, and any grain berries or kernels from which the whitecaps, beards or husks have not been removed. However, there is always the possibility of some of the grain berries being husked out by the action of the augers 53—68, or by the travel of the conveyor 71′; or of completely thrashed grain getting into the tailings, this being particularly true when the machine is traveling over uneven ground or is operating under other adverse conditions. While it is not especially objectionable to pass this completely thrashed grain through the thrashing cylinder again, it is more desirable to avoid it as such represents a needless operation and is likely to result in some of the grain being cracked by the cylinder. Accordingly, this grain is separated out from the tailings before the latter are returned to the thrasher cylinder, such separating or intercepting function being obtained by placing a long screen 83 in the bottom, inclined wall of the elevator 71. All of the tailings from both shoes must pass over this screen in the travel of the tailings up through the elevator, and the mesh of the screen is such that only the completely thrashed grain can pass therethrough. Secured below the screen is an inclined trough or box 84 which receives the grain passing down through the screen and directs the same to a chute 85 at the lower end of the box 84. Said chute extends downwardly and forwardly and opens into the end of the grain trough 49 of the first shoe 36, such grain trough being extended outwardly from the side of the machine to establish communication with the chute 85. The intercepted grain which is thus dumped into the trough 49 is conveyed laterally by the auger 51 to the other side of the machine where it is dumped into the boot end of the elevator 56 along with the grain which has sifted down through the first shoe 36. The intercepting grain is thence conveyed upwardly in the elevator 56 to the trough 57 of the upper shoe 59, being distributed across the shoe by the auger 58. Here this intercepting grain is subjected to

a cleaning operation and, falling through the shoe upon the chute 64, is then conveyed on to the ultimate point of discharge through the clean grain auger 65.

This practice of intercepting the completely thrashed grain from the tailings and returning such grain directly to the second shoe is of two-fold advantage. First, it avoids the possibility of such grain being cracked in the thrashing cylinder. Second, by passing such grain directly to the second shoe the possibility of overloading the first shoe is completely avoided. The grain which can pass through the screen 83 is thoroughly thrashed, and it is only necessary to separate such grain from fine, light refuse which may pass through the screen along with the grain. This separating operation can be performed with ample thoroughness by the second or recleaning shoe. By by-passing this intercepted grain around the first shoe, so that it is not necessary for such grain to pass through the first shoe, the entire area of the first shoe remains effective for cleaning the newly thrashed grain as it is separated from the straw, thus avoiding the possibility of this first shoe being overloaded and avoiding the possibility of loss of grain.

With reference to the grain intercepting function of the screen 83, an important advantage is obtained by having the flight bars of the elevator 71′ drag over the upper surface of this screen. The beards or husks on the grain berries tend to catch in the perforations of such screen, and in the absence of any means for dislodging the same they tend to clog the screen. It will be noted that the flight bars of the elevator in dragging over the surface of the screen act positively to dislodge such berries from the screen and to feed the same positively across the screen.

Another feature of the invention is concerned with the construction and arrangement of the tailings auger for the second shoe, with reference to its point of dumping into the tailings elevator. Referring to Fig. 4, the trough 67 of this auger terminates substantially flush with the inner wall of the elevator casing 71, for dumping the tailings into this elevator. The tailings auger proper, designated 68, also terminates substantially flush with the inner wall of the elevator casing. The shaft 87 on which this auger is mounted is extended transversely across the elevator casing and has bearing support at its outer end in a bearing 88 carried by the outer wall of the latter casing. Such bearing is carried by an outwardly flaring portion of the casing wall, to dispose the bearing at a point removed from the path of the tailings being conveyed by the auger and by the elevator. By thus having the tailings auger terminate short of the interior of the elevator casing, and by extending the auger shaft across the casing to a remotely situated bearing disposed in the outer wall of the casing, as illustrated, there is avoided the possibility of the straw in the tailings conveyed either by the auger or by the elevator becoming wound in the auger and choking the same.

Referring to Fig. 1, it will be noted that the rear wall of the hood 73 is provided with an opening 91 substantially in the plane of the elevator casing. This opening is provided with suitable marginal guides 92 for receiving a removable door or slide 93. By pulling this door upwardly, the contents of the tailings discharged by the tailings auger 68 can be observed for determining the cleaning action of the second shoe.

I claim:

1. In a thrashing machine, the combination of a thrashing cylinder, feeding means therefor, a straw walker receiving the straw from said cylinder, an oscillating grain feeding pan below said straw walker, a first separating shoe receiving the grain from said feeding pan, a draft chamber below said shoe including means for creating a draft through the chamber and separating shoe, tailings and grain augers receiving the tailings and cleaned grain from said first shoe, a second separating shoe disposed above said straw walker, an elevator for transferring the grain from said grain auger to said second shoe, tailings and grain augers for said second shoe, a tailings elevator receiving the tailings from both of said tailings augers and discharging the same to said feeding means, a screen in one wall of said elevator over which the tailings from both augers are caused to pass, said screen separating the completely thrashed grain from said tailings, and a chute under said screen for discharging the screened grain directly to the grain auger of said first shoe, whereby thrashed grain separated from said tailings by the screen by-passes the first cleaning shoe and the draft chamber.

2. In a thrashing machine, the combination of a thrashing cylinder, feeding means therefor, means adapted to receive and convey the straw from said cylinder, a first separating shoe, means for directing to said shoe thrashed grain received from said conveying means, tailings and grain augers receiving the tailings and cleaned grain from said first shoe, a second separating shoe disposed above said conveyor, an elevator for transferring the grain from said grain auger to said second shoe, tailings and grain augers for said second shoe, a tailings elevator on the outer side of the machine receiving the tailings from both of said tailings augers and discharging the same to said feeding means, a screen in one wall of said elevator over which the tailings from both tailings augers are caused to pass, said screen separating the completely thrashed grain from said tailings, and a chute under said screen and on

the outer side of the machine dumping directly into the grain auger of said first shoe at the outer end thereof whereby said completely thrashed grain is adapted to by-pass said first separating shoe.

3. In a thrashing machine, the combination of a thrashing cylinder, feeding means therefor, means adapted to receive and convey the straw from said cylinder, a first separating shoe, means for directing to said shoe thrashed grain received from said conveying means, tailings and grain augers receiving the tailings and cleaned grain from said first shoe, a second separating shoe disposed above said conveyor, an elevator for transferring the grain from said second auger to said second shoe, tailings and grain augers for said second shoe, a tailings elevator on the outer side of the machine receiving the tailings from both of said tailings augers and discharging the same to said feeding means, the tailings auger of said first shoe discharging into the lower end of said tailings elevator, the tailings auger of said second shoe discharging into said tailings elevator at a point in advance of the reception of tailings thereby from said first shoe tailings auger, a separating screen in the lower wall of said elevator over which the tailings from both tailings augers are positively caused to pass, said screen separating completely thrashed grain from said tailings, and a chute under said screen on the outer side of the machine discharging directly into the grain auger of said first shoe at the outer end thereof whereby said completely thrashed grain is adapted to by-pass said first separating shoe.

4. In a thrashing machine, the combination of a thrashing cylinder, feeding means therefor, means adapted to receive and convey the straw from said cylinder, a first separating shoe, means for directing to said shoe thrashed grain received from said conveying means, tailings and grain augers receiving the tailings and cleaned grain from said first shoe, a second separating shoe disposed above said conveyor, an elevator for transferring the grain from said grain auger to said second shoe, tailings and grain augers for said second shoe, a tailings elevator on the outer side of the machine body comprising an enclosing casing and an endless flight bar conveyor receiving the tailings from both of said tailings augers and discharging the same to said feeding means, the tailings auger of said first shoe discharging into the lower end of said elevator casing, the tailings auger of said second shoe discharging into said elevator casing at a point intermediate the ends of said elevator casing for directing tailings to the upper run of said flight bar conveyor, a separating screen in the lower wall of said casing over which the tailings from both tailings augers are positively caused to pass, said screen separating completely thrashed grain from said tailings, and a chute associated with the lower wall of said casing and extending under said screen, said chute being disposed on the outer side of the machine body and discharging directly into the grain auger of said first shoe at the outer end thereof whereby said completely thrashed grain is adapted to by-pass said first separating shoe.

5. In a thrashing machine, the combination of thrashing means, an oscillatory separating shoe for receiving thrashed grain from said thrashing means comprising an integral grain chute, a fixed grain trough disposed to receive grain from said grain chute, said grain chute having sliding cooperation with said fixed trough, a draft chamber above said integral grain chute, means for creating a draft through the chamber and through the separating shoe, an elevator for receiving and delivering tailings from said separating shoe back to said thrashing means, a separating screen in said elevator through which grain may pass, and means for conducting grain passing through said screen directly to said fixed trough, by-passing said oscillatory integral chute and said draft chamber.

6. In a thrashing machine, the combination of thrashing means, an oscillatory separating shoe for receiving thrashed grain from said thrashing means and including an integral grain chute, a fixed grain trough extending transversely across the oscillatory grain chute and provided with means having slidable cooperation with the oscillatory chute whereby said fixed trough is adapted to receive grain discharged by said oscillatory chute at all times, a draft chamber in said shoe, means for creating a draft through said chamber, an elevator for receiving and delivering tailings from said separating shoe back to said thrashing means, a separating screen in said elevator through which grain may pass for separation from the tailings conveyed by said elevator, and a chute for conducting grain passing through said screen directly to said fixed trough, by-passing said oscillatory chute, draft chamber and draft means.

In witness whereof, I hereunto subscribe my name this 1st day of March, 1928.

LOUIS A. PARADISE.