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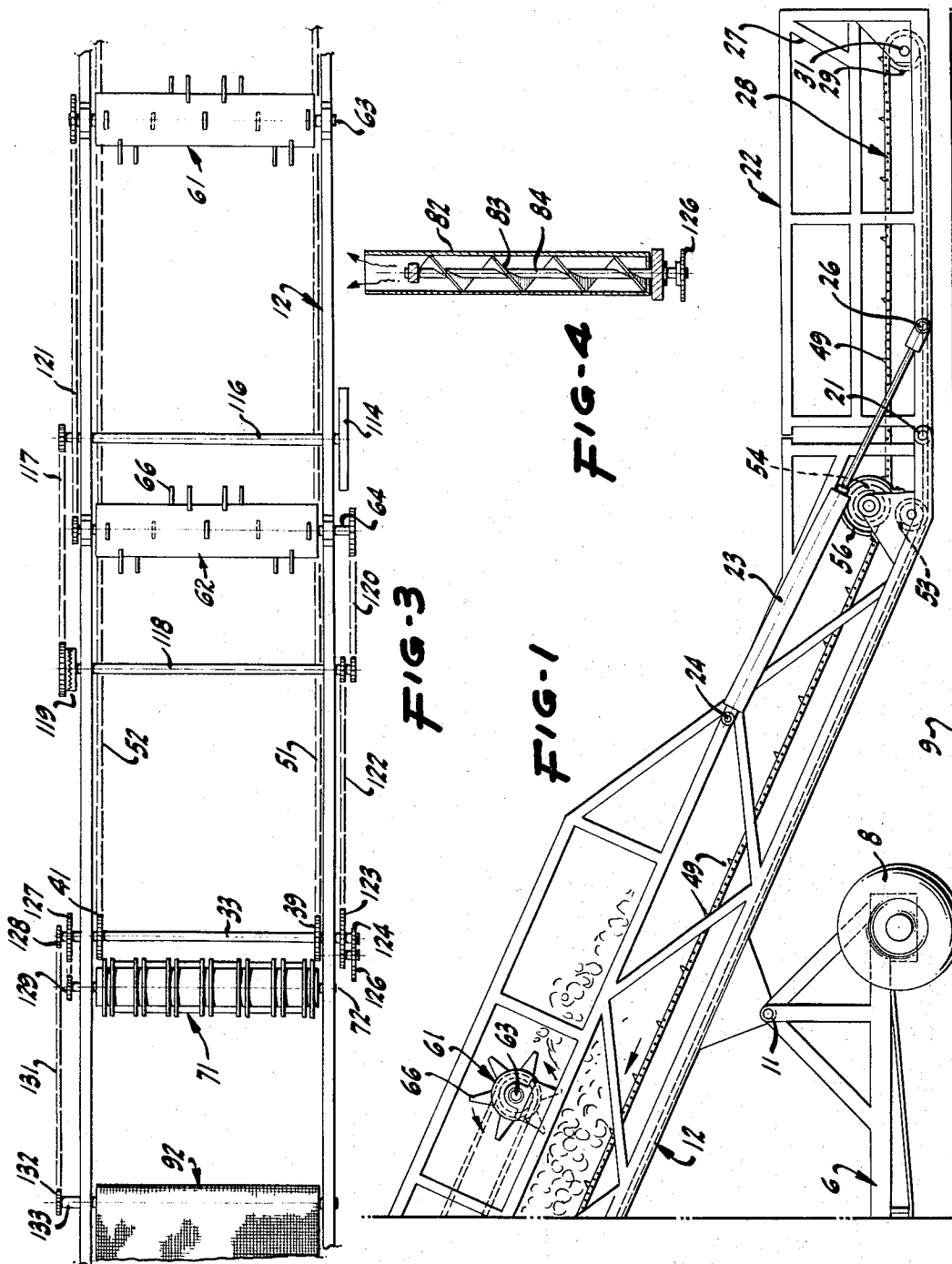
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DEVICE FOR DRY SEPARATING CUT SUGAR CANE

Filed Dec. 9, 1964

3 Sheets-Sheet 1



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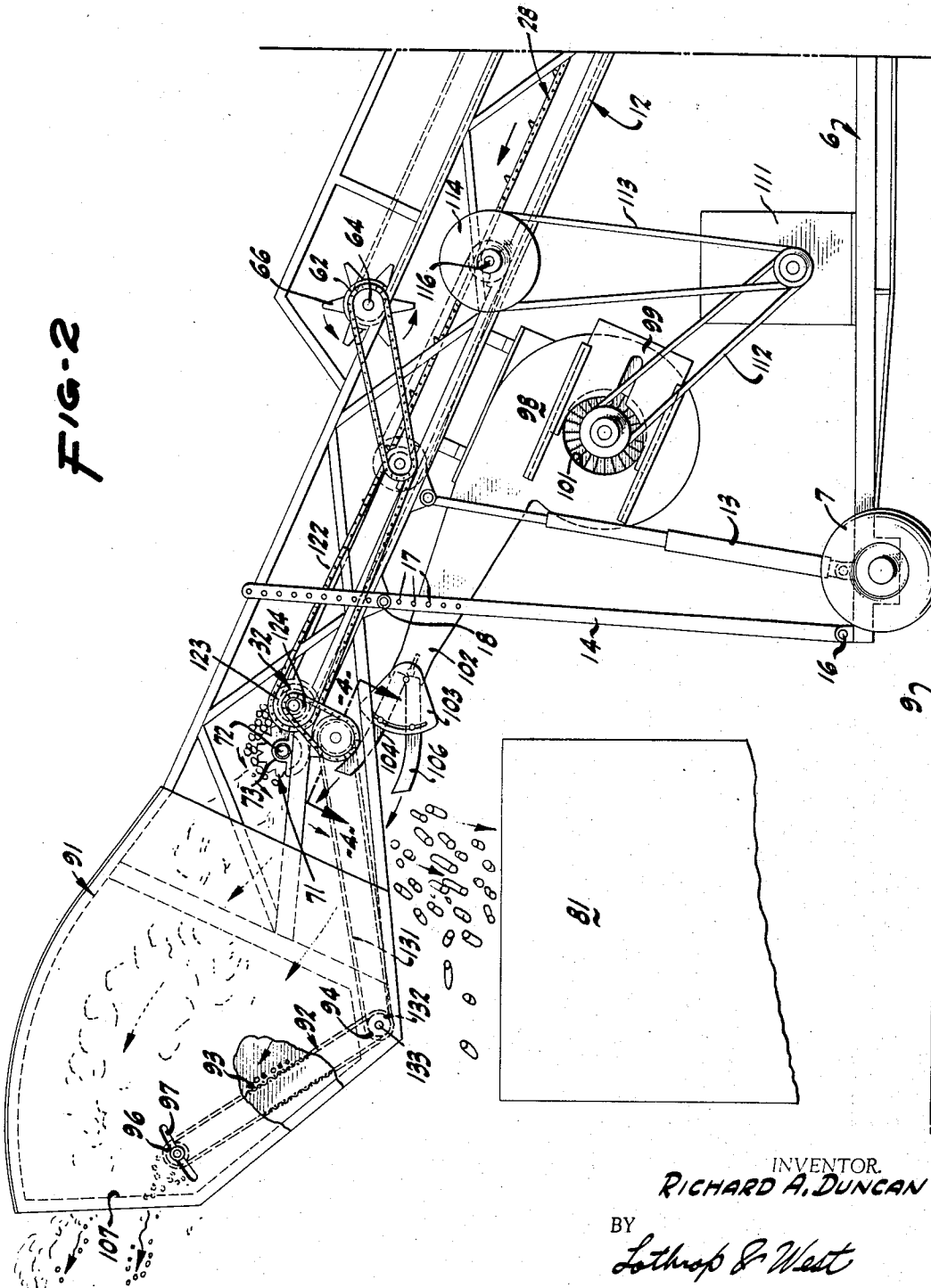
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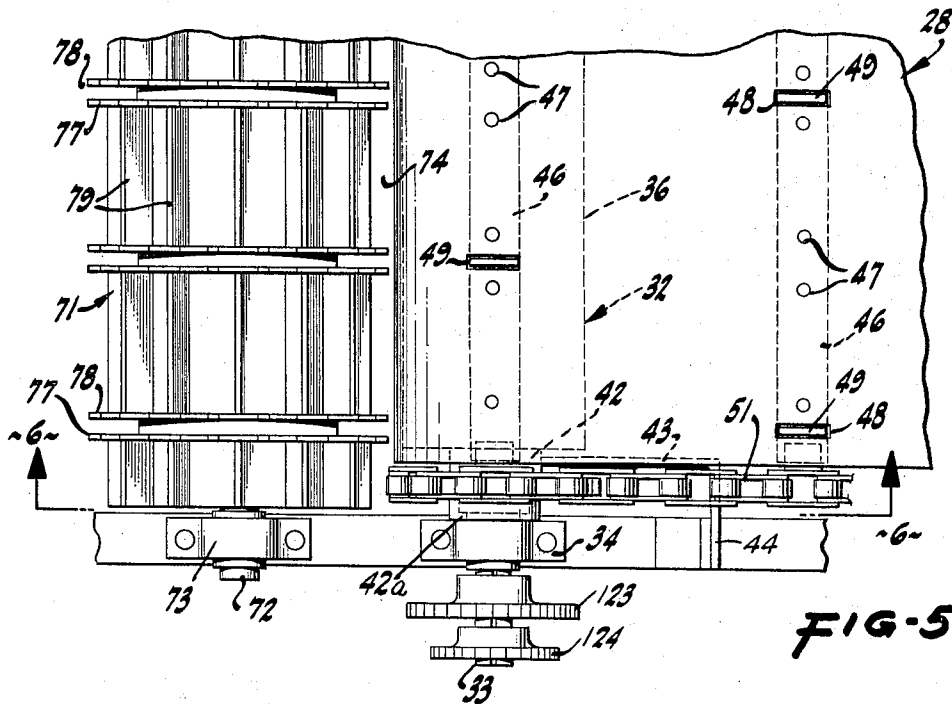


FIG. 5

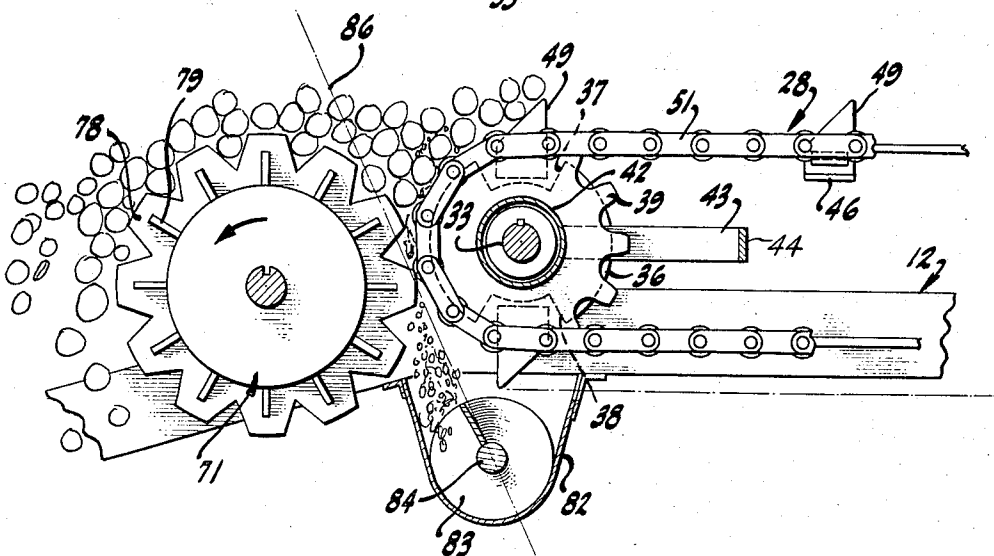


FIG. 6

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DEVICE FOR DRY SEPARATING CUT SUGAR CANE

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12 Claims. (Cl. 209—3)

ABSTRACT OF THE DISCLOSURE

An apparatus used in a sugar cane field for transloading and dry-separating cut sugar from unwanted attendant material.

My invention relates to means primarily useful in garnering sugar cane from a field and transporting the sugar cane to a carrying vehicle while separating the desired cane from undesired debris, earth and trash made up of leaf trash and tops.

The invention particularly relates to mechanism for use either in a permanently installed form or in a portable form for effectuating a dry separation of the desired millable sugar cane from naturally accompanying materials under widely varying operating conditions and despite considerable variation in the wetness or dryness of the materials themselves.

The object is to provide a combination of principles and design to dry clean sugar cane.

Another object of the invention is to provide a sugar cane handling device which can be installed in a fixed location or can be arranged for easy transportation in a sugar cane field to receive the cane in its field cut condition and to carry the cane without extraneous material for discharge into a receiving container.

Another object of the invention is to provide a sugar cane handling device which can handle the material precisely as it is found in the field, yet can operate without interference from earth, debris, trash, and the like.

Another object of the invention is to provide a sugar cane handling device which is effective to move large quantities of sugar cane and accompanying material from its loading point to its discharging point and in an even fashion despite irregular loading.

Another object of the invention is to provide a sugar cane handling device in which the various driven instrumentalities are arranged so as not to become engaged with or entangled by trash of various sorts.

Another object of the invention is to provide a sugar cane handling device which not only moves the cut sugar cane from a loading station to a discharging station, but also serves as an effective separator of the cane from unwanted material during the loading operation.

Another object of the invention is in general to provide an improved sugar cane handling device.

While the sugar cane handling device can be embodied in a number of different ways pursuant to the invention, it has successfully been incorporated as a transloader as described in the accompanying description and as illustrated in the accompanying drawings, in which:

FIGURE 1 is a side elevation of the loading end of a handling device constructed pursuant to the invention;

FIGURE 2 is a side elevation of the discharging end of a handling device constructed in accordance with the invention, FIGURE 2 when placed alongside FIGURE 1 affording a complete side elevation of the entire machine;

FIGURE 3 is a plain of a portion of the incline frame portion of the sugar cane handling device, primarily illustrating certain combing rollers and drive mechanisms;

FIGURE 4 is a detail showing in transverse cross sec-

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tion a portion of an auger mechanism, the plane of section being indicated by the line 4—4 of FIGURE 2;

FIGURE 5 is a detailed plan to an enlarged scale of the upper, discharge end of the conveyor with a portion of the discharge drum, other portions of the surrounding structure being broken away to reduce the size of the figure; and

FIGURE 6 is a cross section, the plane of which is indicated by the line 6—6 of FIGURE 5.

In the particular form of sugar cane handling device chosen as an example herein, there is provided a portable main frame 6 comprised of structural shapes and angles mounted on a plurality of ground-engaging wheels 7 and 8 so that the main frame is readily movable in a field 9 in which sugar cane is available. The main frame adjacent one end is constructed to afford a transverse pivot shaft 11 to which is also connected an incline frame 12, also made up of structural shapes and angles and extending forwardly over the main frame and extending rearwardly over the main frame.

To drop the incline frame for moving the handling device and to mount the incline frame at the desired or selected inclination on the main frame for use, there is afforded a jack mechanism 13 at its lower end connected pivotally to the main frame 6 and at its upper end connected pivotally to the incline frame 12, the jack mechanism being expandable and contractible under control of an operator by any suitable pressure means such as compressed air or hydraulic pressure. When there is no pressure, the incline frame is dropped and when pressure is applied, the incline frame is raised. So that it will not be necessary to maintain pressure on the jack 13 under all conditions, there is likewise mounted on the main frame 6 a stay 14 in the form of a strap connected at its lower end by a pivot 16 to the main frame and having a plurality of apertures 17 therein. A holding device 18 on the incline frame 12 can be inserted through any one of the apertures. When the desired inclination is established by rotating the incline frame 12 about the pivot shaft 11 by operation of the jack 13, the inclination is held by positioning the fastening 18, following which the pressure within the jack can be relieved.

Adjacent its forward or leading end the incline frame is provided with a pivot connection 21 to a hopper frame 22 made up of a plurality of angles and shapes and designed to rock about the pivot connection 21 under control of a jack mechanism 23. One end of the jack 23 is connected to the incline frame by a pivot 24, whereas the other end of the jack is connected by a pivot 26 to the lower portion of the hopper frame. By appropriately manipulating the jack 23, the hopper frame can be lifted or folded when the machine is to be moved. By operation of the jack 23, the frame can be disposed at the desired position with respect to the field 9. It is to be understood that various of the mechanisms, such as the jacks 13 and 23 and the stay 14, can be duplicated on opposite sides of the transloader.

The hopper frame 22 is provided with inclined sides 27 and an open top and supports the forward or leading end of a conveyor 28. The forward support is in the nature of a tail shaft roll 29 supported on a cross shaft 31 appropriately journaled on the hopper frame 22. The conveyor 28 is extensive, travelling not only through the hopper frame, but also on the incline frame 12, and extends around a head shaft roll 32 (FIGURE 2) near the upper end of the incline frame. The tail shaft roll 29 and the head shaft roll 32 are not necessarily but may be virtually identical, substantially as illustrated in FIGURE 5. As an example, the head shaft roll 32 includes a transverse shaft 33 mounted in appropriate journal blocks 34 on the incline frame 12 and between the sides of the frame includes a roller 36 having transversely extending slots

37 and 38 at spaced points around its generally circular periphery.

Mounted on the shaft 33 adjacent but somewhat spaced from the ends of the roll 36 is a pair of sprockets 39 and 41 (see FIGURE 3). Encompassing the portion of the shaft 33 between the roller 36 and the sprocket 39, for example, (see FIGURES 5 and 6) is a free standing guard collar 42 supported by a fore and aft bracket 43 bent transversely at its nether end to form an arm 44 secured to the frame 12. A second pair of guard collars 42a substantially span axially the gaps between the sprockets 39 and 41 and the adjacent journal blocks 34. As appears most clearly in FIGURE 5, the collar 42a can be mounted on the journal block 34 and extends axially toward but stops just short of the sprocket 39. The collars 42 and 42a, in other words do not interfere with the rotation either of the roller 36 or the sprockets 39 and 41, but they serve to shield these members.

The conveyor 28 trained around the rolls 29 and 32 includes a belt, for example of rubberized fabric, at appropriate intervals carrying cross slats 46 secured to the fabric by fasteners 47. Projecting through openings 48 in the fabric at appropriate intervals are upstanding lugs 49. The lugs have an upwardly and backwardly sloping forward face to make sure the cane is cleanly released at discharge. The slats are spaced apart in such a fashion that they are readily received in the slots 37 and 38 as they round the respective rolls 29 and 36.

The cross slats 46 extend beyond the side edges of the rubberized fabric belt and are secured to appropriate links in side chains 51 and 52 trained around the sprockets 39 and 41 and corresponding sprockets of the lower roll 29. In this fashion, when the conveyor is driven, its upper run progresses from a leading low point near the forward end of the hopper frame 22 upwardly on the incline frame and then returns in the lower run to the point of beginning. Since the belt is chain advanced, it moves smoothly to carry whatever load is imposed upon it, being supported by the guided side chains and engaging the lading by reason of the upwardly projecting lugs 49 and the friction of the belt surface. The conveyor feeds all of the material, of whatever degree of moisture, without backfeeding at the discharge end and operates well at a high enough speed to give satisfactory volume with only a shallow depth of material.

Since the conveyor extends from a generally horizontal attitude in the hopper frame to an inclined attitude on the incline frame, the lower run returns around a roller 53 and the upper run advances around side guide wheels 54, the latter of which are protected by guards 56 secured to the incline frame.

Sugar cane, debris and accompanying material dumped onto the upper run of the conveyor in the hopper are carried upwardly on the incline frame. To make sure that the load on the upper run of the conveyor is not excessively high and is laterally distributed, the incline frame at spaced intervals carries a pair of combing rollers 61 and 62 on cross shafts 63 and 64 disposed just above the upper run of the conveyor. Each of the combing rollers or levelling drums includes a number of projecting teeth 66 arranged in reverse helixes symmetrical centrally of the rollers so that the combing rollers when operated serve to retard and to comb back the upstanding material on the conveyor and transversely to distribute the material evenly on the conveyor. The effect is to provide a uniformly thick layer of material of controlled depth carried upwardly by the upper run. The combing rollers or levelling drums are set to leave a depth of material which can readily be penetrated by an air blast to be later described. The elevation of the combing roller 61 is somewhat higher than that of the combing roller 62 relative to the upper run of the belt, so that the combing and distributing function is divided between the two rollers as a means of maintaining a more uniform predetermined depth. Material passing upwardly beyond the upper comb-

ing roller 62 travels around and over the head shaft roller 32.

Disposed on the incline frame is a discharge drum 71 or fluffing drum. This is arranged on a cross shaft 72 mounted on the inclined frame by journal blocks 73. The drum 71 is parallel to the discharge roller 32, but is spaced therefrom to leave a gap 74 therebetween. The discharge drum is made up of a number of toothed disks 77 and 78 arranged in pairs on the shaft 72 and between them supporting a number of cross bars 79 so that the discharge drum is of an open work nature. Material travelling over the drum 71 in the nature of sugar cane stalks arranged approximately transversely may be engaged by the notches in the disks 77 and 78 and is carried upwardly over the discharge drum and is impelled or thrown therefrom to fall into a receiving bin 81 disposed therebelow. Material is thrown from the discharge or fluffing drum in a scattered manner for maximum air exposure.

Some of the material on the upper run of the conveyor belt 28 is not in the nature of sugar cane, but, for example, is in the nature of earth, small debris, rocks and trash of that sort. Such trash is not carried across to the discharge drum, but rather falls through the space 74 by gravity. If any trash is engaged with the discharge drum and is of small enough compass, it falls through the openings in the discharge drum. This debris of a heavy, small nature is caught in a suitable transverse conveyor. One form of conveyor is an auger trough 82 suspended transversely across the incline frame. Within the auger trough (FIGURE 4) is disposed an auger 83 having its shaft 84 extending parallel to the discharge drum and to the trailing roll. The auger shaft 84 substantially vertically below the gap 74 is in the path of falling debris. FIGURE 6 is inclined in the drawings so that the vertical direction is represented by the line 36. The debris received in the auger trough 82 is carried laterally away from the machine to discharge by the operating auger.

Some of the material carried by the conveyor and not discharging into the auger trough and not in the nature of usable sugar cane is material in the nature of heavy debris such as wet leaves, cane tops and comparable trash. This is disposed of in another fashion. The incline frame is extended and enlarged to support a hood 91 open generally at the ends and bottom but closed at the top and sides. Situated on the incline frame at its rearward end and within the hood is a trash screen 92. This preferably takes the form of a belt 93 trained around operating rollers 94 and 96 mounted on the incline frame. The roll 96 is conveniently adjustable in mounting slots 97 so that the inclination of the trash screen can be varied.

Disposed on the incline frame is an air blower 98 having a damper plate 99 movable over its inlet 101 to regulate the influx of air thereto. The blower discharge 102 leads into an adjustable box 103 movable with respect to the nozzle 102 and also carrying a plurality of jet tubes 104 and 106 individually adjustable as to inclination on the box. The tubes 104 and 106 are so disposed as to direct an air current or air blast across the gap existing between the discharge drum 71 and the trash screen 92 in a generally upward direction and toward an outlet opening 107 in the trailing end of the hood 91. Light debris does not fall with the sugar cane but is blown across and through a gap above the trash screen and is discharged. The heavier debris on the debris screen is carried upwardly on the upper run thereof and is discharged over the roller 96 to fall by gravity while the light debris is blown out and falls by gravity through the opening 107 away from the retained cane sections in the receiver 81.

Some material, for example leaf trash with a portion of cane stalk attached, is not held against the trash screen and discharged over the top thereof. Rather, the angle of the trash screen 92 is adjusted so that such material rolls or tumbles back against the air blast and falls into the receiver 81. This arrangement substantially reduces the

amount of trash and debris and minimizes the loss of valuable cane.

This mechanism is effective to receive sugar cane lengths and various other debris and to carry such material to an upper location from which it can be put into the receiver 81. Likewise, the mechanism serves as a separator to remove clods, rocks and heavy small debris carried away by means of a suitable conveyor such as the auger. Also, by reason of the air blasts and the trash screen, the mechanism separates the light material such as leaves and comparable trash and discharges them at a different location.

In order that all of the instrumentalities of the transloader can be appropriately operated, there is mounted on the main frame 6 a prime mover 111 such as an internal combustion engine which has one driver belt 112 connected to the blower 98 to induce the air flow described. The prime mover also has a belt 113 connected to a pulley 114 on a shaft 116 journaled on the incline frame. At its far end the shaft 116 has a chain 117 connected to a cross drive shaft 118 through an overload clutch 119. At its near end the cross drive shaft 118 has a chain 120 driving the combing roller shaft 64. A drive chain 121 extends from the far end of the combing roller shaft 64 to drive the lower combing roller shaft 63. The shaft 118 also has a chain 122 extending to a sprocket 123 fast on the discharge drum shaft 33 and so driving that roller.

At its near end, the shaft 33 carries a sprocket 124 with a chain extending to a sprocket 126 (FIGURE 4) on the auger shaft 84 to drive the auger. At its far end, the upper roller shaft 33 carries a pair of sprockets 127 and 128. The sprocket 127 is connected by a chain to a sprocket 129 (FIGURE 3) on the discharge drum shaft 72 to afford a drive for that drum. The other sprocket 128 is connected by a chain 131 to a drive sprocket 132 on the shaft 133 of the lower roller 94 for the trash screen. There is thus afforded from a central point a complete drive arrangement for all of the rotating devices on the structure, the connections being such that the upper run of the conveyor 28 operates from right to left as seen in FIGURES 1 and 2, and so that the combing rollers 61 and 62 operate in a counterclockwise direction as seen in FIGURES 1 and 2. The auger and the discharge drum likewise operate in a counterclockwise direction as seen in FIGURE 2, while the trash screen conveyor operates with its upper run travelling in an upper direction as seen in FIGURE 2.

With this structure, the entire device can readily be transported to an appropriate point in the field and sugar cane cut approximately to length and with accompanying debris is dumped into the hopper. The conveyor upper run advances the material both by means of the rubberized fabric belt and by means of the upstanding lugs 49 in an upward and rearward direction, the combing rollers assisting in distributing the material and reducing its irregular height to a predetermined thickness on the upper run. As the material advances over the discharge roll, heavy small debris such as rocks and clods falls through the primary gap into the auger housing and is carried away laterally by the auger. Remaining material is passed over the discharge drum and tends to fall by gravity. The cut sugar cane lengths do fall into a subposed receiver 81, but heavy material such as wet leaves and the like is blown by a plurality of air currents or by an air blast over the secondary gap between the discharge drum and the debris screen to lodge on that screen and to be carried by the debris screen upwardly to be discharged through the remote opening 107. Light debris is blown directly over the debris screen while some intermediate material such as leaves with cane attached falls back against the air blast into the receiver.

What is claimed is:

1. A sugar cane handling device comprising a portable main frame; an incline frame; means for pivotally mount-

ing said incline frame on said main frame; means for supporting said incline frame at a desired angle on said main frame; a hopper frame; means for pivotally mounting said hopper frame on said incline frame; means for supporting said hopper frame at a desired attitude on said incline frame; a tail shaft roll on said hopper frame; a head shaft roll on said incline frame; a conveyor extending around said tail shaft roll and said head shaft roll for advancing material supported thereon in a forward direction; a combing roller on said incline frame above said conveyor; a discharge drum on said incline frame spaced forwardly from said head shaft roll to leave a narrow primary gap therebetween affording gravity separation of unwanted material smaller than the sugar cane diameter; an auger trough on said incline frame beneath said primary gap to receive the smaller unwanted material falling therethrough; an auger in said auger trough; a trash screen on said incline frame spaced forwardly from said discharge drum to leave a secondary gap therebetween; means on said incline frame for directing a blast of air through said secondary gap toward said trash screen; and means on said incline frame for driving said conveyor, said combing rollers, said discharge drum and said auger.

2. A sugar cane handling device as in claim 1 in which said trash screen includes a pair of rollers, a belt trained around said rollers and means for advancing said belt on said rollers.

3. A sugar cane handling device as in claim 2 in which a hood is mounted on said incline frame to overlie said secondary gap and said trash screen.

4. A sugar cane handling device comprising a portable main frame, an incline frame, means for pivotally mounting said incline frame on said main frame, means for supporting said incline frame at a selected inclination on said main frame, a conveyor on said incline frame and having a rearward receiving end and a forward discharge end, a discharge drum rotatably mounted on said incline frame spaced forwardly from said discharge end to leave a narrow primary gap therebetween, said gap being capable of being bridged only by material of at least sugar cane size, an auger trough on said incline frame below said gap, an auger in said auger trough, a trash screen on said incline frame spaced forwardly from said discharge drum to leave a secondary gap between, and means on said incline frame for directing a current of air from the vicinity of said discharge drum across said secondary gap and toward said trash screen.

5. A sugar cane handling device as in claim 4 in which said trash screen is in the form of a traveling member driven to discharge material over one end portion thereof.

6. A sugar cane handling device comprising an incline frame, a head shaft roll on said incline frame, a conveyor trained around said head shaft roll and adapted to advance and discharge material forwardly thereover, a discharge drum rotatably mounted on said incline frame parallel to and spaced forwardly from said head shaft roll to leave a primary gap therebetween through which some of said material can fall, said primary gap being sufficiently narrow to be bridged by sugar cane, means on said incline frame beneath said gap for receiving and carrying away said material falling through said primary gap, a pair of rollers on said incline frame parallel to said discharge roller and spaced forwardly therefrom to leave a secondary gap therebetween through which some of said material can fall, a belt trained around said rollers, means for directing an air blast across said secondary gap toward and above said belt to blow some of said material thereon, and means for driving said belt to discharge material therefrom.

7. A sugar cane handling device as in claim 6 in which said air blast directing means is movable to change the path of said air blast.

8. A sugar cane handling device as in claim 6 in which said belt is disposed at an inclination and is driven in a direction to discharge over the upper end thereof.

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9. A sugar cane handling device as in claim 7 in which means are provided for changing the angle of inclination of said belt.

10. An apparatus for handling and separating a mixture of sugar cane and unwanted trash material, said apparatus comprising:

- (a) an elongated incline frame including a lower, rearward, receiving end and an elevated, forward, discharge end;
- (b) a head shaft roll on said incline frame;
- (c) a conveyor trained around said head shaft roll driven to advance and discharge the sugar cane and the trash material thereover;
- (d) a discharge member rotatably and transversely mounted on said incline frame, said discharge member being spaced forwardly from said head shaft roll to provide a gap narrower than the diameter of the sugar cane to allow unwanted material smaller than said diameter to fall therethrough, said discharge member being effective to advance and discharge sugar cane and comparably sized unwanted material;
- (e) a trash screen on said incline frame spaced forwardly from said discharge member to afford an intervening space;
- (f) blower means on said incline frame adjacent said discharge member for directing a current of air through the sugar cane and comparably sized un-

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wanted material discharging from said discharge member and falling through said intervening space, said blower means being effective to blow some of the unwanted material onto said trash screen and being ineffective to blow the sugar cane thereon.

11. The apparatus of claim 10 including a hood mounted on said incline frame to overlie said intervening space and said trash screen, said hood having a discharge end and said trash screen being movable to advance the material blown thereon to discharge the same at said discharge end of said hood.

12. The apparatus of claim 11 including a combing drum rotatably mounted on said incline frame above said conveyor effective to distribute the sugar cane and attendant unwanted material advanced by said conveyor to form a substantially uniform layer of predetermined thickness on said conveyor.

References Cited

UNITED STATES PATENTS

427,660	5/1890	Beach	209—308 X
773,928	11/1904	Calvin	209—115
2,324,754	7/1943	Barber	209—154
2,395,075	2/1946	Smith	198—233

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