Dec. 28, 1943. C. McLAREN 2,337,615

MOBILE FIELD PACKING PLANT

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Fig. 1

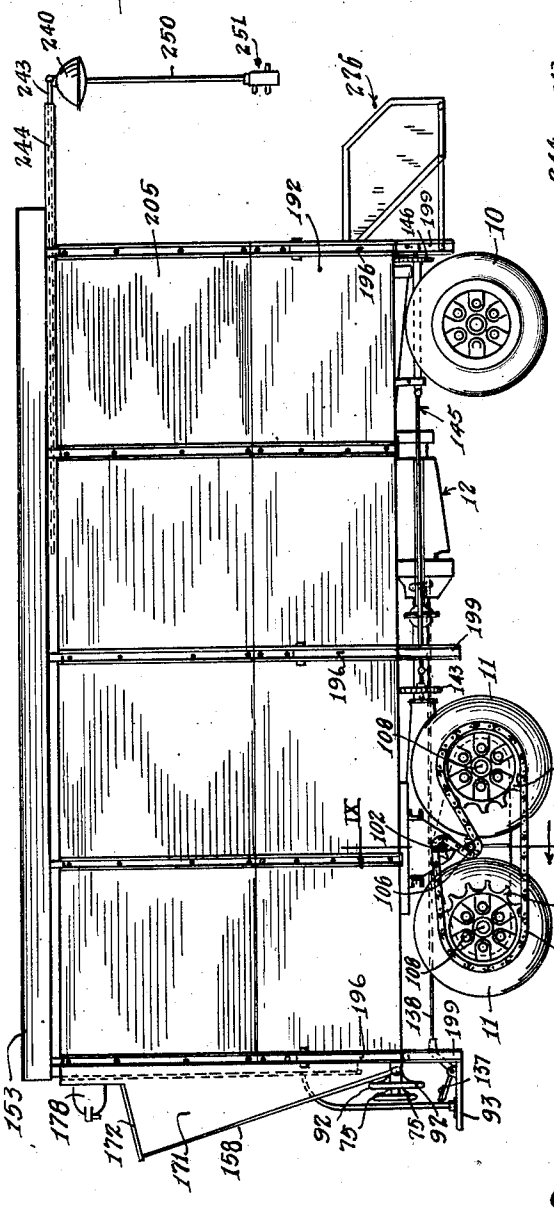
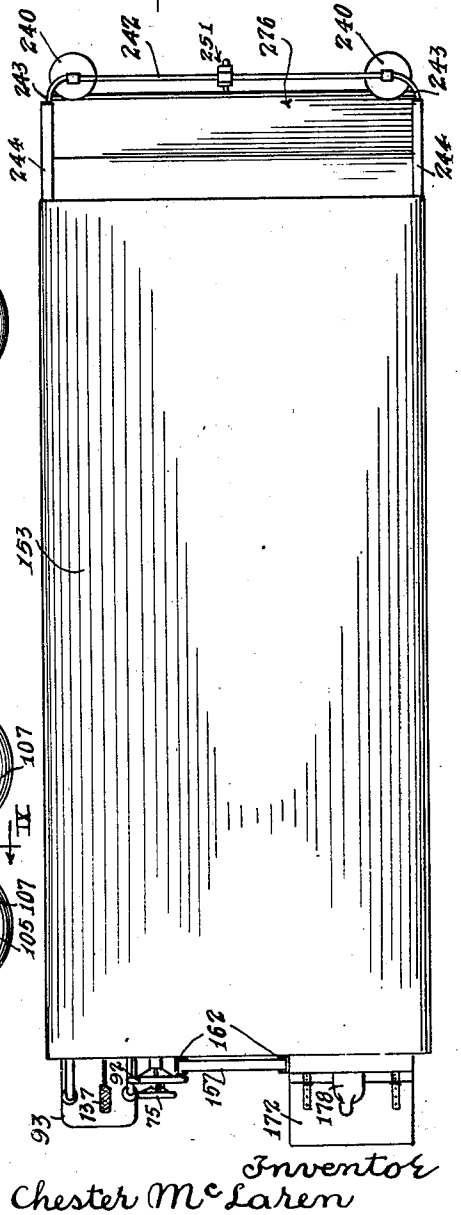


Fig. 2



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MOBILE FIELD PACKING PLANT

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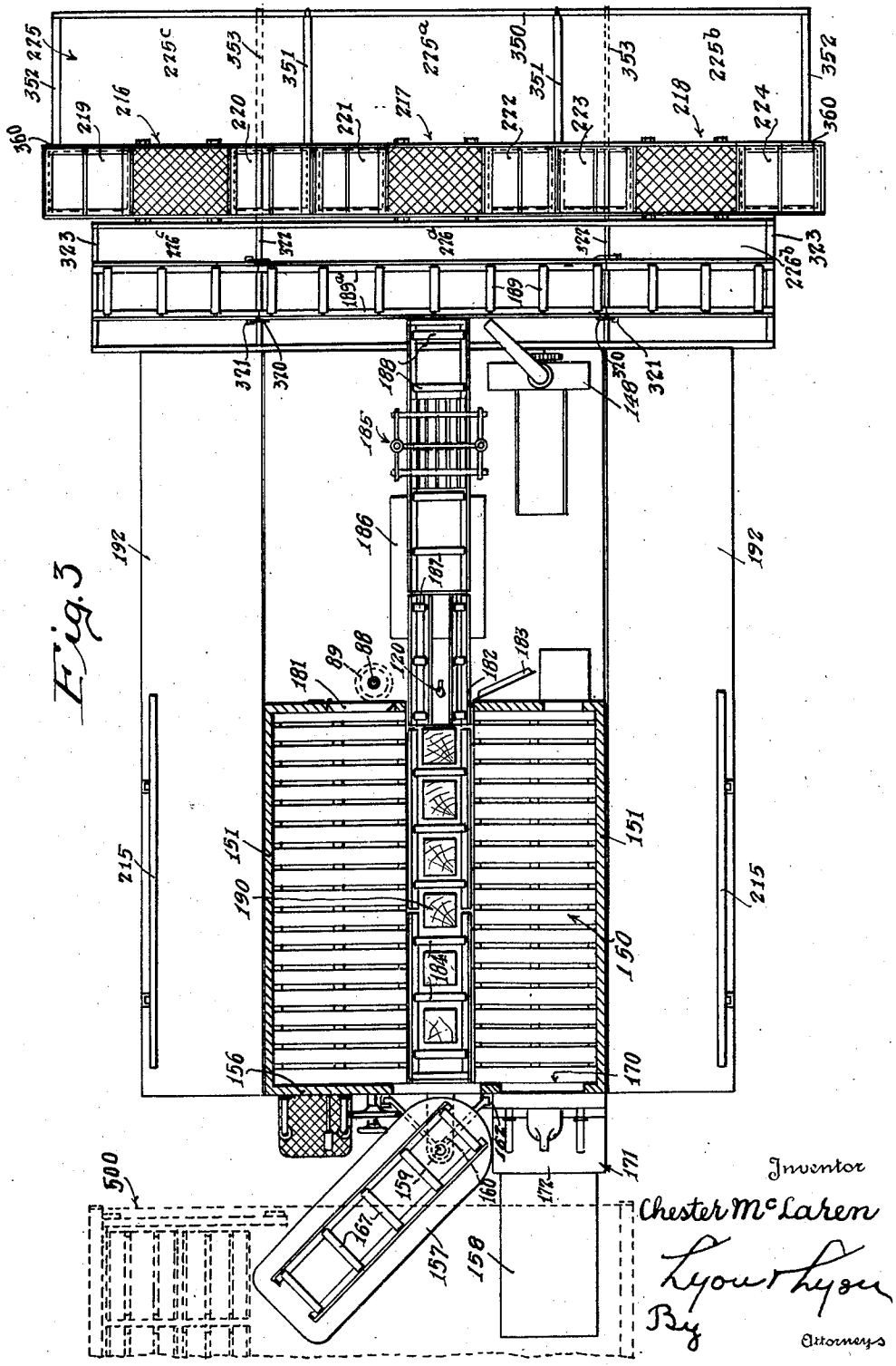


Fig. 3

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Dec. 28, 1943. C. McLAREN 2,337,615

MOBILE FIELD PACKING PLANT

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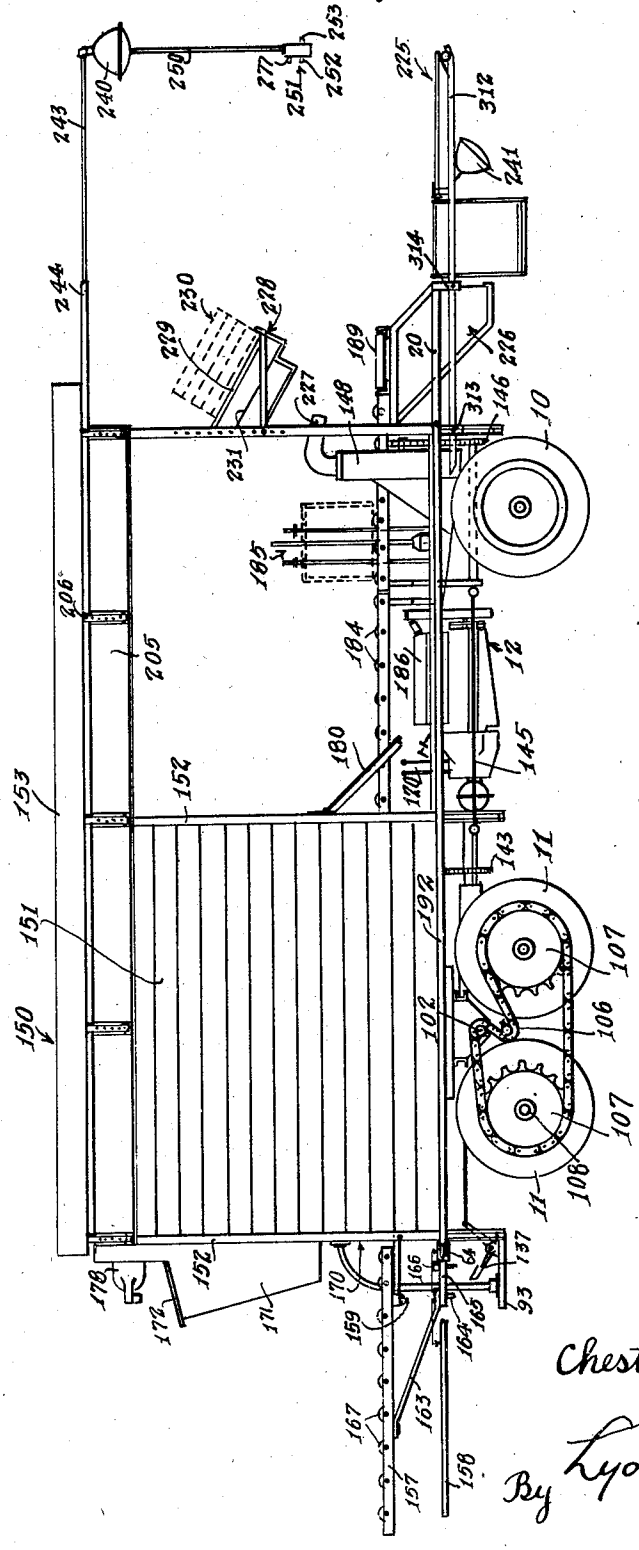


Fig. 4

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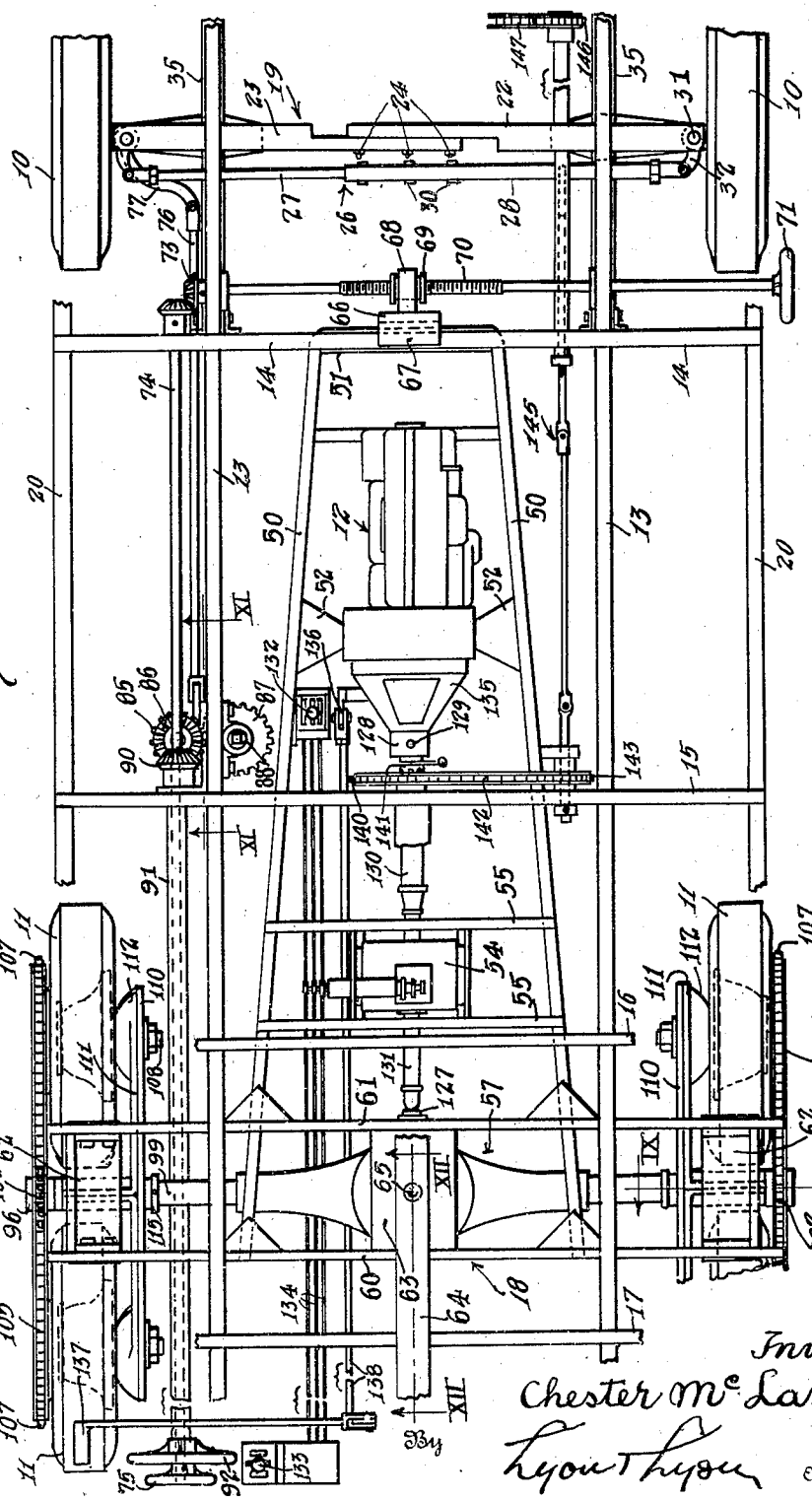
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MOBILE FIELD PACKING PLANT

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Fig. 5



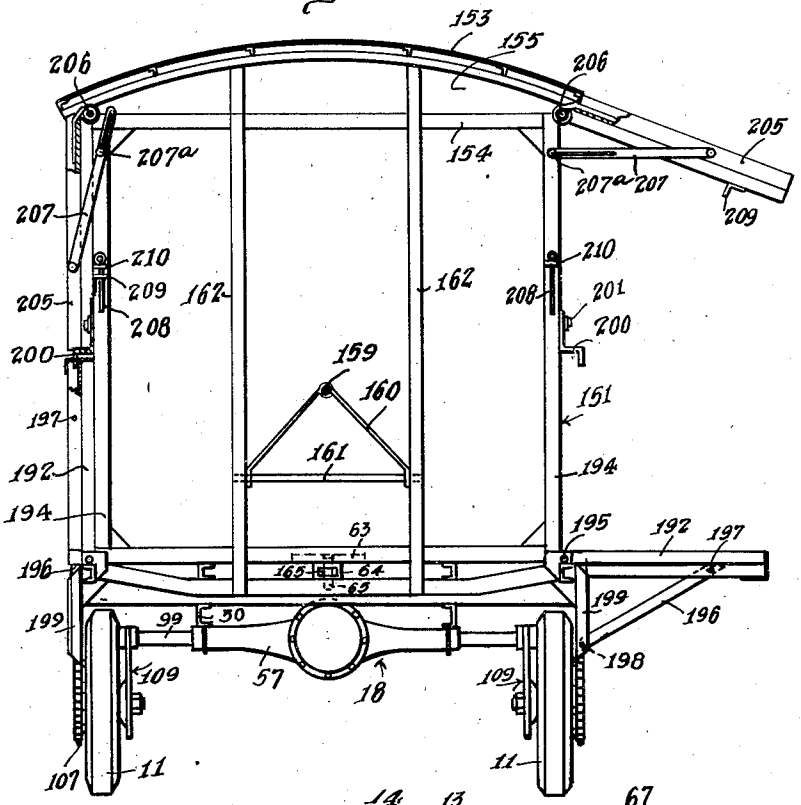
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MOBILE FIELD PACKING PLANT

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Fig. 6



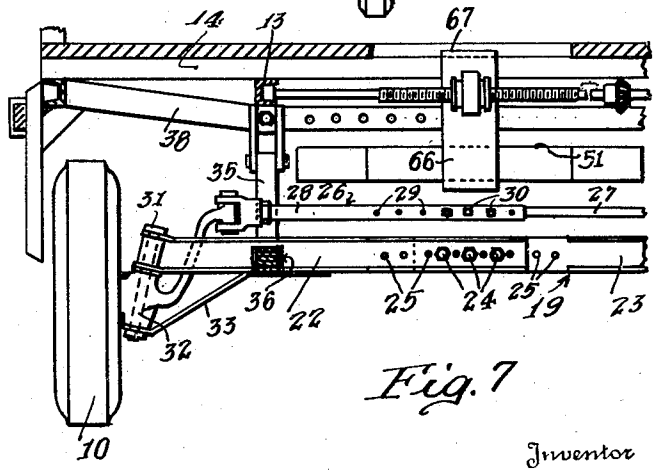


Fig. 7

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MOBILE FIELD PACKING PLANT

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Fig. 12

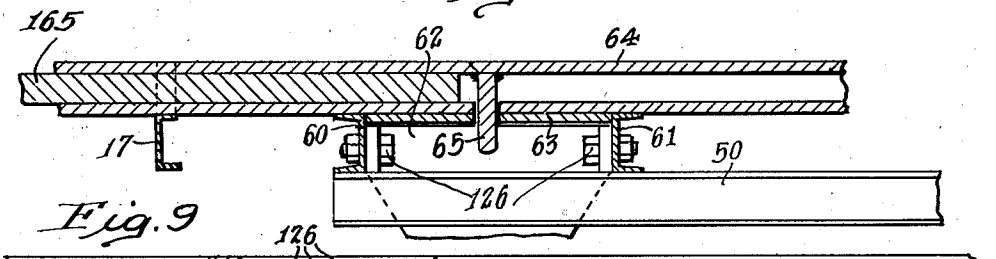


Fig. 9

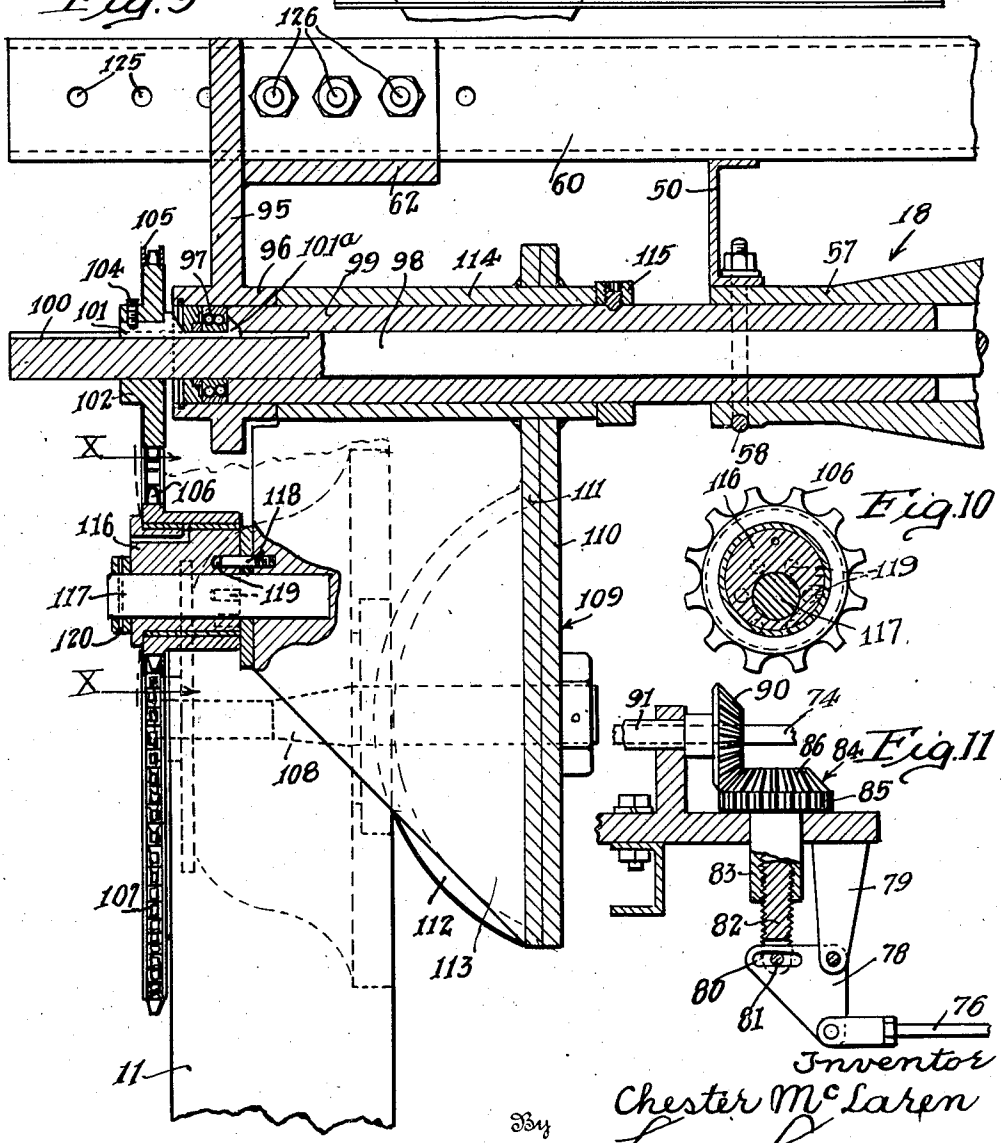


Fig. 10

Fig. 11

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Fig. 8

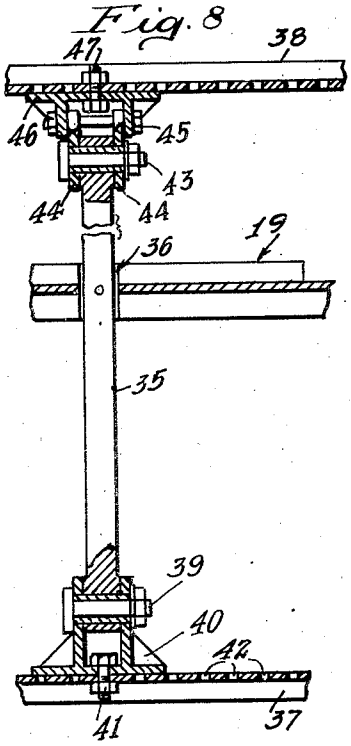


Fig. 13

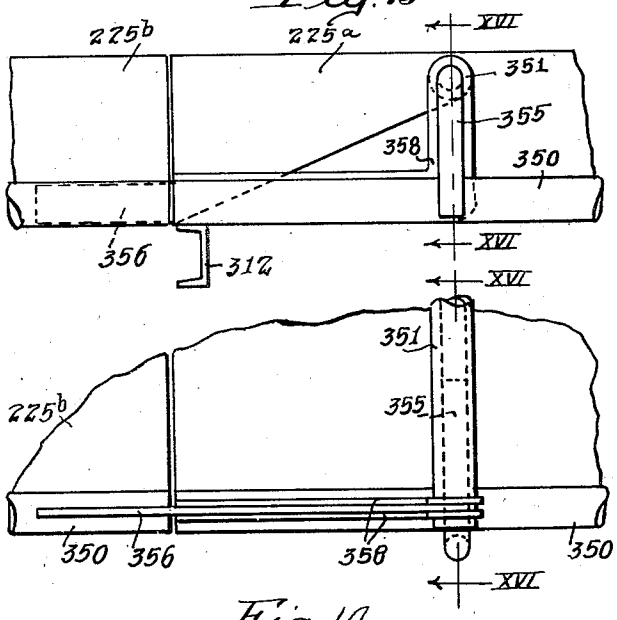


Fig. 14

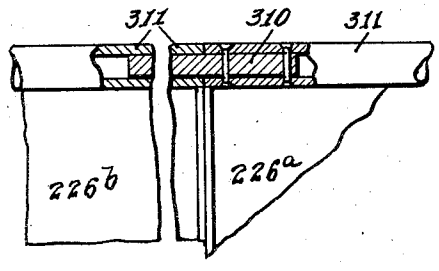


Fig. 15

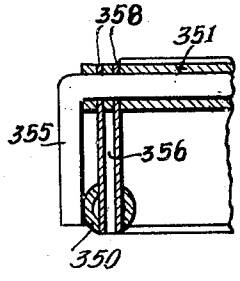


Fig. 16

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MOBILE FIELD PACKING PLANT

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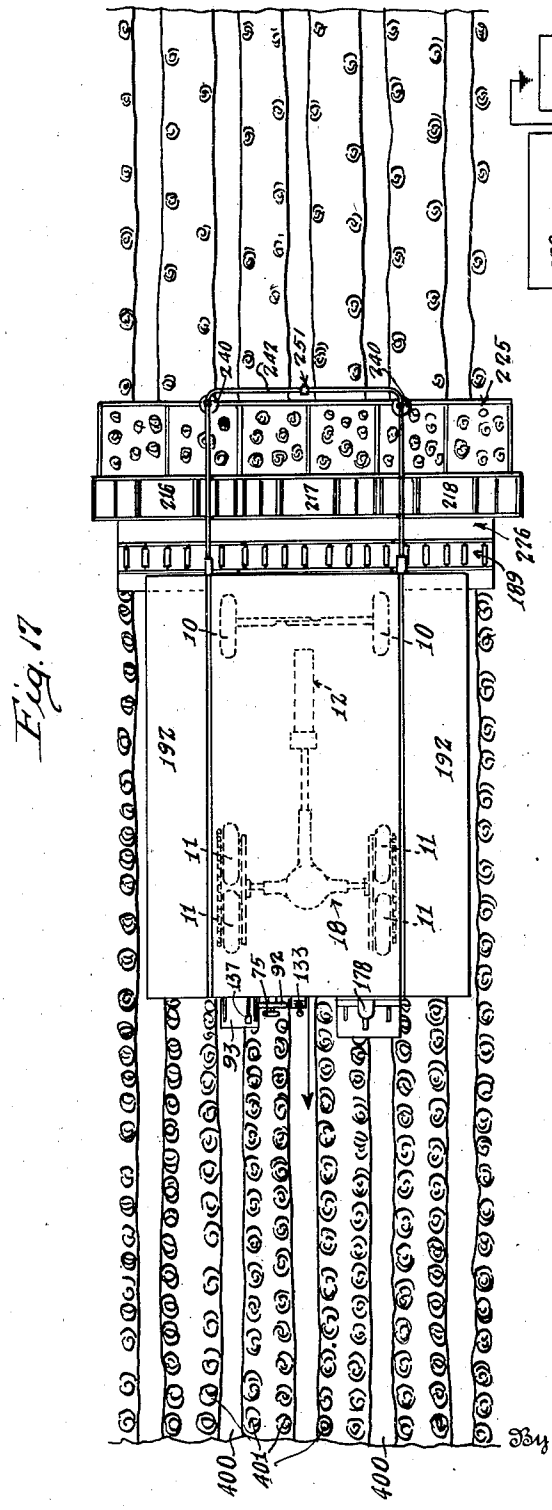


Fig. 17

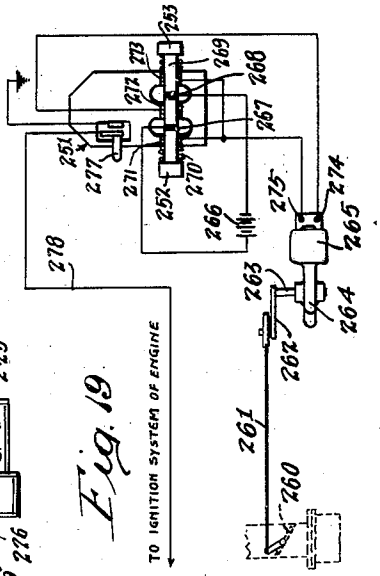


Fig. 19

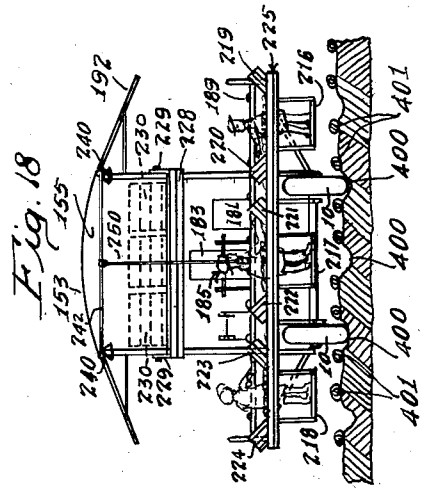


Fig. 18

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UNITED STATES PATENT OFFICE

2,337,615

MOBILE FIELD PACKING PLANT

Chester McLaren, Yuma, Ariz.

Application May 18, 1940, Serial No. 335,946

11 Claims. (Cl. 180—23)

This invention relates to apparatus for processing and/or packing produce in the field, and is particularly useful in handling crops of the type exemplified by lettuce.

Crops such as head lettuce, when shipped any distance by rail or truck, are packed in crates, usually with crushed ice in each crate in addition to the ice that may be added to the top of the pack in the refrigerator car or truck body. Heretofore such packing has been performed in central packing plants, often located a substantial distance from the field. Under such circumstances, the lettuce, after being picked, is hauled to the central packing plant where the heads are trimmed and packed in the crates, usually with ice, after which the crates are lidded and loaded on the car or truck for shipment.

The method described has numerous disadvantages resulting from excessive handling of the crop at two separated points before it is packed in the crates. Another defect is that it is difficult to control the quality of the heads picked in the field because often the quality of the heads cannot be determined until they have been hauled to the packing plant and processed and graded for packing.

A broad object of the present invention is to reduce the cost and the time of harvesting and shipping field crops, such as lettuce and the like, and improve the quality of the packed produce.

A more specific object is to place the picking and packing under the inspection and control of one man, at the time of picking.

Another object is to permit greater flexibility in the harvesting of crops by eliminating the usual central packing plant and performing all the packing in the field so that the packed produce can be hauled directly from the field for delivery to a railway line at any point or to a highway truck.

Another object is to eliminate the total number of operators required to handle the crop during transition from growing position in the field to fully packed condition.

Another object is to eliminate the necessity of hauling away any waste products. As an example, when head lettuce is shipped from the field to a central packing plant, the outer leaves must be left on the head to protect it during shipment to the packing plant, but these outer leaves have to be removed at the packing plant and then hauled away.

Another object of the invention is to facilitate night picking and packing to the extent of making it practicable, where it was not practicable with prior methods, thereby making it possible to harvest a crop in the shortest amount of time while the crop is in prime condition.

Another object is to provide a vehicle for supporting a packing plant, which is particularly adapted to be run through a field without crushing or interfering with the crop, which is capable of being accurately steered to follow the rows of plants, and has a relatively short turning radius to facilitate making turns at the end of a field.

Another object is to provide a vehicle for supporting a field packing plant, which vehicle is capable of being driven accurately in either direction along rows of plants, to avoid crushing the plants.

Another object is to provide a vehicle construction for a field packing plant capable of carrying a reasonable load of packed produce without the sacrifice of mobility due to excessive loading on any wheel, or of an insufficient relative loading of the driving wheels.

Still another object is to provide a vehicle for supporting a field packing plant, which vehicle has a high clearance and a readily adjustable tread to adapt the vehicle to run through a field with the wheels in the furrows between the plants, irrespective of the particular spacing of the furrows.

Numerous minor objects and features of the invention will become apparent from the description to follow of a specific embodiment of the invention.

Any mobile packing plant for use in a field must be relatively large and heavy in order to provide sufficient space for the carrying on of the packing operations. Furthermore, in order to be commercially practicable, such a plant must have a substantial carrying capacity for packed produce in order that it can proceed with a harvesting operation continuously for a reasonable length of time between unloading periods. This is further necessary by reason of the fact that the packing plant should be able to make a round trip down and back through even a large field without unloading so that the truck to which the packing plant delivers its load does not have to run into the field.

The foregoing requirements of space and weight handling capacity are severe in themselves. In addition, a satisfactory field packing plant must be moved through the field so that the pickers follow the vehicle while walking forwardly and tossing the produce forwardly

onto the rear end of the vehicle, where it is processed and packed by packers on the vehicle. Since of necessity the rear end of the vehicle must carry the packing equipment, the packed produce must be loaded onto the forward end of the vehicle and when a full load has been accumulated the forward end of the vehicle then becomes the heaviest end. This makes it highly advisable to have the main driving wheels of the vehicle under the forward end where the heavy load is accumulated. On the other hand, it is quite essential, in order to properly steer a vehicle along the rows of a field without damage to the plants, that the front wheels be movable for steering purposes. This requirement will be obvious since it is well known that when backing an ordinary motor vehicle the rear end of the vehicle responds very slowly to a change in direction of the front wheels, whereas the front end of the car responds quickly.

In accordance with the present invention, I solve the foregoing vehicular requirements of a field packing plant by providing a vehicle having a multi-wheel driving truck on the front end, which driving truck is pivotally supported for limited steering movement relative to the vehicle, while also providing steerable wheels on the rear end of the vehicle, the latter being capable of a larger range of steering movements than the driving truck to permit turns on a relatively short turning radius, as when driving along the road or when making a turnout at the end of a field, the steering movement of the driving truck being relatively small but sufficient to maintain the vehicle in alignment with the rows in the field during field operations.

I also equip the vehicle for movement in the reverse direction, in which the driving truck is at the rear for movement along the highway from one field to another, whereby the machine when running at appreciable speed is quickly responsive to movements of the steering wheels.

The machine is particularly adapted for night harvesting because it can carry on the rear end numerous brilliant flood lights which clearly illuminate the packing platform of the vehicle, and the adjacent ground where the pickers are operating.

The driving truck of the vehicle is also especially designed to provide high clearance without the use of excessively large diameter wheels, thereby reducing the initial cost and the upkeep, and avoiding interference between the wheels and the body of the vehicle, since it is highly desirable that the floor of the body be kept at a reasonably low elevation with respect to the ground, and the use of large wheels would necessitate breaking the floor of the body to provide wells for the wheels to enter.

The driving truck is provided with a plurality of wheels in tandem relation so mounted on the truck that they can rock freely to maintain equal traction on all of the wheels of the truck.

The invention further includes numerous details, some of which are of minor importance by themselves, but all of which together contribute to make an eminently satisfactory and practicable mobile packing plant for use in the field.

The invention will now be explained by describing in detail a particular embodiment thereof as illustrated in the drawings, in which

Fig. 1 is a side elevation of a machine in accordance with the invention, in contracted condition for movement along a highway;

Fig. 2 is a plan view of the machine in the same condition as shown in Fig. 1;

Fig. 3 is a plan view of the machine in expanded condition, ready for operation in the field;

Fig. 4 is a side elevation of the machine in the expanded condition, as shown in Fig. 3;

Fig. 5 is a plan view of the chassis of the machine;

Fig. 6 is a rear elevation of the framework of the machine shown in contracted condition on the left side, and expanded condition on the right side;

Fig. 7 is a detail elevation showing a portion of the rear axle and steering mechanism;

Fig. 8 is a detail horizontal section, showing one rear spring and its attachment to the chassis;

Fig. 9 is a vertical section taken substantially in the plane IX—IX of Fig. 5;

Fig. 10 is a detail vertical section taken in the plane X—X of Fig. 9;

Fig. 11 is a detail vertical section taken in the plane XI—XI of Fig. 5;

Fig. 12 is a detail vertical section taken in the plane XII—XII of Fig. 5;

Fig. 13 is a detail elevational view of a portion of the rear end of the device;

Fig. 14 is a detail plan view of the elements shown in elevation in Fig. 13;

Fig. 15 is a detail plan view, partly in section, showing the method of supporting the demountable ice bins;

Fig. 16 is a detail vertical section, taken in the plane XVI—XVI of Figs. 13 and 14;

Fig. 17 is a schematic diagram, in plan, showing the mode of operation of the machine in the field;

Fig. 18 is a schematic diagram, showing the machine in rear elevation in the field; and

Fig. 19 is a diagram illustrating the construction of the control switch and the electric circuit associated therewith.

As shown in Fig. 1, the machine in accordance with the present invention comprises a body supported upon a powered chassis so that it may be driven under its own power either along the highway to or from a field, or in the field. The chassis includes a pair of rear wheels 10 which are not power-driven but are steerable through a wide arc, and four front wheels 11 which are power-driven from an engine 12 and are steerable through a narrow range.

To avoid confusion, the end of the machine over the wheels 10 will hereinafter be referred to as the rear end because it is the rear end during field operations. However, when the machine is running along the highway the wheels 10 become the front wheels and the wheels 11 become the rear wheels, since the direction of movement when not harvesting is opposite to that when harvesting. A chief reason for this reversal of direction of movement is that whereas it is essential in field operation to have the four traction wheels 11 in front, it is desirable when running along the road to have the wheels 10 in front because they can be steered through a large angle, thereby giving better control of the vehicle when operating at road speeds. It will be understood that during field operation the vehicle moves at an extremely slow speed.

Referring now to Fig. 5, the chassis of the machine includes a pair of main longitudinal frame members 13 which support cross members 14, 15, 16 and 17 on which the body is mounted. The cross members also support outer longitudi-

nal frame members 20 which also function to support the body. The frame, including the members described, is supported upon a front truck 18 on which the wheels 11 are mounted and upon a rear axle 19 upon which the rear wheels 10 are mounted. The front truck 18 and the rear axle 19 are constructed to permit varying the tread distance, or the lateral distance between the wheels to adapt the machine for following field rows of any standard spacing.

Thus the rear axle 19 is constructed of two members 22 and 23 bolted together by three bolts 24 (Fig. 7) and the members 22 and 23 are provided with a plurality of bolt holes 25 so that by removing the bolts 24 the axle members 22 and 23 can be moved to overlap each other a greater or a lesser distance to shorten or widen the tread and the bolts 24 reinserted to hold the parts in the new position. The steering cross rod 26 is likewise made adjustable and consists of a rod 27 which telescopes into a tube 28. Rod 27 and tube 28 are also provided with a plurality of holes 29 for receiving bolts 30 in different positions of adjustment.

It will be apparent from Fig. 7 that the axle 19 is mounted well above the centers of the rear wheels 10 so as to give substantial clearance without employing excessively large wheels. In order to obtain this high mounting of the axle, the wheel steering pins or kingpins 31 are extended down below the axle 19 and the steering knuckles 32 are rotatably mounted on the kingpins 31 below the axle. A reinforcing plate 33 is preferably extended from the lower end of the kingpins to the axle 19, the member 33 on each side being welded to its associated axle member 19 or 22.

The rear ends of the frame members 13 are supported from the rear axle 19 by a pair of semi-elliptic springs 35, each spring passing through its associated axle member 19 or 22, as clearly shown in Fig. 7. Thus the members 19 and 22 are of I-beam form with windows 36 cut in the web of the beam for the passage of the springs.

At their front and rear ends the springs 35 are connected to frame members 37 and 38, respectively (Fig. 8). As shown in Fig. 7, the member 38 extends transversely below the longitudinal frame members 13 and is secured at its outer end to the longitudinal frame member 20, and cross member 37 is similar. The rear end of each spring 35 is secured by a spring bolt 39 to a bracket 40 adjustably secured to the cross member 37 by a bolt 41 which is adapted to be inserted through any one of a plurality of holes 42 in member 37. The front end of spring 35 is secured by a bolt 43 (Fig. 7) to the lower end of a pair of shackle members 44 which are secured at their upper ends by a bolt 45 to a bracket member 46 which is adjustably anchored to the cross member 38 by a bolt 47 in the same manner that the bracket 40 is anchored to the member 37.

It will be apparent from the foregoing description that in order to change the tread distance between the rear wheels 10, it is merely necessary to remove the bolts 24 in the front axle 19, the bolts 30 in the cross rod 26, the bolts 41 and 47 in the spring brackets 40 and 46, respectively, after which the wheels may be shifted either further apart or closer together, as necessary, and the bolts reinserted in different holes in their associated members to lock the parts in the desired new position of adjustment.

The front truck 18 includes a subframe consisting of a pair of longitudinal members 50 which converge toward each other at their rear ends and are interconnected at their rear ends by cross members 51. These subframe members 50 support the engine 12 by means of brackets 52, support a transmission member 54 by means of a pair of cross members 55, and support a differential housing and axle assembly 57 directly (Fig. 9) by yokes 58. The subframe members 50 also have rigidly secured thereto a pair of cross members 60 and 61 (Fig. 5), which are positioned slightly in front of and slightly in the rear of the differential housing 57, as shown in Fig. 5. These cross members 60 and 61 extend laterally beyond the longitudinal members 50 and are interconnected adjacent their outer ends by heavy brackets 62 which are supported by the front wheels in a manner to be described later.

The cross members 60 and 61 of the subframe (Fig. 12) are interconnected at their centers by a sturdy plate 63 which in turn supports a central longitudinal hollow member 64 in the main frame, this member 64 (Fig. 5) being secured to the cross members 17, 16 and 15 of the main frame. A pin 65 extends through the member 64 and the plate 63 to prevent any lateral shifting of the main frame with respect to the subframe members 60 and 61 while permitting pivotal movement of the subframe for steering purposes. Also to permit such steering movement, the cross member 51 at the rear end of the subframe member 50, is movably supported for controlled lateral movement. Thus the member 51 is secured (Fig. 7) to an upwardly extending bracket 66 having at its upper end a forwardly extending lip 67 (Fig. 5) which rests upon the main frame cross member 14, so that the latter supports the weight of the rear end of the subframe and the engine mounted thereon. To laterally adjust the rear end of the subframe for steering movement, the bracket 66 has forwardly extending therefrom a fork 68 engaging a flanged nut 69 on a threaded shaft 70 which is rotatably mounted in bearings provided therefor in the main frame members 13. This shaft 70 projects laterally beyond one side of the body and has a steering wheel 71 mounted directly thereon. At its other end the shaft 70 carries a beveled gear 73 meshing with a gear on the rear end of a longitudinally extending shaft 74 which extends clear to the front end of the vehicle and has mounted thereon a second steering wheel 75. It will be obvious, therefore, that the truck carrying the front wheels can be rotated through a limited angle for steering movement by turning either of the steering wheels 71 or 75.

Steering movement of the rear wheels 10 is effected through a drag link 76 which extends from the right rear steering knuckle 77 forwardly and is pivotally connected at its forward end (Fig. 11) to a bellcrank lever 78 pivotally mounted on a bracket 79. The bellcrank lever 78 has a slot 80 therein engaged by a pin 81 on the lower end of a threaded shaft 82 which screws into a threaded sleeve 83 depending downwardly from a gear 84, the sleeve 83 being journaled in the bracket 79. The gear 84 includes a spur gear 85 and a bevel gear 86. The spur gear 85 (Fig. 5) meshes with the spur gear 87, having a square stub shaft 88 projecting upwardly therefrom and adapted to receive a square opening in the lower end of a steering shaft having a steering wheel 89 (Fig. 3) thereon. The wheel 89 is employed when the machine is being driven in the reverse

direction on the highway, but is removed during field operations to leave the deck clear. The bevel gear 86 meshes with a bevel gear 90 on the rear end of a tubular shaft 91 (Fig. 5) which extends forwardly concentrically about the steering shaft 74, previously mentioned, and terminates at its front end in a steering wheel 92 concentrically positioned with respect to the steering wheel 75. It will be apparent, therefore, that an operator, by squatting on a platform 93 (Fig. 1) at the front end of the vehicle, can manipulate either the steering wheel 75 or the steering wheel 92 during movement of the device through the field. Ordinarily, the rear wheels 10 will be left in neutral position during movement along the rows in a field, and all the steering movement that is necessary produced on the front wheels 11 by rotation of the small wheel 75. It is not necessary for an operator to steer the device constantly at the slow speeds of movement in the field, but it is highly important to steer with the front wheels in order to restore the vehicle quickly to its proper path relative to the rows when it has started to run into the plants. Thus steering response to the front wheel movement is immediate, whereas steering movement of the front end of the vehicle would result only after the vehicle had run a substantial distance following steering movement of the rear wheels 10.

As previously indicated, the front wheels 11 are connected to the cross members 60 and 61 of the subframe 50 through the brackets 62.

Referring to Fig. 9, the brackets 62 include a vertical plate member 95 (also shown in Fig. 1) which supports a bearing tube 96 within which there is supported on an antifriction bearing 97 an axle shaft 98 which extends into the differential housing 57 and is driven by the usual differential mechanism in the housing. Thrust bearing means within the differential housing (not shown) restrains the axle shaft 98 against longitudinal motion. The bearing tubing 96 has rigidly secured thereto a tube 99 which is slidably mounted in the differential housing 57 for longitudinal sliding movement with respect thereto, to permit adjustment of the tread distance of the front wheels in a manner to be described later. The shaft 98 has a keyway 100 therein which receives a key 101 on a sprocket 102 slidably mounted on the shaft. The sprocket 102 may be locked in any position of adjustment longitudinally on the shaft 98 by a set screw 104. The key 101 has a shoulder 101a on its inner end which engages the antifriction bearing 97 so that the key is constrained to move with member 99 during adjustment of the tread distance. The sprocket 102 drives a chain 105 (Fig. 1) which extends under an idler sprocket 106 and around sprockets 107 on the two front wheels 11 on that side of the vehicle. The driving mechanism on the opposite side of the vehicle is identical.

The two front wheels 11 on each side of the vehicle are freely rotatably supported on spindles 108 (Fig. 9) which spindles are anchored to a yoke 109 rotatably mounted on the tubular member 99 so that the two front wheels on each side of the vehicle can rock independently to compensate for irregularities in the ground over which they run and always distributes the weight between the two wheels. This rocking motion in no way interferes with the driving of the wheels by the chain 105, since the driving sprocket 102 for the chain is coaxial with the rocking axis of the wheels.

As shown in Figs. 5 and 9, the yoke 109 comprises a flat inner plate 110 reinforced by a pair of plates 111, each having outwardly extending bosses 112 thereon for reinforcing the wheel spindles 108. The plates 111 are welded at their contact edges to the plate 110 and at their adjacent edges (Fig. 5) they are bent outwardly to form a double wall 113 (Fig. 9) which lies below the axle member 99 and supports the idler sprocket 106. The plates 110 and 111 are rigidly welded to a sleeve 114 which is freely rotatable on the tubular axle housing 99 and is maintained in fixed longitudinal position thereon by a thrust collar 115 bearing against the inner end of sleeve 114. The outer end of sleeve 114 bears against the bearing tube 96.

The idler sprocket 106 is freely rotatably supported on a hub 116 (Figs. 9 and 10) which hub is eccentrically mounted on a stub shaft 117 rigidly anchored to the wall member 113 of the wheel-supporting yoke 109. The position of the idler sprocket 106 is adjusted to tighten or loosen the chain 105 (Fig. 1) by rotating the hub 116 (Figs. 9 and 10) on the shaft 117 and the hub is maintained in any desired position of adjustment by engagement of a stationary pin 118 in one of a plurality of holes 119 in the hub 116, these holes being concentrically positioned about the stub shaft 117. To adjust the sprocket, the hub 116 is pulled partly off the stub shaft 117 (by first removing a lock pin 120 in the outer end of the stub shaft) until the hub is clear of the pin 118 and then rotating the hub into the desired new position in which a new hole 119 is aligned with the pin 118, and moving the hub back into position and locking it in place with the pin 120.

Adjustment of the tread of the front wheels is effected by sliding the whole wheel-supporting structure together with the tube 99 inwardly or outwardly, the tube 99 being slidable longitudinally in the differential housing 57 and the driving sprocket 102 being longitudinally adjustable along the axle shaft 98. The plate members 95 and the brackets 62 are adjustably connected to the cross members 60 and 61 (Fig. 5). As shown in Fig. 9, the cross member 60 has a plurality of holes 125 different ones of which are adapted to register with the holes in the brackets 62 in different positions of adjustment of the latter, the brackets 62 being held to the cross member 60 by bolts 126 inserted through the registering holes in the cross member 60 and the brackets 62. Fig. 9, of course, discloses only the holes and bolts for adjusting the brackets 62 to the cross member 60, but an exactly similar connection is provided between the brackets 62 and the other cross member 61 (Fig. 5) on the subchassis.

Summarizing, adjustment of the tread of the front wheels is had by removing the bolts 126 associated with both the cross member 60 and the cross member 61 on both sides of the vehicle, loosening the lock screws 104 on the drive sprockets 102 on the drive axle 98; then moving the tubular members 99 and the drive sprockets 102 inwardly or outwardly with respect to the differential housing 57 and the axle shaft 98 into the new position of adjustment, after which the drive sprockets 102 are secured to the shaft 98 by tightening the lock screws 104, and the brackets 62 are secured to the cross members 60 and 61 by inserting the bolts 126.

In the particular construction shown, the engine 12 (Fig. 5) is connected to the usual pinion shaft 127 projecting from the forward end of the differential housing 57 through two transmission units. Thus the engine 12 has associated there-

with the usual transmission unit enclosed in a housing 128 on the rear end of the engine. This transmission is controlled by the usual gear shift lever 129 extending upwardly therefrom, which is seldom moved since the associated transmission is seldom shifted and is usually left in high gear, directly coupling the engine 12 to a drive shaft 130. The forward end of the drive shaft 130 extends to a second transmission unit in the gear box 54 which in turn is connected to the pinion shaft 127 by a drive shaft 131.

The transmission within the gear box 54 is the one that is ordinarily used in the operation of the vehicle. The gear box may be of conventional construction having four speeds in one direction and one speed in the opposite direction. During field operations the gear box 54 is positioned in what would ordinarily be considered reverse, but which, in the present discussion, is considered the forward direction. This is because the implement always runs very slowly when in operation in the field and no great adjustment of speed is necessary. If the one speed provided by the gear box 54 does not suffice for the proper control, the gear box 128 can be set into intermediate or low, instead of high, to provide the desired speed variation during field operation. The gear box 54 is remotely controlled either by a shift lever 132 positioned adjacent the steering shaft 88 (for use when running along the road) or by a shift lever 133 positioned on the front end of the implement adjacent the steering wheels 75 and 92. Connections between the gear box and the levers 132 and 133 is had by a set of rods 134 in accordance with well established practice.

The engine 12 is provided with the usual clutch in a clutch housing 135, which is adapted to be controlled either by a pedal 136 positioned adjacent the shift lever 132, or by a pedal 137 (Fig. 1) connected to the clutch by a rod 138.

As will be described later, I provide an ice shaver and blower on the implement which is power driven from the engine 12. To this end a sprocket (Fig. 5) 140 is loosely mounted on the drive shaft 130 and adapted to be selectively engaged with the shaft by a simple dog clutch 141. The sprocket 140 is coupled by a chain 142 to a sprocket 143 coupled through a flexible drive shaft 145 to a sprocket 146 which is coupled by a chain 147 to an ice shaver and blower 148 (Fig. 3).

As has been previously indicated, the floor of the body rests upon the frame cross members 14, 15, 16 and 17 (Fig. 5). The length of these cross members defines the overall width of the implement when in contracted condition for movement along a highway, which width is within the legal limits set by state laws. In the field, the body is expanded in a manner to be described, to provide ample floor space for the operation to be performed.

The implement includes as an essential element, a refrigerated storage room for packed produce, which storage room occupies the forward portion of the vehicle substantially centrally disposed over the front drive wheels 11 (Fig. 4). This storage compartment is generally identified by the reference numeral 150 and is the full width of the contracted vehicle. It is defined laterally by insulated side walls 151 supported between the uprights 152 and by rear and front walls and a roof structure. The roof 153 may be curved, as shown in Fig. 6, and placed above a ceiling 154, the space 155 between the roof and ceiling being filled with thermal insulation.

The rear wall 156 of the storage compartment is provided with a combined door and gangway 157 (Fig. 3) for the unloading of crates of produce and a combined door and gangway 158 for the loading of ice.

The door 157 is pivotally mounted by a pin 159 on a yoke 160, which is mounted for swinging movement on a horizontal rod 161 secured to the frame uprights 162 which define the doorway. The yoke 160 always occupies a position parallel with the door and lying thereagainst, and supports the inner end of the door when the latter is in lower position, as shown in Fig. 3. To support the outer end of the door, a second yoke 163 (Fig. 4) is hingedly secured to the door at a distance outwardly from the pin 159. The yoke 163 is adapted to engage a pin 164 on a frame member 165 supported within and in telescopic relation to the longitudinal frame member 64 (Fig. 5), previously referred to. When the member 165 is extended, the pin 164 is aligned with the pin 159 so that the door is freely swingable horizontally about a vertical axis extending through the pins 164 and 159. The member 165 is retained in outer position, in which its pin 164 is aligned with pin 159 by a lockpin 166 which is adapted to be inserted in a hole in the member 165 and bear against the rear end of the frame member 64 in which the member 165 is telescoped. The lower end of the door 157, when the door is closed or the inner end when it is in lower position, as shown in Fig. 3, is rounded to permit swinging movement of the door without interference when it is functioning as a gangway in unloading produce from the storage compartment to a truck. The door is provided with conveyer rollers 167 to facilitate handling of crates.

The door 158 (Fig. 4) for the loading of ice into the storage compartment, is rigidly attached at its lower end to the body by a simple hinge so that it can be swung down until the outer end rests upon the deck of the truck from which ice is to be unloaded. When this door 158 is in lower position, as shown in Fig. 4, it uncovers an opening 170 through which cakes of ice can be slid into the storage compartment. Immediately above the opening 170 is an ice bin 171, the rear wall 171a of which may be formed of sheet metal, the door 158 lying against the wall 171a when the door is in upper position. This bin is adapted to contain shaved or crushed ice, which is employed to cool the air within the storage compartment and it is provided with a swinging lid 172 at the top for loading.

A blower is positioned in the blower chamber 175 and is driven by an electric motor 178. This blower circulates air through the bin 171 where it is cooled, and into the lower part of the storage compartment through the opening 170.

The greater portion of the ice that is delivered into the storage compartment through the opening 170 is shaved in the ice shaver 148, previously referred to, and ice to be shaved is withdrawn from the storage compartment through an opening in the forward wall of the storage compartment immediately in front of the opening 170 and normally closed by a swinging door 180.

Because of the position of the steering wheel 89 (Fig. 3) a door 181 is provided in the forward wall of the storage compartment immediately back of the wall. By opening this door 181 room is provided just within the storage compartment

for a driver to sit back of the wheel 89 (leftward from the wheel with reference to Fig. 3 since the machine moves to the right with reference to this figure when running along the highway under the control of an operator using the wheel 89). It is to be understood that the storage compartment 150 contains produce only during operations in the field.

The only opening to the storage compartment other than those already described is an opening 182 in the rear wall, centrally disposed opposite the unloading door 157 and used to load the crates into the storage compartment immediately after they are packed with produce. This doorway 182 is adapted to be closed by an ordinary hinged door 183, except when produce is being loaded. To facilitate loading operations, conveyer rollers 184 are provided within the storage compartment in a row extending between the doors 157 and 183 and additional rollers are provided extending rearwardly from the doorway 182 across the rear portion of the deck of the machine.

Further referring to Fig. 3, it will be seen that a lidding machine 185 is positioned immediately rear of the engine which is concealed beneath a hood 186 and conveyer rollers 187 extend between the lidding machine and the first conveyer roller 184 within the storage compartment. Another pair of conveyer rollers 188 are positioned immediately back of the lidding machine 185 and intercept a transverse row of conveyer rollers 189 which extend the full width of the extended deck of the machine.

The conveyer rollers 187 are removable to permit access to the engine below the engine hood 186. The three rearmost rollers 187 are cut away at their centers in effect constituting three pairs of short rollers to leave a clear space for the gear shift lever 120 which extends upwardly from the transmission associated directly with the engine. Conveyer rollers 184 within the storage compartment are collapsible and blocks 190 are mounted between the rollers 184 in the storage compartment to support crates thereon when the conveyer rollers are collapsed.

The conveyer 187, the lidding machine 185 and the ice shaver 148 are mounted on the central rigid deck of the machine, which deck is the same width as the storage compartment 150. During field operations the deck space is increased by means of folding deck sections 192 on each side of the machine. Each of the decks 192 is hinged at its lower edge (Fig. 6) to the frame uprights 194 by hinge pins 195. Each deck 192 is supported in horizontal position when it is lowered by braces 196 which are pivotally connected at their upper ends by pins 197 to the associated deck member 192. The lower ends of the braces 196 have transverse pins 198 therein adapted to ride in vertical guide members 199 rigidly connected to the vehicle frame. These guide members 199 are closed at their lower ends to limit downward movement of the pins 198 therein when the deck members 192 assume horizontal position.

The decks 192 are folded by simply swinging them upward about the hinge pins 195 until they are in vertical position against the frame members 194, in which position they are secured by latches 200 secured against the frame members 151 for vertical sliding movement therealong. Thus each latch has a vertical slot engaged by a bolt 201 secured to the associated vertical frame member 194. In Fig. 6, the deck member 192 on the left side is shown in collapsed position in which it is held flat against the frame member 194 by the latch 200.

Hinged roof extensions 205 (Fig. 6) are also provided to shield the deck extensions 192. Thus the roof section 205 is hingedly secured to the body at its upper edge by hinge pins 206 and is adapted to be retained in extended position by braces 207 having bayonet slots therein engageable with pins 207a on the frame members 194. When the roof extensions 205 are in collapsed vertical position they are locked in position by pins 208 insertable through adjacent eyelets 209 and 210, respectively, on the roof member and the frame. Locking of the roof members 205 in collapsed position also positively locks the deck members 192 in collapsed position because the lower edge 210 of each roof member bears against the latches 200 which retain the deck members in position, positively preventing upward releasing movement of the latches 200.

The extensible deck sections 192 on each side of the machine not only provide for freedom of movement of the operators on the machine, but also provide substantial deck area for loading empty crates forwardly along each side of the storage compartment 150. Collapsible railings 215 may be provided at the outer edges of the deck sections to retain empty crates stacked thereon.

Referring to Fig. 3 there is positioned immediately back of the transverse row of conveyer rollers 189 a structure providing three platforms 216, 217 and 218, respectively, for packers to stand upon with crate-supporting grids for supporting two crates in packing position on opposite sides of each operator. On opposite sides of the platform 216 are frameworks for supporting a pair of crates 219 and 220, respectively. Structures are similarly provided for supporting a pair of crates 221 and 222 on opposite sides of the platform 217, and for supporting a pair of crates 223 and 224 on opposite sides of the platform 218. Immediately back of the row of operators' platforms 216, 217 and 218, is a row 225 of receiving trays, on which the produce is tossed by the pickers who follow the machine through the fields.

Referring now to Fig. 4, there is positioned immediately below the transverse row of conveyer rollers 189, an ice bin 226 into which shaved ice is delivered from the spout 227 of the ice shaver 148, thereby providing a supply of shaved ice for each packer, immediately in front of him. In addition, there is mounted above the transverse row of conveyer rollers 189, a rack 228 for supporting crates in position to be grasped by the packers. The rack 228 has an upper deck 229 on which empty crates 230 may be stacked and has a lower compartment 231 for crate-lining papers which are accessible from the front side.

Since the conveyer rollers 189 and the structure back thereof extend even beyond the full width of the machine in expanded condition, it is so constructed that it can be collapsed when the machine is conditioned for road travel.

The main supporting elements for the structure on the rear end of the vehicle includes the main frame members 20 (Fig. 5 and Fig. 4) which are extended to the rear edge of the ice bins 226. A center section 226a (Fig. 3) of the ice bin is positioned between the frame members 20 and permanently attached thereto. Two outer sections 226b and 226c, respectively, of the ice bin are

detachably supported on the center section 226a. Thus the front and rear top edges of the bin sections 226a, 226b and 226c are formed of pipes and the ends of the pipes 311 on the bin section 226a (Fig. 15) have rods 310 rigidly secured therein and extending outwardly therefrom into the pipes 311 on the demountable bin sections 226b and 226c. The sections 226b and 226c are therefore attached in the position shown in Fig. 3 by simply sliding said pipes 311 on the front and rear ends thereof onto the rods 310 extending from the center bin section 226a.

The transverse conveyer, including the rollers 189, is formed in three sections, each of which includes a pair of side rails 189a interconnected at their ends by hooks 320 and eyes 321. The rails 189a rest upon longitudinally extending frame members 322 at the ends of the center section 226a of the ice bin and members 323 at the outer ends of the demountable ice bin sections 226b and 226c, respectively. When the implement is contracted for movement along the road, the three sections of the conveyer are lifted off the members 322 and 323 and stacked in the center part of the machine.

The structure to the rear of the ice bin 226 is supported by a pair of detachable frame members 312 (Fig. 4) which are positioned below and extend beyond the two frame members 20, respectively. Thus each frame member 312 extends through clips 313 and 314 secured to the associated member 20 and is anchored against longitudinal movement by being bolted or pinned to the clips 314.

The receiving trays 225, positioned back of the operators' platforms, are formed of sheet metal and include a center section 225a and outside sections 225b and 225c, respectively (Fig. 3). These trays slope slightly upwardly and rearwardly and each section is bounded at its rear edge by a reinforcing pipe 350 (Fig. 3). The center tray 225a has longitudinal pipes 351 spaced inwardly from its lateral edges 353 and the outer sections are bounded at their outer edges by pipes 352. Referring to Figs. 13, 14 and 16, the center section 225a is directly supported upon the frame members 312 which are positioned just within the marginal edges 353 of this center section, and the outer sections are hingedly mounted upon the center section. Thus the pipe 351 (Fig. 16) receives in its outer end a rod 355 which projects beyond the pipe 351, is bent down, and secured to the pipe 350. Immediately back of the end of pipe 351 there is hingedly mounted on the rod 355 a plate 356 which is secured to the outer section 225b, being welded or otherwise secured to the pipe 350 of that section. Therefore the section 225b may be swung upwardly and inwardly about the rod 355 as an axis, the forward edge of the section 225b likewise having a plate rotatably supported on the pipe 351. The plate 356 is stiffened when in lower position by engagement between a pair of plates 358 which are secured to and extended upwardly from the rear edge pipe 350 on the center section 225a. It will be obvious that when the outermost trays 225b and 225c are in lower position, they are prevented from swinging below level position by engagement of the lower edge of the plate 356 with the pipe 350 of the center section.

In order to illuminate the packing deck and the field area immediately to the rear of the implement, where the pickers are operating, elevated flood lights 240 are supported on a U-shaped tubular member 242 (Fig. 2) having side arms 243 which telescope into larger tubular members 244 secured to the frame of the body just below the roof. When the arms 243 of the tubular frame are fully telescoped between the tubular members 244, as shown in Fig. 2, the lamps 240 are retracted close to the noncollapsible portion of the body. However, when the tubular members 243 are pulled out of the telescoping tubes 244 into rearward position, as shown in Fig. 4, the lamps 240 are positioned substantially above the rear edges of the receiving trays 225.

To further illuminate the field immediately back of the implement where the pickers are working, additional flood lamps 241 are mounted below the receiving deck 225, these lamps being detachable when the receiving deck is collapsed for road travel.

An important feature of the invention is the control of the speed of movement of the implement in the field by means accessible to a foreman walking back of the implement with the pickers. Thus there is suspended from the tubular member 242 (Fig. 4) on an electric cable 250 a control switch 251 having a pair of buttons 252 and 253 projecting from opposite sides thereof. These buttons 252 and 253 function to close circuits in such a way as to either open or close the throttle of the engine 12.

Thus referring to Fig. 19, the throttle 260 of the engine is closed or opened by a rod 261 pivotally connected to a crankarm 262 on a shaft 263 adapted to be rotated very slowly in either direction through a speed reducing gear mechanism contained in a housing 264 on an electric motor 265. The motor 265 is of the type having a permanent magnet field adapted to be energized with direct current from the usual storage battery 266 on the vehicle, so that it runs in one direction or the other, depending upon the polarity of the current applied thereto.

As shown in Fig. 19, the two terminals of the battery 266 are connected to a pair of switch contacts 267 and 268 on an insulating shaft 269, the opposite ends of which project from the switch 251 and constitute the buttons 252 and 253. The shaft 269 is normally maintained in mid position by a pair of compression springs 270, in which position the movable contacts 267 and 268 are out of contact with three fixed contacts 271, 272 and 273, respectively. The contact 272 is connected to one terminal 274 of the motor 265 and the contacts 271 and 273 are both connected to the other terminal 275 of the motor. If the button 252 is depressed the movable contact 267 closes on the fixed contact 272 and the movable contact 268 closes on the fixed contact 273, thereby connecting the positive terminal of battery 266 to terminal 274 of the motor and connecting the negative terminal of the battery to terminal 275 of the motor. This causes the motor to run in one direction. On the other hand, if the button 253 is depressed, the movable contacts 267 and 268 are connected to the fixed contacts 271 and 272, respectively, whereupon the positive terminal of the battery 266 is connected to terminal 275 of the motor, and the negative terminal of the battery is connected to terminal 274 of the motor, causing the latter to run in the reverse direction.

It is to be understood that the gear reduction between the motor 265 and the crankarm 262 is sufficient to permit a gradual opening or closing of the throttle 260 in response to depression of one or the other of the buttons 252 and 253.

Occasionally it is desirable for the supervisor to be able to make an emergency stop of the vehicle. To this end a third button **277** is provided on the switch **251**, this button functioning to ground a lead **278** (Fig. 19) extending to the ignition system of the engine, and stopping the engine.

Operation

Referring to Figs. 3, 4, 17 and 18, the machine is fully expanded, as shown in Figs. 3 and 4, during field operations, and the tread distance of the front and rear wheels has been adjusted in accordance with the furrow spacing of the field so that the wheels run in two of the furrows **400**, as shown in Fig. 18. The machine is set into slow movement in forward direction (to the left in Fig. 17) by suitable manipulation of the gear shift lever **133** and the adjacent clutch pedal **137**, as previously described.

The rear wheels **10** are set in straight ahead position by suitable manipulation of the large steering wheel **92** and the rear truck **18** is turned slowly from time to time by means of the small steering wheel **75** to keep the wheels in the furrows **400** and prevent them riding out of the furrows onto the plants **401**, growing between the furrows. Such steering can be effected by an operator on the main deck of the machine, who walks around over the lateral deck **192** to the platform **93**, or it may be effected by rotation of the side steering wheel **71** by an operator walking alongside the machine. In practice, it is desirable to have a supervisor following the machine and supervising the picking, and the supervisor can easily correct any deviation of the machine from its proper course by means of the steering wheel **71**.

It will be observed from Fig. 18 that the furrows **400** are commonly at a lower level than the ground where the crop plants are growing, so that the machine must have substantial clearance in order not to scrape the plants. Such clearance is provided by the construction of the present device, as previously described with particular reference to Figs. 6 and 7.

As previously indicated, the pickers follow along behind the machine, cutting the produce (in the case of lettuce, for instance), and tossing the heads onto the receiving trays **225**. Three packers standing on the platforms **216**, **217** and **218**, respectively, take the heads from the receiving trays **225**, grade them, and pack them in the crates **219**, **220**, **221**, **222**, **223** and **224**. Each operator has two trays on opposite sides of him, and he will ordinarily grade the lettuce (when lettuce is being packed), into heads of two different sizes, which he places in the two different crates he is packing. As necessary, he scoops shaved ice out of the ice bin **226** and distributes it over the produce packed in the trays. Thereupon he lifts the loaded trays onto the conveyer rollers **189** and shifts them toward the longitudinal conveyer **188**. Thereafter the packer selects new trays from the overhead rack **228** and packs them.

The loaded crates placed on the conveyer rollers **189** are handled by an operator on the main deck of the machine, who first shifts them over the conveyer rollers **188** into the lidding machine **185** and lids them, after which he shoots them forward over the conveyer rollers **187** and **184** into the storage compartments **150** and stacks them therein. Where packing is proceeding at a relatively rapid rate, it may be necessary to have a second operator within the storage compartment to stack the crates therein. During all field operations, the temperature within the storage compartment is maintained at a relatively low value by the cooling blower driven by the motor **178**, as previously described.

A most important advantage of packing produce in the field as described, is that a single supervisor has immediate and complete control over the entire picking and packing operations. Thus if the pickers start picking immature heads of lettuce, for instance, the packers immediately inform the supervisor, or the pickers directly, so that the condition is corrected at once. Furthermore, if the crop is heavy and the pickers are being overtaxed, the supervisor can immediately slow operations to the proper tempo by reducing the speed of movement of the vehicle by the remote control of the motor through the switch **251** which he can grasp while following the implement. Likewise the supervisor can immediately increase the speed of movement of the implement, if he finds that the crop is thin and the pickers are not working efficiently. It is found that pickers can work most efficiently with the least effort when moving at a certain tempo; therefore operations are greatly facilitated by regulating the speed of movement of the implement through the field to a rate corresponding to the most efficient tempo of operations.

Oftentimes it is practicable with the present invention to run through a field in which only a relatively small percentage of the crop is matured and ready for picking. Under such conditions, the implement is moved at a relatively rapid pace through the field and yet the pickers are given ample time to select and cut all of the crop that is ready for picking. Usually pickers prefer to work at a certain tempo, and ordinarily, when picking in a field where only a small percentage of the crop is ready, they tend to pick a considerable amount of immature produce. Such wastage is greatly reduced, in accordance with the present invention, by increasing the speed of movement through the field.

Since crops such as lettuce are packed immediately, in accordance with the present invention, there is no need of leaving excess leaves on the head, and the pickers cut the heads only without the outer leaves so that all of the unmarketable leaves are left in the field, and there is no necessity of hauling away the trimmings, as is the case with the old system of packing in central plants. Furthermore, occasional poor heads that may be cut by the pickers and tossed onto the trays, are eliminated by the simple expedient of throwing them back into the field.

The implement is continued on its course down the furrows **400** to the end of the field, where it is turned in a relatively short radius by manipulating both the large steering wheel **92** to swing the rear wheels **10** through a wide angle and simultaneous manipulation of the small wheel **75** to angle the front truck **18** to the maximum possible extent. The machine then returns through the field.

If a field is relatively short, the implement may make several trips back and forth through the field before the storage compartment **150** is filled with packed crates. However, the storage compartment should be at least large enough to handle all the crates that may be packed during one trip down and back through the field to avoid the necessity of running a truck into the field for unloading the implement, or of running the implement, without harvesting, to the

end of the field where the receiving truck would be waiting.

To unload the packed crates, the receiving truck **500** (Fig. 3) may be driven alongside the front end of the mobile harvester, the door **158** dropped onto the forward end of the truck, and the door **157** dropped down into horizontal position and swung toward one end of the truck body **500**. The loaded crates are then moved out of the storage compartment along the roller conveyers **167** on the door **157** onto the truck **500**. After the crates in the central part of the storage chamber over the conveyer rollers **184** have been removed, the conveyers **184** may be elevated to facilitate the unloading of the remaining crates. As soon as the crates have been removed from that portion of the storage compartment immediately in front of the ice receiving door **170**, new ice may be loaded from the truck **500** into the storage compartment over the door **158** and the latter may be closed. When the last crates have been unloaded, the door **150** is closed and the machine is ready to resume harvesting operations in the field.

Ordinarily sufficient ice will be loaded into the storage compartment to maintain operations until the next loading period, and the last cake of ice will have been removed from the storage compartment before each harvesting cycle is completed, so that the entire storage space can be utilized for the stacked crates.

The truck **500** may bring to the field a new supply of empty crates, which are stacked on the side decks **192** of the vehicle, and are lined and placed in the racks **228** by one of the operators working on the deck of the machine.

It will have been observed that there are no springs between the body of the machine and the front truck **18**. Springs are not necessary because of the low speed of movement of the machine, and the fact that the two front driving wheels **11** on each side of the machine are free to rock about the tubular member **99** (Fig. 9) so that each wheel always carries its share of the load.

This method of supporting the front driving wheels is also highly important in securing the maximum load carrying capacity in the field, where the ground is always soft and the amount of weight that can be carried by any single wheel is definitely limited. This tandem mounting of the wheels in the manner described is particularly useful because the rows between plants in the fields are often too narrow to accommodate dual tired wheels.

It will be understood that for the purpose of explaining the invention, a specific embodiment thereof has been described in detail, but that many departures from the exact construction shown can be made without departing from the invention which is to be limited only to the extent set forth in the appended claims.

I claim:

1. A vehicular packing plant for field use comprising: a body member having packing apparatus on the rear end and loading space on the front end, supporting and steering wheels under the rear end of said body, and means dirigibly connecting them to the body for steering movement through a wide angle, means for steering said wheels, a driving truck dirigibly mounted under the front end of said body for limited steering movement, said driving truck having a plurality of drive wheels in tandem relation thereon, means for driving said drive wheels, and means for steering said driving truck.

2. A vehicular packing plant for field use comprising a chassis frame and a body supported thereon, an extensible axle below said frame, two spring means fixed to said axle at opposite ends thereof, whereby said springs move laterally relative to each other in response to adjustment of said axle, and means for adjustably connecting said springs to said chassis frame.

3. A vehicular packing plant for field use comprising: a body member, rear wheels under the rear end of said body, a driving truck dirigibly mounted under the front end of said body for limited steering movement, said driving truck comprising a pair of transverse tubular housings on opposite sides thereof, drive shafts extending through said tubular housings and having sprockets secured to the outer ends thereof, a pair of longitudinally extending wheel-supporting members one rotatably mounted on each of said tubular housings, a pair of drive wheels rotatably supported in tandem relation on each of said wheel-supporting members, sprockets on said drive wheels, and chains coupling the sprockets of the drive wheels on each wheel-supporting member to the sprocket of the drive shaft on that side of the vehicle.

4. Apparatus as described in claim 3, in which said transverse tubular housings are interconnected by a differential housing and the tubular housings and the differential housing are positioned at a substantially higher level than the axes of said wheels, whereby high clearance is obtained with small wheels.

5. Apparatus as described in claim 3, with a differential housing between said tubular housings, the latter being axially slidable in the differential housing, and said drive sprockets being axially slidable on said drive shafts for adjustment of the tread distance.

6. Apparatus as described in claim 3, with means for connecting said body member in supported relation directly to said tubular housings.

7. A vehicular packing plant for field use comprising: a body member, rear wheels at the rear end of said body in supporting relation thereto, a drive truck dirigibly mounted under the front end of said body for steering movement, said driving truck comprising a subframe having a plurality of drive wheels in tandem relation thereon, and means for driving said drive wheels, means pivotally supporting the front end of said body member on said truck adjacent the forward end of the latter, means vertically supporting the rear end of said truck from said body member for lateral movement with respect thereto, and means for shifting the said rear end of said truck laterally to impart steering movement to said truck.

8. A vehicular packing plant for field use comprising: a body member, supporting and steering wheels under the rear end of said body member, means dirigibly connecting said wheels to the body member for steering movement through a wide angle, means for steering said wheels, a driving truck dirigibly mounted under the front end of said body member for limited steering movement, said driving truck having a plurality of drive wheels in tandem relation thereon, means for driving said drive wheels, and means for steering said driving truck comprising a steering wheel on the extreme front end of said body member.

9. Apparatus as described in claim 8, including a second steering wheel, and means coupling it to said driving truck for steering the latter, said second steering wheel being located intermediate the ends of said body member for use during rearward movement of the apparatus.

10. A vehicular packing plant for harvesting field crops planted in rows comprising: a body member, supporting and steering wheels under the rear end of said body member, means dirigibly connecting said wheels to the body member for steering movement through a wide angle to permit turning said vehicle in a relatively short turning radius, and means for steering said wheels, a driving truck having a plurality of drive wheels in tandem relation thereon, means for driving said drive wheels, means dirigibly mounting said driving truck under the front end of said body for limited steering movement sufficient to maintain the wheels of said truck between said rows of plants while said packing plant is moving through a field parallel to said rows, and means for steering said driving truck.

11. A front wheel drive vehicle for slowly carrying a packing plant through a field containing produce planted in rows while produce from the field is loaded onto said packing plant, said vehicle comprising: a chassis, a front wheel assembly having wheels adapted to move between said rows of produce, means for driving said wheels, and mean dirigibly mounting said assembly for steering movement with respect to said chassis, steering means for applying relatively finely controlled steering movement of relatively small amplitude to said assembly to maintain said wheels between said rows while said vehicle is traversing a field, rear wheels adapted to move between said rows of produce, means dirigibly mounting said rear wheels for steering movement with respect to said chassis, and steering means independent of said first mentioned steering means for applying relatively coarsely controlled steering movement of relatively large amplitude to said rear wheels to turn said vehicle on a short turning radius at the end of said field.

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