

April 22, 1941.

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2,239,288

MATERIAL HANDLING APPARATUS

Filed Aug. 15, 1938

4 Sheets-Sheet 1

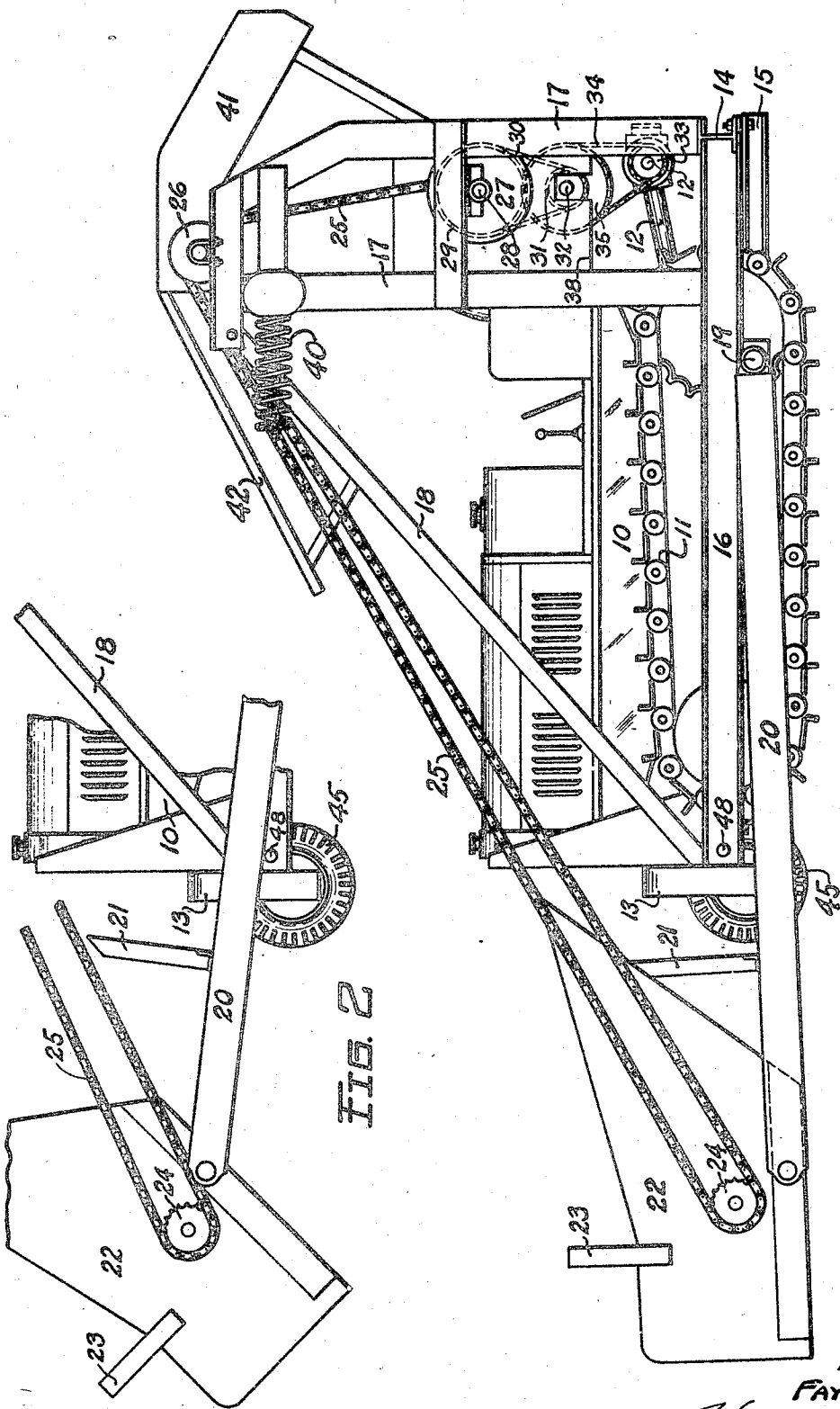


FIG. 1

FIG. 2

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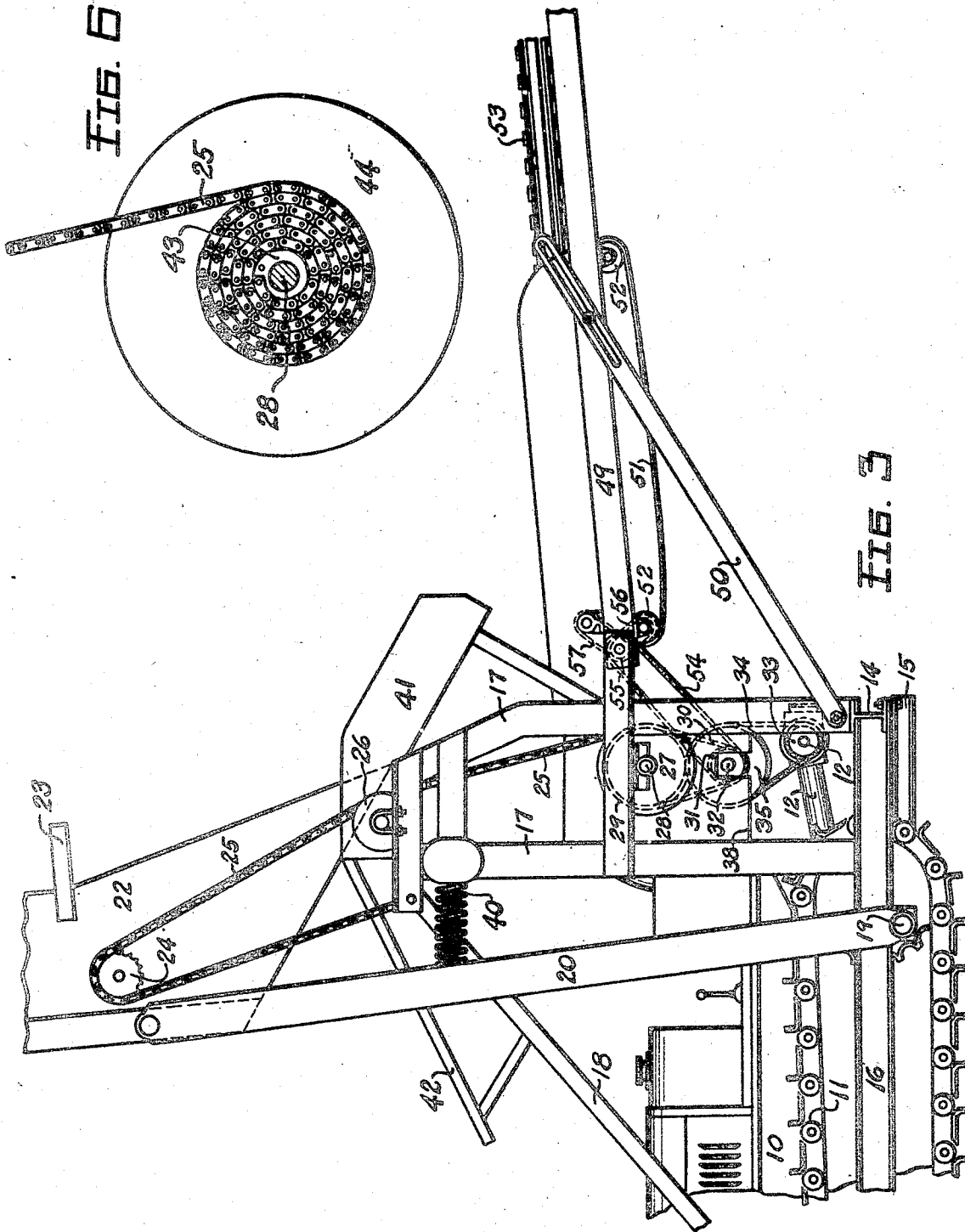


FIG. 3

FIG. 6

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4 Sheets-Sheet 3

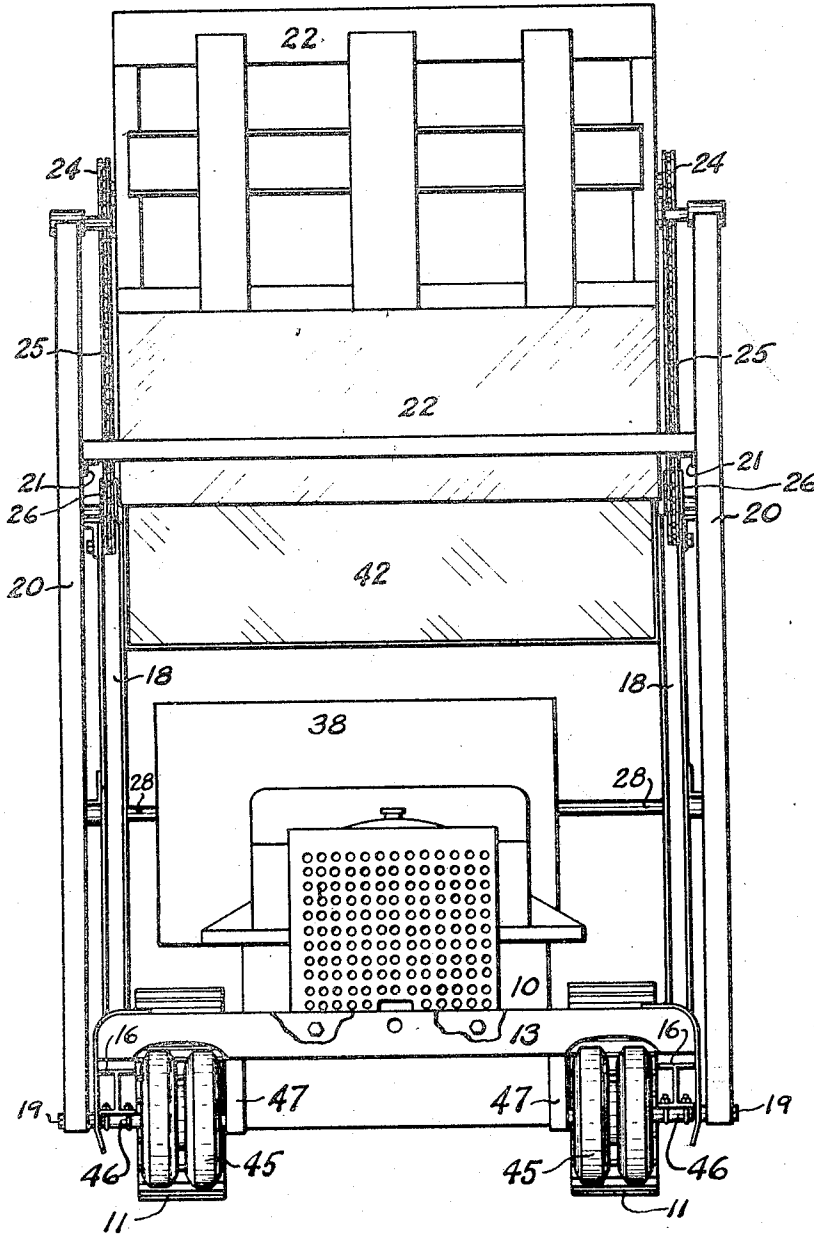


FIG. 4

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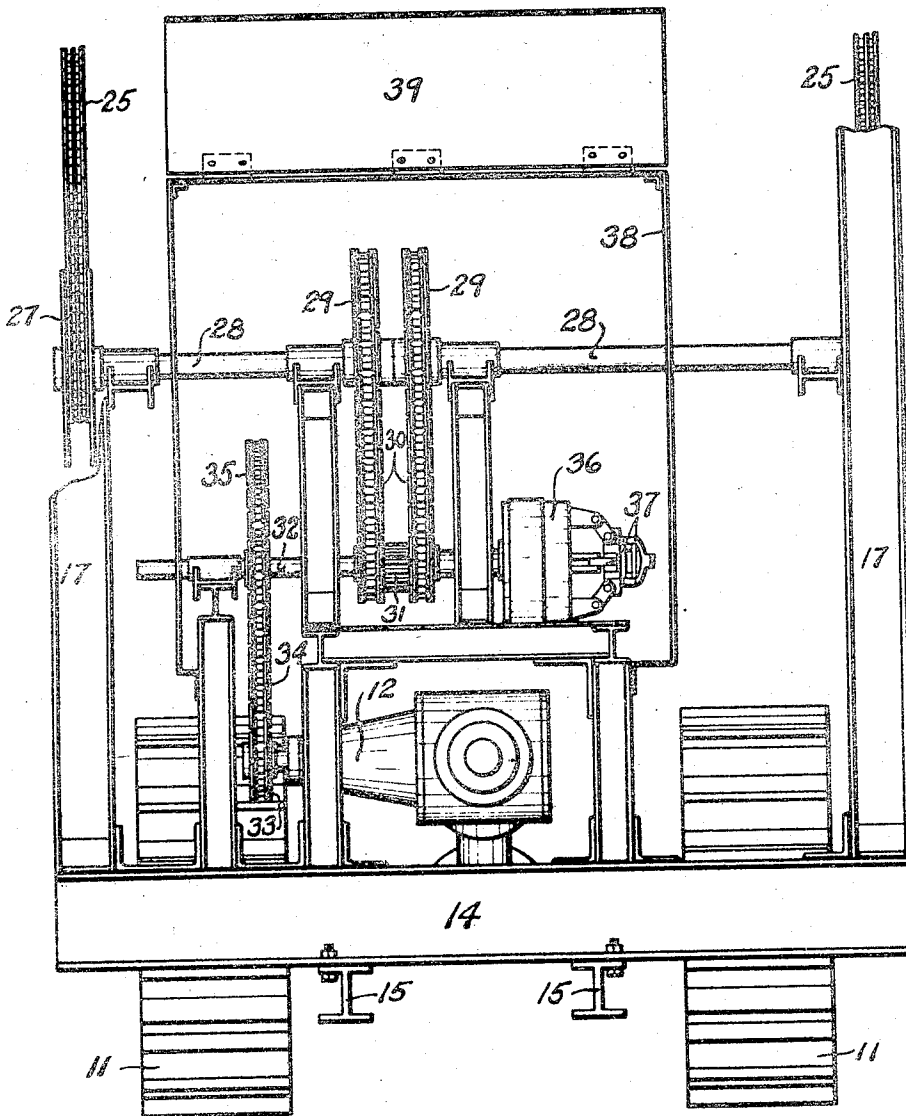


FIG. 5

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UNITED STATES PATENT OFFICE

2,239,288

MATERIAL HANDLING APPARATUS

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Application August 15, 1938, Serial No. 224,976

9 Claims. (Cl. 214-91)

This invention relates to material-handling apparatus and machines, and has as an object to provide an improved unitary, powered, assembly of elements operable to handle, elevate, load, grade, and transport normally loose material.

A further object of the invention is to provide an improved construction and operative relation of elements susceptible of convenient association with a conventional power unit, whereby the latter is equipped to gather, elevate, load, grade, and transport normally loose material.

A further object of the invention is to provide an improved, unitary combination and assembly of elements adapted for convenient removal and replacement relative to a tractor unit, whereby the latter is adapted to gather, elevate, load, transport and grade normally loose material such as beets, gravel, aggregate, and the like.

My invention consists in the construction, arrangement, and combination of elements hereinafter set forth, pointed out in my claims, and illustrated by the accompanying drawings, in which—

Figure 1 is a side elevation of a simplified embodiment of the improvement as operatively associated with a tractor unit, broken lines illustrating otherwise concealed construction. Figure 2 is a fragmentary, detail elevation of the forward portion of the arrangement shown in Figure 1 and illustrating an alternative, dumping position of certain movable elements of the assembly. Figure 3 is a fragmentary, detail elevation of a modified embodiment of the invention wherein certain of the movable elements shown in Figure 1 are illustrated at an opposite limit of their range of travel. Figure 4 is a front end elevation of the embodiment illustrated in Figure 1 with the movable elements of the assembly in the position shown in Figure 3. Figure 5 is a rear end elevation of the embodiment shown in Figure 1 and illustrating power drive means utilized in the invention, certain structural elements being broken away and others omitted for the sake of clarity and to illustrate otherwise concealed construction. Figure 6 is a fragmentary, detail section, on an enlarged scale, illustrating a construction of winding drum advantageously employed in the invention.

In the construction of the improvement as shown, a typical powered tractor unit is illustrated as comprising a suitable, rigid frame 10 supporting the usual prime mover, controls, and accessories, which frame member 10 is mounted for propulsion on suitable assemblies 11, in this instance of caterpillar type, operatively asso-

ciated in driven relation with the prime mover of the unit. The tractor unit is provided with a power take-off 12 permanently associated with and forming a part of said unit, as is common practice, which power take-off is illustrated in this instance in rearwardly-extending relation with said unit. The tractor unit illustrated and herein described is strictly conventional and but typical of various specific constructions of like units commonly available, and in itself forms no part of the instant invention, since any tractor unit having a power take-off and a rigid frame portion affording a suitable mounting for the unit assembly hereinafter described may be operatively associated with and arranged to serve as the powered mounting for adaptations of the novel assembly constituting the invention.

The invention proper comprises an assembly arranged for removable and replaceable association with the tractor unit and for driven relation of certain of its movable elements with the power unit of said tractor. As shown, the elements of the invention are grouped in a unitary assembly on and are carried by a rigid, substantially rectangular frame including a transverse forward member 13 adapted to be removably secured to and carried by the forward end of the tractor frame 10 in somewhat elevated relation above the lower treads of the propulsion assemblies 11, a transverse rear member 14 adapted to be removably secured to the rear portion of the tractor frame 10, as by means of rearwardly-extending bracket arms 15 fixed to or forming part of said tractor frame, and side members 16 engaging between and suitably interconnecting corresponding outer end portions of the members 13 and 14, said latter members extending transversely of the tractor unit and projecting therebeyond sufficiently to position the frame members 16 outside of their adjacent propulsion assemblies 11 and in substantial parallelism with the longitudinal axis of the tractor unit. Each of the frame members 16 supports a frame unit 17 fixed to and rising vertically from the rear portion of its mounting member 16, which frame units 17 are suitably interconnected transversely of the tractor unit and braced by means of rigid diagonal members 18 to the forward ends of their mounting members 16 to form a rigid frame structure rising from the members 16 above and in partially housing relation with the rear portion of the tractor unit. The assembly of elements 13, 14, 16, 17 and 18 thus constitutes a rigid skeleton frame removably and rigidly associated with the frame of

the tractor unit for transportation by the latter, and provides an operative mounting for the other elements of the invention as hereinafter described.

Each of the frame members 16 fixedly supports a pintle 19 projecting laterally therefrom and outwardly of the tractor unit on opposite sides of the latter, which pintles are operatively engaged by suitable journal bearings fixed to corresponding ends of a pair of yoke arms 20 thus mounted for actuation through vertical arcs on opposite sides of and in embracing relation with the tractor and frame assembly. The pintles 19 are positioned somewhat rearwardly of the transverse center plane of the tractor unit, and the yoke arms 20 have a length sufficient to extend from said pintles forwardly of and well beyond the forward end of the tractor unit, a suitably-braced frame 21 bridging between and rigidly interconnecting the forwardly-extending portions of the yoke arms 20 forwardly of the tractor unit and in position to clear said unit as the yoke arms are moved through their respective vertical arcs. The forward ends of the yoke arms 20 embrace and pivotally support a scoop body 22 disposed therebetween, said scoop body being formed with a closed bottom adapted to normally lie in substantially the same plane with the lower margins of the yoke arms 20, an open forward end, a rearwardly and upwardly inclined back wall adapted to bear against the upper margin of the frame 21 when the scoop bottom is substantially parallel with the yoke arms 20 and thereby limit rotation of said scoop body relative to its supporting yoke arms in one direction, and spaced, parallel plates fixedly engaging end margins of its bottom and back members to close end portions of the scoop body, said end closure plates preferably being interconnected by a rigid yoke 23 to stiffen and brace the scoop body. A sprocket wheel 24, or equivalent element, is mounted for free rotation on a spindle fixed to and projecting horizontally from each of the end closure plates of the scoop body 22 forwardly of and somewhat above the pivotal connection between said scoop body and the adjacent yoke arm 20, and a flexible sprocket chain 25, or equivalent member, is fixed at one end to an upper forward portion of each frame 17 and extends forwardly and downwardly therefrom to pass beneath and in operative engagement about the sprocket wheel 24 on the corresponding side of the scoop body 22 and is then carried upwardly and rearwardly from said sprocket wheel to pass over an idler pulley 26 rotatably mounted on the upper end of the frame 17 in alignment with its corresponding sprocket wheel 24, from whence the chain 25 passes downwardly between the frame unit 17 for connection of its other end with a winding drum 27 fixed to and rotatable transversely of and between the frame units 17. Identical arrangements of sprocket wheel 24, chains 25, pulleys 26, and winding drums 27 are provided on each side of the tractor unit and scoop body for simultaneous, synchronized actuation, so that rotation of the winding drums 27 serves to wind their corresponding chains 25 thereon to move the scoop body 22 and yoke arms 20 through vertical arcs upwardly and rearwardly of the tractor unit about the pintles 19 as centers. The two winding drums 27 may, of course, be fixed to opposite ends of a single shaft 28, but for convenience of adjustment and like practical considerations, said drums are illustrated in

fixed relation with opposite end portions of separate aligned shaft sections which cooperate to form the equivalent of a single, transverse shaft 28. The separate sections of the shaft 28 carry identical sprockets 29, each in fixed relation with their inner, adjacent ends, which sprockets are operatively connected by means of suitable chains 30 with a double sprocket unit 31 journaled on and rotatable relative to a jack shaft 32 suitably mounted for rotation in spaced, parallel relation with the shaft 28. The power takeoff 12 of the tractor unit is provided with a sprocket 33 in driving relation through a chain 34 and sprocket gear 35 with the shaft 32, so that when the power takeoff of the tractor unit is engaged for actuation, the shaft 32 is continuously driven thereby. The shaft 32 operatively engages with one portion of a clutch assembly 36 whereof the other portion is fixed in driving relation with the double sprocket 31, so that when the clutch assembly 36 is interengaged, rotation of said shaft 32 acts to simultaneously rotate the double sprocket 31 and thereby drive the shaft portions 28 for rotation of the winding drums 27, while disengagement of the clutch elements serves to free the double sprocket 31 from its driven relation with the shaft 32. The clutch 36 is arranged for selective actuation under the control of the tractor operator through suitable connections 37 disposed in any convenient manner adjacent the operator's position on the tractor. The shafts 28 and 32 are supported on and carried by suitably-disposed frame elements in fixed relation with the frame member 14 and frame units 17, so that the only connection between the actuating mechanism above described and the tractor unit itself is had through the sprocket chain 34, which latter may be readily disconnected to free the mechanism for removal from the tractor unit together with the frame elements of the removable and replaceable assembly. As a protection for the mechanism as well as for those using the apparatus, a suitable housing 38 formed with a hinged rear cover 39 is preferably positioned in enclosing relation with the driving mechanism in the manner indicated in Figure 5.

When the winding drums 27 are rotated to take up the chains 25, the scoop body 22 is caused to rotate relative to its yoke arms 20 until the scoop back engages the frame 21, whereafter said scoop body is caused to move upwardly and rearwardly of the tractor unit together with its yoke arms 20 about the pintles 19 until said yoke arms are substantially vertical, at which time the yoke arms engage with resilient buffer elements 40 fixed in forwardly-extending relation with the frame unit 17 in the path of said yoke arms to limit further rearward travel of said arms. When the yoke arms 20 have been moved to the rearward limit of their range of travel, the bottom of the scoop body 22 is substantially vertical and its back member is then inclined rearwardly and downwardly of the tractor unit, as is clearly shown in Figure 3, in which position the charge carried by the scoop body 22 may escape by gravity and be received within and for direction through a rearwardly and downwardly inclined discharge chute 41 carried by and between the upper ends of the frame units 17. To minimize escape of material from the scoop body during the latter portion of its rearward travel, and to protect the tractor operator, a suitable apron 42 extends forwardly and downwardly from the forward end of the chute 41 in closely adjacent re-

lation with the orbit of the scoop body rear margin, said apron 42 terminating forwardly of the tractor operator's position to permit an unobstructed forward view for said operator. The resilient buffers 40 serve a double purpose in that while limiting rearward travel of the yoke arms 20 they also act to initiate forward travel of said arms after the scoop body has discharged its contents and the clutch 36 is released to permit such forward travel or the drive through the power takeoff is reversed.

While a flexible cable may be substituted for the chain 25 in operative relation with a grooved pulley in place of a sprocket wheel 24, the sprocket chain is preferred because of the convenience of its association with a winding drum in a manner to facilitate lifting of the loaded scoop body when the yoke arms 20 present their maximum lever-arm length. This advantage results from the use of a winding drum having a hub or drum portion 43 of relatively small diameter fixed to its operating shaft 28 and engaged between relatively large diameter drum flanges 44 which are spaced apart a distance only sufficient to receive the width of the chain 25, so that when one end of said chain 25 is fixed to the drum hub 43, rotation of the drum assembly serves to spirally wind the chain about said hub and about itself between the flanges 44, in the manner clearly shown in Figure 6, so that the power is applied to the chain 25 through a relatively short lever arm at the time when the load to be lifted is the greatest, and the take-up speed acting on said chain is increased as the effective lever arm about which the load is moved is decreased.

To assist the tractor unit in supporting and transporting the auxiliary frame and scoop assembly above described, and to prevent undesirable longitudinal tilt of the tractor unit when the charged scoop body is initially lifted from its position forwardly of said tractor unit, suitable broad-tread wheels 45 are disposed forwardly of the tractor unit and adjacent the forward end of each longitudinal frame member 16, which wheels are mounted for free rotation on spindles 46 horizontally disposed transversely of the assembly in fixed relation between the forward end of a frame member 16 and a bracket 47 depending in fixed relation from the frame member 13. Tractors of caterpillar-tread type are characterized by a certain freedom of oscillation in their vertical longitudinal planes in response to varying load conditions, and the wheels 45 have a diameter and mounting such as to bring the treads of said wheels into frame-supporting ground engagement when the tractor unit is tilted forwardly in response to a loading imposed by a lowered or forward position of the scoop body, in which case lateral steering of the tractor unit is impractical because of the non-steerable mounting of the wheels 45, and the unit is then operatively limited to forward and rearward travel. However, when the scoop body is elevated to the position shown in Figures 3 and 4, the tractor unit is shifted to tilt said unit rearwardly and thus elevate the wheels 45 away from engagement with the ground, under which conditions lateral steering of the assembly is unhampered.

Since it may be desirable, at times, to discharge the scoop body contents forwardly of the tractor unit, means operable to such end are provided in the form of adjustable stops 48 carried by forward ends of the frame members 16 for selective positioning through suitable means

(not shown) in intersecting relation, at times, with the orbits of their adjacent yoke arms 20. The stops 48 are arranged to be extended oppositely and outwardly from the assembly after the yoke arms 20 have been elevated thereabove, whereafter said yoke arms are lowered to engage with and rest on the stops 48 and thereby permit forward tilt of the scoop body 22 relative to and about its pivotal mounting between the yoke arms 20 as the chain 25 is slackened, the unbalanced weight of the charged scoop body together with the disposition of the axes supporting the sprockets 24 relative to the pivotal mounting of the scoop body cooperating to permit such forward tilting of the scoop body for discharge of its contents under the control of the operator through the chain 25, in the manner clearly shown in Figure 2. After forward discharge of its contents, the scoop body may be returned to its normal position through take-up winding of the chain 25 to the extent necessary to reposition said scoop body against the frame 21, whereafter continued take-up of said chain acts to lift the yoke arms 20 away from the stops 48 which latter may then be retracted out of intersecting relation with the yoke arm orbits for return of the scoop body and yoke arms to loading position of said body.

The operative assembly thus far described provides a mobile unit of high practical utility adequate to the requirements of many conditions, since it provides means for charging the scoop body through forward travel of the assembly, for transporting the loaded scoop body, and for discharge of material from said scoop body whether forwardly or rearwardly of the assembly, the discharge chute 41 facilitating loading of such material in trucks or cars, when such is desired. However, the invention contemplates the use of additional elements and operative assemblies arranged to convey and grade material handled by the apparatus, and such additions are illustrated in Figure 3 as comprising a conveyer frame 49 hinged at its forward end to the frame units 17 in position to receive discharge from the chute 41 and extended rearwardly of the assembly in longitudinal alignment with the tractor unit. The conveyer frame 49 is thus mounted for altitudinal adjustment of its outer end through a vertical arc and suitable means, such as relatively-adjustable braces 50, are provided to secure and maintain said frame in its selectively-adjusted position. The conveyer frame 49 operatively supports two separate, vertically offset conveyer assemblies, the lower of said assemblies comprising a flexible web or belt 51 mounted on and to travel between roller elements 52 mounted transversely of and spaced apart longitudinally of the frame 49, and the upper of said assemblies comprising a slatted or slotted flexible conveyer unit 53 suitably mounted in operative association with roller elements carried by the frame 49 and extending rearwardly from and beyond the conveyer element 51. The conveyer assemblies are so disposed as to permit discharge from the elevated chute 41 to be first received on the slatted or slotted conveyer 53 which acts as a grader to retain only the material of a size which will not pass through the openings of said conveyer, while the finer material sifts through the conveyer 53 and is received upon and retained by the upper run of the conveyer web 51. Due to the difference in rearward extension of the conveyer assemblies, such assemblies may be simultaneously operated to deliver the larger or

coarser material at one point and the finer material at a different point, or, when desired, the upper conveyer alone may be operated for delivery of its retained material, while the finer material is accumulated on the lower conveyer web for subsequent delivery. Any suitable arrangement of means and connections may be provided for power actuation of the conveyer assemblies, such means being conventionally illustrated as comprising a drive chain 54 operatively connecting between the shaft 32 and a pinion 55 rotatively centered with the hinge mounting of the conveyer 49, and chains 56 and 57 respectively connecting said pinion 55 in driving relation with pinions operatively associated with the conveyers 51 and 53.

The elements included in the invention are all carried by and operatively associated with the horizontal, rectangular frame formed by the members 13, 14 and 16, which supporting frame is arranged for convenient removal and replacement relative to the tractor unit without alteration of or damage to the latter. When it is desired to free the tractor unit from the elements of the invention, the scoop body 22 is elevated to the position shown in Figure 3, the frame members 13 and 14 are disconnected from the tractor frame 10, the chain 34 disconnected from the power takeoff 12, and the frame member 13 released from its connection with the side member 16, said side members being first suitably blocked in position, whereupon the tractor unit may be driven forwardly away from the frame assembly and associated elements for such use as a tractor unit as may be desired. The apparatus constituting the invention may be combined with a tractor unit for seasonal work of a particular character and, upon completion of such work, may be detached from the tractor to permit use of the latter in other fields and for other operations to which it is primarily adapted. The invention is of particular advantage in the handling, loading, grading, and transporting of sugar beets, and, as will be readily apparent, is efficient in the excavating, handling, loading, grading, and transportation of earth, gravel, and like material.

Since many changes in the specific form, construction, and arrangement of the elements shown and described may be had without departing from the spirit of my invention, I wish to be understood as being limited solely by the scope of the appended claims, rather than by any details of the illustrative showing and foregoing description.

I claim as my invention—

1. Material-handling apparatus comprising, in operative combination, a powered tractor unit, a rigid independent frame removably associated with and for unitary selective attachment to and separation from said tractor unit, a scoop member hinged to said frame assembly in leading relation with said tractor unit for actuation between horizontal and vertical positions, a grading conveyer assembly carried by said frame assembly in trailing relation with said tractor unit, and selectively-engageable actuating connections between the power unit of said tractor and said scoop and conveyer assembly.

2. Material-handling apparatus for operative combination with a powered tractor unit, comprising, in a unitary assembly, a rigid frame adapted for selective removable association with the tractor unit, a yoke hinged to lower portions of said frame in embracing and forwardly-ex-

tending relation therewith for actuation through a vertical arc, a scoop on the forward end of said yoke, a grading conveyer assembly carried by said frame in oppositely-extending alignment with said yoke, means carried by said frame operable to actuate said yoke and conveyer assembly, and connections operatively between said latter means and the power unit of the tractor.

3. Material-handling apparatus for operative combination with a powered tractor unit, comprising, in an unitary assembly, a rigid, horizontal frame adapted to removably embrace and be secured to the frame of the tractor, a yoke hinged to said removable frame in forwardly-extending relation therewith for actuation through a vertical arc, a scoop on the forward end of said yoke, a supplementary frame rising from and in fixed relation above rear portions of said horizontal frame, winding drums operatively carried by said supplementary frame, flexible connections operatively between said winding drums and said scoop operable to actuate said yoke about its hinge mounting when said drums are rotated, a grading conveyer assembly carried by said frame in oppositely-extending alignment with said yoke, and connections operatively between the power unit of the tractor and said winding drums and conveyer assembly.

4. Material-handling apparatus for operative combination with a powered tractor unit, comprising, in a unitary assembly, spaced, parallel, frame members arranged for removable mounting transversely of forward and rear ends of the tractor frame, spaced, parallel frame members rigidly interconnecting corresponding ends of said first frame members longitudinally and on opposite sides of the tractor unit, a yoke hinged to said longitudinal frame members in forwardly-extending, embracing relation with the tractor unit for actuation through a vertical arc, a scoop carried by the forward end of said yoke, a supplementary frame fixed to and rising from rear portions of said longitudinal frame members, winding drums mounted for rotation in said supplementary frame, flexible connections operatively between said winding drums and scoop arranged to actuate said yoke about its hinge mounting when said drums are rotated, connections between the power unit of the tractor and said winding drums for the selective power rotation of the latter, and a gravity chute fixed in rearwardly and downwardly inclined relation with the upper end of said supplementary frame to receive discharge from said scoop when the latter is elevated through actuation of the winding drums.

5. Material-handling apparatus for operative combination with a powered tractor unit, comprising, in a unitary assembly, spaced, parallel, frame members arranged for removable mounting transversely of forward and rear ends of the tractor frame, spaced, parallel frame members rigidly interconnecting corresponding ends of said first frame members longitudinally and on opposite sides of the tractor unit, ground-engageable wheel assemblies rotatably mounted adjacent forward ends of said longitudinal frame members to limit downward oscillation of the forward portion of the tractor and frame assembly, a yoke hinged to said longitudinal frame members in forwardly-extending embracing relation with the tractor unit for actuation through a vertical arc, a scoop carried by the forward end of said yoke, a supplementary frame fixed to

and rising from rear portions of said longitudinal frame members, winding drums mounted for rotation in said supplementary frame, flexible connections operatively between said winding drums and scoop arranged to actuate said yoke about its hinge mounting when said drums are rotated, connections between the power unit of the tractor and said winding drums for the selective power rotation of the latter, and a gravity chute fixed in rearwardly and downwardly inclined relation with the upper end of said supplementary frame to receive discharge from said scoop when the latter is elevated through actuation of the winding drums.

6. Material-handling apparatus for operative combination with a powered tractor unit, comprising, in an unitary assembly, a rigid, horizontally-disposed frame arranged to embrace and be removably secured to the tractor unit, ground-engageable wheel means rotatably associated with the forward end of said frame to limit downward oscillation thereof, a yoke hinged to side members of said frame for actuation through an arc between substantially horizontal and vertical positions, a scoop carried by the free end of said yoke in normally leading relation with said tractor, selectively-engageable means connecting between said scoop and the power unit of said tractor for actuation of said yoke about its hinge mounting, a gravity chute fixed in elevated relation with rear portions of said frame and positioned to receive and rearwardly direct discharge from said scoop when said yoke is in substantially vertical position, a grading conveyer assembly mounted in trailing relation with said frame in position to receive the discharge from said chute, and actuating connections between said conveyer assembly and the power unit of the tractor.

7. In apparatus of the character described having a frame assembly adapted for removable association with a tractor unit, a yoke hinged for actuation through a vertical arc to and in embracing, forwardly-extending relation with said frame, a forwardly-opening scoop pivotally mounted for relative oscillation through vertical arcs on the forward end of said yoke, means for limiting relative rearward oscillation of said scoop, winding drums rotatably carried by said frame in selectively-driven relation with the power unit of the tractor, and flexible connections operatively engaging between said winding drums and portions of said scoop offset above and in advance of the pivotal axis of said scoop, whereby take-up of said connections through rotation of their associated winding drums acts to maintain said scoop at the rearward limit of its relative oscillation and to simultaneously actuate said yoke about its hinge mounting.

8. In apparatus of the character described

having a rigid frame in removable association with a powered tractor unit, a yoke hinged for actuation through a vertical arc in embracing, forwardly-extending relation with said frame, and a scoop pivotally mounted for relative oscillation through vertical arcs on the forward end of said yoke, selectively-operable means for discharging said scoop forwardly of the assembly, said means comprising winding drums rotatably associated with said frame in selectively-driven relation with the power unit of the tractor, flexible connections operatively engaging between said winding drums and points on said scoop above and in advance of said scoop mounting axis, means for limiting rearward oscillation of said scoop relative to its mounting yoke, and stop elements on and selectively-adjustable laterally of the forward portion of said frame into and out of intersecting relation with the operative orbit of said yoke, whereby take-up of said flexible connections through rotation of said winding drums acts to hold said scoop at the rearward limit of its range of oscillation and to simultaneously elevate the scoop end of said yoke relative to said frame and past the retracted stop elements, while reverse rotation of said winding drums acts to engage said yoke against the projected stop elements for subsequent forward, discharging oscillation of said scoop about its mounting axis.

9. In apparatus of the character described having a rigid frame formed with horizontal and vertical components removably associated with a powered tractor unit and a scoop yoke-mounted on the horizontal frame component for actuation through a vertical arc in embracing, forwardly-extending relation with the assembly, means interconnecting said scoop and the power unit of the tractor for power-actuation of the former about its hinge mounting, said means comprising shaft elements journaled transversely of the vertical frame component, selectively-engageable means operatively connecting said shaft elements in simultaneously-driven relation with the power unit of the tractor, winding drums fixed to said shaft elements, an idler wheel rotatably carried by the vertical frame component in operative alignment and spaced elevation with each winding drum, a second idler wheel rotatably carried by a side margin of said scoop in operative alignment with each winding drum, and a flexible connection fixed at one end to the vertical frame component and extending forwardly therefrom to operative engagement about the idler wheel of the scoop, and thence rearwardly about the idler wheel of the vertical frame component to connection of its other end with the corresponding winding drum.

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