

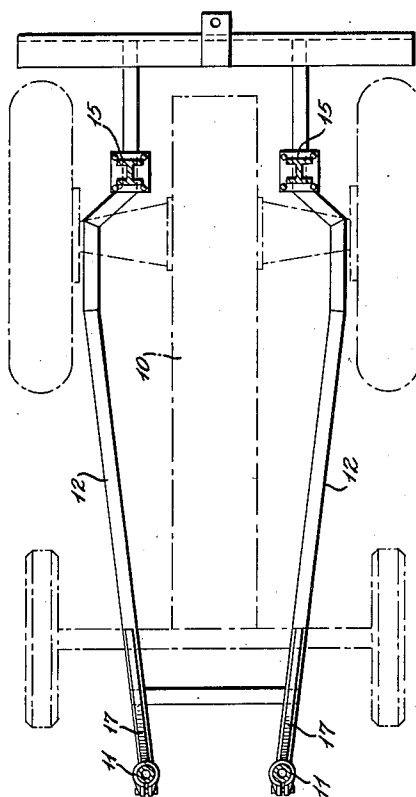
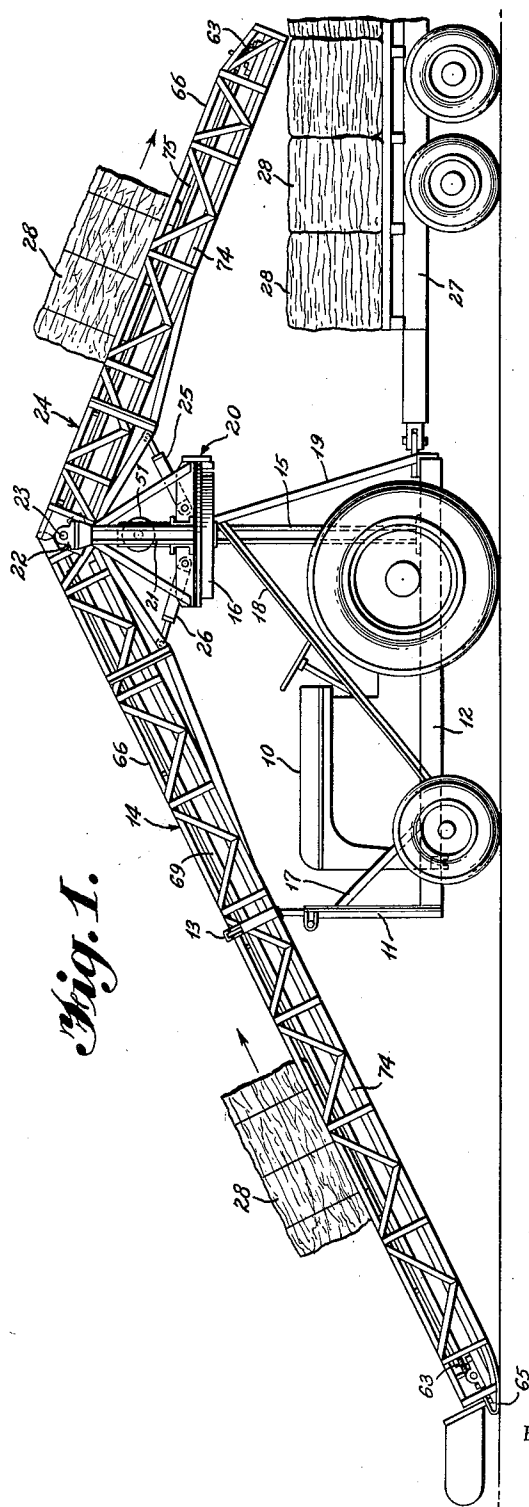
Jan. 22, 1957

E. C. LUNDAHL  
APPARATUS FOR STACKING

2,778,477

Filed Feb. 2, 1955

7 Sheets-Sheet 1



INVENTOR  
*Ezra C. Lundahl*

BY *Stevens, Davis, Miller & Mosher*  
ATTORNEYS

E. C. LUNDAHL

## APPARATUS FOR STACKING

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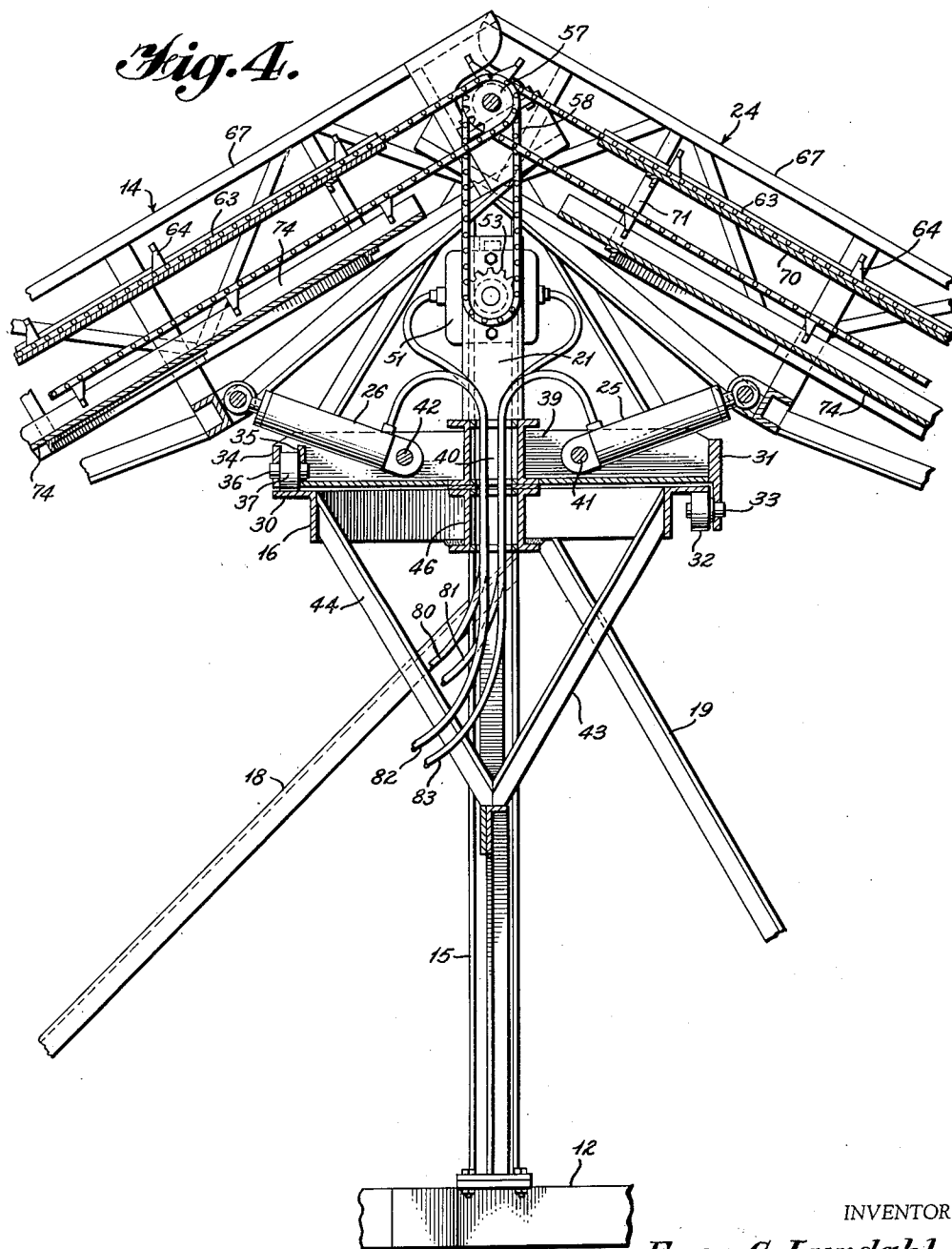
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INVENTOR

*Ezra C. Lundahl*

BY *Stevens, Davis, Miller & Mosher*

ATTORNEYS

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*Fig. 6.*

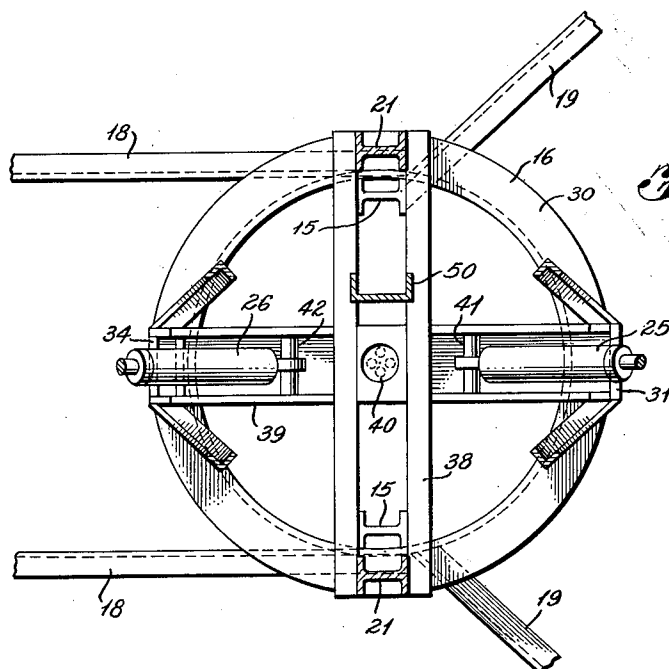
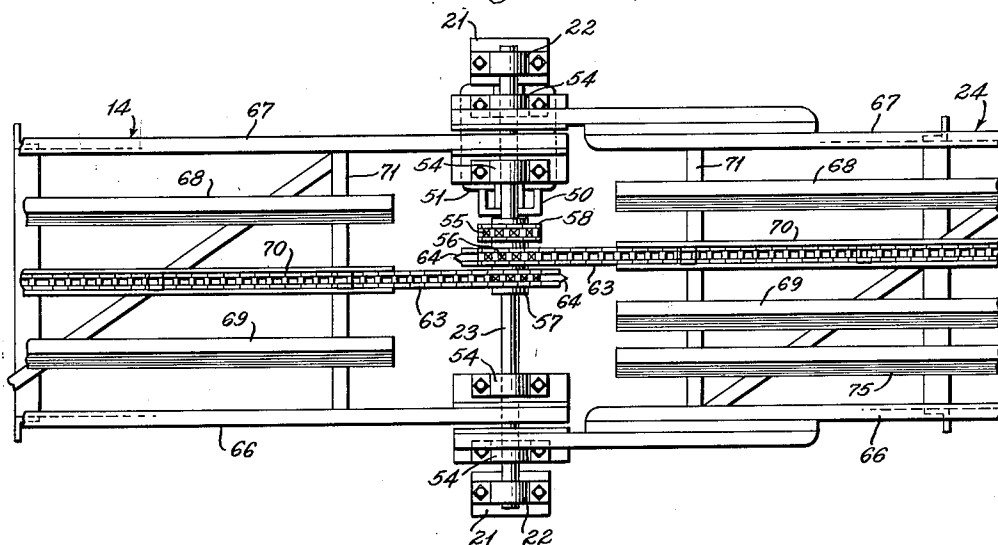


*Fig. 5.*

INVENTOR

*Ezra C. Lundahl*

BY *Stevens, Davis, Miller & Mosher*  
ATTORNEYS

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*Fig. 7.*

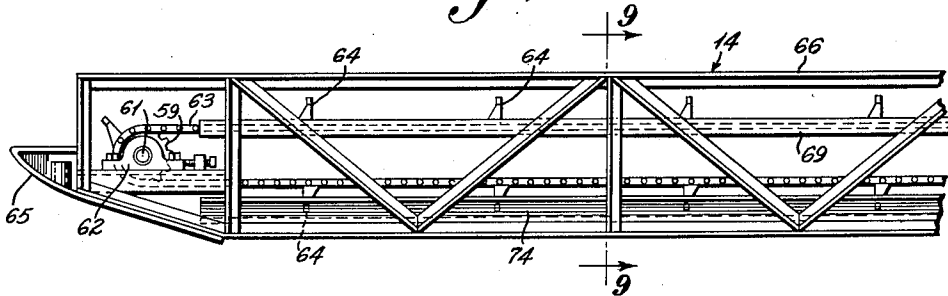


*Fig. 8.*

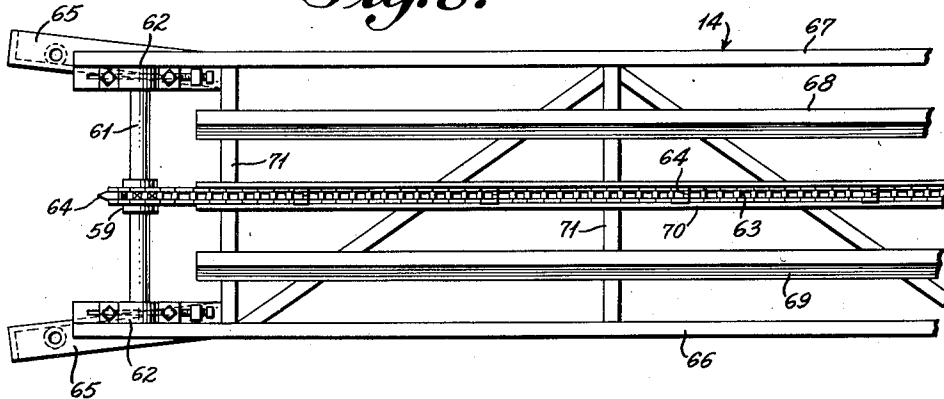
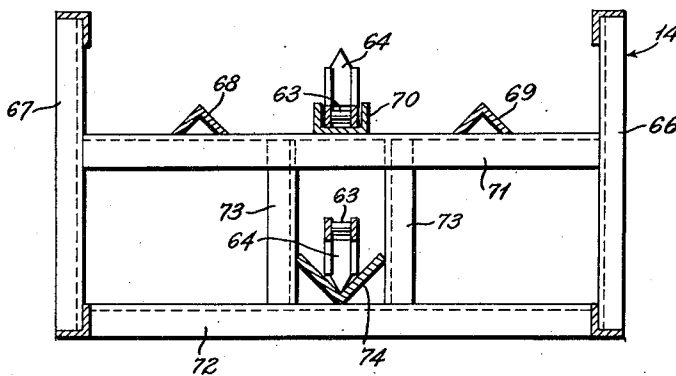


*Fig. 9.*



INVENTOR

*Ezra C. Lundahl*

BY *Stevens, Davis, Miller & Mosher*  
ATTORNEYS

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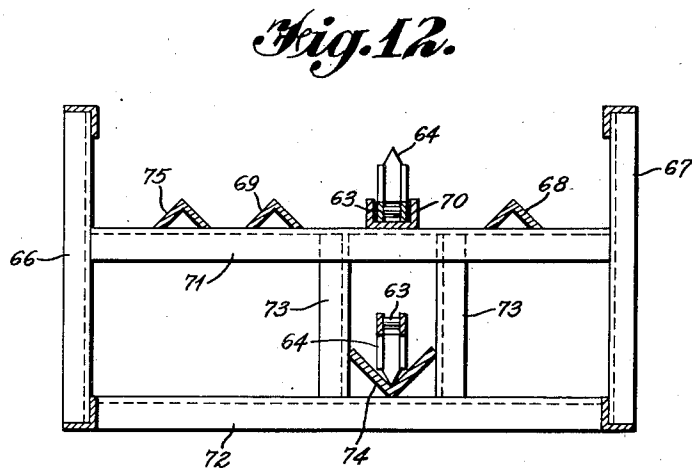
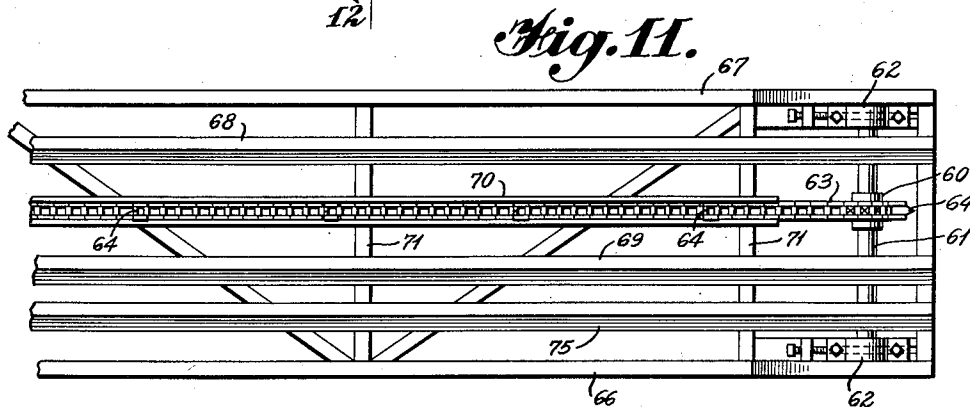
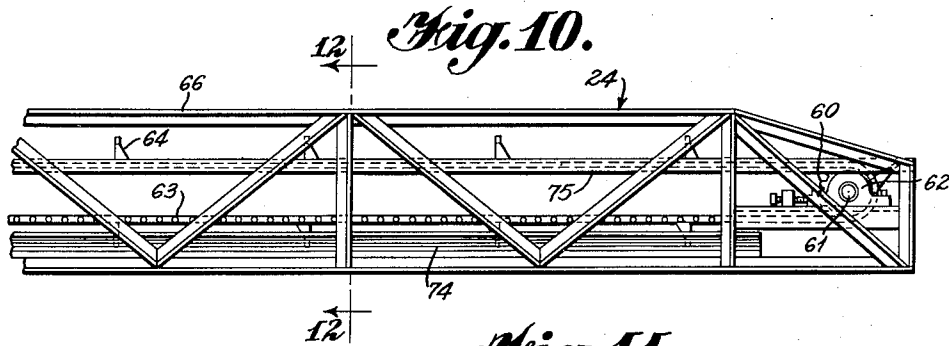
E. C. LUNDAHL

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INVENTOR

*Ezra C. Lundahl*

BY *Stevens, Davis, Miller & Mosher*

ATTORNEYS

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*Fig. 13.*

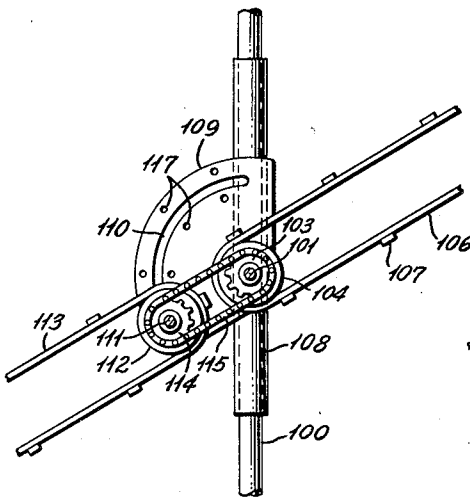


*Fig. 14.*

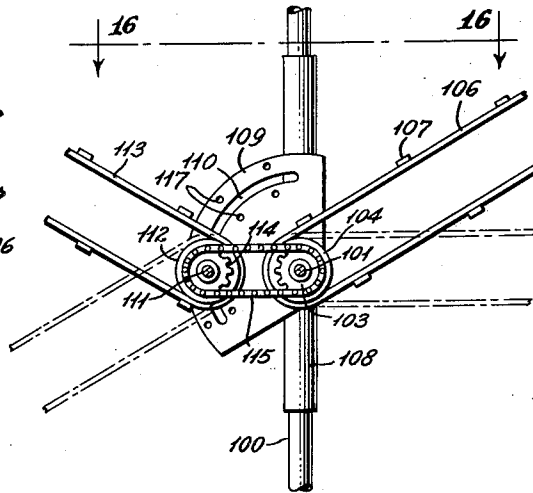


*Fig. 15.*

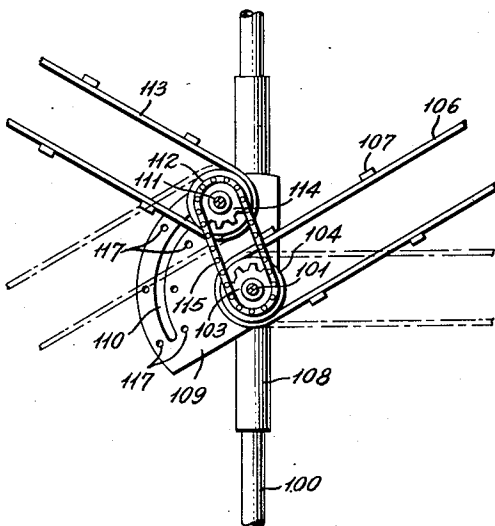
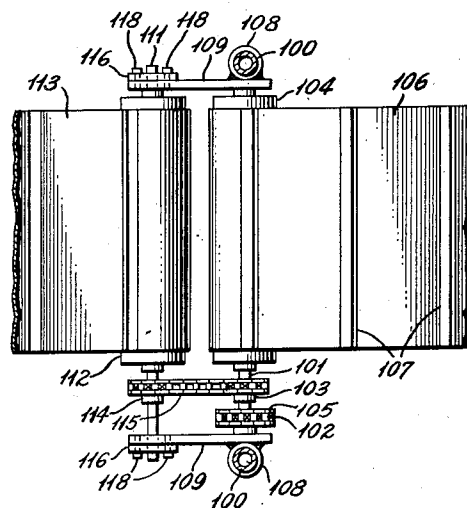


*Fig. 16.*



INVENTOR

*Ezra C. Lundahl*

BY *Stevens, Davis, Miller & Mosher*  
ATTORNEYS

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## APPARATUS FOR STACKING

Ezra C. Lundahl, Logan, Utah

Application February 2, 1955, Serial No. 485,660

8 Claims. (Cl. 198—91)

This invention relates to a powered stacker and is more particularly concerned with a machine or apparatus for stacking or loading baled hay, sacks of grain, or other commodities whether boxed, packaged, baled or sacked that can be conveyed without injury to the items being handled. Further, this invention relates to an apparatus for conveying loose material such as grain, gravel, sand etc.

The principal object of the present invention is to provide apparatus of the character above referred to which is adapted to load or stack bales of hay, packaged, boxed or sacked material as well as loose material such as grain, gravel, sand, etc. quickly and expeditiously.

It is a further object of the present invention to provide stacking and loading apparatus specially designed to adjust the level or height to which the articles or materials being stacked may be brought and further to adjust the angular relationship of the stacking apparatus to the vehicle or other means mounting same as well as to adjust the apparatus both angularly and in elevation to the stack or pile upon which the articles or materials are being loaded.

It is a still further object of the present invention to provide apparatus of the type described which will be characterized by a simpler and more durable construction than devices heretofore advanced for this purpose.

It is another and further object of the present invention to provide an apparatus mounted on a tractive vehicle capable, as in handling hay, of being driven through a field and automatically and mechanically pick up previously prepared bales of hay off the ground and convey them to a load wagon or truck. In this operation the apparatus of the present invention will by virtue of its adjustable features deliver the bales of hay to the load wagon or truck at any height desired, thereby eliminating completely any manual handling of the bales of hay while loading same from the field onto a load wagon or truck.

As a further object of the present invention, to provide a loading and stacking apparatus characterized by a pair of aligned conveyor and elevator arms rotatably and independently pivotally mounted adapted to function interchangeably as a load pick up arm and a load delivering arm whereby the apparatus can be used, for example first to pick up bales of hay and load them on a wagon and thereafter by elevating the pick up arm to a position over a hay stack and reversing the power drive to the arms, interchange the function of the arms whereupon the original pick up arm now becomes the load delivering arm feeding the bales to the stack whereas the original load delivering arm now becomes the pick-up arm to pick up bales from the wagon for feeding to the stack.

In the arrangement of the apparatus the arms are rotatably mounted as previously mentioned to rotate through an arc of at least 365°. Hence, this feature of the invention enables the horizontal positioning of the ends of the arms at any desired load pick up and load de-

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livering points thereby avoiding to the fullest possible extent unnecessary lifting, carrying or moving of the bales of hay or other commodity or material being handled.

In addition to the above the apparatus when arranged with belt type conveyors is provided with means for adjusting the adjacent ends of the arms in an over or under relationship to be more fully described hereinafter in order to smooth out the transfer of the material or items from one arm to the other regardless of the relative angular positions of the arms.

Other and further objects of the invention will become more fully apparent from a detailed consideration of the following description when taken in conjunction with the drawings in which:

Figure 1 is a view in side elevation showing the apparatus of the present invention being utilized to stack bales of hay;

Figure 2 is a view in plan of the chassis of the vehicle illustrated in Figure 1;

Figure 3 is a view in elevation partly broken away illustrating the standard arrangement and driving arrangement for the apparatus;

Figure 4 is a view in section of Figure 3 taken along line 4—4;

Figure 5 is a view in section taken along line 5—5 of Figure 3;

Figure 6 is a view in plan of the elevator arms of the apparatus showing the driving connection;

Figure 7 is a view in elevation of one end of one of the elevator arms;

Figure 8 is a view in plan of the arm shown in Figure 7;

Figure 9 is a view in section taken along line 9—9 of Figure 7;

Figure 10 is a view in elevation of the other arm;

Figure 11 is a view in plan of the arm illustrated in Figure 10;

Figure 12 is a view in section taken along line 12—12 of Figure 10;

Figures 13, 14 and 15 are diagrammatic views illustrating the modification of the adjacent ends of the arms when using belt type conveyors and some of the various relative positions the arms may assume; and

Figure 16 is a view in section taken along line 16—16 of Figure 14.

Referring now to Figure 1, the preferred form of the apparatus of the present invention is therein illustrated. As will be noted, the apparatus consists essentially of a wheeled vehicle 10 of the tractor type on which is mounted at the forward end thereof upright standards 11 having their lower ends connected to the frame 12 of the vehicle 10. Two such standards 11 are provided spaced apart and connected at their upper ends by means of a yoke 13 suitably dimensioned to receive an arm generally designated as 14 when the arm is in its lowest position at which time its free end is contacting the ground. To the rear of the vehicle 10, standards 15 are attached at their lower ends to the frame 12. Two such standards 15 are provided, one joined to each side of the frame 12. A turntable 16 of annular design is fixed to the top of the standards 15. As a means to brace the standards 11 and 15, struts 17, 18 and 19 are arranged in a conventional manner. Located on the top of the turntable 16 is a top assembly generally designated as 20 in Figure 1. Standards 21 are mounted on opposite sides of the assembly 20 with the lower ends of the standards 21 being fixed thereto. Bearings 22 are attached to the top of each standard 21 for the purpose of receiving a shaft 23. The forward arm 14 and rear arm 24 are each pivotally mounted on the shaft 23. Hydraulic cylinders 25 and 26 are connected between the arm 24 and assembly 20 and the arm 14 and assembly 20, respectively, by pivot

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pins and serve as a means whereby the arms 14 and 24 may be raised or lowered being pivoted about the shaft 23. Each of the arms 14 and 24 are provided with a conveyor, which conveyors are driven in common by means which will be more fully explained hereinafter.

In the operation of the apparatus as illustrated in Figure 1, a commodity, as for example baled hay, is being transferred from a point to the left of arm 14 onto a truck 27 hitched to the rear of the vehicle 10. As will be evident from Figure 1, bales of hay 28 are caused to ride up the arm 14 and down the arm 24 to be loaded onto the truck 27.

Referring now to Figures 3, 4 and 5, the description of the turntable and rotary mount for the arms 14 and 24 will now be described. As shown in this figure, the turntable 16 is undercut to define a horizontally extending peripheral flange 30. The assembly 20 is composed of two intersecting cross frames 38 and 39, each consisting of horizontal spaced bars whereby in the intersection of the two cross frames is defined an area which is unobstructed. This area or space is designated by the numeral 40. The cylinders 25 and 26 are fixed intermediate the ends of the cross frame 39 by means of pins 41 and 42, respectively, each of which is fixed between the two plates of the cross frame. The end of each cylinder is mounted by its respective pin in a manner to freely pivot relative thereto. The pistons of cylinder assemblies 25 and 26 are pivotally connected to the arms 14 and 24 by pins as previously mentioned. To one end of cross frame 39 is connected a roller assembly which is adapted to ride on the under surface of the flange 30. The roller assembly is comprised of a plate 31 which is fixed to one edge of the bars of cross frame 39 normally thereto to depend downwardly. A roller 32 mounted for free rotation on a spindle shaft 33 is arranged in contact with the under surface of flange 30 with the shaft 33 being fixed in the plate 31. At a point opposite from this roller assembly is provided an upper roller assembly comprised of two plates 34 and 35 fixed on edge to the other ends of the bars of cross frame 39 and spaced horizontally apart. A stubbed shaft 36 is fixed in the two plates 34 and 35 and a roller 37 is journaled on the stubbed shaft 36 in a manner for free rotation. The turntable 16, as previously mentioned, is fixed to the top of standards 15. To assist in making this mounting more durable, struts 43 and 44 are provided joined between the standards 15 and the turntable 16. In alignment with the space 40 defined by the assembly 20 and directly beneath there is located a guide hub 46 of annular design. This hub 46 is supported from assembly 20 by any suitable means for example by welding as will be evident from Figure 4.

On top of the assembly 20 is mounted a frame 50, one leg of which is joined to one of the standards 21. Within this frame 50 is mounted a hydraulic motor 51. The output shaft 52 of the hydraulic motor 51 has mounted on its end a sprocket wheel 53. The shaft 23 as previously mentioned is mounted in bearings 22 at the top of the standards 21. Mounted on the shaft 23 in suitable bearings to be freely pivotal relative thereto are the arms 24 and 14. Each of these arms comprise a truss-like structure characterized by a lattice framework defining a bottom and two sides. It is the side members of each of these arms that are pivotally mounted on the shaft 23. The bearings which function in this pivotal connection of the arms are identified in Figure 3 by the numeral 54. Also mounted on the shaft 23 are three sprocket wheels 55, 56 and 57. These sprocket wheels are fixed or keyed to the shaft 23 whereby rotation of the sprocket wheel 55 will result in rotation of the shaft 23 and hence rotation of wheels 56 and 57. Sprocket wheel 55 is mechanically connected to the sprocket wheel 53 mounted on the end of the drive shaft of the hydraulic motor 51 by means of an endless chain 58. Thus, it is evident that operation of the motor 51

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through this mechanical connection will result in rotation of shaft 23.

At the ends of arms 14 and 24 remote from the pivotal mount on shaft 23 are mounted sprocket wheels 59 and 60 respectively. Considering the case of arm 14 first, the sprocket 59 is fixed to a shaft 61 which is bearing supported in each of the two side members of the arm 14 in pillow blocks 62. The sprocket 59 is mechanically connected with the sprocket 57 by means of an endless chain 63. The chain 63 is characterized by a series of spaced teeth 64. The bottom part of the arm 14 is constituted in part by longitudinal rail elements 68 and 69 which define a runway upon which bales of hay, for example, may slide when being transported the length of arm 14 through the operation of the endless chain 63 and teeth 64. The return for the endless chain 63 is underneath the runway. The end of the arm 14 is provided with shoes 65 which function as contact members with the ground.

In Figure 9 is shown a cross section of the arm 14. As will be noted, the construction of arm 14 includes lattice framework side members 66 and 67 with rails 68 and 69 and especially designed rail 70 defining the runway. The rails 68 and 69 are of inverted V design whereas the rail 70 is substantially U-shaped in cross section to function as a guide for the endless chain 63 and teeth 64. The several rails extend the length of the arm 14 and are supported at spaced intervals by cross bars 71 connected between the side members 66 and 67. Also provided at spaced intervals along the length of the arm 14 are cross bars 72 connecting the bottoms of the side members 66 and 67. To function as a guide for the return of the endless chain 63 upright bars 73 are connected between the cross bars 71 and the cross bars 72 horizontally spaced apart defining therebetween an unobstructed path for the return of the endless chain 63. To prevent the chain 63 and teeth 64 from sagging during the return run, a V-shaped channel is defined by means of rail 74 extending substantially the length of the arm 14 in the passageway defined between the bars 73.

The structure of arm 24 is substantially similar to arm 14 with the exception that an additional inverted V design of rail 75 is provided as part of the runway and in place of shoes 65 the end of arm 24 is square cut to facilitate discharge of the articles being handled as for example bales of hay. In all other respects, the design of arm 24 is like arm 14 and accordingly, the same reference numerals have been applied to Figures 10 to 12 as were applied to Figures 7 to 9 to denote the common parts.

The power necessary to operate the motor 51 and the hydraulic piston and cylinders 25 and 26 is derived from the vehicle 10 or alternatively, from a source of power located adjacent to this apparatus. The motor 51, as well as the piston and cylinder assembly 25 and 26, being of the hydraulic type, it is necessary to bring hydraulic lines from the source of power to these elements. This is accomplished by means of lines 80, 81, 82 and 83. These lines are connected to a suitable source of power, as for example, the hydraulic take-off of the vehicle 10 and the lines are brought through the turntable assembly through the hub 46 and central opening 40. The line 82 connects with the piston and cylinder assembly 26, the line 83 connects with the piston and cylinder assembly 25 and the lines 80 and 81 connect with the hydraulic motor 51. By bringing the hydraulic lines through hub 46 and opening 40 and thus in effect along the axis of the turntable assembly, operation of the apparatus, including rotating the arms 14 and 24 about the axis of the turntable assembly will not materially interfere with the operation of the hydraulic circuit. In actual operation of this apparatus, a complete rotation of 360° of the arms 14 and 24 will not effect a material twisting of the hydraulic lines 80 to 83 inclusive. It is true that there will be some twisting of these lines, if care is not taken to control the rotation of the arms and they are

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rotated completely five or six times. In normal use of the apparatus, however, the degree of twisting has shown to be negligible and thus in all ordinary and careful circumstances of use twisting of the lines can be ignored.

An alternative arrangement for the adjacent ends of arms 14 and 24 is schematically illustrated in Figures 13 to 16 inclusive. This arrangement is particularly beneficial when the conveyors of the arms are in the form of endless belts. As shown, standards 100, attached at their lower ends to top assembly 20 (see Figure 1) are arranged in vertical fashion similarly to standards 21. Journalled into the standards 100 is a horizontal shaft 101 upon which is fixed a main sprocket 102, a belt sprocket 103, and a belt roller 104. Main sprocket 102 is mechanically connected by means of an endless chain 105 to the drive sprocket 53 of the motor 52 (see Figure 3). Carried on roller 104 is one end of endless belt 106 constituting the conveying means for one of the arms 14 and 24. Belt 106, as will be evident, is characterized by a series of transversely extending ribs 107. Received on standards 100 are sleeves 108 which serve as the supporting means for plates 109 which are welded thereon. Each plate 109 is cut with an arcuate slot 110 having a center located on the axis of shaft 101. Thus all points of slots 110 will be equidistant from shaft 101.

Slidably received in the slots 110 of plates 109 are the ends of a shaft 111. Upon shaft 111 is fixed a roller 112, carrying one end of endless belt 113 constituting the conveying means for the other of the arms 14 and 24, and a belt sprocket 114 mechanically connected to belt sprocket 103 by endless chain 115. Additionally a plate 116 is fixed to each end of shaft 111 adjacent to plates 109. Each plate 109 defines pairs of holes 117 on opposite sides of slot 110. Each plate 116 likewise defines a pair of holes which are bored in positions to align with any selected pair of holes 117 of plate 109. Accordingly the shafts 101 and 111 may be relatively positioned as shown in Figures 13, 14 and 15 and retained in such relative positions by pins or bolts 118 (see Figure 16). In the arrangement above described the arms 14 and 24 in place of being pivotally mounted on a common shaft, will be pivotally mounted one each on the shafts 101 and 111.

Although the present invention has been shown and described with reference to particular embodiments, nevertheless, various changes and modifications obvious to one skilled in the art are within the spirit, scope and contemplation of the invention.

What is claimed is:

1. A portable loading conveyor apparatus for transferring bales of hay and like articles from one location to another comprising a vehicle, a substantially vertically extending support mounted on said vehicle, a first member fixed on said support, a second member rotatably engaged with and supported by said first member, shaft means supported by said second member, a pair of conveyor supporting arms arranged in end to end relation pivotally mounted at their adjacent ends on said shaft means, endless conveyor means extending around said arms, drive means mounted on said second member operatively connected to move said conveyor means around said arms, elevating means operatively connecting each of said arms with said second member for pivoting each of said arms with respect to said second member so that said arms can be independently pivoted to different angular positions respecting the vertical to facilitate transfer of articles from one elevation to another, and means to supply power from the vehicle to said elevating means and said drive means through said first member and said second member to enable substantially free rotation of said second member through an arc of at least 360°.

2. A portable loading conveyor apparatus as recited in claim 1, wherein said means to supply power passes through said first member and said second member along the axis of rotation of said second member.

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3. A portable loading conveyor apparatus as recited in claim 1, wherein said first member functions as a turntable and includes a peripheral flange and said second member includes roller means riding on said flange to guide said second member during rotation thereof.

4. A portable loading conveyor apparatus as recited in claim 1, wherein positioning means are provided to enable one of the adjacent ends of said arms to be relatively positioned with respect to the other, whereby the adjacent ends of said arms can be positioned vertically offset.

5. A portable loading conveyor apparatus as recited in claim 4, wherein said positioning means includes a pair of plates defining arcuate slots with one of the adjacent ends of said arms slidably received in said slots.

6. A portable loading conveyor apparatus for transferring bales of hay and like articles from one location to another comprising a vehicle, a substantially vertically extending support mounted on said vehicle, a first member fixed on said support, a second member rotatably engaged with and supported by said first member, shaft means supported by said second member, a pair of conveyor supporting arms arranged in end to end relation pivotally mounted at their adjacent ends on said shaft means, endless conveyor means extending around said arms, a hydraulic motor mounted on said second member operatively connected to move said conveyor means around said arms, hydraulic piston and cylinder assemblies operatively connecting each of said arms with said second member for pivoting each of said arms with respect to said second member so that said arms can be independently pivoted to different angular positions respecting the vertical to facilitate transfer of articles from one elevation to another, and hydraulic lines to supply power from the vehicle to said hydraulic piston and cylinder assemblies and said hydraulic motor passing through said first member and said second member to enable substantially free rotation of said second member through an arc of at least 360°.

7. A portable loading conveyor apparatus for transferring bales of hay and like articles from one location to another comprising a vehicle, a substantially vertically extending support mounted on said vehicle, a first member fixed on said support, a second member rotatably engaged with and supported by said first member, a shaft bearing supported in said second member, a pair of conveyor supporting arms arranged in end to end relation, each pivotally mounted at their adjacent ends on said shaft, endless conveyor means extending around said arms operatively connected to be driven by said shaft, drive means mounted on said second member operatively connected to drive said shaft and thus move said conveyor means around said arms, elevating means operatively connecting each of said arms with said second member for pivoting each of said arms with respect to said second member so that said arms can be independently pivoted to different angular positions respecting the vertical to facilitate transfer of articles from one elevation to another, and means to supply power from the vehicle to said elevating means and said drive means through said first member and said second member to enable substantially free rotation of said second member through an arc of at least 360°.

8. A portable loading conveyor apparatus for transferring bales of hay and like articles from one location to another comprising a vehicle, a substantially vertically extending support mounted on said vehicle, a first member fixed on said support, a second member rotatably engaged with and supported by said first member, a shaft bearing supported in said second member, a pair of conveyor supporting arms arranged in end to end relation, each pivotally mounted at their adjacent ends on said shaft, endless conveyor means extending around said arms and operatively connected to be driven by said shaft, a hydraulic motor mounted on said second member opera-

tively connected to drive said shaft and thus move said conveyor means around said arms, hydraulic piston and cylinder assemblies operatively connecting each of said arms with said second member for pivoting each of said arms with respect to said second member so that said arms can be independently pivoted to different angular positions respecting the vertical to facilitate transfer of articles from one elevation to another, and hydraulic lines to supply power from the vehicle to said hydraulic piston and cylinder assemblies and said hydraulic motor passing through said first member and said second member to enable substantially free rotation of said second member through an arc of at least 360°.

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