

Aug. 8, 1961

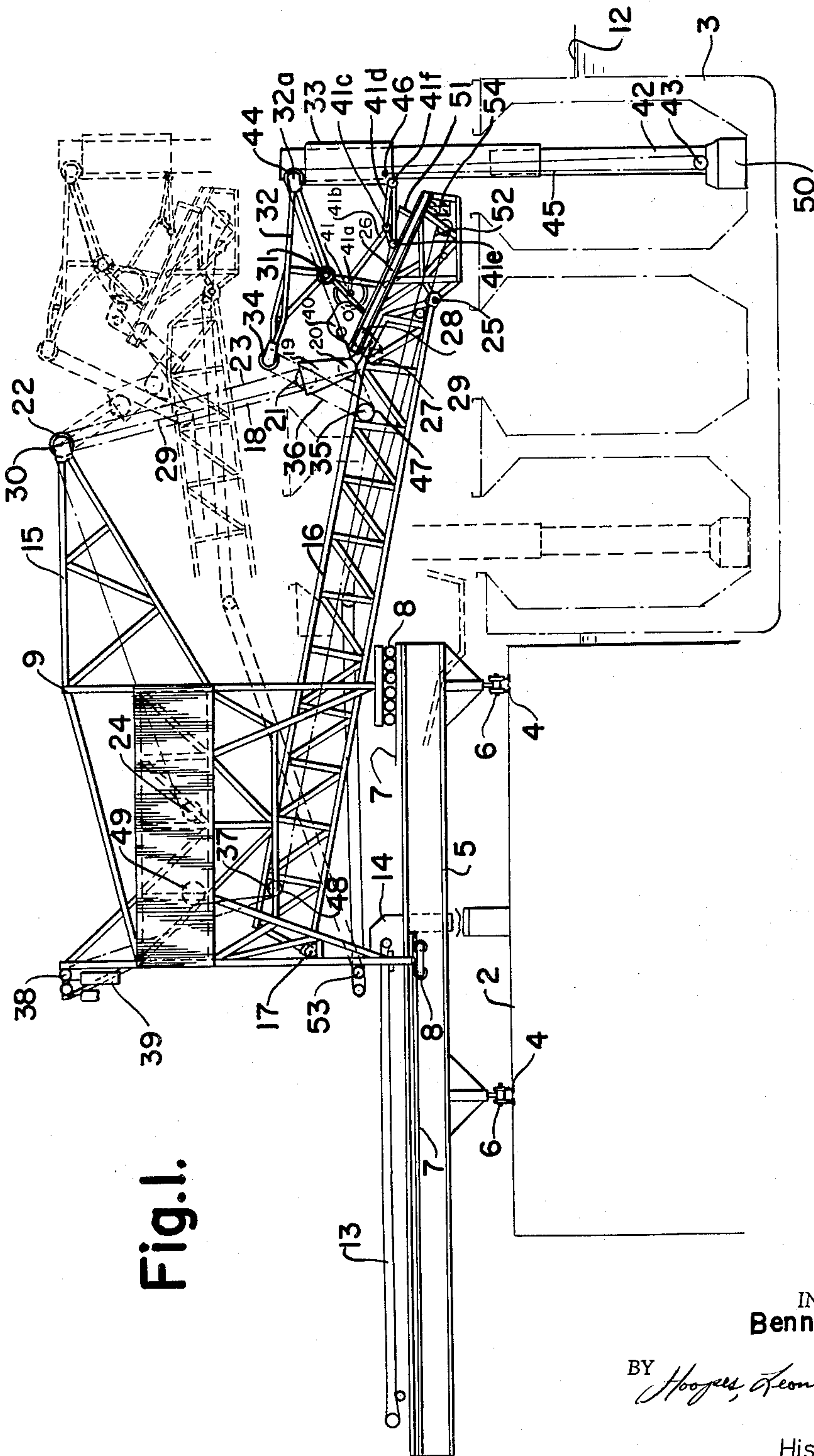
B. A. ROSE

2,995,259

UNLOADER

Filed March 17, 1960

4 Sheets-Sheet 1



INVENTOR.
Bennie A. Rose

BY *Hoopes, Leonard & Buell*

His Attorneys.

Aug. 8, 1961

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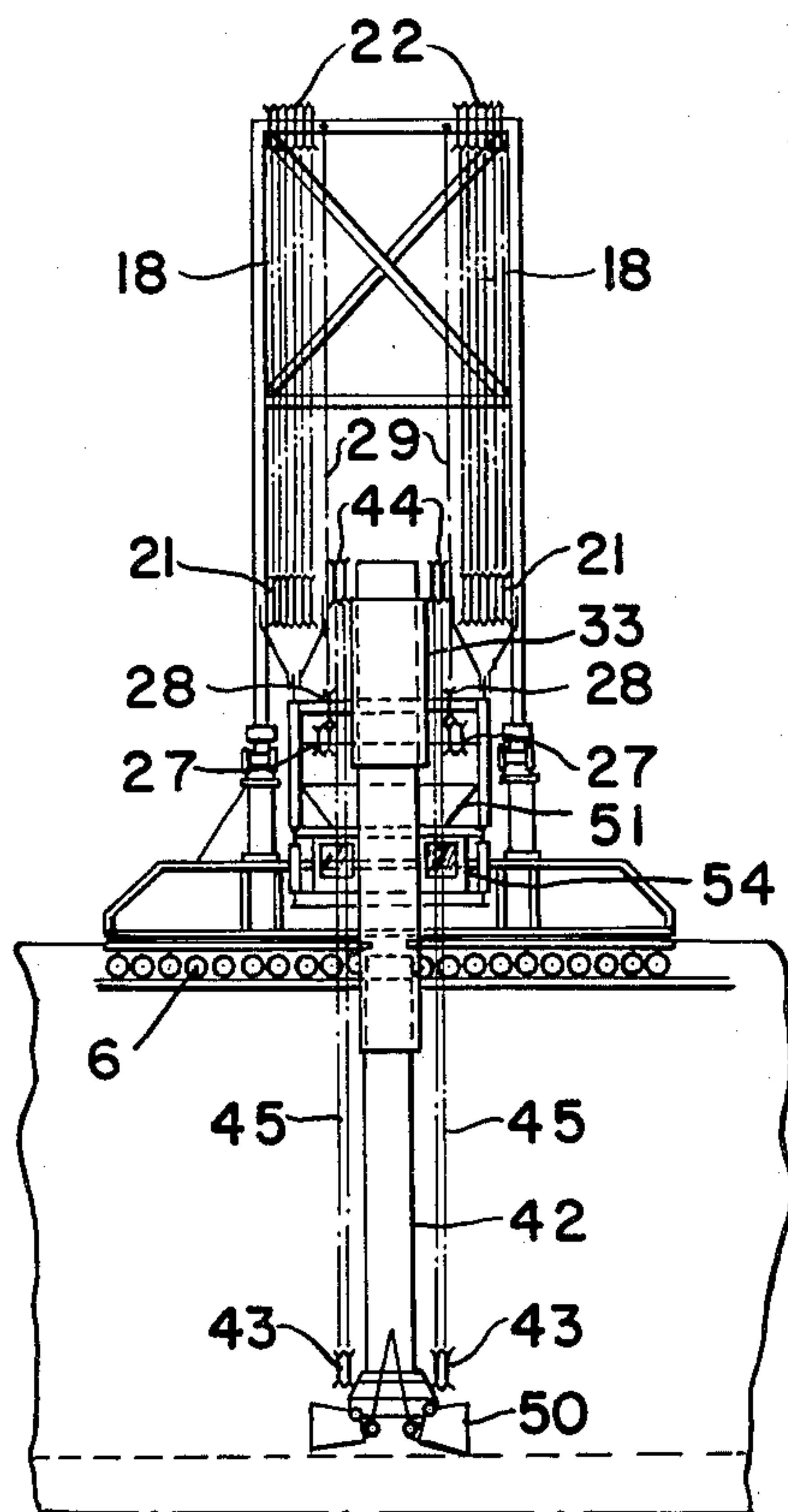
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4 Sheets-Sheet 2

Fig.2.



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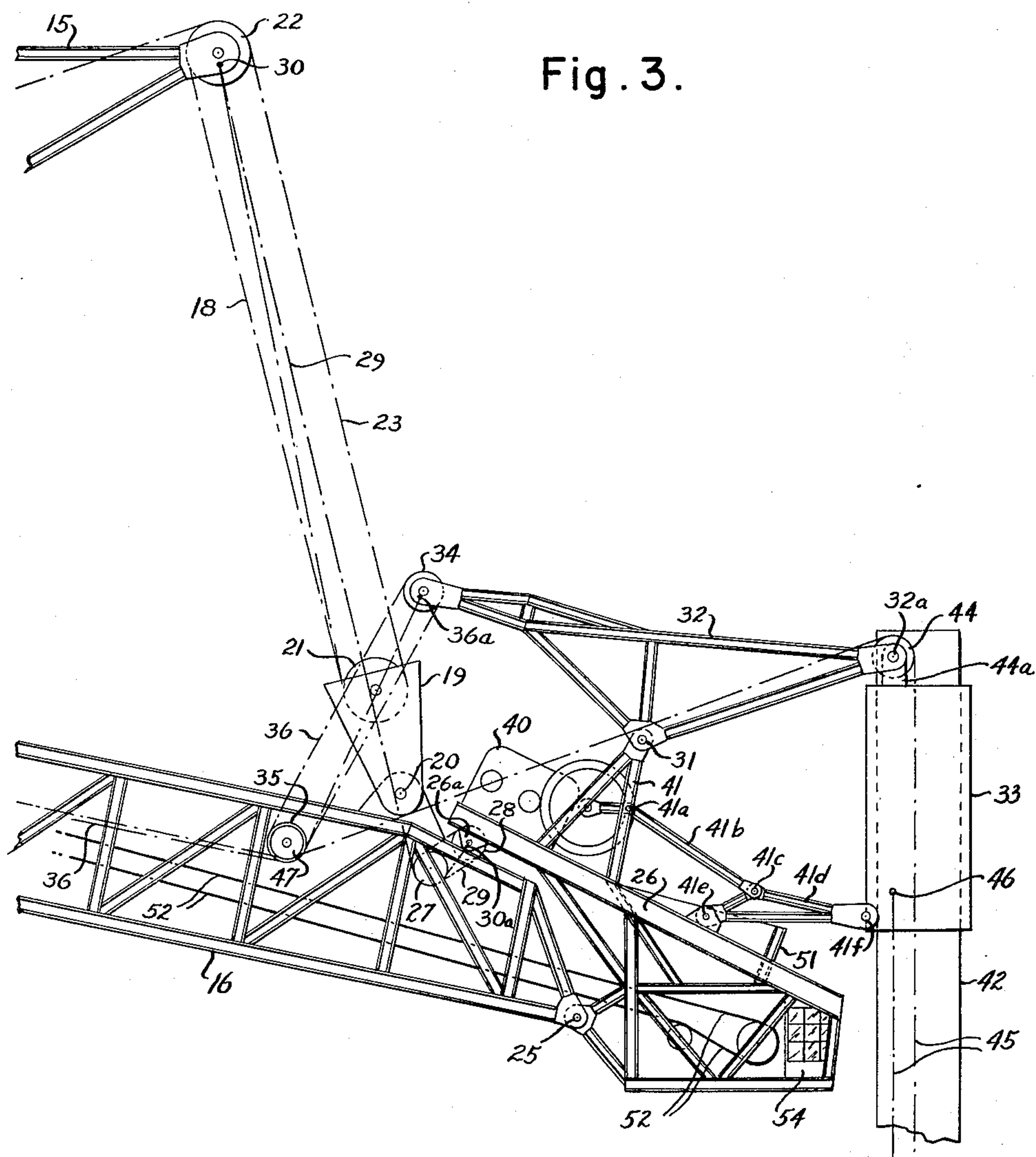
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Fig. 3.



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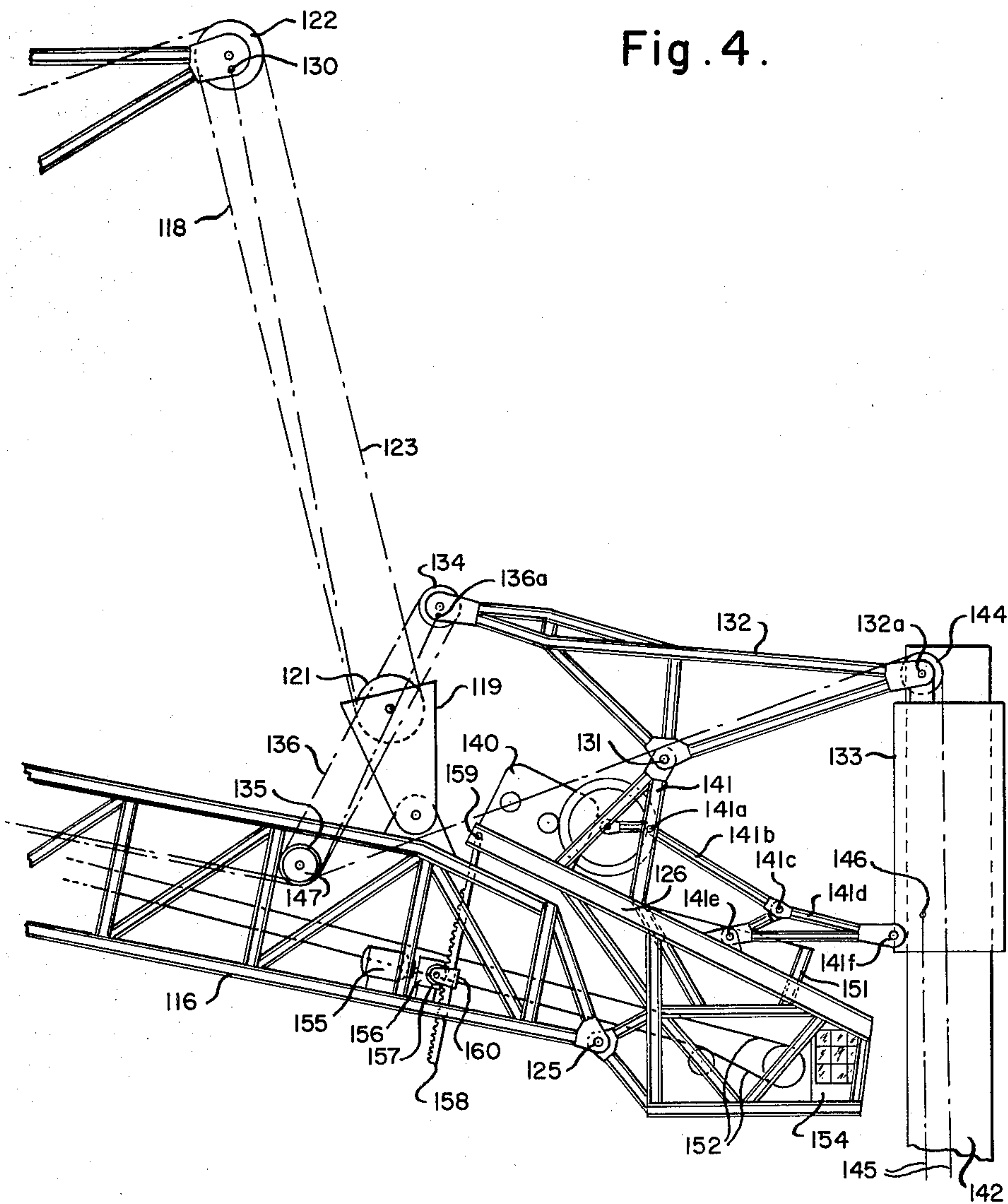
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4 Sheets-Sheet 4

Fig. 4.



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2,995,259

UNLOADER

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7 Claims. (Cl. 214-14)

This invention relates to an unloader, particularly an unloader for removing bulk material from receptacles such as the holds of ships, railway cars, trucks, etc. My unloader has especial utility in unloading bulk cargo from the holds of ships and for purposes of explanation and illustration will be described as so embodied. This invention is in the nature of an improvement over the invention of my Patent No. 2,796,180. This application is in part a continuation of my copending application Serial No. 745,939, filed July 1, 1958, now abandoned.

In my said patent there is disclosed an unloader comprising a base, a generally horizontally oriented boom pivoted to the base for generally vertical swinging movement whereby an end of the boom moves to different elevations, which end of the boom projects outwardly away from the base and is free of undersupport so as to be adapted to extend over a ship, a material receiving hopper carried by the boom, conveying means carried by the boom for conveying material from the hopper to a delivery point, a generally vertically oriented stem, connections between the stem and the boom through which the stem is carried by the boom, means for shifting such connections to move the stem between an outward and downward position and an inward and upward position generally above the hopper, material handling means carried by the stem at the lower portion thereof and means for operating the material handling means. Adjustable linkage of some complexity was provided to maintain the stem in generally vertical orientation in different operative positions of the boom.

I have devised a different and less complex mechanism for maintaining generally vertical the stem of an unloader of the type disclosed in my said patent when the stem is positioned to remove material from the hold of a ship. I form the boom of the unloader with a body portion and an end portion pivoted to the body portion together with connections between the stem and the pivoted end portion of the boom through which the stem is carried by the end portion of the boom and means, preferably although not necessarily actuated by generally vertical swinging movement of the boom, turning the end portion of the boom about its pivotal connection with the body portion of the boom so that the stem maintains generally vertical orientation when the stem is positioned to remove material from the hold of a ship in all operative positions of the boom.

In a preferred structure I provide a generally vertically oriented guide, connections between the guide and the pivoted end portion of the boom through which the guide is carried by the end portion of the boom, means actuated by generally vertical swinging movement of the boom turning the end portion of the boom relatively to the body portion of the boom about its pivotal connection with the body portion of the boom so that the guide maintains generally vertical orientation when the stem is positioned to remove material from the hold of a ship in all operative positions of the boom, means for shifting the connections between the guide and the end portion of the boom to move the guide between an outward and downward position and an inward and upward position generally above the hopper, a stem mounted in the guide for generally vertical movement relative to the guide, means for so moving the stem relatively to the guide, material handling means carried by the stem at

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the lower portion thereof and means for operating the material handling means.

The means employed in my above mentioned preferred structure actuated by generally vertical swinging movement of the boom turning the end portion of the boom about its pivotal connection with the body portion of the boom may comprise reeving extending between the body portion of the boom and the end portion of the boom determining the angular relationship between the body portion of the boom and the end portion of the boom and operable upon generally vertical swinging movement of the boom. More specifically, I may employ an elongated tension element reeved between the body portion of the boom and the end portion of the boom and also connected with the base, as, for example, by being dead-ended to the base. I also preferably provide means including reeving extending between the base and the boom for generally vertically swinging the boom. I further prefer to provide an operator's station located in the pivoted end portion of the boom with the operating controls for the unloader disposed at the operator's station.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings I have shown a present preferred embodiment of the invention in which

FIGURE 1 is a diagrammatic side elevational view of an unloader with parts shown in one position in solid lines and in another position in dotted lines;

FIGURE 2 is an end view of the unloader shown in FIGURE 1 as viewed from the right;

FIGURE 3 is an enlarged fragmentary diagrammatic side elevational view of a portion of the structure shown in FIGURE 1; and

FIGURE 4 is a view similar to FIGURE 3 showing a modified structure.

Since the unloader of my present invention is of the same general type as that of my said patent I refer to my said patent for the general structure of the unloader, and I have shown in the drawings of the present application only so much of the unloader as is necessary to understand its structure and operation. For other details of the structure see my said patent.

Referring now more particularly to the drawings, there is shown at 2 an unloading dock alongside water 12 in which floats a cargo ship 3. The water may be the ocean or a river, lake, canal or other body of water. The water may be influenced by the tides or not, but my unloader has especial utility in the unloading of ships whose elevation relative to the unloading dock changes substantially due to change in the tide or rising of the ship due to decreased displacement as it is being unloaded or for both reasons.

Mounted upon the dock 2 and extending generally parallel to the edge of the dock against which the ship lies are parallel rails 4 upon which a gantry 5 is mounted through wheels 6. The gantry is movable parallel to the length of the ship on the rails 4 so that all of the holds of the ship from bow to stern may be unloaded. The gantry 5 carries rails 7 disposed substantially at right angles to the rails 4, i.e., crosswise of the ship, along which the unloading mechanism may move so as to provide for unloading of each hold throughout the entire width of its hatch or hatches. Mounted on the rails 7 through wheels 8 is a carriage 9. The carriage is movable to selected positions crosswise of the ship so that by correlated movements of the gantry and carriage all portions of all holds in the ship can be reached.

The gantry is provided with an endless belt conveyor 13 adapted to receive material which has been unloaded

from the ship as will presently be described and to deliver that material to a delivery station 14.

The carriage 9 includes structural framework as shown including a portion 15 at the upper part of the carriage which projects toward the right as shown in FIGURE 1. A boom 16 is mounted on the carriage, being pivoted to the carriage at 17 for turning movement relative to the carriage about a horizontal axis parallel to the rails 4. The boom is elongated in the direction crosswise of the ship and is adapted to be swung in a vertical plane about axis 17 to raise and lower its right-hand end which carries the primary unloading mechanism as will presently be described. The position of the boom is determined by reeving 18 extending between the portion 15 of the carriage 9 and links 19 connected with the boom at 20. The reeving 18 includes sheaves 21 at the upper ends of the links 19, sheaves 22 pivoted to the portion 15 of the carriage 9 and elongated tension elements 23 extending about the sheaves 21 and 22 and to a drum 24 mounted in the carriage. When the right-hand end of the boom 16, viewing FIGURE 1, is to be lowered the drum 24 is turned in the clockwise direction to pay off the lines 23 and the right-hand end of the boom moves downwardly due to gravity. When the right-hand end of the boom is to be raised the drum 24 is turned in the counterclockwise direction to wind up the elongated tension elements 23 and hence shorten the distance between the sheaves 21 and the sheaves 22 and elevate the end of the boom.

Pivoted to the body portion of the boom by spaced coaxial pivots 25 is an end portion of the boom designated generally by reference numeral 26. To avoid prolixity the body portion of the boom will hereinafter be called simply "the boom" and the pivoted end portion of the boom will hereinafter be referred to simply as a "support." The boom carries sheaves 27 and the support carries sheaves 28. Elongated tension elements 29 are reeved between the sheaves 27 on the boom and the sheaves 28 on the support 26 and the ends of the elongated tension elements 29 are dead-ended at 30 to the portion 15 of the carriage 9 and at 30a to the brackets 26a which are parts of the support 26 and carry the sheaves 28. The support 26 tends by gravity to turn in the clockwise direction about the coaxial pivots 25. The parts are so proportioned that as the boom 16 is swung upwardly from the solid line position to the dotted line position shown in FIGURE 1 the elongated tension elements 29 are in effect payed out as the sheaves 27 approach the points 30 where the ends of the elongated tension elements 29 are dead-ended to the portion 15 of the carriage 9. The result is an increase in the distance between the sheaves 27 and the sheaves 28 and relative turning in the clockwise direction of the support 26 in relation to the boom 16 about the axis of the pivots 25, the support 26 being thus maintained in substantially constant orientation despite changes in the angularity of the boom.

Pivoted to the support 26 at 31 is a carrier 32 pivoted at 32a to a guide 33 generally in the form of a sleeve for a purpose to be presently described. The carrier 32 carries sheaves 34 and the boom 16 carries sheaves 35. An elongated tension element 36 is dead-ended to the carrier 32 at 36a and reeved about the sheaves 34 and 35 and extends about other sheaves 37 and 38 to a counterweight 39 which largely counterbalances the sleeve 33 and the elements carried thereby presently to be described. Mounted on the support 26 is a motor 40 for operating gears 41 each carrying a crank pin 41a. A connecting rod 41b extends from each crank pin 41a to one of a pair of pins 41c carried by an arm 41d pivoted to the support 26 at 41e and to the sleeve 33 at 41f. When the crank is in one position the parts are as shown in the drawings and when the crank is in the extreme opposite position the carrier is tilted toward the left and the

sleeve 33 has its axis extending downwardly and inwardly for a purpose to be presently described.

A stem 42 is slidable within the sleeve 33, being guided in such movement by the sleeve. The stem carries near its lower end sheaves 43 and the sleeve carries at its upper end sheaves 44 mounted in brackets 44a forming parts of the sleeve 33. Elongated tension elements 45 are dead-ended to the sleeve 33 at 46 and pass downwardly and about the sheaves 43 and thence upwardly and about the sheaves 44. The elongated tension elements 45 then pass about sheaves 47 and 48 to a drum 49 about which the elongated tension elements 45 are wound. When the drum 49 is turned in the clockwise direction the elongated tension elements 45 are wound up on the drum and the stem 42 is raised relatively to the sleeve 33. Conversely when the drum 49 is turned in the counterclockwise direction the elongated tension elements 45 are payed out and the stem 42 is lowered through the sleeve 33.

A bucket 50 is carried by the stem at the lower portion thereof and conventional means for opening and closing the bucket may be provided as described, for example, in my said patent.

The boom 16 carries a hopper 51 for receiving bulk material delivered thereto by the bucket 50, the bulk material entering through the hopper 51 falling upon an endless conveyor 52 carried by the boom and conveying the material toward the left. The hopper is shown as being disposed in the pivoted end portion of the boom or support 26. The endless conveyor 52 may extend about a sheave 53 carried by the carriage 9 and deliver the material to the conveyor 13. I preferably provide the operator's station at 54 in the support 26 where the operating controls for the unloader are disposed.

Starting a cycle of operations from the full line position of the parts shown in the drawing, the bucket 50, having been open as it moved downwardly into the bulk material in the hold of the ship, is closed to take up a bucket full of the bulk material whereupon the drum 49 is operated to raise the stem 42 in the sleeve 33. Simultaneously the drum 24 may be operated to raise the boom 16 from the solid line position to the dotted line position or at least partly to the dotted line position. Due to the provision of the elongated tension element 29 extending about the sheaves 27 and 28 and dead-ended to the portion 15 of the carriage 9 at 30 the support 26 maintains substantially constant orientation for all angular positions of the boom 16. Such substantially constant orientation of the support 26 may also be obtained by other operating means connected between the boom 16 and the support 26.

As the bucket 50 is elevated about the hopper 51 the crank 41 is operated to turn the arm 41d so as to swing the bucket inwardly over the hopper. When the bucket 50 is over the hopper 51 the bucket is opened and its contents fall into the hopper and onto the conveyor 52 and subsequently onto the conveyor 13 and pass to the delivery point 14. Thereupon the crank 41 is operated to swing the stem out to the orientation shown in the drawing. The boom 16 may move down to the full line position, the orientation of the support 26 being maintained as above explained. Simultaneously the stem may move downwardly within the sleeve and the bucket may be opened ready to initiate the succeeding cycle.

FIGURE 4 shows a modified structure having means for maintaining the end portion of the boom in substantially constant orientation to maintain the stem in generally vertical orientation when the stem is positioned to remove material from the hold of a ship in all operative positions of the boom but which means are separate from the means for swinging the boom about its generally horizontal axis. In FIGURE 4 the elements which are the same as those shown in FIGURE 3 are designated by reference numerals which are the same as the

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reference numerals used in FIGURE 3 plus 100. In FIGURE 4 an electric motor 155 is mounted on the body portion of the boom and through reduction gearing 156 drives a pinion 157 in mesh with a rack 158 pivotally connected at 159 with the end portion of the boom. The rack 158 is maintained in mesh with the pinion 159 by a strap 160. The motor 155 is a reversible type motor and the controls for operating that motor are preferably located in the operator's station 154. The operator by suitably operating the motor 155 can turn the pinion 157 in either direction and thus maintain the end portion of the boom in substantially constant orientation in all operative positions of the boom.

Thus by a comparatively simple mechanism provision is made for maintaining the stem substantially vertical when the stem is positioned to remove material from the hold of a ship regardless of the angular position of the boom. My unloader performs all the functions of the unloader of my said patent and is less costly to build and more reliable in operation. The mechanism herein described controls the stem within somewhat closer limits than the mechanism of my said patent and insures more accurate delivery of the unloaded material into the hopper.

What I have shown and described a present preferred embodiment of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. An unloader comprising a base, a generally horizontal oriented boom connected with the base for generally vertical swinging movement whereby an end of the boom moves to different elevations, said end of the boom projecting outwardly away from the base and being free of undersupport so as to be adapted to extend over a ship, the boom having a body portion and an end portion pivoted to the body portion, a material receiving hopper carried by the boom at the outwardly projecting end thereof, conveying means carried by the boom for conveying material from the hopper to a delivery point, a generally vertically oriented stem, connections between the stem and the end portion of the boom through which the stem is carried by said end portion of the boom, means including connections between the body portion of the boom and the end portion of the boom whereby the end portion of the boom can be maintained in substantially constant orientation to maintain the stem in generally vertical orientation when the stem is positioned to remove material from the hold of a ship in all operative positions of the boom, means mounted entirely upon the pivoted end portion of the boom for shifting the connections between the stem and the pivoted end portion of the boom to move the stem between an outward and downward position and an inward and upward position generally above the hopper, material handling means carried by the stem at the lower portion thereof and means for operating the material handling means.

2. An unloader comprising a base, a generally horizontally oriented boom connected with the base for generally vertical swinging movement whereby an end of the boom moves to different elevations, said end of the boom projecting outwardly away from the base and being free of undersupport so as to be adapted to extend over a ship, the boom having a body portion and an end portion pivoted to the body portion, a material receiving hopper carried by the boom at the outwardly projecting end thereof, conveying means carried by the boom for conveying material from the hopper to a delivery point, a generally vertically oriented guide, a stem mounted in the guide for generally vertical movement relatively to the guide, connections between the guide and the end portion of the boom through which the guide is carried by said end portion of the boom, means including connections between the body portion of the boom and the end portion of

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the boom whereby the end portion of the boom can be maintained in substantially constant orientation to maintain the guide in generally vertical orientation when the stem is positioned to remove material from the hold of a ship in all operative positions of the boom, means mounted entirely upon the pivoted end portion of the boom for shifting the connections between the guide and the pivoted end portion of the boom to move the guide between an outward and downward position and an inward and upward position generally above the hopper, means for moving the stem generally vertically relatively to the guide, material handling means carried by the stem at the lower portion thereof and means for operating the material handling means.

3. An unloader comprising a base, a generally horizontally oriented boom connected with the base for generally vertical swinging movement whereby an end of the boom moves to different elevations, said end of the boom projecting outwardly away from the base and being free of undersupport so as to be adapted to extend over a ship, the boom having a body portion and an end portion pivoted to the body portion, a material receiving hopper carried by the boom at the outwardly projecting end thereof, conveying means carried by the boom for conveying material from the hopper to a delivery point, a generally vertically oriented stem, connections between the stem and the end portion of the boom through which the stem is carried by said end portion of the boom, reeving extending between the body portion of the boom and the end portion of the boom determining the angular relationship between the body portion of the boom and the end portion of the boom and operable upon generally vertical swinging movement of the boom to turn the end portion of the boom relatively to the body portion of the boom about its pivotal connection with the body portion of the boom so that the end portion of the boom maintains substantially constant orientation and the stem maintains generally vertical orientation when the stem is positioned to remove material from the hold of a ship in all operative positions of the boom, means for shifting the connections between the stem and the end portion of the boom to move the stem between an outward and downward position and an inward and upward position generally above the hopper, material handling means carried by the stem at the lower portion thereof and means for operating the material handling means.

4. An unloader comprising a base, a generally horizontally oriented boom connected with the base for generally vertical swinging movement whereby an end of the boom moves to different elevations, said end of the boom projecting outwardly away from the base and being free of undersupport so as to be adapted to extend over a ship, the boom having a body portion and an end portion pivoted to the body portion, a material receiving hopper carried by the boom at the outwardly projecting end thereof, conveying means carried by the boom for conveying material from the hopper to a delivery point, a generally vertically oriented stem, connections between the stem and the end portion of the boom through which the stem is carried by said end portion of the boom, an elongated tension element reeved between the body portion of the boom and the end portion of the boom and also connected with the base determining the angular relationship between the body portion of the boom and the end portion of the boom and operable upon generally vertical swinging movement of the boom to turn the end portion of the boom relatively to the body portion of the boom about its pivotal connection with the body portion of the boom so that the stem maintains generally vertical orientation when the stem is positioned to remove material from the hold of a ship in all operative positions of the boom, means for shifting the connections between the stem and the end portion of the boom to move the stem between an outward and downward position and an inward and upward position generally above

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the hopper, material handling means carried by the stem at the lower portion thereof and means for operating the material handling means.

5. An unloader comprising a base, a generally horizontally oriented boom connected with the base for generally vertical swinging movement whereby an end of the boom moves to different elevations, said end of the boom projecting outwardly away from the base and being free of undersupport so as to be adapted to extend over a ship, the boom having a body portion and an end portion pivoted to the body portion, a material receiving hopper carried by the boom at the outwardly projecting end thereof, conveying means carried by the boom for conveying material from the hopper to a delivery point, a generally vertically oriented stem, connections between the stem and the end portion of the boom through which the stem is carried by said end portion of the boom, an elongated tension element reeved between the body portion of the boom and the end portion of the boom and dead-ended to the base determining the angular relationship between the body portion of the boom and the end portion of the boom and operable upon generally vertical swinging movement of the boom to turn the end portion of the boom relatively to the body portion of the boom about its pivotal connection with the body portion of the boom so that the stem maintains generally vertical orientation when the stem is positioned to remove material from the hold of a ship in all operative positions of the boom, means for shifting the connections between the stem and the end portion of the boom to move the stem between an outward and downward position and an inward and upward position generally above the hopper, material handling means carried by the stem at the lower portion thereof and means for operating the material handling means.

6. An unloader comprising a base, a generally horizontally oriented boom connected with the base for generally vertical swinging movement whereby an end of the boom moves to different elevations, means including reeving extending between the base and the boom for so swinging the boom, said end of the boom projecting outwardly away from the base and being free of undersupport so as to be adapted to extend over a ship, the boom having a body portion and an end portion pivoted to the body portion, a material receiving hopper carried by the boom at the outwardly projecting end thereof, conveying means carried by the boom for conveying material from the hopper to a delivery point, a generally vertically oriented stem, connections between the stem and the end portion of the boom through which the stem is carried by said end portion of the boom, an elongated tension element reeved between the body portion of the

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boom and the end portion of the boom and also connected with the base determining the angular relationship between the body portion of the boom and the end portion of the boom and operable upon generally vertical swinging movement of the boom to turn the end portion of the boom relatively to the body portion of the boom about its pivotal connection with the body portion of the boom so that the stem maintains generally vertical orientation when the stem is positioned to remove material from the hold of a ship in all operative positions of the boom, means for shifting the connections between the stem and the end portion of the boom to move the stem between an outward and downward position and an inward and upward position generally above the hopper, material handling means carried by the stem at the lower portion thereof and means for operating the material handling means.

7. An unloader comprising a base, a generally horizontally oriented boom connected with the base for generally vertical swinging movement whereby an end of the boom moves to different elevations, said end of the boom projecting outwardly away from the base and being free of undersupport so as to be adapted to extend over a ship, the boom having a body portion and an end portion pivoted to the body portion, a material receiving hopper carried by the boom at the outwardly projecting end thereof, conveying means carried by the boom for conveying material from the hopper to a delivery point, a generally vertically oriented stem, connections between the stem and the end portion of the boom through which the stem is carried by said end portion of the boom, an operator's station located in the end portion of the boom, operating controls for the unloader disposed in the operator's station, means actuated by generally vertical swinging movement of the boom turning the end portion of the boom relatively to the body portion of the boom about its pivotal connection with the body portion of the boom so that the stem maintains generally vertical orientation when the stem is positioned to remove material from the hold of a ship in all operative positions of the boom, means for shifting the connections between the stem and the end portion of the boom to move the stem between an outward and downward position and an inward and upward position generally above the hopper, material handling means carried by the stem at the lower portion thereof and means for operating the material handling means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,796,180 Rose June 18, 1957

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,995,259

August 8, 1961

Bennie A. Rose

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 2, for "ot" read -- to --; column 5, line 25, for "What" read -- While --; lines 31 and 32, for "horizontal" read -- horizontally --.

Signed and sealed this 9th day of October 1962.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents