June 28, 1927. 1,633,627

M. E. FIRST

MECHANISM FOR HANDLING MATERIAL

Filed Nov. 11, 1922 4 Sheets-Sheet 1

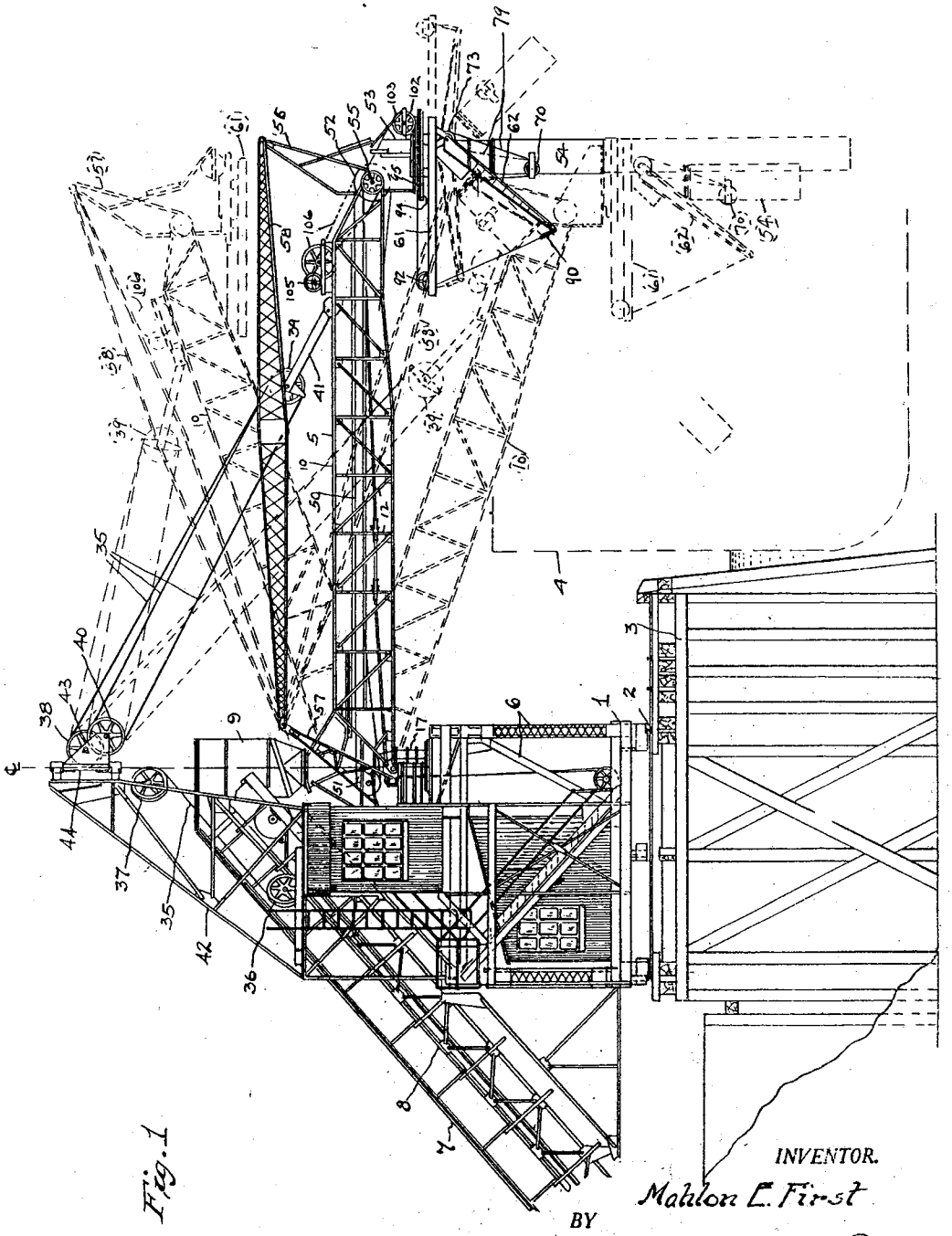


Fig. 1

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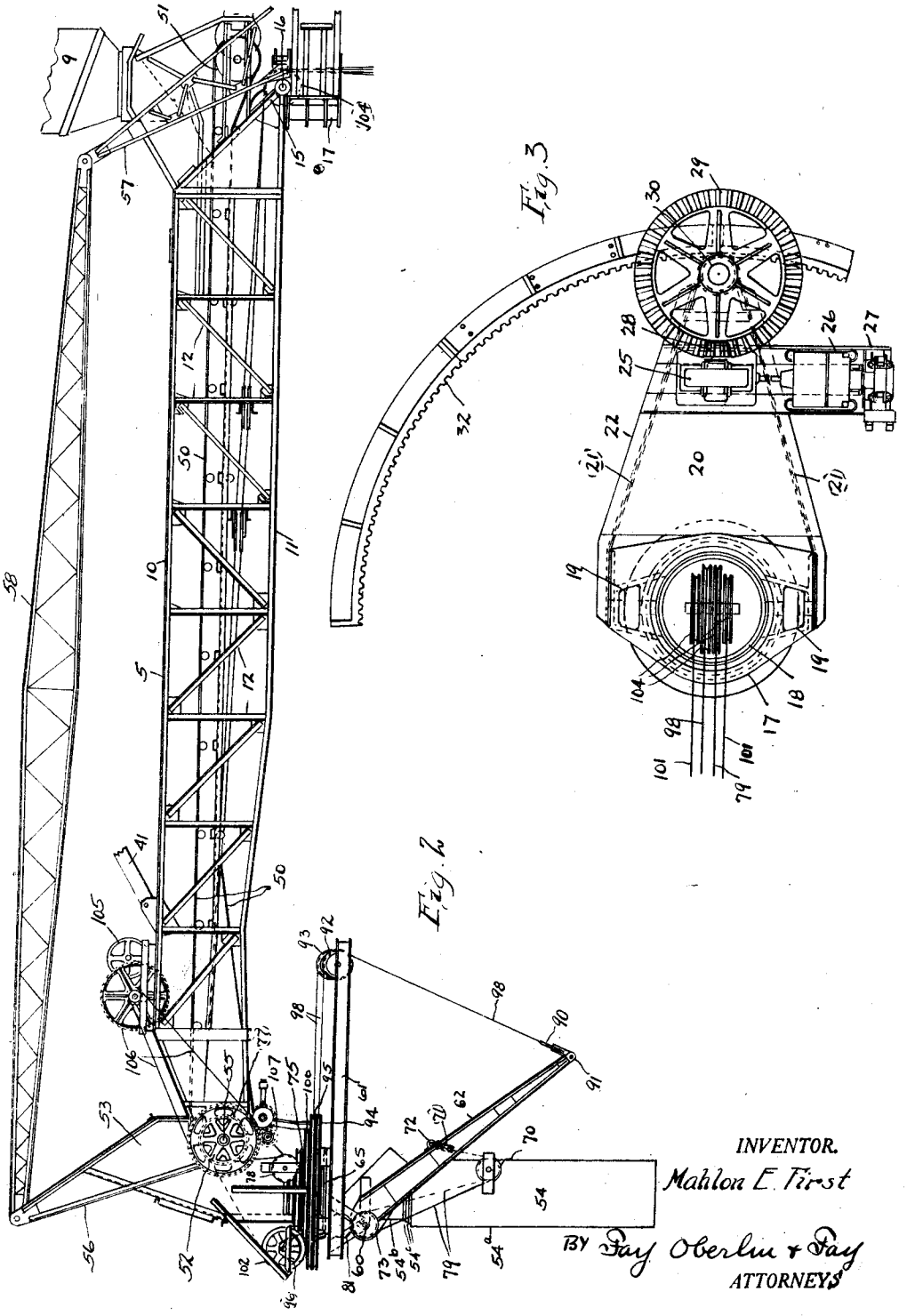


Fig. 2

Fig. 3

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MECHANISM FOR HANDLING MATERIAL

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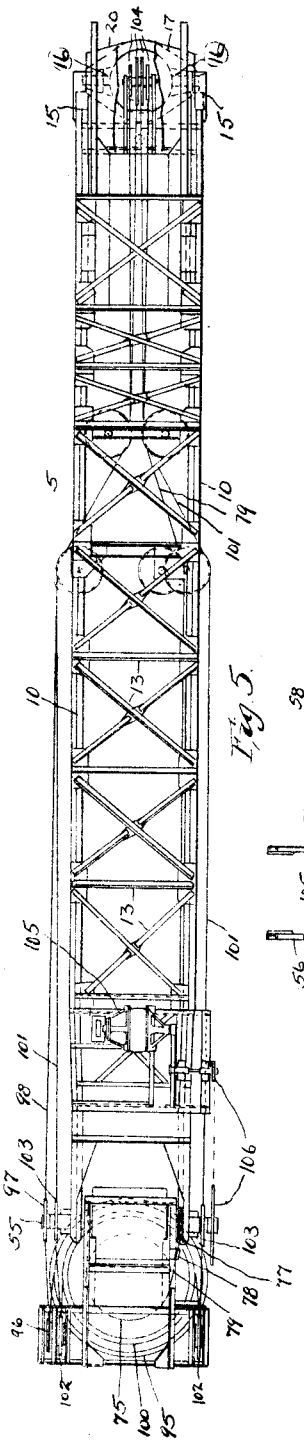


Fig. 5

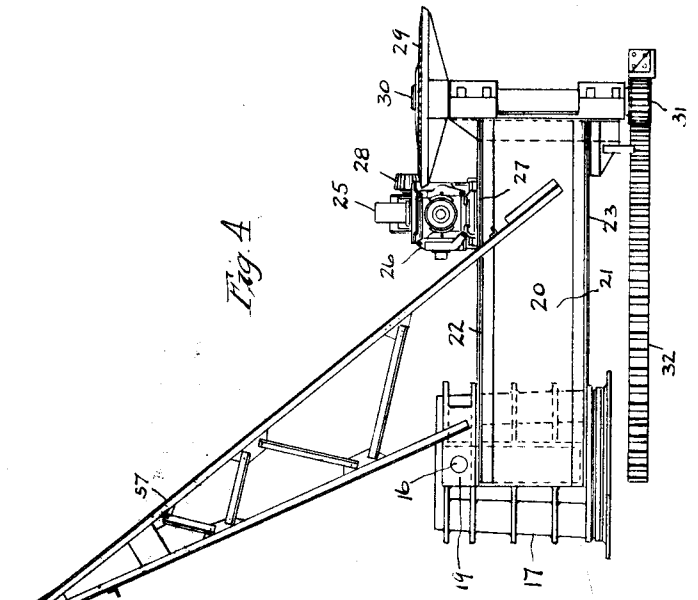


Fig. 4

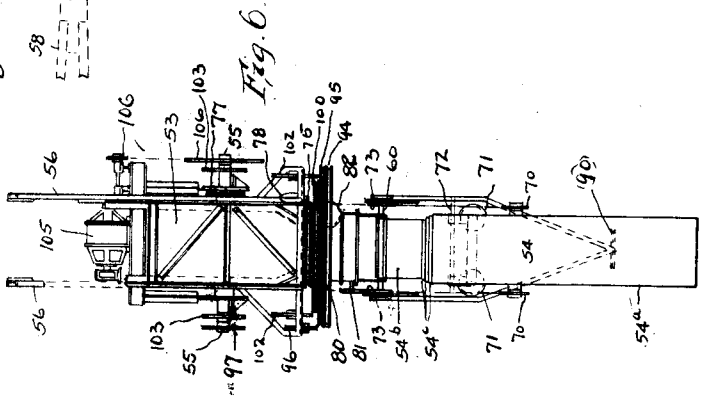


Fig. 6

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4 Sheets-Sheet 4

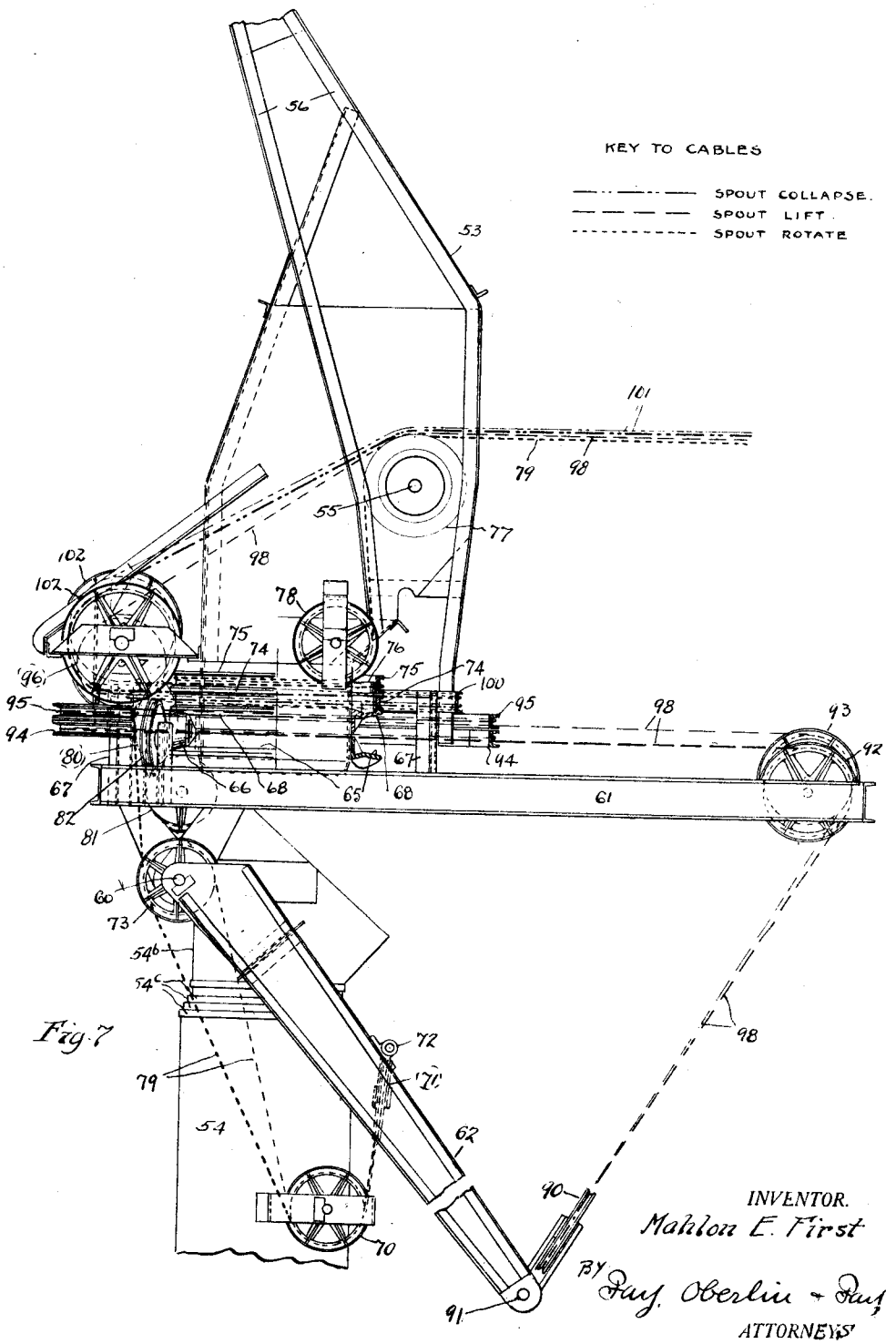


Fig. 7

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Patented June 28, 1927. 1,633,627

UNITED STATES PATENT OFFICE.

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MECHANISM FOR HANDLING MATERIAL.

Application filed November 11, 1922. Serial No. 600,248.

The present improvements relate in general to conveying mechanism for transferring material, such as coal, iron ore and the like, from one point to another, as, for example, for reloading such material from a pile on a dock into a vessel lying alongside such dock. It is not intended, however, to imply that the mechanism is limited to any such particular use, comprehending, as it does, features of construction capable of wide application to the handling of various materials where the material requires to be transferred from one point to another and distributed or loaded in a more or less uniform manner at the discharge or unloading point. One object of the invention is to provide means for conveying material horizontally at a considerable elevation in the clear i. e., without requiring a support at the outer or discharge end. A further object is to provide for readily varying the elevation of such point of discharge. In connection with the foregoing means are provided for trimming the load or distributing the discharged material uniformly over a relatively wide area either side of the point of discharge, having regard to the direction in which the material is normally conveyed, as well as for shifting such point of discharge in a direction approximately at right angles to such normal direction.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawings and the following description setting forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—

Fig. 1 is a side elevation of a material-handling mechanism embodying my present improvements, such mechanism being designed more particularly for reloading a vessel from a pile of material resting on, or lying adjacent to, a dock; Fig. 2 is a similar side elevation on a larger scale of the boom which constitutes the principal element of such mechanism, viewing the same from the opposite side to that shown in Fig. 1; Fig. 3 is a plan view likewise on a larger scale than that of Fig. 1, showing the mechanism for swinging such boom; Fig. 4 is a side elevation of the boom swinging mechanism on the same scale as shown in Fig. 3; Fig. 5 is a plan view of such boom; Fig. 6 is a front elevation of such boom as viewed from the left in Figs. 2 and 5, and shows the discharge spout through which material conveyed along the boom is delivered; and Fig. 7 is a central section through such spout and mechanism supporting same.

In the embodiment of the invention thus illustrated in the drawings the various component parts of the mechanism are supported on a movable base 1 that is arranged to travel along rails 2 constituting a trackway on the dock or pier 3. Only the outline of the hull 4 of the vessel to be loaded is shown in Fig. 1 it being understood that such vessel will be tied up alongside the dock 3 at a point adjacent to the pile or stack of material (not shown) that is to be loaded into such vessel. Such material will lie to the left of the dock or pier, i. e., to the left of the mechanism as shown in said Fig. 1.

The mechanism of present interest comprises, as already indicated in connection with the brief description of the drawings, a boom 5, this being swingably supported at its inner end on a superstructure 6 that rises from base 1. Supported by the same superstructure, but on the opposite side from such boom, is an upwardly inclining frame 7 which carries an apron conveyor 8 or equivalent conveying means whereby the material to be loaded into the vessel 4 may be elevated to a point above the inner end of said boom 5. The particular construction of such elevating mechanism forms no part of the present invention and so need not be further described; nor is it deemed necessary to describe the means whereby the material from the pile or stack is delivered to such conveyor. Indeed the latter may be entirely dispensed with in certain situations where the material can be otherwise delivered to the hopper-like receptacle 9 located above the inner end of the boom 5, from which the material is received by the conveying mechanism carried by such boom, and which constitutes, along with the latter, the feature of present interest. Said hopper 9, where an apron conveyor is employed, as shown and just described, for the purpose of elevating the material, constitutes in effect the head section of such conveyor.

The detail construction of boom 5, as

shown in the larger scale views afforded by Figs. 2 and 5, is on the order of an open truss frame, the respective side members of which comprise top and bottom chords 10 and 11 tied together by a series of web members 12, disposed in the vertical planes of said truss frames, respectively. The latter are in turn tied together in properly spaced relation by means of similar transverse web members 13.

The inner end of boom 5 is provided with foot castings 15 whereby the boom is pivotally attached through the medium of pins 16 to a turntable center 17 so as to be oscillatory about a horizontal axis, such center being rotatable about a vertical axis. Such turntable center 17, as shown in Fig. 3, is tubular, being thus rotatably mounted on an inner tubular post 18 that rests on a suitable deck in the superstructure 6 that rises from base 1. Two oppositely projecting lugs or ears 19 on said center provide means for attaching the foot castings 15 of the boom to such center. Said center is also provided with a rearwardly projecting radial arm 20 which, as shown in Figs. 3 and 4, is of substantial construction, preferably consisting of side plates 21, spaced apart where attached to said center and converging at their outer ends, said side plates being connected together by means of top and bottom plates 22 and 23. On the platform provided by the upper plate composing such arm 20 is mounted a reduction gear 25 adapted to be driven by an electric motor 26 supported on a laterally extending bracket 27, such reduction gear including a bevel driving pinion 28 that meshes with a bevel gear 29 fixed to the outer end of a vertical shaft 30 journaled in the outer end of arm 20, i. e., at approximately the point where the side plates 21, forming part of such arm, come together. The lower end of said shaft 30 is provided with a spur pinion 31 that meshes with a stationary internal annular gear 32 that is suitably supported on the same deck in superstructure 6 that supports the boom turntable center. As a matter of fact said gear 32 is not a complete gear, it being unnecessary for it to extend through more than an arc of 180 degrees so that said boom center may be swung through a corresponding arc. Such rotation, it will be evident, may be produced in either direction by appropriately rotating the bevel pinion 28 through the medium of motor 26 and reduction gearing 25.

For the purpose of raising and lowering the outer end of boom 5 a line or cable 35 is provided, such cable passing from a suitable winding drum (not shown), that is, housed, along with the driving mechanism therefor, in the superstructure 6 on base 1, around sheaves 36, 37 and 38, relatively stationarily mounted, as will be presently described, thence around a sheave 39 attached to said boom near its outer end and around another sheave 40 mounted like the first-named sheave, and so passing finally to sheave 39 adjacent to which it is fixedly attached. Said last-named sheave is secured to the boom through the medium of pivotal arms or links 41 capable of assuming various angular positions in a vertical plane with respect to such boom. Sheaves 36 and 37, over which the line or cable 35 initially passes, are supported on fixed axes in a derrick-like structure 42 that rises to a considerable height above superstructure 6 so as to clear the hopper 9; while sheaves 38 and 40 are journaled in a frame 43 swiveled to the upper end of said derrick about a vertical axis 44 that is aligned with the axis of the boom turntable center. Sheaves 37, moreover, is so located that the cable as it passes on to sheave 38 will lie on the line of such axis. The boom, it will accordingly be seen, may be freely swung about the axis in question, irrespective of its angular position relatively to such axis, and conversely the outer end of the boom may be raised and lowered irrespective of the position the boom occupies in a horizontal plane.

For the purpose of conveying material delivered to hopper 9 from the inner to the outer end of the boom, the latter is provided with an endless belt conveyor 50 that passes around suitable sheaves or drums 51 and 52 located adjacent its inner and outer ends, respectively. The rear end of the conveyor 50 will of course lie to the rear of the discharge opening in hopper 9 so that the material delivered to the latter by elevator 8 will be received on the upper lap of such conveyor 50 and be carried thereby along the boom until the outer end thereof is reached, whereupon the material will be discharged into a hopper-like receptacle 53, from which depends a discharge spout 54, the construction and manner of mounting of which will require separate detail description.

The hopper 53 just referred to as constituting in effect the head section of the discharge spout 54 is oscillatorily supported in the outer end of boom 5 about the same axis 55 that constitutes the axis of the sheave or drum 52. In other words, irrespective of any swinging movement imparted to such hopper or spout head, it will always remain in approximately fixed relation to the discharge end of conveyor 50. Fixedly attached to such spout-head are two arms 56, one on each side thereof, which arms project in a general vertical direction to approximately the same height above the boom 50, and two corresponding arms 57 are fixedly mounted on the boom turntable center at the rear end of such boom. A light frame structure 58 is pivotally attached at its respective ends to the upper ends of said two pairs of arms 56 and 57 so as to constitute

in effect a link between the same, with the result that as the outer end of boom 5 is raised or lowered, said link 58 will correspondingly swing spout-head 53 so as to maintain the same at all times vertical; or what amounts to the same thing, the base of such head, from which the spout is directly supported, will be at all times maintained horizontally.

The spout 54 is of telescopic construction, being composed of a sufficient number of sections to permit such spout to be extended or contracted as may be found necessary in the particular field of use wherein the loading mechanism is employed. For the purpose of thus controlling the length of the spout, it is merely necessary to provide means for raising or letting down, as the case may be, the outer section 54^a of said spout, the intermediate sections 54^b being arranged to be picked up by each other, and finally by the outer section as the latter is raised. The inner telescoping section 54^c of the spout is pivotally hung about a transverse axis 60 from the underside of a platform 61 that is rotatably secured about a vertical axis to the spout head 53 so as to constitute in effect a turntable support for said spout. Fixedly attached to said inner spout section 54^c is an arm 62, that in the normal vertically depending position of the spout projects downwardly at an acute angle to the axis of the spout (see Fig. 2); but by raising the outer end of arm 62 until it is brought approximately parallel with turntable platform 61, the spout it will be seen, may be brought into a position inclining at a corresponding acute angle from the horizontal. The actual angle between the spout and arm 62 will not be less than that at which the material being handled will flow freely down the spout.

The manner in which the turntable platform 61, whereby the extensible discharge spout 54 is supported, is secured to the spout head, or in other words to the outer end of the boom, is best shown in Fig. 7. From the latter it will be seen that spout head 53 is provided at its lower end with a lateral flange 65 that forms a trackway for a series of rollers 66 mounted about radially directed axes in a framework 67 that rises from said platform. A complementary flange 68, likewise fixedly secured to the spout head, holds these rollers in place and thus secures the platform against any tilting movement relatively to the spout head, while still leaving it free to rotate about the axis of such spout head which, of course, coincides with the axis of the spout when the latter depends in normal vertical position.

For the purpose of controlling the length of the spout and for swinging arm 62 and thus the discharge spout about axis 60, as well as for rotating the platform 61 and thus the spout about the vertical axis defined by the circular roller trackway which the flanges 65 and 68 constitute suitable cable connections are provided which will now be described in detail. It will be noted that the cables in question extend outwardly through or above the boom 5 from drums (not shown) located at the inner end thereof and operated in any suitable manner.

Since, due to its telescopic construction, the spout 54 normally tends under gravity to extend itself to its full length, it is merely necessary to provide a cable for collapsing such spout, i. e. for raising the outermost section thereof. To this end, two sheaves 70 are attached to such outer section, one on each side thereof and so located transversely of the spout as to project somewhat beyond the rear edge thereof, i. e. beyond the side directed towards arm 62. A second pair of sheaves 71 is hung in said arm so as to be oscillatory about an axis 72 parallel with the common axis of said sheaves 70, while two other sheaves 73 are mounted on the shaft that constitutes the axis 60, one on each side of the inner section 54^c of the spout. Mounted above and integral with roller flange 68 on the spout head is a peripherally grooved extension forming a fixed ring 74, while directly thereabove is a second, similarly grooved, floating ring 75 that is held in place by means of rollers 76 so as to be freely rotatable about such spout head. Two sheaves 77 and 78, mounted on one side of said spout head above ring 75, serve to guide a cable 79 onto the latter. Said cable is carried one or more times around said ring and thence passes over relatively angularly disposed sheaves 80 and 81 in the forward portion of turntable platform 61 onto one of the sheaves 73 and so around one of the sheaves 70, said sheaves 73 and 70 being the ones on the near side, as shown in Fig. 7; then said cable passes over the pair of sheaves 71 and sheaves 70 and 73 on the far side, as shown in said Fig. 7, back onto said fixed ring 74, a sheave 82 in the platform on the spout head serving properly thus to guide the cable back. The end of the cable is carried around the ring a sufficient distance to insure against its ever being completely unwound, due to rotation of the platform, and is fixedly attached to such ring.

As a result of the arrangement of sheaves and the manner in which the cable is passed around the same and around rings 74 and 75, as just described, it will be seen that as the platform is rotated in one direction or the other, the cable on the near side will be unwound from one of said rings and at the same time wound up on the far side on the other ring, or vice versa, so that the portion of said cable that lies between the two sheaves 70 and is looped about the sheaves

71 will remain unchanged in length. However, the length of such loop may at any time, i. e. irrespective of the angular position of the platform 61 about its vertical axis of oscillation, be increased by paying out said cable, or be decreased by drawing in on the same. The effect of lengthening such looped portion of the cable 79 is, of course, to allow the outer section 54ª of the spout to drop and thus extend such spout, while conversely the effect of shortening such cable will be to draw up such outer section of the spout and thus collapse the latter.

Substantially equivalent means are provided for oscillating arm 62, and thus the spout 54, and for retaining same in unchanged angular position with respect to the platform, irrespective of any rotative movement that may be imparted to the latter. Such means comprise a sheave 90 secured to the outer end of said arm so as to be oscillatory about a transverse axis 91; two sheaves 92 and 93 adjacent the rear end of the platform, i. e. in that portion of the latter farthest removed from the spout head; a peripherally grooved ring 94 fixedly attached to the framework wherein the spout head is supported; a similar ring 95 rotatably mounted on such framework directly above ring 94; and sheaves 96 and 97 likewise mounted on said framework, one above the other, but with their axes at right angles to that of the rings just referred to. The lowermost sheave 96 of the two sheaves last referred to is mounted with its lower edge aligned with the groove in the rotatable or floating ring 95, while the uppermost sheave 97 is preferably mounted on the same axis 55 as sheave 77 so as to receive a cable 98 that is carried out over the boom substantially parallel with cable 79 that controls the extension and collapsing of the spout. From sheave 97 cable 98 passes over sheave 96 and one or more times around floating ring 95; thence over sheave 93 down around sheave 90, back over sheave 92 and c to fixed ring 94, around which it passes one or more times anc to which its end is fixedly attached. As in the case of the spout extending and collapsing cable 79, so in the case of cable 98, gravity is relied upon to pay such cable out, i. e. to normally cause the spout to assume the vertically depending position shown in Figs. 1, 2 and 7. By drawing in on said cable, however, the portion thereof that lies between sheaves 92 and 93 and is looped about sheave 90 will be correspondingly shortened, with the result that the arm 62 is drawn up towards the turntable 61, i. e. into a more nearly horizontal position, and the spout will be swung in a corresponding direction from the vertical. Furthermore, rotation of the turntable 61 about its axis will have no effect upon such angular position of the spout nor cause the same to be swung from the vertical, if that happens to be the position in which it has been left, inasmuch as the cable 98 will be wound up on the fixed ring 94 and unwound on the floating ring 95, or vice versa, an exactly equal amount, thus leaving at all times the length of the looped portion of such cable that passes around sheave 90 unchanged.

For the purpose of rotating the turntable 61, there is fixedly attached to the upper portion of the turntable frame 67, so as to be in effect integral therewith, another peripherally grooved ring 100, such ring being somewhat smaller in diameter than the rings 94 and 95 and being conveniently located immediately above the latter of the rings just named. In order to properly guide onto such ring 100 the cable 101, that serves thus to rotate said ring and through it the turntable 61, two guide sheaves 102 are mounted on approximately the same axis but spaced from each other in the forward portion of the frame that supports the spout head 53, said sheaves being respectively disposed with their lower edges on line with the lower and upper portion of the groove in said ring 100. In addition to said sheaves 102, two other sheaves 103 are mounted in said frame at a higher level, one on each side of the spout head, (preferably on the same axis 55 as the sheaves 77 and 97), over which the respective ends of the cable 101 are carried after passing around said sheaves 102 and 103, the intermediate portion of the cable being passed one or more times around the ring 100. In the case of this cable 101 for rotating the platform 61, one end is, of course, payed out as the other is drawn in, the ring 100 functioning as the familiar bull-ring in the mounting of a swinging boom or derrick.

It has not been deemed necessary to illustrate the construction of the winding drums that are required for operating the several cables 79, 98 and 107 since these are, of course, of familiar construction. Such winding mechanism may be mounted where most convenient at the inner end of the boom, preferably in such relation thereto and to the other parts of the mechanism as not to cause the length of the several cables or lines to be disturbed by either the swinging movement of said boom or its oscillation in a vertical plane. The manner in which the cables are carried back along the boom to sheaves 104 in the post 18 is best shown in Figs. 2 and 3.

Power for driving the endless belt conveyor 50, that carries the material from the inner to the outer end of the boom, is conveniently applied, as shown, (see Fig. 2) to the drum 52 at such outer end, an electric motor 105 mounted on the boom being con-

nected through suitable reduction gearing 106 to the shaft of said drum. Associated with the latter I desirably employ a rotary brush 107 that is connected to be driven from the same gearing and contacts with the lower lap of the drum as it leaves the same. Any material that might otherwise adhere to the conveyor is thus removed and due to the location of the brush is returned to the spout head to which the rest of the material is discharged from the conveyor.

The general operation of my improved material handling mechanism should be apparent from the foregoing description of the construction and operation of its several component parts. The various positions which the boom 5 and spout 54 may assume are well illustrated in Fig. 1. It should be noted again that the adjustment of the spout, either in the matter of length by extending or collapsing the sections thereof, or in the matter of angular position relatively to the turntable platform 61, may be accomplished with equal ease whatever the position of the boom, either in a horizontal or vertical plane. Furthermore, in any position of the parts just referred to, such turntable platform 61 may be rotated in the horizontal plane, such rotation of course being of utility only where the spout is inclined from the vertical. However, rotation of the platform is then effective to distribute the material as it is discharged through the spout over a relatively large area. For example, where the vessel to be loaded lies with its median line or keel approximately directly beneath the spout head, it is possible, by swinging the spout in the fashion just described, to distribute the load transversely of the hold of the vessel so as to require practically no further trimming. At the same time a sufficient range for the discharge of the material longitudinally of the vessel is afforded to fill a substantial length thereof without relatively shifting either the machine or the vessel. Where necessary the boom 5 may, of course, be swung in a horizontal plane to further extend the range through which the material can be discharged longitudinally of the vessel.

As a particular section of the vessel becomes filled, the discharge spout will be gradually collapsed and if desired or necessary, the load may be discharged at a still higher level by elevating the outer end of the boom. Such elevation of the boom, due to the action of link 58, will not disturb the angular adjustment of the spout and such adjustment in turn may be varied irrespective of the angular position of the boom in a vertical plane.

It will be understood, of course, that any suitable form of conveyor may be employed for carrying the material from the inner to the outer end of the boom, depending upon the character of the material to be handled and upon the maximum angular inclination at which the boom may require to be held in operation. The machine is, of course, particularly adapted for use in reloading material from a dock onto a vessel, the base 1 in such case being adapted, as shown, to travel lengthwise of the dock so as to work from material stacked along such dock as where vessels have been unloaded by a Hulett unloader or like machine. However, as already pointed out, it is not intended to imply any limitation in the use of the machine to the particular situation referred to, but constructed on a smaller scale, it may be equally advantageously employed in handling materials in warehouses, and material storage yards of various kinds.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom and oscillable in a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing over said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, and means independent of an operator for holding said head in substantially vertical position.

2. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom and oscillable in both a horizontal and vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing over said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, and means independent of an operator for holding said head in substantially vertical position.

3. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom and oscillable in a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing over said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means independent of an operator for holding said head in substantially vertical position, and a frame attached to said head rotatable about a vertical axis.

4. In mechanism of the character de-

scribed, the combination of a suitable base, a boom supported therefrom oscillable in both a horizontal and vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means independent of an operator for holding said head in substantially vertical position, and a frame attached to said head rotatable about a vertical axis.

5. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom and oscillable in a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing over said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means independent of an operator for holding said head in substantially vertical position, and a telescopic spout hung below said head.

6. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom and oscillable in both a horizontal and vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing over said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means independent of an operator for holding said head in substantially vertical position, and a telescopic spout hung below said head.

7. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom, said boom being oscillatory in both a horizontal and a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout-head oscillatorily mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means adapted to oscillate said head upon vertical oscillation of said boom, whereby said head is at all times maintained in vertical position, a frame rotatably attached to said head about a vertical axis, and a discharge spout oscillatorily hung from said frame about a transverse axis.

8. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom, said boom being oscillatory in both a horinzontal and a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout-head oscillatorily mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means adapted to oscillate said head upon vertical oscillation of said boom, whereby said head is at all times maintained in vertical position, a frame including a horizontally projecting arm rotatably attached to said head about a vertical axis, a discharge spout oscillatorily hung from said frame about a transverse axis, an arm projecting from said spout in the same direction as the arm on said frame, sheaves in the outer ends of said arms, respectively, and a cable passing from said head around said sheaves, whereby the arm on said spout may be drawn towards the arm on said frame.

9. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom, said boom being oscillatory in both a horizontal and a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout-head oscillatorily mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means adapted to oscillate said head upon vertical oscillation of said boom, whereby said head is at all times maintained in vertical position, a frame including a horizontally projecting arm rotatably attached to said head about a vertical axis, a discharge spout oscillatorily hung from said frame about a transverse axis, an arm projecting from said spout in the same direction as the arm on said frame, sheaves in the outer ends of said arms, respectively, a cable passing from said head around said sheaves, whereby the arm on said spout may be drawn towards the arm on said frame, and compensating means whereby the length of the cable portion thus passing around said sheaves remains the same irrespective of rotation of said head.

10. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom, said boom being oscillatory in both a horizontal and a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout-head oscillatorily mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means adapted to oscillate said head upon vertical oscillation of said boom, whereby said head is at all times maintained in vertical position, a frame including a horizontally projecting arm rotatably attached to said head about a vertical axis, a discharge spout oscillatorily hung from said frame about a transverse axis, an arm projecting from said spout in the same direction as the arm on said frame, sheaves in the outer ends of said arms, respectively, a cable passing from said head around said sheaves, where-

by the arm on said spout may be drawn towards the arm on said frame, and compensating means whereby the length of the cable portion thus passing around said sheaves remains the same irrespective of rotation of said head, said means including a fixed ring and a floating ring mounted on said head concentric with its vertical axis, said cable being attached at one end to said fixed ring, thence passing over said sheave and back around said floating ring.

11. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom, said boom being oscillatory in both a horizontal and a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout-head oscillatorily mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means adapted to oscillate said head upon vertical oscillation of said boom, whereby said head is at all times maintained in vertical position, a frame rotatably attached to said head about a vertical axis, a telescopic discharge spout oscillatorily hung from said frame about a transverse axis, sheaves attached to the inner and outer sections of said spout, and a cable passing from said head around said sheaves, whereby the length of said spout may be adjusted.

12. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom, said boom being oscillatory in both a horizontal and a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout-head oscillatorily mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means adapted to oscillate said head upon vertical oscillation of said boom, whereby said head is at all times maintained in vertical position, a frame rotatably attached to said head about a vertical axis, a telescopic discharge spout oscillatorily hung from said frame about a transverse axis, sheaves attached to the inner and outer sections of said spout, a cable passing from said head around said sheaves, whereby the length of said spout may be adjusted, and compensating means whereby the length of the cable portion thus passing around said sheaves remains the same irrespective of rotation of said head.

13. In mechanism of the character described, the combination of a suitable base, a boom supported therefrom, said boom being oscillatory in both a horizontal and a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout-head oscillatorily mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means adapted to oscillate said head upon vertical oscillation of said boom, whereby said head is at all times maintained in vertical position, a frame rotatably attached to said head about a vertical axis, a telescopic discharge spout oscillatorily hung from said frame about a transverse axis, sheaves attached to the inner and outer sections of said spout, a cable passing from said head around said sheaves, whereby the length of said spout may be adjusted, and compensating means whereby the length of the cable portion thus passing around said sheaves remains the same irrespective of rotation of said head, said means including a fixed ring and a floating ring mounted on said head concentric with its vertical axis, said cable being attached at one end to said fixed ring, thence passing over said sheaves and back around said floating ring.

14. In mechanism of the character described, the combination of a suitable base, a tubular turn-table center on said base, a boom pivotally attached to said center about a transverse axis, a radially projecting arm on said center, a segmental rack concentric with said center, a motor carried by said arm and intergeared with said rack, whereby said center and thus said boom may be oscillated, a discharge spout depending from the outer end of said boom and oscillatory with respect thereto, and cable connections for oscillating said spout extending from the outer end of said boom to said center and passing downwardly through the latter.

15. In mechanism of the character described, the combination of a suitable base, a tower structure rising from said base, a tubular center on the latter, a boom pivotally attached to said center about a transverse axis, a radially projecting arm on said center, a segmental rack concentric with said center, a motor carried by said arm and intergeared with said rack, whereby said center and thus said boom may be oscillated, a conveyor extending along said boom, a discharge spout depending from the outer end of said boom, said spout being both oscillatory about a transverse axis and rotatable about a vertical axis, cable connections from a point in said tower to the outer end of said boom for oscillating the latter in a vertical plane, and cable connections for oscillating and rotating said spout, respectively, extending from the outer end of said boom to said center and passing downwardly through the latter.

16. In mechanism for loading a vessel from a dock, the combination of a base movable along a dock, a tower structure on said base, a boom supported therefrom and oscillable in a vertical plane, drums at the respective ends of said boom rotatable about

transverse axes, an endless conveyor passing around said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, and means independent of an operator for holding said head in substantially vertical position.

17. In mechanism for loading a vessel from a dock, the combination of a base movable along such dock, a tower structure on said base, a boom supported therefrom and oscillable in both a horizontal and vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, and means independent of an operator for holding said head in substantially vertical position.

18. In mechanism for loading a vessel from a dock, the combination of a base movable along such dock, a tower structure on said base, a boom supported therefrom and oscillable in a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means independent of an operator for holding said head in substantially vertical position, and a frame attached to said head rotatable about a vertical axis.

19. In mechanism for loading a vessel from a dock, the combination of a base movable along such dock, a tower structure on said base, a boom supported therefrom and oscillable in both a horizontal and vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means independent of an operator for holding said head in substantially vertical position, and a frame attached to said head rotatable about a vertical axis.

20. In mechanism for loading a vessel from a dock, the combination of a base movable along such dock, a tower structure on said base, a boom supported therefrom and oscillable in a vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means independent of an operator for holding said head in substantially vertical position, and a telescopic spout hung below said head.

21. In mechanism for loading a vessel from a dock, the combination of a base movable along such dock, a tower structure on said base, a boom supported therefrom and oscillable in both a horizontal and vertical plane, drums at the respective ends of said boom rotatable about transverse axes, an endless conveyor passing around said drums, a spout head oscillably mounted in the outer end of said boom about the axis of the corresponding conveyor drum, means independent of an operator for holding said head in substantially vertical position, and a telescopic spout hung below said head.

Signed by me, this 7th day of November, 1922.

MAHLON E. FIRST.