July 22, 1952 L. B. NEIGHBOUR ET AL 2,604,203

FRAME AND SUPPORTING STRUCTURE FOR GRAIN ELEVATING MACHINES AND THE LIKE

Filed Nov. 19, 1948 2 SHEETS—SHEET 1

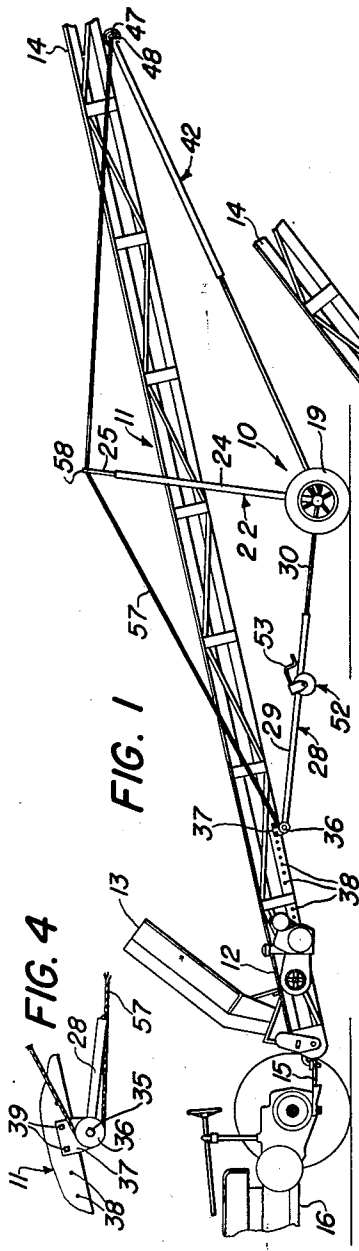


FIG. 1

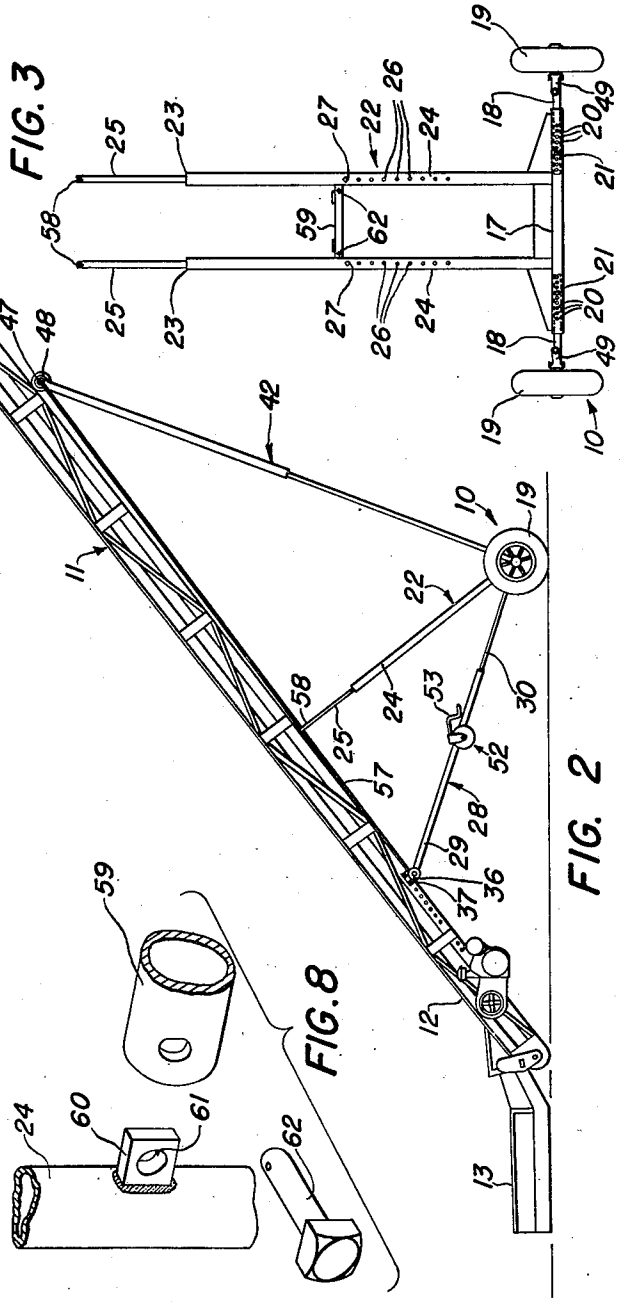


FIG. 2

FIG. 3

FIG. 4

FIG. 8

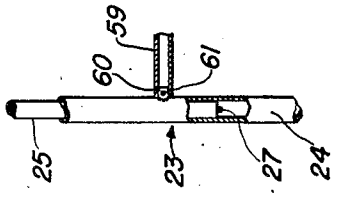


FIG. 5

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FIG. 6

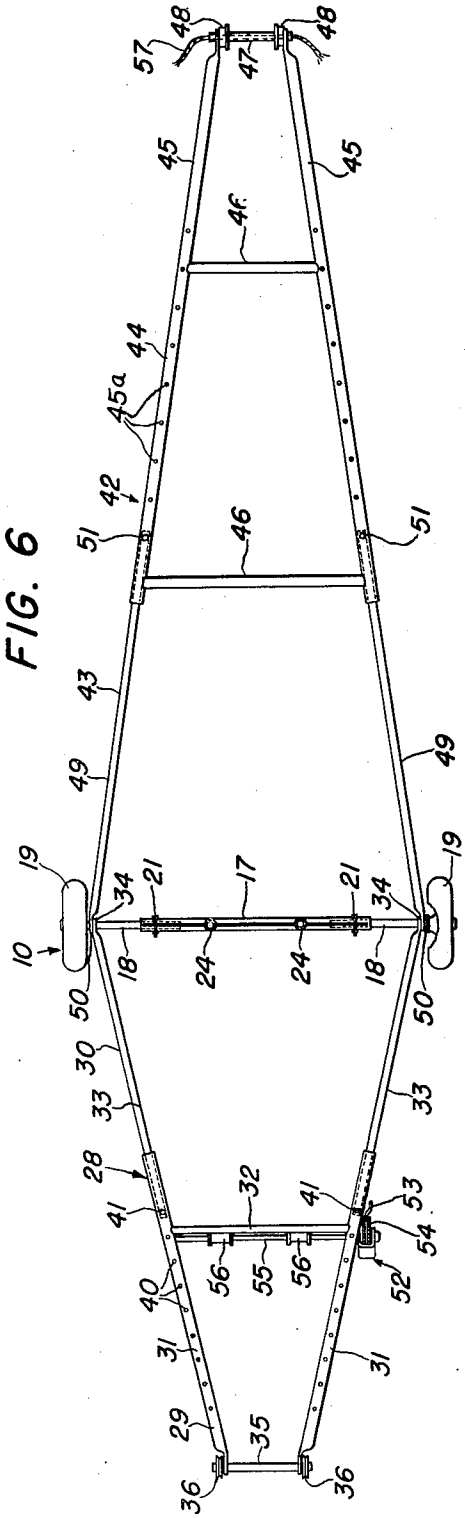
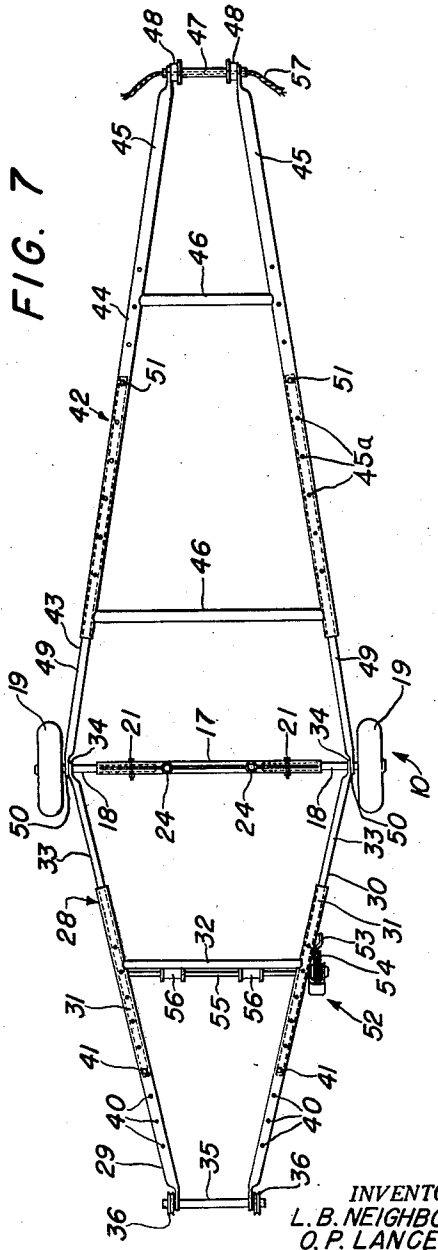


FIG. 7



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FRAME AND SUPPORTING STRUCTURE FOR GRAIN ELEVATING MACHINES AND THE LIKE

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17 Claims. (Cl. 198—233)

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This invention relates to a material-handling device or apparatus of the portable type used on farms, for example, for the elevating of grain and similar material. More particularly, the invention relates to improved frame and supporting structure for carrying the inclined elevating element of the machine.

A typical elevator of the type referred to ordinarily comprises a wheeled truck which provides a base for an elongated elevator and includes means for elevating or depressing the elevator for varying the inclination of the elevator with respect to the horizontal. It is an important object of the present invention to improve the supporting structure so that the elevator has proper stability and balance regardless of its angle of inclination. Another important object is to provide supporting or frame structure which is adjustable to accommodate elevators of different lengths.

The usual elevator supporting structure includes frame elements providing a transverse axle, a derrick for raising the elevator and a reach connected between the axle and the receiving end portion of the elevator, together with mechanism for elevating the derrick to raise the elevator and for lowering the derrick to lower the elevator. It is usual in such construction to provide a vertical structure commonly called a mast and to include in the raising and lowering mechanism cable means or the like having connections with the mast, with a suitable winding mechanism, and with the derrick. It is desirable in elevators of this type that the mast structure be so provided that it does not interfere with the operation of the elevator when used to handle bales of hay, straw or the like. According to the present invention, the mast structure is so arranged that its upper end portion normally occupies a position below the upper level of the elevator so that bales or the like will have an unobstructed passage up the elevator.

The relation of the winding mechanism to the derrick by means of the cable is ordinarily such that substantial column loads are imposed on the mast, at least during initial raising of the elevator. In constructions heretofore known, the column loading of the masts was relieved after the elevator assumed a predetermined angle; however, the masts were then placed in tension and the usual result was increased cable loading. A feature of the present invention is a mast structure comprising a pair of relatively separable sections which are related in such manner as to assume column loading but are separable for elongation when the elevator assumes a position at or beyond a predetermined angle, thereby relieving the mast structure of either column or tension loading and further lightening the cable loads.

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A further and important object of the invention is to provide a relationship between the derrick, the reach means, and the axle means so that lengthening or shortening of the derrick and reach means will be accompanied by lengthening and shortening of the axle means, whereby the tread of the wheels on the supporting truck will be varied. In other words, the transverse spacing between the wheels is increased as the length of the derrick and reach means is increased in accordance with the use of elevators of increased lengths.

Since balance and stability of the elevator are important, the construction contemplated by the present invention involves further the feature of an adjustable connection between the reach means and the elevator proper so that the weight at the receiving end of the elevator may be balanced with respect to the weight at the discharge end of the elevator. Ordinarily, if the receiving end of the elevator is too heavy, it is difficult to maneuver the elevator in setting the same up for use. Further, increased weight at the receiving end of the elevator imposes an additional and undesirable load on a tractor or other vehicle used for transporting the elevator.

In general, the invention has for its principal object the provision of an elevator having increased stability and balance, portability, and features contributing toward the easy assembly and disassembly thereof.

Further important objects and desirable features inherent in and encompassed by the invention will become apparent to those versed in the art as a preferred form of the invention is fully disclosed in the following specification and accompanying sheets of drawings, in which

Figure 1 is a side elevational view of the elevator, shown in transport position and connected to a tractor;

Figure 2 is a side elevational view of the elevator set up for operation;

Figure 3 is a detailed view, on a slightly enlarged scale, of the axle and mast structures;

Figure 4 is a fragmentary view on a slightly enlarged scale, showing the connection of the reach means to the elevator proper;

Figure 5 is a fragmentary view, partly in section and on an enlarged scale, showing the adjustability of the mast sections and a transverse

member which may be removed for setting up the elevator and which may be installed for sustaining the elevator in transport position;

Figure 6 is a plan view showing the frame or base structure with its components in their fully extended positions;

Figure 7 is a plan view similar to that appearing in Figure 6 but illustrating the components in shortened relative positions, and

Figure 8 is a perspective exploded view showing the interconnection between a portion of the mast and a transverse removable member.

In general design, the elevator illustrated herein follows conventional construction, in so far as its appearance is concerned. It will be appreciated, of course, that the various details illustrated and about to be described may be modified according to individual desires, without departing from the spirit and scope of the invention.

The elevator comprising the material-handling device chosen for the purposes of illustration and description may be said to include, generally and briefly, a base or supporting structure **10** on which is carried an elevator element **11**. The elevator is carried on the base element **10** by means providing for elevation or depression of the elevator through various angles of inclination to the horizontal. The lower or forward end of the elevator comprises a receiving or boot end **12**, shown here as having associated therewith a wagon-unloading hopper **13**. The opposite or rear upper end of the elevator element **11** comprises a discharge end portion **14**, with which is ordinarily associated a discharge hopper or chute, not shown here since it forms no part of the present invention and representative types of such are familiar to those versed in the art. The boot end of the elevator may have a suitable hitch **15** by means of which the elevator may be connected to a tractor **16** for transportation thereof.

The frame structure or base element **10** comprises a transverse member providing axle means **17**, here shown as being tubular and of substantial extent in a direction transverse to the length of the elongated elevator element **11**. The axle means includes a plurality of elements or members, the central one of which is comprised by the member **17** and two outer ones of which are each in the form of a short axle member or spindle **18**. Each spindle has journaled thereon a wheel **19**, which provides means for carrying the frame or base element **10** on the ground.

Each spindle **18** is telescopically received by the proximate end of the tubular axle means **17**, and the latter has a plurality of axially spaced apertures **20** for selectively receiving a securing means in the form of a bolt or pin **21**. The spindles are provided respectively with apertures or bores for selective alignment with any of the apertures or openings in the axle means **17**, whereby the transverse spacing between, or tread of, the wheels **19** may be varied or adjusted. The relationship of the components **20** and **21** and the apertures in the spindles **18** is such as to provide disconnectible or releasable securing means for securing the spindles **18** in selected positions of adjustment.

The axle means **17** is provided intermediate the wheels **19** with upright supporting or mast structure designated generally by the numeral **22**. The mast comprises a pair of upright, laterally spaced apart side elements **23**, each of which includes a lower section **24** and an upper section **25**. The lower sections are preferably tubular and receive the upper sections **25** telescopically therein. Each lower section has a plurality of openings or apertures **26**, any one of which may receive a securing means in the form of a pin or bolt **27**. The construction is such (Figure 5) that the lower end of an upper section **25** rests on or is sustained by the pin **27**. For purposes that will be hereinafter explained, the number of apertures **26** in each of the lower sections **24** is equal to the number of apertures in each end portion of the axle means **17**.

The pin **27** is part of a disconnectible or releasable securing means for interconnecting the upper and lower mast sections and is so arranged that the proximate upper section **25** is free to move upwardly but not downwardly with respect to the lower section. In other words, the pin **27** provides a limit or abutment means. Therefore, the mast is capable of column loading but cannot be placed in tension, inasmuch as the upper sections may pull out of the lower sections. The importance of this feature will appear below.

The axle means is connected to the receiving end portion **12** of the elevator element **11** by reach means designated generally by the numeral **28**. As best shown in Figures 6 and 7, the reach means comprises a pair of relatively adjustable sections, one being a forward section **29** and the other a rearward section **30**. The forward section includes a pair of forwardly converging, tubular side members **31** rigidly cross connected adjacent their rear ends by a transverse member **32**. The rear section **30** comprises a pair of forwardly converging side members **33**, which are respectively telescopically received by the tubular members **31**. The rear end portions of the side members **33** are pivotally connected to the axles at **34**. The forward ends of the side members **31** of the front reach section **29** carry a transverse shaft **35** which has at each of its outer ends a sheave **36**. The transverse shaft **35** provides means for pivotally connecting the forward end of the front reach section **29** to a pair of transversely spaced brackets **37** (only one of which appears in Figures 1, 2 and 4) by means of which the reach is connected to the forward or boot end portion **12** of the elevator element **11**. This portion of the elevator element has at each side a plurality of openings **38** spaced lengthwise of the elevator and selectively adapted to receive securing means in the form of bolts **39** for securing the brackets **37** to the elevator in selected positions of longitudinal adjustment. This feature contributes to the means for selectively balancing the elevator according to the length thereof or the height at which the same is operated.

The front and rear reach sections **29** and **30** are relatively extensible or contractible so that the over-all length of the reach may be increased or shortened. For this purpose, each of the members **31** of the front reach section has a plurality of longitudinally spaced apertures **40**, here shown as being nine in number to correspond with the nine openings **20** and **26** in the axle and mast components respectively. The forward end of each member **33** of the rear reach section **30** has an aperture to receive securing means in the form of a bolt or pin **41** which may be selectively passed through any of the apertures **40**.

Inasmuch as the angle of convergence of the members **31** is fixed by the rigid cross connection thereof by the transverse member **32**, the angle of convergence of the members **33** will likewise be fixed. The entire reach structure is in the

form of a triangular construction having a truncated apex. Accordingly, when the members 33 are adjusted inwardly or outwardly with respect to the members 31, the transverse spacing between the rear ends 34 of the members 33 will vary. It is for this reason that the adjustability has been provided in the axle means at 20—21. In other words, when it is desired to vary the length of the reach 28, the bolt or pin 21 must be removed from the axle means 17—18. As the reach is shortened, the end portions 34 move inwardly, thus narrowing the tread of the wheels 19. Conversely, if the reach is lengthened, the end portions 34 move laterally farther apart, thus increasing the tread of the wheels 19.

The connection of the bolts 41 respectively between the members 31 and 33 is such as to interconnect the members for both tension and compression loading. It will be noted, from the description that follows, that the reach 28 is placed in compression when the elevator element 11 is raised or lowered.

A further component of the frame or base element 10 comprises a derrick indicated generally by the reference numeral 42. As best shown in Figures 6 and 7, the derrick includes a lower or forward section 43 and a rear or upper section 44. The rear section comprises a pair of tubular side members 45 that converge rearwardly and that are rigidly cross-connected by a pair of transverse members 46. The rear end portions of the members 45 carry a transverse shaft 47 at each of the outer ends of which is a roller or track guide 48. As best shown in Figures 1 and 2, these rollers engage the under portion of the elevator element 11 and sustain the latter on the derrick 42. The front derrick section 43 comprises a pair of rearwardly converging members 49 which are pivotally connected at 50 to the spindles 18 of the axle means 17. The members 49 are respectively telescopically received by the tubular members 45 and the latter have a plurality of longitudinally spaced apertures or openings 45a, each set of openings being nine in number to correspond with the sets of openings previously described in connection with the axle, mast, and reach members. The rear ends of the members 49 are apertured for the respective reception of securing means in the form of bolts or pins 51 for interconnecting the reach sections 43 and 44 in any selected position of relative longitudinal adjustment.

The derrick, like the reach, is of triangular construction having a truncated apex. Inasmuch as the angle of convergence of the side members 45 is fixed by the rigid cross connections 46, the angle of convergence of the members 49 is likewise fixed. Therefore, as the members 49 telescope inwardly and outwardly with respect to the members 45, the transverse spacing between the end portions 50 will vary. However, the adjustability of the axle accommodates the variations in spacing between the portions 50, just as the adjustability of the axle accommodates the variations in spacing of the end portions 34 of the side members 33 of the rear reach section 30.

For the purpose of elevating and depressing the elevator, the apparatus includes raising and lowering mechanism including winding mechanism, designated generally by the numeral 52. Any suitable type of winding mechanism may be utilized. That shown includes a crank 53 which operates a worm gear 54 on a transverse shaft 55 carried by the front reach section 31 and including a pair of winding drums 56. A cable 57 at each side of the structure constitutes extensible and contractible means for moving the derrick 42 about its pivotal connection 50 with the axle means 17—18. Each cable is wound partly on the proximate winding drum 56, extends forwardly and is trained about the proximate sheave 36 at the forward end of the reach 28 and then extends rearwardly to the upper portion of the mast, at which point it is preferably secured at 58. The cable extends rearwardly for connection to the rear end portion of the derrick 42. The connection of the cable 57 to the rear end portion of the derrick may be made in any suitable manner. In a preferred construction, the transverse shaft 47 may be hollow and the cable may extend therethrough (Figures 6 and 7) so that a single length of cable may be used for both sides of the machine.

Another feature of the invention is the means for sustaining the load of the elevator on the mast 22 during transportation thereof. This means preferably comprises a transverse tubular supporting member 59 which is removably supported between the lower mast sections 24 (Figures 3 and 5). Each mast section 24 has secured thereto, preferably by welding, a lug 60 having an aperture 61 therein. The lug is preferably in the form of an ordinary blank nut having an aperture (Figure 8). Opposite end portions of the transverse member 59, being hollow and somewhat larger than the lugs, provide recesses for loosely receiving the lugs 60. These end portions are apertured for alignment respectively with the lug apertures 61, and the aligned apertures may receive securing means in the form of pins or bolts 62 for securing the transverse member in place. The transverse member is disposed at a sufficient height above the bottom portions of the mast sections 24 so that, after the pins 62 are removed, the mast sections may be sprung laterally apart to withdraw the lugs and release the transverse member. The member may then be removed so that the elevator element 11 may be lowered completely to the axle means 17. This construction is an important aid in assembling or disassembling the elevator. For example, in the assembly, the truck or base section can be set up with the elevator element 11 resting on the transverse axle means 17 between the elements of the mast 22. The remainder of the structure may then be assembled and the elevator element raised to a point sufficient to allow installation of the transverse member 59. In other words, if the member 59 were permanently connected between the opposite elements of the mast, it would be necessary to set up the elevator with the elevator element at a substantial angle, which would not be only difficult but hazardous.

The operation of the elevator and the importance of the frame or supporting structure thereto may be best understood by first comparing Figures 1 and 2. In Figure 1, the elevator element is in its transport position, preferably sustained by the transverse element or member 59 between the mast elements. When it is desired to set up the elevator for operation, the boot end is disconnected from the tractor and is allowed to rest on the ground, as shown in Figure 2. The winding mechanism is operated to swing the derrick means forwardly and upwardly, thus resulting in elevating the elevator element 11. Inasmuch as the stop pins or bolts 27 limit downward movement of the upper mast sections 25, the mast is capable of taking column loading and

increasing the leverage or mechanical advantage for initially elevating the elevator element. This result will be obvious from an examination of Figure 1. In other words, the sheave **36**, connecting point **58**, and connecting point provided by the transverse shaft **47**, provide three connecting points respectively at the apices of an imaginary triangle. As the cable **57** is tightened, the three points approach a straight line, so that when the position of Figure 2 is reached, the cable **57** is exerting a straight line pull between the points **36** and **47**.

It will be noted that in Figure 1 the upper portion of the upper mast section **25** is a substantial distance above the upper level of the elevator element **11**, whereas, in Figure 2, the upper portion of the mast is below the upper level of the elevator. The automatic removal of the upper portions of the mast elements from positions in which they project upwardly beyond the upper level of the elevator eliminates these portions as obstacles to the passage up the elevator of bulky objects, such as bales of hay or straw. Although such result (non-obstruction) is obtainable in some prior constructions, the arrangement of the mast is such that the mast is placed in tension after the elevator passes a predetermined angle. In other words, three points comparable to **36**, **58** and **47** not only approach a straight line but pass to the other side of such straight line so that the imaginary triangle of which these three points are apices is inverted. Such result not only places tension loading on the mast but undesirably increases cable loads. According to the present invention, the telescopic relationship of the upper portion of the mast to the lower portion provides that the upper portion may pull out of the lower portion, being, of course, still guided by the lower portion so that complete separation is impossible. Hence, after the maximum angle has been passed, the cable will exert a straight pull between the points **36** and **47**, which is entirely in accord with the ability of the lifting structure, since the initial mechanical advantage achieved by the relationship of the parts shown in Figure 1 is no longer needed.

As previously stated, an important feature of the invention is the adjustability of the reach and derrick means whereby increase in length of these means automatically requires an increase in the transverse spacing between the wheels **19**, all of which means that the frame structure has increased stability as the length of the elevator is increased. In this respect, it will be understood that the elevator element **11** is made up of a plurality of detachable sections which may be increased or decreased in number to vary the length of the elevator. Normally, the elevator will be increased in increments of two feet and provision is made in the present case for the variation of length within nine increments. Therefore, there are provided the sets of nine openings at **20**, **26**, **40** and **50**.

It will be found that the addition of sections to increase the length of the elevator will ordinarily be made at the rear or discharge end. Consequently, the addition of sections will tend to lighten the boot end. Undesirable over-balance in this respect may be obviated by changing the position of the connection of the reach **28** to the forward portion **12** of the elevator by means of the adjustable securing means **37—38—39**.

Increase in length of the reach means and derrick means, accompanied by increase in the tread of the wheels **19**, is not automatically followed by increase in length of the mast; however, the length of the mast should be increased in the same increments used in increasing the length of the axle, reach, or derrick.

Another important advantage of the construction provided by the adjustable reach, derrick, and axle is the use of tubular members. Not only are such members inherently stronger than the ordinary angle members used in prior constructions, but the fact that the axle is adjustable to accommodate adjustment in length in the reach and derrick means enables the rigid cross bracing of one section of each of the reach and derrick means, all of which results in a frame better able to resist twisting strains.

Other features of the invention not specifically enumerated or pointed out above will undoubtedly occur to those versed in the art, as will many modifications and alterations in the preferred form of the invention illustrated and described, all of which may be achieved without departing from the spirit and scope of the invention.

What is claimed is:

1. Frame structure for material-handling apparatus or the like having an elongated elevator, comprising: axle means disposed transversely as respects the length of the elevator and including a pair of relatively extensible and retractible parts for respectively carrying wheels so that the tread of such wheels is adjustable according to relative extension or retraction of said parts; a supporting frame extending generally normal to the axle means and including a pair of elongated frame elements having a pair of ends adjacent the axle means and converging to a pair of ends remote from the axle means, each element comprising first and second relatively extensible and retractible members; means connecting the first or axle-adjacent members respectively to the axle parts; means rigidly cross-connecting the second members to maintain the angle of convergence of the second members; means guiding the first members on the second members to maintain the angle of convergence of the first members; and releasable means normally holding the axle parts against extension or retraction but releasable to provide for such extension or retraction to accommodate wheel tread variation as the members of the frame elements are extended or retracted.

2. Frame structure for material-handling apparatus or the like having an elongated elevator, comprising: supporting means disposed transversely as respects the length of the elevator and including a pair of relatively extensible and retractible parts for carrying ground-engaging means respectively thereon so that the spacing between such ground-engaging means is therefore adjustable according to relative extension or retraction of said parts; a supporting frame extending generally normal to the supporting means and including a pair of elongated frame elements having a pair of ends adjacent the supporting means and another pair of ends remote from the supporting means, said elements converging from one pair of ends to the other, each element comprising first and second relatively extensible and retractible members; means connecting the first or supporting-means-adjacent members respectively to the supporting means parts; means rigidly cross-connecting the second members to maintain the angle of convergence of the second members; means guiding the first members on the second members to maintain the angle of convergence of the first members; and

releasable means normally holding the supporting means parts against extension or retraction but releasable to provide for such extension or retraction to accommodate variations in the spacing between the ground-engaging means as the members of the frame elements are extended or retracted.

3. Frame structure for material-handling apparatus or the like having an elongated elevator, comprising: a tubular axle disposed transversely as respects the length of the elevator; a wheel spindle telescopically carried by each end of the axle for extension or retraction axially of the axle so that the tread of wheels carried respectively by the spindles is variable as the spindles are adjusted with respect to the axle; a frame of substantially triangular construction having the axle and spindles as its base and including side elements converging to a truncated apex remote from the axle, each side element including a pair of telescopically arranged, extensible and retractible members for lengthening or shortening the frame as respects the altitude of the triangular construction; means fixing the axle-adjacent members respectively to the spindles; means rigidly cross-connecting the axle-remote members to maintain the angle therebetween regardless of adjustment thereof as respects the axle-adjacent members; and means lockable to hold the spindles against extension or retraction but releasable to accommodate such movement as the side element members are extended or retracted.

4. Frame structure for material-handling apparatus or the like having an elongated elevator, comprising: base means including interconnected sections arranged for relative extension and retraction in a direction generally transverse to the length of such elevator for varying the width of the base means; supporting means extending from the base means generally normal to said transverse direction and including interconnected sections arranged for relative extension and retraction to vary the length of the supporting means; and means interconnecting the base means and the supporting means for extending and retracting the sections of one means in response to extension or retraction of the sections of the other means.

5. Frame structure for material-handling apparatus or the like having an elongated elevator, comprising: a truck having a pair of sections respectively including wheel-carrying means and interconnected for relative extension and retraction in a direction generally transverse to the length of such elevator for varying the tread of wheels on the wheel-carrying means; a support extending from the truck in a direction generally normal thereto and including a pair of sections interconnected for relative extension and retraction to vary the length of the support; and means interconnecting the support and the truck for extending and retracting the wheel-carrying means and thus varying the tread of wheels carried thereby in response to varying of the length of the support.

6. In a material-handling apparatus of the type having an elongated elevator inclining upwardly from a receiving end adjacent to ground to an elevated discharge end: supporting structure therefor, comprising a truck disposed below the elevator and intermediate the ends thereof and having a pair of wheel-carrying means adjustable toward and away from each other along a line transverse to the length of the elevator; reach means extending between the truck and the receiving end of the elevator and including adjustable sections for varying the length of the reach means; means interconnecting the reach means and the truck for adjusting the wheel-carrying means simultaneously with adjustment of the reach means; derrick means extending from the truck toward the delivery end of the elevator and including adjustable sections for varying the length of the derrick means; and means interconnecting the truck and derrick means for adjusting the length of the derrick means simultaneously with adjustment of the wheel-carrying means.

7. In a material-handling apparatus of the type having an elongated elevator inclining upwardly from a receiving end adjacent to ground to an elevated discharge end: supporting structure therefor, comprising a truck disposed below the elevator and intermediate the ends thereof and having axle parts adapted to carry wheels and arranged for adjustment to vary the tread of such wheels; reach means of generally triangular construction having the truck as its base and extending to a generally truncated apex adjacent the receiving end of the elevator, said reach means including a pair of sections interconnected for relative extension and retraction to vary the length of the reach means; means interconnecting one of the reach sections and the axle parts to provide for variations in wheel tread simultaneously with variations in the length of the reach means; derrick means of generally triangular construction having the truck as its base and extending to a generally truncated apex adjacent the delivery end of the elevator, and including a pair of sections interconnected for relative extension and retraction to vary the length of the derrick means; and means interconnecting one of said derrick sections and the axle parts for varying the length of the derrick simultaneously with varying of wheel tread.

8. Material-handling apparatus, comprising: an elongated elevator having receiving and delivery end portions; a truck beneath the elevator and intermediate the ends thereof; reach means extending lengthwise between and having opposite end portions articulately connected to the truck and to the receiving end portion of the elevator; derrick means extending from the truck toward the delivery end of the elevator and having one end pivoted to the truck on a transverse axis and its other end sustaining the delivery end portion of the elevator from below and movable fore and aft along the elevator to raise and lower the elevator to effect variations in the angle thereof to the horizontal as the derrick means swings about its axis on the truck; mast means extending upwardly from the truck and having a lower section pivoted to the truck on a transverse axis and an upper section telescopically arranged on the lower section; means sustaining the upper section in a limited downward position on the lower section but providing for upward movement of the upper section; means including a load-supporting connection between the upper mast section and the derrick so that swinging of the mast is accompanied by swinging of the derrick; means including an extensible and retractible load-supporting connection between the mast means and a portion of the elevator at the receiving end side of the mast; and means for extending and retracting said last named load-supporting connection to swing the mast to vary the angle of the elevator, said

telescopic arrangement of the mast sections providing for upward movement of the upper section relative to the lower section as the angle of the elevator increases beyond a predetermined point.

9. Material-handling apparatus, comprising: a base element; an elongated elevator element fulcrumed on the base element for elevation and depression; an upright mast on the base element, including an upwardly shiftable section normally sustained by the base element in a lowered, column-load-sustaining position and providing a first loading point higher than the elevator element when the elevator element is depressed below a certain angle; derrick means pivoted on the base element and sustaining the elevator, and arranged for raising and lowering to elevate and depress the elevator, said derrick including a second loading point lower than the aforesaid first point when the elevator element is depressed below said predetermined angle; means on one of the elements providing a third loading point lower than the first loading point, said three points forming generally the apices of a triangle with the first point the highest apex when the elevator element is depressed below the aforesaid predetermined angle; and tension-load-supporting means including a first part connected between the first and second points and a second part connected between the first and third points, at least one of said parts being contractible to impose column-loading on the mast for raising of the derrick so that the second point moves upwardly and the three points approach a straight line including the first and third points as the elevator element is elevated to the aforesaid predetermined angle, said mast section thereafter shifting upwardly as aforesaid to relieve the mast of column loading and to apply tensional loading directly through the tension-load-supporting means.

10. The invention defined in claim 9, further characterized in that: selectively adjustable means is provided in the mast for varying the lowered, column-load-sustaining position of the mast and hence varying the height of the first loading point.

11. Material-handling apparatus, comprising: a base having a first pair of interconnected sections arranged for varying the length of the base and a second pair of interconnected sections arranged to vary the width of the base; means interconnecting certain of the sections for increasing the width of the base simultaneously with increase in length thereof; an elevator fulcrumed on one of the first sections for elevation and depression; a derrick pivoted to the other of the first sections and sustaining the elevator, and including interconnected parts arranged to vary the length of the derrick; means connecting at least one of said parts with certain of the base sections to effect variations in derrick length in accordance with variations in length and width of the base; and means on the base for elevating the derrick, including upright supporting structure, and means mounting said structure on the base for vertical adjustment independently of variations in the base or derrick.

12. In a material-handling device of the type having a base, an inclined elevator, and a pair of mast elements carried by and extending upwardly from the base, one at each side of the elevator: the improvement comprising a pair of lugs rigidly secured to the mast elements, one on each element and projecting horizontally and facing each other, each lug being relatively short in a horizontal direction and having an aperture therein; a transverse bar disposed crosswise between the mast elements and having opposite end portions respectively receiving the lugs, said end portions being apertured respectively for alignment with the lug apertures; and a pair of securing members, one for each lug, passed through said aligned apertures and through the lug apertures.

13. The invention defined in claim 12, in which: the opposite end portions of the bar are recessed and the lugs are smaller than and respectively loosely received in said recessed end portions so that the bar may have limited movement relative to the mast element.

14. Frame structure for material-handling apparatus or the like having an elongated elevator, comprising: a pair of relatively extensible and retractible frame sections, one of which includes a pair of converging tubular members rigidly cross-braced to fix the angle of convergence, and the second of which includes a pair of members respectively telescopically received by the tubular members and extensible and retractible relative thereto; and means for releasably securing said members in selected positions of extension or retraction.

15. In a material-handling device including means providing a base on which an elevator is carried for elevation and depression, the improvement comprising: upright mast structure carried by the base and including a pair of upright, spaced apart members disposed with the elevator therebetween, said members being sufficiently resilient to provide for spreading thereof from and return to normal spacing; a transverse member of substantially sufficient length to fit between the normally spaced mast members and below the elevator in position to limit depression of the elevator; and means releasably connecting the transverse member to the mast members for release thereof to provide for further depression of the elevator, said releasable means including elements on the mast members respectively engaging end portions of the transverse member when the mast members are normally spaced and respectively disengageable when the mast members are spread.

16. Frame structure for material-handling apparatus or the like having an elongated elevator, comprising: base means including interconnected sections arranged for relative extension and retraction in a direction generally transverse to the length of such elevator for varying the width of the base means; supporting means having a first end proximate to the base and extending from the base means generally normal to said transverse direction to a second end remote from the base, and including interconnected sections arranged for relative extension and retraction to vary the distance between said first and second ends; and means adjustably mounting the first end of the supporting means on the base means and providing for varying the width of said base end.

17. Frame structure for material-handling apparatus or the like having an elongated elevator, comprising: axle means disposed transversely as respects the length of the elevator and including a pair of relatively extensible and retractible axle parts for respectively carrying wheels, so that the tread of such wheels is adjustable according to relative extension or retraction of said parts; a supporting frame extending

generally normal to the axle means and including a pair of elongated frame elements having a pair of ends adjacent the axle means and a pair of ends remote from the axle means; means adjustably connecting the axle-adjacent ends of the members to the axle means to vary the transverse spacing between said axle-adjacent ends; and means at the axle-remote ends of the members for supporting the elevator.

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