May 12, 1959 L. O. FUNDERBURK, JR 2,886,189

APPARATUS FOR HANDLING CONCRETE AGGREGATES

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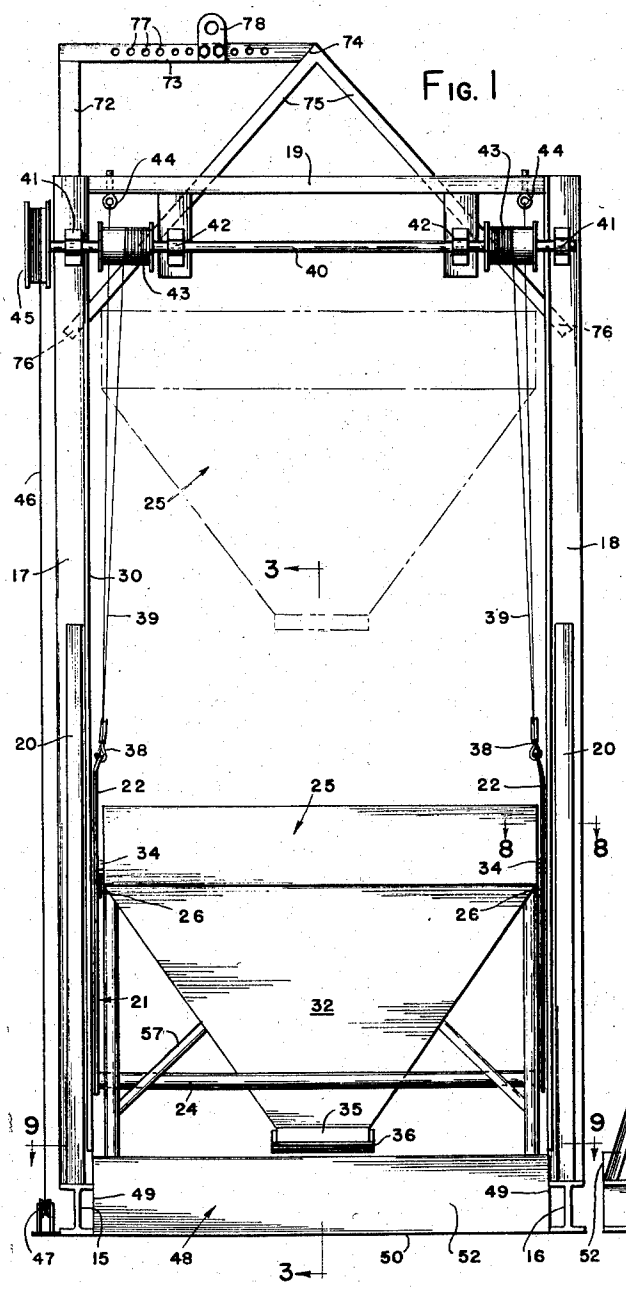


FIG. 1

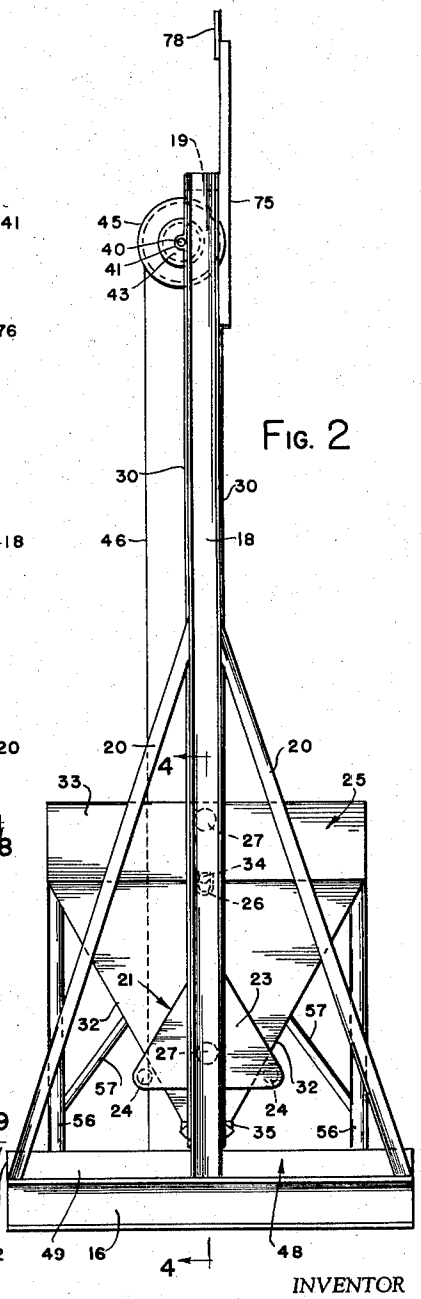


FIG. 2

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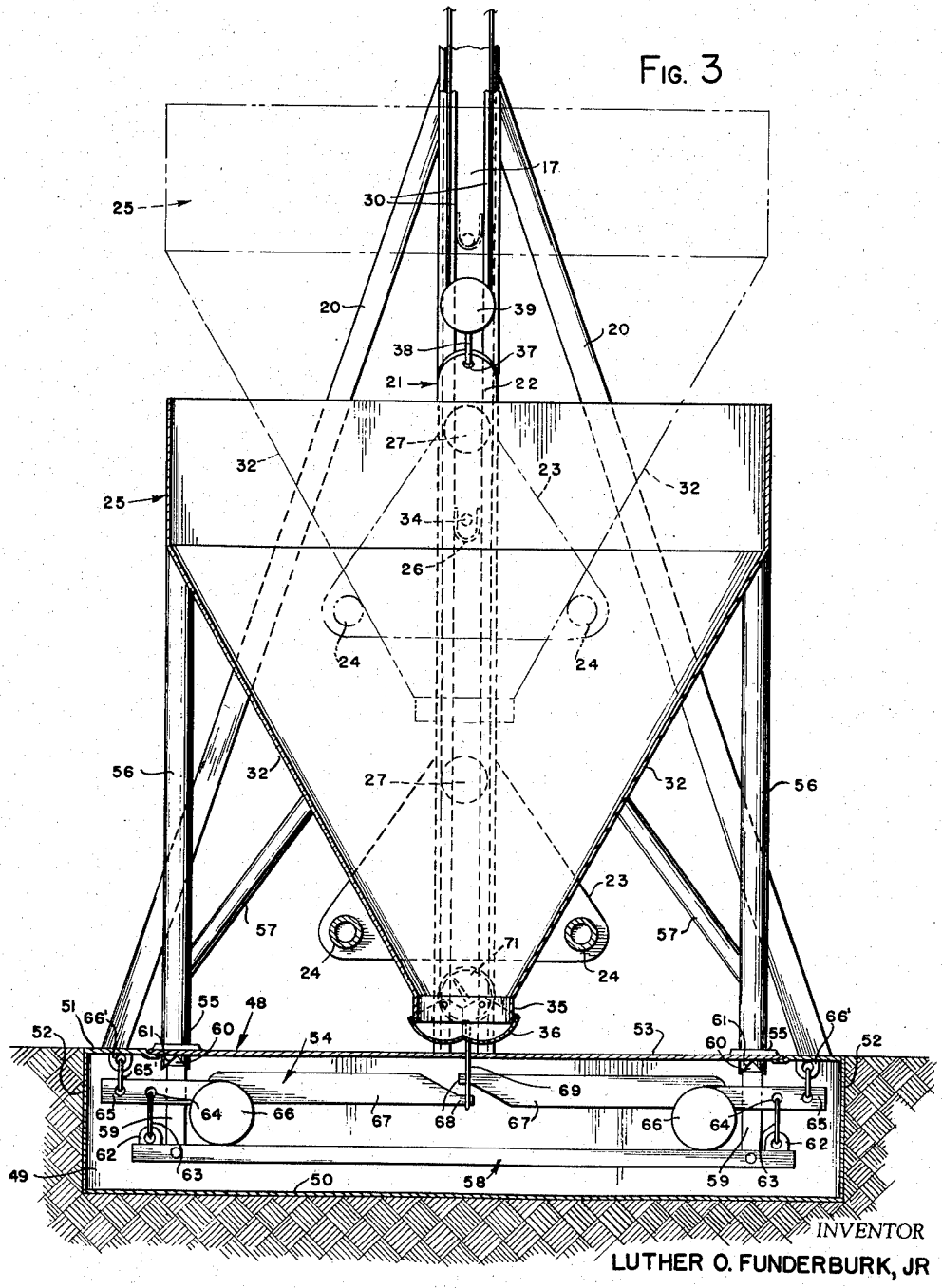
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APPARATUS FOR HANDLING CONCRETE AGGREGATES

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FIG. 3



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APPARATUS FOR HANDLING CONCRETE AGGREGATES

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FIG. 4

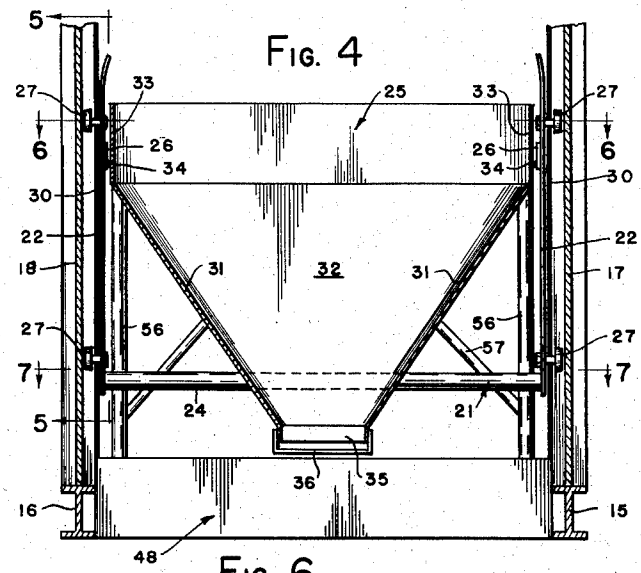


FIG. 5

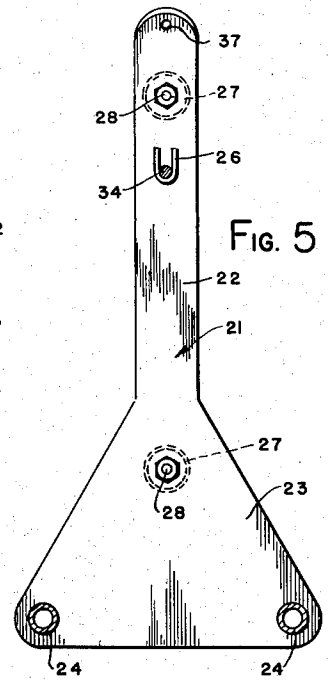


FIG. 6

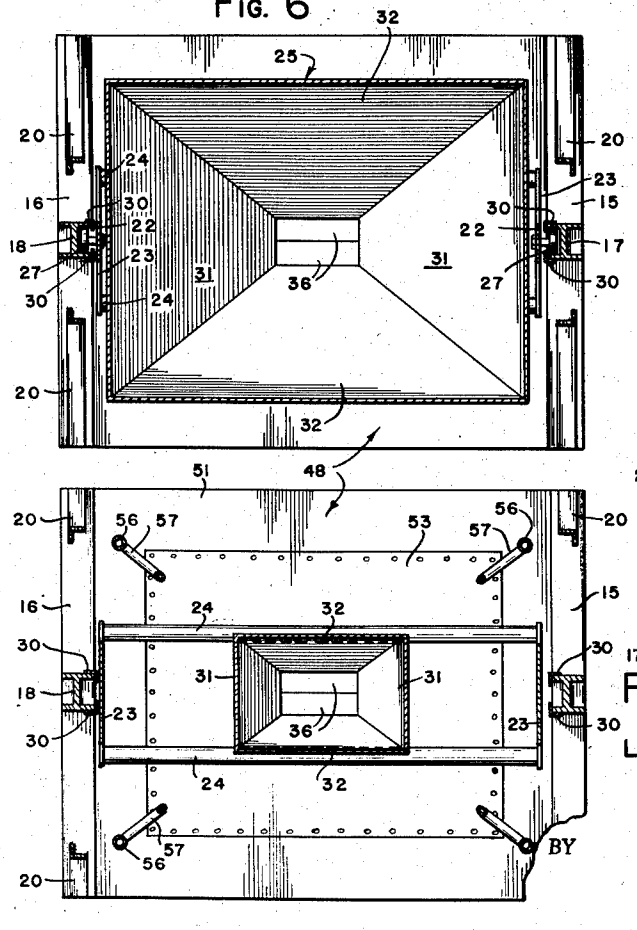


FIG. 8

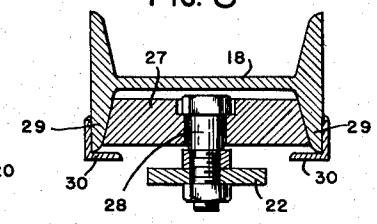


FIG. 7

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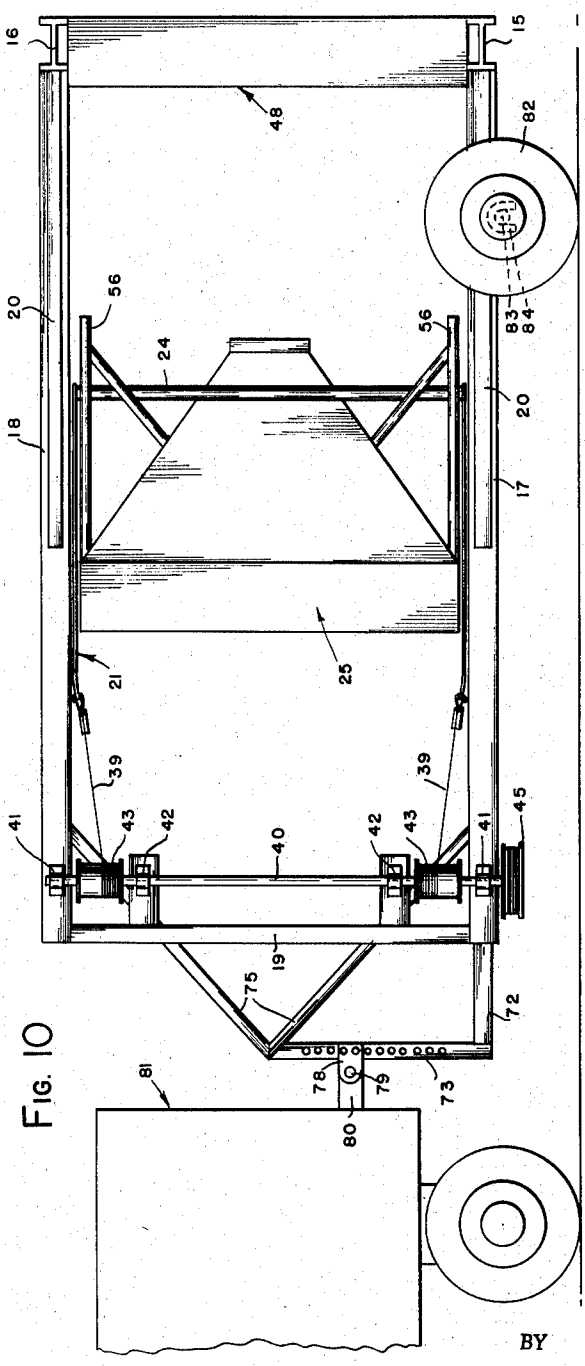


FIG. 10

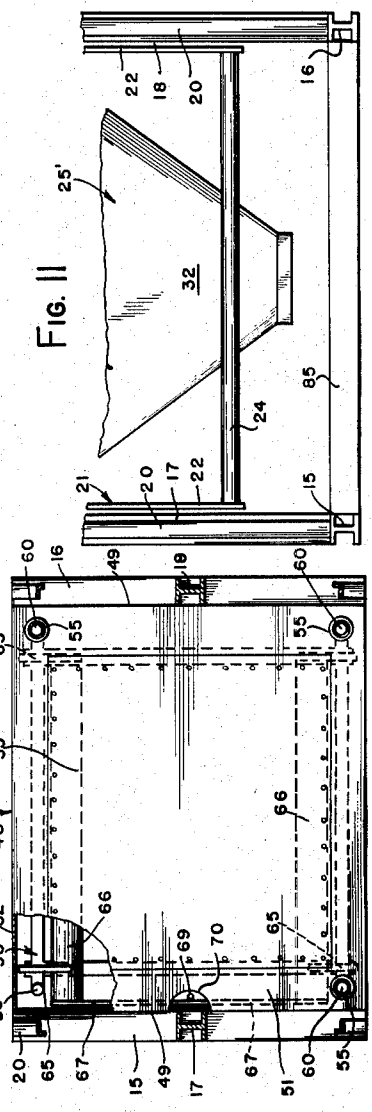


FIG. 11

FIG. 9

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United States Patent Office 2,886,189
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2,886,189

APPARATUS FOR HANDLING CONCRETE AGGREGATES

Luther O. Funderburk, Jr., Camden, S.C.

Application February 28, 1956, Serial No. 568,231

10 Claims. (Cl. 214—2)

This invention relates to improvements in material handling apparatus.

Reference is hereby made to my prior co-pending application, Serial Number 346,453, filed April 2, 1953, now Patent 2,739,804, which prior application contained subject matter common to the present application but not claimed herein.

A primary object of the invention is to provide apparatus for handling concrete aggregates, or the like, in the ready mix concrete industry, where relatively high capacity concrete mixer trucks must be filled or charged with the aggregates.

A further important object is to provide apparatus of the above-mentioned character for hoisting the concrete aggregates, or the like, and transferring them to the concrete mixer, in a highly efficient manner, with or without a concurrent weighing operation.

Another object of the invention is to provide apparatus of the above-mentioned character, including a frame or tower having sides, between which a large capacity concrete mixer truck may pass for being filled with the concrete aggregates from a large balanced hopper, engaging the tower above the mixer truck.

Another object is to provide in a apparatus of the above mentioned character novel means for supporting the balanced hopper for the concrete aggregates.

A further object is to provide an apparatus of the above-mentioned character, which will have a capacity great enough to charge or fill the largest size concrete mixer trucks, and allow them to pass between the side uprights of the frame or tower; the apparatus nevertheless having overall dimensions which will allow the apparatus to meet state highway requirements for vehicles, as to length, width, height and road clearance, when the apparatus is in a generally horizontal position for transportation upon a highway.

A further object is to provide novel means whereby the primary scale linkage or mechanism, when used, may be housed at the bottom of the apparatus, below a ramp or plate over which the mixer truck passes while being serviced by the apparatus.

A still further object of the invention is to provide apparatus for handling, transferring and weighing concrete aggregates, or the like, which apparatus is substantially unitary in construction, relatively light weight, sturdy and durable, readily portable and relatively inexpensive to manufacture.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a front elevation of material handling apparatus embodying the present invention,

Figure 2 is a side elevation of the same,

Figure 3 is an enlarged vertical section taken on line 3—3 of Figure 1,

Figure 4 is a central vertical section taken on line 4—4 of Figure 2,

Figure 5 is an enlarged vertical section taken on line 5—5 of Figure 4 with parts omitted,

Figure 6 is a horizontal section taken on line 6—6 of Figure 4,

Figure 7 is a similar view taken on line 7—7 of Figure 4,

Figure 8 is an enlarged horizontal section taken on line 8—8 of Figure 1, with parts omitted and showing details of a carriage roller and guide means for the roller,

Figure 9 is a horizontal section taken on line 9—9 of Figure 1,

Figure 10 is a side elevation of the apparatus in a horizontal position and being towed behind a truck or the like on suitable wheel means, and,

Figure 11 is a fragmentary front elevational view of an apparatus embodying a slight modification of the invention.

In the drawings, wherein for the purpose of illustration are shown preferred embodiments of the invention, attention is directed first to Figures 1 to 10, inclusive, wherein the numerals 15 and 16 designate a pair of bottom horizontal base members or bars, which may be conveniently formed from sections of I-beams, as shown. The bars 15 and 16 are spaced apart and parallel as shown in the drawings, and they form the main support or base for the apparatus.

Arranged at the longitudinal centers of the horizontal bars 15 and 16 and extending vertically thereabove are a pair of vertical frame members or columns 17 and 18, having their lower ends rigidly secured by welding or the like to the tops of the bars 15 and 16. The vertical columns 18 are parallel and in lateral alignment, and they extend for substantial distances above the bars 15 and 16 and constitute the sides of the upstanding frame or tower portion of the apparatus, which tower portion is substantially entirely open between the columns 17 and 18 and above the bars 15 and 16, Figure 1. The tops of the columns 17 and 18 are rigidly connected by a horizontal transverse brace bar 19, having its opposite ends rigidly secured thereto by welding or the like. Pairs of inclined or diagonal braces 20 are preferably provided upon opposite sides of the apparatus, and the upper ends of these braces 20 are rigidly secured by welding or the like to the forward and rear sides of the columns 17 and 18, near the longitudinal centers of the latter, Figures 1 and 2. The lower ends of the diagonal braces 20 are rigidly secured by welding or the like to the tops of the horizontal base bars 15 and 16 adjacent their opposite ends, Figure 2. The braces 20 are thus in the same vertical planes as the columns 17 and 18 and the bars 15 and 16, leaving the apparatus open between the columns 17 and 18, Figure 1.

A vertically movable carriage 21 is provided, and this carriage as viewed from the front, Figures 1 and 4, is generally U-shaped and open at its top. The carriage 21 comprises a pair of vertical side plates 22, adapted to be arranged inwardly of the columns 17 and 18 and close to the inner sides of the same. The lower end portions of the carriage sides 22 are enlarged and may be substantially triangular as shown at 23, Figures 2, 3 and 5. The lower enlarged portions 23 of the opposite sides 22 of the carriage 21 are rigidly connected by a pair of spaced parallel horizontal support bars or tubes 24, having their opposite ends rigidly secured by welding or the like to the portions 23. The tubes 24 are thus disposed in spaced parallel relation at the same elevation, adjacent the lower end of the carriage 21, and these tubes extend transversely of and between the columns 17 and 18, Figure 1, but are spaced from opposite sides of the columns

as shown in Figures 2, 3 and 7. The horizontal tubes **24** form upon the carriage **21** a support or cradle for the lowered tapered end of a hopper **25**, to be described.

Somewhat below their upper ends, the carriage side plates **22** are provided upon their inner faces with upwardly opening U-shaped support or bearing elements **26**, rigidly secured thereto by welding or the like. The elements **26** are at the transverse centers of the side plates **22**, and consequently at the transverse centers of columns **17** and **18**. The elements **26** are spaced midway between the horizontal tubes **24** and a substantial distance above the same, Figure 5, so as to form therewith triangular points of support for the hopper **25**, as will be further described.

Vertically spaced pairs of rollers **27** are arranged outwardly of the carriage sides **22** near their upper and lower ends, and at their transverse centers, Figure 5. The rollers **27** are freely journaled upon shafts **28**, Figure 8, suitably rigidly secured to the side plates **22** and projecting horizontally outwardly therefrom a slight distance, as shown. The rollers **27** engage between the inner vertical flanges **29** of the I-beam columns **17** and **18**, Figures 6 and 8, and the rollers are caged between the flanges **29** by pairs of vertical angle bars **30**, welded or otherwise rigidly secured to the inner sides of the columns **17** and **18**, and extending throughout the major portions of their heights, as shown. The construction in Figure 8, as regards the rollers **27** and angle bars **30**, and associated elements is preferably identical with the corresponding construction, shown particularly in Figure 13 of my co-pending application Serial Number 346,453, filed April 2, 1953 for Weighing and Transferring Apparatus, now Patent 2,739,804.

The hopper **25** is arranged between the carriage sides **22** and between the vertical columns **17** and **18**, as shown in the drawings. The hopper is rectangular in horizontal cross section and open at its top, and its dimensions are such at its top, Figures 1 and 2, that the hopper extends for substantially the entire distance between the columns **17** and **18**, Figure 1, and for substantial distances outwardly of the columns as shown in Figure 2. The hopper **25** extends equidistantly upon opposite sides of the columns **17** and **18**, Figure 2. A short distance below its upper end, the hopper **25** tapers downwardly at all four sides, and has the general shape of an inverted pyramid. The inclined side walls **31** between the columns **17** and **18** slope somewhat less steeply than the other pair of side walls **32**, Figure 3. The hopper **25** is of balanced or symmetrical design, and the lower tapered end of the hopper, as defined by the inclined walls **32** is adapted to engage between the horizontal tubes **24** and to rest thereon, as shown in the drawings. Near and below its upper end, the opposite vertical walls **33** of the hopper have rigidly secured to their outer sides, at the transverse center of the hopper, a pair of short horizontal trunnions **34**, adapted to enter and rest within the U-shaped bearing elements **26** of the carriage sides **22**. The arrangement is such that when the trunnions **34** are seated within the bottoms of the U-shaped elements **26**, the sloping side walls **32** will be contacting and resting upon the tubes **24**, as best shown in broken lines, Figure 3. Thus, the symmetrical hopper **25** is supported in a balanced manner with respect to the columns **17** and **18** and the base bars **15** and **16**, and the hopper does not render the apparatus unstable or likely to tilt when it is raised and lowered. The hopper is provided at its bottom with a short reduced discharge extension **35**, rectangular in horizontal cross section, and adapted to be closed by conventional movable closure means **36**. The discharge opening of the hopper is midway between the columns **17** and **18**, Figure 1, and in alignment therewith, Figures 2 and 3. As shown in Figure 2, the width of the hopper **25**, at its top, may nearly equal the lengths of the bars **16**, although these bars may be somewhat longer, if desired. The hopper **25** is preferably of a size to contain from six to

seven cubic yards of dry concrete aggregates, or large enough to fill the mixing drum of the largest size concrete mixer truck. The size of the hopper may, however, be varied somewhat if desired, and I do not wish to restrict the invention to a particular size of hopper.

As shown in the drawings, the upper ends of carriage side plates **22** extend somewhat above the top of the hopper **25** and may be inwardly directed somewhat and apertured as at **37** for the reception of suitable hooks or lifting elements **38**, carried by the lower ends of block and tackle cable means **39**. A transverse horizontal shaft **40** is journaled for rotation within fixed bearings **41**, rigidly secured to the forward sides of columns **17** and **18** near their upper ends, and preferably somewhat below the cross brace **19**, Figure 1. Additional bearings **42** for the rotatable shaft **40** may be provided, and such bearings are dependingly secured to the cross brace **19**, inwardly of the columns **17** and **18**. Spools **43** are rigidly secured to the shaft **40** to turn therewith, near and inwardly of the columns and bearings **41**, and corresponding ends of the cable means **39** are windable upon the spools **43**, and secured thereto, while the other corresponding ends of the block and tackle cable means are secured as at **44** to the cross brace **19**, near and inwardly of the columns **17** and **18**, Figure 1. One end of the shaft **40** has secured thereto a relatively large winding drum **45**, rigid therewith, and a flexible element or cable **46** is secured to and windable upon the drum **45** and may extend vertically downwardly therefrom, Figures 1 and 2, for engagement under a fixed guide **47**, near the bottom of the apparatus, Figure 1. From the guide **47**, the cable **46** extends to a suitable power-operated winch or the like, not shown, whereby the cable **46** may be caused to turn the shaft **40** and the spools **43** for raising and lowering the carriage **21** and hopper **25**.

At the bottom of the apparatus, and between the horizontal base members **15** and **16**, a rectangular box or housing **48** for a primary scale linkage is provided. This housing **48** is of strong construction and may be formed of steel or the like, and opposite sides **49** of the housing **48** may be welded or otherwise rigidly secured to the base bars **15** and **16**. The bottom wall **50** of the housing **48** may be flush with the bottoms of the bars **15** and **16**, Figures 1 and 2, but the top wall **51** of the housing projects somewhat above the bars **15** and **16**, as shown. The other side walls **52** of housing **48** may be flush with the ends of bars **15** and **16**, Figures 2, 7 and 9. The top wall **51** is provided with a large rectangular removable section or panel **53**, as shown, to provide access to the primary scale linkage or mechanism **54** contained within the housing **48**. The top wall **51** is further provided near the four corners of the housing **48** with opening means **55** for a purpose to be described.

The hopper **25** is provided near its four corners with depending vertical legs **56**, in vertical alignment with the opening means **55** and adapted to pass therethrough, to the interior of housing **48**, below the top wall **51**, Figure 3. The legs **56** have corner diagonal braces **57** rigidly secured thereto, and these braces **57** are also rigidly secured to the hopper **25**, as shown.

Arranged within the housing **48** is the primary scale mechanism **54** of conventional construction, comprising a horizontal rectangular frame **58**, provided near its four corners with upstanding vertical pins **59**, rigidly secured thereto, and having their top ends pointed at **60**. The pins **59** are in vertical alignment with the opening means **55** and the vertical legs **56** of the hopper. The bottoms of the legs **56** have conically tapered recesses **61**, Figure 3, in their lower ends to receive the points **60** of the scale pins **59**, whereby the primary scale linkage may support the weight of the hopper after the carriage **21** has dropped free of the same, Figure 3.

The rectangular frame **58** is suspended near its corners from eyes **62**, rigidly secured thereto, and connected with vertical links **63**, as shown, having their upper ends se-

cured at 64 to horizontal extensions or arms 65. The outer ends of arms 65 are suspended by links 65' from apertured lugs 66', which are dependingly rigidly secured to the top wall 53, Figure 3. The scale arms 65 have their inner ends rigidly secured by welding or the like to horizontal torque tubes 66, arranged above the frame 58 and extending for substantially the entire width of the same, Figure 9. At corresponding ends of the torque tubes 66, opposed inwardly directed horizontal scale levers 67 are rigidly secured thereto and have overlapping inner end portions 68, operatively connected with a vertical element or link 69, extending above the primary scale linkage and through an opening 70 in the top wall 51, adjacent the horizontal bar 15 and column 17, as shown in Figure 9. The element 69 leads to and is connected with a suitable weighing scale 71 shown diagrammatically in broken lines in Figure 3 only. The weighing scale 71 may be suitably mounted upon the outer side of the adjacent vertical column 17 or mounted separately near the apparatus, as preferred. I wish to make it clear that the apparatus and the invention is not limited to use with any particular form of scale mechanism, and I have illustrated one preferred type of scale mechanism within the housing 48, and other types of mechanism may be substituted, if desired.

Means are provided for hitching the apparatus to the rear end of a truck or the like for towing the same, after the apparatus has been swung or tilted sidewise to a horizontal position, Figure 10. Such means comprises a vertical extension 72 on the top of column 17, Figure 1, which extension has a horizontal draw bar 73 rigidly secured thereto at one end of the latter, the opposite end of the draw bar 73 being rigidly secured at 74 to the upper converged ends of a pair of diagonal braces 75, having their lower ends secured at 76 to the sides of the columns 17 and 18 remote from bearings 41, Figures 1 and 2. The draw bar 73 is apertured at 77 to permit the adjustment lengthwise of the same of an apertured hitching tongue 78, rigidly secured thereto.

When the apparatus as shown in Figure 1 is tilted about the horizontal base bar 15 and downwardly to the horizontal position of Figure 10, the draw bar 73 becomes vertically disposed, as shown, and the tongue 78 is horizontally disposed for connection at 79 with the hitch 80 of the towing vehicle 81, Figure 10. The lower side of the apparatus, Figure 10, is supported near its rear end by suitable wheels 82 having a connecting axle 83, which axle may engage suitable bracket means 84, detachably rigidly secured to the lower side of the column 17, which is now horizontally disposed.

Operation

The apparatus as shown and described may be set up on level ground, with a small or shallow well provided in the ground, Figure 3, so that the top wall 51 of the housing 48 will be flush with the level of the ground. If this well in the ground is not formed, and the top wall 51 is spaced above the ground, then a suitable inclined ramp of concrete, dirt or the like, is formed at opposite sides of the apparatus leading up to the level of the top wall 51, so that the wheels of a concrete mixer truck may pass over the top wall 51.

With the apparatus set up, as above-described, the carriage 21 and hopper 25 may be raised and lowered between the positions shown in Figure 1, by operating a winch or the like connected with the cable 46. When the cable 46 is pulled downwardly, Figure 1, it is unwound from the drum 45, and this of course turns the shaft 40 and the spools 43. The cable means 39 are arranged to wind up on the spools 43 as the cable 46 unwinds from drum 45, hence the pulling of the cable 46 downwardly will elevate the carriage and hopper. When the cable 46 is allowed to pay out from the winch, and to rewind itself on the drum 45, the hopper and carriage will descend by gravity to the bottom of the apparatus,

and the cable means 39 will unwind from the spools 43 automatically.

The hopper 25 is loaded by any suitable manner or means with concrete aggregates while in a lowered position. If it is desired to weigh the hopper and its contents, the cable means are operated to allow the legs 56 to pass through the opening means 55 and engage and rest upon the scale pins 59. The scale mechanism within the housing 48 now entirely supports the hopper 25 and its contents, and the weight may be noted upon the scale 71.

During this weighing operation, the carriage 21 is allowed to drop free of contact with the hopper 25, Figure 3, so that the tubes 24 are spaced from the inclined walls 32, and the U-shaped elements 26 drop free of the trunnions 34.

After the weighing operation, the cable means are again operated for raising the carriage 21, and the tubes 24 will engage the sloping sides 32 and the U-shaped elements 26 will re-engage the trunnions 34. The hopper 25 is now cradled in a balanced manner upon the carriage 21, and the tubes 24 extend horizontally across or beneath the entire width of the hopper walls 32, Figures 1 and 7. It is impossible for the hopper to tilt or to shift off-balance, due to the support afforded by the tubes 24 and the bearings or elements 26.

The hopper 25 is raised with the carriage 21 to a point near the top of the apparatus, Figure 1, and the concrete mixer truck is now driven directly onto the top of the housing 48 and between the columns or uprights 17 and 18, so that its intake opening is arranged in proper registration with the outlet extension 35 of the hopper 25. The means 36 are now open to allow the contents of the hopper to pass into the concrete mixer, and when the batch of aggregates has been transferred to the mixer, the mixer truck may pass entirely through the apparatus, between the columns 17 and 18 and below the hopper 25. The box or housing 48 thus serves as a ramp or platform for the mixer truck, and the scale linkage 54 is protected from damage due to the weight of the truck.

When it is desired to transport the apparatus to a new location, the same is tilted upon one side to the horizontal position shown in Figure 10, and the hitching tongue 78 is adjusted lengthwise of the draw bar 73 so that it may be readily attached to the hitch 80 of the towing vehicle. The wheel means 82 is positioned near the rear end of the apparatus in the horizontal position, and the entire apparatus is now bodily supported and ready for transportation. As shown in Figure 10, it is preferred to arrange the hopper and carriage near the longitudinal centers of the columns 17 and 18, when the device is being transported, for the purpose of distributing the weight between the wheel means 82 and the hitch 80. The carriage 21 and hopper 25, Figure 10, may be secured to each other and to the columns 17 and 18 by any desired means, such as by lashing with cables or the like.

It should be noted that when the apparatus is arranged as in Figure 10, its widest side or dimension, Figure 1, is arranged vertically, and its narrow side, Figure 2, is arranged widthwise of the highway. The dimensions of the apparatus are such, Figure 10, that it will meet with state highway regulations as to width, length, height and road clearance, without the necessity of any special permit. At the same time, the device, when set up for use, will admit the largest size concrete mixer truck between the vertical columns 17 and 18 and below the hopper 25, and the truck may pass completely over the scale housing 48. The apparatus is unitary in construction, and relatively light weight, considering its size.

In Figure 11, there is shown a slight modification of the apparatus, wherein all parts are identical with the corresponding parts shown and described in the first form of the invention, except for the fact that the housing 48 and scale mechanism 54 is entirely omitted, and the space between the horizontal base bars 15 and 16 is open or empty. In Figure 11, the opposite ends of the bars 15

and 16 may be rigidly connected by suitable cross bars 85, rigidly secured thereto, and forming therewith a horizontal open rigid rectangular base frame for the apparatus. The legs 56 may also be omitted from the hopper 25', Figure 11, since the scale mechanism is omitted and there will be no weighing operation. Otherwise, the apparatus in Figure 11 is constructed and operated in the same manner shown and described in connection with the first form of the invention, and the concrete mixer truck may still pass between the columns or uprights 17 and 18, when the bars 15, 16 and 85 are flush with the ground.

I also contemplate using the apparatus for other purposes than the handling of the particular concrete aggregates and for transferring such aggregates, with or without weighing, to mobile concrete mixers. It is entirely feasible to use the apparatus in connection with various types of material for hoisting the same and then transferring the material to a vehicle which may pass between the uprights or columns of the apparatus. In this connection, means other than the specific carriage and hopper means shown and described may be employed.

I wish to mention that while I have shown the rollers 27 as a preferred means for guiding the carriage 21 along the caged tracks, Figure 8, non-rotatable slides or blocks may be used instead of the rollers 27, for performing the same function satisfactorily. Further, I wish to point out that the vertically movable carriage 21 and its attached rollers 27, caged by the angle bars 30 within the columns 17 and 18, constitutes in the apparatus a movable brace to prevent the spreading or bowing of the two columns, and making this simplified construction possible, without cross bracing of the columns 17 and 18.

It is to be understood that the forms of the invention herewith shown and described are to be taken as preferred examples of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. Apparatus for handling concrete aggregates or the like, comprising a pair only of spaced apart substantially vertical columns, a pair of substantially horizontal base bars secured to the bottoms of the columns and extending upon opposite sides of the columns, a relatively low housing structure secured between said base bars and columns adjacent the bottoms of the columns and serving as a ramp for a concrete mixer truck passing between said columns, a primary scale linkage disposed within said housing structure and including upstanding pin elements, said housing structure having openings in its top adjacent said pin elements, a carriage connected with the columns and adapted to travel longitudinally thereof, means for raising and lowering the carriage, and a hopper mounted upon the carriage for movement therewith and being liftable therefrom and including depending legs adapted to pass through said openings of the housing structure and to engage the pin elements of said scale linkage when the carriage and hopper are lowered.

2. Apparatus for handling concrete aggregates and for transferring them to a concrete mixer truck, comprising a pair only of substantially vertical columns which are spaced apart sufficiently to allow the concrete mixer truck to pass between them, substantially horizontal members secured to the bottoms of the columns and extending beyond opposite sides of the same, a carriage engaging said columns and extending therebetween and adapted to be raised and lowered, said carriage including substantially vertical side members arranged close to the columns and a pair of spaced transverse horizontal bars secured to and connecting the lower ends of the side members, said bars being at the same elevation, a hopper arranged between said side members of the carriage and connected therewith near the tops of the side members, said hopper tapering downwardly and having a pair of inclined downwardly converging side walls engaging between said bars of the carriage and extending below said bars, the hopper having discharge opening means spaced below said bars and between the same, and cable means connected with said carriage for raising and lowering the carriage.

3. Material handling apparatus comprising, a pair only of spaced uprights, substantially horizontal base members secured to the bottoms of the uprights, a generally U-shaped carriage including vertical sides arranged between the uprights, a pair of spaced apart transverse horizontal bars extending between and secured to said sides at the lower ends thereof and arranged at the same elevation and spaced upon opposite sides of the uprights, substantially U-shaped elements secured to the inner faces of said sides near their upper ends, roller means carried by said sides of the carriage and engaging the uprights, a hopper arranged between said sides of the carriage and including downwardly converging side walls engaging between said bars of the carriage and extending below said bars, the hopper having discharge opening means spaced below said bars and between the same, trunnions secured to the hopper near its upper end and engaging within said U-shaped elements, and cable means connected with the carriage to elevate and lower the same.

4. Apparatus for handling concrete aggregates or the like comprising a pair of spaced uprights, a pair only of substantially horizontal base members secured to the bottoms of the uprights, a relatively low housing secured between said base members adjacent the bottoms of the uprights and adapted to serve as a ramp upon which a concrete mixer truck may pass while moving between said uprights, scale mechanism arranged within said housing and protected thereby and having contact parts, the top of said housing having openings adjacent said contact parts, a generally U-shaped carriage arranged between said uprights and having substantially vertical sides disposed close to the inner sides of the uprights, roller means carried by said sides and engaging the uprights to guide the carriage thereon, a pair of spaced horizontal support bars secured to the lower ends of the said sides of the carriage and extending therebetween and arranged at substantially the same elevation, generally U-shaped bearing elements secured to the inner faces of the carriage sides near their upper ends, a symmetrical hopper arranged between the carriage sides and uprights and tapering downwardly and having a pair of downwardly converging sides engaging between said support bars, trunnions secured to opposite sides of the hopper near its upper end and engaging the U-shaped bearing elements to support the weight of the hopper, depending legs secured to the hopper in alignment with said openings of the housing and said contact parts of the scale mechanism and engaging the latter when the carriage is lowered, whereby the hopper is bodily lifted from said carriage during weighing, and cable means connected with the carriage to raise and lower the same.

5. Apparatus for handling concrete aggregates comprising a pair only of spaced substantially vertical columns, substantially horizontal base bars secured to the lower ends of the columns and extending beyond opposite sides of the same, a housing for scale mechanism arranged between and secured to said base bars adjacent the bottoms of the columns and adapted to have a concrete mixer truck pass over the same when the truck moves between the columns, a carriage arranged between and engaging the columns and adapted to be raised and lowered, a hopper mounted upon the carriage and projecting beyond opposite sides of the carriage and pair of columns equidistantly so that the hopper is balanced, cable means mounted upon the columns near their tops and connected with the carriage for raising and lowering it, and draw bar means secured to the columns near their tops and projecting above the tops of the columns when the apparatus is upright, the apparatus being tiltable upon one side about the longitudinal axis of one base bar to a sub-

stantially horizontal position wherein said columns are in vertically spaced relation and the draw bar means is disposed forwardly of the columns for connection with a towing vehicle, the wider side of the apparatus between said columns now being arranged vertically and the narrower side extending horizontally during transportation of the apparatus.

6. Material handling apparatus comprising a pair only of spaced substantially vertical columns, horizontal base bars secured to the lower ends of the columns, a ramp structure arranged between and secured to the base bars, the base bars and ramp structure extending equidistantly on opposite sides of the columns, the columns and base bars being spaced apart a greater distance than the length of the base bars and ramp structure, whereby the apparatus is wider in one direction than in the other direction, a substantially U-shaped carriage arranged between and engaging said columns and adapted to be raised and lowered, a downwardly tapering balanced hopper cradled upon said carriage and projecting equidistantly upon opposite sides of the columns in a direction lengthwise of the base bars, the hopper extending for substantially the entire distance between the columns, whereby the hopper is wider transversely of the base bars than longitudinally thereof, cable means mounted upon the columns near their tops and secured to the carriage for raising and lowering it, and draw bar means connected with the columns and extending above the tops of the columns when the apparatus is upright, the apparatus being tiltable sidewise about the longitudinal axis of one base bar to a substantially horizontal position for towing by a vehicle while supported on wheels, the wide side of the apparatus then being arranged vertically and the narrow side horizontally, said draw bar means then being forwardmost, and said base bars and ramp structure being rearmost.

7. Apparatus for handling concrete aggregates or the like comprising a supporting base, a pair only of spaced substantially vertical columns having their lower ends secured to said base and extending above the same, a generally U-shaped carriage arranged between the columns and including a pair of spaced apart substantially horizontal bars at its lower end, said bars connecting the sides of the U-shaped carriage, a downwardly tapering balanced symmetrical hopper engaging between said bars and having a lower discharge end spaced below said bars, socket elements carried by the sides of said carriage near the top of the carriage, support elements secured to opposite sides of the hopper near the top of the hopper and engageable within the socket elements, guide means carried by the opposite sides of the carriage and engaging the columns for guiding the carriage as the same is raised and lowered, and cable means connected with the carriage to raise and lower the same.

8. Apparatus for handling concrete aggregates and for transferring them to a concrete mixer truck, comprising a pair only of substantially vertical columns spaced apart sufficiently to allow passage of the concrete mixer truck between them, a relatively low scale housing rigidly secured between the bottoms of the column and serving as a ramp over which the concrete mixer truck may pass, a primary scale linkage disposed within said housing and including contact parts, the top of the housing having openings adjacent said contact parts, a substantially U-shaped carriage movably engaging said columns and adapted to be raised and lowered, said carriage including upstanding sides and a pair of spaced apart substantially horizontal bars connecting said sides near their lower ends, a hopper arranged between the sides of the carriage and having inclined downwardly converging side walls engaging between said bars of the carriage and extending below the same, the hopper having a discharge end spaced below the bars of the carriage and centrally thereof, interconnecting means for the carriage and hopper near the tops of the carriage sides, legs secured to the hopper and adapted to enter the openings of the housing and to engage the contact parts of the scale linkage when the carriage and hopper are lowered, and cable means connected with the carriage for raising and lowering it.

9. Apparatus for handling concrete aggregates and for transferring them to a concrete mixer truck, comprising a single pair only of spaced uprights adapted to serve as tracks, said uprights being spaced apart sufficiently to allow the passage of a concrete mixer truck therebetween, a base rigid with the lower ends of said uprights and connecting the uprights and serving as a ramp over which the concrete mixer truck may pass when entering between said uprights, a balanced symmetrical hopper arranged for vertical movement between the uprights and projecting equidistantly upon opposite sides of the uprights and having a pair of inclined downwardly converging side walls and a bottom reduced discharge end, a pair of support elements secured to the hopper near its upper end and upon its sides adjacent to the uprights, and a carriage for the hopper, said carriage comprising a pair of vertical sides disposed between the inner sides of the uprights and the adjacent sides of the hopper, socket elements secured to said sides of the carriage and receiving said support elements of the hopper to bear the weight of the hopper, guide means upon said sides of the carriage engaging said uprights adapted to serve as tracks, and a pair of spaced apart horizontal bars extending between and connecting the sides of the carriage at the lower ends of said sides and receiving between them said downwardly converging walls of the hopper for cradling the lower end portion of the hopper, said bottom discharge end of the hopper spaced below said bars and midway between the same.

10. Apparatus for handling concrete aggregates and for transferring them to a concrete mixer truck according to claim 9, wherein said sides of the carriage are provided at their lower ends with enlarged portions extending upon opposite sides of the uprights, and wherein said horizontal bars extend between and have their ends secured to the enlarged portions and are arranged at the same elevation.

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