Aug. 24, 1943. H. A. WAGNER ET AL 2,327,476

HOISTING TOWER

Filed Aug. 9, 1941 3 Sheets-Sheet 1

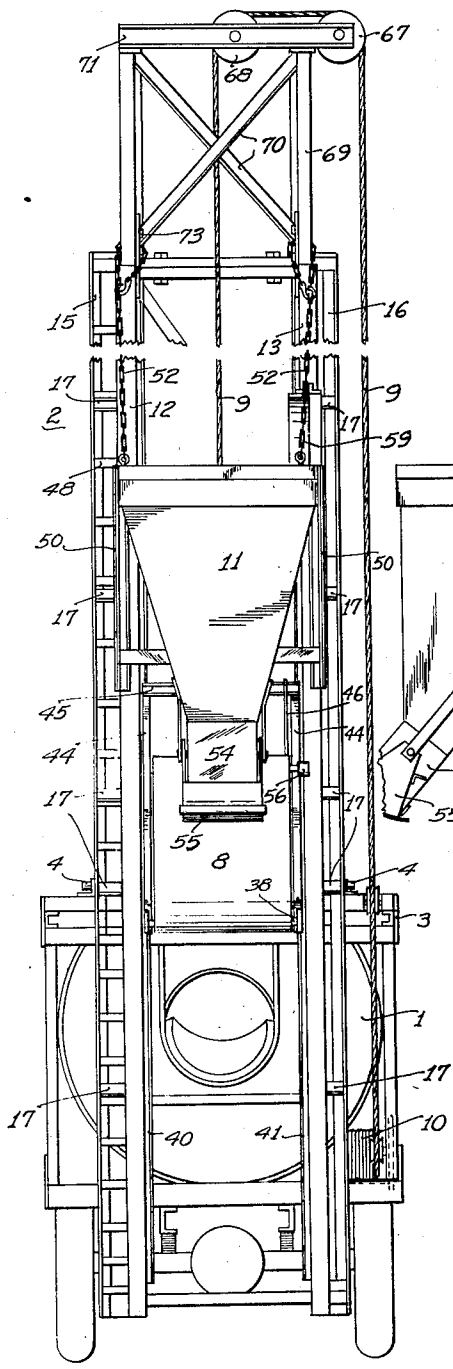


Fig 1

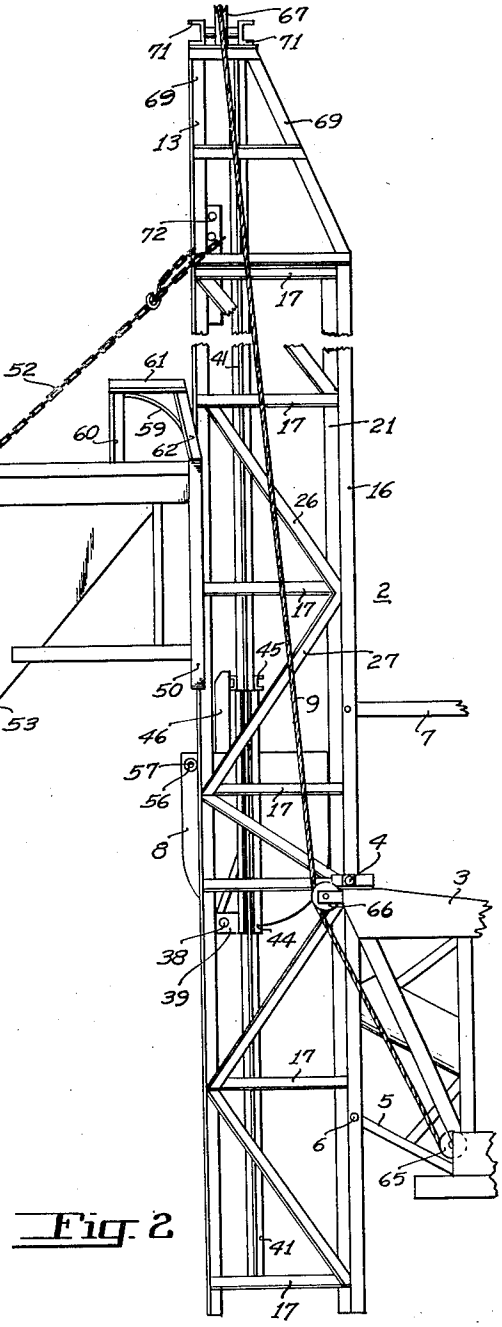


Fig 2

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HOISTING TOWER

Filed Aug. 9, 1941 3 Sheets-Sheet 2

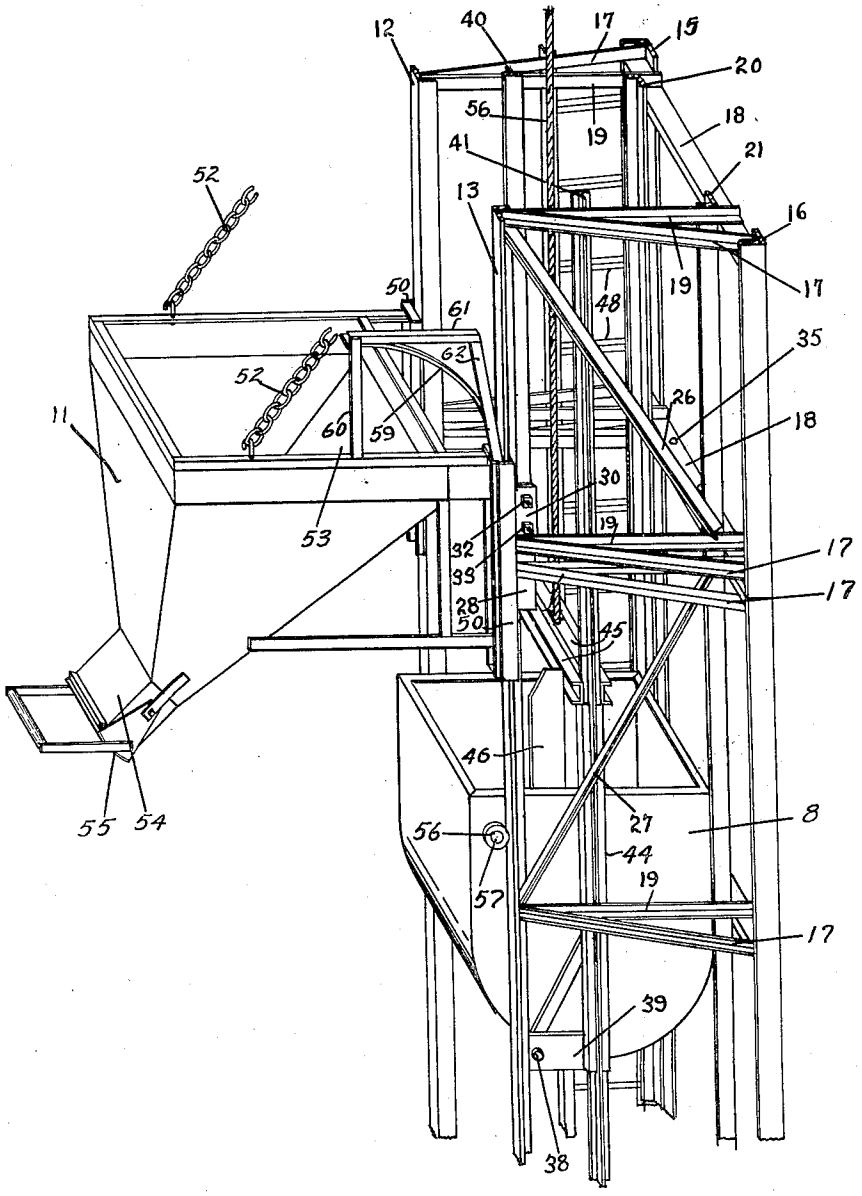


Fig III

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HOISTING TOWER

Filed Aug. 9, 1941 3 Sheets-Sheet 3

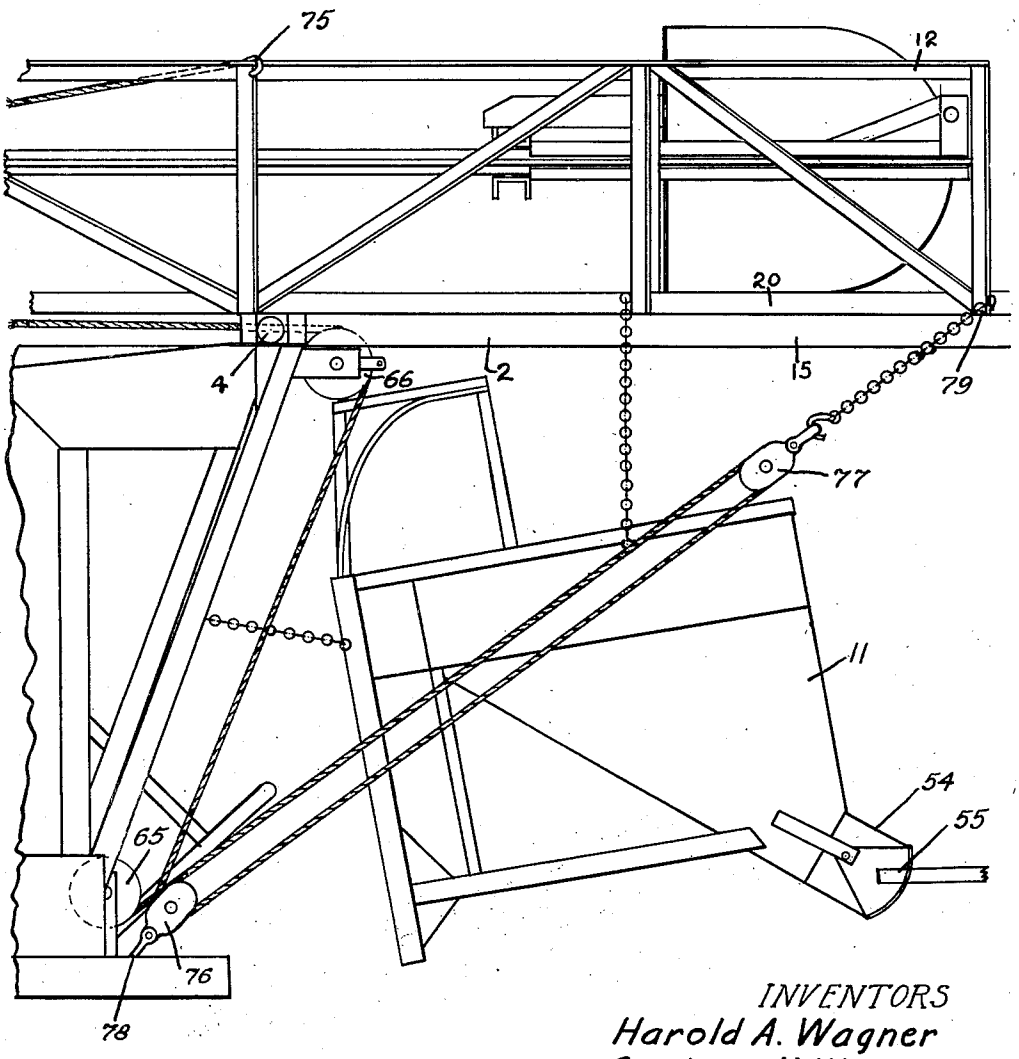


Fig IV

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UNITED STATES PATENT OFFICE

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HOISTING TOWER

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Application August 9, 1941, Serial No. 406,206

13 Claims. (Cl. 214—95)

The present invention relates to hoisting towers, and more particularly to those of a portable type such as may be used for elevating materials on construction projects. While it is not necessarily so limited, the elevator tower arrangement is suitable for pivotal mounting upon a mobile vehicle upon which it may readily be transported in a horizontal position and quickly elevated to a vertical operative position.

It is frequently desirable to provide a compact portable tower, particularly for use in construction work, for elevating material from ground level to heights thereabove. To permit of maximum utilization of the tower structure it should be light in weight in order that it can readily be mounted upon a mobile vehicle for transportation over ordinary roads and in such a position as to have a reasonably low clearance height. Because of the varying nature of different construction projects, the structure should be capable of adjustment to meet with the requirements of each job, not only as to types of material which may be handled thereby, but also as to the height of the tower. Time is a highly important element in construction work, and consequently the tower should be capable of being raised and lowered within a minimum period. All adjustments and operative features of the structure should be simple so as to enable fool proof operation even by unskilled hands.

It is, therefore, an object of the present invention to provide a new and improved elevator tower structure which is relatively light in weight, simple and compact in design, and readily adjustable to meet with varied requirements.

It is a more specific object of the present invention to provide a new and improved elevator tower structure including a bucket and a receiving hopper which is particularly applicable for use in connection with a concrete mixing apparatus.

A further object of the invention is to provide a new and improved elevator tower structure having a bulk material elevating bucket slidably mounted therein and a receiving hopper adjustably mounted on one side of the tower, the bucket and hopper being so constructed that the bucket is automatically dumped as it is moved past the hopper.

Another object of the invention is to provide a new and improved elevator tower structure including a hopper mounted on one side of said tower and a bucket slidably mounted within the tower and adapted for automatically dumping its contents into the hopper upon its being moved thereby, the tower being so constructed that the hopper may be positioned and the bucket dumped thereinto at any point between the opposite limits of bucket travel.

Another object of the present invention is to provide an open faced tower having a bucket slidably mounted therein and supported for tilting movement through the open face of the tower at substantially any point between the opposite limits of travel thereof.

Another object of the invention is to provide an open faced elevator tower structure having a load handling carriage mounted for longitudinal sliding movement within the tower, the carriage and cooperating guide rails being so constructed as substantially to preclude spreading of the tower sides during material elevating operations.

In accordance with the illustrated embodiment of the invention, the tower structure comprises a plurality of parallel uprights defining a longitudinal elevator shaft, the uprights being braced together around three sides of the tower whereby the elevator shaft is open along the front side of the tower. An elevator bucket carriage is slidably mounted within the tower shaft upon guide rails secured to the opposite sides of the tower, the guide rails being flanged along their outer edges, while the bucket carriage is provided with slides for fitting cooperatively around the rail flanges. A bucket is pivotally supported within the carriage adjacent its lower end and is normally held in an upright position. A hopper is adjustably mounted upon the front side of the tower so as to extend across the open face and is so constructed as to engage with a portion of the bucket as the carriage is moved therepast to cause forward tilting movement of the bucket through the open tower face and dumping of the bucket contents into the hopper. The uprights defining the opposite sides of the front of the tower are provided with oppositely extending flanges and the hopper supporting structure includes a pair of slides extending cooperatively around such flanges. The slides of the hopper support and of the bucket supporting carriage thus engaging the tower act to preclude spreading of the tower sides during the elevating operations. By virtue of the open faced tower design, the hopper may be positioned at any point along the front side thereof between the opposite limits of travel of the bucket within the elevator shaft and the bucket contents automatically dumped therein. The tower being of relatively light weight, and compact design, is particularly applicable for mounting upon the rear end of

portable concrete mixer apparatus. The tower may be pivoted intermediate its ends upon the rear end of the mixer framework and transported thereupon in the horizontal position. For elevating the tower to the vertical operative position, means are provided for conveniently connecting the bucket hoisting cable to the lower end of the tower so that a separate hoisting drum is not required for raising the tower.

Further objects and advantages of the invention will become apparent as the description proceeds, taken in connection with the accompanying drawings, while the features of novelty will be pointed out with greater particularity in the appended claims.

In the drawings, Figure 1 is a front elevation of the tower structure shown mounted upon the rear end of a portable concrete mixer; Figure 2 is a side elevation of the structure corresponding to Figure 1; Figure 3 is a partial view in perspective of the tower structure including the elevator bucket and receiving hopper; and Figure 4 is a fragmentary view illustrating the tower in the horizontal position for transportation.

Referring particularly to Figures 1 and 2 of the drawings, the elevator tower structure of the invention will be described as it may be applied to a mobile concrete mixer apparatus indicated generally at 1. It will readily be appreciated, however, upon a perusal of this specification, that the invention is not necessarily so limited, in that the tower structure may be applied equally well to other apparatus and for purposes other than for handling merely concrete. Thus, for example, the concrete mixer 1, insofar as the present disclosure is concerned, may be taken to represent any mobile vehicle upon which it is desired to mount a portable elevator structure. Furthermore, it is not essential that the tower structure disclosed be mounted upon a mobile vehicle, since, obviously, it can be stationarily mounted in an upright position upon any suitable foundation. As illustrated, the longitudinal tower structure, indicated generally at 2, is suitably pivoted intermediate its ends at some point such as 4 upon an upper portion of the mixer framework 3. When in the vertical position the lower end of the tower may be attached to the vehicle framework by means of a pair of braces 5 secured to the opposite sides of the framework 3 adjacent the lower end thereof, the outer ends of the braces 5 being removably attached by pins 6 to the adjacent uprights of the tower. Other braces 7 may be connected between the tower above the pivot 4 and other suitable fixed parts (not shown) of the mixer superstructure for further steadying the tower in the elevated position. For lowering the tower, the braces 5 and 7 may be disconnected therefrom after which the tower may be pivoted about the bearing 4 to a horizontal position such as indicated in Figure 4.

A bucket 8 is mounted for longitudinal movement within the tower 2 by means of a cable 9 trained over suitable guide pulleys on the tower structure and extending to a suitable winch drum 10 provided on the mixer unit. Adjustably mounted upon the front side of the tower 2 is a hopper 11 which is adapted to receive the contents from the bucket 8.

Referring more particularly to the perspective view of Figure 3, the tower structure 2 is formed of a plurality of parallel uprights which are braced together around three sides of the tower only so that the front side of the tower is open substantially throughout the full length thereof, or, at least, throughout the full length of travel of the bucket 8 mounted therein. The front uprights 12 and 13 and the rear uprights 20 and 21 are spaced at right angles with respect to each other so as to define a substantially rectangular elevator shaft therebetween for the bucket 8. The rear uprights 20 and 21 are rigidly secured together by means of suitably spaced transverse members 18 while the front uprights 12 and 13 are rigidly secured to the rear uprights 20 and 21, respectively, by a plurality of suitably spaced cross members 19 extending therebetween. An additional pair of rear uprights 15 and 16 are rigidly attached to the outer ends of the transverse members 18 which ends extend somewhat beyond the uprights 20 and 21, respectively. Braces 17 extend between the front uprights 12 and 13 and the uprights 15 and 16, respectively, to increase the rigidity of the opposite sides of the tower as against lateral stresses, it being understood that there are no transverse members extending between and rigidly uniting the front uprights 12 and 13 intermediate their opposite ends. Suitable diagonal braces 26, 27 may be provided as desired between the uprights around the three sides such as is shown between the uprights 13 and 21.

While the tower may be made as a unitary structure of a predetermined length, it is preferred, for reasons of greater flexibility and adaptability to the requirements of varying needs, to construct the tower of a plurality of separate sections and which may be united together end to end to form a tower of any reasonable desired length. Such sections can readily be combined when the tower is in the lowered or horizontal position. In the view of Figure 3 the end portions of two such tower sections are shown removably attached together. The front uprights 12 and 13 of two sections may be secured together by means of overlapping plates 28 and 30 which may be fixed to the adjacent ends of the two sections and bolted together by bolts 32, 33. The rear side of the tower sections may be secured together by means of bolts 35 extending between pairs of cross members 18 at the adjacent ends of the two tower sections.

For guiding the movement of the bucket 8 within the elevator shaft of the tower, a pair of rails 40, 41 are secured to the inner sides of the tower in a parallel relation with respect to the various uprights. The guide rails may be formed of any suitable metal members such as T irons, the edge of the webs of which may be welded to the transverse brace members 19 of the tower. The flat sides of the T shaped members thus face each other and define bearing surfaces for the bucket carriage within which the bucket 8 is supported. The bucket carriage comprises a rectangular framework including a pair of double flanged slides 44 which fit over the oppositely extending flanges of the guide rails 40, 41, the upper ends of the slides 44 being connected together by transversely extending channel beams 45. The bucket 8 is pivotally mounted within the carriage as at 38 on the ends of bracket arms 39 secured to the lower ends of the vertical frame members of the bucket carriage and extending outwardly therefrom toward the front of the tower. It will be observed that the pivotal support for the bucket is thus somewhat forwardly of the center of gravity thereof so that the upper end of the bucket is normally biased toward the rear side of

the tower. The bucket is maintained in the upright position within the supporting carriage, however, by means of a stop 46 extending upwardly from the top of the bucket and which engages with the front side of the cross beams 45 of the bucket carriage. The end of the cable 9 is preferably removably fastened to a cross pin extending between the carriage beam members 45 centrally thereof. By virtue of the fact that the slides 44 of the bucket carriage fit cooperatively around the flanges of the guide rails 40, 41, disengagement of the bucket carriage from the guide rails during longitudinal movements thereof within the elevator shaft is positively precluded. Another important feature of this cooperative arrangement of the guide rails and the carriage slides is that there will be no tendency for the bucket carriage to spread the opposite side walls of the tower structure apart upon a laterally unbalanced load obtaining within the bucket or for any other reason. Thus the bucket carriage will tend effectively to hold the tower side walls together in a predetermined spaced relation.

The hopper 11 mounted upon the front side of the tower is of a width substantially equal to that of the tower, or at least, as wide as the bucket 8. The hopper is supported upon the tower by means including a pair of oppositely disposed parallel slides 50 which are cooperatively arranged upon the sliding surfaces provided by the front uprights 12 and 13. The front uprights, in this instance, are formed of angle irons having one pair of flanges extending away from each other in opposite directions providing flat bearing surfaces in the plane of the front side for the slides 50. The slides 50 include channel edges which extend around the edges of the oppositely extending flanges of the uprights 12 and 13 and, since the slides 50 are rigidly secured together in a predetermined spaced relation through the structure of the hopper proper, there will be no tendency on the part of the hopper, however loaded, to exert any lateral stresses upon the tower structure which might cause spreading of the tower sides. In this respect, the supporting structure for the hopper 11 cooperates with the bucket carriage in precluding any wedging apart action upon the tower sides.

The hopper may be raised to any predetermined position upon the face of the tower by means of cable 9 which may temporarily be disconnected from the bucket supporting carriage and suitably connected to the hopper for effecting the positioning thereof by means of the power driven winch drum 10. For holding the hopper in the adjusted position suitable means such as a pair of chains 52 may be provided, one end of each being suitably connected to the hopper, while the other end may be hooked around the front uprights as shown in Figure 2. The hopper itself may be of any suitable construction, being preferably provided with a bottom wall 53 sloping downwardly and outwardly from the tower, and having a discharge chute 54 at the lowermost end thereof with a suitable closure gate 55 for controlling the flow of material therefrom. To enable the operator readily to climb the tower, as for fastening the chains 52 in place and for disconnecting the cable from the hopper, a ladder 48 is provided along one side of the tower.

Means are provided for effecting automatically the dumping of the contents from the bucket 8 into the hopper 11 as the bucket carriage is moved upwardly in the tower past the hopper. It will be observed that the bucket 8 is somewhat deeper than the shaft defined by the tower uprights so that the foremost portion thereof projects outwardly from the forward face of the tower. Attached to one side wall of the bucket adjacent the upper end thereof and near the forward edge portion projecting beyond the front side of the tower is a roller 56 arranged on a suitable shaft 57. Mounted upon the upper surface of the hopper 11 for cooperative engagement by roller 56 is an arcuate track portion 59 suitably secured to braces 60, 61 and 62. The track 59 is mounted on the same side relative to the tower as the roller 56 on the bucket 8 and extends into the path of travel of the roller so that upon upward movement of the bucket the roller will ride upon the lower surface of the track 59 thereby causing the bucket to tilt outwardly through the open face of the tower upon its supporting pivot 38 in the bucket carriage. Continued upward movement of the bucket carriage will cause the bucket to swing outwardly, dumping its contents into the hopper 11. After the contents have been dumped from the bucket 8 and the carriage is lowered, the bucket will again assume its normal upright position within the bucket carriage.

It will be observed that due to the open faced design of the tower, the hopper may be positioned at any height between the limits of movement of the bucket carriage and the bucket will automatically be dumped into it without requiring any further adjustments. This remains true irrespective of the number of sections added to the tower.

The hoisting cable 9 extending from the winch drum 10 on the mixer is trained over an idler pulley 65 mounted on the lower portion of the mixer frame 3 and another idler pulley 66 mounted on an upper portion of the mixer frame adjacent the tower pivot 4. From pulley 66, the cable extends to the top of the tower and is trained over a pair of pulleys 67 and 68 mounted upon the superstructure unit. The superstructure unit comprises a plurality of uprights 69 rigidly secured together as by cross braces 70 and having a pair of cross head channels 71 between which the pulleys 67 and 68 are journaled. The superstructure unit may be bolted as at 72 and 73 to the upper end of any terminal tower section in the same manner as the various tower sections are fastened together. From the centrally positioned pulley 68, the cable 9 extends down through the elevator shaft and is connected to the bucket carriage as described.

In the lowered position of the bucket carriage, concrete may be loaded into the bucket from the mixer by manipulation of the conventional spoon on the rear end of the mixer. It is to be understood, however, that the arrangement described is in no way limited in its applicability to a concrete mixing apparatus. While in the specific embodiment of the invention described in detail, a bulk material handling bucket is shown mounted within the traveling carriage, it will be obvious that any desired form of load handling means is represented thereby. If a platform is substituted therefor, a member corresponding to the stop 46 may be secured in any suitable manner to the carriage beams 45 for stabilizing it. Also, the hopper may readily be removed from the tower if its use is not required for the particular job at hand.

In Figure 4 the tower is shown in the lowered or horizontal position as for traveling. In order to maintain the over all height of the structure in this position at a minimum, the hopper 11 may

be removed from the tower face by sliding it from the lower end thereof and suspended by suitable means, such as the chains 52, from the overhanging lower end of the tower.

When the operator desires to erect the tower to the vertical operative position, the hopper 11 is first removed from the suspended position, and the end of the cable 9 is detached from the bucket carriage and suitably anchored to the tower as indicated at 75. A length of cable is reeled off of the drum 10 and trained over a pair of trip-blocks 76 and 77, the block 76 being anchored as at 78 to the lower portion of the mixer frame and block 77 chained to the end of the tower as at 79. The cable from the pulley 65 extends through block 77, then through block 76, and then up over pulley 66. As the cable is wound up on drum 10, the outer end of the tower is pulled downwardly, pivoting the tower about the point 4 to the upright position 10. The tower may then be anchored by fastening of the braces 5 and 7, after which the blocks 76, 77 may be removed, the hopper mounted on the front of the tower, and the end of cable 9 again attached to the bucket carriage for normal operation.

For lowering the tower the procedure is substantially the reverse to that just described. Thus, with the cable arrangement as described, either raising or lowering of the tower may be expediently effected by the single cable and winch drum provided for hoisting the bucket. Also, the same cable is utilized for making adjustments of the hopper on the front of the tower.

Having described the invention in what is considered to be a preferred embodiment thereof, it is to be understood that the various specific details shown are primarily illustrative and that the invention may be carried out by other means.

What we claim is:

1. In a device of the class described, the combination comprising a tower formed of a plurality of separable sections secured together in an end to end relation, said tower being adapted to be conveyed from place to place in a horizontal position upon a vehicle, a hinge connection between the tower and the vehicle to allow the tower to be raised to a vertical operative position upon reaching a destination, said tower including said sections being box-like in shape having an open face and strengthening cross members along its two sides and back, said hinge connection being secured to the back side of said tower, a hopper adapted to be mounted at any desired height upon said tower, a bucket adapted for conveying materials upwardly within said tower to the height of said hopper, and means associated with said hopper for causing said bucket to move into dumping position upon said bucket reaching the height of said hopper.

2. An elevator arrangement comprising a tower structure adapted to be pivotally secured adjacent one end thereof to a vehicle, said tower being further adapted to be transported horizontally upon said vehicle and shifted to a vertical operative position, said tower comprising a rectangular arrangement of parallel uprights, means bracing said uprights along one pair of opposite sides and across the rear side, said tower being open along the front side, a bucket longitudinally movable within said tower between said uprights, a pair of guides secured to the opposite sides of said tower, a supporting carriage for said bucket slidably mounted on said guides, said bucket being pivotally mounted to said carriage adjacent the lower end thereof and forwardly of the center of gravity of said bucket, a stop extending upwardly from the upper edge of said bucket and engaging with said carriage to prevent rearward tilting of said bucket in said carriage, a hopper adjustably supported entirely upon the forwardmost of said uprights, and means on said hopper for engaging said bucket and causing forward tilting of said bucket within said carriage upon movement of said carriage past said hopper.

3. An elevator arrangement comprising a tower structure including pairs of front and rear parallel uprights, cross members securing said rear uprights together, cross members securing said front uprights to corresponding rear uprights, said tower being open at the front side, a bucket carriage slidably arranged for movement longitudinally of said tower between said uprights, a bucket pivotally mounted upon said carriage for forward tilting movement between said front uprights, a hopper slidably secured to said front uprights and removable from the lowermost ends thereof, and means on said hopper to be cooperatively engaged by said bucket as said carriage is moved upwardly relative to said tower for forwardly tilting said bucket and causing dumping of the contents thereof into said hopper.

4. An elevator apparatus comprising a tower structure including a plurality of parallel uprights, a pair of front uprights defining an open side for said tower, a bucket carriage slidably mounted within said tower between one pair of oppositely disposed side uprights, a bucket pivotally mounted within said carriage so as normally to assume an upright position, said bucket being tiltable through said open side of said tower, a receiver adapted to be adjustably positioned adjacent the front side of said tower at any point along the extent thereof, said receiver being arranged wholly on the outside of said tower and means on said receiver for engaging said bucket as said bucket carriage is moved upwardly within said tower for effecting tilting of said bucket and the unloading of the contents thereof into said receiver.

5. An elevating apparatus comprising a tower including a plurality of uprights, transverse members rigidly securing said uprights together around three sides of said tower defining a substantially rectangular elevator shaft open along the front side for substantially the full length thereof, a bucket carriage mounted for longitudinal movement in said shaft, a bucket pivotally mounted in said carriage, the front edge of said bucket normally extending beyond the front side of said tower, and means for effecting forward pivotal movement of said bucket through said front tower side.

6. An elevating apparatus comprising a tower including a plurality of parallel uprights, means bracing said uprights together along one pair of opposite sides and along the rear side of said tower, the front side of said tower being open substantially throughout the full length thereof, a bucket carriage slidably mounted between the opposite sides of said tower, a bucket mounted in said carriage, the front edge of said bucket in the upright position thereof extending substantially between the uprights defining the front side of said tower, a pivotal mounting for said bucket upon said carriage, the axis of said pivotal mounting extending horizontally and parallel with the front side of said tower, means for moving said carriage and bucket longitudinally of said tower, and means adapted to be adjustably secured to the front side of said tower at any point thereof between the limits of movement of said bucket

carriage for engaging said bucket and causing tilting thereof through said open tower side for unloading said bucket.

7. In a mobile concrete mixer apparatus, a tower comprising a plurality of parallel uprights, said uprights defining front, rear, and opposite sides for said tower and a longitudinal rectangular elevator shaft therebetween, means bracing said uprights rigidly together along said rear and opposite sides, the front side of said tower being open substantially throughout the full length thereof, said tower being pivotally supported adjacent one end to said mixer, the open side of said tower facing away from said mixer, a bucket carriage slidably arranged for longitudinal movement within said tower, a bucket pivotally supported within said carriage for tilting movement through said open side of said tower, the front side of said bucket in the upright position thereof extending substantially between the tower uprights defining the front side thereof, a hopper slidably mounted upon the front side of said tower and adapted to be adjustably secured thereto at any point between limits of movement of said carriage, and means provided on said hopper for effecting emptying of said bucket into said hopper.

8. In a mobile mixer apparatus including a framework, an elevating tower structure comprising a plurality of parallel uprights defining front, rear, and opposite sides for said tower, means rigidly securing said uprights together along the rear and opposite sides of said tower, the front side of said tower being open substantially throughout the full length thereof, means pivotally mounting said tower to an upper part of said framework for movement about a horizontal axis, said tower being adapted to be transported in a horizontal position on said framework, a bucket carriage slidably mounted within said tower for longitudinal movement therein, a bucket pivotally mounted within said carriage for tilting movement through the open side of said tower, the front side of said bucket in the upright position thereof extending substantially between the tower uprights defining the front side thereof, and receiver means slidably secured upon said last mentioned uprights for receiving contents from said bucket, said receiver means being removable from the lower ends of said uprights.

9. An elevator apparatus comprising a plurality of parallel uprights defining a longitudinal elevator shaft, means fastening said uprights together around three sides of said shaft, said shaft being open along the front side, a carriage slidably mounted within said shaft for movement longitudinally thereof, means for receiving contents from said carriage, support means for said contents receiving means comprising a pair of slides mounted upon a pair of said uprights on the opposite sides of said front side, said slides being removable from the lowermost ends of said last mentioned uprights.

10. An elevator comprising a plurality of parallel uprights defining a tower having a longitudinal elevator shaft therein, means fastening said uprights together around three sides of said tower, said shaft being open along the front side of said tower substantially the full length thereof, an elevator carriage slidably mounted within said shaft for movement longitudinally thereof, a pair of guide rails secured to the inner opposite sides of said tower parallel with said uprights, said rails having oppositely extending flanges along the outer edge thereof, slides on the opposite sides of said carriage and fitting cooperatively around said guide rail flanges whereby spreading of said tower sides upon movement of said carriage longitudinally thereof is substantially precluded.

11. An elevator comprising a plurality of parallel uprights defining a tower structure having a longitudinal elevator shaft therein, means fastening said uprights together around three sides of said shaft, said shaft being open along the front side of said tower, a load carriage slidably mounted within said shaft, a pair of guide rails secured to the inner opposite sides of said tower having a pair of oppositely extending flanges along the outer edge thereof, channel slides fitting cooperatively around said flanges secured to the opposite sides of said carriage whereby spreading of said tower sides during elevating movements of said carriage is substantially precluded.

12. An elevator apparatus comprising a plurality of parallel uprights defining a tower structure having a longitudinal elevator shaft therein, means fastening said uprights together around three sides of said tower, said shaft being open along the front side of said tower, an elevator bucket slidably mounted within said shaft for movement longitudinally thereof, said bucket being tiltable through the open front side of said tower for dumping the contents thereof, a hopper for receiving the contents from said bucket, a pair of said uprights on the opposite sides of said front side forming a pair of guide rails having oppositely extending flanges, means for supporting said hopper on said guide rails including a pair of slides having portions extending around said flanges, said hopper supporting means being movable longitudinally of said tower across the open front side thereof, said hopper and supporting means therefor tending to preclude spreading of the tower sides.

13. An elevator apparatus comprising a plurality of parallel uprights defining a tower structure having a longitudinal elevator shaft, means fastening said uprights together around three sides of said tower, said shaft being open along the front side of said tower, an elevator bucket carriage, guide rails secured to the inner opposite sides of said tower having outwardly extending flanges along the outermost edge thereof, slides on the opposite sides of said carriage fitting cooperatively around said rail flanges, a hopper slidably mounted upon the front side of said tower for receiving the contents from said bucket, a pair of said uprights defining the front side of said tower having a pair of oppositely extending flanges, and a supporting structure for said hopper including a pair of slides extending around said upright flanges.

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