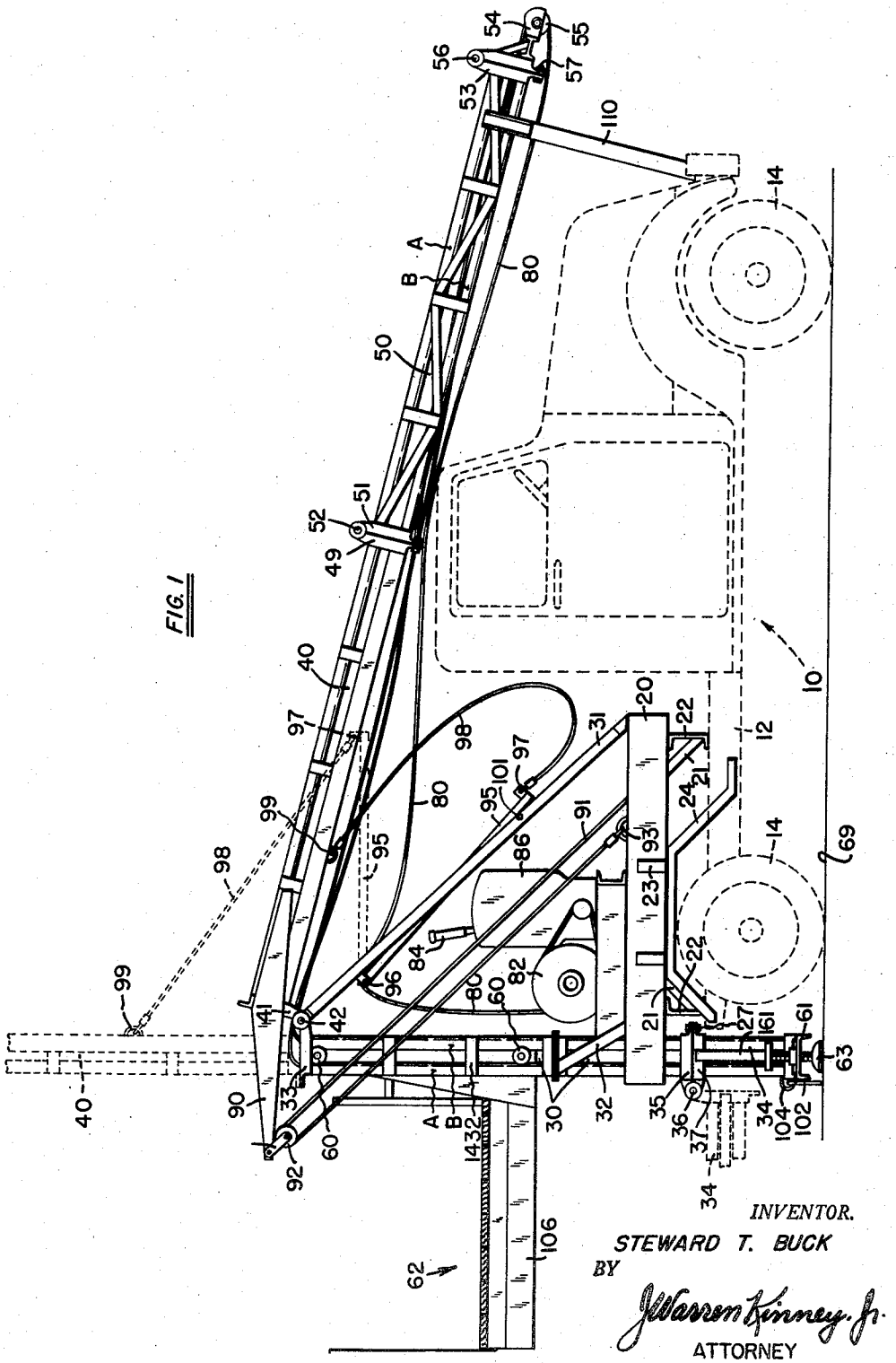
Sept. 2, 1958 S. T. BUCK 2,850,191

PORTABLE ELEVATOR TOWER

Filed March 20, 1956 5 Sheets-Sheet 1

FIG. 1



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PORTABLE ELEVATOR TOWER

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FIG. 3

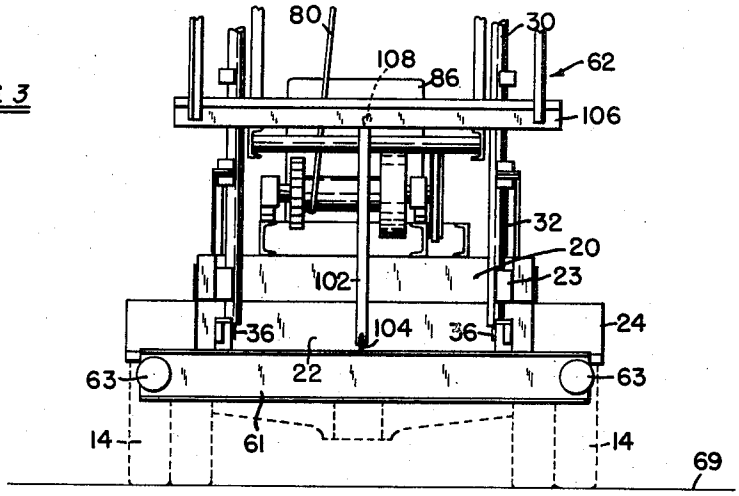
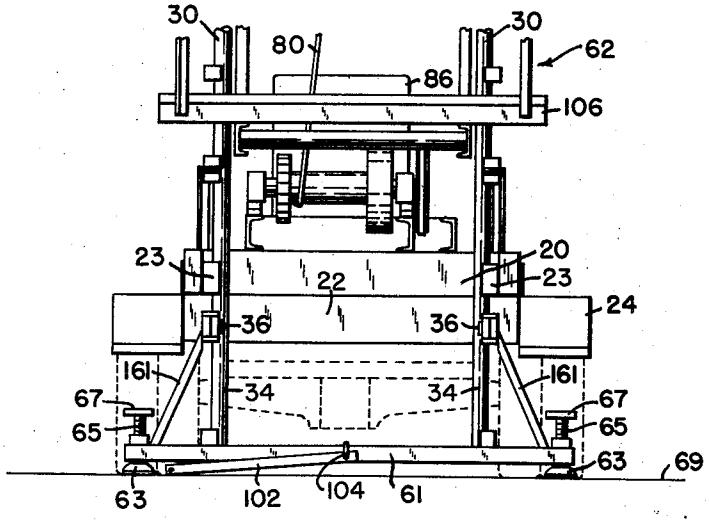


FIG. 2



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PORTABLE ELEVATOR TOWER

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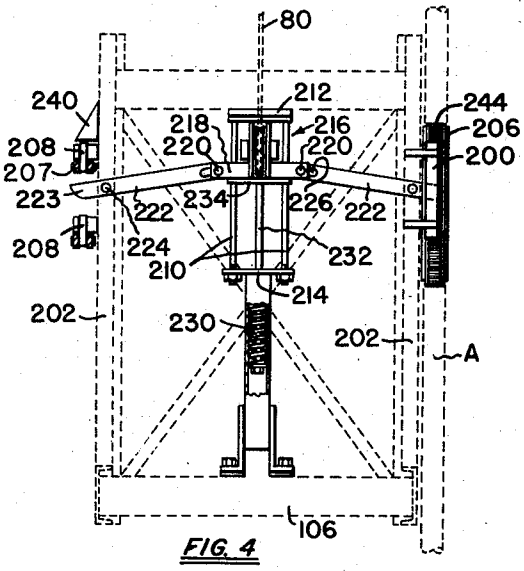

FIG. 4

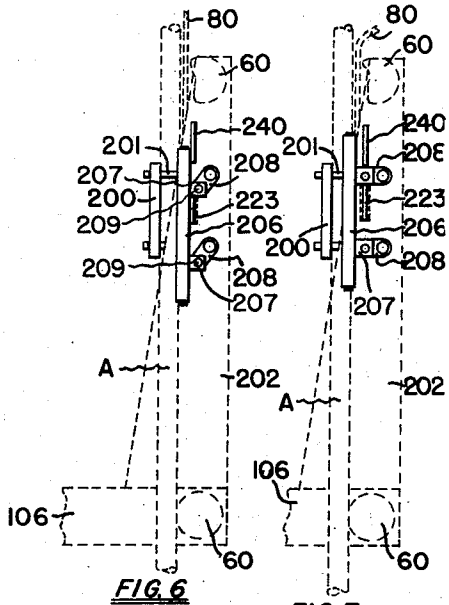

FIG. 6

FIG. 7

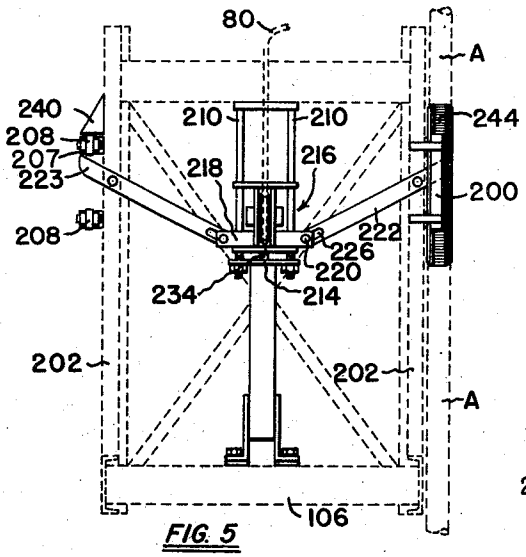

FIG. 5

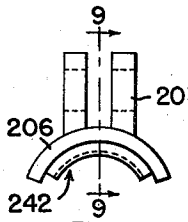

FIG. 8

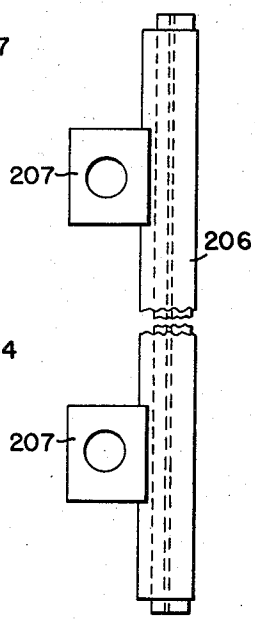

FIG. 10

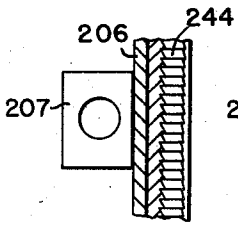

FIG. 9

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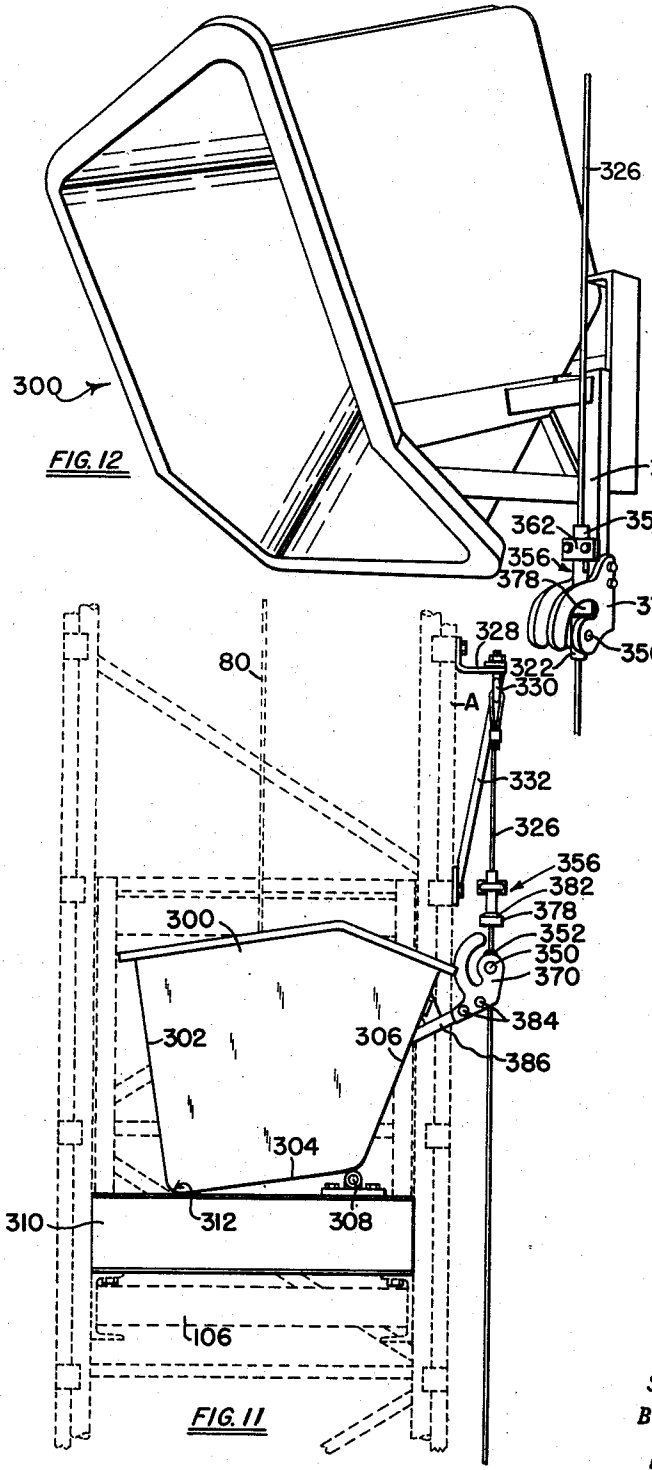

FIG. 12

FIG. 11

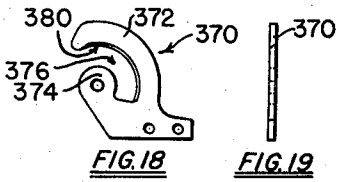

FIG. 18 FIG. 19

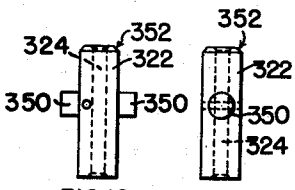

FIG. 16 FIG. 17

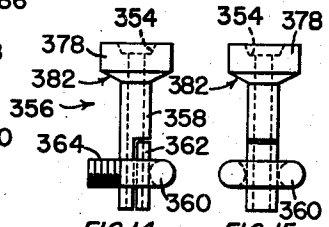

FIG. 14 FIG. 15

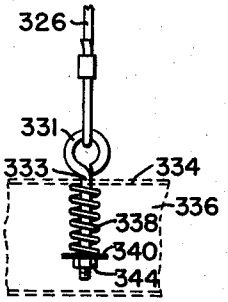

FIG. 13

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PORTABLE ELEVATOR TOWER

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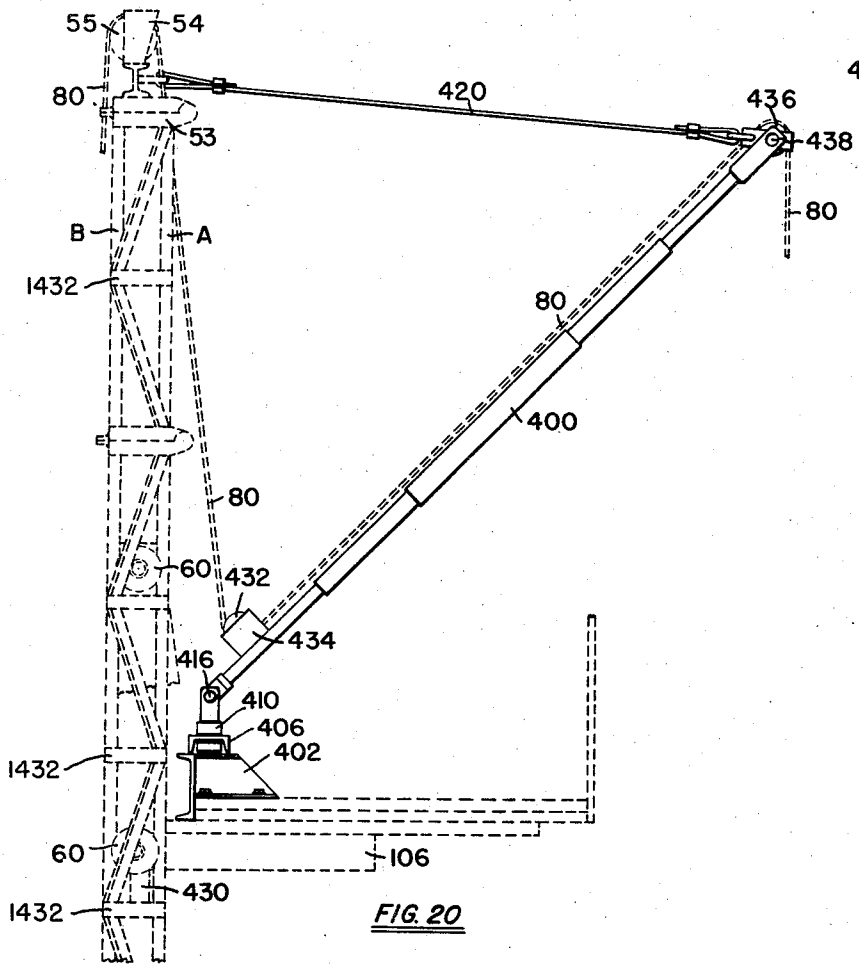

FIG. 20

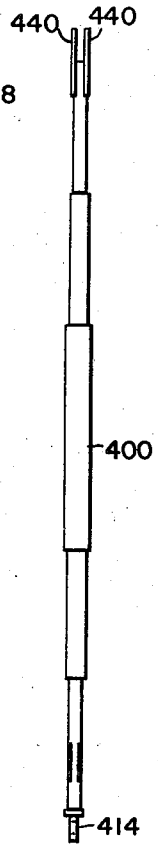

FIG. 21

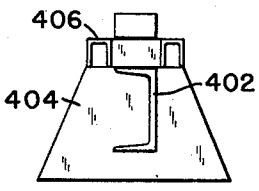

FIG. 22

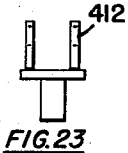

FIG. 23

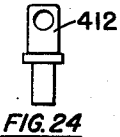

FIG. 24

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United States Patent Office 2,850,191 Patented Sept. 2, 1958

2,850,191

PORTABLE ELEVATOR TOWER

Steward T. Buck, Cincinnati, Ohio

Application March 20, 1956, Serial No. 572,688

5 Claims. (Cl. 214—630)

This invention relates to a portable hoisting tower assembly, and more particularly to a sectional hoisting tower having a platform elevator operably associated therewith.

An object of the invention is to provide a sectional hoisting tower assembly in conjunction with a wheel-supported transport vehicle for enabling the tower to be conveniently moved from one location to another.

Another object of the invention is to provide a sectional hoisting tower in conjunction with a wheel-supported transport vehicle wherein the tower comprises a lower section which is selectively movable between a lowered position in axial alignment with other portions of the tower, and in which position the said lower tower section will be ground-engaging for thereby supporting the weight of the tower structure; the said lower portion being shiftable to a raised, inoperative position during transport of the tower and vehicle.

A further object of the invention is to provide a portable hoisting tower assembly having the hereinabove described characteristics and which includes elevator actuating means which are secured to and carried by the transport vehicle, said elevator actuating means being provided with a protective roof which is automatically raised to an operator-protecting position incident to erection of the tower assembly.

Still another object of the invention is to provide a portable hoisting tower having an elevator operably associated therewith in connection with a wheel-supported transport vehicle, with a lower tower section which when fully lowered provides a vertical extension for the tower elevator, thereby enabling the elevator to be lowered to ground level for loading and unloading operations; thereby avoiding the necessity of providing means for bodily raising and lowering the entire tower-supporting base as disclosed in my Patent No. 2,653,685 dated September 29, 1953.

Still a further object of the invention is to provide a portable hoisting tower which, when in a collapsed position, will compactly approximate the overall confines of the transport vehicle to which it is mounted, thereby providing a mobile unit which may be conveniently driven on the public highway, under bridges and the like, without requiring dismantling of the tower structure.

Another object of the invention is to provide the elevator of a hoisting tower assembly with fully automatic elevator supporting safety means which are automatically rendered operable in the event the supporting cables should break or become slack.

Still another object of the invention is to provide a dump bucket attachment for the elevator platform of a hoisting tower.

A further object of the invention is to provide adjustable means for automatically dumping an elevator supported dump bucket when it reaches a predetermined location on the hoisting tower, said means automatically righting the bucket incident to its being lowered from said location.

Another object of the invention is to provide a hoisting boom attachment for the elevator of a hoisting tower for providing a platform derrick wherein the elevator hoisting cable is utilized as the lifting cable of the derrick.

These and other objects are attained by the means described herein and as disclosed in the accompanying drawings, in which:

Fig. 1 is a side elevation of a mobile portable hoisting tower embodying the teachings of the present invention in a fully collapsed or retracted transport position.

Fig. 2 is an end view of the lower portion only of device of Fig. 1.

Fig. 3 is an end view similar to Fig. 2, but illustrating the lower tower section in a fully elevated, inoperative, transport position.

Figs. 4 and 5 are front views of the safety device comprising a detail of the present invention with parts thereof broken away and with the elevator and hoisting tower indicated in broken outline, for clarity of detail and understanding, showing the device in normal inoperative and operative positions, respectively.

Figs. 6 and 7 are side views of Figs. 4 and 5, respectively.

Fig. 8 is a top elevational view of a brake shoe comprising a detail of the invention.

Fig. 9 is a sectional view taken on line 9—9 of Fig. 8.

Fig. 10 is a side elevational view of the brake shoe of Fig. 8.

Fig. 11 is a side elevational view of a dump bucket assembly comprising a detail of the invention.

Fig. 12 is a perspective view of the bucket of Fig. 11 in dumping position.

Fig. 13 is a side view of the lower end of cable **326** of Fig. 11.

Fig. 14 is a rear elevational view of the adjustable cable stop comprising a detail of the invention.

Fig. 15 is a side elevational view of Fig. 14.

Fig. 16 is a rear elevational view of the cable sleeve comprising a detail of the invention.

Fig. 17 is a side elevational view of Fig. 16.

Fig. 18 is a side elevational view of the one of the bucket actuators comprising a detail of the invention.

Fig. 19 is a rear elevational view of Fig. 18.

Fig. 20 is a side elevational view of a hoisting boom assembly comprising a detail of the invention.

Fig. 21 is a front elevational view of the boom of Fig. 20.

Fig. 22 is a front view of the boom support.

Fig. 23 is a front view of the boom mount.

Fig. 24 is a side elevational view of Fig. 23.

With reference to Fig. 1, the numeral **10** denotes generally a transport vehicle which includes a framework **12** suitably supported upon road engaging wheels **14**.

It should be understood that the present invention is neither directed to nor concerned with the particular type of transport vehicle, which therefore has been illustrated in the drawings in broken outline.

A base **20** is fixedly secured to frame **12** by means of channels **22** and structural elements **21**, whereby base **20** will, in effect, comprise an integral part of frame **12**.

The numeral **24** denotes generally a fender suspended from supports **23**.

A sectional tower is secured to and carried by base **20**, and in the preferred embodiment of the invention the tower comprises a first section **30** which is secured to and in fixed, rigid, upstanding relationship with the rear end of base **20** such as by means of brace elements **31** and **32**. Hinge plates **33** and **35** are permanently secured to the upper and lower ends, respectively, of the first tower section, and a second or base section **34** having a hinge plate **37** at its upper end is pivotally secured as at **36** to

the lower end of section **30** for movement between the fully lowered position illustrated in solid outline in Fig. **1**, in axial alignment with section **30**, and the elevated, inoperative position extending rearwardly of base **20** and section **30**, as indicated in broken outline in Fig. 1. When in lowered position tower section **34** is securely though releasably anchored to section **30** such as by means of a bolt **27** which extends through hinge plates **35** and **37**.

The tower likewise may include a third section **40** the lower end of which is provided with a hinge plate **41** pivoted as at **42** to hinge plate **33** on the upper end of the first secton **30**; and a fourth section **50** having hinge plate **51** at its lower end is pivotally secured as at **52** to hinge plate **49** at the upper end of section **40**. If desired, a cat-head assembly **54** including a pulley **55** may be pivotally connected by pintle **56** and bolt **57** to hinge plate **58** secured to and carried by the free upper end of section **50**.

Each of the various tower sections, **30**, **34**, **40** and **50**, is provided with a pair of laterally spaced, elongate track-defining elements A and B between which wheels **60** of an elevator assembly denoted generally by the numeral **62** are received for endwise movement therebetween.

Pulley **55** of the cat-head assembly guides an elevator control or lift cable **80**, one end of which is secured to elevator drum **82** which is adapted to be selectively driven in opposite directions and/or locked against rotation by means of manual manipulation of control lever **84** of a suitable power source denoted generally by the numeral **86**. The other end of cable **80** is operatively secured to the elevator **62**.

A tower lever **90** is fixedly secured to the lower end of tower section **40**, said lever projecting a substantial distance beyond and at the sides of said tower section. Suitable means, such as, by way of example, a pulley **92**, is secured to the free outer end of lever **90** to permit the application of a tower elevating force to the lever for swinging sections **40** and **50** from the lowered positions indicated in solid outline to their fully erected, vertical positions denoted in broken outline, in axial alignment with tower section **30** incident to a reeling in of cable **91** by means of a suitable winch, not illustrated. The free end of the cable may be anchored to the base as at **93**.

With particular reference now to Figs. 1 and 2, it will be noted that the lower ends of tower sections **34** terminate in a transverse foot-member **61** the outer ends of which, note Fig. 2, are spaced outwardly from the sides of the tower sections. Adjustable ground-engaging means comprising ground-engaging plates **63**, secured to and carried by the lower ends of shaft **65** of a jack screw mechanism, including a hand-wheel **67**, are provided at opposite ends of member **61** for thereby enabling an operator to selectively effect a firm engagement with a supporting surface **69** such as the ground, or the like. The numerals **161** of Figs. 1 and 2 denote transverse brace members which rigidly interconnect hinge plates **37** and member **61**.

With reference to Figs. 1 and 2, it will be noted that the lower tower section will thus support the weight of the upper portions of the tower, the weight of which will thereby be removed from the wheeled vehicle.

When it is desired to move the device from one location to another, the upper tower sections **40** and **50** will be lowered, it being noted that elevator **62** is first securely though releasably anchored relative to the fixed tower section **30**. Then, after the upper tower sections have been lowered and secured to brace member **110**, Fig. 1, the jack screws may be released for freeing the lower tower section **34**, which may then be swung upwardly to the inoperative position of Fig. 3, in which condition it may be securely though releasably anchored by means of a connector element **102** the lower end of which is connected as at **104** to a portion of transverse element **61**, the upper end thereof being secured as at **108** to a portion of elevator platform **106**.

With reference again to Fig. 1, the numeral **95** denotes generally a roof panel pivotally secured at **96** to brace member **31** for movement between the fully lowered, inoperative position indicated in solid outline to the fully elevated, operative position indicated in broken outline. The free end of said panel is connected at **97** to a cable **98** which is secured to tower section **40** as at **99** whereby elevation of the tower will automatically raise the panel to a substantially horizontal position above and over the power plant **86** and that portion of base **20** on which the elevator operator sits or stands. A stop pin **101** will limit the lowered position of said panel.

From the foregoing it will be noted that I have thus provided a portable hoisting tower in association with a transport vehicle and the weight of which tower, when fully erected, will be sustained by the ground, or other supporting surface, through the lowermost section of the tower, and be relieved entirely from the transport vehicle.

With reference now to Figs. 4 through 7, the numerals **200** denote pressure plates rigidly secured by brackets **201** to the upstanding side members **202** of the elevator assembly **62**, whereby they will be disposed in closely spaced parallelism or in actual light, sliding relationship with the forward face of the vertical elevator-track or elevator guide defining elements A.

The numerals **206** denote elongate brake shoes pivotally secured by parallel links **208** to side members **202** for movement between the normal, inoperative positions of Figs. 4 and 6, in spaced relationship with the rear face of track or guide elements A, to the operative positions of Figs. 5 and 7, in positive locking engagement with said elements.

The brake shoes are automatically shifted from inoperative to operative positions, should the elevator supporting cable **80** break or become slack.

With particular reference now to Figs. 4 and 5, the numerals **210** denote vertical guide elements spanning horizontal plates **212** and **214** and upon which pulley cage **216** is slidably mounted. Plates **212** and **214** are rigidly secured to the elevator platform assembly.

A plate **218** is secured to and carried by the pulley cage for movement therewith, the ends of said member being provided with pivot pins **220**. The outer end of each of a pair of arms **222** is pivotally mounted as at **224** to side members **202**. The inner ends of arms **222** are provided with elongate slots **226** which slidably engage pins **220**, thereby permitting the arms to be moved between the positions of Figs. 4 and 5.

A tension spring **230** is disposed between plate **214** and the lower end of rod **232**, the upper end of which is secured to lower plate **234** of the pulley cage, whereby the pulley cage will be normally and yieldably urged downwardly from the position of Fig. 4 to that of Fig. 5 by the action of spring **230**.

The weight of the elevator when lifted by cable **80** will oppose and overcome the counterforce of spring **230** for disposing the pulley cage and arms **222** in the relative positions illustrated in Figs. 4 and 6, in which condition brake **206** and pressure plates **200** are disposed in inoperative position with respect to guides A, thereby permitting the elevator to be freely moved along the guides of the hoisting tower assembly.

However, if cable **80** should break or become slack, pulley cage **216** will be instantly lowered to the position of Fig. 5, thereby swinging the outer end **223** of arms **222** upwardly about and relative to pivots **224** for engaging and lifting the uppermost of the mounting ears **207** which are rigidly secured to the brake shoes **206** and which are pivotally connected to parallel links **208** at **209**. In this manner the entire length of the brake shoes will be uniformly and positively jammed against the rear surface of guide elements A. The jamming action will be augmented by pressure plates **200** which, being disposed closely adjacent or in sliding contact with the opposite or forward face of guide elements A, will, in ef-

fect, result in the front and rear faces thereof being compressed between adjacent faces of the pressure plates and brake shoes, whereby relative motion between the elevator and the hoisting tower will be positively precluded.

With particular reference now to Figs. 6 and 7, the numerals **240** denote stop elements engageable by and which limit the upward swing of parallel links **208**.

In Figs. 8, 9 and 10 I have illustrated the preferred construction of the brake shoes which preferably include an arcuate braking surface **242** which is serrated as at **244** for providing a surface which will actually cut into the rear surface of guide elements A whenever the cable **80** is slack or broken and the parallel links **208** have been shifted to the horizontal position of Fig. 7.

In this manner I have thus provided simple, inexpensive, yet highly efficient, foolproof safety means in conjunction with the elevator of a hoisting tower.

In Fig. 11 I have illustrated the manner in which the elevator **62** of Fig. 1 may be provided with a dump bucket assembly of the type which includes means for automatically tipping the bucket to a dumping or discharge position when it reaches a certain elevation.

The numeral **300** denotes generally a bucket having rear and bottom walls **302** and **304**, respectively, and a forwardly inclined front wall **306**. The bucket is pivotally secured as at **308** to a channel element **310** secured to and spanning bottom **106** of the elevator platform. Pivotal connection **308** is disposed adjacent the intersection of forward wall **306** and bottom wall **304** whereby the bucket will be gravitationally maintained in the upright position of Fig. 11 by reason of portion **312** contacting the upper surface of beam **310**.

A bucket dumping arm **386** is rigidly secured to and in projecting relationship with bucket **300**, said arm comprising a cable sleeve or control cable follower **322** (Figs. 16 and 17) having an axial bore **324** therethrough for slidably receiving a control cable whose upper end is secured relative to an elevator guide A by means of a bracket **328** and an eye bolt **330**. If desired, a supporting strut **332** may be provided for rigidly anchoring the eye bolt assembly relative to the tower.

The lower end of cable **326** may be secured to the eye **331** (Fig. 13) of an eye bolt **333** the shank of which extends through an aperture in the top web **334** of a channel **336** which is secured to and extends transversely of the lower end of the hoisting tower. A spring **338** is disposed between the adjacent faces of web **334** and an abutment **340** secured to the end of shank **333** such as by means of a nut **344**. In this manner the control cable is maintained in a taut but yieldable condition along and in parallelism with the hoisting tower.

The control cable-follower is provided with a pair of transversely extending trunions **350**, and one end of the follower is tapered as at **352** for engaging socket portion **354** at one end of the cable-supported abutment means denoted generally by the numeral **356**.

The cable abutment comprises a hollow shank **358** through which cable **326** extends and to which the abutment may be securely though releasably anchored by means of U-bolt **360** and pressure plate **362** which will be tightly compressed onto the cable incident to tightening of a nut onto the threaded end **364** of the U-bolt. With reference now to Fig. 11, it will be noted that the cable stop or abutment has thus been anchored to cable **326** whereby the tapered or socket-receptive end **352** of the cable follower will be received within socket **354** incident to relative upward movement of the bucket assembly relative to the control cable.

With particular reference now to Figs 11, 12 and 18, the numeral **370** denotes a bucket actuator or cam which includes a pair of laterally spaced arcuate members **372** and **374** which define an arcuate channelway **376** dimensioned to receive the enlarged lower end or headed portion **378** of the cable abutment after the tapered end **352** of sleeve **322** has been received within socket **354**. In the preferred embodiment of the invention surface **380** of arcuate member **372** is chamfered to facilitate its engagement with tapered face **382** of the cable abutment.

The bucket actuator plates **370** are fixedly secured as at **384** to arm **386** which is rigidly secured relative to the upper portion of bucket **300**, note Fig. 11. The said bucket actuator plates are likewise pivotally secured to sleeve **322** on trunnions **350**.

From the foregoing it will be noted that elevation of the elevator will cause tapered end **352** of follower **322** to be received within socket **354** of cable abutment **356**, thereby terminating the upward relative motion of the sleeve relative to the stop, and for providing a fulcrum about which the arcuate cam members **370** are swung whereby to initially strike against and then pass outwardly over or around the enlarged lower portion **378** of the abutment for disposing the shank **358** of the abutment between the cam members and within throat or channelway **376**, thereby imparting a turning force to bucket **300** as the elevator is lifted further whereby the bucket will be tilted to the discharge position illustrated in Fig. 12.

After the contents of the bucket have been discharged, lowering of the elevator will automatically return the bucket to the upright position of Fig. 11 incident to a lowering of the bucket actuator relative to and then from engagement with the cable abutment.

The aforesaid means enables a dump bucket to be automatically dumped to a discharging position incident to elevation of the platform to a predetermined position relative to the hoisting tower thereby rendering it unnecessary to require the presence of workmen on the elevator for dumping the bucket. It also provides positive protection against accidental or unintentional dumping of the bucket.

In Fig. 20 I have illustrated the manner in which a hoisting boom **400** may be associated with elevator platform **106** for thereby providing a platform derrick in order to obtain maximum utility of the hoist.

The numeral **402** denotes a mounting channel secured to and carried by a cross beam **404** which spanningly engages side elements **106** of the elevator platform. A third channelway **406** spans the upper ends of channel **402** and provides a bearing plate for a rotatable trunnion **410** having a pair of upstanding, laterally spaced ears **412** between which the lower end **414** of boom **400** is pivotally secured as at **416**.

With particular reference to Fig. 20, it will be noted that the upper end of the boom is secured relative to the upper end of the tower by means of a cable **420**.

In the preferred embodiment of the invention, I utilize the elevator hoisting cable **80** for the hoisting boom by first anchoring the elevator in an elevated condition with respect to the hoisting tower, such as by means of a stop member **430** which extends transversely across the laterally spaced tower elements **1432** and beneath the lower set of wheels **60**. Elements **1432** interconnect the elongate track defining elements or guides A and B After the elevator platform **106** has thus been secured relative to the tower, the end of hoisting cable **80** is disconnected from the elevator and is then threaded under pulley **432** secured to and carried by the lower end of boom **400** as at **434** and thence over pulley **436** rotatably journaled as at **438** between plates **440** at the upper end of the boom. I am thus able to utilize not only the elevator hoisting cable but also the power means for elevating the elevator to operate the derrick attachment, thereby providing a highly efficient device having maximum utility with a minimum of expense.

It should be understood that various changes and modifications, within the scope of the appended claims, may be made, without department from the spirit of the invention.

What is claimed is:

1. In combination: An elevator tower, an elevator platform, means for raising and lowering the platform relative to the tower, a bucket having rear, bottom, side and front walls, means pivotally mounting the front portion of the bucket bottom to the platform, an actuator arm secured to and projecting forwardly of the bucket, an abutment, means mounting said abutment relative to the tower, means on said actuator arm continuously engaging said abutment mounting means, and other means on said actuator arm engageable with said abutment incident to raising of the platform for automatically swinging said bucket forwardly about its pivotal connection to discharge position, and for returning said bucket from discharge position back to an upright position on the platform incident to lowering of the platform.

2. In combination: An elevator tower, an elevator platform, means for raising and lowering the platform relative to the tower, a bucket having rear, bottom, side and front walls, means pivotally mounting the front portion of the bucket bottom to the platform, an actuator arm secured to and projecting forwardly of the bucket, a control cable in spaced parallelism with said tower, abutment means secured to and carried by said cable, and follower-cam means on said actuator arm engageable with said cable and abutment means incident to raising of the platform for automatically swinging said bucket forwardly about its pivotal connection to discharge position, and for returning said bucket from discharge position back to an upright position on the platform incident to lowering of the platform.

3. In combination: An elevator tower, an elevator platform, means for raising and lowering the platform relative to the tower, a control cable extending along the tower, a bucket having rear, bottom, side and front walls, means pivotally mounting the front portion of the bucket bottom to the platform, an actuator arm secured to and projecting forwardly of the bucket toward the control cable, abutment means secured to and carried by said cable, means on said actuator arm including a control cable-follower and an abutment-cam, said cable-follower having an axial bore for slidably receiving said cable, said cam including a pair of arcuately slotted members pivotally secured to and on opposite sides of the cable-follower, said cable-follower adapted to abut said abutment means for providing a fulcrum about which the cam is swung incident to raising of the platform into spanning engagement with the abutment means for swinging the bucket forwardly about its said pivotal connection to discharge position and for returning said bucket from discharge position back to an upright position on the platform incident to lowering of the platform.

4. The combination described in claim 3, wherein the abutment means includes a socket portion circumscribing the control cable, and wherein the upper end of the cable-follower terminates in a socket-receptive head.

5. In combination: An elevator tower, an elevator platform, means for raising and lowering the platform relative to the tower, a control cable extending along the tower, a bucket having rear, bottom, side and front walls, means pivotally mounting the front portion of the bucket bottom to the platform, an actuator arm secured to and projecting forwardly of the bucket toward the control cable, abutment means including a shank portion terminating in an enlarged lower end secured to and carried by said cable, an abutment-cam including a pair of arcuately slotted members secured to said actuator arm, a control cable-follower having an axial bore for slidably receiving said cable, said follower pivotally mounted to and between said arcuate members, said cable-follower adapted to abut the lower end of said abutment means for providing a fulcrum about which the arcuate cam-members are swung over the enlarged lower end of the abutment and straddling the shank portion thereof for swinging the bucket forwardly about its said pivotal connection to discharge position incident to raising of the platform, and for returning said bucket from discharge position back to an upright position on the platform incident to lowering of the platform.

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