April 26, 1955 R. L. BROWNING 2,707,053

CRANE TROLLEY

Filed July 21, 1953

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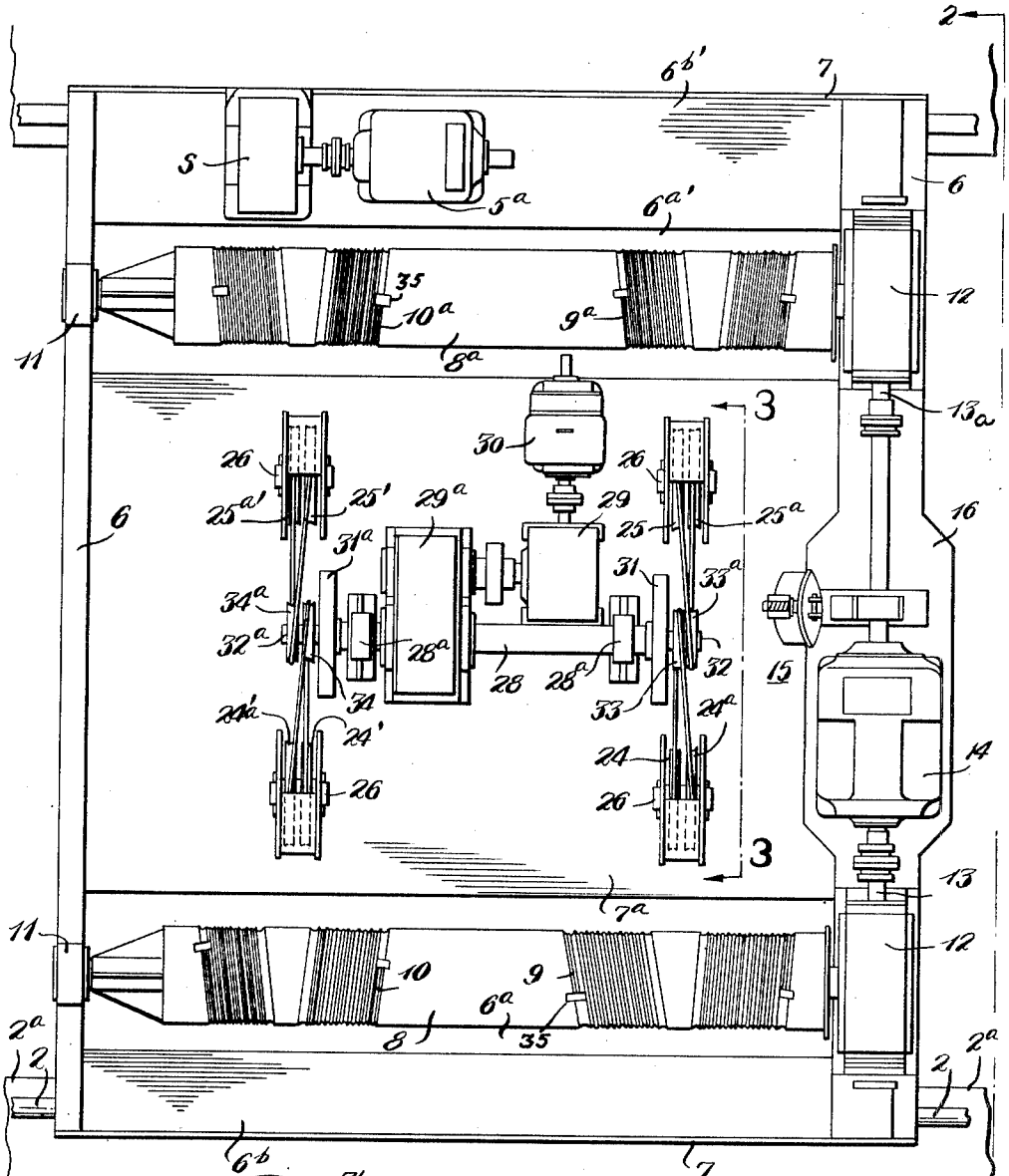



FIG. 1

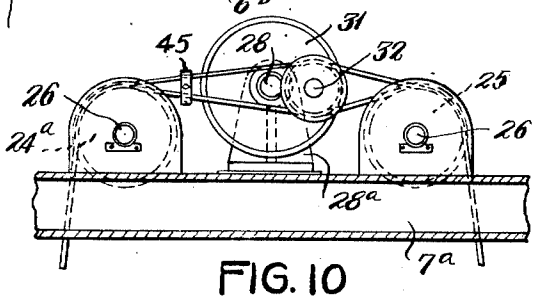



FIG. 10

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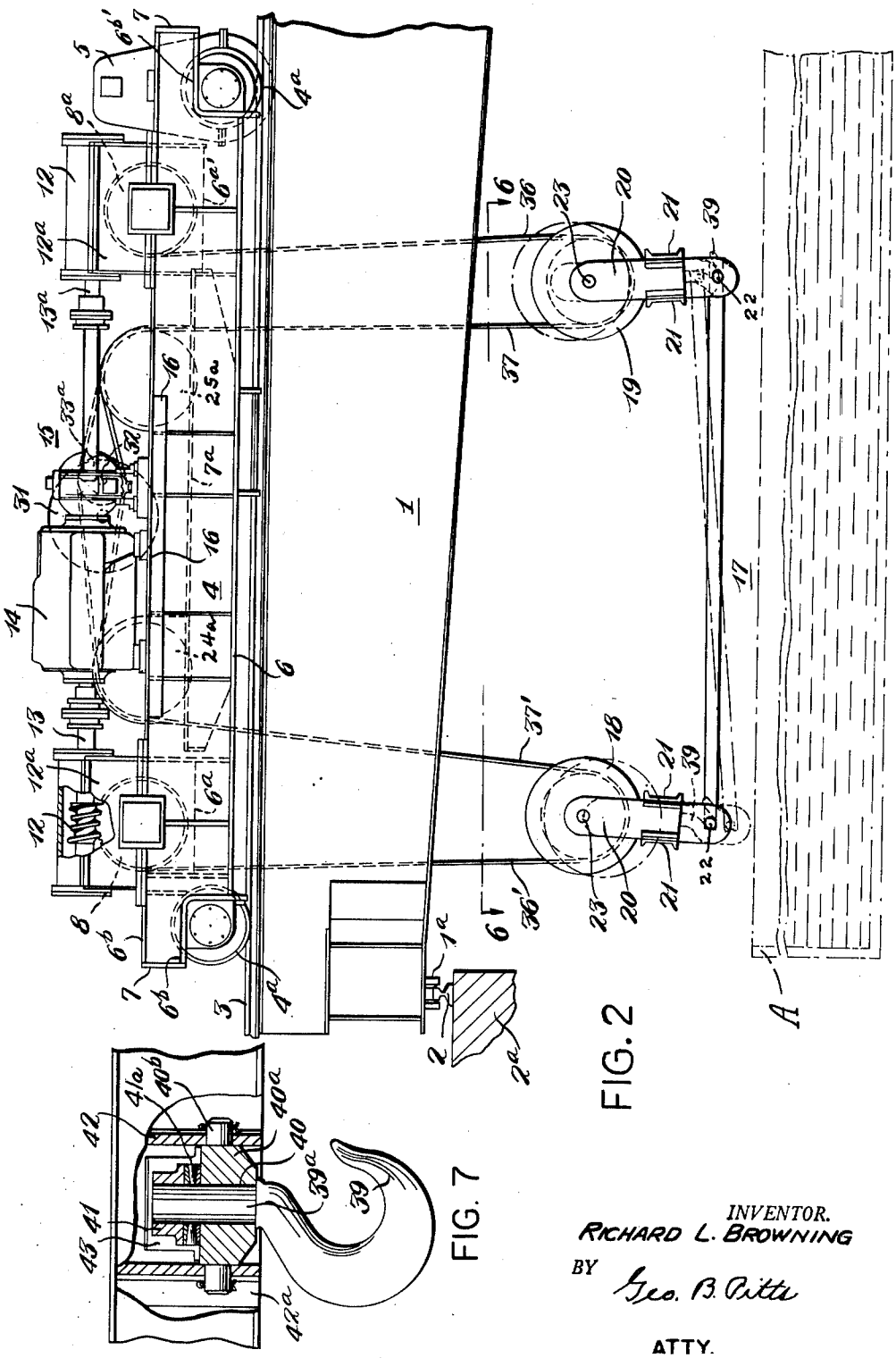


FIG. 2



FIG. 7

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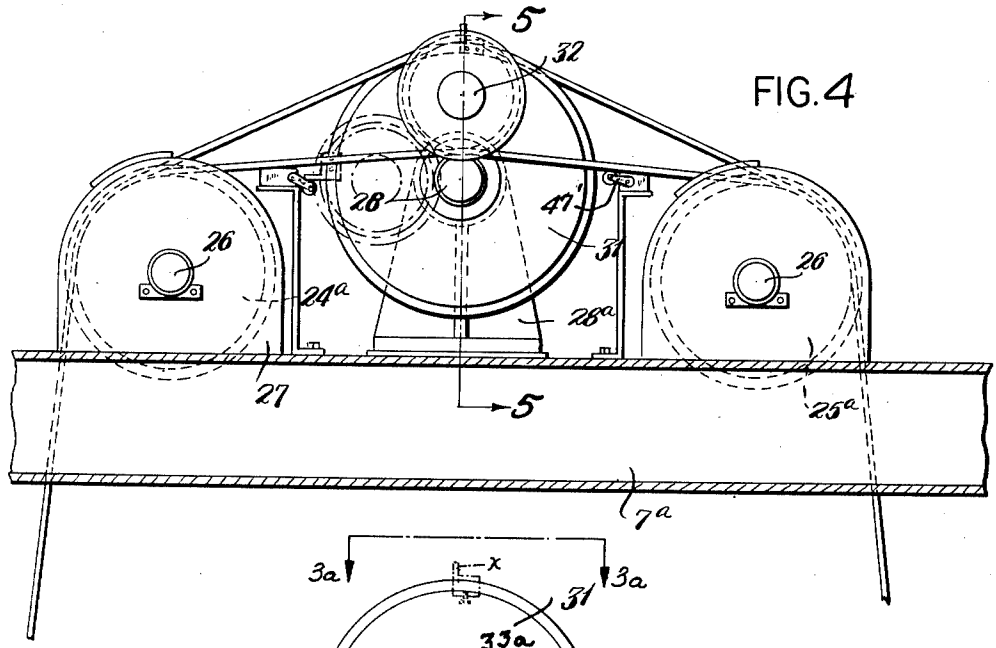



FIG. 4

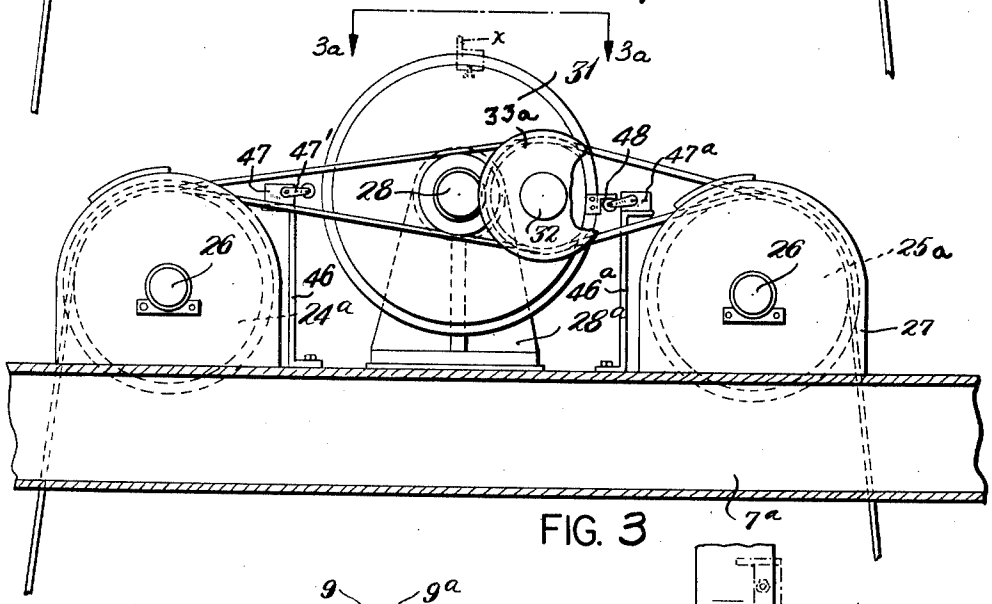



FIG. 3

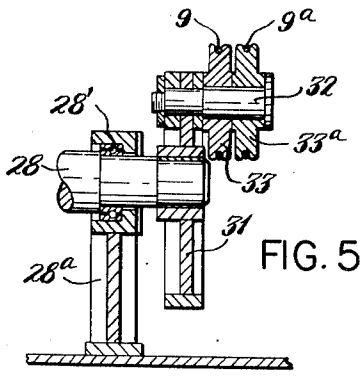



FIG. 5

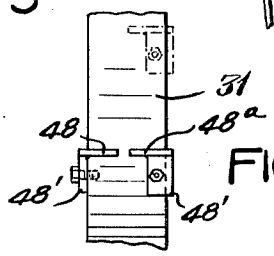



FIG. 3a

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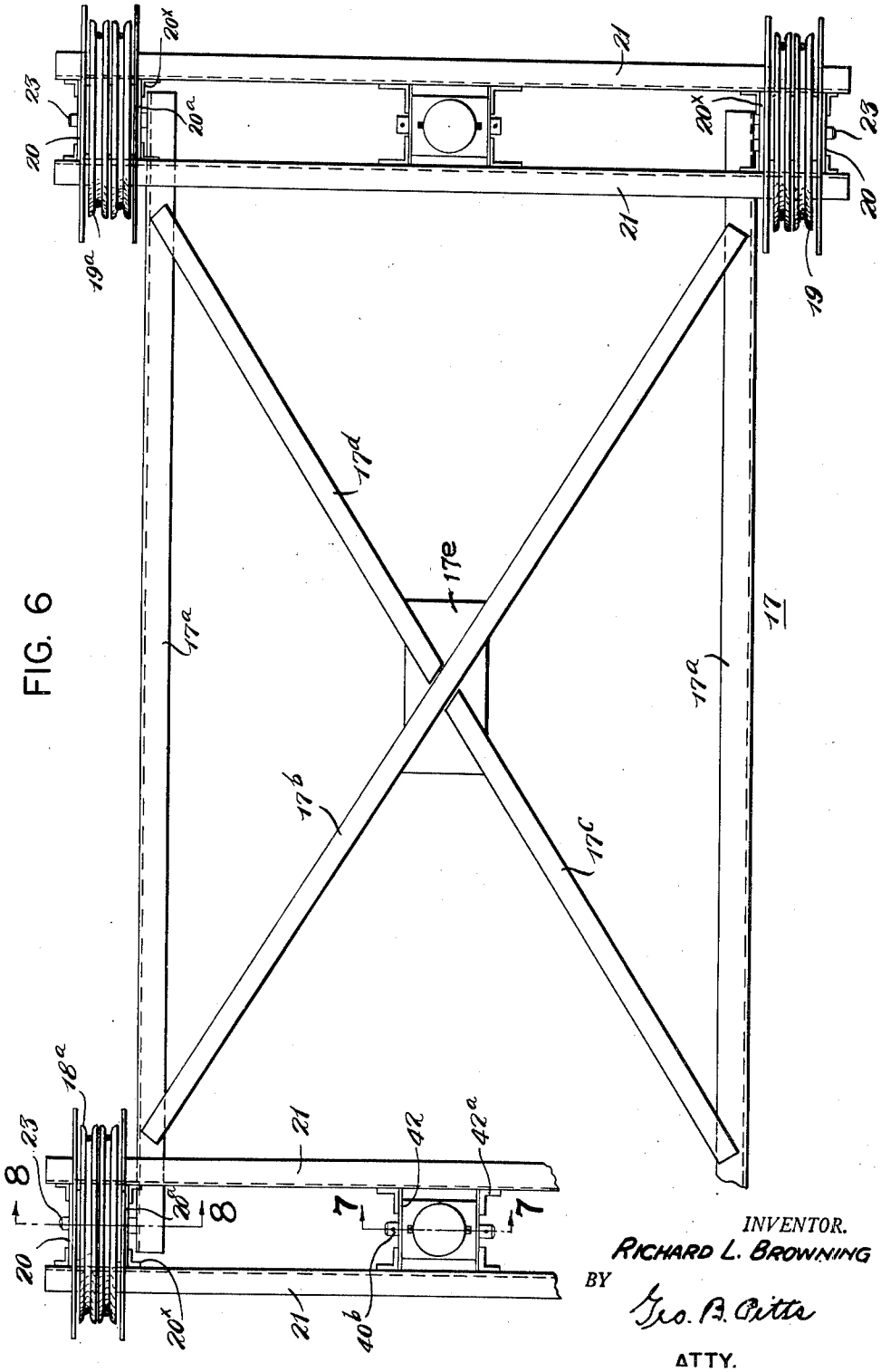



FIG. 6

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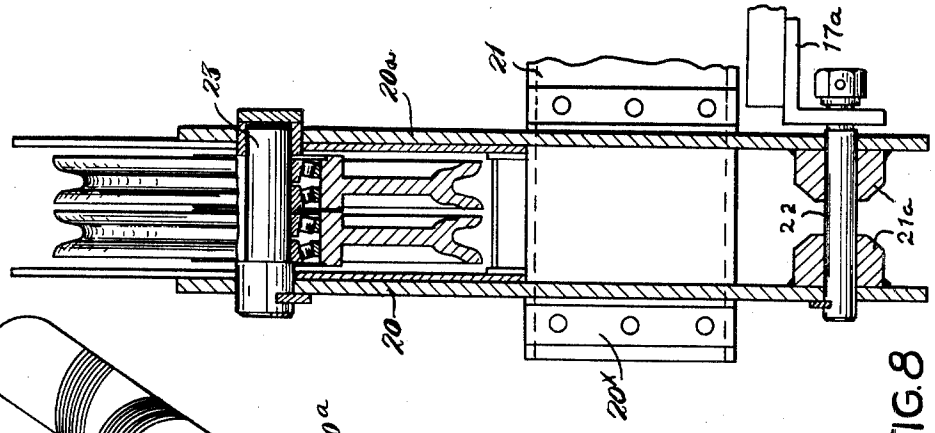



FIG. 8

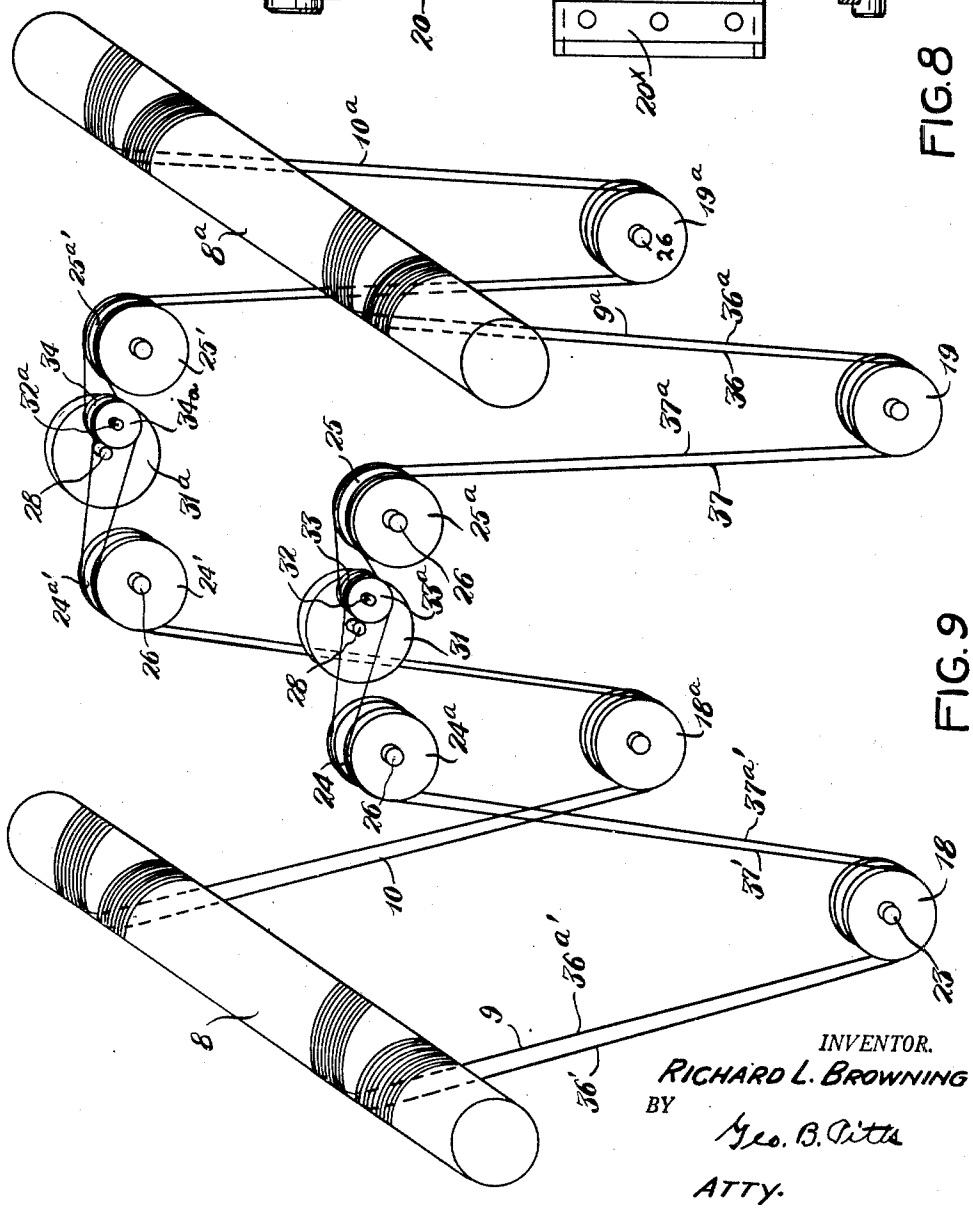



FIG. 9

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United States Patent Office 2,707,053 Patented Apr. 26, 1955



2,707,053

# CRANE TROLLEY

Richard L. Browning, Euclid, Ohio, assignor to Victor R. Browning & Company, Incorporated, Willoughby, Ohio, a corporation of Ohio

Application July 21, 1953, Serial No. 369,461

12 Claims. (Cl. 212—21)

This invention relates to a crane trolley for handling machines and parts thereof, dies and various structural bodies and shapes, that is, raised from one location and transferred to a position where they may be lowered to a selected level for treatment; the apparatus embodying my invention, as herein disclosed, is particularly adapted for use where such machines, parts, dies and shapes are subjected to treatment in a fluid medium, in a container—for example, immersion in a suitable liquid or a liquid solution in a tank. The invention includes a raisable platform or support, the surface area and construction of which depend on the size and weight of the machines, parts, dies and shapes and/or where a plurality thereof are to be handled in a single operation. The invention includes power means (*a*) for raising and lowering the platform or support to effect immersion of the machine, dies and shapes in the treating solution and (*b*) following the treatment operation, for tilting the latter to permit gravitation of the solution into the tank and escape of air confined in the machine, dies and shapes.

One object of the invention is to provide, in an apparatus having a suspended platform or support, improved means for tilting the latter.

Another object of the invention is to provide, in an apparatus having a suspended platform or support, automatically controlled means for tilting the platform or support.

Another object of the invention is to provide an improved apparatus of this type having a raisable platform or support and means capable of readily controlling the raising and/or tilting of the latter.

Another object of the invention is to provide an improved apparatus of this type wherein the power-operated means for raising the platform or support and tilting the latter are conjointly related to simplify the construction and operations.

Another object of the invention is to provide an improved apparatus of this type having a platform for bodies to be handled, the platform being suspended by pairs of cables connected to the opposite ends thereof, respectively, corresponding portions of the cables being adapted to raise and lower the platform and other corresponding portions of the cables being adapted to tilt the platform.

Another object of the invention is to provide an improved apparatus of this type consisting of a platform for bodies to be handled, suspended by pairs of cables connected to the opposite ends thereof, respectively, corresponding outer portions of the pairs of cables being connected to and wound on spaced, parallel related driven drums, respectively, and adapted to raise and lower the platform, spaced sets of alined sheaves on which corresponding inner portions of the cables wind and unwind, and power operated devices between the sets of alined sheaves and operatively connected to the intermediate portions of the cables and arranged to exert pull on the cables wound on either set of alined sheaves to unwind the cables from the latter and simultaneously deliver the cables to the other set of alined sheaves for winding the cables on the latter, whereby the platform is tilted.

Another object of the invention is to provide, in apparatus of this type having a platform or support suspended by pairs of cables, improved means for operating the pairs of cables to simultaneously raise and lower the opposite ends of the platform or support about a transverse axis to selected tilted positions, whereby the construction is simplified and that end of the platform or support, which is lowered, is moved a minimum distance.



Other objects of the invention will be apparent to those skilled in the art to which my invention relates, from the following description taken in connection with the accompanying drawings, wherein

Fig. 1 is a fragmentary plan view of a crane trolley embodying my invention, parts thereof being shown in operated position;

Fig. 2 is an elevation on the line 2—2 of Fig. 1, this view showing a tank containing a treating solution;

Fig. 3 is a fragmentary elevation on the line 3—3 of Fig. 1, showing the parts in normal position, enlarged, parts being broken away;

Fig. 3*a* is a fragmentary plan view on the line 3*a*—3*a* of Fig. 3;

Fig. 4 is a view similar to Fig. 3, but showing parts in the position illustrated in Fig. 1;

Fig. 5 is a fragmentary section on the line 5—5 of Fig. 4;

Fig. 6 is a section on the line 6—6 of Fig. 2;

Fig. 7 is a view partly in section on the line 7—7 of Fig. 6;

Fig. 8 is a fragmentary section on the line 8—8 of Fig. 6;

Fig. 9 is a schematic view; and

Fig. 10 is an elevational view similar to Fig. 3, but showing an arrangement where one end only of the platform is raised and lowered.

In the drawings, **1** indicates a bridge provided at its opposite ends with wheels **1***a* which engage tracks **2**, one end portion only of the bridge being shown (see Fig. 2). Each track **2** is fixed to and extends longitudinally of an elevated abutment or ledge **2***a*. As will be understood, at least one pair of alined wheels **1***a*, which roll on the tracks **2** and support the bridge **1**, is driven by a suitable motor (not shown). The bridge **1** is provided with tracks **3** on which a carriage, indicated as an entirety at **4**, is mounted for movement longitudinally of the bridge **1**. One or more tanks A, each filled with a suitable solution dependent on the nature of the treating employed for the bodies, are mounted on the flooring between the side walls for the ledges **2***a* and within the area traversed by the bridge **1**. One pair of alined wheels **4***a* for supporting the carriage **4** on the tracks **3** is driven through a suitable reduction gearing enclosed in a housing **5** by a motor **5***a* mounted on the adjacent end portion of the carriage **4**. The driving of the motor for moving the bridge **1** on the tracks **2**, the motor **5***a* to effect traverse of the carriage **4** on the tracks **3**, as well as the operations of the mechanisms (later referred to) carried by the carriage **4**, are controlled by an operator in a cab (not shown) depending from the bridge **1** in a well known manner. The carriage **4** consists of side frames **6** connected by transverse plates **6***a*, **6***a'*, **6***b*, **6***b'*, the latter supporting the housing **5** and motor **5***a*, end walls **7** and a base **7***a* between the plates **6***a*, **6***a'*. **8**, **8***a*, indicate suitable drums on which the outer sections of pairs of cables **9**, **10**, and **9***a*, **10***a*, respectively, are wound, the diameters of the drums being equal to insure uniform pay-out and take-up of the pairs of cables when the drums are rotated. As shown in Figs. 1 and 2, the drums **8**, **8***a*, are disposed above the plates **6***a*, **6***a'*, respectively, and provided at their opposite ends with shafts which are mounted in suitable bearings **11**. The shafts at corresponding ends of the drums **8**, **8***a*, are drivingly connected through suitable gear reductions **12** to alined shafts **13**, **13***a*, the inner ends of which are suitably connected to the opposite ends of the shaft of a motor **14**. The shaft **13***a* is provided with an electrically controlled brake **15**, preferably constructed as shown in my Letters Patent No. 2,491,850, dated December 20, 1949. The gear reductions **12** are mounted on suitable standards **12***a*, whereas the motor **14** and brake **15** are mounted on a support **16** suitably secured to the adjacent side frame **6**.

**17** indicates as an entirety a platform adapted to be raised and lowered and tilted as later set forth. The platform **17** preferably consists of the following: **17***a* indicates side members connected together by diagonally disposed members **17***b*, **17***c*, **17***d*, which are suitably fixed (*a*) at their outer ends to the end portions of the side members **17***a* and (*b*) to a centrally disposed plate **17***e*.

18, 18*a* and 19, 19*a*, indicate pairs of sheaves swingably mounted at the opposite ends of the platform 17, the sheaves of each pair being axially related and each sheave of each pair being in the plane of the adjacent sheave of the other pair. As later set forth, the cables 9, 9*a*, are looped around the sheaves 18, 19, respectively, and the cables 10, 10*a*, are looped around the sheaves 18*a*, 19*a*, respectively, whereby the platform 17 is suspended for movement vertically and into a tilted position. The mountings for the sheaves of each pair are connected together, whereby they swing as a unit about the adjacent end of the platform 17. As the pairs of sheaves are mounted and connected to the platform 17 in the same manner, reference to the mountings and connections for one pair thereof will suffice, the same reference characters identifying like parts for the other pair of sheaves. Accordingly, referring to one pair of the sheaves, 20 and 20*a*, indicate pairs of spaced elongated arms, one pair for each sheave, connected intermediate their opposite ends by angles 20*x* to the end portions of a pair of spaced cross-members 21, 21. The lower ends of each pair of arms are provided with collars 21*a* which rotate on a shaft 22, the inner end of the latter being supported on the adjacent platform side member 17*a*, as shown in Fig. 8, whereas the upper ends of each pair of arms 20, 20*a*, suitably support the opposite ends of a shaft 23, on which the adjacent sheave rotates. It will be noted that each sheave 18, 18*a*, 19, 19*a*, preferably consists of two side-by-side sheaves, as shown in Figs. 6 and 8, independently rotatable on the adjacent shaft 23 to compensate for any uneven tension on the cables during reeving of the latter; however, the two sheaves, in each instance, will be referred to as a sheave to clarify the description and to avoid confusion in defining the invention in the appended claims.

24, 24*a*, and 25, 25*a*, indicate spaced, alined pairs of main sheaves, around which the cables 9, 9*a*, respectively, wind and unwind as later set forth and 24', 24*a*' and 25', 25*a*', indicate separate spaced, alined pairs of main sheaves around which the cables 10, 10*a*, respectively, wind and unwind as later set forth. The sheaves of each pair are independently rotatable on a shaft 26 which is mounted at its opposite ends on a standard 27 supported on the base 7*a*.

As shown, the main sheaves 24—24*a* are axially related to the main sheaves 24'—24*a*', and the main sheaves 25, 25*a*, are axially related to the main sheaves 25', 25*a*', and all of the sheaves have the same diameter to insure uniform reeving of the pair of cables. 28 indicates a shaft mounted in a suitable antifriction bearing 28' provided on spaced standards 28*a* and disposed parallel to the drums 8, 8*a*, and midway between the pairs of main sheaves 24—24*a* and 25—25*a*, and pairs of main sheaves 24'—24*a*' and 25', 25*a*', the standards 28*a* being mounted on the base 7*a*. The shaft 28 is driven through suitable gear reductions mounted in housings 29, 29*a*, respectively, by a motor 30 suitably mounted on the base 7*a* and automatically controlled as later set forth. The opposite ends of the shaft 28 (preferably outwardly of the standards 28*a*) are provided with disks 31, 31*a*, which support the inner ends of shafts 32, 32*a*, respectively, disposed in axial alinement and eccentrically to the axis of the shaft 28 (see Fig. 5). As shown in Figs. 1 and 5, (*a*) the shaft 32 is provided on its outer end portion with cable-engaging devices, preferably consisting of independently rotatable sheaves 33, 33*a*, intermediate the pairs of sheaves 24—24*a*, and 25—25*a* and substantially in the plane of the latter and the cables 9, 9*a*, are looped around the sheaves 33, 33*a*, respectively, whereas (*b*) shaft 32*a* on the disk 31*a* is provided on its outer end portion with cable-engaging devices, preferably consisting of independently rotatable sheaves 34, 34*a*, intermediate the pairs of sheaves 24'—24*a*' and 25'—25*a*' substantially in the plane of the latter and cables 10, 10*a*, are looped around the sheaves 34, 34*a*, respectively.

It will be observed (*a*) that the opposite ends of each of the cables 9, 10, and cables 9*a*, 10*a*, are suitably connected at 35 to the drums 8, 8*a*, respectively; (*b*) that the outer sections of the cables are initially wound on the latter and adapted to simultaneously unwind from the drums and wind thereon, according to the direction of rotation of the shafts 13, 13*a*, to raise or lower the platform 17; and (*c*) that corresponding portions of the inner sections of the cables engage and reeve on similarly related sheaves, so that the following reference to one cable (cable 9*a*) and the sheaves engaged thereby will apply to each of the other cables. As shown, the inner section of the cable 9*a* consists of portions 36, 36*a*, which extend downwardly from the drum 8*a*, reeve around the adjacent sheave 19 and extend upwardly from the latter as shown at 37, 37*a*, to wind on and unwind from the sheaves 25*a*, 25, respectively; and the cable portions 37, 37*a*, extend from the sheaves 25*a*, 25, to and are looped or reeved around, the adjacent intermediate sheave 33*a* on the shaft 32. From the foregoing description it will be noted that the inner section of cable 9, consists of portions 36', 36*a*', which extend downwardly from the drum 8, reeve around sheave 18 and extend upwardly from the latter, as shown at 37', 37*a*', to wind and unwind from the sheaves 24*a*, 24, respectively; and the cable portions 37', 37*a*', extend from the sheaves 24*a*, 24, to and are looped or reeve around the adjacent intermediate sheave 33*a* on the shaft 32. It will also be noted that the inner section of cable 10*a* engages with and reeves around sheave 19*a*, sheaves 25*a*', 25', and sheave 34 similarly to the inner section of cable 9*a* and that the inner section of cable 10 engages and reeves around sheave 18*a*, sheaves 24*a*', 24', and 34*a*.



Figs. 2, 3 and 9 show the eccentrically mounted intermediate sheaves 33—33*a*, and 34, 34*a*, in normal position, in which position the platform 17 is supported horizontally by those cable portions which extend downwardly from the drums 8, 8*a*, and upwardly to the sheaves 24—24*a*, 25—25*a*, 24'—24*a*' and 25'—25*a*'. Accordingly, by driving the motor 14 to rotate the drums 8, 8*a*, the outer sections of the cables will wind on or from the drums to bodily raise or lower the platform 17 according to the direction in which the shaft of the motor 14 is driven.

To tilt the platform 17, shaft 28 is driven by the motor 30 in the selected direction, for example, counter-clockwise, as viewed in Figs. 1, 3 and 4, to move the intermediate sheaves 33—33*a* and 34—34*a* toward or to a selected position, one position being shown in full lines and another position being shown in dotted lines (see Fig. 4). In such operation, the intermediate sheaves will exert pull on the cable portions 37, 37*a*, of the cables 9*a* and 10*a* leading from the main sheaves 25*a*—25 and 25'—25*a*', to unwind the cables from the latter, whereby the adjacent end of the platform 17 will be raised and simultaneously deliver the cable portions 37', 37*a*', on which the cables will wind, whereby, due to its weight, the adjacent end of the platform will move downwardly. In such operation, it will be observed that the platform 17 is rocked about an intermediate transverse axis, as shown in dotted lines in Fig. 2, so that the opposite ends thereof move a minimum distance to attain any desired inclination.

With the cable-engaging devices 33—33*a*, 34—34*a*, normally disposed as shown in Fig. 3, they may be moved through an arc of 180 degrees or to any intermediate position as shown in Figs. 1 and 4, the inclination of the platform 17 being dependent on the angular position to which the devices are moved. The inclination of the platform 17 may be increased by positioning the shafts 32, 32*a*, on a longer radius relative to the axis of the shaft 28.

The platform 17 may be raised or lowered when in either a normal or tilted position by operation of the motor 14 to rotate the drums 8, 8*a*, in the selected direction to take up or pay out the cable portions 36—36*a*, 36'—36*a*'; also, by driving both motors 14 and 30 the raising or lowering of the platform and tilting of the latter may be effected simultaneously.

From the foregoing description it will be noted that the cables are connected intermediate the raising and lowering mechanism and the tilting mechanism to the respective opposite ends of the platform so that these mechanisms co-operate to support the platform in any position thereof or while either mechanism is being operated.

In the use of cables each having its outer end portions wound on a drum and its intermediate portion looped around an intermediate member, I provide between the

member and the points of contact with the adjacent drum two cable legs of equal length, which engage a pair of main sheaves on the base **7***a* and sheaves on the adjacent end of the platform, whereby the latter is suspended by these legs and the legs of the other cables, as already set forth. In this arrangement, the platform is disposed between the main sheaves **24**—**24***a*, **24**′—**24***a*′, **25**—**25***a* and **25**′—**25***a*′ and the drums **8**, **8***a*, so that the weight of the platform **17** serves to maintain the legs of all the cables taut with the result (*a*) that in operating the intermediate sheaves **33**—**33***a*, **34**—**34***a*, from their normal position to a selected position to tilt the platform or in the reverse direction, the lengths of the legs simultaneously unwound from the main sheaves adjacent one drum and delivered to the main sheaves adjacent the other drum are equal and (*b*) that the movement of the platform during tilting thereof is readily controlled.

**39** indicates a hook mounted on and depending from each pair of cross members **21**, **21**, intermediate the ends thereof. The inner end of each hook is integral with an upwardly extending shank **39***a* which rotatably fits and extends through an opening **40** formed in a cross-head **40***a*. The extended upper end of the shank **39***a* is provided with an inverted cup-shaped member **41**, suitable roller thrust bearings **41***a* being interposed between the annular wall of the member **41** and the cross-head **40***a*. The opposite ends of the cross-head **40***a* are provided with trunnions **40***b* mounted in openings formed in plates **42** disposed at right angles to and between the adjacent cross members **21**, **21**, the plates **42** being suitably secured to the latter by angles **42***a*. The upper end of the shank **39***a* and bearings therefor are preferably enclosed in a housing **43** suitably secured to the cross-head **40***a*. The hooks **39** are preferably in alinement and adapted to swing on axes parallel to the pairs of cross members **21**, **21**. The hooks **39** are adapted to be connected with a load which is to be raised and transported to a selected location. When the raising mechanism is employed for this purpose, the platform **17** is removed.

As already set forth, Figs. 2 and 3 show the intermediate sheaves **33**—**33***a*, **34**—**34***a*, in normal position at one side of the main shaft **28**—right side as viewed in Fig. 3—(that is, wherein the axes of the intermediate sheaves and axis of the main shaft are disposed in a horizontal plane) and the platform **17** in a horizontal position. By operation of the shaft **28** counter-clockwise (as viewed in Fig. 3) the sheaves **33**—**33***a*, **34**—**34***a*, may be moved to a selected position, and as shown in full lines in Fig. 4 or 180 degrees to the position as shown in dotted lines, which latter position effects maximum tilting of the platform **17** about a transverse axis. With the intermediate sheaves in the normal position as above set forth, the platform is always tilted in the same direction. However, by changing the cables **9**, **9***a*, **10**, **10***a*, with respect to the main sheaves and intermediate sheaves, the normal position of the latter sheaves (*a*) may be disposed at the left side of the main shaft (as shown in dotted lines—Fig. 4), whereby the platform **17** will be tilted in the opposite direction or (*b*) at an intermediate position, such as shown in full lines (Fig. 4), in which latter position the platform may be tilted in either direction, about a transverse axis. Where conditions require tilting of the platform about the shafts **22** at one end thereof, the cables, which would otherwise be delivered from the pairs of intermediate sheaves to the adjacent main sheaves, are provided with an abutment or stop, such as a clamp **45** (as shown in Fig. 10), which would prevent the cables from winding on the adjacent main sheaves and those portions of the cables between the latter sheaves and the intermediate sheaves would become slack upon operation of the shaft **28** counter-clockwise as viewed in Fig. 10.

Provision is made for automatically stopping the motor **30** upon movement of the intermediate sheaves **33**—**33***a*, **34**—**34***a* to a selected position or to the 180 degree position and in the reverse direction to normal position. For this purpose I provide standards **46**, **46***a*, on the base **7***a* at opposite sides of one of the disks **31**, **31**′ (preferably disk **31**), the standards supporting suitable switches **47**, **47***a*, respectively, each switch being disposed in the path of movement of one of the stops **48**, **48***a*. Each switch **47**, **47***a*, consists of normally closed contacts, the movable spring operated member thereof being provided with an arm **47**′ arranged to be engaged and operated by



the adjacent stop. The circuits for the switches and motor **30** are controlled by a suitable switch mechanism, such as a controller in the cab already referred to. In operation, with the intermediate sheaves **33**—**33***a*–**34**—**34***a*, in normal position, as shown in Fig. 3, switch **47***a* is open, but switch **47** is closed, so that by operation of the controller to one position, shaft **28** is driven counter-clockwise, whereupon stop **48***a* disengages the adjacent arm **47**′ and switch **47***a* closes. As the intermediate sheaves move to the 180 degree position, stop **48** engages the arm **47**′ of switch **47**, breaking the circuit through the latter and stopping the motor **30**. By operation of the controller to its opposite position, the circuit for the motor is reversed to drive the shaft **28** in the reverse direction; the stop **48** disengages the arm **47**′ of the switch **47**, whereby the latter is closed and upon engagement of the stop **48***a* with the arm **47**′ of switch **47***a* the circuit through the latter is opened to stop the motor **30**. Each stop **48**, **48***a*, consists of an angle shaped body **48**′ having an integral radial extension which serves as the adjacent stop. The body **48**′ fits over the rim of the disk **31** and is secured to the latter by a bolt or other device. Two stops are provided so that the stop which is positioned to engage the arm **47**′ of the switch **47** may be adjusted circumferentially of the disk **31** to engage the arm **47**′ of the latter switch at a selected position, as shown at *x* in Fig. 3.

To those skilled in the art to which my invention relates many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. My disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. In apparatus of the class described, the combination with a bridge mounted on elevated ledges for movement longitudinally thereof and a carriage mounted on said bridge for movement endwise of the latter, of a platform provided at its opposite ends with sheaves, spaced drums on said carriage, spaced pairs of axially related main sheaves mounted on said carriage on axes parallel and adjacent to each of said drums, pairs of cables the outer sections of which are adapted to wind on and unwind from said drums, the inner sections of the pairs of cables extending downwardly and reeved around the sheaves on the opposite ends of said platform and upwardly and adapted to wind on and unwind from said pairs of main sheaves, whereby said platform is suspended by said pairs of cables, means for rotating said drums to simultaneously wind the outer sections of said cables on or unwind the outer cable sections from said drums to raise or lower said platform according to the direction of rotation of said drums, and a mechanism between said pairs of axially related main sheaves for tilting said platform, said mechanism comprising devices engaging said cables, respectively, and simultaneously movable away from the axially related pairs of main sheaves adjacent one of said drums to unwind the cables from said sheaves and toward the axially related pairs of main sheaves adjacent the other drum to wind the cables on the latter sheaves, whereby said platform is tilted about a transverse axis thereof.

2. An apparatus as claimed in claim 1 wherein two of said cable-engaging devices are disposed substantially in the plane of each pair of said main sheaves adjacent one of said drums and one of the adjacent pairs of main sheaves adjacent the other drum.

3. An apparatus as claimed in claim 1 wherein said cable-engaging devices consist of intermediate sheaves mounted on alined axes and means for simultaneously moving said intermediate sheaves away from either of the axially related pairs of main sheaves to unwind the cables from said sheaves and toward the other axially related pairs of main sheaves to wind the cables on said last referred to sheaves, whereby said platform is tilted about a transverse axis thereof.

4. An apparatus as claimed in claim 1 wherein the sheaves at each end of said platform are axially related, swingably connected to said platform and connected together to swing as a unit.

5. An apparatus as claimed in claim 3 wherein said tilting mechanism comprises a main shaft disposed midway between and parallel to said axially related pairs of main sheaves, stud shafts in alined relation eccentrically

fixed to said main shaft, two of said intermediate sheaves being mounted on each of said stud shafts and means for rotating said main shaft in opposite directions.

6. An apparatus as claimed in claim 4 wherein is provided on the connections between the sheaves at each end of said platform a hook depending from and trunnioned on said connections.

7. An apparatus as claimed in claim 5 wherein means are provided for limiting the movement of said intermediate sheaves in a direction to tilt said platform at a selected position and in the reverse direction at a predetermined position.

8. An apparatus as claimed in claim 5 wherein said intermediate sheaves are eccentrically mounted on disks drivingly connected to said moving means and said means are provided between one of said disks and said base for adjustably limiting the movement of said disk in a direction to tilt said platform at a selected position and in the reverse direction at a predetermined position.

9. An apparatus as claimed in claim 5 wherein said moving means consist of a motor connected to an electric circuit and said intermediate sheaves are eccentrically mounted on disks drivingly connected to the shaft of said motor and means are provided for limting the movement of said disks in a direction for tilting said platform at a selected position and in the reverse direction at a predetermined position, said limiting means consisting of separate electric switches mounted on said base and connected in said circuit and separate stops on one of said disks, one stop being arranged to engage and operate one of said switches to stop said motor upon movement of said intermediate sheaves in a direction to tilt said platform at a selected position and the other stop being arranged to engage and operate the other switch and stop said motor in the movement of said intermediate sheaves in the reverse direction at a predetermined position.

10. An apparatus of the class described, the combination with a bridge mounted on elevated ledges for movement longitudinally thereof and a carriage mounted on said bridge for movement endwise of the latter, of a platform provided at its opposite ends with sheaves, spaced drums on said carriage, spaced alined pairs of main sheaves mounted on said carriage on axes parallel and adjacent to each of said drums, pairs of devices movably mounted between said spaced alined pairs of sheaves, pairs of cables, the outer end portions of each cable being wound on one of said drums, its intermediate portion being reeved about one of said devices and corresponding portions of said cable being wound on the adjacent pair of main sheaves and reeved about one of said sheaves on said platform, means for simultaneously rotating said drums for raising or lowering said platform, and means for simultaneously moving said pairs of devices away from said alined spaced pairs of main sheaves adjacent either of said drums to unwind the cables from said sheaves and toward the alined spaced pairs of main sheaves adjacent the other drum to wind the cables on said latter sheaves, whereby said platform is tilted about a transverse axis thereof.



11. In apparatus of the class described, the combination with a bridge mounted on elevated ledges for movement longitudinally thereof and a carriage mounted on said bridge for movement endwise of the latter, of a platform provided at its opposite ends with sheaves, spaced drums mounted on said carriage, a main shaft mounted on said carriage intermediate said drums, disks mounted on the outer end portions of said shaft, stud shafts eccentrically mounted on said disks, respectively, in axial relation, a pair of sheaves mounted on each of said stud shafts, axially related pairs of main sheaves mounted on said carriage at each side of said main shaft and between the latter and the adjacent drum, pairs of cables, the outer sections of each pair of cables being wound on one of said drums and the inner sections of said pairs of cables being reeved about the sheaves on the adjacent end of said platform and wound on the adjacent axially related pairs of main sheaves and reeved around one of said sheaves on each of said stud shafts, means for rotating said drums to wind or unwind the outer cable sections thereon for raising or lowering said platform according to the direction of rotation thereof, and means for rotating said main shaft in opposite directions, whereby the sheaves on said stud shafts simultaneouly move away from the axially related pairs of main sheaves at either side of said main shaft to unwind the cables from the latter sheaves and toward the other axially related pairs of main sheaves to wind the cables on the latter sheaves, for tilting said platform about a transverse axis thereof.

12. In apparatus of the class described, the combination with a bridge mounted on elevated ledges for movement longitudinally thereof and a carriage mounted on said bridge for movement endwise of the latter, of a platform provided at its opposite ends with sheaves, spaced drums mounted on said carriage, spaced axially related pairs of main sheaves mounted on said carriage between said drums, pairs of cables, the outer sections of each pair of cables being wound on one of said drums and the inner sections of said pairs of cables being reeved about the sheaves on the adjacent end of said platform and wound on the adjacent axially related pairs of main sheaves, means for rotating said drums to wind or unwind the outer cable sections thereon for raising or lowering said platform according to the direction of rotation thereof, and mechanism between said spaced axially related pairs of main sheaves and engaging the pairs of cables leading therefrom for simultaneously unwinding one pair of cables from said axially related pairs of main sheaves at either side of said mechanism and winding the other pair of cables on the axially related pairs of main sheaves at the other side of said mechanism for tilting said platform about a transverse axis thereof.

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