

May 26, 1953

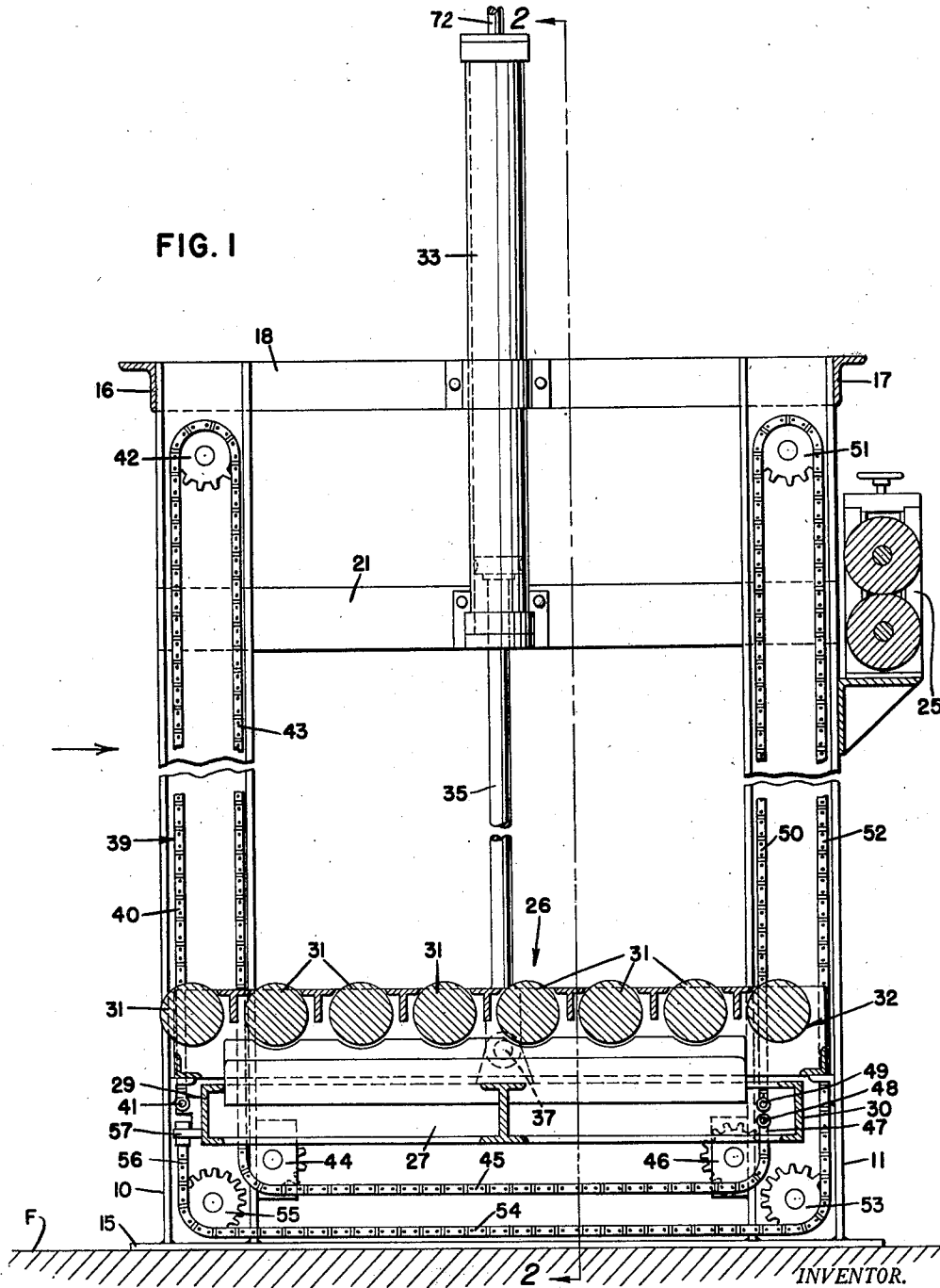
D. V. STROCK

2,639,784

LEVELING DEVICE FOR TIN PLATE FEEDER PLATFORMS

Filed Dec. 27, 1950

4 Sheets-Sheet 1



INVENTOR.
DONN V. STROCK
BY *Bosworth & Seaside*
ATTORNEYS

May 26, 1953

D. V. STROCK

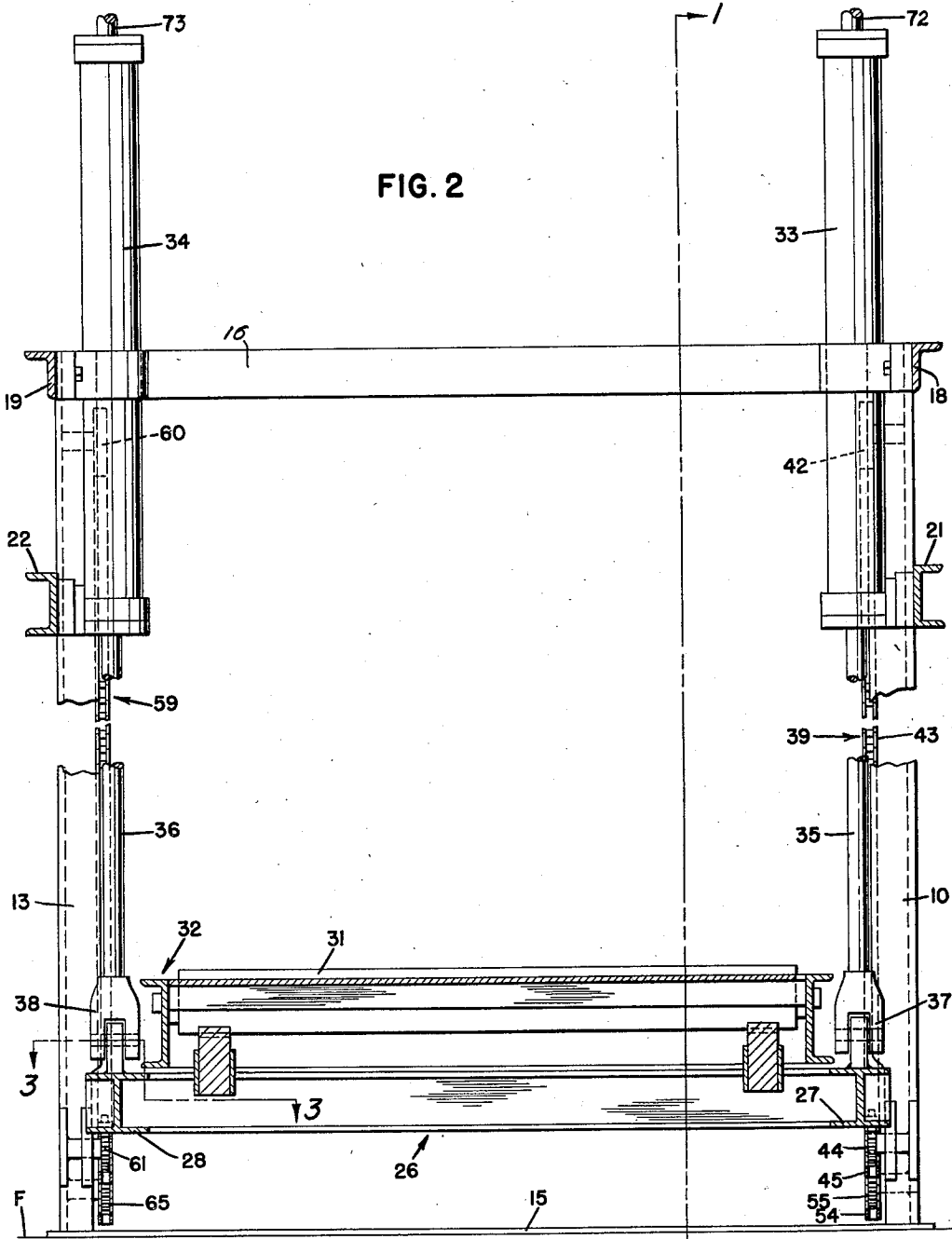
2,639,784

LEVELING DEVICE FOR TIN PLATE FEEDER PLATFORMS

Filed Dec. 27, 1950

4 Sheets-Sheet 2

FIG. 2



INVENTOR.

DONN V. STROCK

BY *Bosworth & Sessione*

ATTORNEYS

May 26, 1953

D. V. STROCK

2,639,784

LEVELING DEVICE FOR TIN PLATE FEEDER PLATFORMS

Filed Dec. 27, 1950

4 Sheets-Sheet 3

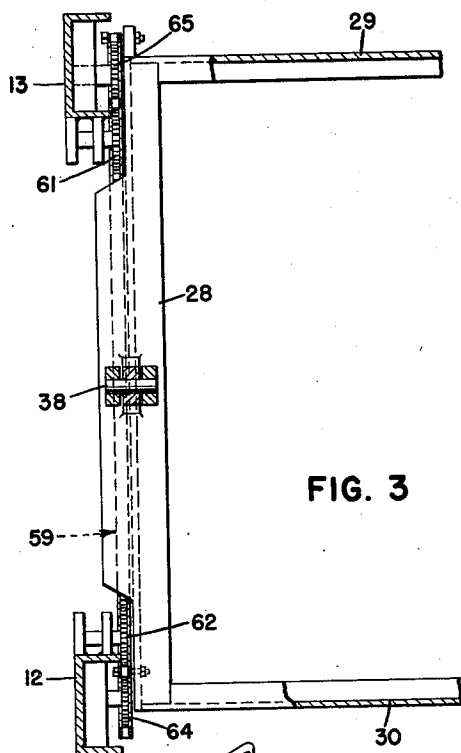


FIG. 3

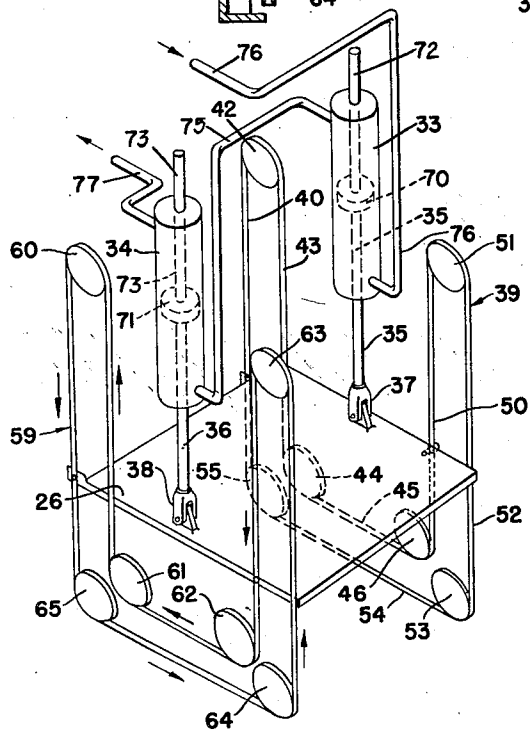


FIG. 4

INVENTOR.
DONN V. STROCK
BY *Bosworth + Sessions*
ATTORNEYS

4

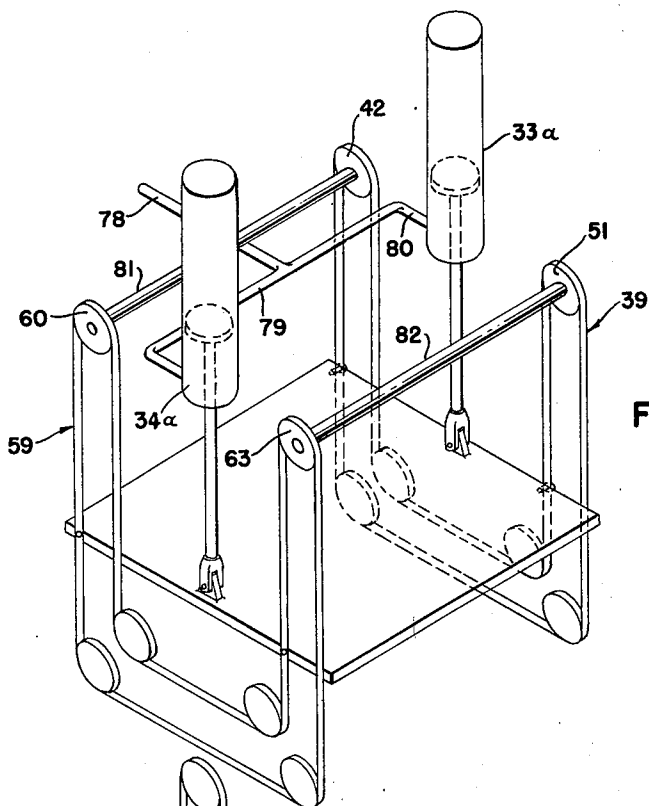


FIG. 5

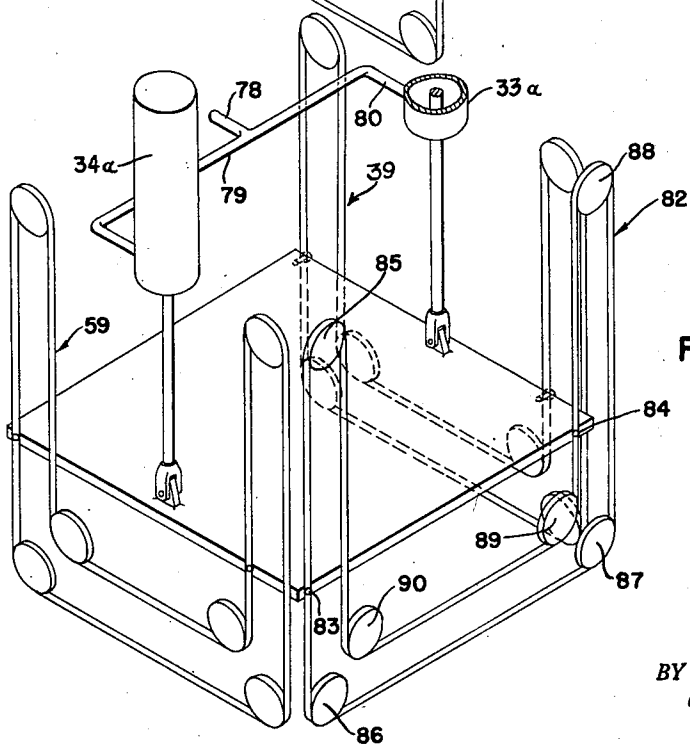


FIG. 6

INVENTOR.
DONN V. STROCK
BY *Bosworth + Sessions*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,639,784

LEVELING DEVICE FOR TIN PLATE
FEEDER PLATFORMS

Donn V. Strock, Youngstown, Ohio, assignor to
The Aetna-Standard Engineering Company,
Youngstown, Ohio, a corporation of Ohio

Application December 27, 1950, Serial No. 202,932

13 Claims. (Cl. 187—22)

1

This invention relates to elevating platforms and more particularly to platforms arranged to raise or lower a stack of work pieces to a predetermined level with respect to a conveyor or other apparatus. The invention is described herein in its application to a tin plate sheet feeder but it is to be understood that the invention may be employed for other uses and purposes.

Tin plate sheet feeders ordinarily require elevating platforms arranged to raise a stack of sheets of tin plate to a desired level so that the topmost sheets of the stack can be removed and fed to a pair of pinch rolls or other conveyor mechanism which delivers the sheets to a subsequent operation. Thus, as the sheet feeder operates, the stack must be periodically raised to bring the top sheets of the stack into proper relationship with the feeding mechanism.

Heretofore the platforms have been hydraulically actuated by means of cylinder and piston mechanisms disposed in pits beneath the platforms. Inasmuch as the stacks of sheets on the platforms may weigh several thousand pounds and since the stacks frequently are not centered accurately with respect to the platforms, the cylinders and pistons for raising the platforms have had to be of massive and expensive construction in order to resist deflection due to off-center positioning of the stacks; also, the expense of installation of such devices has been great because of the necessity of providing a deep pit for the hydraulic cylinders beneath the level of the mill floor.

According to the present invention the difficulties with prior types of elevating platforms are obviated and a simple platform which can be constructed at relatively low cost is provided by employing tension members on either side of the platform to lift the platform and by providing equalizing chains, cables or the like to hold the platform level and always parallel to itself even though the load on the platform may be substantially off-center and hence unbalanced. With the arrangement of the present invention the requirement for a massive hydraulic cylinder and piston apparatus is eliminated as is the necessity for a pit beneath the platform.

A general object of the invention is the provision of an elevating platform which can be constructed and installed at reasonable cost and in which the platform is held level, even when subjected to unbalanced loads, by means of tension members on either side of the platform. Another object of the invention is the provision of a hydraulically actuated platform in which forces due to unbalanced loads on the platform are not transmitted to the hydraulic lifting mechanism and in which no sliding guides for the platform are required. Another object of the

2

invention is the provision of a simple equalizing mechanism for elevating platforms whereby the platforms are maintained level under off-center or unbalanced loads. Further objects and advantages of the invention will become apparent from the following description of a preferred form thereof, reference being made to the accompanying drawings. The essential characteristics are summarized in the claims.

Referring to the drawings, Figure 1 is a vertical sectional view of an elevating platform embodying my invention, the section on which the figure is taken being indicated by line 1—1 in Figure 2; Figure 2 is a section taken at right angles to Figure 1 as indicated by the line 2—2 of Figure 1; Figure 3 is a fragmentary horizontal section taken as indicated by the line 3—3 of Figure 2; Figure 4 is a diagrammatic illustration of preferred form of lifting and equalizing mechanism for the platform, including a preferred form of hydraulic circuit; and Figures 5 and 6 are views similar to Figure 4 but showing modified arrangements.

As shown in the drawings, an elevating platform mechanism made according to a preferred form of the invention may comprise a vertically extending framework made up of upright channel section corner columns 10, 11, 12 and 13. These columns rest on a suitable foundation plate 15 supported by the floor structure F and are secured together into a rigid structure by horizontally extending angle irons 16, 17, 18 and 19 at the tops of the columns and by a pair of oppositely disposed channel section members 21 and 22 connecting the columns 10 and 11 and 12 and 13, respectively. Members 21 and 22 extend along the sides of the frame leaving the ends of the frame open between the base of the frame and the top thereof so that stacks of sheets may be fed into the machine in the direction of the arrow in Figure 1, for example, and the sheets removed individually from the stack through the pinch roll mechanism indicated at 25, automatic mechanism (not shown) being employed to lift the sheets individually from the stack and deliver them to the pinch rolls.

In order to support the sheets in proper position and to raise the stack as sheets are removed therefrom, a lifting platform indicated in general at 26 is disposed for vertical movement within the frame. The lifting platform may be of any conventional construction such as, for example, a pair of longitudinally extending I-beams 27 and 28 and transverse channels 29 and 30 forming a box-like structure on which a series of rollers 31 are mounted by means of the frame structure indicated in general at 32.

In order to raise and lower the platform 26, a pair of hydraulic cylinders 33 and 34 are mounted in the main frame structure, the cylinder 33

3

being supported by the top frame member 18 and the intermediate channel frame member 21, while cylinder 34 is supported by the top frame member 19 and channel member 22. The piston rods 35 and 36 for the cylinders 33 and 34, respectively, extend downwardly and are secured to the I-beams 27 and 28 of the platform 26 through the pivotal connections 37 and 38, respectively. Thus, by supplying hydraulic fluid under pressure by means of a suitable pump (not shown) to the lower ends of the cylinders 33 and 34, the platform can be raised to the desired level. With this arrangement, however, it is obvious that a load on the platform that was not centered longitudinally thereof would cause the platform to pivot about the pivotal connections 37 and 38 while, if the load were not centered transversely of the platform, the platform would tend to tilt laterally (i. e., about a longitudinal axis), pivotal connections 29 and 30 would bind and bending forces would be applied to the piston rods 35 and 36 and lateral forces to the hydraulic cylinders 33 and 34.

In order to restrain the platform against tilting about a transverse axis (such as axis of the pivots 37 and 38) without requiring sliding guides for the platform and without requiring the imposition of lateral forces on the piston rods 35 and 36, I employ tension elements on either side of the platform which are constructed and arranged to maintain the platform always parallel to itself as it is raised and lowered by the hydraulic cylinders. The arrangement of one of these tension elements is illustrated in Figure 1. In the embodiment shown, the tension element comprises a chain indicated in general at 39. Chain 39 comprises a vertical reach 40 secured to one corner of the platform as at 41 and extending upwardly within the vertical column 10. The chain passes over the sprocket 42 which is supported near the top of the column 10, then extends downwardly in a vertical reach 43 past the platform and around a sprocket 44 secured near the bottom of the column 10, thence horizontally along the length of the apparatus in a horizontal reach 45, around a sprocket 46, and upwardly in a vertical reach 47 to point 48 where it is secured to the opposite end of the platform 26.

Immediately above connection 48 is connection 49 from which vertical reach 50 leads upwardly within column 11 to sprocket 51 mounted near the top of the column. The chain then leads downwardly as shown by reach 52 to the lower sprocket 53 mounted in column 11 adjacent the base thereof. The chain continues in a horizontal reach 54 to sprocket 55 mounted adjacent the base of column 10 and then vertically upwardly in reach 56 to connection 57 which is disposed immediately beneath connection 41.

A similar chain indicated in general at 59 is provided on the other side of the platform, chain 59 passing over sprockets 60, 61, 62, 63, 64 and 65 (see Figures 2, 3 and 4) which correspond to sprockets 42, 44, 46, 51, 53 and 55 respectively. The chains can be considered as continuous flexible elements secured to the corners of the platform.

The chains function to prevent tilting of the platform 26 about the pivotal connections 29 and 30. This action will be evident from a consideration of the diagram constituting Figure 4 where-in it will be seen that the chains each constrain the corners of the platform to which they are attached to move precisely the same vertical dis-

4

tances. The chains thus prevent one end of the platform from being raised or lowered faster than the other, but the chains of Figure 4 do not prevent one side of the platform from being raised or lowered faster than the other; thus, in the absence of other equalizing means the platform would be subject to lateral tilting under uneven loads.

In order to prevent such lateral tilting of the platform 26, I preferably employ the hydraulic system illustrated in Figure 4. As shown in this figure, the cylinders 33 and 34 are provided with pistons 70 and 71, the piston 70 being connected to the platform through piston rod 35 while the piston 71 is connected to the platform through piston rod 36. In addition, piston rods 72 and 73 project upwardly from pistons 70 and 71 and extend through the upper heads of their respective cylinders. Pistons 70 and 71 are of the equal diameter and all of the piston rods are of the equal diameter, thus the effective areas of the pistons are equal and a given movement of either piston in either direction will displace the same amount of fluid on both sides thereof.

In order to insure that the cylinders and pistons will lift both sides of the platform equal distances, hydraulic fluid, such as oil, under pressure is supplied by an appropriate pump to the lower side of piston 70 through conduit 76. This raises the piston 70 and correspondingly the side of the platform 26 to which piston rod 35 is connected. As this action takes place a volume of hydraulic fluid equal to the volume admitted beneath piston 70 is discharged from the upper portion of cylinder 33 above piston 70. The fluid, which is substantially incompressible, flows through conduit 75 to the lower end of cylinder 34 where it acts upon piston 71 to raise piston 71 and the side of the platform 26 to which the piston is attached the same distance as the distance traveled by piston 70 in cylinder 33. At the same time an equal volume of hydraulic fluid is returned to a sump or to the pump through the return line 77. With this arrangement the pistons 70 and 71 are constrained to move equal distances within the cylinders 33 and 34 so that lateral tilting of the platform is prevented even though the loads are unbalanced, while the chains prevent longitudinal tilting of the platform in the manner described above.

Another arrangement for preventing lateral tilting of the platform is shown in Figure 5. Here the cylinders 33a and 34a have fluid under equal pressure supplied to them through the main conduit 78 and the branch conduits 79 and 80 connected thereto; the pistons, therefore, are not constrained by the hydraulic system to move equal distances, and in order to compensate for unequal lateral distribution of loads on the platform the sprockets 42 and 51 are connected by shafts 81 and 82 to the sprockets 60 and 63, respectively. Thus, the chain 39 is constrained to move with the chain 59 and both sides of the platform must move alike even though the platform is unevenly loaded. It will be evident that the movements of opposite sides of the platform will be synchronized so long as any two corresponding sprockets are connected by a shaft. While two interconnecting shafts are shown in the drawings only one shaft is required and more than two shafts may be employed where large unbalanced loads are expected.

A further modification of the invention is illustrated in Figure 6. Here the chains 39 and 59 prevent longitudinal tilting of the platform as

5

before and equal fluid pressures are supplied to the cylinders 33a and 34a as in the modification shown in Figure 5. In this form of the invention, however, a chain 82 is employed to prevent lateral tilting of the platform, the chain being secured to the platform at 83 and 84 and passing over sprockets 85, 86, 87, 88, 89 and 90. The operation of the chain is the same as the operation of chains 39 and 59 previously described. It will be evident that for platforms subject to large unbalanced loads another transversely extending chain corresponding to chain 82 could be installed at the other end of the platform if desired and, conversely, for light loads either the chain 59 or the chain 39 could be eliminated, leaving two chains, one extending lengthwise of the platform and the other transversely of the platform, for stabilizing the platform and maintaining it level.

From the foregoing description of preferred forms of the invention it will be evident that I have provided a lifting platform which is adapted to carry heavy loads and which will remain level even though the loads are not properly centered in respect to the platform. Because of the fact that the lifting of the load is carried out through tension members and tension members are also employed to prevent the platform from tilting, the necessity for heavy, rigid and expensive compression members, guides and the like is eliminated; accordingly, the cost of the platform is substantially reduced as compared to costs of platforms of conventional construction. The lifting cylinders being mounted on the supporting frame structure above the platform eliminate the necessity for providing a foundation providing a deep pit, and thus the installation of my platforms is less costly than the installation of conventional elevating platforms. My apparatus is simple and sturdy and is foolproof in operation.

Those skilled in the art will appreciate that various changes and modifications can be made in the preferred forms of the apparatus described herein without departing from the spirit and scope of the invention.

I claim:

1. An elevating platform mechanism comprising a frame structure, a platform movable within said frame structure, power means for raising and lowering said platform and means for guiding said platform in a vertical path and preventing said platform from tilting about an axis extending through the center of said platform comprising a flexible tension element having a vertical reach secured to the platform on one side of said axis, a vertical reach secured to the platform on the opposite side of said axis and reaches interconnecting said vertical reaches, and means mounted in said frame structure for guiding said flexible tension element whereby said vertical reaches are constrained to move equal distances in the same direction.

2. An elevating platform mechanism comprising a frame structure, a platform movable within said frame structure, power means disposed above said platform and connected thereto by tension elements for raising and lowering said platform and means for guiding said platform in a vertical path and preventing said platform from tilting about an axis extending through the center of said platform comprising a flexible tension element having a vertical reach secured to the platform on one side of said axis, a vertical reach secured to the platform on the opposite side of said axis and reaches interconnecting said

6

vertical reaches, and means mounted in said frame structure for guiding said flexible tension element whereby said vertical reaches are constrained to move equal distances in the same direction.

3. An elevating platform mechanism comprising a vertical frame structure, a platform movable within said frame structure, means for raising and lowering said platform comprising two fluid pressure cylinder and piston mechanisms having fixed parts secured to said frame structure and movable parts secured to said platform on opposite sides thereof substantially midway between the ends thereof, and means for guiding said platform in a vertical path and preventing said platform from tilting about an axis extending through the connection between said movable parts and said platform comprising a flexible tension element having a vertical reach secured to the platform adjacent one end thereof, a vertical reach secured to the platform adjacent the other end thereof and reaches interconnecting said vertical reaches, and means mounted in said frame structure for guiding said flexible tension element whereby said vertical reaches are constrained to move equal distances in the same direction.

4. Mechanism according to claim 3 wherein two flexible tension elements, one on each side of said platform, are provided.

5. Mechanism according to claim 3 wherein means are provided for preventing said platform from tilting about an axis transverse to said axis extending through said connections, said means comprising a flexible tension element arranged as defined in claim 3 but acting at right angles to said flexible tension element defined in claim 3.

6. Mechanism according to claim 3 wherein means are provided for preventing said platform from tilting about an axis transverse to said axis extending through said connections.

7. An elevating platform mechanism comprising a vertical frame structure, a platform movable within said frame structure, power means for raising and lowering said platform pivotally connected to said platform on opposite sides thereof and means for guiding said platform in a vertical path and preventing said platform from tilting about said pivots comprising a chain, sprockets mounted in said frame structure for guiding said chain, said chain having four vertical reaches and two horizontal reaches interconnecting said vertical reaches, one of said vertical reaches being secured to the platform adjacent one end thereof and another of said vertical reaches being secured to the platform adjacent the other end thereof, said vertical reaches connected to said platform being constrained to move equal distances in the same direction.

8. Mechanism according to claim 7 wherein two sets of chains and associated sprockets are provided, one on each side of said platform, at least one sprocket on one side of said platform being interconnected by a shaft to the corresponding sprocket on the other side of said platform to constrain said chains to move equal distances.

9. An elevating platform mechanism comprising a vertical frame structure, a platform movable within said frame structure, means for raising and lowering said platform comprising two fluid pressure cylinders secured to said frame, pistons in said cylinders having piston rods pivotally secured to said platform on opposite sides thereof substantially midway between the ends

thereof, means for constraining said pistons to move equal distances in the same direction and means for guiding said platform in a vertical path and preventing said platform from tilting about said pivots comprising a chain, sprockets mounted in said frame structure for guiding said chain, said chain having four vertical reaches and two horizontal reaches interconnecting said vertical reaches, one of said vertical reaches being secured to the platform adjacent one end thereof and another of said vertical reaches being secured to the platform adjacent the other end thereof, said vertical reaches connected to said platform being constrained to move equal distances in the same direction.

10. An elevating platform mechanism comprising a vertical frame structure, a platform movable within said frame structure, means for raising and lowering said platform comprising two fluid pressure cylinder and piston mechanisms of equal diameter having fixed parts secured to said frame structure and movable parts secured to said platform on opposite sides thereof substantially midway between the ends thereof, one of said cylinder and piston mechanisms having piston rods of equal diameter projecting from both sides of the piston thereof through the cylinder heads thereof whereby movement of the piston results in displacement of equal volumes of liquid from the cylinder on both sides of piston, a conduit for supplying liquid under pressure to one side of said piston to move said piston with respect to said cylinder, a conduit leading from the other side of said piston to the other cylinder and piston mechanism and connected so that liquid displaced from the said other side of said piston of the first mechanism will cause the piston of the said other mechanism to move the same distance and in the same direction with respect to its cylinder as the piston of the first mechanism moves with respect to its cylinder, and means for guiding said platform in a vertical path and preventing said platform from tilting about an axis extending through the connection between said movable parts and said platform comprising a flexible tension element having a vertical reach secured to the platform adjacent one end thereof and a vertical reach secured to the platform adjacent the other end thereof, and means mounted in said frame structure for guiding said flexible tension element whereby said vertical reaches are constrained to move equal distances in the same direction.

11. An elevating platform mechanism comprising a frame structure, a platform movable within said frame structure, and means for raising and lowering said platform comprising two fluid pressure cylinder and piston mechanisms of equal diameter having fixed parts secured to said frame structure and movable parts secured to said platform on opposite sides thereof, one of said cylinder and piston mechanisms having piston rods of equal diameter projecting from both sides of the piston thereof through the cylinder heads thereof whereby movement of the piston results in displacement of equal volumes of liquid from the cylinder on both sides of piston, a conduit for supplying liquid under pressure to one side of said piston to move said piston with respect to said cylinder, a conduit leading from the other side of said piston to the other cylinder and piston mechanism and connected so that fluid displaced from the said other side of said piston of

the first mechanism will cause the piston of the said other mechanism to move the same distance and in the same direction with respect to its cylinder as the piston of the first mechanism moves with respect to its cylinder.

12. An elevating platform mechanism comprising a vertical frame structure, a platform movable within said frame structure, means for raising and lowering said platform comprising two fluid pressure cylinder and piston mechanisms having fixed parts secured to said frame structure and movable parts secured to said platform on opposite sides thereof substantially midway between the ends thereof, a conduit for supplying liquid under pressure to one side of said piston to move said piston with respect to said cylinder, a conduit leading from the other side of said piston to the other cylinder and piston mechanism and connected so that liquid displaced from the said other side of said piston of the first mechanism will cause the piston of the said other mechanism to move in the same direction with respect to its cylinder as the piston of the first mechanism moves with respect to its cylinder, the cylinder and piston mechanisms having dimensions such that the liquid displaced from the first mechanism will cause the piston of the second mechanism to move the same distance as the piston of the first mechanism, and means for guiding said platform in a vertical path and preventing said platform from tilting about an axis extending through the connection between said movable parts and said platform comprising a flexible tension element having a vertical reach secured to the platform adjacent one end thereof and a vertical reach secured to the platform adjacent the other end thereof, and means mounted in said frame structure for guiding said flexible tension element whereby said vertical reaches are constrained to move equal distances in the same direction.

13. An elevating platform mechanism comprising a vertical frame structure, a platform movable within said frame structure, means for raising and lowering said platform comprising two fluid pressure cylinders of equal diameter secured to said frame structure above said platform, pistons in each cylinder, each piston having piston rods of equal diameter projecting from both sides thereof through the heads of the cylinder thereof whereby movement of the pistons results in displacement of equal volumes of liquid from the cylinders on both sides of pistons, the downwardly extending piston rods being secured to said platform on opposite sides thereof, a conduit for supplying liquid under pressure to the under side of one of said pistons, and a conduit leading from the upper side of said piston to the under side of the other piston so that fluid displaced from the said upper side of said first piston of the first mechanism will cause the other piston mechanism to move the same distance and in the same direction with respect to its cylinder as the first piston of the first mechanism moves with respect to its cylinder.

DONN V. STROCK.

References Cited in the file of this patent

UNITED STATES PATENTS		
Number	Name	Date
905,114	Suplee	Nov. 24, 1908
1,573,172	Laffey	Feb. 16, 1926