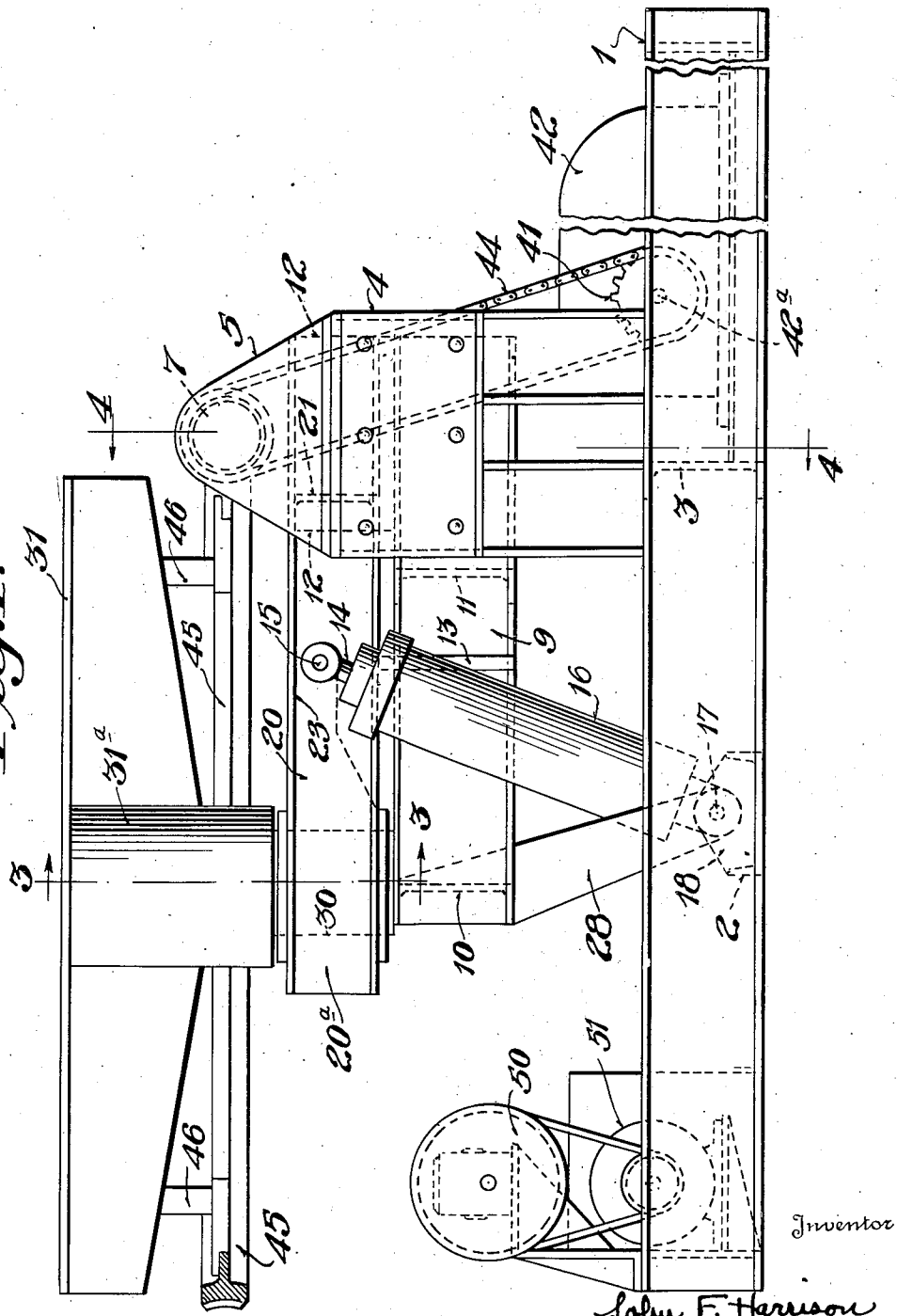
May 10, 1949. J. F. HARRISON 2,469,644

WORK POSITIONER

Filed June 5, 1945 8 Sheets-Sheet 1

Fig. 1.



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WORK POSITIONER

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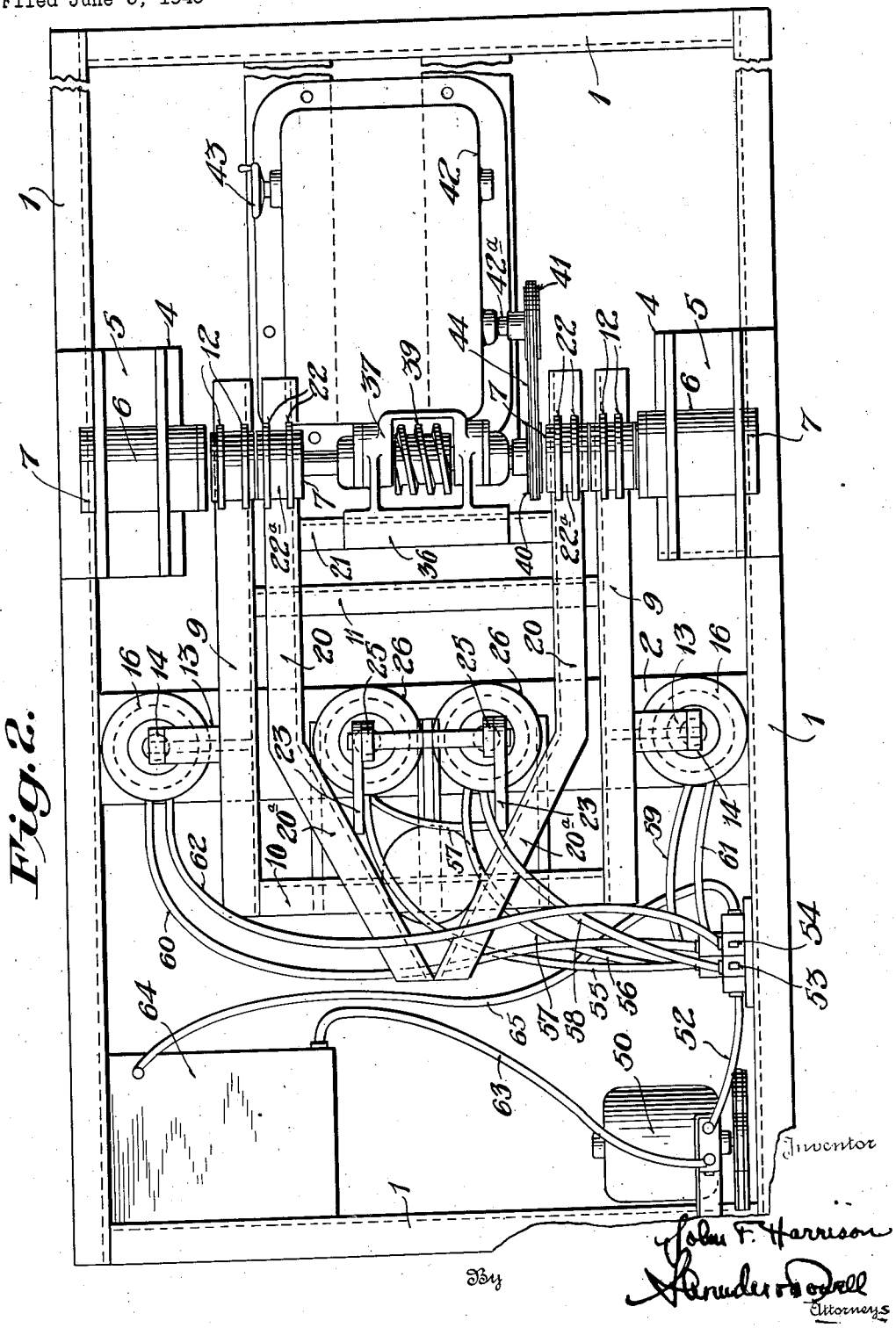

Fig. 2.

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Fig. 9.

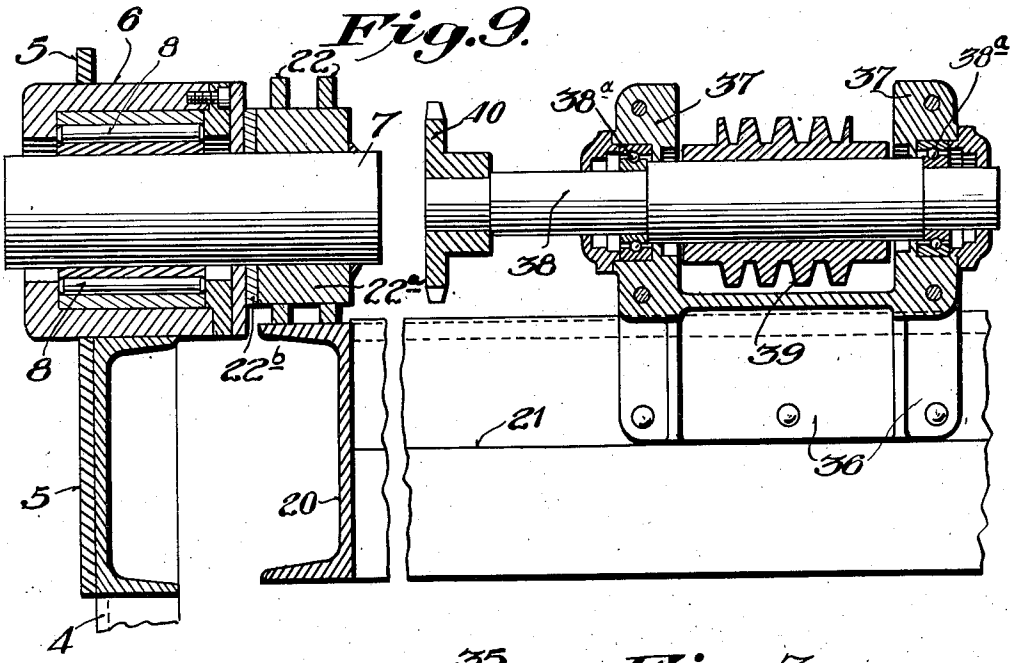
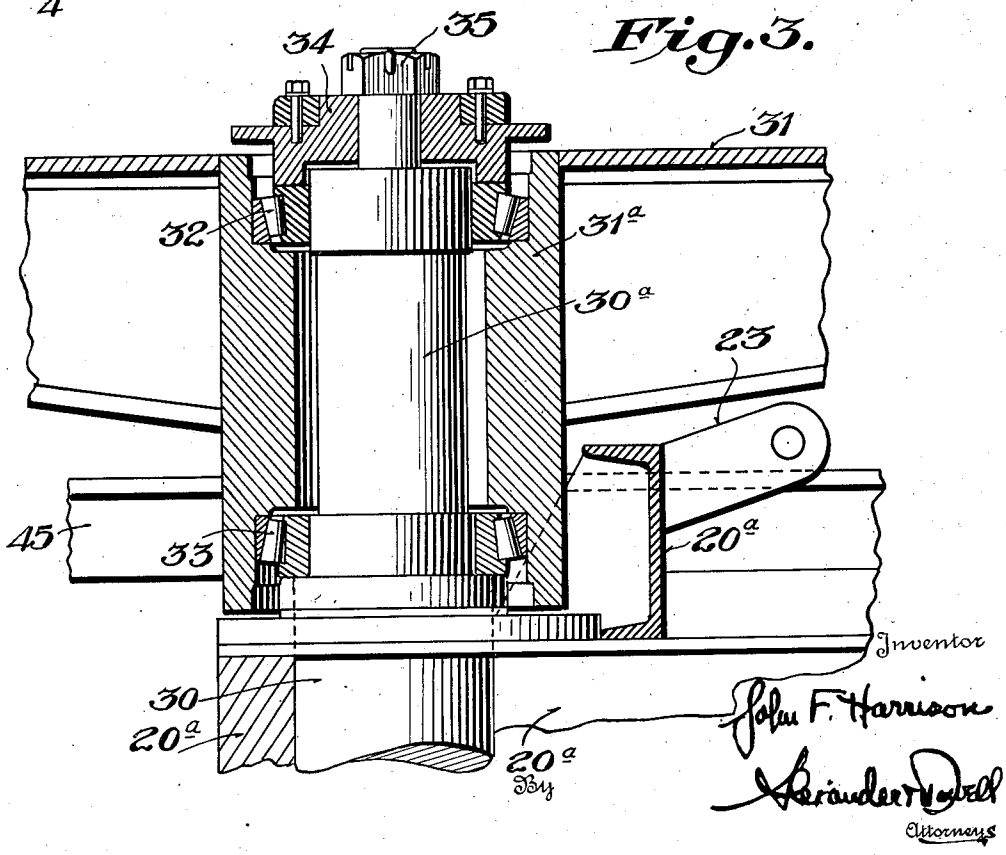


Fig. 3.



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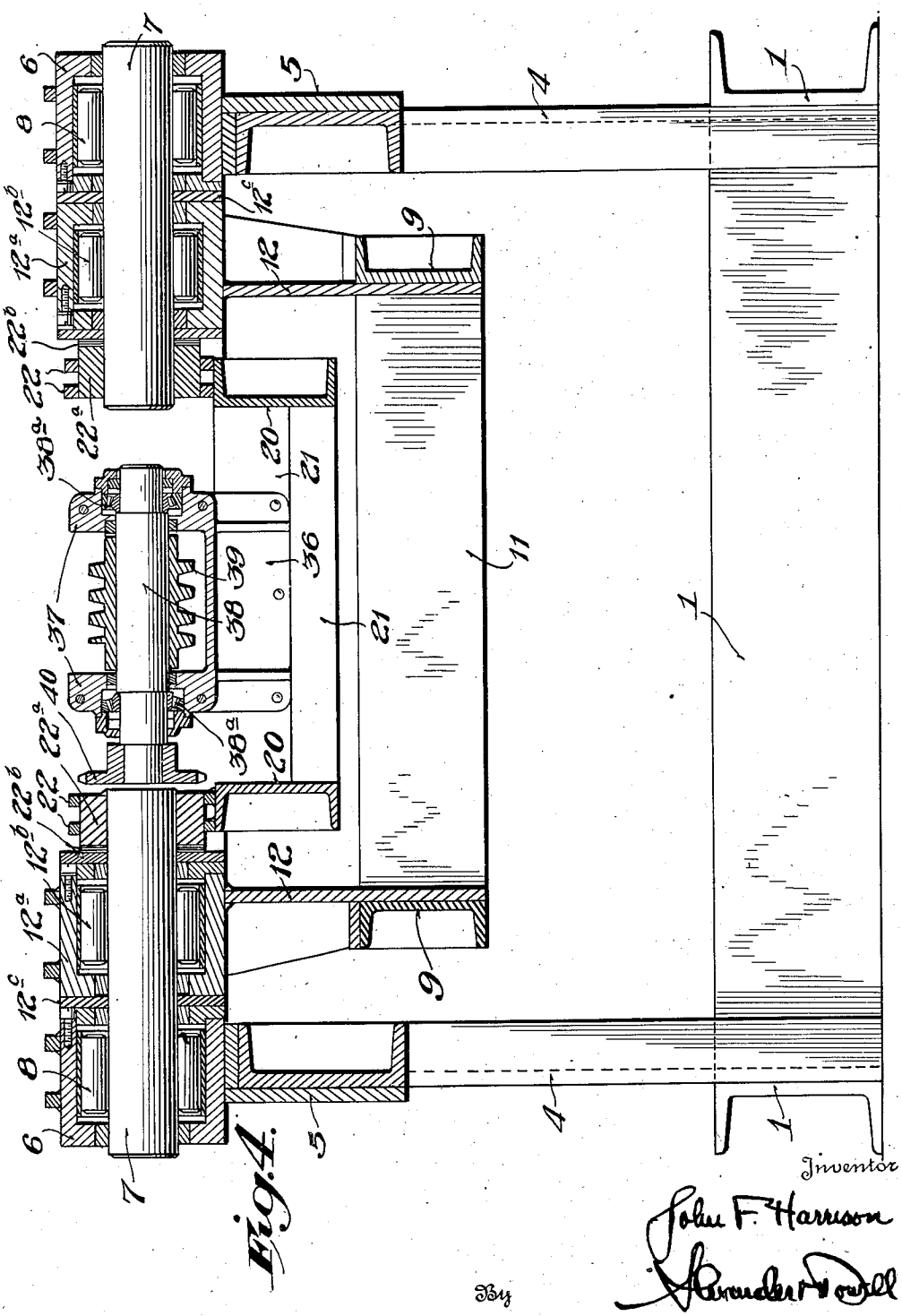

Fig. 4.

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WORK POSITIONER

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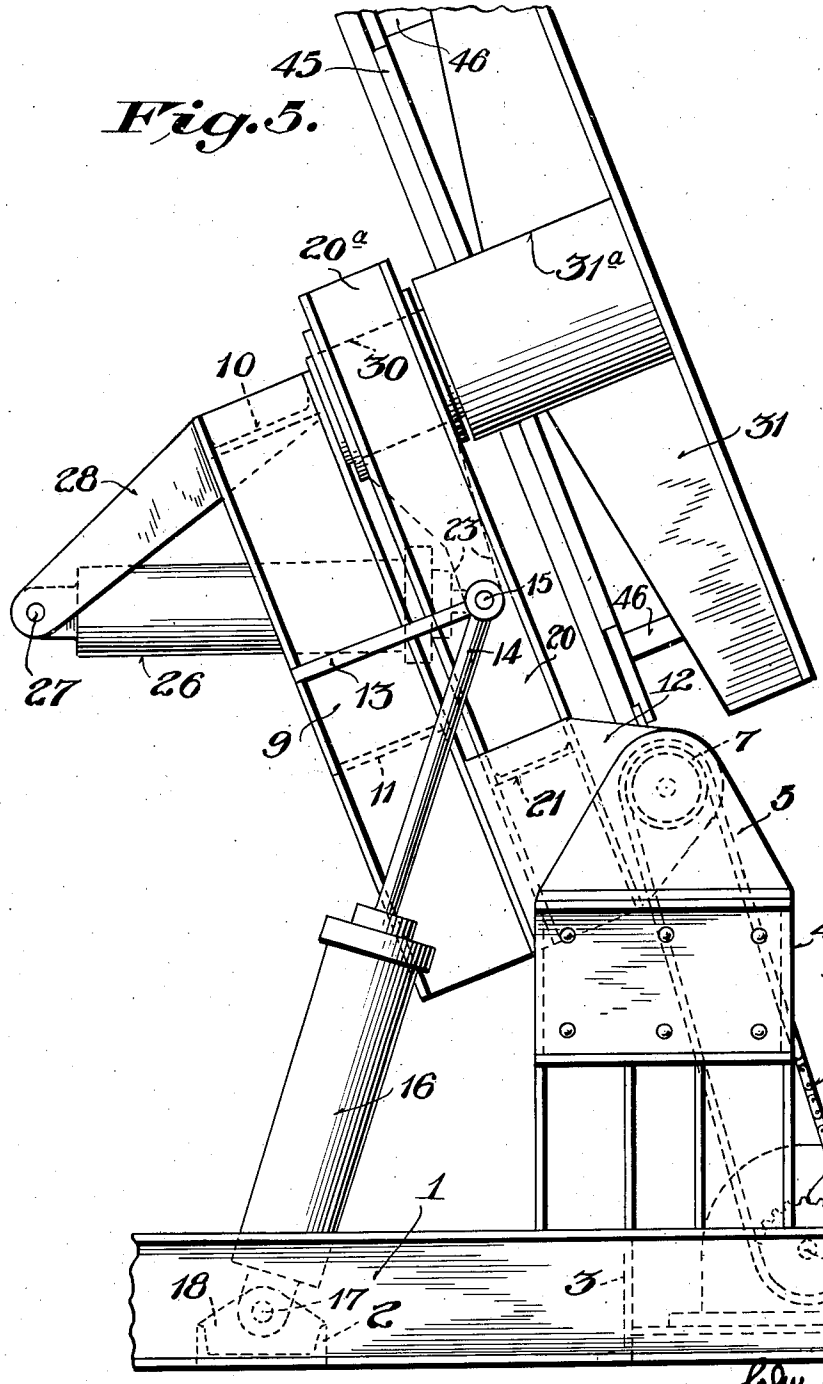
Fig. 5.



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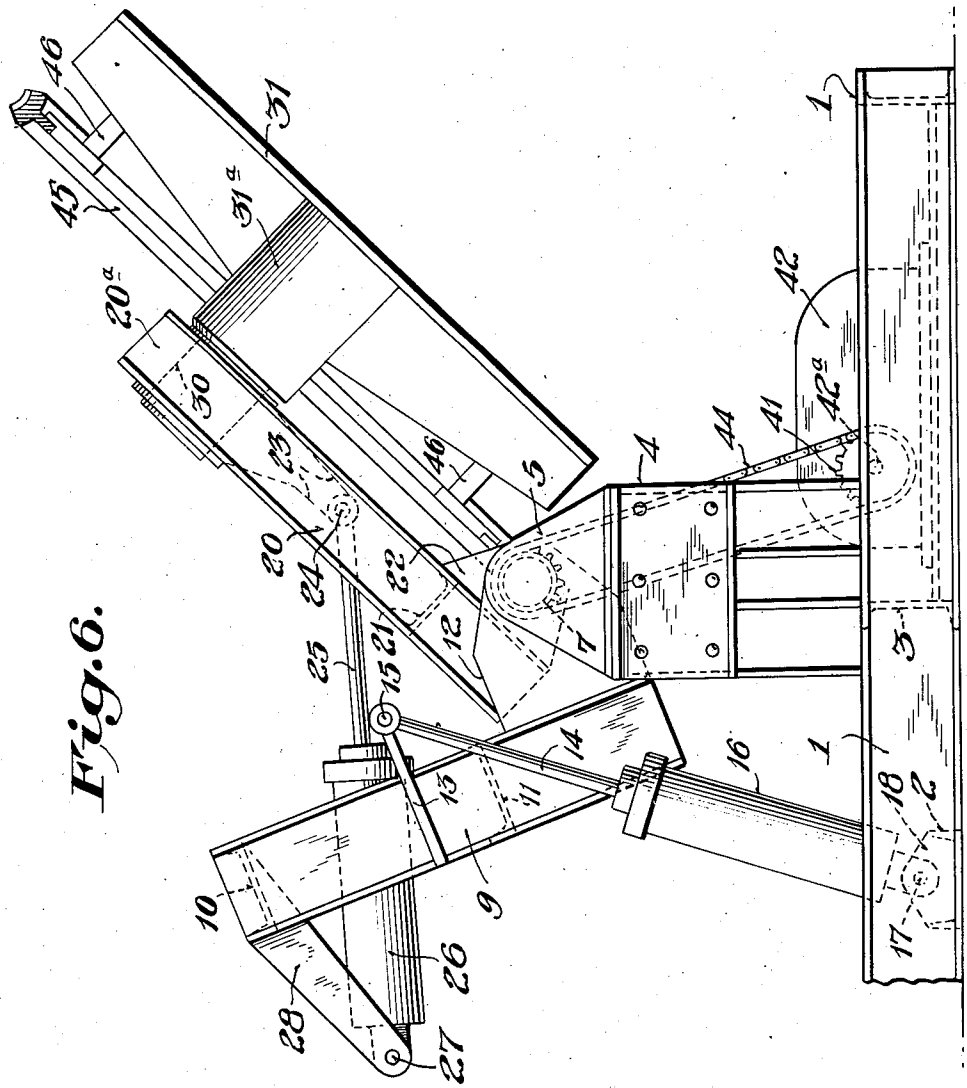

Fig. 6.

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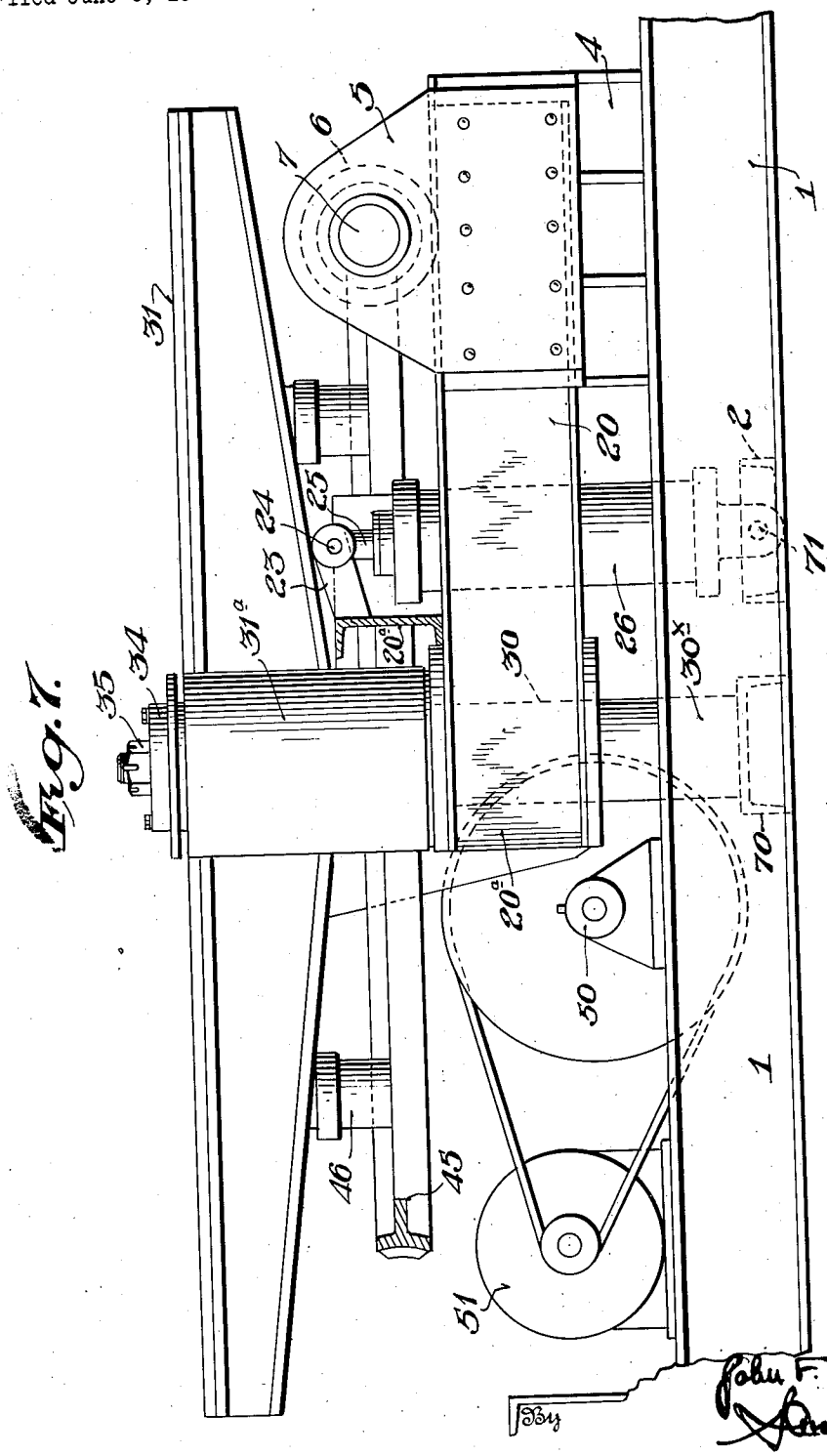

Fig. 7.

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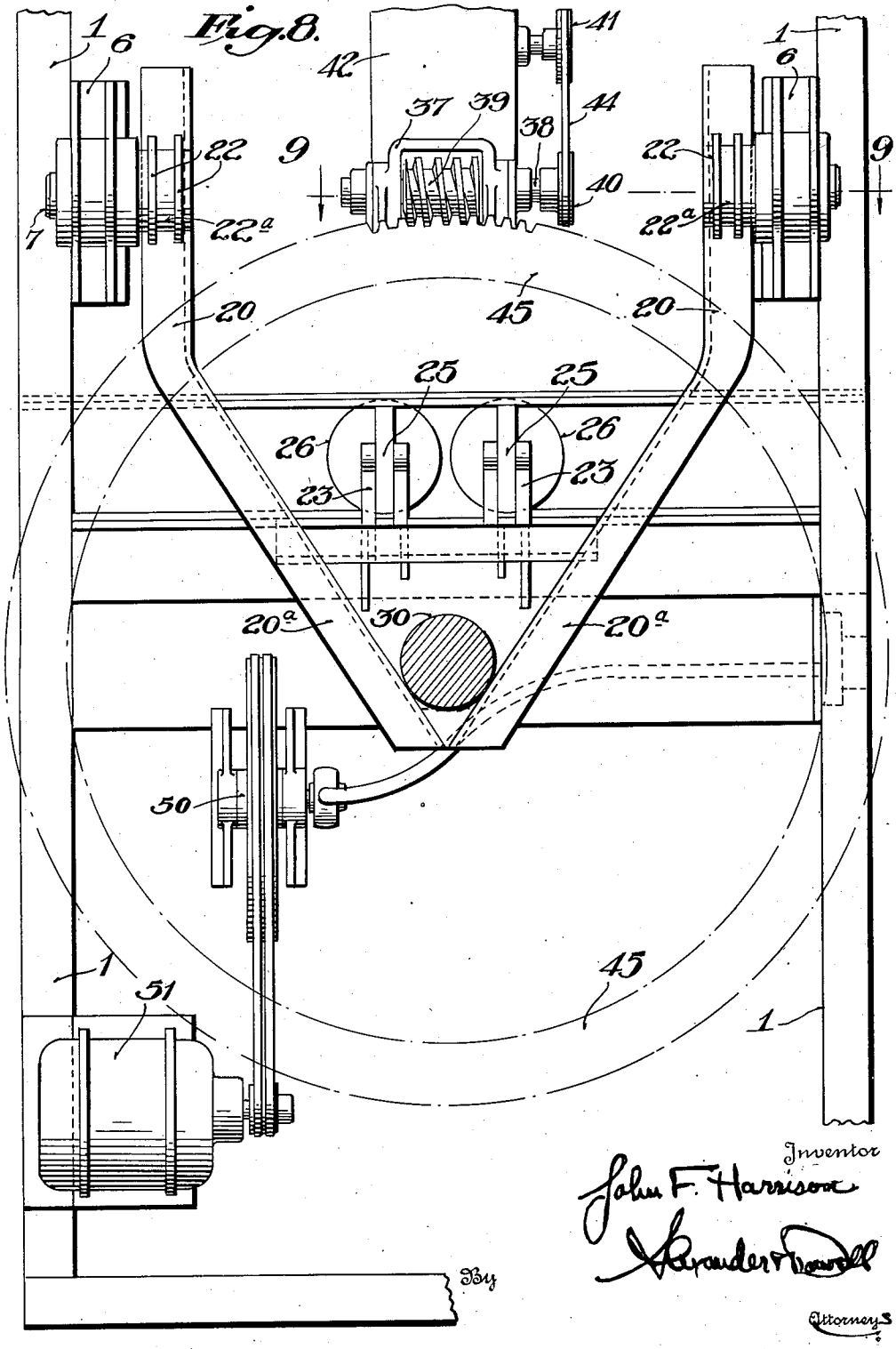
Fig. 8.



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Patented May 10, 1949 2,469,644

UNITED STATES PATENT OFFICE

2,469,644

WORK POSITIONER

John F. Harrison, Springfield, Ohio, assignor of one-fourth to Carl F. Greiner, Springfield, Ohio

Application June 5, 1945, Serial No. 597,675

6 Claims. (Cl. 29—288)

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This invention is a novel improvement in work positioners, and the principal object thereof is to provide a positioner having a rotatable turn-table mounted upon a subframe pivotally mounted adjacent one edge on a horizontal axis, said positioner having a second subframe horizontally pivoted on the same horizontal axis, with hydraulic means connecting the two subframes and connecting the base and lower subframe, whereby the subframes may be individually pivoted or tilted into various positions on said horizontal axis to bring the rotatable turn-table into any desired angularity with respect to the base within the limits of the machine.

Another object of the invention is to provide a work positioner of the above type in which the pivot axis of the subframes is so positioned with respect to the turn-table that when the turn-table is tilted into working position, the center of the load on the turn-table will be disposed substantially directly over and closely adjacent to the pivot axis, thus reducing strains on the parts of the positioner since the load in tilted position will not be placed in an increasingly overhung position with respect to the pivot axis as is the case in most conventional positioners now in general use.

A further object of the invention is to provide a work positioner in which the loading height of the table will be relatively lower than in positioners of the usual type wherein the pivot axis of the table intersects the vertical centerline of the table, my arrangement providing a machine in which the pivot axis is disposed at one side of the vertical centerline of the table permitting the use of a worm gear drive; and the low loading height in my arrangement eliminates the necessity of using elevated loading platforms or the necessity of placing the positioner into deep pits in order to achieve convenient loading height; and my arrangement permits the production of a positioner which is inherently portable and which can be moved around the plant as desired without entailing the expense of providing pits or elevated loading platforms.

A still further object of the invention is to provide a work positioner of the above type utilizing, however, only one tiltable subframe carrying the rotatable work table, but in which the parts are so arranged that the features above enumerated will nevertheless be realized or provided.

Other minor objects of the invention will be hereinafter set forth.

I will explain the invention with reference to the accompanying drawings which illustrate several practical embodiments thereof, to enable others familiar with the art to adopt and use the same; and will summarize in the claims the novel features of construction, and novel combinations of parts, for which protection is desired.

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In said drawings:

Fig. 1 is a side elevation of one embodiment of my novel positioner, involving the use of two independently actuated subframes for positioning the turn-table, which latter is shown in horizontal loading or unloading position, and the two subframes retracted with respect to the base.

Fig. 2 is a top plan view of the positioner shown in Fig. 1 with the turn-table, however, removed to more clearly show the underlying parts or members.

Fig. 3 is an enlarged transverse section on the line 3—3, Fig. 1.

Fig. 4 is an enlarged transverse section on the line 4—4, Fig. 1.

Fig. 5 is a side elevation similar to Fig. 1 but showing both subframes tilted through the same arc, to bring the turn-table into inclined position.

Fig. 6 is a side elevation similar to Figures 1 and 5, but showing both subframes tilted through different arcs to bring the turn-table into substantially inverted position from that shown in Figure 1.

Fig. 7 is a side elevation, similar to Fig. 1, but showing a modified positioner in which one subframe only is utilized to pivot the turn-table.

Fig. 8 is a top plan view of the positioner shown in Fig. 7.

Fig. 9 is a transverse section on the line 9—9, Fig. 8.

As shown, my novel work positioner comprises frame members 1, preferably formed of channel irons or the like, connected together at their corners in any desired manner to provide an open frame of general rectangular shape, said frame having a cross member 2 extending between the sides intermediate the ends thereof. The side frames are also connected together by an intermediate cross member 3, preferably a channel iron disposed parallel with but spaced from cross member 2. Other cross members or braces may also be provided, if desired.

Upon the side members of the frame, preferably above the cross member 3, are uprights 4 carrying on their upper ends brackets 5 carrying bearing housings 6 for stub shafts 7 (Fig. 4) journaled in roller bearings 8, whereby the shafts 7 will be freely rotatable in the housings 6, said shafts 7 extending outwardly from upper subframe 20 beyond the outer faces of the bearing housings 6, as shown in Figs. 2 and 4. The housings 6 at opposite sides of the frame 1 are in axial alignment to form the pivotal axis of a pair of subframes as clearly indicated in Figs. 2 and 4.

The lower subframe comprises parallel side beams 9 connected at their outer ends by a cross beam 10, and by a second cross beam 11 intermediate the ends of the side beams 9, said side beams being so spaced that the same underlie

the central portions of the projecting ends of the shaft sections 7, as shown in Fig. 2. Brackets 12 on the side beams 9 carry bearing housings 12a journaled upon the shaft sections 7, whereby the lower subframe 9—11 may be tilted on a horizontal axis on the shaft sections 7 from the position shown in Fig. 1 to the positions shown in Figs. 5 and 6. The lower subframe 9—11 when in horizontal position shown in Fig. 1 is disposed at about half the height of the shaft sections 7 above the frame 1, as indicated. Bearing housings 12a carry roller bearings 12b similar to bearings 8; and wear plates 12c are interposed on shaft sections 7 between the adjacent faces of bearing housings 6 and 12a.

On the outer sides of the side beams 9 intermediate the cross beams 10 and 11 are brackets 13, pivotally connected with the upper ends of pistons 14 by pins 15, said pistons 14 operating in hydraulic cylinders 16 pivoted at its lower end, as at 17, on lugs 18 carried by the cross member 2 of the frame 1, said cylinders 16 being positioned between the side members 1 of the frame, and the side beams 9 of the lower subframe 9—11, as indicated in Fig. 2, and said cylinders 16 being normally disposed in an inclined position with respect to the vertical, as shown in Figs. 1, 5 and 6, the cylinders 16 serving, when fluid is admitted into the lower ends thereof below the pistons, the swing the lower subframe 9—11 upwardly about the shaft sections 7 as an axis.

Disposed above the lower subframe 9—11 is an upper subframe consisting of parallel side beams 20 having brackets 22 (Fig. 6) carrying hubs 22a in which are anchored the stub shafts 7 projecting outwardly through bearings 12b in housings 12a and bearings 8 in housings 6 supported by the uprights 4 on the main frame 1. Washers or shims 22b (Fig. 4) are interposed on shaft sections 7 between the adjacent faces of hubs 22a and bearing housing 12a. The outer ends of side beams 20 converge as at 20a and are connected together at the apex. Said beams 20 are also connected together adjacent the shaft sections 7 by a cross beam 21. The brackets 22 extend above the side beams 20 of the upper subframe 20—21 so that the axis of shaft sections 7 will normally be disposed above the upper subframe when the latter is in normal horizontal position shown in Fig. 1.

The upper subframe 20—21 is likewise tiltable by means of hydraulic cylinders. As shown, the upper subframe is provided with brackets 23 (Figs. 2 and 6) secured to the converging portions 20a of the side beams 20, said brackets 23 being pivotally connected by pins 24 (Fig. 6) to piston rods 25 having pistons housed in cylinders 26, the lower ends of cylinders 26 being pivotally connected as at 27 to brackets 28 depending from or below the lower subframe 9—11 as shown in Fig. 6, brackets 28 preferably depending from the cross member 10 of the lower subframe 9—10—11. Preferably, the arrangement is such that when both subframes are in lowered or horizontal positions, shown in Fig. 1, the axis of pins 17 and 27 of cylinders 16 and 26 will be disposed in substantial alignment across the frame of the positioner, and the pivot pins 15 and 24 of the piston rods 14 and 25 will also be disposed in substantial alignment. However, such arrangement of pivot pins of the cylinders and piston rods is not essential, and the same may be differently arranged as desired.

By the above construction the lower subframe 9—11 may be tilted by introducing fluid under compression into the lower ends of cylinders 16 only to swing the lower subframe, carrying with it the upper subframe, as shown in Fig. 5, thus raising both subframes 9—11 and 20—21 equal amounts, the cylinders 26 remaining inactivated. The pistons 14 of cylinders 16 will thereby raise the lower subframe 9—11 inclusive, and the upper subframe 20—21 which normally rests thereon into an inclined position such as shown in Fig. 5. Where, however, a greater swing of the upper subframe 20—21 is desired, fluid under pressure may also be introduced into the lower ends of the cylinders 26 whereupon the pistons 25 will swing the upper subframe 20—21 into further inclined position, such as shown in Fig. 6, whereby the turn-table, hereinafter described, may be brought to a position substantially inverted from that shown in Fig. 1, that is may be tipped beyond a vertical plane. Also, the subframes obviously may be actuated in reverse order, if desired.

Within the converging portions of the side beams 20a of the upper subframe is a stub shaft 30, preferably welded to or otherwise secured in fixed position in said upper subframe, said shaft 30 having a reduced portion 30a (Fig. 3) extending above the tops of the subframe 20—21. Upon the reduced portion 30a is mounted the hub 31a of a turn-table 31 of substantial diameter, said hub being preferably mounted on upper and lower roller bearings 32—33 so as to permit free rotation of turn-table 31 on the fixed shaft 30, the turn-table 31 being preferably retained upon the reduced portion 30a of the shaft 30 by means of a removable cap 34 (Fig. 3) maintained in position on the upper end of the shaft 30a by a cap bolt 35. The turn-table 31, however, may be rotatably mounted in any other desired manner upon the stub shaft 30.

In order to rotate turn-table 31, a bracket 36 (Figs. 2 and 4) is provided on the cross beam 21 of the upper subframe 20—21 at the center thereof, said bracket having arms carrying a bearing housing 37 for a worm shaft 38 carrying a worm 39 thereon (Figs. 2 and 4), said worm shaft 38 being mounted in antifriction bearings 38a (Fig. 4) of a type which will maintain shaft 38 against axial movement in housing 37. Shaft 38 carries on one end, beyond housing 37, a chain sprocket 40 opposite a sprocket 41 (Figs. 1 and 2) on the shaft 42a of a motor 42 mounted on the base frames 1 of the positioner, said motor 42 being of variable speed type controlled by a rheostat from a hand wheel 43 or the like (Fig. 2) whereby the motor may be adjusted for various speeds. A chain 44 runs over the sprockets 40—41 for imparting rotation to worm shaft 38 by motor 42. The axis of worm shaft 38 is in alignment with the shaft sections 7, so that as the upper, lower or both subframes are swung, the distance between the centers of sprockets 40—41 will remain unchanged. Hence, a gear train drive may if desired, be substituted for the chain and sprocket drive 40—41 for the worm shaft 38 as the shaft centers remain constant.

As shown in Fig. 4, the worm 39 is disposed above the tops of the upper subframe 20—21, and as shown in Figs. 1, 5 and 6, the turn-table 31 carries a worm gear ring 45 fixedly secured to the under side of the turntable 31 by means of brackets 46 so that the turn-table 31 and worm gear 45 will swing or pivot in unison. Worm gear 45 constantly meshes with worm 39 in any pivoted position of the subframe 20—21.

In order to actuate the cylinders 16 and 26, I

provide a hydraulic oil pump 50 (Figs. 1 and 2) driven by a motor 51, said oil pump and motor being mounted in one corner of the base frame 1 of the positioner; and pump 50 delivers oil through duct 52 under pressure to two valves indicated at 53—54 (Fig. 2), the valve 53 having ducts 55—56 leading to the cylinders 26 which actuate the upper subframe 20—21, ducts 57—58 returning the oil to said valve 53, while the valve 54 is provided with oil ducts 59—60 leading to cylinders 16, and with ducts 61—62 returning from the cylinders 16 which actuate the lower subframe 9—11. The cylinders 16 and 26 are double-acting, and are thus pressure controlled in both directions. Suction pipe 63 delivers oil from a sump 64 to the pump 50, while oil is returned from the valves 53 and 54 to sump 61 by a pipe 65.

By the above construction, when the cylinders 16 are activated both subframes 9—11 and 20—21 are pivoted around the shaft sections 7 the same amount. When cylinders 26 only are activated, the upper subframe 20—21 only is pivoted around the shaft sections 7.

An important feature of my invention resides in the fact that when the turn-table 31 is in a tilted or working position, the center of the load on the turn-table will be normally disposed above the shaft sections 7 as shown in Fig. 5, that is, the load will be more closely centered above the table pivots than in conventional machines, due to the fact that center of the table approaches the pivot shafts 7 as the table is tilted from the horizontal position, thus reducing stresses in the parts comprising the support since the load will not be placed in increasingly overhung position with respect to the pivots 7 as is the case in most conventional positioners.

Another advantage in my positioner is that the loading height of the table is much lower than heretofore possible in positioners in which the table pivots on its center line with the pivot under the turn-table vertical bearings, as in conventional machines.

My positioner herein disclosed is extremely convenient to operate, and its use eliminates the necessity of providing elevated loading platforms, or the placing of the positioner in a deep pit to achieve convenient loading heights. My machine, therefore, is portable and can be moved around a plant as desired without entailing the expense of providing various pits or platforms to receive same. The original installation is therefore very economical, and the machine can be placed in buildings with low ceilings or crane clearances.

In the modification shown in Figs. 7, 8 and 9, a somewhat similar positioner is illustrated in which, however, the lower subframe shown at 9—11 inclusive in Figs. 1–6, is omitted and hence the positioner in this modification is provided with a single subframe 20—21 only. The frame 1 is substantially identical with that shown in the preceding figures and similar parts bear the same reference numerals.

In this modification the subframe comprises side beams 20 converging at their outer ends as at 20*a*, and the stub shaft 30 is secured at the apex of the converging beams in the same manner described in connection with the preceding figures. However, the stub shaft 30 projects below the side beams 20 as indicated at 30*x*, Fig. 7, and normally rests upon a cross-beam 70 when the subframe is in horizontal position, the cross-beam 70 extending between and being secured to the base frame 1.

The side beams 20 of the subframe carry the upstanding brackets 22 which support the hubs 22*a* which carry the shaft sections 7 which latter extend outwardly from the hubs 22*a* and pass through the roller bearings 8 in the bearing housings 6 supported upon the base frames 1, but the shaft sections 7 in this modification are of less length than in the preceding figures by an amount equal to the width of the bearing housings 12 in Fig. 4. Preferably washers or shims 22*b* are interposed between the adjacent facings of the hubs 22*a* and the bearing housings 6, as shown in Fig. 9.

The bracket 37 for worm shaft 38 carrying worm 39 is arranged in the same manner as in the preceding figures, the shaft 38 also carrying sprocket 40 for the chain 44 which also runs around sprocket 41 diven by the motor 42, the shaft sections 7 and the worm shaft 38 being disposed in axial alignment, and the turn-table 31 carrying the worm gear ring 45 meshing with worm 39 as in the preceding figures.

In this modification the subframe is pivoted by double acting cylinders 26, as in the preceding figures, the cylinders 26 having pistons carrying piston rods 25 connected at their upper ends as at 24 with brackets 23 extending from the side beams 20*a* of the subframe, as indicated in Fig. 7, while the lower ends of the cylinders 26 are pivoted as at 71 to lugs carried by the cross member 2 of the frame 1 in the same manner that the cylinders 16 in the preceding figures where so pivoted.

The double acting cylinders 26 are actuated by fluid under pressure from pump 50 through suitable valving, not shown, the pump being actuated by the motor 51.

In this modification it is obvious that as the fluid is admitted to the lower ends of the cylinders 26 when the subframe is in lowered or horizontal position, the pistons therein will be forced upwardly and the rods 25 will act upon brackets 23 to pivot the subframe about the shaft sections 7 as in the preceding figures. Since the worm gear 39 is coaxial with the shaft sections 7, the worm gear ring 45 will remain in mesh with worm 39 in any and all pivotal positions of the subframe. Obviously the tilting movement of the subframe in this modification is limited to the stroke of the double acting pistons 26; but aside from this limitation the same general advantages are obtained in this modification as in the preceding figures, i. e., as the turn-table 31, carried by the subframe, is swung upwardly the load thereon will be increasingly moved more closely into position above or over the table pivots 7 so that the load will substantially overlie the pivots, thus reducing stresses in the parts of the positioner in supporting the load in such tilted position; and moreover, due to the low loading height of the turn-table 31, it is not necessary to provide elevated loading platforms, or to place the positioner in deep pits to achieve convenient loading heights; and moreover, the positioner is inherently portable as it can be moved around from place to place.

I do not limit my invention to the exact forms shown in the drawings, for obviously changes may be made therein within the scope of the claims.

I claim:

1. A work positioner comprising a base having a pair of spaced uprights carrying aligned bearings; a subframe carrying brackets at one end

having hubs journaled in said bearings; a turn-table freely rotatably journaled in said subframe at the end opposite the said bearings, said turn-table carrying a worm ring gear; a worm journaled coaxially of said bearings and meshing with said ring gear; means for rotating said worm; and means interposed between and connecting the subframe and base for pivoting and maintaining the subframe in tilted position thereon; whereby the loading height of the turn-table above the base will be maintained at a minimum.

2. A work positioner comprising a base having a pair of spaced uprights carrying aligned bearings; a subframe carrying vertically offset brackets at one end having hubs journaled in said bearings; a turn-table freely rotatably journaled in said subframe at the end opposite the bearings; a worm ring gear concentrically mounted on the turn-table; a worm journaled coaxially of and between said bearings and meshing with said ring gear; means for rotating the worm; means interposed between and connecting the subframe and base for pivoting and maintaining the subframe in tilted position thereon; and means for actuating said pivoting means, whereby the loading height of the turn-table above the base will be maintained at a minimum.

3. A work positioner comprising a base having a pair of spaced uprights carrying aligned bearings; an upper subframe carrying brackets at one end having hubs journaled in said bearings; a turn-table freely rotatably journaled in said subframe at the end opposite said bearings; said turn-table carrying a worm ring gear; a worm journaled coaxially of said bearings meshing with said ring gear; means for rotating the worm; a lower subframe having brackets at one end journaled in the said bearings; means interposed between and connecting the lower subframe and upper subframe for pivoting and maintaining the upper subframe in adjusted angularity with respect to the lower subframe; and means interposed between and connecting the lower subframe and base for pivoting and maintaining the lower subframe in adjusted angularity with respect to the base, whereby the loading height of the turn-table with respect to the base will be maintained at a minimum.

4. A work positioner comprising a base having a pair of spaced uprights carrying aligned bearings; an upper subframe carrying vertically offset brackets at one end having hubs journaled in said bearings; a turn-table freely rotatably journaled in said subframe at the end opposite said bearings; a worm ring gear concentrically mounted on the turn-table; a worm journaled coaxially of and between the bearings and meshing with said ring gear; means for rotating the worm; a lower subframe having vertically offset brackets at one end journaled in the bearings; means interposed between and connecting the lower subframe and upper subframe for pivoting and maintaining the upper subframe in adjusted angularity with respect to the lower subframe; means interposed between and connecting the lower subframe and base for pivoting and maintaining the lower subframe in adjusted angularity with respect to the base; and means for individually actuating said pivoting means, whereby the loading height of the turn-table above the base will be maintained at a minimum.

5. A work positioner comprising a base having a pair of spaced uprights carrying aligned bearings; an upper subframe carrying vertically offset brackets at one end having hubs for stub shafts journaled in said bearings; a turn-table freely rotatably journaled in said subframe at the end opposite the bearings; a worm carried by a shaft journaled in a second bracket carried by the subframe and in substantial axial alignment with said stub shafts; a worm gear ring concentrically mounted on the turn-table and meshing with the said worm; means for rotating the worm; a lower subframe having vertically offset brackets at one end carrying bearings journaled on the stub shafts; means connecting the lower subframe and upper subframe for pivoting and maintaining the upper subframe in adjusted angularity with respect to the lower subframe; means connecting the lower subframe and base for pivoting and maintaining the lower subframe in adjusted angularity with respect to the base; and means for individually actuating said pivoting means, whereby the loading height of the turn-table above the base will be maintained at a minimum.

6. A work positioner comprising a base having a pair of spaced uprights carrying aligned bearings; an upper subframe carrying vertically offset brackets at one end having hubs for stub shafts journaled in said bearings; a turntable freely rotatably journaled on said subframe at the end opposite the bearings; a worm carried by a shaft journaled in a second bracket carried by the subframe and in substantial axial alignment with said stub shafts; a worm gear ring concentrically mounted on the turn-table and meshing with the said worm; means on the base for rotating the worm shaft; a lower subframe having vertically offset brackets at one end carrying bearings journaled on the stub shafts between the first mentioned bearings and hubs of the upper subframe; means connecting the lower subframe and upper subframe for pivoting and maintaining the upper subframe in adjusted angularity with respect to the lower subframe; means connecting the lower subframe and base for pivoting and maintaining the lower subframe in adjusted angularity with respect to the base; and means for individually actuating said pivoting means, whereby the loading height of the turn-table above the base will be maintained at a minimum.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,371,344	Brackett	Mar. 15, 1921
1,442,267	Gross	Jan. 16, 1923
1,580,358	Wright	Apr. 13, 1926
1,843,794	Weddell	Feb. 2, 1932
1,925,296	Barrett	Sept. 5, 1933
1,985,169	Howell et al.	Dec. 18, 1934
2,027,421	Eisenberg	Jan. 14, 1936
2,072,998	Allin	Mar. 9, 1937
2,182,743	Clergy	Dec. 5, 1939
2,220,815	Feilcke	Nov. 5, 1940
2,227,688	Wood	Jan. 7, 1941
2,277,631	Bullock	Mar. 24, 1942
2,318,791	Mueller	May 11, 1943
2,348,062	Faber	May 2, 1944
2,396,161	Cullen	Mar. 5, 1946