March 12, 1940. W. O. TRUITT ET AL 2,193,047

LIFTING AND TRANSPORTING TRUCK

Filed Aug. 25, 1938 4 Sheets-Sheet 1

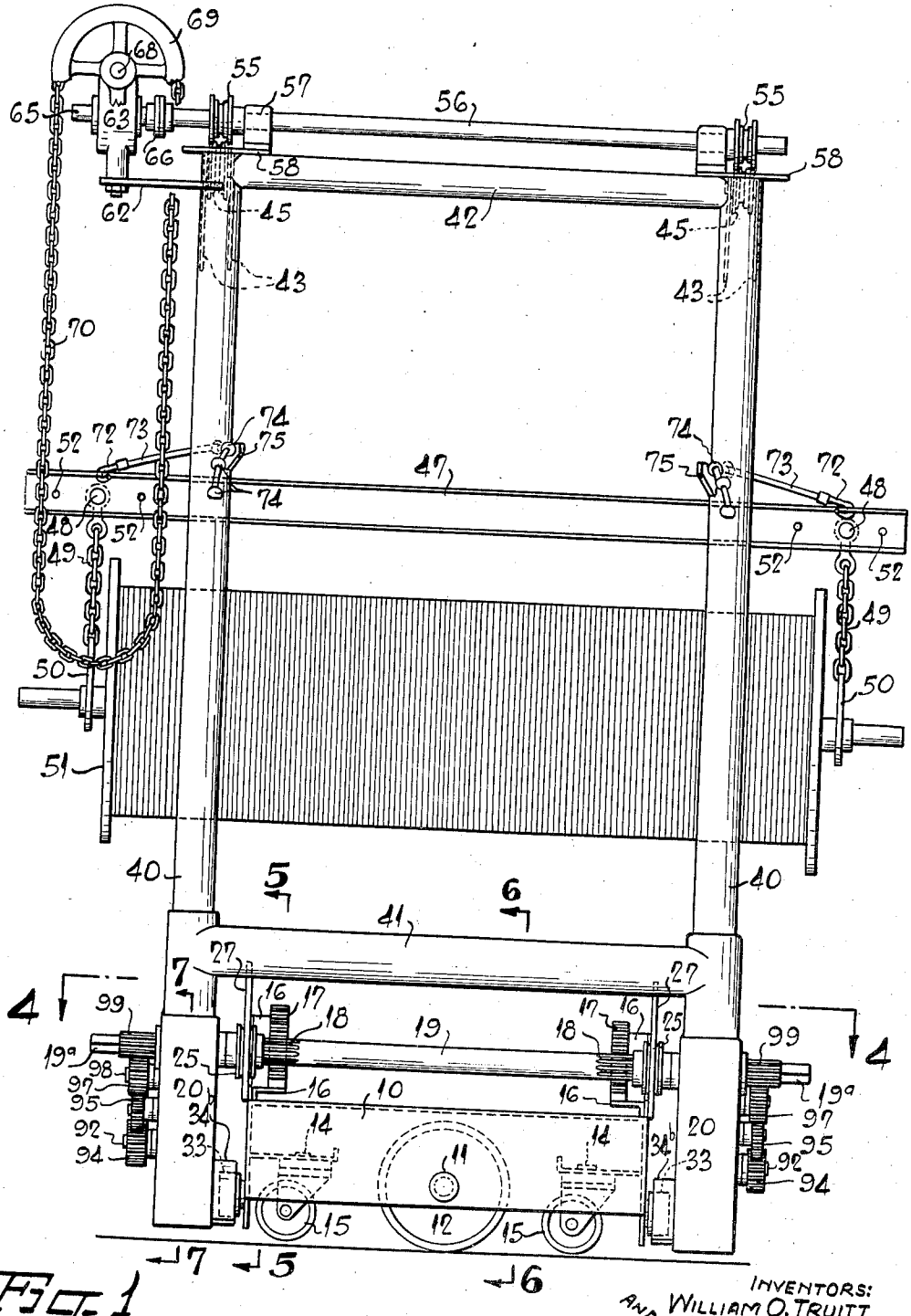

FIG. 1

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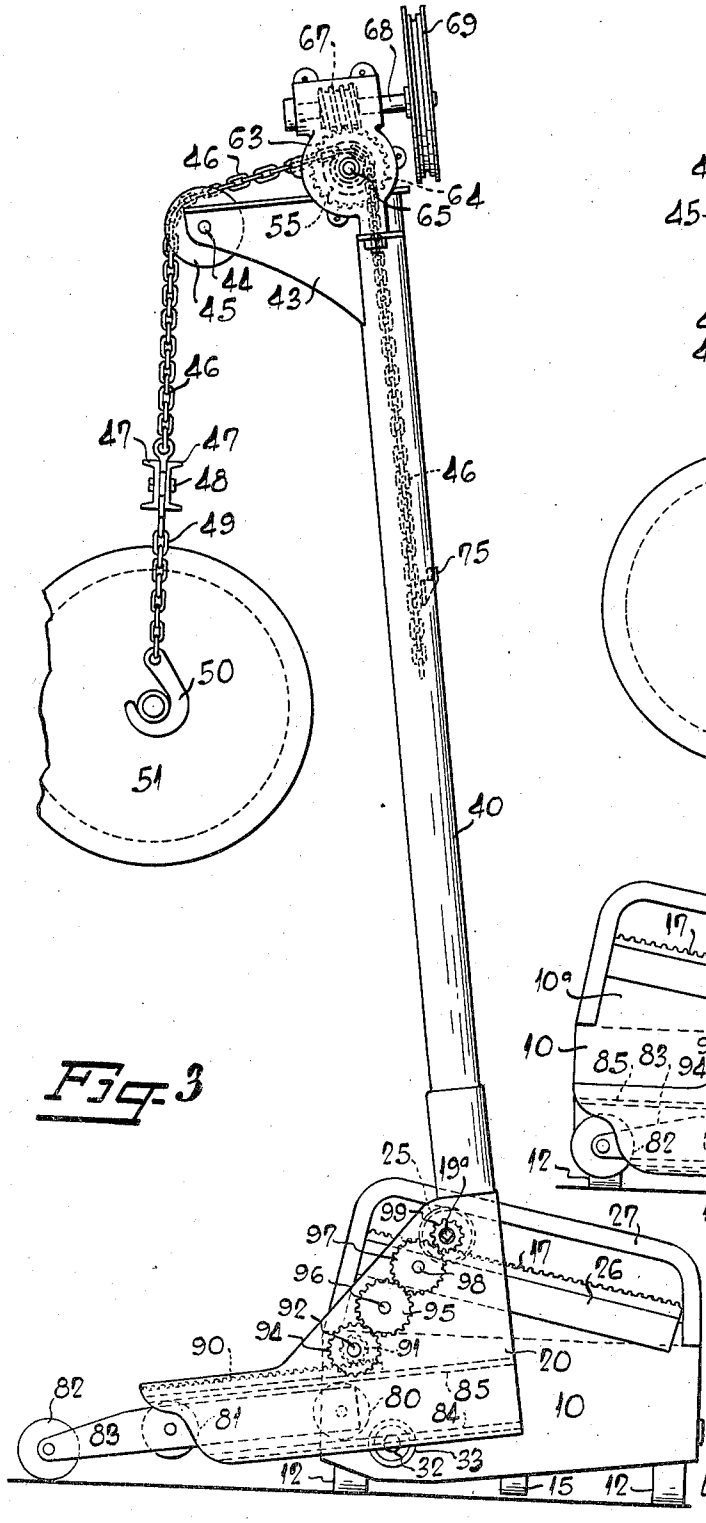

Fig-3

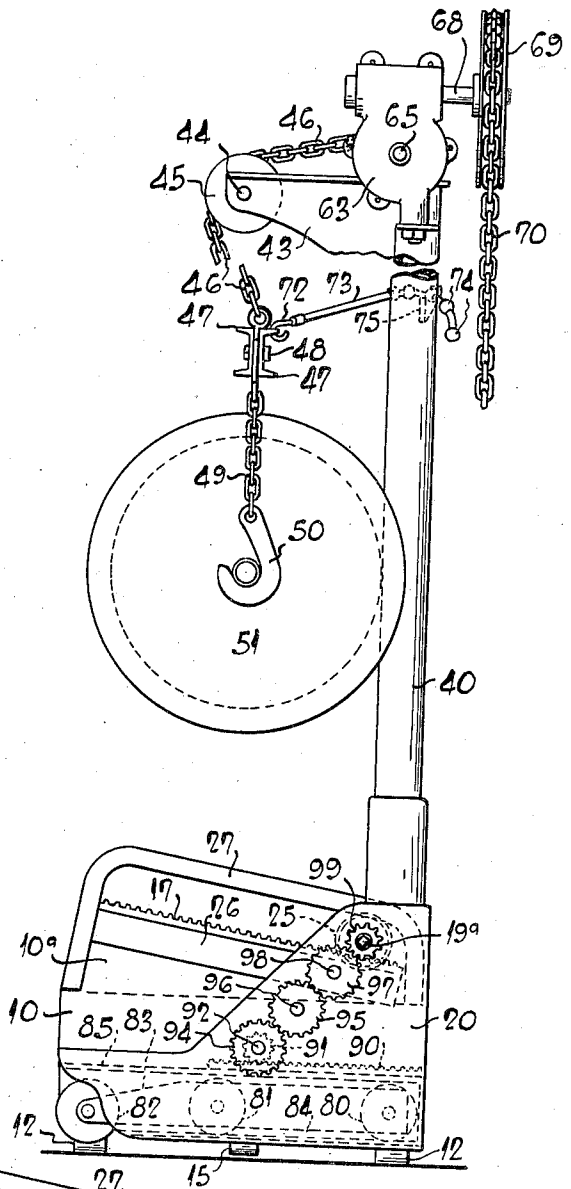

Fig-2

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March 12, 1940. W. O. TRUITT ET AL 2,193,047

LIFTING AND TRANSPORTING TRUCK

Filed Aug. 25, 1938 4 Sheets-Sheet 3

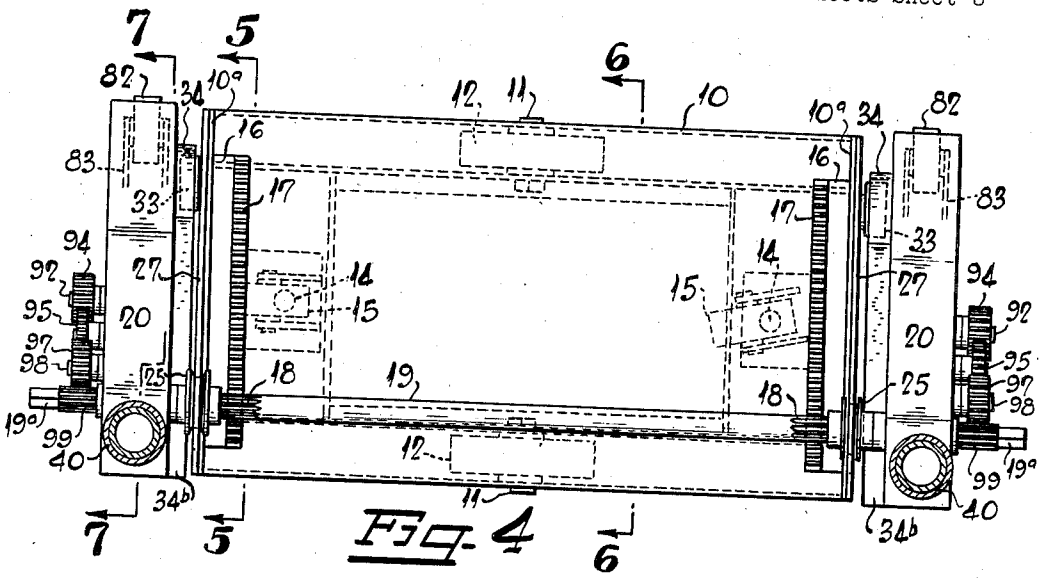

FIG. 4

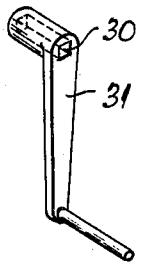

FIG. 4A

FIG. 5

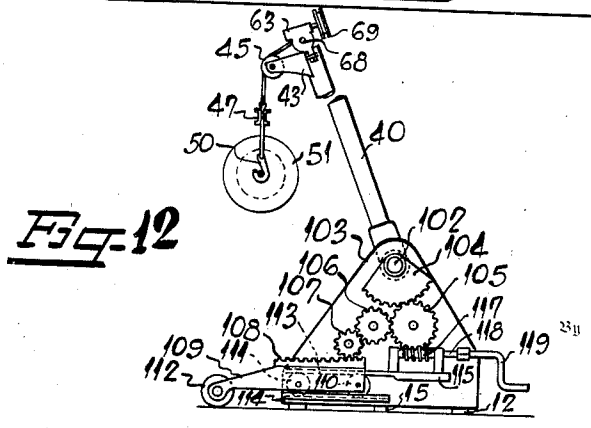

FIG. 12

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LIFTING AND TRANSPORTING TRUCK

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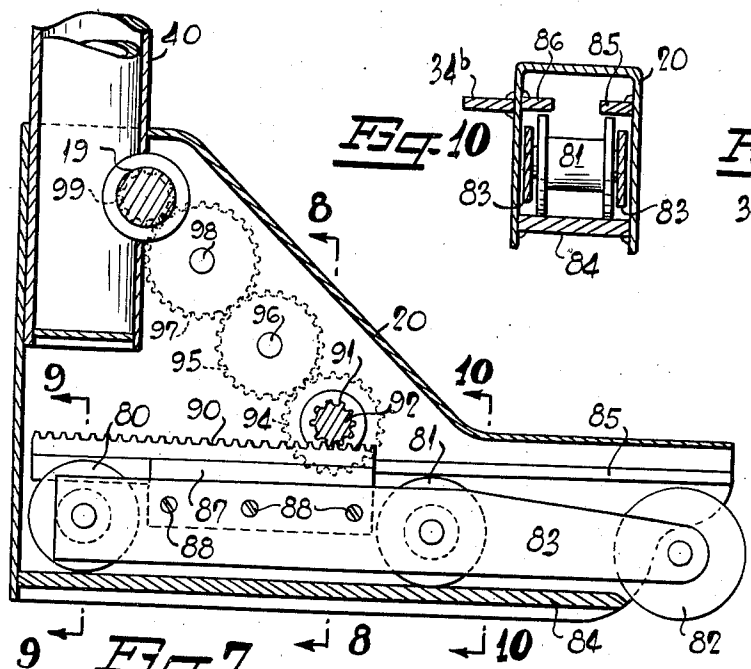

Fig. 7

Fig. 10

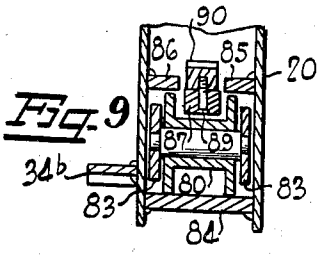

Fig. 9

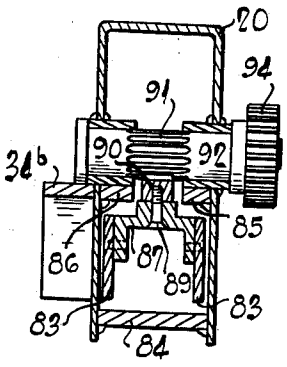

Fig. 8

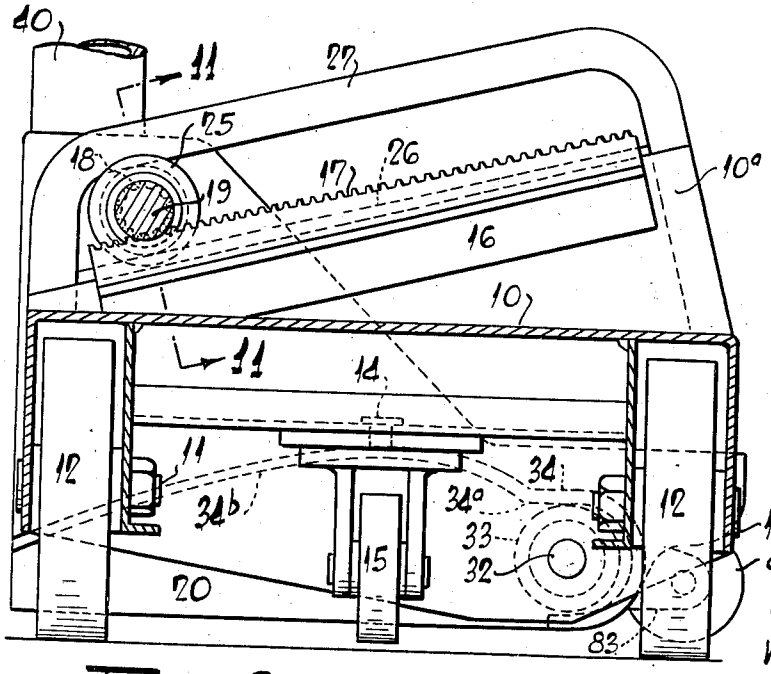

Fig. 6

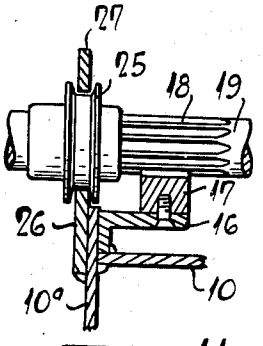

Fig. 11

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Patented Mar. 12, 1940 2,193,047

UNITED STATES PATENT OFFICE

2,193,047

LIFTING AND TRANSPORTING TRUCK

William O. Truitt and Wallace B. Truitt,
Greensboro, N. C.

Application August 25, 1938, Serial No. 226,782

9 Claims. (Cl. 212—10)

This invention relates to an apparatus for lifting heavy objects such as warp beams in textile mills and comprises a mechanism capable of having two motions, one a vertical lift and the other a horizontal movement. Although the present apparatus is primarily designed to lift and transport warp beams, it may be used or adapted for use with a plurality of articles such as bundles, bales, boxes or packages using the same general principles without departing from the spirit of the invention.

It is a well known fact that textile mills have their looms arranged in parallel rows so that a very small aisle will be disposed between adjacent rows of looms. The obvious reason for so positioning the looms is to conserve floor space and thereby position more looms within a given space and to provide aisles for transporting warp beams and cloth rolls. During the operation of the looms, it is necessary at times, to remove heavy beams of cloth from the take-up end of the looms adjacent the aisles as well as to replace exhausted warp beams in the other end of the looms. Due to the narrowness of the aisles, it is necessary to provide a relatively narrow truck for carrying the warp beams to and from the loom. However, when it is necessary to place the beam in position or remove it, from the looms, it is necessary to boom out, or cantilever the beam into space so that it can be lowered into the bearings on the loom. When this is done, it is also necessary to extend the width of the base to prevent overturning of the truck.

It is, therefore, an object of this invention to provide a portable truck having a mast thereon for carrying heavy objects, such as textile beams, said truck having apparatus associated therewith for moving the mast laterally of the truck and also having other apparatus associated with the lower end of the mast for simultaneously extending the width of the truck base in the direction that the mast is moving.

It is a further object of this invention to provide a portable truck base having a boom pivotally secured thereto and also having means for supporting a load on the upper end of the boom, with means for cantilevering the boom relative to said truck, and means for simultaneously extending the base of the truck so that a vertical center line through the load which is carried by the mast will always pass through the base of the truck, as well as means for lifting the beam relative to the truck for transporting the same along the aisles.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of the lifting apparatus;

Figure 2 is an end elevation looking at the left-hand side of Figure 1 showing the mast of the lifting device in an upright vertical position, and showing the load carried thereby in position for being transported from place to place;

Figure 3 is a view similar to Figure 2 but showing the mast in an inclined position and also showing the base in an extended position with the load raised from or ready to be lowered to a loom, respectively;

Figure 4 is a sectional plan view taken along the line 4—4 in Figure 1;

Figure 4A is an isometric view of a crank which is adapted to be used for extending the base of the lifting apparatus or for retracting the same;

Figure 5 is a transverse, vertical, sectional view taken along the line 5—5 in Figures 1 and 4, showing the base of the lifting apparatus in an extended position;

Figure 6 is a transverse, vertical, sectional view taken along the line 6—6 in Figures 1 and 4;

Figure 7 is a transverse, vertical, sectional view through the lower end of the mast and taken along the line 7—7 in Figures 1 and 4;

Figure 8 is a vertical, sectional view taken along the line 8—8 in Figure 7;

Figure 9 is a vertical sectional view taken along the line 9—9 in Figure 7;

Figure 10 is a vertical sectional view taken along the line 10—10 in Figure 7;

Figure 11 is a sectional detail view taken along line 11—11 in Figure 6;

Figure 12 is a view showing a slightly modified form of the invention in which the mast is pivotally secured to the truck instead of being mounted for bodily movement thereon, as in the preceding form.

The machine consists primarily of the following parts: (1) A truck supported on wheels for easily moving from place to place; (2) a mast consisting of one or more uprights with bases for supports when the mast is moved sidewise of the truck; (3) a means for racking the mast sidewise and moving the supported load to position laterally of the truck in such a manner that the center of gravity of the load will fall inside the center line of the supporting wheel at the base of the mast; (4) a means for hoisting and lowering the load.

Referring more specifically to the drawings, the numeral 10 denotes the framework of a truck which has mounted in its lower portion main wheels 12 on fixed axes. Also mounted in the lower portion of the truck framework 10 as at 14 are swivel casters 15, having their lower peripheries elevated slightly above the floor line for easy steering. As the truck is being moved from place to place, the main wheels 12 carry the major portion of the load; however, the swivel

wheels 15 are provided for touching the floor, one at a time for preventing the truck from becoming overbalanced and also to serve as pilot wheels when it is desired to turn the truck at an angle from a straight line of travel.

The ends of the truck 10 have plates 10a extending upwardly therefrom to which are secured angle members 16 (Figure 11) the outstanding leg of each angle member being adapted to support an inclined rack 17. These racks are disposed at each end of the truck and are adapted to support and also mesh with gear teeth 18 which are cut in a longitudinally disposed shaft 19. The ends of shaft 19 are journaled in thruster housings 20, which housings are disposed at each end of the truck 10.

In order to hold the gear teeth 18 in mesh with the racks 17 at all times, flanged or grooved rollers 25 are secured on shaft 19 and these rollers are adapted to travel along trackways 26 which are secured to the side of plates 10a, at each end of the truck. The plates 10a also have secured thereto inverted U-shaped guide members 27, the lower inclined edge of which fits into the upper side of flanged wheel or roller 25. Of course, the inclined edges of the U-shaped members are parallel to the tracks 26 and also parallel to the racks 17 into which the gear teeth 18 mesh.

The ends of the shaft 19 project past the thruster housings 20 and have squared portions 19a on its ends. When it is desired to turn the shaft 19 and thereby vary the position of the shaft and housings relative to the rack 17 and truck 10, it is only necessary to insert the squared cavity 30 of crank 31 (see Figure 4A) upon one of the squared ends 19a of the shaft 19 and then impart rotative movement to the shaft.

Rotatably mounted upon each end of the truck 10 as at 32 are rollers 33, which rollers are adapted to support the lower side of semi-circular plate 34 when the thruster housings 20 are in a retracted position as shown in Figures 2 and 6. The plates 34 are welded to the proximate faces of thruster housings 20. By observing Figures 4 and 6, it is seen that when the thruster housings are in a retracted position, they are supported by rack 17 and rollers 33. In other words, the left-hand side of the thruster housing 20 (Figure 6) is supported through shaft 19 which has gear teeth 18 thereon meshing with the rack 17, whereas the right-hand side of the housing is supported by roller 33, the upper side of which normally supports semi-circular plate member 34, which, in turn, projects out from the thruster housing.

The thruster housings 20 are adapted to support a suitable mast comprising upright tubular members 40 which are tied together at their lower ends by cross member 41. These uprights are also tied together at their upper ends by a second cross member 42. Secured to the upper end of the tubular members 40 by any suitable means such as welding or the like, are brackets 43, in which are rotatably mounted as at 44 suitable sheaves 45. A chain or cable 46 is adapted to pass over each of the sheaves 45 and the lower end of these chains support a pair of channel struts 47.

Removably secured in each end of channel struts 47 as at 48 are suspended chain members 49, each of said members having a hook 50 connected to its lower end, the hooks serving to support the ends of a warp beam 51. Other spaced holes such as indicated by reference characters 52 are provided in the strut 47 in order to accommodate beams of greater or lesser length. This provision may be made by merely removing the upper end of chain 49 from one hole and placing it in another, so that the distance between the chains will approximately correspond to the distance between the heads of the warp beam 51.

Each chain 46 also passes over another sheave 55, there being two of said sheaves, which are fixedly secured around a shaft 56. This shaft is journaled in suitable bearings 57 disposed on the upper side of plates 58, said plates being secured to the upper ends of the tubular member 40 and cross member 42. After passing over the sheaves 55 the chains 46 are allowed to project down into the hollow tubular members 40.

Welded to the side of one of the tubular members 40 is a plate 62 (Figure 1) which plate supports housing 63. This housing has a worm gear 64 mounted therein upon a shaft 65 (Figure 3), and this shaft is connected to the shaft 56, by means of a coupling 66. Meshing with worm gear 64 is a worm 67, which is fixedly secured on a shaft 68, said shaft having a sheave pulley 69 fixedly secured thereon. Upon the pulley 69 an endless chain 70 is adapted to be mounted which is used for turning the sheave 69 to cause shafts 68, 65 and 56 to be rotated in the desired direction to raise or to lower the channel struts 47 and warp beam 51 to the desired elevation.

Although it is generally the practice to boom the tubular members 40 to the position shown in Figure 3 when the warp beam 51 or other object which is being lifted is lowered, it is to be understood that after such object has been lifted, and is to be transported from place to place, it is necessary to secure the beam against swinging movement. In order to make this warp beam a more rigid part of the mast, during transportation, it is preferable to use some suitable means such as hooks 72 which penetrate suitable holes in the flanges of channel struts 47. These hooks are secured on one end of cables or chains 73, which have projections 74 fixed thereon, at spaced intervals. A suitable notched plate 75 is welded to each of the upstanding tubular members 40 and into these notches the cables 73 are adapted to be inserted so that the projections 74 will engage the notched plates 75 and thereby hold the periphery of the beam 51 against the upright tubular members 40. It will be noted by referring to Figure 1 that two cables 73 are provided and the cables are secured to the struts 47 near each end, so as to pull each end of the struts toward the center line of the mast. By thus securing the beam in position, it is seen that the swinging movement will be eliminated and therefore the mast beam and the truck can be transported from place to place without danger of being overturned due to the swinging of the beam.

With the beam 51 in elevated position as shown in Figure 2 and drawn against the masts 40, it is then transported to the desired position, where it may be lowered and placed in the bearings of a loom or upon the floor of the building. When placing the beam in the bearings on one side of the loom, it is necessary to move the beam laterally of the truck so that it can be lowered directly in a vertical plane and the ends thereof fall into the bearings on the loom.

The first operation necessary to accomplish this result is to release the hooks 72 from the channel struts 47, after which the beam 51 will be suspended by the chains 46 and 49 which, in turn, are supported by sheave pulleys 45. The next operation will be to move the mast comprising members 40 and the thruster supports 20 to the left substantially in the manner shown in

Fig. 3, so that the beam will lie in the proper vertical plane for lowering into the bearings on the loom or for placing on the floor. Then by inserting the crank 31 onto the squared end 19a of the shaft 19, and turning the shaft 19 in a counter-clockwise manner in Figures 2 and 3, it is seen that the thruster housing 20, tubular members 40, lifting assembly comprising members 67, 68, 69 and the beam 51 may be bodily moved to the left. Of course, when this counter-clockwise movement is imparted to this shaft, the gear teeth 18 will engage the teeth in racks 17 to effect this movement. While this movement to the left takes place, the truck 10 and its supporting wheels remain in the same position on the floor.

It is a well known fact that when the vertical center line through the center of gravity of an object falls outside of the base of the objects, that an overturning movement will be effected. Applying this same principle to the present invention, it is necessary to provide means to insure that the vertical center line through the load or beam 51 will not fall without the base which is supporting it. We have therefore provided a thruster mechanism that moves laterally in the same general direction as the beam 51 and also simultaneously with the lateral movement of the beam. This thruster mechanism provides a means for extending the width of the base of the truck 10 so that a vertical line passing through the center of gravity of the beam 51 will always lie within the base of the truck and prevent an overturning of the load and the supporting assembly.

This thruster mechanism comprises three rollers namely 80, 81 and 82 at each end of the truck which rollers are rotatably mounted between bars 83. The rollers 80 and 81 are normally disposed within the thruster housing 20, and are supported by a plate 84 in the bottom of the thruster housing and also supported by bars 85 and 86 which are also disposed in the thruster housing directly above the rollers. The roller 82 is somewhat larger than the rollers 80 and 81, and this roller is disposed normally on the exterior of the thruster housing 20 with its lower periphery slightly above the top of the floor. Secured between the plates 83 at a point between the rollers 80 and 81 is a bracket 87, said bracket being secured to these plates by means of screws 88 (see Figure 7). Secured on the top of this bracket by means of screws 89 is a rack 90, which meshes with gear teeth 91 cut in a short shaft 92, said shaft 92 being journaled in the sidewalls of thruster housing 20. The shaft 92 projects through the exterior of the thruster housing 20 and has fixedly secured on the exterior end thereof a gear 94. This gear is adapted to mesh with an idler gear 95 pivoted as at 96 to the side of the thruster housing 20. The idler gear 96 meshes with another idler gear 97 rotatably mounted as at 98 to the exterior of thruster housing 20 and this gear meshes with gear teeth 99, cut in the end of shaft 19. While only one thruster assembly has been described, it is to be understood that each thruster housing 20 has an identical assembly thereon.

When the crank 31 is inserted on one end of the shaft 19 and counterclockwise rotation has been imparted (Figure 2), the mast 40 and the hoisting mechanism carried by the upper end thereof, gradually will move to the left. After a slight amount of rotation, the roller 33 will move out from under the semi-circular plate 34. When the thruster housing and the mast have been forced a distance to the left in Figure 2, necessary to cause the point 34a to move past the top of roller 33 as shown in Figures 5 and 6, then the top of the mast will tilt, that is, rotate slightly in a counter-clockwise manner substantially to the position shown in Figure 3. In the meantime, due to the gears 94, 95, 97 and the gear teeth 99, the racks 90, the rollers 80 and 81 and 82 will be simultaneously forced to the left in Figures 2 and 3. This movement to the left is always sufficient to keep a vertical center line through the left-hand roller 82 in Figure 3 farther to the left than a vertical center line through the center of gravity of the beam 51.

After the points 34a move away from rollers 33, the left-hand side of the mast and thruster housings (Figure 5) are supported by racks 17 whereas the right-hand side is supported by rollers 82. The rollers 33 do not support anything after the point 34a leaves them, but rollers 82 are substituted for them. It is thus seen that the thruster assembly, the thruster housing, the mast, and the load carried thereby will simultaneously move to the left while the truck 10 remains stationary. It is also seen that the rollers 80, 81 and 82 move to the left at a much faster rate than the other parts, so as to provide a base sufficiently wide to prevent overturning of the entire assembly.

Figure 12 shows a modified form of the invention, in which like reference characters will apply to like parts. In this form the tubular members 40 are pivotally secured as at 102 to a truck 103, made substantially along the same lines as truck 10 just described. This truck has main rollers 12, and swivel caster rollers 15. Fixedly secured on the end of shaft 102, is a gear segment 104 which meshes with a gear 105, said gear 105 also meshing with an idler gear 106. The gears 105 and 106 are rotatably secured to the side of truck 103. Gear 106 meshes with another idler pinion 107 which pinion also meshes with rack 108. The rack 108 is secured to the upper side of bracket 109, said bracket being adapted to support rollers 110, 111, and 112 the rollers 110 and 111 being adapted to roll between upper and lower trackways 113 and 114, respectively. It will be noted that the upper trackway 113 has a cam surface 115 on the lower side thereof near its right-hand end, which, when engaged by the right-hand roller 110 will tilt the left hand roller 112 slightly upwardly from the floor.

The gear 105 is adapted to mesh with a worm 117 said gear being mounted on shaft 118 and the end of this shaft accommodates a crank 119 for rotating this shaft and the worm. As the crank 119 is turned, a clockwise rotary motion is imparted to the gear 105 which will turn the gear segment 104 and the tubular members 40 to cause these members to cantilever their load 51 to the left. Simultaneously with the cantilevering of this load, that is the counter-clockwise rotation of the tubular members 40, the rack 108 and its associated rollers 110, 111 and 112 will move to the left to increase the width of the base. This form of the invention varies from the preceding form in that the mast is pivoted at one point which remains stationary during the raising or lowering of the crane. Also the upper end of the mast can be rotated through a greater arc and consequently more remote points may be reached when it is desired to raise or to lower the load.

In the drawings and specification, there has

been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being set forth in the appended claims.

We claim:

1. In a hoisting and transporting truck, a rectangular base, a pair of wheels mounted for rotation centrally of the base on an axis disposed transversely of the base, a pair of caster wheels carried by the ends of the base and normally out of contact with the floor on which the truck rests when the truck is level, a pair of members telescoped in the base and each having a wheel on its outer end held out of contact with the floor when the members are telescoped in the base, a mast carried by the base and having hoisting means thereon, means for tilting the mast laterally of the base and also for moving said members out of telescoping relation to the base to cause the wheels on the outer ends of the members to contact the floor and maintain the equilibrium of the truck when the mast is tilted.

2. In a hoisting and transporting truck, a rectangular base, a pair of wheels mounted for rotation centrally of the base on an axis disposed transversely of the base, a pair of caster wheels carried by the ends of the base and normally out of contact with the floor on which the truck rests when the truck is level, a pair of members telescoped in the base and each having a wheel on its outer end held out of contact with the floor when the members are telescoped in the base, a mast carried by the base and having hoisting means thereon, means for moving the mast laterally of the base and also for moving said members out of telescoping relation to the base to cause the wheels on the outer ends of the members to contact the floor and maintain the equilibrium of the truck when the mast is moved.

3. A truck for transporting web rolls and the like along aisles in textile mills and the like, comprising an elongated base provided with wheels mounted for rotation on an axis disposed transversely of the base, a pair of caster wheels disposed on each side of said axis and out of contact with the floor on which the base rests when the base is level, an upwardly extending mast having hoisting mechanism thereon, a pair of members mounted in the base for sliding movement laterally of the base, each of said pair of members having a wheel in its outer end held out of contact with the floor when the members are disposed within the base, means for moving said members outwardly of the base to cause their wheels to contact the floor and at the same time moving said mast laterally of the base.

4. In a hoisting and transporting truck, a base member having wheels on its lower surface for contact with a floor, a pair of thruster housings mounted for movement laterally of the base, a mast structure carried by the thruster housings and having a hoisting mechanism disposed on its upper end, a pair of guideways in the thruster housings, a wheeled member mounted for movement in each guideway, the outer end of each wheeled member having a wheel thereon for contacting the floor when the wheeled members are moved laterally of the thruster housing, means carried by the thruster housings and engaging the base for moving the thruster housings laterally of the base and at the same time tilting the mast structure laterally of the base, and other means connected to the last-named means for moving the wheeled members out of the thruster housings to cause the wheel on the outer end of each wheeled member to engage the floor and maintain a position at all times outside the center of gravity of the truck and the load carried by the hoisting mechanism.

5. A wheeled truck having an upstanding mast structure provided with hoisting means on its upper end, a pair of normally inoperative wheeled members movable laterally and downwardly of the truck to increase its overall width, and common means for moving the mast laterally of the truck and moving said wheeled members laterally and downwardly of the truck for a loading and unloading operation.

6. A truck comprising a wheeled base member, and a structure movable laterally of the base member, the structure having a hoisting mechanism in its upper portion and a plurality of wheels in its lower portion normally out of contact with the floor and being movable into contact with the floor when the structure is moved laterally of the base member, means for moving the structure laterally of the base member, and means actuated by the last-named means for moving said wheels at a greater rate relative to the base member than the rate at which the structure is moved.

7. A truck comprising a wheeled base member provided with a pair of ends and a pair of sides, an upwardly inclined guideway disposed in each end, a rack associated with each guideway, a framework having a mast structure rising therefrom, a hoisting mechanism on the upper end of the mast structure, a rotatable shaft mounted in the framework and having pinions thereon for engagement with said racks, flanged rollers on said shaft for movement in said guideways, inclined guiding means disposed between the framework and the base for tilting the framework and mast as the framework is moved laterally of the base, a pair of wheeled members telescopically mounted in the framework and being movable out of telescopic relation for engaging the floor on which the base rests, and inter-connecting means between the shaft and the wheeled members for moving the wheeled members out of telescopic relation when the shaft is rotated to move the framework laterally of the base and to tilt the framework relative to the base.

8. A wheeled truck having a mast structure equipped with a hoisting mechanism and provided with a pair of laterally extensible members having wheels on their outer ends for engaging the floor on which the truck rests, means for tilting the mast structure laterally of the truck, and other means operable by the first-named means for moving said extensible members laterally of the truck in the same direction as the mast structure is tilted simultaneously with the tilting of the mast structure.

9. A portable truck base having a boom pivotally secured thereto and also having means for supporting a load on the upper end of the boom, with means for cantilevering the boom relative to said truck, and means for simultaneously extending the base of the truck so that a vertical center line through the load which is carried by the mast will always pass through the base of the truck.

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