

July 27, 1954

V. H. CARTWRIGHT

2,684,772

LIFTING TRUCK FORK

Filed Oct. 10, 1952

3 Sheets-Sheet 1

FIG. 1.

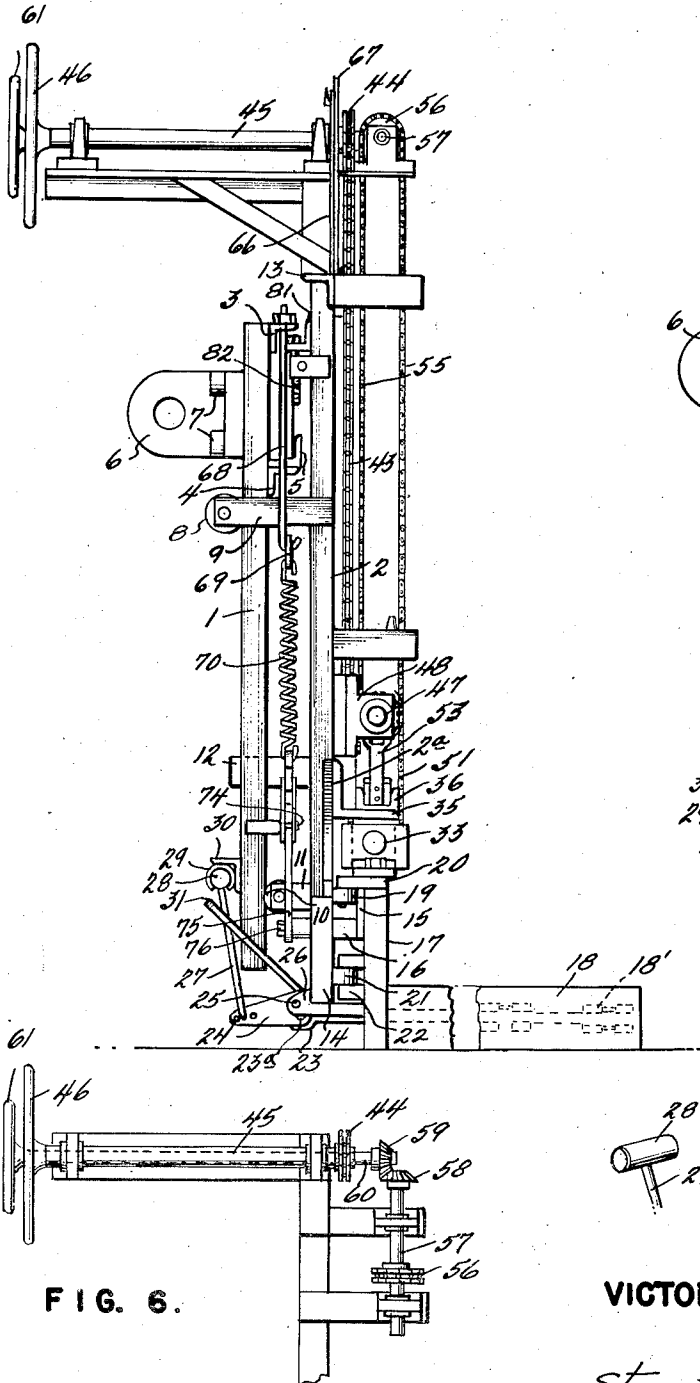


FIG. 2.

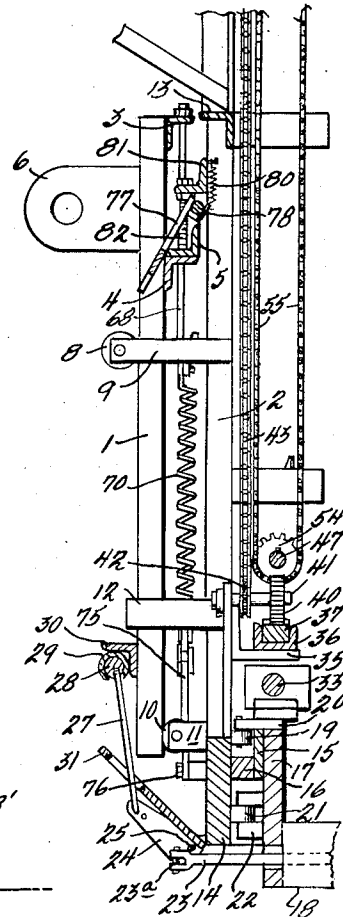
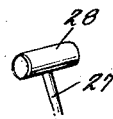


FIG. 7.



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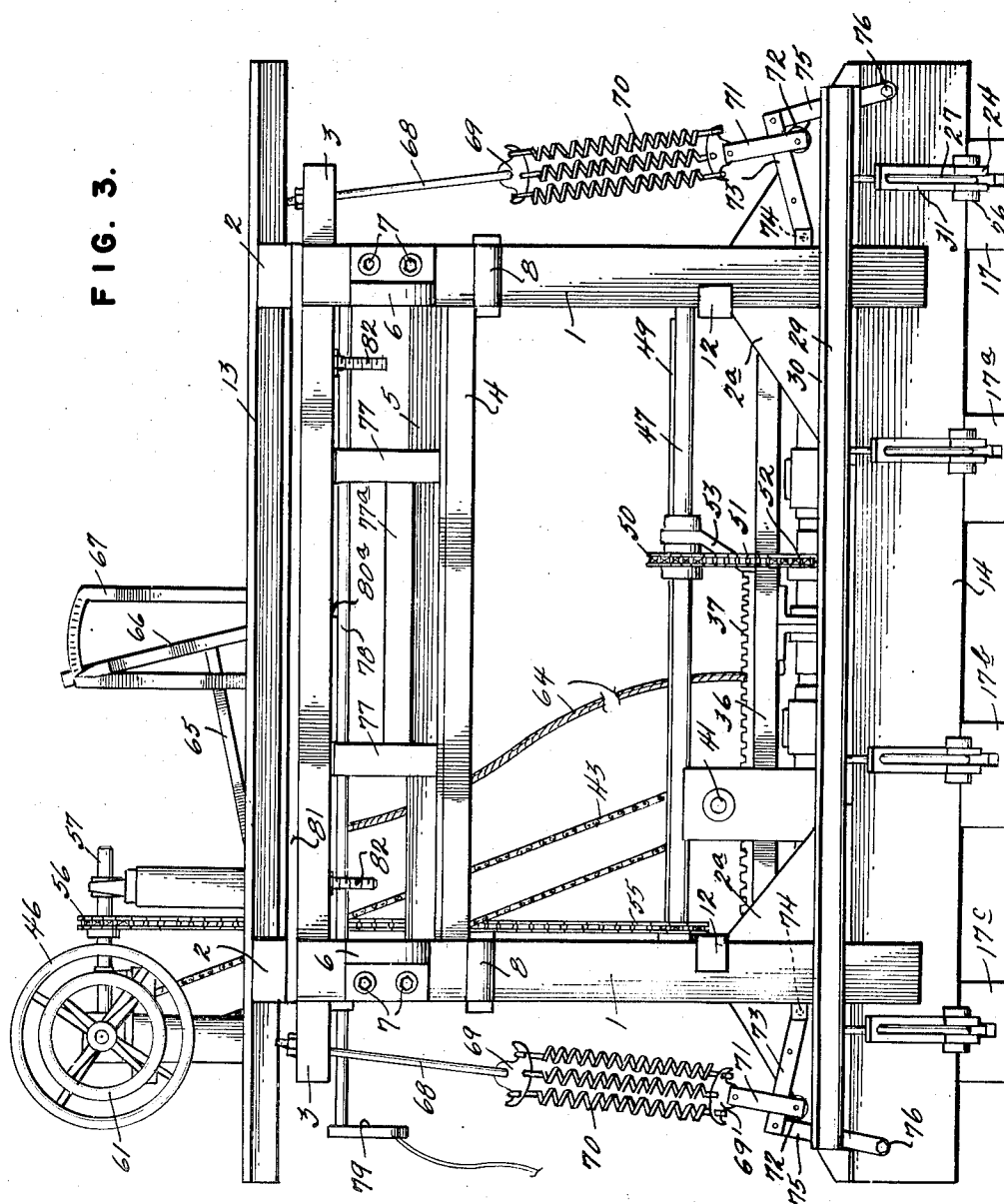
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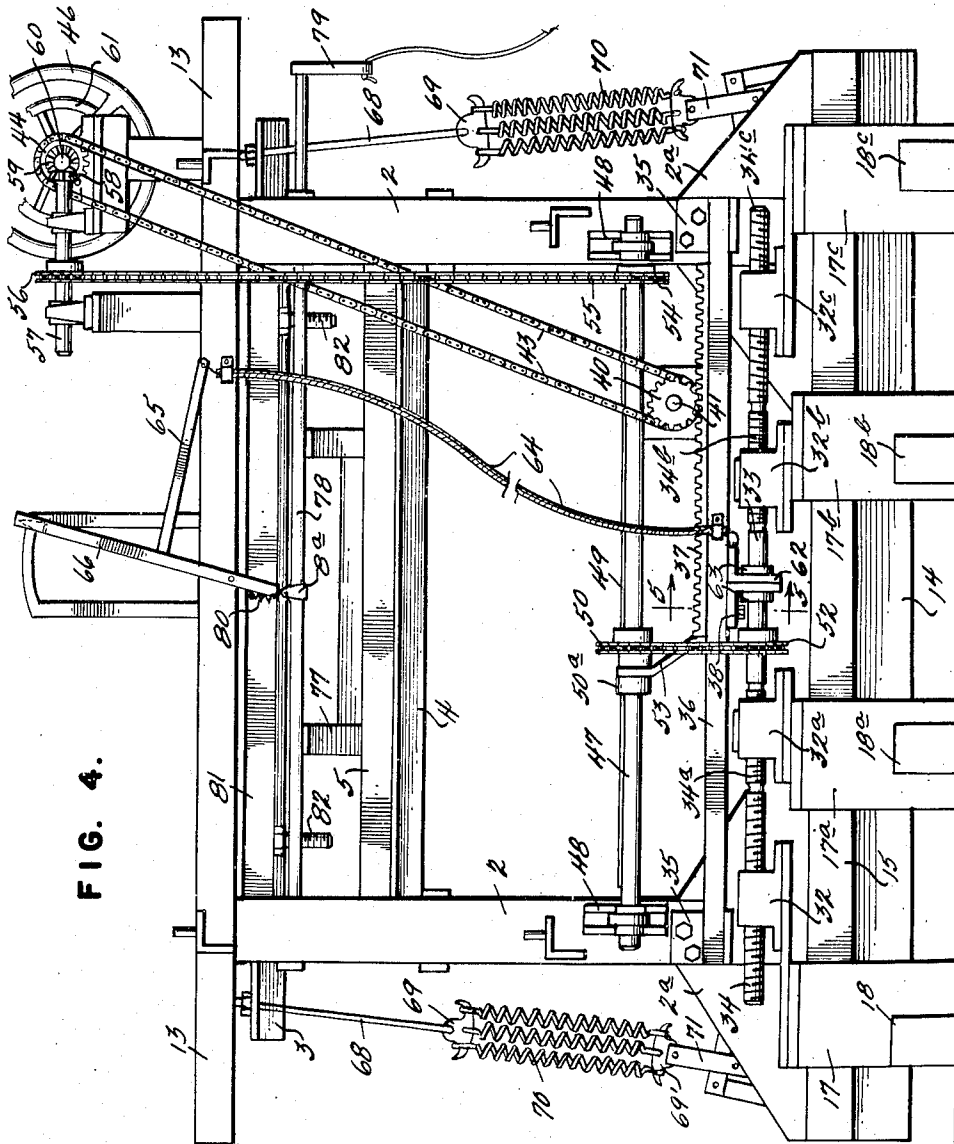
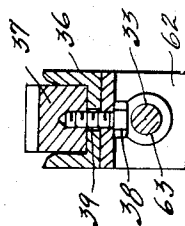


FIG. 4.

FIG. 5.



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LIFTING TRUCK FORK

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Application October 10, 1952, Serial No. 314,191

2 Claims. (Cl. 214-655)

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This invention relates to lifting forks, and more particularly to lifting forks of the general type shown and described in my prior Patent No. 2,530,375, issued November 21, 1950.

In this patent there is disclosed a lifting fork comprising a pair of vertical, parallel, relatively movable frames one of which is constructed to be attached to the fork truck, which is equipped with means for raising the frame, and the other of which carries the horizontally extending tines or arms adapted to engage the load.

In said patent the tines or arms are provided with gripping or clamping means, operated by the relative vertical movement of the two frames, such clamping means being arranged to grip the lower or finger courses of a stack or bricks or other articles disposed between the tines or arms, and thus lift these finger courses, as well as the rest of the stack, superposed on such courses above the arms, without the necessity of using a pallet to support the stack.

It frequently happens that, in the use of such apparatus, it is desirable to vary or adjust the distance between adjacent arms, so as to adapt them for handling articles of different sizes. An object of the present invention, is, therefore, to devise a construction by means of which the distance between the arms may be readily varied or adjusted by the operator of the truck without leaving his seat.

Such forks are usually provided with four or more tines or arms, and a more specific object of the invention is to devise means for simultaneously adjusting the distance between all of the arms, such means being so constructed that the several arms will remain equally spaced at all times. To this end, means are provided for causing the outermost arms to move further, when being adjusted, than the intermediate arms.

It also frequently happens, in the operation of such apparatus, that it becomes desirable to shift the entire group of arms laterally, relative to the truck, in order to readily insert them between the finger rows of stacks of articles without the necessity for carefully maneuvering and accurately positioning the truck itself. Another object of the present invention is, therefore, to devise means whereby the entire group of arms may be shifted laterally by the truck operator to any extent desired, without leaving his seat.

A still further object of the invention is to design a construction by means of which both of the above mentioned adjustments of the arms may be readily made at the same time, that is to say, the spacing of the arms may be varied as

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required, to whatever position the entire group of arms may be shifted, laterally of the truck.

With the above and other objects in view, and to improve generally on the details of such apparatus, the invention consists in the construction and arrangement of parts hereinafter described and claimed, and illustrated in the accompanying drawings, forming part of this specification, and in which:

Fig. 1 is an end elevation of my improved lifting fork, parts being broken away;

Fig. 2 is a vertical transverse section, showing the two frames in a relative position different from that of Fig. 1;

Fig. 3 is a rear elevation of the device, looking toward the left side of Fig. 1;

Fig. 4 is a front elevation of the device, looking toward the right side of Fig. 1;

Fig. 5 is a transverse section on an enlarged scale substantially on the line 5-5 of Fig. 4, looking in the direction of the arrows;

Fig. 6 is a fragmentary plan view of a portion of the mechanism shown at the top of Fig. 1; and

Fig. 7 is a perspective view of one of the operating connections hereinafter described.

Referring to the drawings in detail, my improved fork comprises a rear frame adapted to be attached to the lifting truck, and a front frame carrying the tines or arms, as in said patent.

The rear frame is made up of a pair of spaced vertical members 1 connected by horizontal members 3, 4 and 5. A pair of perforated brackets 6 are secured by bolts 7 to the vertical members 1 near their upper ends, these brackets constituting the means by which the rear frame is attached to the fork truck; (these brackets correspond with the brackets 34 in said patent).

The front frame comprises a pair of spaced vertical members 2 connected at their upper ends by a horizontal member 13, and at their lower ends by a heavy beam 14. The members 2 are preferably braced to the beam 14 by triangular gusset plates 2^a, as shown in Figs. 3 and 4.

The two frames are connected for relative vertical movement by means of a pair of rollers 8 carried by brackets 9 secured to the vertical members 2 and adapted to engage the outside of the vertical members 1, and a pair of rollers 10 mounted in brackets 11 secured to the lower ends of the members 2 and adapted to bear against the inner faces of the vertical members 1.

A pair of brackets 12 is also secured to the vertical members 2 near their lower ends and have their free ends bent around the members 1, as

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shown in Fig. 1, so as to hold such members in contact with the rollers 10.

A track member 15 is mounted on and extends parallel with the beam 14, being spaced therefrom by a strip 16.

A plurality of vertical plates 17, 17^a, 17^b and 17^c bear against the front face of the track member 15 and each is provided at its upper end with a roller 19 carried by a bracket 20, which roller engages behind the track member 15 in the space between such track member and the beam 14, as clearly shown in Figs. 1 and 2.

Also secured to each plate 17, 17^a, etc. near its lower end is a roller 21 carried by a bracket 22, which roller bears against the front face of the beam 14. Thus, each of these plates is free to traverse the track member 15 and beam 14 and to move laterally relative thereto.

The plates 17, 17^a, etc. carry the tines or arms 18, 18^a, 18^b and 18^c, as clearly shown in Figs. 1 and 4. Each of these arms is equipped with gripping means 18', as indicated in dotted lines in Fig. 1, such gripping means being constructed and operating substantially like the gripping means shown and described in detail in my said prior patent. As in said patent, these gripping means are actuated by an operating rod 23, movable longitudinally of the arm and projecting from the rear end thereof as clearly shown in Figs. 1 and 2. This operating rod is pivotally connected at 23^a to a lever 24 which is itself pivotally mounted at 25 on the brackets 26 secured to the plate 17.

To the outer end of the lever 24 is pivotally connected the lower end of a link 27, the upper end of which is rigidly secured to a cylindrical block 28, as clearly shown in Fig. 7.

All of these cylindrical blocks associated with each of the arms 18, 18^a, etc. are enclosed within and slide freely through a tubular member 29, having an open slot at its lower side to accommodate the links 27. This tubular member 29 is welded or otherwise secured to an angle member 30 extending along the rear frame and secured to the vertical members 1 thereof.

It will be seen that the above described blocks and tubular member constitute a slidable connection between each of the operating rods or links 27 and the frame members 1, this slidable connection permitting the free lateral movement of the arms and the operating mechanism associated therewith.

A guide plate 31 having a slot, through which the link 27 passes, is preferably provided, such plate being rigidly secured as by welding to the bracket 26.

Rigidly secured by suitable brackets to the top of the plates 17, 17^a, etc. are internally threaded blocks or nuts 32, 32^a, 32^b and 32^c, which nuts engage screw threaded portions of a shaft 33. These screw threaded portions or screw elements are designated 34, 34^a, 34^b and 34^c, and such portions or elements engage the correspondingly lettered blocks or nuts. It will be particularly noted that the screw elements 34 and 34^a on the one hand, engaging the nuts 32 and 32^a, are threaded in the same sense or direction, while the screw elements 34^b and 34^c, engaging the nuts 32^b and 32^c are threaded in the same sense or direction, but in a sense or direction which is the reverse of that of the screw elements 34 and 34^a.

It will further be particularly noted that the screw elements 34 and 34^a are of steeper pitch than the screw elements 34^b and 34^c.

As a result of the above described construction,

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it will be apparent that, when the shaft 33 is rotated, the several screw elements cause the corresponding nuts and the arms or tines to which they are secured to move laterally, and that the outermost nuts and arms will move further or at a faster rate than the intermediate nuts and arms. It will be further noted that each outermost arm and its adjacent intermediate arm move in the same direction, that is outwardly from the middle of the group. Thus, when the shaft 33 is rotated in one direction, the arms 18, 18^a, etc. are spread apart or spaced at a greater distance from each other, and when the shaft is rotated in the other direction the arms are drawn together and are spaced a smaller distance from each other.

The pitch of the threads of the respective screw elements is so designed that each nut or arm moves at a rate proportional to its distance from the middle of the group, that is to say, the outermost arms being further from the middle, move at a higher rate than the intermediate arms, and the pitch of the threads is such as to maintain all of the arms at a substantially uniform distance from each other at all times. Thus, in all positions of the arms, the distance between the arms 18 and 18^a is substantially the same as that between the arms 18^a and 18^b.

Secured to the vertical members 2 by brackets 35, just above the shaft 33, is a channel member 36, in which freely slides a toothed rack 37. The channel member 36 has a slot 39 extending longitudinally therethrough for part of its length and a bolt 38 works freely through this slot and extends into the rack 37. This bolt also passes through a bracket 62 which lies snugly against the lower surface of the channel 36.

A pinion 40 is mounted on a shaft 41 and engages the rack 37. This pinion is turned by means of a sprocket wheel 42 on the shaft 41, which sprocket wheel is driven by a sprocket chain 43 extending up over a sprocket wheel 44 secured to a hollow shaft 45 mounted in a suitable framework at the top of the machine and provided at its free end with a hand wheel 46 by means of which it may be turned.

Another horizontal shaft 47 is journaled in bearings 48 secured to the frame members 2 and is formed with a key or spline 49 extending along the same. A sprocket wheel 50 having a hub 50^a provided with a keyway engaging the key 49 is slidably mounted on this shaft 47. A sprocket chain 51 extends around the sprocket wheel 50 and around a sprocket wheel 52 secured to the shaft 33. A forked bracket 53, rigidly secured to the rack 37, engages an annular groove in the hub 50^a of the sprocket 50, so that this sprocket is caused to move laterally with the rack 37.

A sprocket wheel 54 is carried by the end of the shaft 47 and a chain 55 extends around this sprocket wheel and a sprocket wheel 56 mounted on a shaft 57 journaled in suitable bearings at the top of the machine. As best shown in Fig. 6, this shaft 57 carries at its end a beveled gear 58 which meshes with a similar gear 59 carried at the end of a shaft 60 which passes through the hollow shaft 45 and carries at its other end a hand wheel 61 by means of which it may be turned.

The bracket 62, above referred to, and clearly shown in Fig. 5, embraces the shaft 33 between spaced collars 63 fixed thereto. As above explained, this bracket is rigidly secured to the rack 37 by means of the bolt 38, so that when the rack 37 moves, the shaft 33 moves with it.

From the foregoing, it will be apparent that,

when the rack 37 is moved longitudinally of the channel 36 by turning the hand wheel 46, it carries with it both the sprocket 50 and the shaft 33. As the shaft moves longitudinally, it carries with it the nuts 32, 32^a, etc. and the arms 18, 18^a, etc., so that the entire group of arms is shifted as a unit laterally of the frame, that is to say, to one side or the other of the center. It will be further noted that, because of the fact that this lateral shifting is effected through the medium of the shaft 33, and because of the further fact that the sprocket 50 driving the shaft is similarly shifted by the rack 37 so that it operates the shaft 33 at all times, the spacing of the arms may be varied as desired by rotating the shaft 33, regardless of the position to which the group of arms may be shifted laterally. Thus, the spacing of the arms is entirely independent of the lateral position of the group as a whole, and may be effected independently of such position. At this point, it may be explained that the hand wheels 46 and 61, as indicated in Fig. 1, are located in such a position as to be conveniently accessible to the operator of the truck, such truck being connected to the brackets 6 in the manner illustrated in Fig. 1 of my above mentioned prior patent. The present invention therefore provides means whereby the truck operator is able to both vary the spacing of the fork arms, as desired, and to shift such arms as a group laterally to any required position without leaving his station or seat on the truck.

I preferably provide means for indicating to the truck operator the relative lateral position of the group of arms. To this end I employ a Bowden wire 64, one end of which is attached to the bracket 62, or other part movable with the rack 37, and the other end of which is attached to a lever 65 secured to a pointer 66, movable over a scale 67 readily visible to the operator of the truck, and this facilitates the insertion of the arms beneath the load.

As described in my said prior patent, and already mentioned in the present specification, the gripping or clamping means associated with the arms is operated by the vertical movement of the rear frame relative to the front frame. To produce this operation of the gripping means, I provide a resilient connection between the two frames. As shown, this consists of a pair of rods 68 suspended from the frame member 3, carried by the rear frame, each such rod supporting, by means of a bracket 69, a set of springs 70, the lower end of these springs being connected to a member 71. This member 71 straddles a lever 73, pivoted to the frame at 74 and carries at its lower end a roller 72 which engages the lower surface of the lever 73. The free end of this lever is connected by a link 75 with the beam 14 of the front frame as indicated at 76. The particular construction of this improved spring mechanism is not claimed herein, but is being described and claimed in detail in a co-pending application Serial No. 321,623, filed November 20, 1952.

When the arms of the fork are inserted under the load and the rear frame is then raised by the truck, the front frame is resiliently pulled upward through the springs 70. The weight of the load, however, prevents the front frame from rising. It therefore temporarily remains fixed as the springs are extended, and the relative move-

ment between the two frames operates through the links 27 and levers 24 to operate the clamping or gripping means associated with the arms. After the rear frame has moved a suitable distance, the cross member 5 thereof engages the ends of stop screws 82, carried by horizontal member 81, carried by the front frame, thus preventing further relative movement of the frames, and the arms then lift the load as hereinabove mentioned, and also as described in my said prior patent. It sometimes happens that it is not necessary to employ the clamping or gripping means in raising a load and, in this case, I provide means for locking the two frames together so that there is no relative vertical movement between them. This locking means consists of a horizontal rock shaft 78 having an operating handle 79 at one end, and having secured thereto a pair of thrust members 77 connected by a bar 77^a. By rocking the shaft 78 counterclockwise, as viewed in Fig. 2, but before the rear frame has been raised, the ends of the members 77 can be swung into engagement with the member 5, thus causing the two frames to move together when the rear frame is raised.

In order to facilitate this operation, the members 77 are preferably biased to locking position by means of a spring 80 attached to a clip 80^a secured to the shaft 78.

What I claim is:

1. A lifting fork comprising a frame, four horizontally disposed, parallel, spaced arms supported by said frame, and constituting two pair, each pair consisting of an outer and an intermediate arm, interengaging screw and nut elements carried by said frame and arms respectively, and means for rotating all of said screw elements at the same speed, the screw elements of one pair being reversed as to the other pair, the screw elements for the two outermost arms having threads of steeper pitch than those for the two intermediate arms, whereby each of the said outermost arms moves in the same direction but at a higher rate and over a greater distance than the adjacent intermediate arm.

2. A lifting fork comprising a frame, means for attaching the same to a truck to be transported thereby, a plurality of horizontally disposed, parallel, spaced arms carried by said frame, mechanism manipulable by the operator of the truck without leaving his station for simultaneously shifting said arms to any desired position laterally of the truck, and means visible to the operator of the truck while at his station for indicating the relative position of said arms.

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