

Feb. 23, 1932.

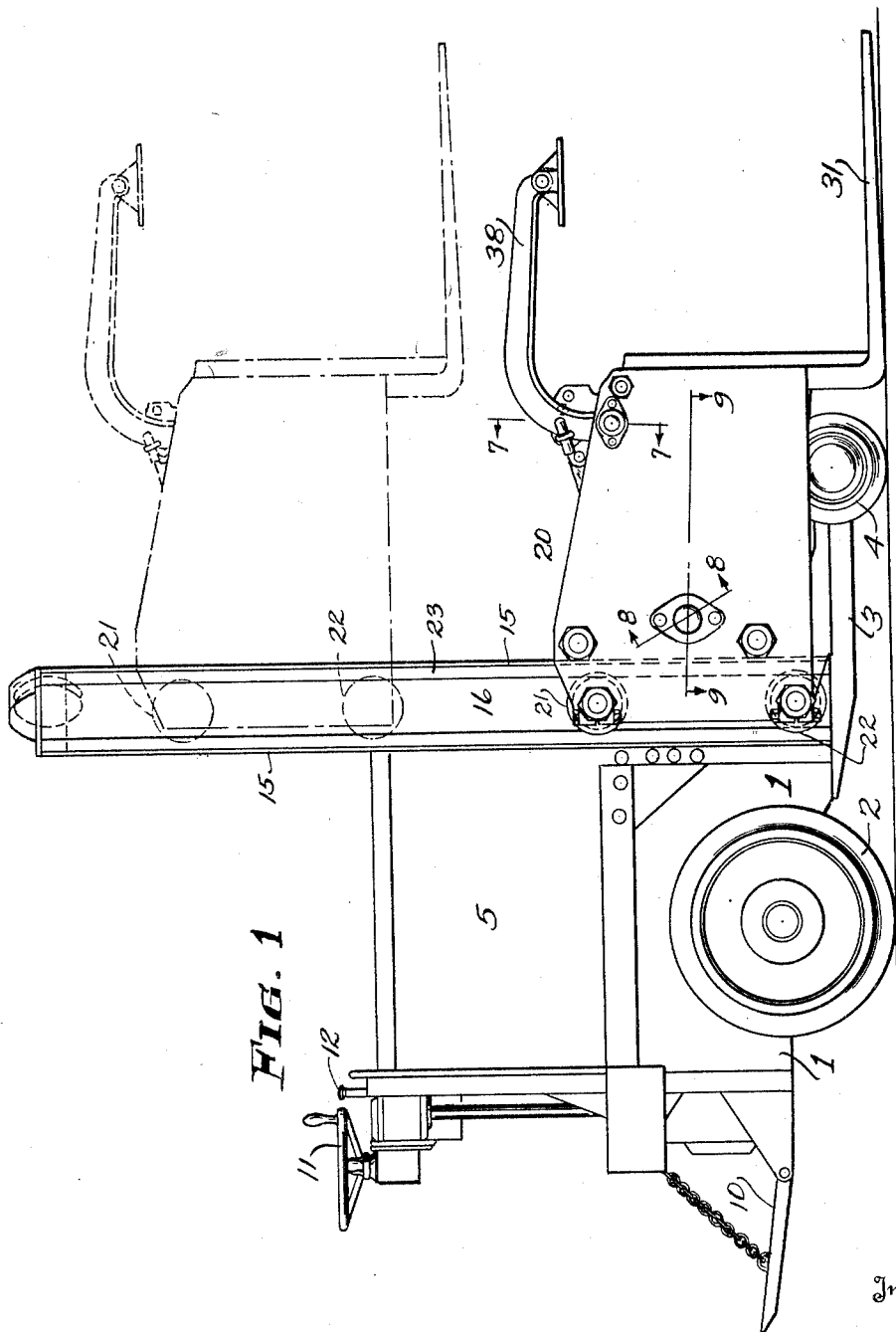
E. J. ABBE

1,846,413

INDUSTRIAL TRUCK

Filed Nov. 3, 1930

4 Sheets-Sheet 1



Inventor

Edward J. Abbe

By

Bates, Golrick & Teare

Attorneys

Feb. 23, 1932.

E. J. ABBE

1,846,413

INDUSTRIAL TRUCK

Filed Nov. 3, 1930

4 Sheets-Sheet 2

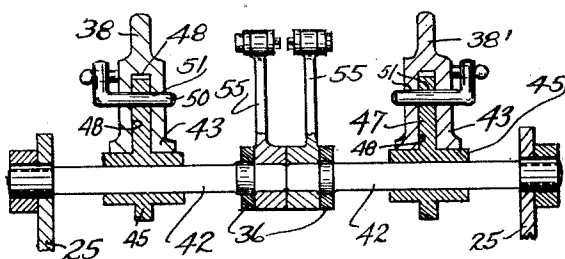


FIG. 7

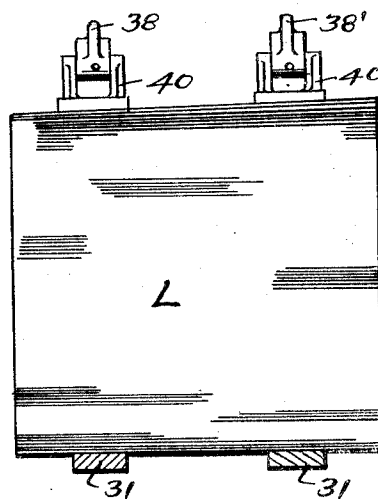


FIG. 5

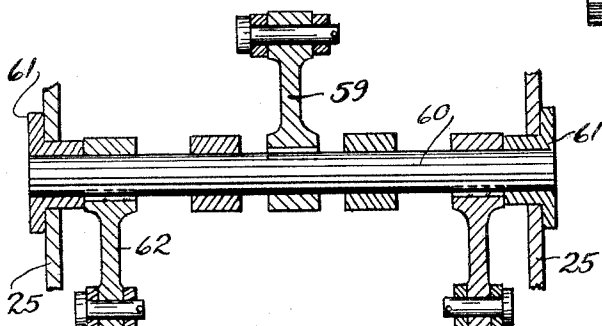


FIG. 8

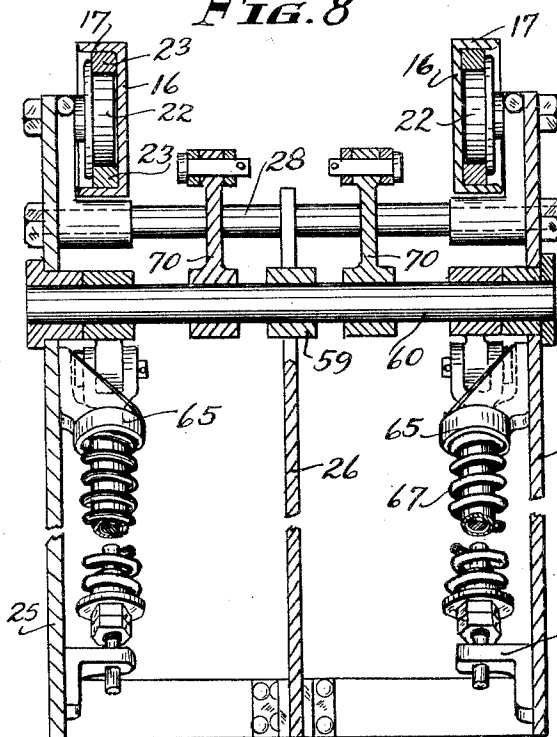


FIG. 9

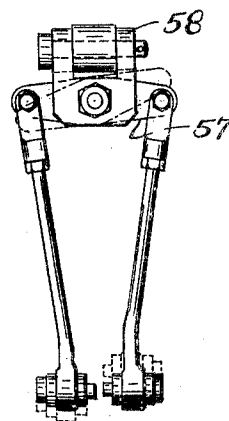


FIG. 6

Inventor

Edward J. Abbe.

By Bates Colrick Teare

Attorneys

Feb. 23, 1932.

E. J. ABBE

1,846,413

INDUSTRIAL TRUCK

Filed Nov. 3, 1930

4 Sheets-Sheet 3

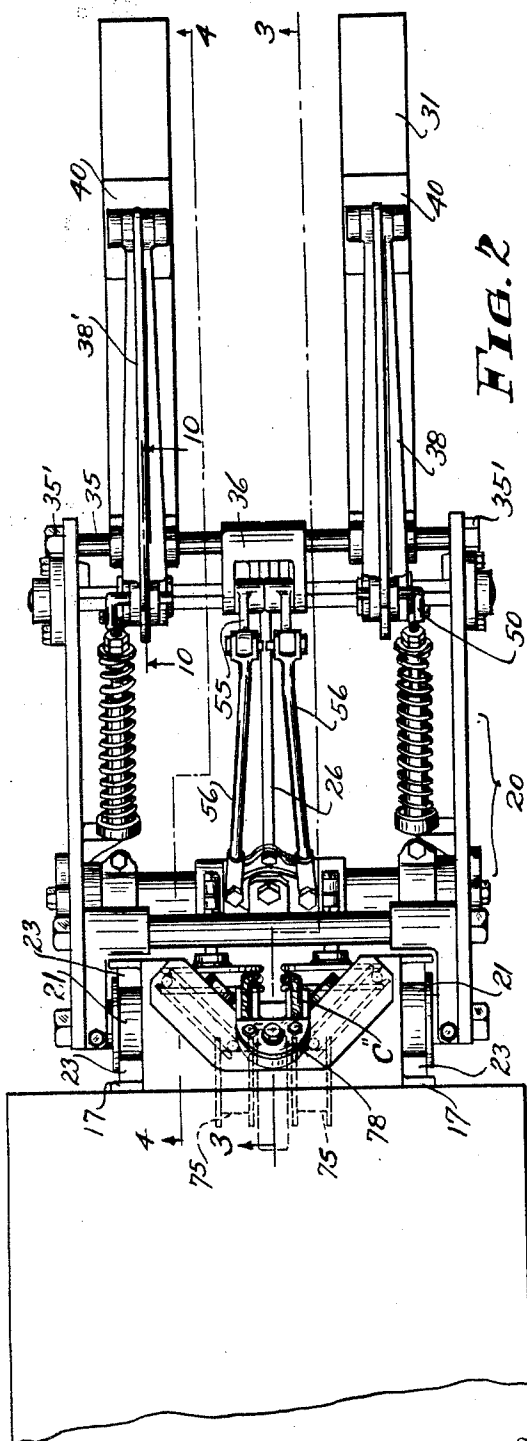


FIG. 2

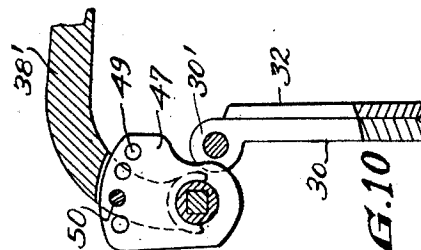


FIG. 10

Inventor

Edward J. Abbe

By Bates, Gollick & Teare

Attorneys

Feb. 23, 1932.

E. J. ABBE

1,846,413

INDUSTRIAL TRUCK

Filed Nov. 3, 1930

4 Sheets-Sheet 4

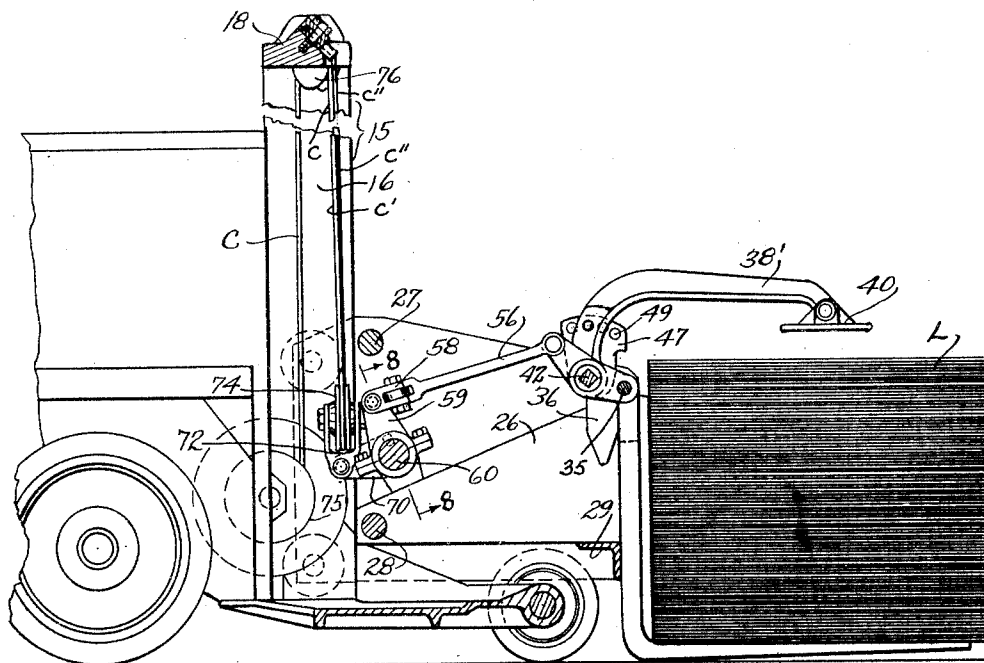


FIG. 3

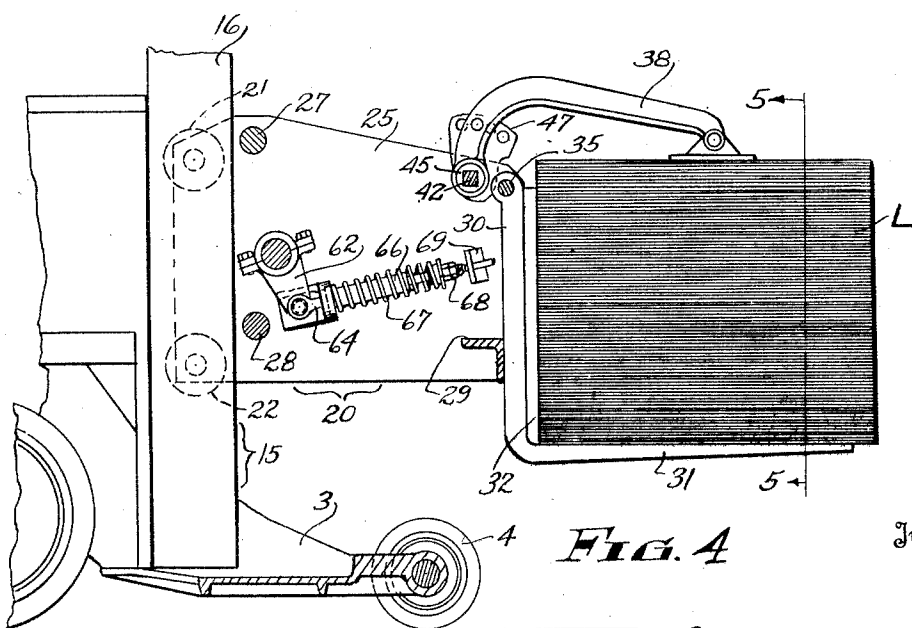


FIG. 4

Inventor

By

Edward J. Abbe
Bates, Golick & Teare
Attorneys

UNITED STATES PATENT OFFICE

EDWARD J. ABBE, OF CLEVELAND, OHIO, ASSIGNOR, TO THE ELWELL-PARKER ELECTRIC COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

INDUSTRIAL TRUCK

Application filed November 3, 1930. Serial No. 492,887.

The present invention has been made to overcome several serious problems in the use of industrial trucks and like load handling and conveying mechanisms, designed to secure, lift and carry loads of various weights and/or dimensions. One specific problem solved is in connection with handling and conveying sheet stock. Obviously, it is highly desirable to be able to lift and carry bundles of stock, which bundles vary greatly in their general dimensions. Furthermore, it is highly desirable to be able to lift, convey and deposit bundles which are thicker, say on one side, than on another, even though the loads may be of approximately the same size for a given job.

To better illustrate the problems presented and solved by the present invention it may be stated that it is old to provide a plurality of load lifting forks and clamps therefor, which clamps are arranged to impose clamping force on the load directly opposite, say above, the tines of the forks. If the clamping force is applied by power, it is of course more convenient to operate the clamps simultaneously. This is the usual method. However, when a load of metal plates, for example, is thicker on one side than on another, such simultaneous operation of the clamps, as previously carried out, results in forcibly clamping only one side of the load, leaving the other side more or less free to get out of place. Design of lifting and clamping arrangements for industrial trucks in accordance with the present invention overcomes this difficulty in a very simple manner.

It may be stated that it is also old to move a plurality of load lifting fork tines or members with relation to each other, so as to be able to more effectively support wide and narrow loads. However, so far as I know, there has been heretofore no arrangement in this class of equipment which will insure that the clamping force will be applied directly opposite the tines which are thus movable for

adjustment, say transversely of the truck. My invention overcomes this difficulty by providing a device whereby the clamping means must be adjusted in accordance with the position of the tines.

With the above in view, the general object of the invention is to provide a load handling mechanism for industrial trucks and the like which shall be more flexible, and more efficient than similar units previously available.

Specific objects include the provision of a load handling mechanism for an industrial truck by the use of which the load may be quickly secured on the lifting elements of the truck and effectively handled, notwithstanding considerable variations in the dimensions of various loads. A further specific object is to provide a simple, flexible and efficient load gripping arrangement for industrial trucks and the like, which will enable the truck to securely lift and carry loads, such as loose bundles of sheet metal stock for example, without loss of time, particularly in the loading operation, without danger of causing damage to the load, and which will securely hold the load during transportation.

A still more specific object is to provide a simple and automatically operating equalizing device for a plurality of load grippers or clamps on an industrial truck or like material handling apparatus.

Further objects, as will be hereinafter shown, include the simplification and general refinement of load handling mechanisms of the type herein illustrated. The various novel features of the invention will be made clear from the following description relating to the accompanying drawings showing the preferred form. The essential characteristics are summarized in the claims.

In the drawings, Fig. 1 is a side elevation of an industrial truck incorporating the invention and showing two positions of the

load lifting parts, one position in broken lines; Fig. 2 is a plan view of the rearward or load handling portion of the truck; Fig. 3 is a cross sectional view of the parts shown in Fig. 2, the view being taken substantially along the line 3—3 on Fig. 2; Fig. 4 is a sectional view in substantial accordance with the lines 4—4 on Fig. 2, but with the load handling mechanism in raising position; Fig. 5 is a sectional front elevation taken substantially along the line 5—5 on Fig. 4; Fig. 6 is a detailed sub-assembly view of parts of the mechanism which are also shown in Figs. 2 and 3; Figs. 7 and 8 are sectional views taken substantially along the lines 7—7 and 8—8 on Fig. 1 (see also 8—8 on Fig. 3); Fig. 9 is a sectional view taken substantially along the line 9—9 on Fig. 1, and Fig. 10 is a sectional detail view taken substantially along the line 10—10 on Fig. 2.

Referring again to Figs. 1 to 4, it may be noted that the invention is applicable to any truck of suitable construction, but is particularly useful in connection with so-called tier-lift trucks, a suitable example of which is illustrated.

In Figs. 1 and 2, 1 indicates the general frame or chassis of the truck body, this frame being suitably braced and adapted to be supported by a pair or set of driving wheels 2, and a pair or set of smaller load carrying wheels 4 (one wheel of each set being shown). The frame has a low slung extension 3 carrying the smaller wheels 4, which are preferably dirigible. Surmounting the chassis is an upright housing portion 5 which carries the power plant of the truck, storage batteries and electric motors for example, the truck having any suitable arrangement for transmitting the power to the driving wheels and to the load lift, to be presently described. The power transmitting arrangements except for portions thereof associated with the load lift are not shown, many examples being well known.

The truck may be controlled by an operator standing on a forwardly disposed platform 10 attached to the main frame, in which position he has within his reach the necessary control elements, such as a steering wheel 11 and suitable motor control switches, the position of one of the latter being illustrated at 12.

Disposed intermediately of the large and small wheels, there is an upright trackway affording framework 15. The character of this is shown best in Figs. 2, 3 and 9. As shown, there are spaced channels 16 with oppositely facing flanges 17. These channels may rest with their lower ends on suitable boss formations on the frame extension 3. The channels may of course, be rigidly secured to the upright housing portion of the truck and may be braced at the top by a cross member 18, which, as shown, also supports

suitable sheaves and anchorages for load lifting cables, to be presently described.

The load lifting mechanism includes a carriage 20, the preferred construction of which will be presently described and the carriage is provided with suitable guiding members, preferably rollers 21 and 22, which, as shown in Fig. 2, run on rails 23 secured to the upright channel sections 16. The frame of the carriage 20 preferably comprises side plates 25 and an intermediate plate 26, which plates are held in generally parallel relationship by suitable rigid cross members, examples of which are shown at 27, 28 and 29.

The load which may, for example, as a bundle of sheet metal plates (see L, Figs. 3, 4 and 5) is carried rearwardly from the plates 25 and 26 on L-shaped load carrying arms or tines having substantially vertically extending portions 30 and horizontally extending portions 31. The load rests on the horizontal portions of the arms, and may be properly located forwardly against bearer strips 32 of suitable soft material, attached to the upright portions 30 of the arms. The L-shaped arms are adjustably arranged on a rigid cross bar 35. This cross-bar 35 is secured to the side plates 25 by nuts 35' and it is also secured in a bracket member 36 on the intermediate frame plate 26. The general shape of the bracket 36 is best shown in Figs. 2 and 3. The arms may incidentally be rotated about the bar 35 as a center, so that they may be swung inwardly to an idle position above the carriage, thus decreasing the overall length of the truck when not carrying a load.

The load clamping arrangement includes a pair of clamping arms 38 and 38' which are preferably identical. These arms have suitable clamping pads at their outer ends at 40 to engage the load, and are secured for pivotal movement to the side plates 25 and bracket 36, through the intermediacy of separate rock-shafts 42, each of which have their opposite end portions suitably journaled in the bracket 36 (see Figs. 3 and 7) and the plates 25. The separate rock shafts 42 are parts of the arrangement whereby the clamping forces of the arms are equalized.

Each of the clamping arms has a hub portion 43 apertured or slotted to embrace a mounting piece 45, which latter forms part of an adjustable connection between the arm and its shaft 42. This connection is adjustable so that the shaft 42 may rock within definite limits, while permitting the clamp arms to be raised and lowered through considerably greater arcs with respect to the load lifting arms. The mounting piece 45 may slide on its shaft 42, but cannot turn on the shaft, the device shown for this being, for example, a squared opening in the hub of the mounting piece, which opening slidably fits a squared or complementarily formed portion of the shaft, see Figs. 3 and 7. Each

mounting piece 45 has a flange 47 embraced by a slot 48 in the respective arm, and each flange has an arcuately arranged series of holes 49, adapted to be selectively engaged by a removable pin 50 arranged to extend through aligned holes 51 in the arm and the selected one of the holes 49.

The device just described permits either or both of the arms to be located various distances from the load supporting portions of the carrier arms 30—31, whereby the operating mechanism, to be presently described, will operate in the same manner for loads of different vertical dimensions, and with equal efficiency irrespective of such difference.

Secured to respective inner ends of the squared rock-shafts 42 are a pair of upwardly extending arms 55 which, through the intermediacy of suitable links 56, are connected with an equalizing beam 57 (see Fig. 6) carried on a yoke 58 which is in turn carried by an upwardly extending central arm 59. Rocking the arm 59 forwardly and rearwardly, causes the clamp arms to grip and release the load; see Figs. 3 and 4. The arm 59, see Figs. 3 and 9 particularly, is keyed to a heavy rock-shaft 60 which has its ends suitably journaled in bearing members 61 on the side plates 25. When the shaft 60 is turned in a counter-clockwise direction, as viewed in Fig. 3, the clamping arms 38 and 38' are raised to unclamp the load; and to yieldingly hold the arms in this, their normal position (see Fig. 3), I provide adjustable spring devices, such as shown in Figs. 2, 4 and 9. These spring devices include depending arms 62 near the outer ends of the shaft 60, the arms being pivotally connected to rods 64, slidably arranged in suitable rigid brackets 65 and 69, mounted on the side plates 25. The rods 64 extend through tubes 66 which carry coil springs 67, and each spring reacts, at one end, on its rigid bracket 65 and, at the other, on an adjustable abutment device 68, including, for example, the usual double nut arrangement and spring follower, which causes the spring to rock, and normally hold, the arm 62 swung rearwardly, i. e. toward the load, raising the load clamp.

On opposite sides of the arm 59 and rigidly attached to the shaft 60 are forwardly extending arms 70, each of which pivotally carries a sheave block 72. The blocks pivot about axes which extend normal to the working planes of the arms 70, so that the sheaves shown at 74, carried by the blocks, may swing freely in line with their cable loops.

The power arrangement, heretofore mentioned, may comprise a suitable motor driven cable hoist having winding drums 75, see Figs. 2 and 3. Respective cable stretches, attached to these drums, pass upwardly at C, to and over individual sheaves 76 on the cross member 18 of the upright frame, thence downwardly as at C' to the blocks 72 and

again upwardly in a loop C'' to a suitable equalizer or anchorage 78 on the cross member 18. It is to be understood that the upward loop C'' may move in the equalizer 78 on suitable guides, it being further apparent that the equalizer may include a roller, not shown, if desired, for greater freedom of movement for the cable loop stretch C''.

In operation, it will be seen that as the drums 75 are turned in a clockwise direction, as viewed in Fig. 3, the cable will raise the blocks 72 and turn the arms 70 in a clockwise direction, as shown in Fig. 3, which through the upstanding arm 59 on the shaft 60 will pull forwardly on the equalizer beam 57 and cause the clamping arms 38 and 38' to be borne downwardly onto the load. After this clamping is accomplished, further drawing in on the cables simply raises the carriage 20, the load carrying and clamping arms, together with the load, as a unit. It is obvious that as the load varies in weight the clamping force will also vary, simply because the arms will be forced downwardly onto the load in direct proportion to the pull exerted on the cable. When the load has been moved to its desired location, lowering the same onto suitable supports, such as stringers, on a platform, car or bin floor, results in automatically releasing the load clamp, because the springs 67 then act to move both clamps away from the load. The load may then be cleared by driving the truck forwardly.

Fig. 5 illustrates one of the conditions encountered in practical operations. Here it will be seen that the right hand side of the load is thicker than the left side. In the event of such a load, the clamp 38 need only be brought to a lower plane than that of the clamp 38' and this is all accomplished through the agency of the equalizer (Fig. 6), the separate rock shafts (Fig. 7) and associated mechanisms above described.

A further highly desirable advantage obtained by the present arrangement is that the clamp arms and L-shaped arms 30—31 may be moved toward and away from the center of the truck desired distances so as to distribute the clamping action of the arms 38 and 38' in accordance with the requirement of the load. When such adjustment is made, it is impossible for the operator to move the clamp arms out of registration with the tines 31. I have arranged for this by the device shown in Figs. 4 and 10. The lower parts of the flanges 47 which adjustably connect the arms 38 and 38' to the squared shafts 42 engage slots 30' in the upper ends of the L-shaped fork arms 30—31, whereby movement of the clamp arms along the squared shafts 42 necessarily moves the L-shaped arms as well. The device insures that the clamping force will be taken directly by the horizontal portions of the load carrying arms.

The hub portions 43 of the clamp arms 38

and 38' are, as shown, slotted to embrace the mounting pieces 45 on the squared rock shafts 42. This permits the arms to be easily disengaged from the mounting pieces and removed entirely if desired at any time, for example when the truck is used continuously for handling loads that do not require clamping.

If desired, and by the arrangement suggested particularly in Fig. 10, both the clamping arms and the forks of each set may be swung rearwardly into a carrying position above the carriage 20, thus making it possible to conveniently decrease the overall length of the truck for manipulation when empty. It will be seen, for example, that with the pins 50 removed, the clamping arms may be swung back over the carriage and by extending the slots 30' in the fork portions 30, the forks may likewise be swung rearwardly over the carriage, clearing the flanges 47. Both sets of arms may then be secured against being jolted out of place by replacing the pins 50 in the outermost openings 49.

I claim:

1. In an industrial truck, a load lifting device, load clamping means on said device including spaced relatively movable clamping members and mechanism operating on said members to clamp the load, said mechanism including an equalizing device interconnecting said clamping members whereby the clamping force is equally distributed on different portions of the load.

2. In an industrial truck, an upright trackway, a load lifting carriage mounted on the trackway and means to raise and lower the carriage, a plurality of clamp arms pivotally attached to the carriage, mechanism connected to and operated by said raising and lowering means for operating the clamp arms, said mechanism including an equalizing device whereby the force of said first named means is distributed equally to the clamping arms irrespective of variations in vertical dimensions of the load.

3. In an industrial truck, a frame, load handling means mounted on the frame and movable relative thereto, load lifting means on said handling means adapted to engage the bottom of the load to lift it, a plurality of clamping members on the load handling means disposed generally over the load lifting means, and a power device connected with the clamping members, the connection including an equalizing device, whereby the same clamping force is applied to two clamping members notwithstanding the fact that the acting surfaces of such two clamping members may be disposed in different horizontal planes.

4. In an industrial truck, an upright frame, a load carriage guided for movement on said frame, substantially horizontally extending means on the carriage adapted to pass be-

neath a load to lift it, and a plurality of clamping members pivotally mounted on the carriage and disposed above said means, elevating mechanism carried by the frame and connected with the clamping members to move the same to clamping position and to thereafter raise the carriage, the connection between the elevating means and the clamping members including an equalizing bar and links connecting the equalizing bar with the clamping members, whereby the action of the elevating means on the equalizer bar will be distributed in respective proportions to the clamping members notwithstanding that said members are disposed with their clamping surfaces in different horizontal planes.

5. In a load handling machine, a movable frame, a load lifting arm on the frame, a corresponding clamping arm on the frame, said arms being vertically movable relative to each other to clamp a load and adjustable transversely of the frame for desirable disposition with relation to different loads, and means connecting the load lifting arm with the clamping arm in such manner that the set of arms must be adjusted transversely, as stated, simultaneously.

6. In mechanism of the kind described, load lifting means, comprising a carriage and a guide therefor, a plurality of load engaging members movable transversely of the carriage, a corresponding plurality of clamping members, and key devices connecting the clamping member to respective load lifting members, whereby a given set of said members must be moved simultaneously, thereby insuring that the clamping force will be imposed on the portion of the load directly supported by the lifting members.

7. A load engaging and clamping device for an industrial truck, comprising a frame having substantially parallel guiding supports, a load lifting arm mounted on one of said supports, a clamp arm mounted on the other of said supports, and means connecting said arms including a tongue on one of the arms and a slot in the other, said tongue being adapted to occupy the slot during all the relative operating movements of the arms, whereby displacement of one of the arms out of the vertical plane of the other is prevented.

8. In an industrial truck, a load carrying frame, a pair of aligned bars journaled in the frame for independent rocking movement, load lifting means carried on said frame and load clamping devices disposed over the lifting means, there being means connecting the clamping devices with said aligned bars for rocking movement therewith, and means including an equalizing device for independently but substantially simultaneously rotating the said aligned bars to cause the clamping devices to clamp the load on the lifting means.

9. Mechanism according to claim 8, where-
in there are mounting pieces connecting the
clamping devices with said aligned bars, the
mounting pieces embracing said bars and
keyed thereto for movement along the bars
5 and wherein the clamping devices are also
rotatively adjustable with respect to the
mounting devices, whereby the clamping de-
vices may be adjusted horizontally as well
as vertically for different loads.

10 In testimony whereof, I hereunto affix my
signature.

EDWARD J. ABBE.

15

20

25

30

35

40

45

50

55

60

65