

Aug. 4, 1953

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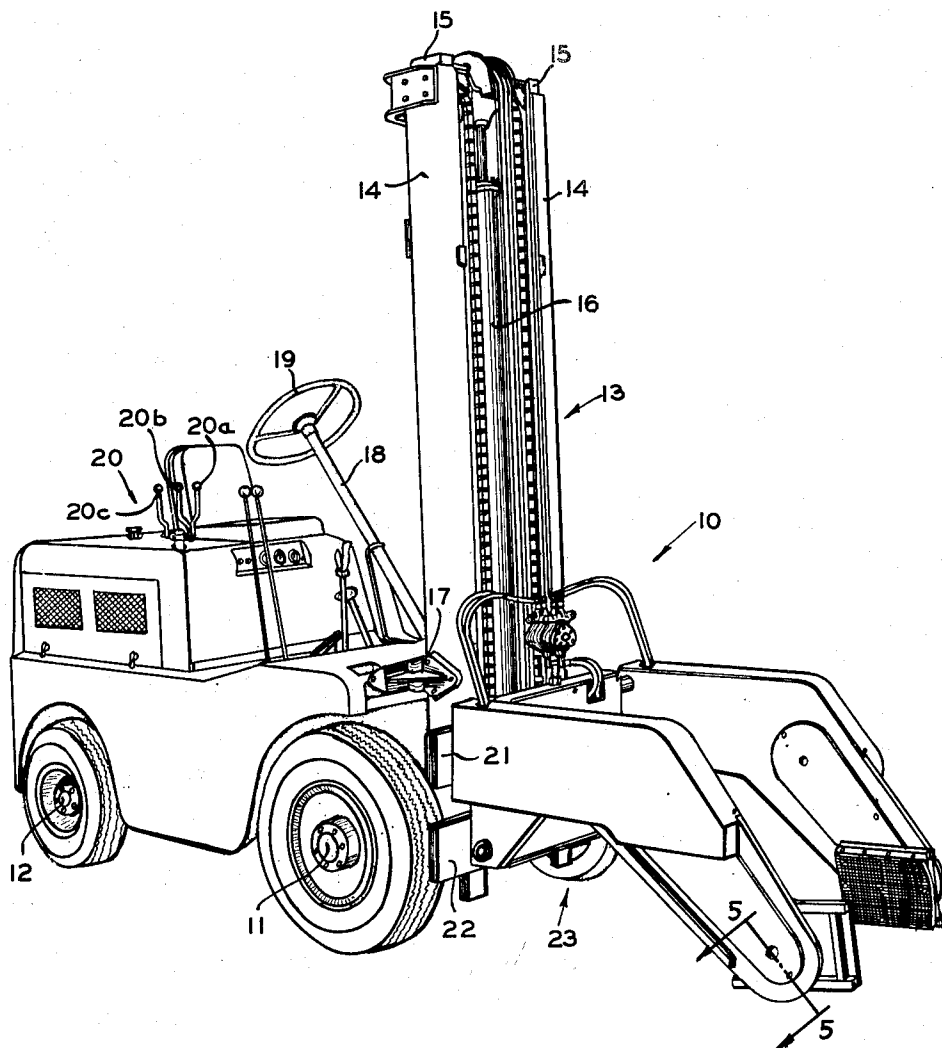
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COMBINATION CLAMP AND ROTATING MECHANISM

Filed March 1, 1950

6 Sheets-Sheet 1

FIG. 1



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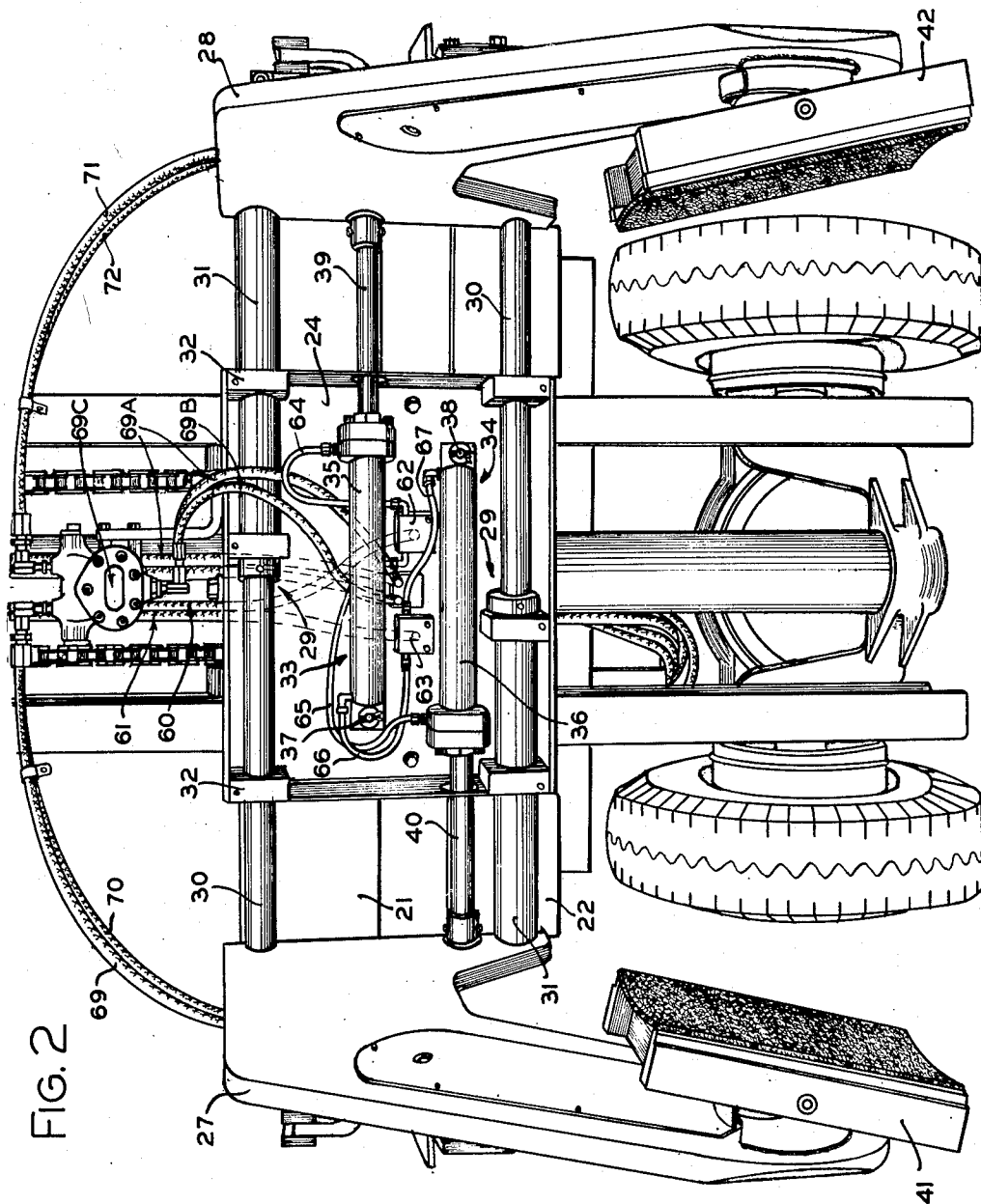
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COMBINATION CLAMP AND ROTATING MECHANISM

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6 Sheets-Sheet 2



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COMBINATION CLAMP AND ROTATING MECHANISM

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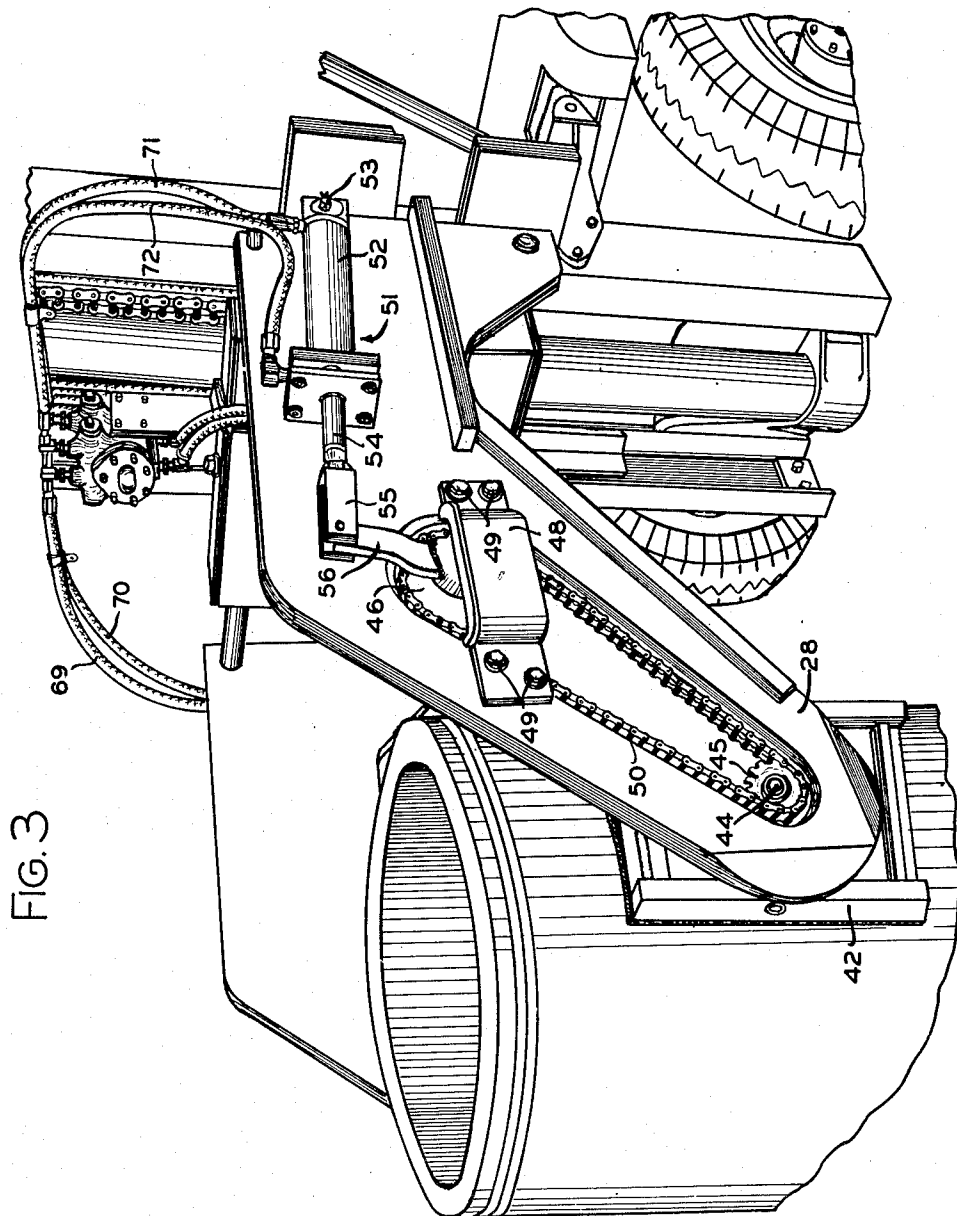


FIG. 3

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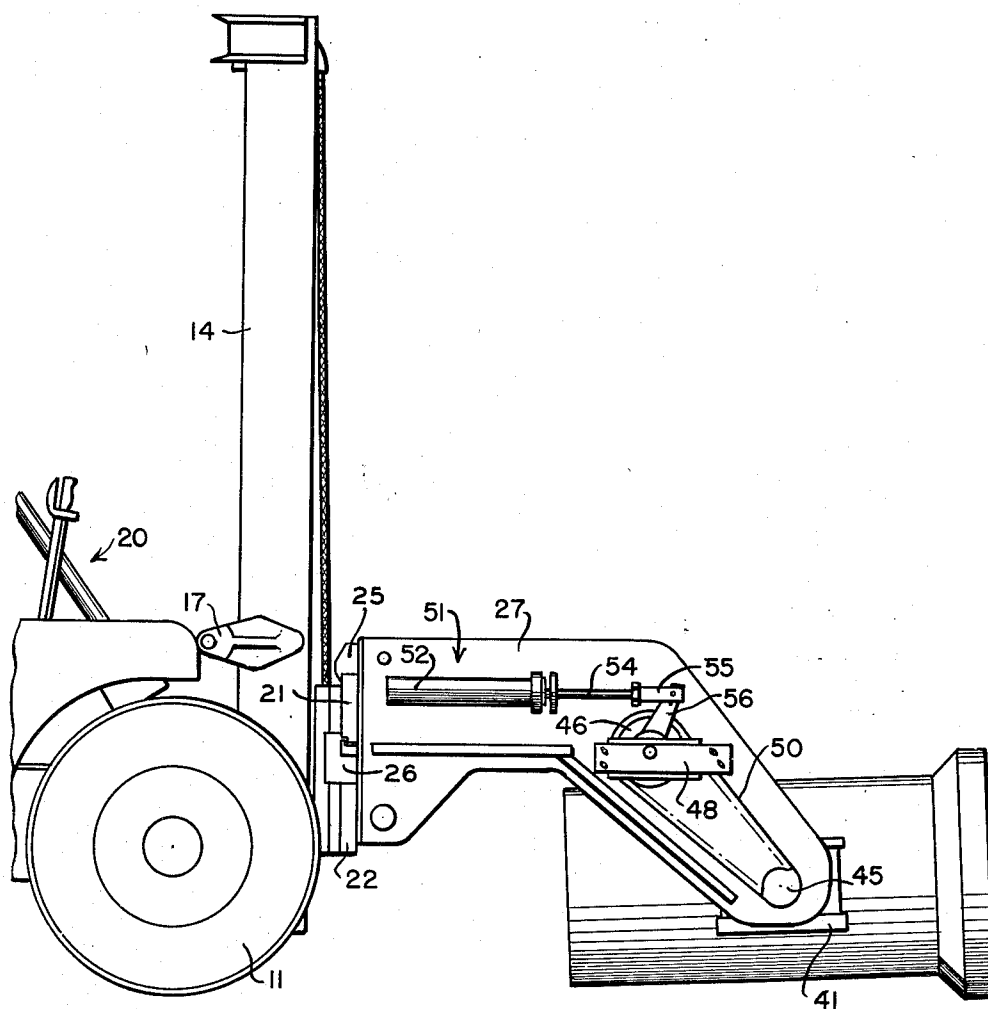
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COMBINATION CLAMP AND ROTATING MECHANISM

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6 Sheets-Sheet 4

FIG. 4.



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COMBINATION CLAMP AND ROTATING MECHANISM

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6 Sheets-Sheet 5

FIG. 6

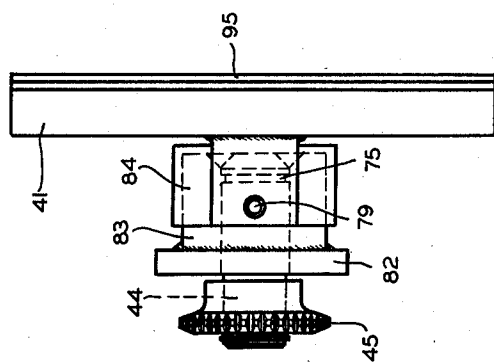


FIG. 5

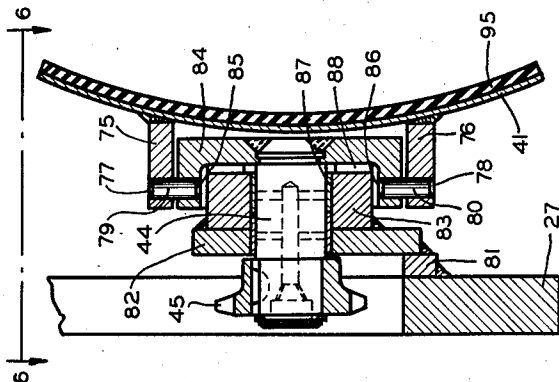
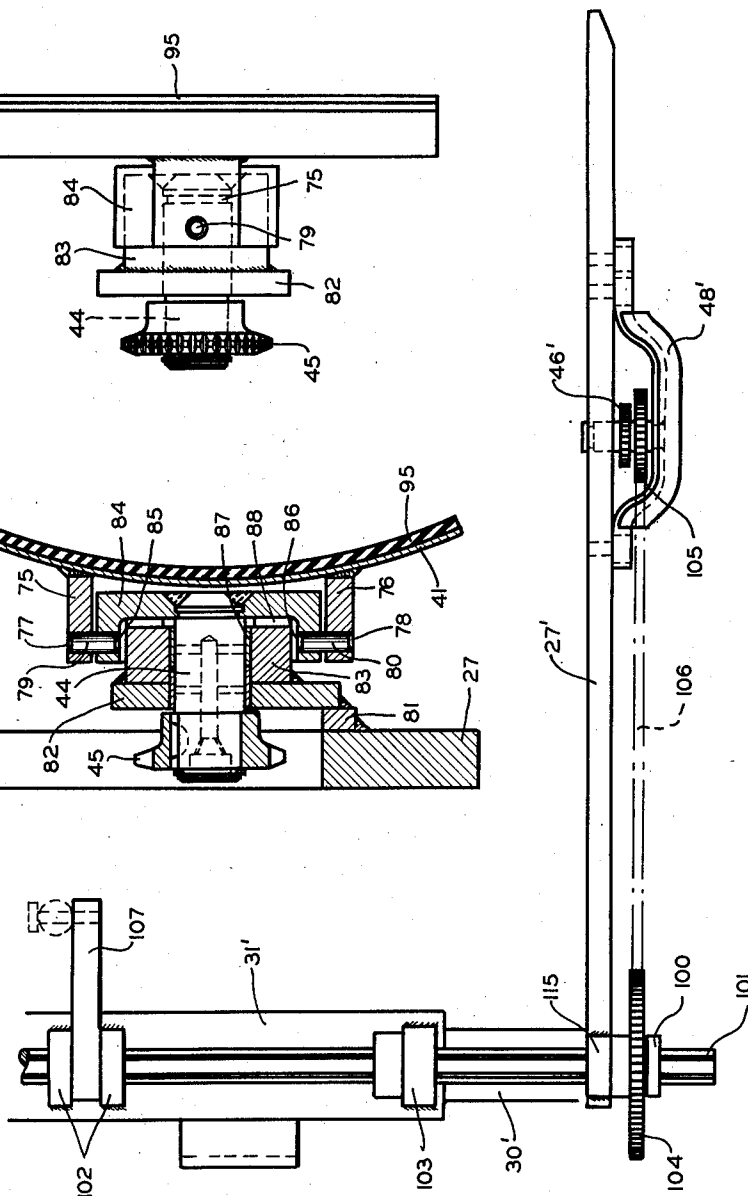


FIG. 7



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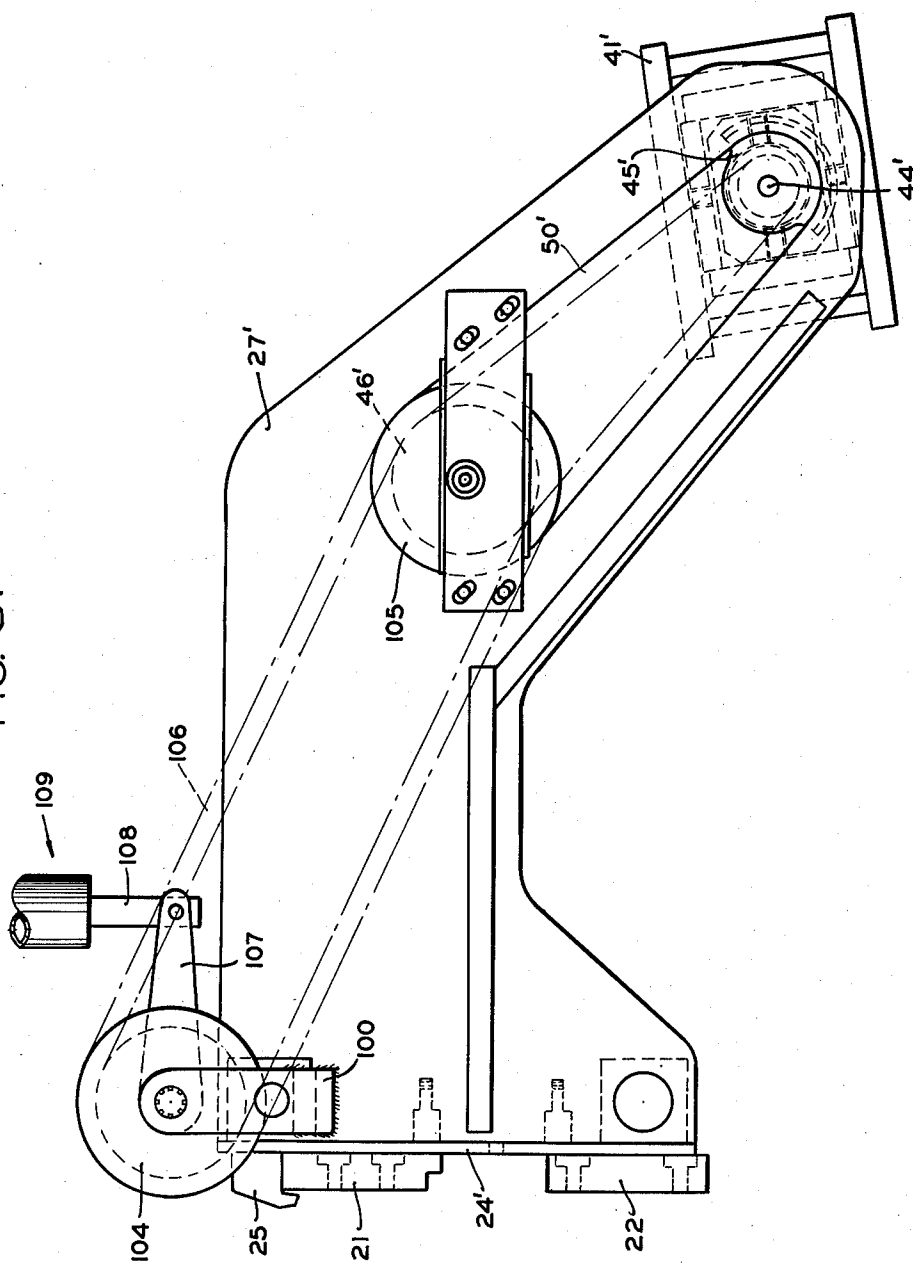
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COMBINATION CLAMP AND ROTATING MECHANISM

Filed March 1, 1950

6 Sheets-Sheet 6

FIG. 8.



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UNITED STATES PATENT OFFICE

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COMBINATION CLAMP AND ROTATING MECHANISM

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Application March 1, 1950, Serial No. 147,004

16 Claims. (Cl. 214—652)

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My invention relates to a combination clamp and rotating mechanism for industrial trucks of a character capable of clamping a load and then rotating the load.

The mechanism of my present invention may be adapted for handling a wide variety of commodities, but for purposes of describing a specific embodiment of my invention, I have chosen to illustrate and describe my invention as it is embodied in a mechanism for handling large diameter pipe.

At the present time, when picking up sections of large diameter pipe and more particularly vitrified clay sewer pipe having a bell portion formed adjacent its one end, which are stacked in either a horizontal or a vertical position, one section must first be broken out manually in order that access may be had to it and the remaining sections, in that present forms of clamping means are excessively bulky and cannot be disposed within the spaces between adjacently stacked sections.

It is an object of my invention to provide a clamping means having clamping arms of narrow extent so as to enable the disposal thereof to engage a load standing in a row without necessitating manual breaking of the load out of the row.

In the instance referred to in the handling of bell pipe, which may for example, comprise a plurality of pipes arranged on end and adjacent each other in a row, the clamp arms of the mechanism of my invention may be disposed in the spaces at opposite sides of one pipe section and the pipe sections adjacent each side thereof so that the one pipe section may be removed without first having to dispose it manually in a position out of the row.

It is a further object of my invention to provide the aforementioned clamp arms with swivel mounted clamp jaws together with means for rotating the swivel clamp jaws so that a load may be picked up in either a vertical or horizontal position and deposited or stacked in either a horizontal or vertical position.

Now in order to acquaint those skilled in the art with the manner of constructing and using devices embodying the principles of my invention, I shall describe in connection with the accompanying drawings a preferred embodiment of my invention.

In the drawings:

Figure 1 is a perspective view of a conventional type of industrial truck with which my present invention has been embodied;

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Figure 2 is an enlarged perspective view of the front portion of the truck of Figure 1 with the front cover plate of the clamping and rotating mechanism removed to show in front elevation hydraulic means provided for actuating the clamping means of my present invention;

Figure 3 is an enlarged perspective view of the front portion of the truck of Figure 1 having a section of a pipe in clamped position between the clamping jaws with the side cover plate of one of the clamping arms removed to show in elevation the rotating mechanism for rotating a clamping jaw;

Figure 4 is a side elevational view of the clamping and rotating mechanism of my invention supporting a section of pipe;

Figure 5 is a sectional view of a swivel clamp jaw taken substantially along the line 5—5 of Figure 1 looking in the direction indicated by the arrows;

Figure 6 is a plan view of the swivel clamp jaw, taken substantially along the line 6—6 in Figure 5 looking in the direction indicated by the arrows;

Figure 7 is a partial plan view of a modified form of rotating mechanism of my present invention; and

Figure 8 is a partial side elevational view of the modified form of rotating mechanism shown in Figure 7.

Referring now to Figure 1, there is shown a conventional industrial truck, indicated generally by the reference numeral 10, having front driving wheels 11 and rear steering wheels 12. A vertical mast of known construction, indicated generally by the reference numeral 13, comprises two pairs of channel-shaped vertically extending members, such as members 14—14 and 15—15, which are telescopically arranged and actuated in a known manner by conventional hydraulic piston and cylinder means 16. The mast has connection as at 17 to a suitable hydraulic piston and cylinder assembly for effecting tilting of the mast.

The industrial truck 10 is provided with a steering column 18 having at its upper end a conventional hand steering wheel 19 which is adapted to be manipulated by an operator of the truck. Control levers, 20a, 20b and 20c, are provided for the operator for controlling respectively, vertical movement of the mast, actuation of the rotating means, and actuation of the clamping means of my present invention. The truck is additionally supplied in a conventional manner, with a motor, clutch and brake pedals, and suitable gear

shift controls so that the vehicle may be driven either forwardly or backwardly.

Adjacent the front end of the truck is a load supporting carriage of known construction, comprising a pair of frame members 21 and 22 extending transversely of the truck, which are adapted to be moved vertically upward or downward on the mast 13.

The rotating and clamping means of my invention, indicated generally at 23, is adapted to be supported on the frame members 21 and 22 of the load supporting carriage. The arrangement is such that the rotating and clamping means 23 is detachably supported on the load supporting carriage, so that if desired, it may be removed and other attachments substituted therefor so that the truck may be used for a wide variety of purposes. The rotating and clamping means 23, as shown in Figure 2, comprises a fixed plate member 24 which is disposed centrally of the ends and in juxtaposition of the frame members 21 and 22 of the load supporting carriage. The plate 24, as shown in Figure 4, is attached to the load supporting carriage by means of one or more hook-like brackets 25 welded to the rear surface of the plate 24 and hooked over the upper frame member 21. The plate 24 is additionally secured to the upper frame member 21 by means of one or more brackets 26 bolted to the rear surface of the plate 24 and having upwardly extending flanges which are adapted to engage the lower edge of the upper frame member 21. The lower frame member 22 forms a brace against which the lower portion of plate 24 may bear. This construction permits the rotating and clamping means of my invention to be easily and speedily detached to permit substitution of other devices on the front end of truck 10.

The aforementioned plate member 24, in a sense defines a main frame member providing for the support of the clamping mechanism of my present invention. The clamping mechanism as best shown in Figure 2 preferably comprises a pair of spaced apart parallel and relatively movable clamp arms 27 and 28 one being disposed at opposite sides of the plate member 24 at right angles thereto. The clamp arms 27 and 28 each comprise a horizontally extending rearward portion and a forward portion extending angularly downwardly forwardly therefrom.

Suitable guide means are provided for guiding the movement of the clamp arms 27 and 28 toward and away from the sides of the plate member 24 and such means preferably comprise a pair of telescopic assemblies, indicated at 29, disposed forwardly of the plate 24, each having a rod member 30 journaled for axial movement within a sleeve member 31. One of the assemblies 29 is disposed horizontally adjacent the upper edge of the plate 24 with the outer end of the rod 30 being suitably secured to the inner vertical side of the clamp arm 27 adjacent the upper rear corner portion thereof and the outer end of the sleeve 31 being suitably secured to the inner vertical side of the clamp arm 28 adjacent the upper rear corner portion thereof. The other of the assemblies 29 is disposed horizontally adjacent the lower edge of plate 24 with the outer end of its rod 30 being suitably secured to the inwardly facing vertical side of the clamp arm 28 adjacent the lower rear corner portion thereof and the outer end of the sleeve member 31 being suitably secured to the inwardly facing vertical side of the clamp arm 27 adjacent

the lower rear corner portion thereof. The telescopic assemblies 29 are guided in their lengthwise movement by a plurality of pillow blocks 32 which are rigidly secured in a suitable manner to the front of the plate member 24 one at each of the corners thereof.

Suitable actuating means is provided for moving the clamp arms 27 and 29 toward and away from each other, and such means preferably comprises a pair of hydraulic piston and cylinder assemblies 33 and 34 located forwardly and centrally of the plate member 24 in opposed relation, as shown in Figure 2. The closed ends of the cylinders 35 and 36 of the hydraulic piston and cylinder assemblies 33 and 34 are pivotally secured to the front of the plate 24 as indicated at 37 and 38, respectively. The outer end of the piston rod 39 of the hydraulic piston and cylinder 33 is detachably connected in a conventional manner to the inwardly facing vertical side of the movable clamp arm 28 adjacent the central rear portion thereof. The free end of piston rod 40 of the hydraulic piston and cylinder assembly 34 is connected in a conventional manner to the inwardly facing vertical side of the movable clamp arm 27 adjacent the lower rear portion thereof. A plurality of fluid lines 60, 61, 64, 65, 66 and 67 are provided to conduct fluid under pressure, developed, for example, by means of a pump driven by the engine of the truck to the hydraulic actuating assemblies 33 and 34 to effect movement of the clamp arms 27 and 28 toward and away from each other in a manner to be described in greater detail hereinafter. The sequence of operations involved in actuating the clamp arms 27 and 28 will also hereinafter be described.

Located adjacent the outer ends of each of the forwardly and downwardly projecting ends of the clamp arms 27 and 28 are a pair of clamp jaws 41 and 42 which are disposed laterally of the inner sides of the arms 27 and 28 in facing relation.

The jaws 41 and 42 are of the same construction and they are mounted in an identical manner to the arms 27 and 28, respectively, in view of which the following description is limited to jaw 41.

Clamp jaw 41 is of a curved configuration forming substantially the segment of a cylinder so as to be adapted to engage a cylindrical load, and has secured, as by welding, to its convex side, a pair of parallel spaced apart outwardly extending arm members 75 and 76 which have aligned openings 77 and 78 formed respectively therein. It will be understood that the jaws 41 and 42 may be of other configuration in that the shape of the jaws is dictated by the shape of the load to be handled. Secured, as by welding, to the inwardly facing side of the clamp arm 27 is a spacer bar 81 to which a bracket 82 is welded along one edge. Secured to the bracket 82, as by welding, is a hub member 83 in which a bushing 87 is disposed and in which, in turn, a shaft 44 is journaled. A sprocket pinion 45 is suitably keyed to the outer end of shaft 44 and, as shown, lies in an opening formed in clamp arm 27. Welded to the inwardly projecting end of shaft 44 is a cup-shaped member 84 which has aligned openings 85 and 86 formed therein. An annular ring or washer 88 is provided between the hub member 83 and the cup-shaped member 84 to maintain them in spaced apart relation. The arm members 75 and 76 of the clamp jaw 41 are positioned on opposite sides of the cup-

shaped member 84 with the openings 77 and 78 of the arm members 75 and 76 aligned with the openings 85 and 86 of the cup-shaped member 84, respectively. Pins 79 and 80 are disposed in each of the pair of openings so as to form a pivotal support for the clamp jaw 41. It will be noted a frictional facing material 85, such as rubber, may be applied to the concave side of the clamp jaw 41. As previously noted, the clamp jaw 42 may be rotatably mounted to the clamp arm 28 in the same manner as above described in connection with clamp jaw 41 and therefore, it is believed, a detail description of the mounting of clamp jaw 42 is unnecessary.

The aforementioned rotating means for imparting rotary movement to the clamp jaws 41 and 42 is located partially within the confines of the clamp arms 27 and 28 and partially extends laterally outwardly of the sides of the arms 27 and 28. Since the rotating mechanisms provided for each of the clamp jaws 41 and 42 are identical in construction, except that they are disposed in reverse relation to each other, I shall describe in detail only the rotating mechanism associated with the clamp arm 28.

Within and adjacent the other end of the opening in clamp arm 28, in which sprocket pinion 45 of clamp jaw 42 is disposed in a second sprocket gear 46 mounted on a shaft (not shown) which is supported adjacent its ends by an inner cover plate member 47 shown in Figure 2, and a U-shaped bracket 48 mounted, as by bolts 49, to the outer side of the arm 28. A chain 50 is trained about the sprocket gear 46 and the sprocket pinion 45 for providing a driving relation therebetween.

Suitable actuating means is provided for rotating the gear 46, and such means preferably comprises a hydraulic piston and cylinder assembly 51 located adjacent the outwardly facing side of the clamp arm 28 adjacent the rear portion thereof. The closed end of the cylinder 52 of the hydraulic piston and cylinder assembly 51 is pivotally secured, at 53 adjacent the rear end of the clamp arm 28. The free end of piston rod 54 of the hydraulic piston and cylinder assembly 51 is pivotally connected by means of a yoke member 55 to the outer end of a crank arm 56 which is rigidly secured, as by welding, to an outwardly facing hub secured to the aforementioned gear 46.

It will be seen that when the piston rod 54 of the hydraulic piston and cylinder assembly 51 is extended from the position shown in Figure 3, rectilinear movement of the piston rod 54, by means of the crank arm 56, is translated into counterclockwise rotary movement of the sprocket gear 46. The counterclockwise rotary movement of the sprocket gear 46 is translated into counterclockwise rotary movement of the pinion 45, by means of the chain 50, which causes the shaft 44 to rotate counterclockwise, thus imparting counterclockwise rotary movement to the clamp jaw 42. When the piston rod 54 of the hydraulic piston and cylinder assembly 51 is retracted from the position shown in Figure 3, rectilinear movement of the piston rod 54 is translated into clockwise rotation of the gear 46 which, by means of chain 50, pinion 45 and shaft 44, cause the clamp jaw 42 to rotate in a clockwise direction. A plurality of fluid lines 69, 70, 71 and 72 are provided to conduct metered fluid under pressure from a flow divider, indicated at 69-c, to the hydraulic actuating assemblies, one of which is shown at 51 in Figure 3, mounted on

the outwardly facing sides of the arms 27 and 28 to effect synchronized rotation of the clamp jaws 41 and 42 in a manner to be described in greater detail hereinafter.

The degrees of rotation and the speed of rotation of the clamp jaw 41 may be varied by altering the stroke of the piston rod 54 of the hydraulic piston and cylinder assembly 51 and by changing the gear ratio between the gear 46 and the pinion 45.

A typical illustration of the manner in which the aforescribed mechanism may be utilized will now be described.

The operator may, for example, position the truck 10 in front of a section of pipe lying on the ground with the clamp arms 27 and 28 and jaws 41 and 42 in the position shown in Figure 1. The truck is manipulated so that the clamp arms 27 and 28 are positioned parallel to the lengthwise axis of the section of pipe. The operator then spreads the clamp arms 27 and 28 by selectively operating one of the remote control levers of the group at 20 which controls the selective connection of fluid lines 60 and 61 with a source of fluid under pressure developed by suitable pump means carried by the truck 10. When either line 60 or 61 is connected with the source of fluid under pressure, the other is bled. The lines 60 and 61, as shown, extend to suitable terminal blocks 62 and 63, respectively. A pair of fluid lines 64 and 65 extend from the terminal block 62 to the forward ends of the cylinders 35 and 36 of the hydraulic piston and cylinder assemblies 33 and 34. Another pair of fluid lines 66 and 67 extend from the terminal block 63 to the closed ends of the cylinders 35 and 36 of the hydraulic piston and cylinder assemblies 33 and 34. In the position of the parts shown in Figure 2, the line 61 is under pressure and the line 60 is under bleed so as to provide for the admission of fluid under pressure through the terminal block 63 to lines 66 and 67 so that the piston rods 39 and 40 are disposed in extended position.

After the clamp arms 27 and 28 have been spread apart, the truck 10 is then driven forward until the clamping jaws 41 and 42 are disposed closely adjacent to the horizontal diametrical axis of a pipe section intermediate of the ends thereof.

In order to effect clamping of the section of pipe, the valve controlling the connection of fluid lines 60 and 61 is manipulated so that the line that was under pressure is now under bleed and the line that was under bleed is now under pressure. This reversal of the pressure conditions of the lines effects flow through the terminal block 62 to lines 64 and 65 and establishes bleed of lines 66 and 67. Under these conditions the piston rods 39 and 40 of the hydraulic piston and cylinder assemblies 33 and 34 are forced to a retracted position until the clamp jaws 41 and 42 engage the sides of the section of pipe.

By selectively operating a different lever of the group at 20, fluid is induced into the hydraulic cylinder assembly 16 forcing the telescopic members 15-15 of the mast 13 upward. The members 15-15 carry the load supporting carriage and clamping and rotating mechanism upwardly with it, thus raising the section of pipe off of the ground enabling it to be transported to a new location.

Now, when depositing a load, the procedure as outlined above is reversed. That is, the truck is positioned in front of and adjacent to the area

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where the section of pipe is to be deposited. The hydraulic piston and cylinder assembly 16 is suitably actuated to lower the telescopic mast members 15—15 and the load supporting carriage until the lower portion of the section of pipe engages the surface of the ground. Thereafter, the clamp arms 27 and 28 may be retracted from engagement with the section of pipe. The truck may then be backed away.

If the sections of pipe are picked up in a horizontal position with the bell portions facing the truck, and are required to be stacked or unloaded in a vertical position or a horizontal position with the bell portions facing away from the truck, as shown in Figure 4, the operator only has to actuate the previously described rotating mechanism to revolve the clamp jaws and section of pipe therewith. It will also be understood that a section of pipe may be picked up in a vertical position, as shown in Figure 3, and stacked or unloaded in a horizontal position with either the bell portion facing the truck, or with the bell portion facing away from the truck, as shown in Figure 4. It will be further understood that a section of pipe may be picked up in a horizontal position with the bell portion facing away from the truck, as shown in Figure 4, and deposited or stacked in a vertical position, as shown in Figure 3, or in a horizontal position with the bell portion facing the truck.

If the operator desires to effect rotation of the clamp jaws 41 and 42, he selectively operates lever 28b, adjacent the driver's seat, which controls the selective connection of fluid lines 69A and 69B, with a source of fluid under pressure developed as previously mentioned, by suitable pump means carried by the truck, which fluid under pressure is directed to the flow divider 69C which accurately divides the flow into two equal volumes irrespective of the fluid resistance in the hydraulic piston and cylinder assemblies 51. The fluid is then directed into either pair of fluid lines 69 and 71, or 70 and 72. When either pair of lines 69 and 71, or 70 and 72, are connected with the source of fluid under pressure, the other pair is bled. The lines 70 and 71 extend from the aforementioned flow divider 69C to the closed ends of a pair of hydraulic piston and cylinder assemblies, one of which is indicated at 51 of Figure 3, which are mounted to the outwardly facing sides of the clamp arms 27 and 28 while lines 69 and 72 extend from the flow divider 69C to the forward ends of the cylinders comprising the last mentioned hydraulic piston and cylinder assemblies.

In order to effect rotation of the clamp jaws 41 and 42 through 90° counterclockwise from the position shown in Figure 3, lines 69 and 72 are placed under bleed and lines 70 and 71 under pressure. The piston rod 54 of the hydraulic assembly 51 is pushed outward causing gear 46 to rotate counterclockwise which, in turn, rotates gear 45, shaft 44 and clamp jaw 42 counterclockwise. It will be understood that the corresponding parts (not shown) mounted to the outer face of arm 27 will be actuated in a similar manner. If it is desired to rotate the clamp jaws 41 and 42 90° clockwise from the position shown in Figure 3, the opposite lines are actuated. That is, lines 69 and 72 are placed under pressure while lines 70 and 71 are placed under bleed conditions.

Thus, by suitable control of the admission of fluid under pressure to the hydraulic actuating means associated with the clamp jaws, the driver

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may selectively dispose the clamp jaws in either a horizontal or vertical position, and by appropriate control of the hydraulic actuating means for the clamping means, as described, effect actuation of the clamping and rotating mechanism as may be desired in handling various kinds of commodities.

A modified form of rotating mechanism is shown in Figures 7 and 8. Since the mechanism is symmetrical about a vertical median plane, it is believed that a partial plan view and a side elevational view will be sufficient for purposes of the present disclosure. Primed reference numerals have been employed in these figures to designate those parts which are the same or similar to parts forming the preferred embodiment of my invention.

Since the rotating mechanism is connected to the clamp jaws in a similar manner, I shall describe in detail only the connection of the rotating mechanism with the clamp jaw 41'.

Secured to the outer vertical surface of the clamp arm 27', as by welding, adjacent the rear portion thereof, is a vertical bracket 100 which extends above the upper horizontal edge of the clamp arm 27'. The bracket 100 is spaced from the clamp arm 27' at its upper end and provides a support for one end of a splined shaft 101 extending transversely of the truck, immediately forward of a plane passing through the vertical support plate member 24'. The splined shaft 101 is additionally supported intermediate of its ends, by means of block members 102 and 103 welded to the plate member 24'.

Mounted on the splined shaft 101, between clamp arm 27' and bracket 100, is a sprocket wheel 104 having an internally splined central opening adapted to mate with the splined shaft 101. A thrust bearing 115 is suitably mounted on the upper edge of clamp arm 27' for movement therewith and the splined shaft 101 is journaled therein. A second sprocket wheel 105 is disposed coaxially of the sprocket gear 46' between the latter and the U-shaped bracket 48' mounted to the outer side of arm 27'. The sprockets 46' and 105 are adapted to be rotated conjointly. A chain 106 is trained about the sprockets 104 and 105 for providing a driving relation therebetween.

Fixedly mounted to the splined shaft 101 intermediate of the ends thereof, between support block members 102, is a crank arm 107 which has connection at its outer end with a piston rod 108 of a hydraulic piston and cylinder assembly 109 pivotally anchored to a bracket (not shown) carried by the supporting plate 24'. Looking now at Figure 8, it will be observed, if the piston rod 108 is extended downwardly under the influence of fluid pressure controlled by the operator of the truck, the crank arm 107 will be rotated clockwise. Clockwise rotation of the crank arm 107 will cause conjoint clockwise rotation of the splined shaft 101, sprocket wheel 104, chain 106, sprockets 104 and 46', chain 50', and sprocket pinion 45', which effects clockwise rotation of the clamp pad 41'. It should be realized that while the clamp pad 41' is being rotated that the clamp pad mounted to the other clamp arm on the opposite side of the truck is also being rotated. It should further be observed that since there is a mechanical connection between the rotatable clamp pads, they are rotated in synchronism. When it is desired to rotate the clamp pads counterclockwise, the operator of the truck may admit fluid to the hydraulic piston and cyl-

inder assembly 109 causing the piston rod 108 to be retracted upwardly. The splined shaft 101 is held against lateral shifting by means of a collar member 110 secured to the support block member 103. Since the splined shaft 101 is journaled in brackets carried by the clamp arms, the clamp arms may be moved laterally without effecting synchronized rotation of the clamp pads.

While I have shown and described what I consider to be a preferred embodiment of my invention, it will be understood that various modifications and rearrangements may be made therein without departing from the spirit and scope of my invention.

I claim:

1. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively horizontally movable clamp arms at opposite sides of said plate member, said clamp arms having a horizontally extending rearward portion and an angularly downwardly extending forward portion, means for effecting relative horizontal movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted about a horizontal axis at each of the forward ends of said clamp arms, the axes of said clamp jaws lying in a horizontal plane which extends below said rearward portions of said clamp arms and means on said clamp arms for rotating at least one of said clamp jaws about its axis.

2. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively horizontally movable clamp arms at opposite sides of said plate member, each of said clamp arms comprising a plate having an elongated opening formed therein, means for effecting relative horizontal movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted about a horizontal axis at each of the forward ends of said clamp arms, a sprocket pinion connected to each of said clamp jaws and being disposed one within each of said elongated openings in the respective clamp arms adjacent one end of each thereof, a sprocket gear disposed one within each of said elongated openings in said clamp arms adjacent the other end thereof, chain means between the respective sprocket pinions and sprocket gears, and means for rotating said sprocket gears for effecting rotary movement of said clamp jaws about their axes.

3. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively horizontally movable clamp arms at opposite sides of said plate member, said clamp arms each having a horizontally extending rearward portion and an angularly downwardly extending forward portion, each of said clamp arms having an elongated opening formed in the forward portion thereof, means for effecting relative horizontal movement of said clamp arms toward and away from each other, a pair of clamp jaws one piv-

otally mounted on a horizontal axis at each of the forward ends of said clamp arms, a sprocket pinion connected to each of said clamp jaws and being disposed one within each of said elongated openings in the respective clamp arms adjacent one end of each thereof, a sprocket gear disposed one within each of said elongated openings in said clamp arms adjacent the other end of each thereof, chain means between the respective sprocket pinions and sprocket gears, and means for rotating said sprocket gears for effecting rotary movement of said clamp jaws about their axes.

4. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively horizontally movable clamp arms at opposite sides of said plate member, said clamp arms each having a horizontally extending rearward portion and an angularly downwardly extending forward portion, each of said clamp arms having an elongated opening formed in the forward portion thereof, means for effecting relative horizontal movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted about a horizontal axis at each of the forward ends of said clamp arms, a sprocket pinion connected to each of said clamp jaws and being disposed one within each of said elongated openings in the respective clamp arms adjacent one end of each thereof, a sprocket gear disposed one within each of said elongated openings in said clamp arms adjacent the other end of each thereof, chain means between the respective sprocket pinions and sprocket gears, said sprocket gears, sprocket pinions, and chain means being disposed within the confines of the vertical side surfaces of said clamp arms, and means for rotating said sprocket gears for effecting rotary movement of said clamp jaws about their axes.

5. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively horizontally movable clamp arms at opposite sides of said plate member, said clamp arms each having a horizontally extending rearward portion and an angularly downwardly extending forward portion, each of said clamp arms having an elongated opening formed in the forward portion thereof, means for effecting relative horizontal movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted about a horizontal axis at each of the forward ends of said clamp arms, a sprocket pinion connected to each of said clamp jaws and being disposed one within each of said elongated openings in the respective clamp arms adjacent one end of each thereof, a sprocket gear disposed one within each of said elongated openings in said clamp arms adjacent the other end of each thereof, chain means between the respective sprocket pinions and sprocket gears, a pair of crank arms one each rigidly secured to the hub portions of one each of said sprocket gears laterally outwardly of said clamp arms, and means connected with the outer ends of said crank arms for rotating the latter for effecting

rotary movement of said clamp jaws about their axes.

6. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively movable clamp arms at opposite sides of said plate member, said clamp arms each having a horizontally extending rearward portion and an angularly downwardly extending forward portion, each of said clamp arms having an elongated opening formed in the forward portion thereof, means for effecting relative movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted at each of the forward ends of said clamp arms, a sprocket pinion connected to each of said clamp jaws and being disposed one within each of said elongated openings in the respective clamp arms adjacent one end of each thereof, a sprocket gear disposed one within each of said elongated openings in said clamp arms adjacent the other end of each thereof, chain means between the respective sprocket pinions and sprocket gears, a pair of crank arms one each rigidly secured to one each of the hub portions of said sprocket gears laterally outwardly of said clamp arms, a pair of hydraulic piston and cylinder assemblies one each mounted adjacent one end to the outwardly facing vertical side of one each of said clamp arms, and the end of each of said hydraulic piston and cylinder assemblies having connection to one each of the outer ends of the respective crank arms.

7. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively movable clamp arms at opposite sides of said plate member, said clamp arms having a horizontally extending rearward portion and an angularly downwardly extending forward portion, each of said clamp arms having an elongated opening formed in the forward portion thereof, means for effecting relative movement of said clamp arms toward and away from each other, a pair of brackets one each secured to the inward vertical sides of each said clamp arms adjacent and extending across one end of each of said elongated openings in said clamp arms, a first shaft journaled in one each of said brackets and extending transversely of said clamp arms, a pair of clamp jaws one mounted at one end of each of said shafts laterally inwardly of said clamp arms, a sprocket pinion mounted on the other end of each of said first shafts and disposed one within each of said elongated openings in the respective clamp arms at the one end of each thereof, a plate member provided for the inner side of each of said clamp arms for substantially closing said elongated openings therein, a U-shaped bracket mounted to the outer side surfaces of said clamp arms adjacent to and extending across the other end of each of said elongated openings in said clamp arms, a second pair of shafts one each extending transversely of said clamp arms and being journaled at one of the ends thereof in said plate members and at their other ends in said U-shaped brackets, a sprocket gear mounted on each of said second shafts intermediate of the ends thereof and within said elongated openings in said clamp arms, chain means between the respective sprocket pinions

and sprocket gears, and means for rotating said sprocket gears for effecting rotary movement of said clamp jaws.

8. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively movable clamp arms at opposite sides of said plate member, said clamp arms having a horizontally extending rearward portion and an angularly downwardly extending forward portion, each of said clamp arms having an elongated opening formed in the forward portion thereof, means for effecting relative movement of said clamp arms toward and away from each other, a pair of brackets one each secured to the inward vertical sides of each said clamp arms adjacent and extending across one end of each of said elongated openings in said clamp arms, a first shaft journaled in one each of said brackets and extending transversely of said clamp arms, a pair of clamp jaws one mounted at one end of each of said shafts laterally inwardly of said clamp arms, a sprocket pinion mounted on the other end of each of said first shafts and disposed one within each of said elongated openings in the respective clamp arms at the one end of each thereof, a plate member provided for the inner side of each of said clamp arms for substantially closing said elongated opening therein, a U-shaped bracket mounted to the outer side surfaces of said clamp arms adjacent to and extending across the other end of each of said elongated openings in said clamp arms, a second pair of shafts one each extending transversely of said clamp arms and being journaled at one of the ends thereof in said plate members and at their other ends in said U-shaped brackets, a sprocket gear mounted on each of said second shafts intermediate of the ends thereof and within said elongated openings in said clamp arms, chain means between the respective sprocket pinions and sprocket gears, a pair of crank arms one each rigidly secured to the hub portions of one each of said sprocket gears laterally outwardly of said clamp arms inwardly of said U-shaped brackets, a pair of hydraulic piston and cylinder assemblies one each mounted adjacent one end to the outwardly facing vertical side of each of said clamp arms, and the outer end of each of said hydraulic piston and cylinder assemblies having connection to one each of the outer ends of the respective crank arms.

9. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively horizontally movable clamp arms at opposite sides of said plate member, said clamp arms each comprising a plate having a horizontally extending rearward portion and an angularly downwardly extending forward portion, each of said clamp arms having an elongated opening formed in the forward portion thereof, means for effecting relative horizontal movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted on a horizontal axis at each of the forward ends of said clamp arms, the axes of said clamp jaws lying in a horizontal plane which extends below said rearward portions of said clamp arms, a sprocket pinion connected to each of said clamp jaws and being disposed one within each of said elongated openings in the respective clamp

arms adjacent one end of each thereof, a sprocket gear disposed one within each of said elongated openings in said clamp arms adjacent the other end of each thereof, chain means between the respective sprocket pinions and sprocket gears, means for rotating said sprocket gears for effecting rotary movement of said clamp jaws, and means having connection with said last named means for synchronizing rotary movement of said clamp jaws about their axes.

10. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively movable clamp arms at opposite sides of said plate member, said clamp arms each having a horizontally extending rearward portion and an angularly downwardly extending forward portion, each of said clamp arms having an elongated opening formed in the forward portion thereof, means for effecting relative movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted at each of the forward ends of said clamp arms, a sprocket pinion connected to each of said clamp jaws and being disposed one within each of said elongated openings in the respective clamp arms adjacent one end of each thereof, a sprocket gear disposed one within each of said elongated openings in said clamp arms adjacent the other end of each thereof, chain means between the respective sprocket pinions and sprocket gears, a pair of crank arms one each rigidly secured to one each of the hub portions of said sprocket gears laterally outwardly of said clamp arms, a pair of hydraulic piston and cylinder assemblies one each mounted adjacent one end to the outwardly facing vertical side of one each of said clamp arms, the end of each of said hydraulic piston and cylinder assemblies having connection to one each of the outer ends of the respective crank arms, fluid hoses for conducting fluid under pressure to said hydraulic piston and cylinder assemblies, and flow divider means interposed in said fluid hoses for equally dividing the fluid under pressure between said pair of hydraulic piston and cylinder assemblies for effecting synchronized rotary movement of said clamp jaws.

11. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively movable clamp arms at opposite sides of said plate member, said clamp arms each having a horizontally extending rearward portion and an angularly downwardly extending forward portion, each of said clamp arms having an elongated opening formed in the forward portion thereof, means for effecting relative movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted at each of the forward ends of said clamp arms, a sprocket pinion connected to each of said clamp jaws and being disposed one within each of said elongated openings in the respective clamp arms adjacent one end of each thereof, a sprocket gear disposed one within each of said elongated openings in said clamp arms adjacent the other end of each thereof, chain means between the respective sprocket pinions and sprocket gears, a splined shaft extending horizontally and transversely of said vertical

plate member forwardly thereof, a pair of first sprocket wheels one each carried by said clamp arms, said first sprocket wheels being non-rotatably mounted on said splined shaft and unrestrained against lengthwise movement therealong, a pair of second sprocket wheels one each mounted to each of said sprocket gears coaxially thereof, chain means between the respective first and second sprocket wheels, a crank arm rigidly secured to said splined shaft, and a hydraulic piston and cylinder assembly having connection to the outer end of said crank arm for effecting limited rotation of the latter.

12. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively movable clamp arms at opposite sides of said plate member, means for effecting relative movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted at each of the forward ends of said clamp arms, a pair of hydraulic piston and cylinder assemblies one each mounted to each of said clamp arms, means between the outer ends of each of said hydraulic piston and cylinder assemblies and the respective clamp jaws for effecting rotation of the latter in response to movement of the outer ends of said hydraulic piston and cylinder assemblies, fluid hoses for conducting fluid under pressure to said hydraulic piston and cylinder assemblies, and flow divider means interposed in said fluid hoses for equally dividing the fluid under pressure between said pair of hydraulic piston and cylinder assemblies for effecting synchronized rotary movement of said clamp jaws.

13. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively horizontally movable clamp arms at opposite sides of said plate member, means for effecting relative horizontal movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted on a horizontal axis at each of the forward ends of said clamp arms, a splined shaft extending horizontally and transversely of said vertical plate member forwardly thereof, means between the ends of said splined shaft and the respective clamp jaws for effecting rotation of the latter in response to rotary movement of the former, and means having connection with said splined shaft for rotating the latter and said clamp jaws conjointly therewith.

14. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively horizontally movable clamp arms at opposite sides of said plate member, means for effecting relative horizontal movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted on a horizontal axis at each of the forward ends of said clamp arms, hydraulic piston and cylinder assembly means mounted to one of said clamp arms, means between the outer end of said hydraulic piston and cylinder assembly means and respective clamp jaw for effecting rotation of the latter in response to movement of

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the outer end of said hydraulic piston and cylinder assembly means, and said means being disposed within the confines of said clamp arm.

15. The combination clamping and rotating mechanism of claim 14 wherein said means comprises, a sprocket pinion connected to said clamp jaw, a sprocket gear rotatably mounted to said clamp arm, chain means between said sprocket gear and said sprocket pinion, and a crank arm secured to said sprocket gear and having connection at its outer end with the outer end of said hydraulic piston and cylinder assembly means.

16. For use with an industrial truck having a load supporting carriage, a combination clamping and rotating mechanism comprising, a vertical plate member adapted to be supported by said load supporting carriage, a pair of vertical spaced apart parallel relatively horizontally movable clamp arms at opposite sides of said plate member, one of said clamp arms comprising a plate having an elongated opening formed therein, means for effecting relative horizontal movement of said clamp arms toward and away from each other, a pair of clamp jaws one pivotally mounted about a horizontal axis at each of the forward ends of said clamp arms, a sprocket pinion connected to one of said clamp jaws and being dis-

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posed within said elongated opening in the respective clamp arm adjacent one end thereof, a sprocket gear disposed within said elongated opening in said clamp arm adjacent the other end thereof, chain means between said sprocket pinion and sprocket gear, and means for rotating said sprocket gear for effecting rotary movement of said clamp jaw about its axis.

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