Jan. 28, 1958 J. A. SAINT 2,821,316

ROLL CLAMP FOR LIFT TRUCK

Filed May 27, 1955 5 Sheets-Sheet 1

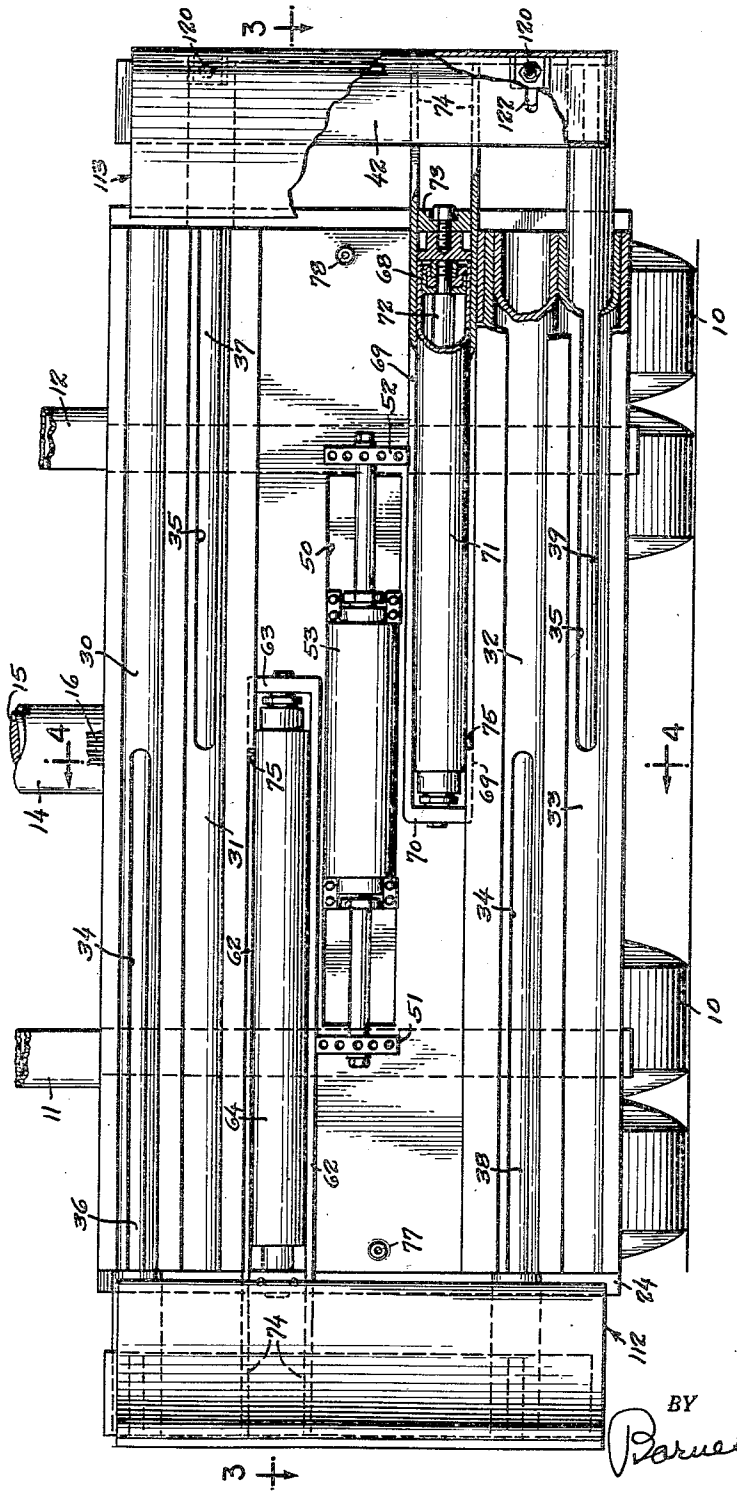


Fig. 1

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ROLL CLAMP FOR LIFT TRUCK

Filed May 27, 1955 5 Sheets-Sheet 2

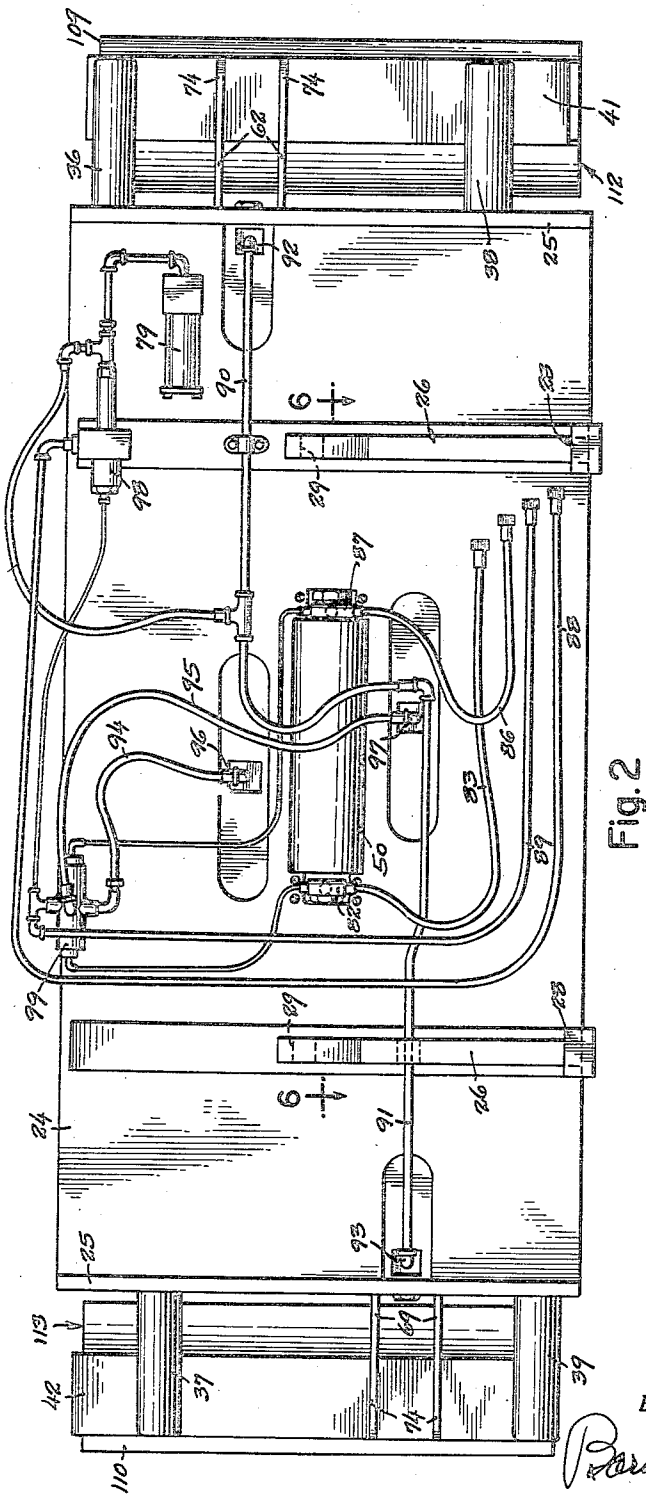


Fig. 2

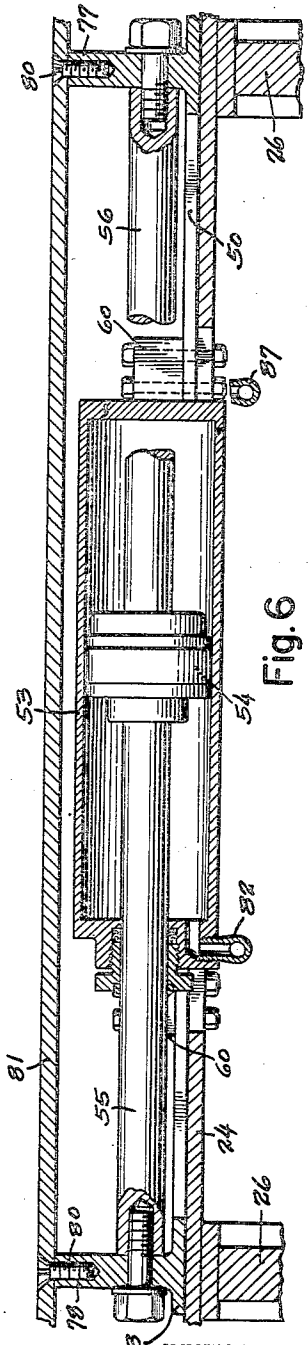


Fig. 6

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ROLL CLAMP FOR LIFT TRUCK

Filed May 27, 1955 5 Sheets-Sheet 3

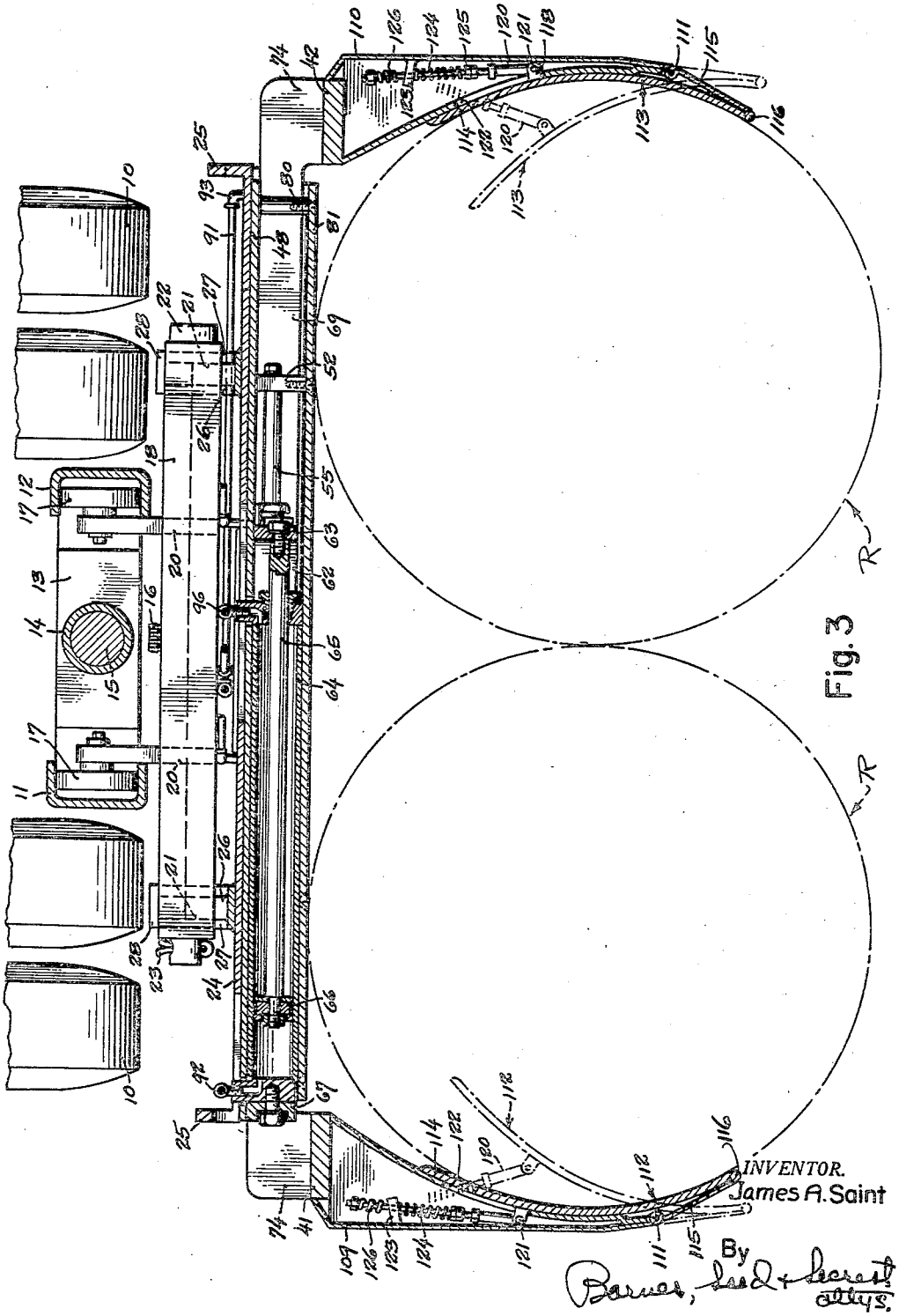


Fig. 3

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ROLL CLAMP FOR LIFT TRUCK

Filed May 27, 1955 5 Sheets-Sheet 4

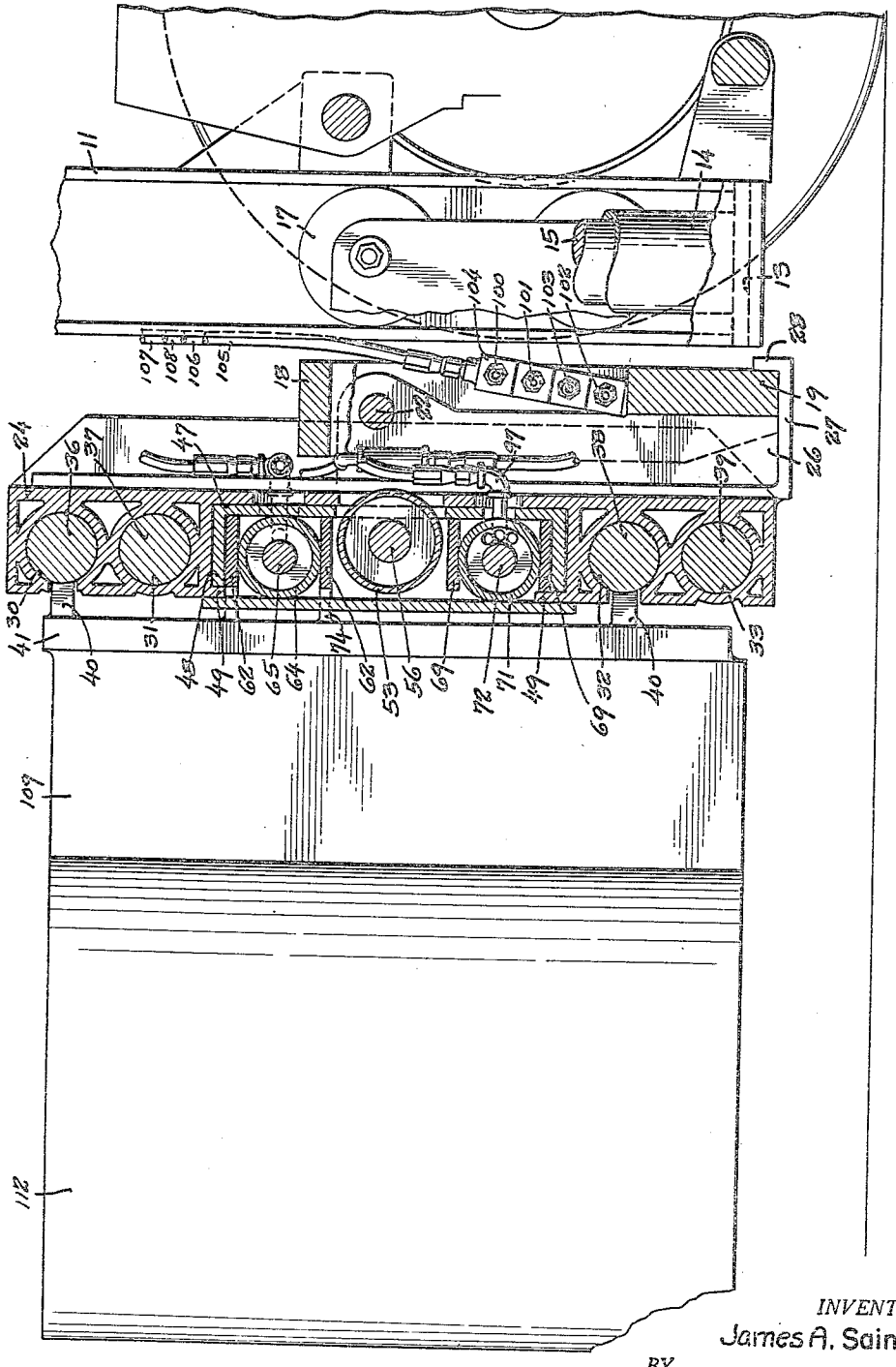



Fig. 4

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ROLL CLAMP FOR LIFT TRUCK

Filed May 27, 1955 5 Sheets-Sheet 5

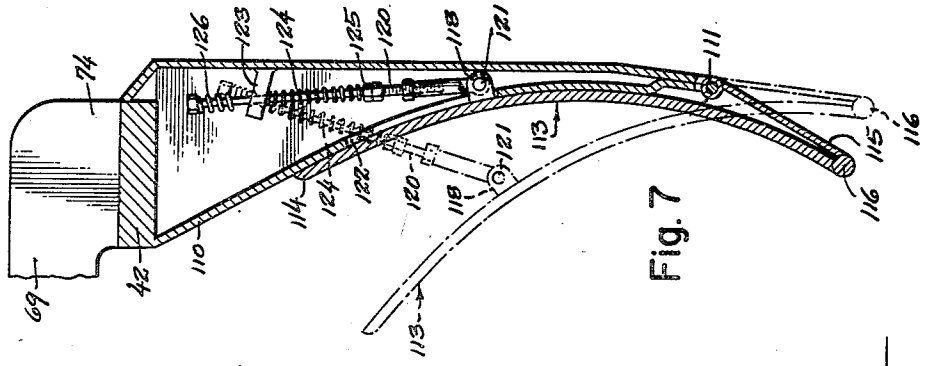


Fig. 7

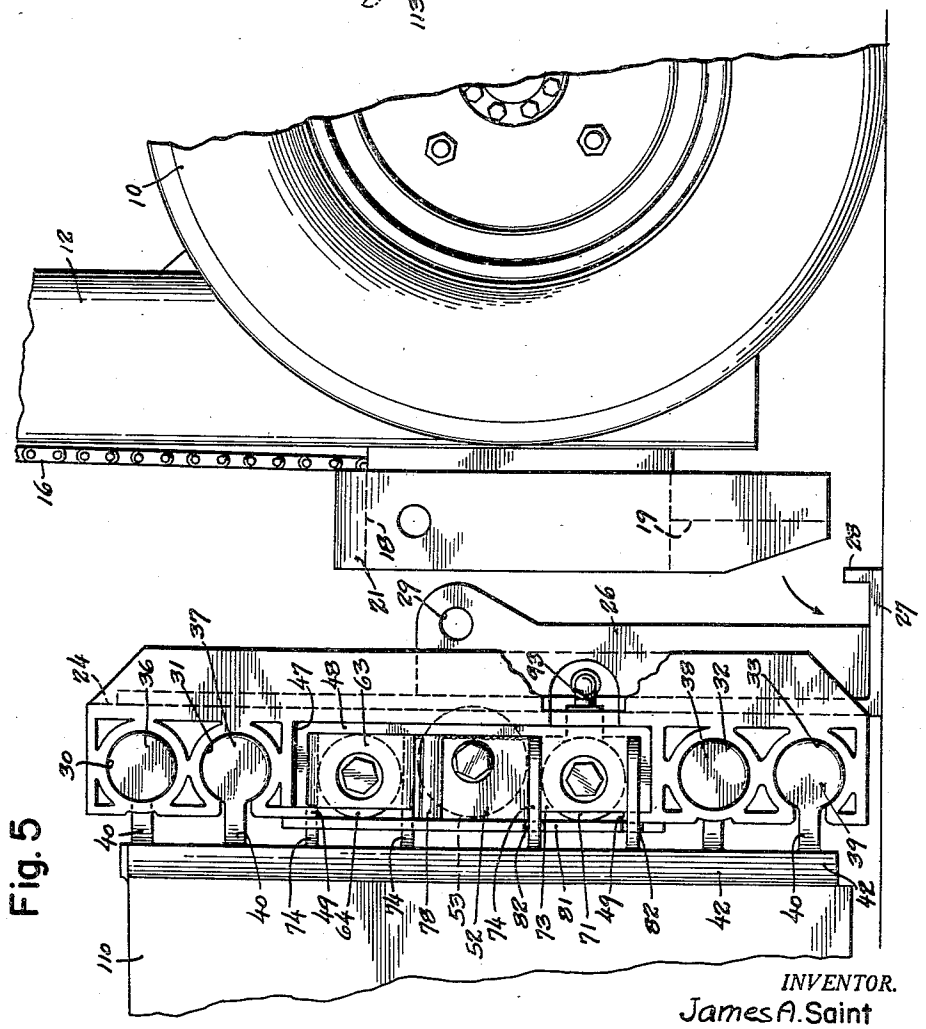


Fig. 5

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United States Patent Office 2,821,316 Patented Jan. 28, 1958



2,821,316

# ROLL CLAMP FOR LIFT TRUCK

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Application May 27, 1955, Serial No. 511,681

27 Claims. (Cl. 214—653)

This invention relates to clamps, and particularly clamps arranged and adapted to be operated hydraulically and which are adapted to be mounted on industrial lift trucks for handling rolls of paper and other cylindrical objects.

It is one object of the present invention to provide clamp structure which admits of being mounted upon a lift truck interchangeably with other material-handling equipment such as a scoop bucket, forks or the like, and which permits said interchange to be accomplished with unusual ease and expedition.

A further particular object of the invention is to provide perfected clamp structure including opposed clamping jaws of an arcuate shape, top plan considered, and characterized in that said jaws are hinged with the hinge axis forwardly spaced beyond a transverse vertical plane occupied by a radius of each of the two jaws when the latter are located in their object-clamping position, thus to securely lock the jaws upon the clamped object with no liability of the jaws rocking about their hinge axes.

As a further object still the invention purposes to provide a hydraulically activated clamp structure in which, comparatively speaking, the jaws open rapidly and close slowly, and wherein the hydraulic system is substantially proof against leakage while the jaws are closed upon an object, whereby to preclude accidental release of the pressure imposed upon the object.

With the above and other still more particular objects and advantages in view, and which will each appear and be understood in the course of the following description and claims, the invention consists in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the accompanying drawings:

Figure 1 is a front elevational view of clamp structure constructed to embody the preferred teachings of the present invention, mounted upon an industrial lift truck which is shown fragmentarily, a cover plate for the hydraulic cylinders of said structure being deleted from the view.

Fig. 2 is a rear elevational view of the clamp structure, shown detached from the lift truck.

Fig. 3 is a fragmentary horizontal sectional view on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary longitudinal vertical sectional view drawn to an enlarged scale on line 4—4 of Fig. 1.

Fig. 5 is a fragmentary end view, employing the same scale as that of Fig. 4, illustrating the manner in which the clamp structure is mounted on the lift truck.

Fig. 6 is a fragmentary horizontal sectional view drawn to an enlarged scale on line 6—6 of Fig. 2; and

Fig. 7 is a fragmentary horizontal sectional view detailing one of the clamping jaws.

With reference being had to said drawings, there is indicated in Figs. 1, 4 and 7 an industrial truck of the character providing two traction wheels 10 at the front and having a steerable wheel or wheels (not shown) at the rear. At substantially the vehicle's front-end limit there is supported by the frame of the vehicle a standard composed of two masts 11 and 12 spaced apart at opposite sides of the vehicle's longitudinal median line. While these masts are commonly of a telescoping nature comprised, in each instance, of an inner and an outer inwardly facing channel member of which the outer member is stationary and the inner member slidably mounted therein, for ease of illustration each said mast is here shown as comprising only a single channel member. In the space between said masts and footing upon a platform 13 which is rigid with the masts there is provided an upright cylinder 14 having hydraulic connection with a fluid pump driven from the engine of the vehicle, and working in this cylinder is a piston 15 whose function is to impose lift force upon a head sheave (not shown). A chain 16, anchored at one end, is trained over said sheave and has its other end connected to a carriage lying to the front of the masts and deriving slide support from rollers 17 which work in the gutters of said masts.



The carriage, considered in front elevation, is of a generally rectangular configuration and is or may be fabricated from four upright bars disposed in spaced paralleling relation and welded at the top and bottom to connecting cross-ties 18 and 19, respectively. The two inner bars, designated by 20, are spaced apart a distance moderately less than the span between the masts and project rearwardly beyond the carriage proper into overlying relation to the gutters of said masts, the guide rollers 17 being journaled on stud shafts carried by these inner bars. Adjacent the top of the carriage, the four vertical bars are co-axially drilled to receive a mounting pin 22 having a head at one end bearing against one of the side bars 21 and projecting by its other end beyond the other side bar 21. A cotter pin 23 secures the mounting pin in place.

Trucks having carriages like or similar to that which I have here described have found wide acceptance in and about industrial operations, with one reason for this acceptance being the ease and rapidity with which a single truck may have different material-handling attachments interchangeably mounted thereon. Fork arms and scoop buckets are examples of two such attachments, and the manner of mounting same is clearly illustrated and described in the Graves' Patents 2,553,530 and 2,553,531. The mount for the paper clamp of the present invention has been engineered so as to adapt itself to this same type of carriage.

Proceeding now to describe said mount, there is provided a frame-work which includes a back-plate 24 arranged, in use, to be disposed on edge in a position extending transversely of the truck to the front thereof. Along the rear face of this plate there is presented at each end a stiffening flange 25 and, between such flanges, a pair of spaced-apart vertical ribs 26. A respective foot 27 extends horizontally inwardly beyond each rib at the bottom thereof, and at the inner end of each foot there is an upturned hooking toe 28. The ribs are so placed as to find a moderately close fit in the space between the outer bars 21 of the carriage, and provided in these ribs, adjacent the upper ends, is a respective drill-hole 29.

I have illustrated in Fig. 5 the procedure incident to attaching the frame-work to the carriage. With the carriage elevated in a degree sufficient to have the cross-tie 19 clear the toes 28, the truck is driven forwardly until the outer bars 21 of the carriage are brought into straddling relation alongside the outer faces of the ribs 26. The carriage is then lowered until the holes in the bars 21 line up with the holes 29 in the ribs 26, whereupon the mounting pin 22 is inserted through these holes and locked in place by the cotter pin 23. When so positioned the cross-tie 19 is lodged in the space between the back face of the ribs and the terminal toes 28, the toes finding hooking engagement behind such cross-tie. The frame-work is shown in

this view as resting upon the ground but it is usual to set the same upon a block or other support elevated somewhat above the ground.

The frame-work is or may be fabricated from pipe, bar and plate stock joined into a unitary structure by welding, but for clarity in illustration I have here shown the same as being a casting. In the front and running the full length of the frame-work there is provided a forwardly facing horizontal guideway **47** spaced equidistantly from the top and the bottom edges, and received for endwise movement in this guideway is a slide **48** made sectionally to a channel shape. Marginal lips **49** retain the slide within the guideway.

Above and below said guideway the frame-work presents a pair of cylinders, as **30—31** and **32—33**, each extending substantially the full length of the frame-work and open at both ends. There is provided in the front wall of two of the cylinders **30** and **32** a respective open-end slot **34** running inwardly from the port side of the framework for approximately half the length of the cylinder, and there is provided in the front wall of the other two cylinders **31** and **33** a respective open-end slot **35** running inwardly from the starboard side of the frame-work for approximately half the length of the cylinder. Pipes, as **36**, **37**, **38** and **39**, affording a guide function hereinafter to be described, receive a sliding fit in these cylinders and on extremities thereof which are opposite as between pipes **36** and **37** and between pipes **38** and **39** each pipe has welded thereto a laterally projecting lug **40**. The paired lugs at each side of the frame-work are rigidly joined by a respective header, as **41** and **42**, so that the two pipes **36** and **38** slide together as one couple and the two pipes **37** and **39** slide together as another couple.

Reverting to the slide **48** there is provided a generally rectangular cut-out **50** in the back wall thereof centered both as respects the length and the height of the wall, and at the two ends of this cut-out there are provided flanges **51** and **52**. A horizontally disposed hydraulic cylinder **53** is received in the opening which said cut-out provides, and working in the cylinder is a piston **54** from which oppositely extending rods **55** and **56** pass through stuffing boxes in the two ends of the cylinder and are fixedly connected to the flanges **51** and **52** of the slide. At each end of the cylinder and bearing against the same there is bolted to said back wall of the slide a respective pair of stops **60**. It will be apparent that these stops localize the cylinder with respect to the frame-work, wherefore movement of the piston in either direction within the cylinder responsively shifts the slide.

Within the slide in the space above the hydraulic cylinder **53** there is received a slipper yoke composed of parallel side arms **62** welded at the outer ends to the header **41** and having the inner ends joined by a cross-bar **63**. The upper arm of the yoke finds a slide bearing against the top edges of the flanges **51** and **52**. A horizontally disposed single-rod hydraulic cylinder **64** is received in the space between the yoke arms, with its stuffing-box end pointing toward the cross-bar **63**, and the rod **65** of the piston which works in such cylinder is rigidly secured to such cross-bar. The head end of the cylinder is anchored to a lug **67** which is made integral with the slide. Excepting that the same is reversely mounted and has the outer end of the concerned slipper yoke welded to the other header **42**, a counterpart of the above-described cylinder-and-yoke assembly is received within the slide in the space below the shift cylinder **53**. In this latter instance I denote the yoke arms by **69**, the cross-bar by **70**, the cylinder by **71**, the piston therein by **68**, the connecting rod by **72**, and the anchoring lug by **73**. The marginal lips **49** which contain the slide **48** project inwardly in a degree sufficient to also contain the slipper yokes, but it will be noted, in compensation of the movement of root projections **74** of the slipper yokes as the latter work in the slide, that each said lip is notched to provide a cut-back **75** extending for approximately one-half the length. Such root projections are welded or otherwise fixedly secured to the header **41** or to the header **42**, as the case may be, and this is to say that the root projections of the upper slipper yoke are connected to the header **41** and the root projections of the lower slipper yoke are connected to the header **42**.

The two flanges **51** and **52**, together with posts **77** and **78** located adjacent the ends of the slide, each have holes drilled and tapped therein to accommodate screws **80** for the removable mounting of a plate **81** arranged to cover the three hydraulic cylinders. Slots **82** in said cover plate accommodate the root projections **74** of the slipper yokes in the latter's slide movement.

Each of the three hydraulic cylinders is of the double-acting type. Hydraulic fluid to one end of the shift cylinder **53** is delivered through a fitting **85** from a flexible hose **86**. A hose **88** leads through pipe branches **90** and **91** to fittings **92** and **93** on the outer ends of the two clamp cylinders **64** and **71**, and a hose **89** leads through pipe branches **94** and **95** to fittings **96** and **97** on the inner ends of the two clamp cylinders. **98** and **99** denote check valves, and **79** denotes an accumulator, associated in the usual manner with the fluid-flow lines of the hydraulic system. Quick-release female couplings on the four hoses **83**, **86**, **88** and **89** engage male complements **100**, **101**, **102** and **103** provided on a block **104** carried by the carriage of the truck, such block connecting by flexible hoses with a control valve (not shown) of the usual or a suitable construction. It will be understood that the two clamp cylinders work oppositely in concert, and an operation of the control valve such that pressure fluid is delivered to a selected end of any cylinder perforce automatically "dumps" oil from the other end to a reservoir.

Proceeding now to describe the clamps proper, there is provided at each side of the slide and welded or otherwise firmly anchored to the related headers **41** and **42** a respective forwardly jutting cheek. Denoted by **109** and **110**, these cheeks are hollow and are by preference formed to the general plan configuration of a right-angled triangle, with that side which corresponds to the hypotenuse facing inwardly and having a moderately concave curvature developed on a rather long radius about a center occurring on a perpendicular passing through the cheek's back face at a point fairly close to the tip end of the cheek. Hinge butts are let into the inner face of each cheek to have the hinge eyes overlie the extreme tip of the cheek, and a respective pin **111** connects these butts to butt complements which are fixed to a related one of two opposed clamping jaws **112** and **113**. The inner or clamping face of these clamping jaws is curved, with the curvature developed on a radius approximating that of the largest paper roll for which the clamp is intended, say 40", and in its preferred geometry the jaws have an overall span in the neighborhood of 60° with approximately one-fourth of this span projecting forwardly beyond the hinge axis. In fabricating the jaw a curved piece **114** of heavy-gauge plate stock runs the full length of the jaw, and a flat piece **115** of thin-gauge plate stock extends along the back side of the jaw's short arm from the tip to the hinge, being disposed tangent to the hinge eyes and to a piece of pipe which forms a nosing **116** for the extreme front edge of the jaw. The pipe is of such a diameter as to make the nosing fairly blunt.

On the back face of the jaw's long arm there is provided a pair of vertically spaced ears **118**. A respective rod **120** is hinged by its front end, as at **121**, to each of these ears and extends horizontally therefrom through a slot **122** into the hollow interior of the related cheek, where the inner end passes through a hole formed in a lug **123** welded to the back wall of the cheek. To the front of such lug a spring **124** is compressed between the lug and a nut **125** adjustably threaded on the rod. To

the rear of such lug a balancing spring **126** is received, having as its function to yieldingly localize the jaw as the latter is urged by the spring **124** into the expressed normal position in which it is shown by dotted lines in each of Figs. 3 and 7. In this position the curved inner faces of the short outer arms of the two jaws lie more or less in planes perpendicular to a transverse vertical plane traversing the two axes about which the jaws are hinged. The outer faces diverge rearwardly in a moderate degree. It is to be pointed out that a movement of the jaw from said dotted line position to the working position in which it is shown by full lines in said views causes the pivot pin **121** to move past a center line projected from the hinge pin **11** through the rock axis of the rod **120**, and namely through the hole formed in the lug **123**. In consequence of this "toggle" throw, the spring **124** acts to yieldingly resist movement of the jaw from either its said normal or its said working position. The spring load is, however, quite moderate so that little pressure is required to move the jaw out of either of said positions.

The operation is as follows:

Delivery of pressure fluid through hose **89** to the inner or tail ends of the clamp cylinders **64** and **71** forces the concerned pistons outwardly so as responsively to spread the jaws **112** and **113**. Delivery of pressure fluid through hose **88** to the outer or head ends of the clamp cylinders influences the pistons in a counter direction so as to close the jaws. With the referred-to check valves **98** and **99** in the system, the fact of having the stuffing boxes (which are a common point of leakage) lie at the inner ends of the clamp cylinders gives positive assurance of a hydraulic lock precluding an accidental relaxation of pressure upon clamped paper rolls as the same are being transported from one to another point. This fact of having the stuffing boxes lie opposite the ends of the cylinders into which pressure fluid is fed when the jaws are to be closed is furthermore important in that the volumetric capacity of such stuffing box or tail end of the cylinder is reduced, in comparison with the head end, by the cross-sectional area of the piston rod. This perforce means that the piston, for any given volume of pressure fluid, will move a lesser distance when the fluid is fed to the head end than when it is fed to the tail end. Thus, speaking comparatively, the jaws of the present clamp structure close slowly and open rapidly. This is highly advantageous from the standpoint of minimizing tearing of a paper roll's outer wrapping. As regards a slow clamping motion, the operator is self-evidently enabled to exercise greater care in closing the jaws upon a roll or rolls than would otherwise be the case. In freeing a roll or rolls from the clamping jaws it is important that such be done rapidly where, as is frequently, the case, the rolls are released while still elevated a short distance above the surface onto which they are to be deposited. Should a slow relaxation of the grip take place the roll or rolls will slip downwardly before the grip is completely released, and tearing then results.

The rounded albeit moderately thin noses of the jaws, with their flat-faced diverging flanks, permit the jaws to be first forcefully wedged between touching rolls, following which pressure is applied to establish a grip, and the truck is then backed off to withdraw the gripped rolls. In a manner which it is thought will be apparent, as the cheeks **109** and **110** move inwardly the pressure of the rolls uponthe long arms of the jaws pushes said long arms back until the same are finally brought to bear against the cheeks in the course of which the rolls, designated by the letter R, reach the position shown by broken lines in Fig. 3. In this position the toggle rod **120** will have moved past center and the rolls are "locked" in by the hooking action of the jaws. When a roll or rolls is deposited at the desired point of delivery and the rolls are relieved of the pressure of the jaws, the act of backing off the truck brushes the rolls against the nosing ends of the jaws and this moves the pivot points **121** past center whereupon the jaws swing into their normal open positions by force of the springs **124**.

The invention is thought to be clear from the foregoing detailed description of my now preferred illustrated embodiment. Changes can be resorted to without departing from the spirit of the invention and it is accordingly my intention that no limitations be implied and that the hereto annexed claims be given the broadest interpretation to which the employed language fairly admits.

What I claim is:

1. In combination with an industrial lift truck having a vertically movable carriage presenting vertical bars at each side drilled to receive a transverse horizontal mounting pin, a frame adapted to occupy a position to the front of the carriage and upon its back face presenting drilled vertical ribs arranged to lie alongside the side bars of the carriage with the drill-holes registering with the drill-holes of the side bars so as to receive the mounting pin therethrough, means on the carriage engaging means on the frame for fixedly locking the one to the other when the mounting pin is in place, a forwardly extending cheek member at each side of the frame carried by the frame for relative movement toward and from one another, opposed roll clamping jaws hingedly carried by said cheek members and each having its clamping face developed on an arc such as will closely fit the surface of the roll which the jaws are intended to handle, and means for actuating the cheek members, means being provided so positioning the jaws when the latter are closed upon a roll that the widest span between said jaws occurs at a point on each jaw spaced inwardly well beyond a transverse vertical plane traversing the hinge axes.

2. In combination with an industrial lift truck having a vertically movable carriage presenting vertical bars at each side drilled to receive a transverse horizontal mounting pin, a frame adapted to occupy a position to the front of the carriage and upon its back face presenting drilled vertical ribs arranged to lie alongside the side bars of the carriage with the drill-holes registering with the drill-holes of the side bars so as to receive the mounting pin therethrough, means on the carriage and on the frame arranged to interfit and lock the one fixedly to the other when the mounting pin is in place, a slide supported by the frame for transverse shifting movements, forwardly extending cheek members at each side of the slide carried by the latter for relative transverse movement toward and from one another, a pair of opposed roll-clamping jaws one carried by one and the other by the other cheek member, and separate means for shifting the slide and for imparting said relative movement to the cheek members.

3. In combination with an industrial lift truck having a vertically movable carriage presenting vertical bars at each side drilled to receive a transverse horizontal mounting pin, a frame adapted to occupy a position to the front of the carriage and upon its back face presenting drilled vertical ribs arranged to lie alongside the side bars of the carriage with the drill-holes registering with the drill-holes of the side bars so as to receive the mounting pin therethrough, means on the carriage and on the frame arranged to interfit and lock the one fixedly to the other when the mounting pin is in place, forwardly extending cheek members at each side of the frame carried by the latter for relative transverse movement toward and from one another, a pair of opposed roll-clamping jaws one carried by one and the other by the other cheek member, and means for imparting said relative movement to the cheek members.

4. Structure according to claim 3 in which the clamping jaws have an arcuate clamping face developed on a radius at least as large as the radius of the largest roll which the jaws are intended to clamp.

5. Structure according to claim 4 in which the clamping jaws are hinged to the related cheek member for pivot movement about a vertical axis forwardly spaced well

beyond the transverse vertical plane occupied by a radius of said face bisecting the arc of the clamping face.

6. Structure according to claim 4 in which the clamping jaws are hinged to the related cheek member to pivot about a vertical axis forwardly spaced beyond the transverse vertical plane occupied by a radius of said face bisecting the arc of the clamping face and are each movable about their hinge axis between two extremes one of which opens the jaws for access of a roll and the other of which closes the jaws upon the roll, means being provided acting upon the jaws when the latter are in either of said positions yieldingly holding the jaws in such position.

7. In combination with an industrial lift truck having a vertically movable carriage presenting a horizontal rail at the bottom with vertical bars at each side, said bars being drilled to receive a transverse horizontal mounting pin, a frame having on its back face a pair of transversely spaced vertical ribs arranged to straddle the side bars of the carriage so as to position the frame to the front of the carriage, said ribs having holes arranged to register with the drill-holes of the side bars and providing at the bottom a respective hooking toe arranged, when the mounting pin is inserted through said registering holes, to lodge behind said horizontal rail of the carriage and lock the frame to the carriage, a pair of opposed clamping jaws carried by said frame for relative movement toward and from one another, and means for actuating said jaws.

8. Clamp structure for use with an industrial lift truck having a vertically movable carriage, and comprising, in combination: a frame mounted on said carriage, a slide supported by the frame for transverse linear shifting movements, in a horizontal direction, forwardly extending cheek members at each side of the slide carried by the latter for transverse movement toward and from one another in a horizontal direction, a pair of opposed clamping jaws one carried by one and the other by the other cheek member, and separate hydraulic means for shifting the slide and for moving the cheek members.

9. Roll clamping structure for use with an industrial lift truck comprising a frame adapted to be mounted on the truck, a slide mounted on the frame for transverse linear shifting movements in a horizontal direction, forwardly extending cheek members at each side of the slide and carried by the latter for relative transverse movement toward and from one another in a horizontal direction, a pair of opposed clamping jaws one mounted on one, the other on the other cheek member, at least one of said jaw mountings being a hinge mounting, means for imparting said relative movement to the cheek members, and means independent of said last named means for shifting the slide in its said horizontally directed movement.

10. Structure according to claim 9 in which the clamping jaws have an arcuate clamping face developed on a radius at least as large as the radius of the largest roll which the jaws are intended to clamp.

11. Roll clamping structure for use with an industrial lift truck comprising a frame adapted to be mounted on the truck, forwardly extending cheek members at each side of the frame carried by the latter for relative transverse movement toward and from one another, a pair of opposed clamping jaws one mounted on one and the other on the other cheek member, and means for imparting said relative movement to the cheek members, said clamping jaws each having an arcuate clamping face developed on a radius at least as large as the radius of the largest roll which the jaws are intended to clamp, the frame carrying a face plate against which a roll bears when such roll is clamped by the jaws, the mountings for said jaws being hinge mountings, means being provided so positioning the jaws when the latter are closed upon said largest roll that a prolongation of the particular arc about which each jaw's clamping face is developed is in tangent relation to the face plate and the widest span between said jaws occurs at a point on each jaw spaced inwardly well beyond a transverse vertical plane traversing the hinge axes.

12. Roll clamping structure for use with an industrial lift truck comprising a frame adapted to be mounted on the truck, forwardly extending cheek members at each side of the frame carried by the latter for relative transverse movement toward and from one another, a pair of opposed clamping jaws one mounted on one and the other on the other cheek member, and means for imparting said relative movement to the cheek members, said jaws each presenting an arcuate clamping face developed on a radius at least as large as the radius of the largest roll which the jaws are intended to clamp, the mountings for said jaws being hinge mountings, means being provided so positioning the jaws when the latter are closed upon a roll that the widest span between said jaws occurs at a point on each jaw spaced inwardly well beyond a transverse vertical plane traversing the hinge axes, the jaws being each movable about its hinge axis between two extremes one of which opens the jaw for access of a roll and the other of which closes the jaw upon the roll, means being provided acting upon the jaws when the latter are in either of said positions yieldingly holding the jaws in such position.

13. Structure according to claim 11 in which the jaws are each a fabricated structure having at the tip a nosing strip of pipe, providing at the front and running the full length of the jaw a curved piece of plate stock disposed tangent to the nosing strip, and at the rear presenting a short backing of plate stock extending between the nosing strip and the hinge with its two ends tangent thereto.

14. Roll clamping structure for use with an industrial lift truck comprising a frame adapted to be mounted on the truck, forwardly extending cheek members at each side of the frame carried by the latter for relative transverse movement toward and from one another, a pair of opposed clamping jaws one hinged to one and the other hinged to the other cheek member, and means for imparting said relative movement to the cheek members, said clamping jaws each having an arcuate clamping face developed on a radius at least as large as the radius of the largest roll which the jaws are intended to clamp, the frame carrying a face place against which a pair of rolls bear when such rolls are clamped side-by-side by the jaws, means being provided establishing a roll-clamping closed position of the jaws whereat a prolongation of the particular arc about which each jaw's clamping face is developed is in approximate tangent relation to the face plate, the arc of each jaw extending through approximately 60° with the hinge axis lying appreciably closer to the front than to the rear limit of said arc.

15. Structure according to claim 14 in which the widest span between said jaws, when the jaws occupy said roll-clamping closed position occurs at a point on each jaw spaced inwardly well beyond a transverse vertical plane traversing the hinge axes.

16. Clamping structure for use with an industrial lift truck comprising a frame adapted to be mounted on the truck, a horizontal slide-way extending transversely of the frame, a slide received for endwise sliding movement in said slide-way, forwardly extending cheek members at each side of the slide, clamping jaws carried by said cheek members, a pair of slipper yokes journaled for endwise sliding movement in the slide, one adjacent the top and the other adjacent the bottom of said slide, root connections from one of said slipper yokes to one of the cheek members and from the other of said slipper yokes to the other cheek member, the cross-arms of said yokes being disposed at the ends thereof opposite from the connection with the related cheek member, a respective double-acting hydraulic cylinder for each slipper yoke received between the side arms thereof and having the end of said cylinder which is proximal to the root end of the

related slipper yoke anchored to the slide, said anchored end of the respective cylinder being closed, a piston in each cylinder and a rod therefor projecting from the other end of the cylinder and connected with the cross-arm of the related yoke, and means for shifting the slide.

17. Structure according to claim 16 in which the means for shifting the slide comprises a double-acting hydraulic cylinder received between the two slipper yokes and anchored to the frame, a piston in said cylinder, and rods made fast to the piston projecting from opposite ends of the cylinder and each connected with the slide.

18. Clamping structure for use with an industrial lift truck comprising a frame adapted to be mounted on the truck, forwardly extending cheek members at each side of the frame, clamping jaws hingedly carried by said cheek members, a pair of slipper yokes journaled one above the other for endwise sliding movement in the frame, root connections from one of said slipper yokes to one of the cheek members and from the other of said slipper yokes to the other cheek member, the cross-arms of said yokes being disposed at the ends thereof opposite said root connections, a respective double-acting hydraulic cylinder for each slipper yoke received between the side arms thereof and having the end of said cylinder which is proximal to the root end of the related slipper yoke anchored to the frame, said anchored end of the respective cylinder being closed, and a piston in each cylinder and a rod therefor projecting from the other end of the cylinder and connected with the cross-arm of the related yoke, the clamping faces of the jaws being arcuate developed on a radius no smaller than that of the largest roll which the jaws are intended to clamp, means being provided so positioning the jaws when the latter are closed upon a roll that the widest span between said jaws occurs at a point on each jaw spaced inwardly well beyond a transverse vertical plane traversing the hinge axes.

19. The clamping structure of claim 18 having cylindrical guide-ways in the frame paralleling the slide axes of the slipper yokes and placed above and below the latter, and pipes fixedly connected with the cheek members finding a slide fit in said guide-ways.

20. In combination with an industrial lift truck having a vertically movable carriage, a frame detachably connected to the carriage to occupy a position to the front of the carriage, a pair of opposed roll-clamping jaws carried by the frame for relative transverse movement toward and from one another, a fluid pressure actuated power means carried by the frame and operatively connected with the jaws for imparting said relative transverse movement to the jaws, a remote source of fluid pressure for said power means carried by the lift truck, and flexible hoses extending between the power means and the source of fluid pressure each including a quick-release coupling within its length.

21. Roll-clamping structure for an industrial lift truck comprising a frame carried by the truck, forwardly extending cheek members carried by the frame so as to occupy positions one at one side and the other at the other side thereof and at least one of which is movable in a direction toward and from the other member, a pair of opposed clamping jaws hingedly mounted one on one and the other on the other cheek member intermediate the ends thereof so as to provide a toe portion to the front and a heel portion to the rear of the hinge axis, the jaws being each movable about its hinge axis between two extremes one of which opens the jaw for access of a roll and the other of which closes the jaw upon the roll, means acting upon the jaws when the same are in open position yieldingly holding the jaws in said open position, pressure from the roll upon the heel portions of the jaws as the truck moves forwardly preparatory to clamping the roll acting to move said jaws to the closed position, and power means for imparting relative movement to the cheek members.



22. Structure according to claim 21 in which the jaws each present an arcuate clamping face developed on a radius approximately the same as that of the largest roll which the jaws are intended to clamp, and wherein, when the jaws are open, that portion of the jaw between the hinge and the outer tip of the jaw lies approximately normal to a transverse vertical plane common to the two axes about which which the jaws are hinged.

23. Structure according to claim 22 in which the nose which lies at the extreme front of each toe portion is curvilinear in section with the curve developed on a radius sufficiently small to permit ready entrance of the nose between two touching rolls.

24. A roll-clamping jaw for use with an industrial lift truck and comprising a fabricated structure having at the tip a nosing strip of pipe, providing at the front and running the full length of the jaw a curved piece of plate stock having its front face disposed tangent to the nosing strip, and at the rear presenting a short backing of plate stock also disposed tangent to the nosing strip and extending therefrom to a hinge butt provided at the rear of the jaw, the backing being tangent to said hinge butt.

25. Roll-clamping structure for an industrial lift truck comprising a frame carried by the truck, forwardly extending cheek members carried by the frame for relative movement toward and from one another, a pair of opposed clamping jaws hingedly mounted one on one and the other on the other cheek member intermediate the ends thereof so as to provide a toe portion to the front and a heel portion to the rear of the hinge axis, the jaws being each movable about its hinge axis between two extremes one of which opens the jaw for access of a roll and the other of which closes the jaw upon the roll, means acting upon the jaws when the same are in either of said extreme positions yieldingly holding the jaws in such position, pressure from the roll upon the heel portions of the jaws as the truck moves forwardly preparatory to clamping the roll acting to move said jaws to the closed position, and power means for imparting said relative movement to the cheek members.

26. Roll-clamping structure for an industrial lift truck comprising a frame carried by the truck, forwardly extending cheek members carried by the frame so as to occupy positions one at one side and the other at the other side thereof and at least one of which is movable in a direction toward and from the other member, a pair of opposed clamping jaws hingedly mounted one on one and the other on the other cheek member, the jaws being each movable about its hinge axis between two extremes one of which opens the jaw for access of a roll and the other of which closes the jaws upon the roll, and power means for imparting said relative movement to the cheek members, said jaws each presenting an arcuate clamping face developed on a radius approximately the same as that of the largest roll which the jaws are intended to clamp, that portion of the jaw between the hinge and the outer tip of the jaw, when the jaws are open, lying approximately normal to a transverse vertical plane common to the two axes about which the jaws are hinged.

27. The clamp structure recited in claim 8 in which the hydraulic means comprises three cylinder-and-piston assemblies each mounted so that its axis is substantially horizontal, one of said assemblies having its cylinder fixed to the frame and its piston connected to the slide, the other two assemblies each having its cylinder fixed to the slide and having the pistons connected one to one and the other to the other cheek member.


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