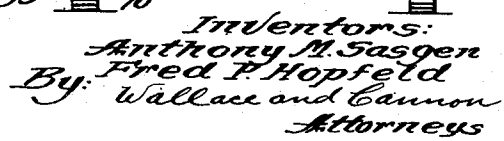


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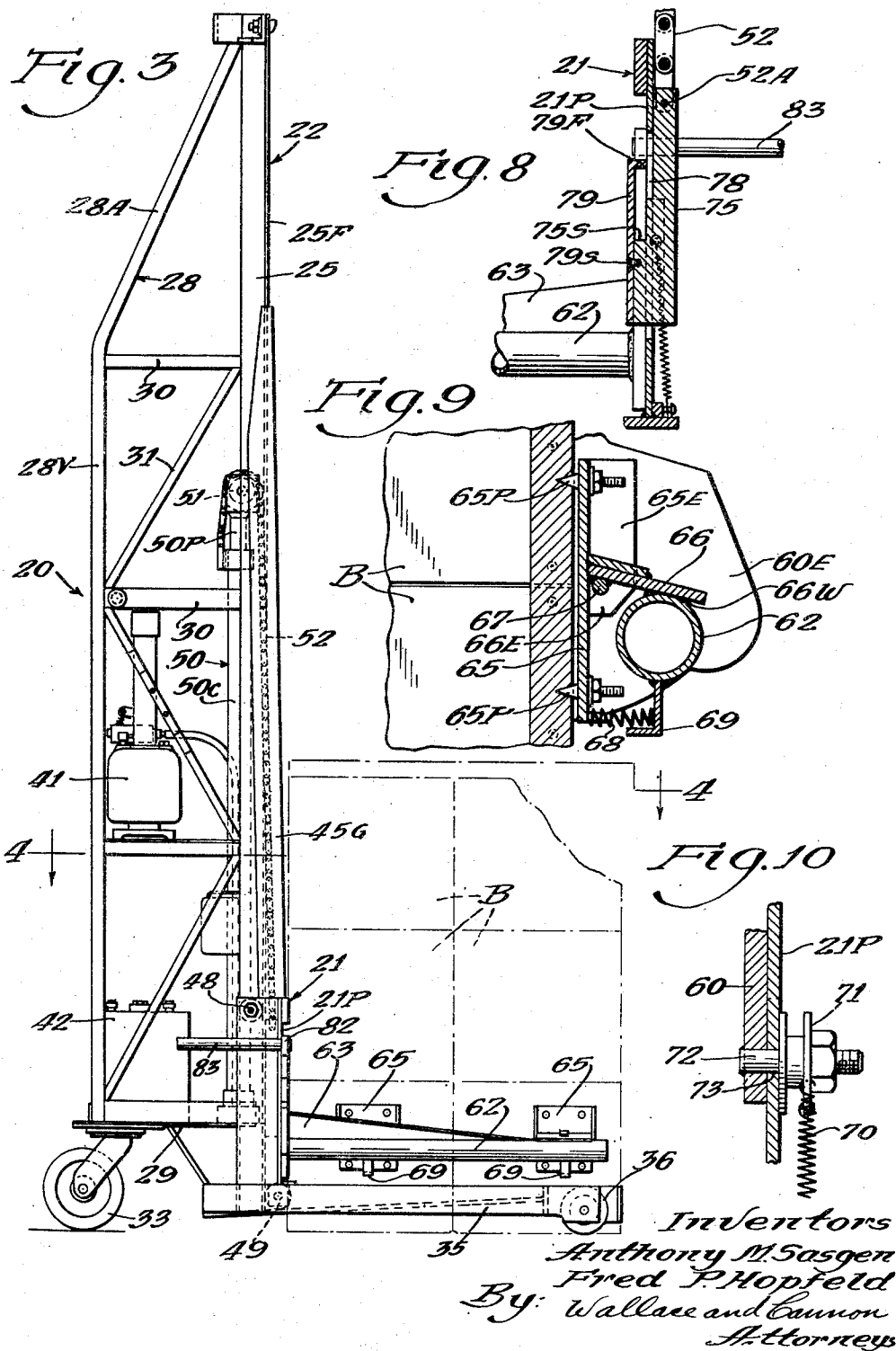
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Fig. 4

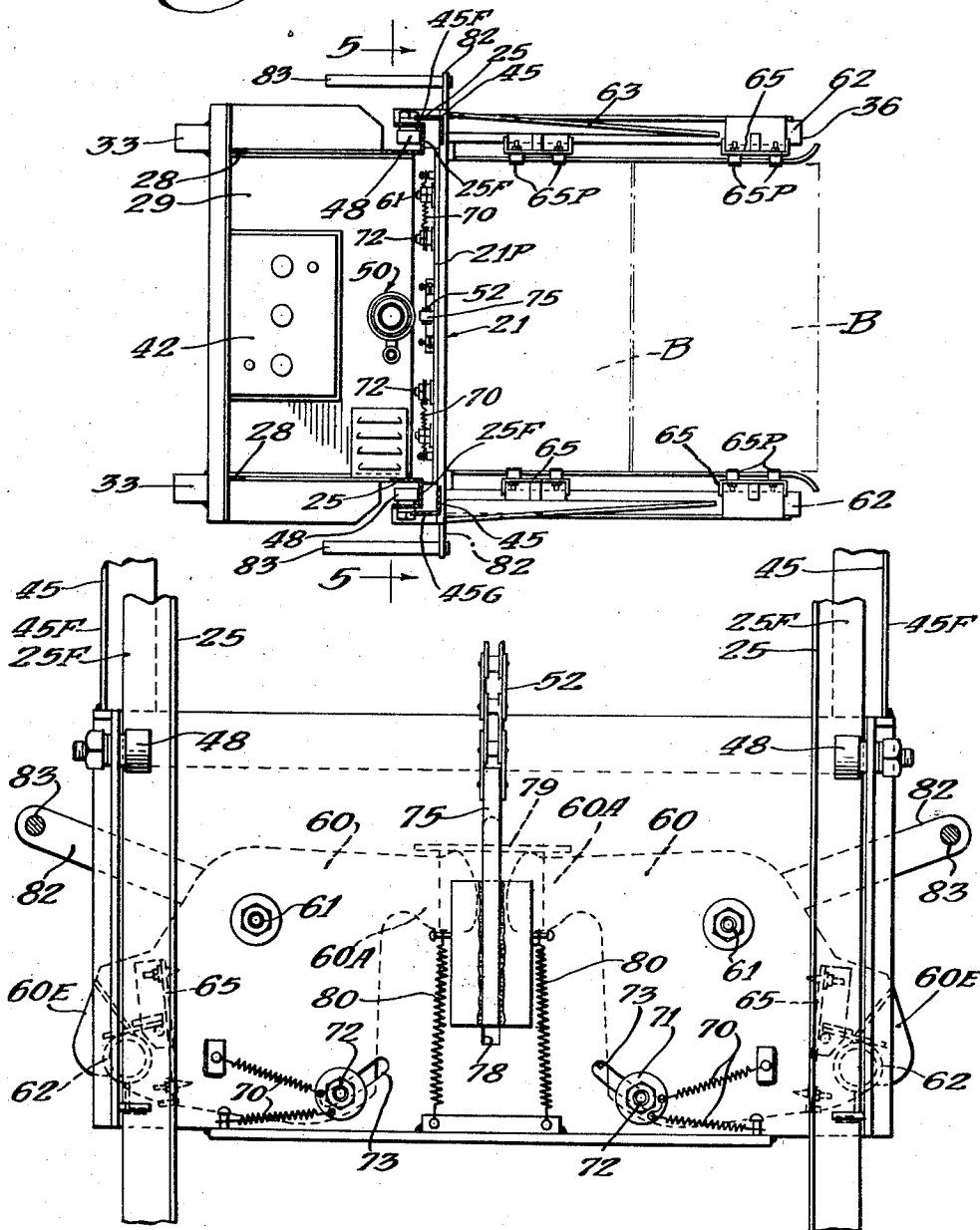


Fig. 5

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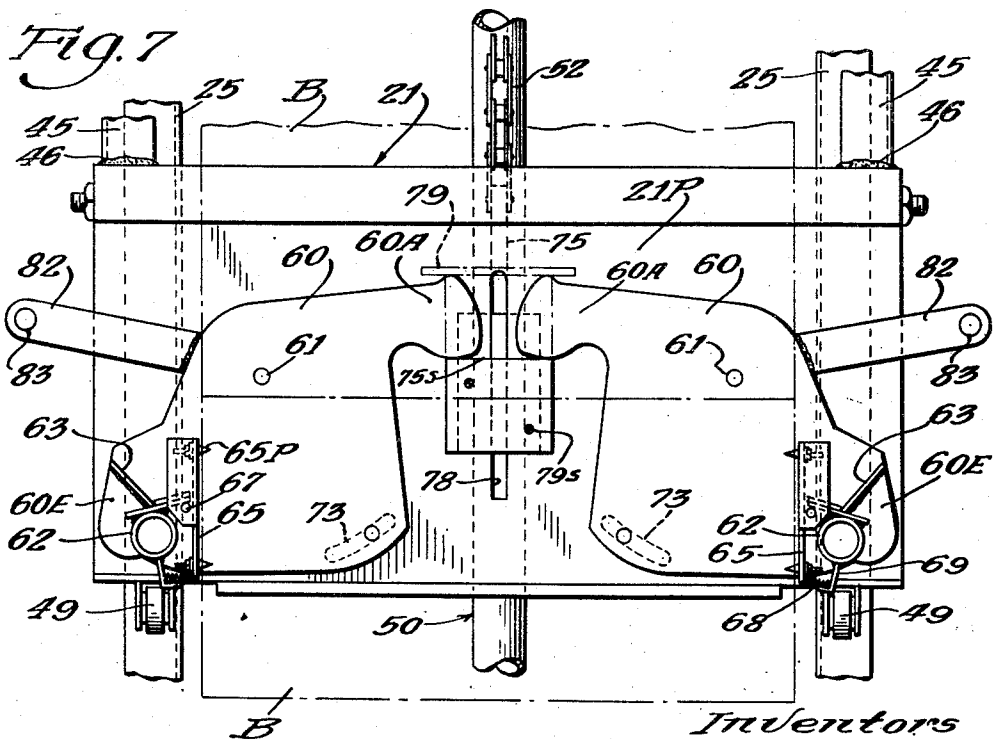
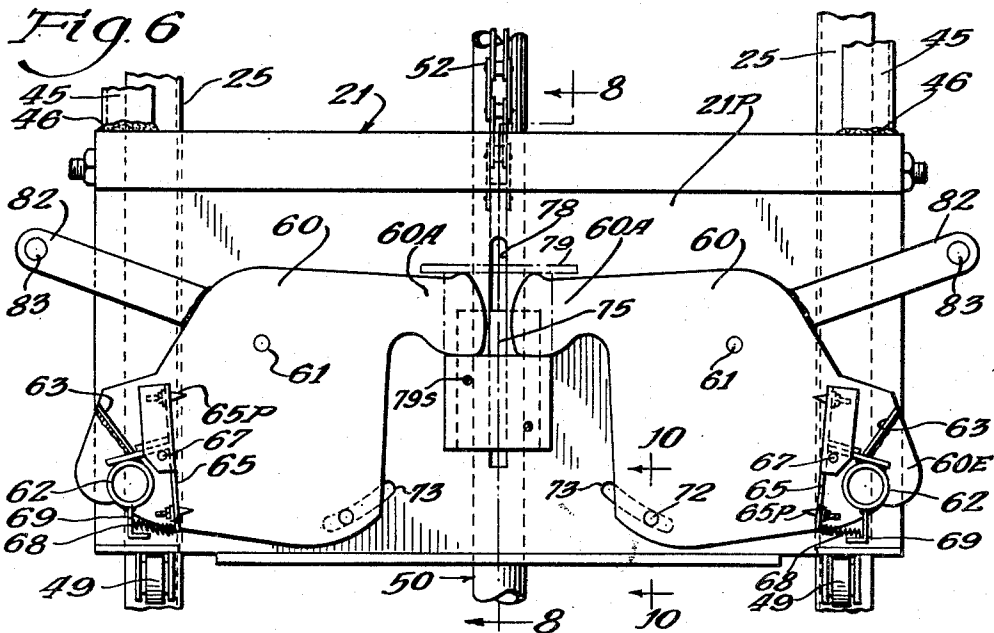
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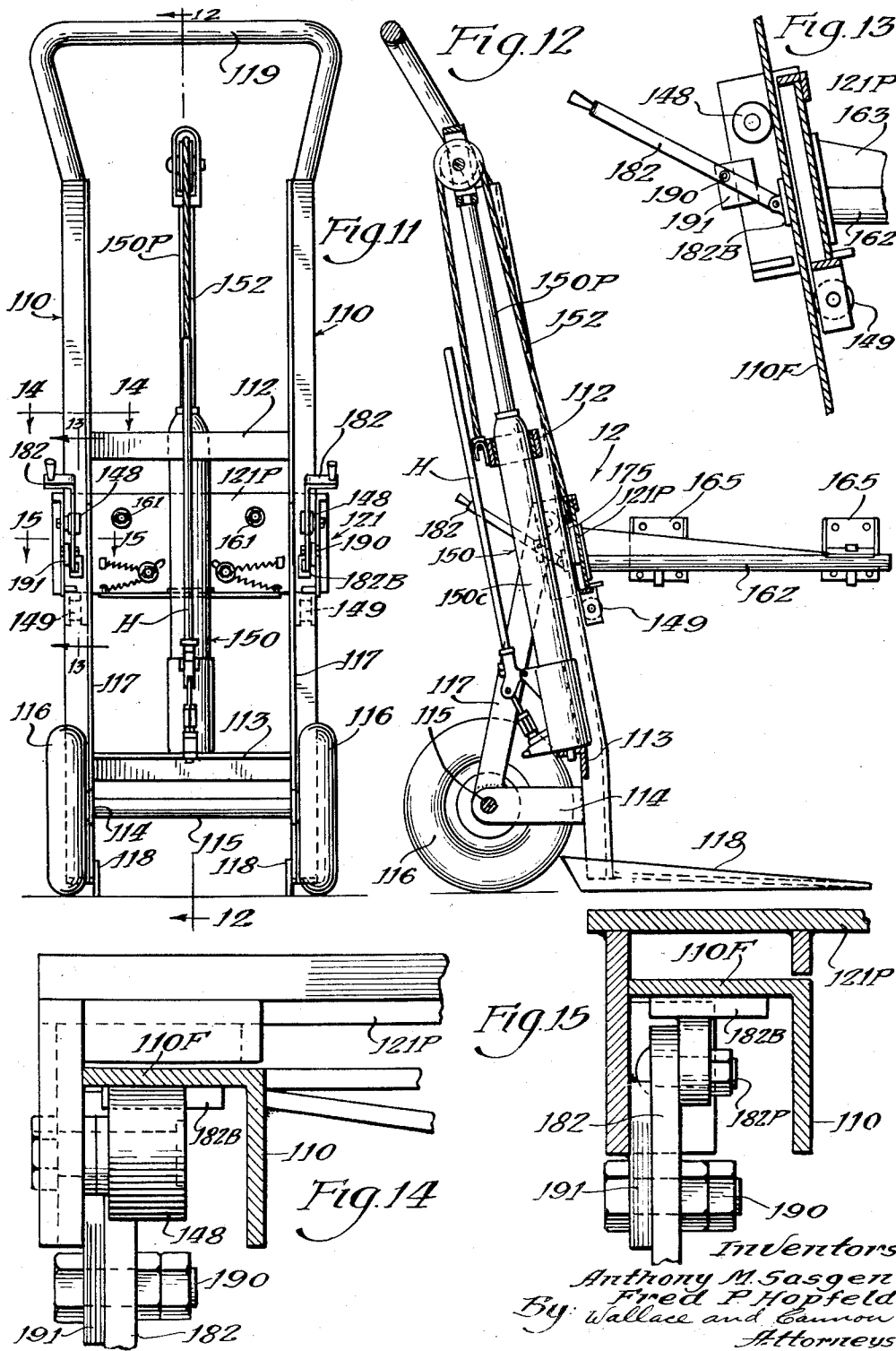
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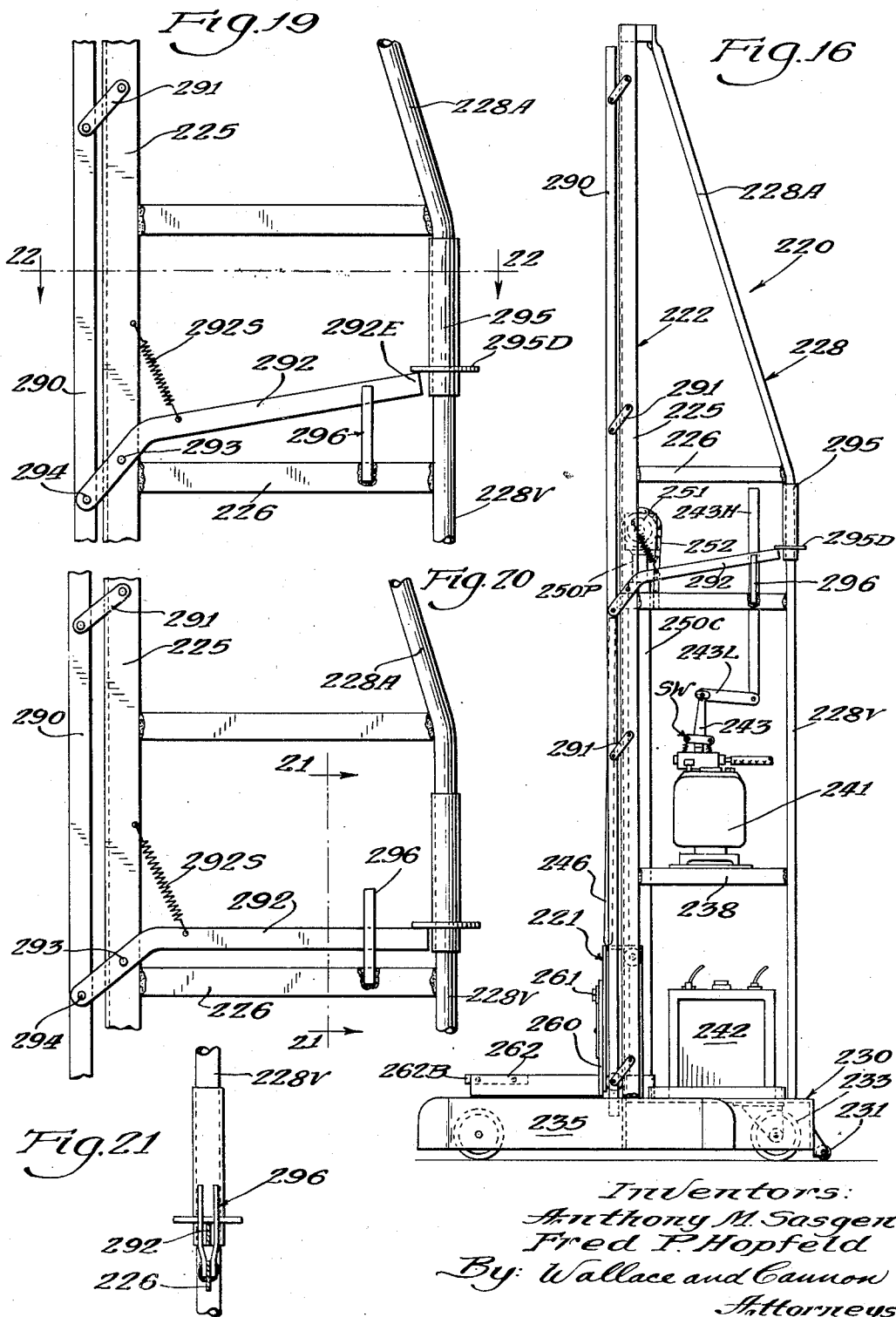
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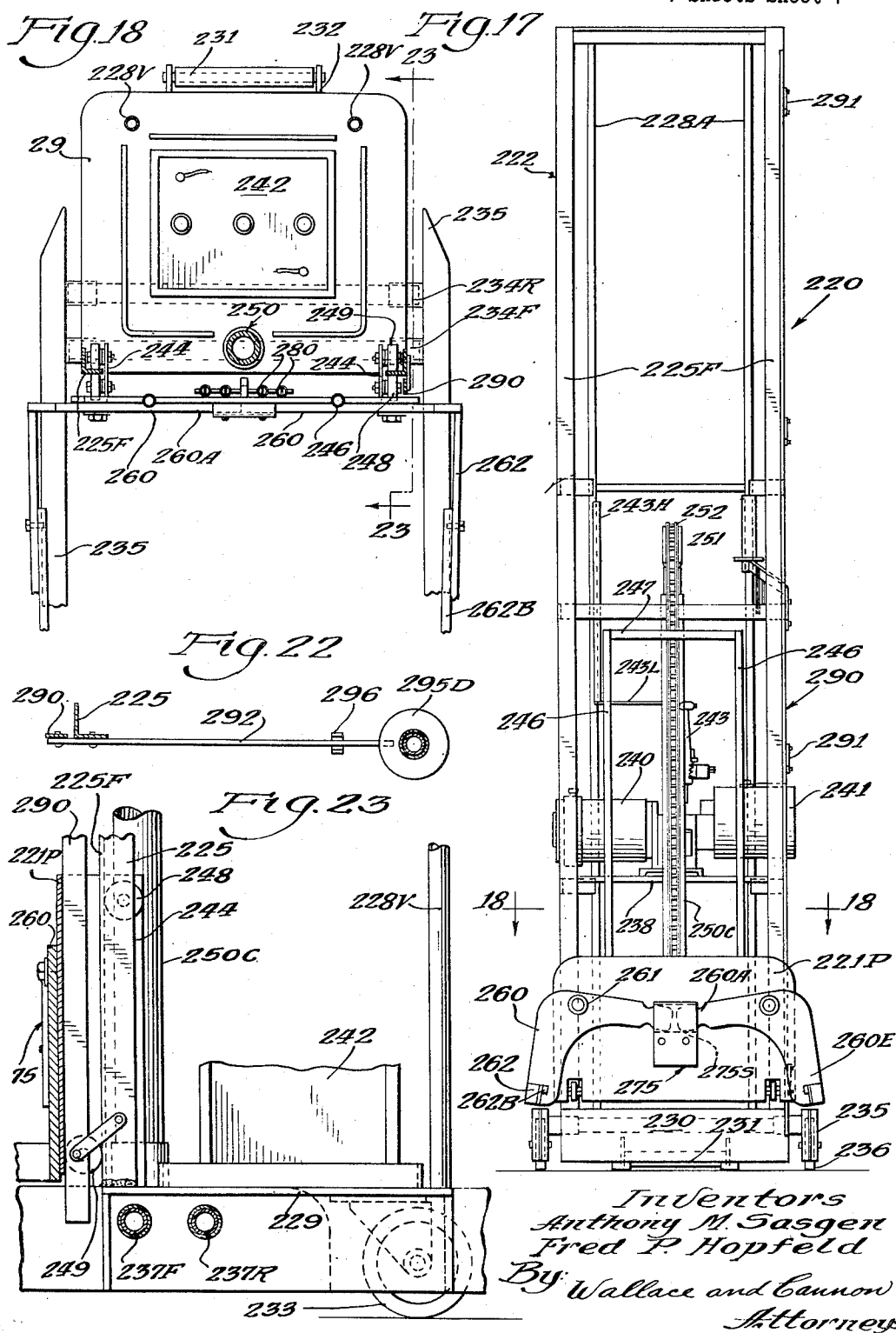
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LIFTING AND STACKING TRUCKS

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Application October 18, 1952, Serial No. 315,452

11 Claims. (Cl. 214—653)

This invention relates to lifting and stacking trucks of the kind utilized to lift and to stack different kinds of relatively large objects, such as boxes, crates, barrels and the like, and particularly the invention relates to such devices that engage the objects to be lifted and moved with what might be termed a clamping action applied to opposite sides of such articles. The present disclosure represents a continuation-in-part of application Ser. No. 286,642 filed May 7, 1952 and now abandoned.

It is, of course, known that articles such as boxes, crates, and the like, have been handled by lifting and stacking trucks through the use of a side clamping action, but in all instances of which we are aware, this clamping mechanism has been relatively complicated and expensive, and to enable such a clamping mechanism in a lift truck to be constructed in a simple and economical manner is an important object of the present invention. Other and related objects are to enable the clamping action in such a lift truck to be obtained through the use of the power mechanism which serves to elevate the clamped articles such as boxes, and to enable this result to be obtained by a structure, including a manually operated brake, that is simple in form and rugged and safe in operation.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments of the present invention and the principles thereof and what we now consider to be the best mode in which we have contemplated applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Fig. 1 is a front elevational view of a relatively large power operated lifting and stacking truck embodying the features of the invention;

Fig. 2 is a rear view thereof;

Fig. 3 is a side elevational view of the truck, taken from the left in Fig. 1;

Fig. 4 is a plane section taken substantially along the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary, vertical sectional view taken along the line 5—5 of Fig. 4 and looking in what may be termed a rearward direction;

Fig. 6 is an enlarged front view showing the clamping mechanism in its released or normal position;

Fig. 7 is a view similar to Fig. 6 and illustrating the clamping mechanism in its engaged relation;

Fig. 8 is a vertical sectional view, taken substantially along the line 8—8 of Fig. 6;

Fig. 9 is a transverse sectional view of one of the clamping elements;

Fig. 10 is a fragmentary, sectional view, taken substantially along the line 10—10 of Fig. 6;

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Fig. 11 is a rear elevational view showing a hand truck embodying the features of the invention;

Fig. 12 is a vertical sectional view taken substantially along the line 12—12 of Fig. 11.

Fig. 13 is a fragmentary vertical sectional view taken substantially along the line 13—13 of Fig. 11.

Fig. 14 is a fragmental planned section, taken along the line 14—14 of Fig. 11;

Fig. 15 is a fragmental planned section taken along the line 15—15 of Fig. 11;

Fig. 16 is a side elevational view of a power operated lifting and stacking truck embodying the features of the present invention;

Fig. 17 is a front elevational view of the truck shown in Fig. 16;

Fig. 18 is a sectional plan view taken on the line 18—18 of Fig. 17;

Fig. 19 is a fragmentary detail view on an enlarged scale of a portion of the truck shown in Fig. 16;

Fig. 20 is a view similar to Fig. 19 showing the brake actuating lever in a different position of actuation;

Fig. 21 is a section elevational view taken on the line 21—21 of Fig. 20;

Fig. 22 is a sectional view taken on the line 22—22 of Fig. 19; and

Fig. 23 is a fragmentary sectional view taken on the line 23—23 of Fig. 18.

For purposes of disclosure, the invention is herein illustrated in Figs. 1 to 10 as embodied in a relatively large lifting and stacking truck 20, that embodies a self-contained power unit for attaining the desired lifting action in respect to a vertically slidable carriage 21 that is mounted for vertical movement along the forward face portion of column structure 22, and it is upon the forward face of the vertically movable carriage 21 that the box or article clamping means of the present invention are mounted, as will hereinafter be described.

The column 22 is afforded by a pair of spaced, forward angle bars 25 that are joined together at vertically spaced points by horizontal cross bars 26 that are welded to the angle bars 25. The column also includes rear truss-like bracing structure that includes a pair of spaced bars 28 that are connected at their upper ends to the upper ends of the angle bars 25, and which extend downwardly and rearwardly as at 28A, Fig. 3, and then downwardly as at 28V in parallel relation with respect to the angle bars 25. At their lower ends the members 25 and 28 are rigidly connected to a base plate 29, and intermediate the top and bottom ends of the members 25 and 28, horizontal cross bars 30 and angular bracing members 31 are afforded to provide a rigid column structure.

The base plate 29 is provided with a pair of caster wheels 33 adjacent to rear corners, and from the other or forward corners of the base plate a pair of special forwardly projecting arms 35 are provided which have wheels 36 thereon adjacent the forward ends thereof. The arms 35 and the base plate 29, together with the casters 33 and the wheels 36 provide a stable base for the column 22 and the unit may thus be moved about in a shop, packing shed or the like.

On the base 29 and the column 30, power operated means are afforded for use in operating the lifting and clamping mechanism of the truck, and for this purpose an elevated shelf 38 is provided in the column upon which hydraulic unit 40 and a drive motor 41 are provided, and a battery 42 for energizing the motor 41 is provided on the base 29. These elements of the structure may be of any conventional type, and the operation of the hydraulic unit is controlled in a conventional manner by means of a control handle 43. The carriage 21, as pointed out hereinabove, is mounted for vertical movement up and down the guideway that is afforded by

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the spaced angle bars 25, and in this respect it is important to note that the angle bars 25 are so positioned that flanges 25F thereof are extended away from each other and in a common plane with the other flanges of the angle bars 25 extending rearwardly or to the left, as shown in Fig. 4.

The carriage 21 is afforded by a main plate 21P that is generally rectangular in character, and which has vertically extended angles 45 secured to its opposite vertical edges as by welding at 46, Fig. 6. The angles 45 are so arranged that each such angle 45 has one flange that is parallel to the face of the plate 21P and with the other flanges 45G thereof extending rearwardly and, to a slight extent, beyond the flanges 25F of the guideway. The flanges 45F have guide rollers 48 fixed thereon adjacent to the upper edge of the plate 21P so as to roll along the rear faces of the respective flanges 25F, while the plate 21P has a pair of lower rollers 49 mounted thereon just below the lower edge of the plate 21P, so as to roll along the forward or right hand faces of the flanges 25F, as shown in Fig. 4. The angles 45 are in the present instance extended a substantial distance upwardly beyond the upper edge of the plate 21P so as to afford a bearing surface located forwardly of the guide members 25, this upward extension of the angles 45 serving as a rear support against which a load may bear in some instances. The upper end portions of the angles 45 are connected by a cross bar 45C as shown in Fig. 1.

The carriage 21 is arranged to be raised and lowered by means of a piston and cylinder device 50 that is mounted in an upright position on the platform 29 and midway between the two angles 25. The cylinder 50C of the piston and cylinder device is fixed at its lower end to the platform 29, and the piston 50P extends from the upper end of the cylinder 50C and may be forced upwardly or may be allowed to be moved downwardly, by the action of the hydraulic unit 40 in a conventional manner. The upper end of the piston 50P has a sprocket 51 fixed thereon and a chain 52 extended over the sprocket 51 has one end thereof fixed as at 52A to the upper end of the cylinder 50C. Thus, by upward movement of the piston 50, the other or forward end or run of the chain 52 may be caused to move upwardly, and this forward end of the chain 52 is operatively connected to the carriage 21, as will be hereinafter described, to effect raising and lowering movements of the carriage.

Under and in accordance with the present invention, the connection of the chain 52 with the carriage 21 is effected in such a way that this chain is also operable to impart clamping movement to article-clamping means mounted on the carriage 21, and to thereafter effect the desired elevation of the carriage 21. Such article clamping means are arranged over the spaced projecting arms 35 of the base, and are arranged for relative approaching or clamping movement so as to move toward opposite ends of the articles that are to be clamped and lifted. In Figs. 3, 6 and 7, such articles are indicated as comprising a plurality of boxes B such as apple crates, which are shown in two tiers of three boxes each, and the clamping means are arranged to engage the opposite ends of both tiers of boxes with a sufficient force to enable the boxes to be lifted or elevated through upward actuation of the carriage 21. In the present instance, the approaching or clamping movements of the clamping means are effected through the medium of a rocking motion, and for this purpose a pair of rocking plates 60 are disposed on the forward side surface of the plate 21P, and are mounted on such plate 21P by pivots 61. It will be noted that the pivots 61 are located substantially midway between the top and bottom of the plate 21P, and are located inwardly from the opposite ends of the plate 21P. Thus, by rocking the outer end portions 60E of the plates 60 in a downward direction, there will be a component of inward movement imparted to such ends 60E, and it is this inward

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component of movement that is utilized to attain the desired clamping action. The actual work engaging means are supported on the plates 60 by means of relatively large supporting tubes 62, which are welded at their rear ends to the ends 60E of the rocking plates 60, and the supporting tubes 62 are braced with respect to the ends 60E by triangular bracing plates 63 which are welded to the plates 60 and to the respective tubes 62.

The actual work engaging means, of course, will vary in accordance with the form and character of the particular articles that are to be clamped and lifted by the clamping means, and, as herein shown, the clamping means are afforded by a pair of clamping plates 65 that are pivotably mounted on each of the supporting tubes 62. Each of the clamping plates 65 is mounted on the tubes 62 by means including a relatively small mounting plate 66 welded as at 66W to the top of the tube 62, and extending in an upward and slightly upward direction, as will be evident in Fig. 9 of the drawings. At its inner edge, each plate 66 has a pair of downwardly extending ears 66E, and a pivot rod 67 extended through the ears 66E serves as pivotal support for the related clamping plate 65. In affording such a mounting, the clamping plate 65 has outwardly extended ears 65E, as shown in Figs. 4 and 9, and the pivot rod 67 extends parallel to the axis of the tube 62 and through such ears 66E. An expansion spring 68 acting between the lower end of the clamping plate 65 and a bracket 69 welded on the lower surface of the tube 66 serves to urge the lower end of the clamping plate in an inward direction. Thus, in an engaging movement of the clamping means the lower edge of the clamping plate 65 will first engage the adjacent surface of the article that is to be clamped, but by reason of the pivotal mounting of the clamping plate 65 such clamping plate will assume an equalized relationship, as shown in Fig. 7 of the drawings. In the present instance, the clamping plates are provided with a plurality of inwardly extended pointed members 65P adjacent the top and bottom edges thereof, so that these pointed members may penetrate the wood of the crates or boxes B, and these members 65P are preferably in a longitudinal sense so as to limit and determine the extent of such penetration.

The rocking plates 60 are normally urged in an unclamping direction by means of a plurality of springs 70 anchored on rear portions of the carriage 21 and connected to a washer 71 in each instance, such washer 71 being carried on a stud 72 that is fixed to the related rocking plate 60 and which projects rearwardly through the plate 21P through an arcuate slot 73 formed in the plate 21P in a centered relationship with respect to the related pivot 61.

Under and in accordance with the present invention the rocking plates 60 are operated or actuated through their clamping movements through the action of the chain 52, and in accomplishing this the chain 52 has a lost motion connection with the carriage 21 whereby in a first upward actuation of the chain 52, clamping movements are imparted to the rocking plates 60, and thereafter the chain 52 is effective not only to impart lifting movements to the carriage 21, but also to maintain the clamping means in its effective clamping relationship. In accomplishing this, the clamping plates 60 have inwardly extended actuating arms 60A near their upper edges, and these arms 60A are operatively associated with a transmitting head 75 that is mounted on the carriage 21 for limited lost motion in a vertical direction. The head 75 is in the form of a block, as shown in Figs. 1, 2, 5, 6, 7, and 8, and the sides of the block are slotted so that they may engage opposite sides of a vertical slot 78 formed in the plate 21P. Thus a portion of the transmitting head 75 is located rearwardly of the plate 21P and the upper end of this rear portion of the head 75 is connected to the chain 52 as at 52A, Fig. 8. Forwardly of the plate 21P, the head 75 is cut away in its upper portions to afford an upwardly facing

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horizontal shoulder 75S, and the arms 60A are arranged to be disposed over and rest upon the shoulder 75S. The arms 60A are held in position on or over the shoulder 75S by a retaining plate 79 that is secured as by screws 79S to the forward face of the lower portion of the head 75, and a rearwardly extended flange 79F along the upper edge of the plate 79 serves to engage the upper edges of the arm 60A to hold these arms downwardly in engagement with the shoulder 75S. The head 75 is normally urged in a downward direction to the lower limit of its lost motion with respect to the plate 21P by means such as a pair of springs 80, as shown in Figs. 5 and 8.

Thus, when an upward movement is imparted to the chain 52, the upward forces are first applied to the transmitting head 75, and such forces tend to move the head 75 upwardly with respect to the carriage 21, and such upward relative movement is resisted by the springs 70 and 80. In order to enable these springs to be made relatively strong, it is desirable to afford means whereby upward movement of the carriage may be readily restrained until the desired clamping action of the clamping means with respect to the boxes B has been completed, and such restraining means may take different forms, one such form being illustrated in the embodiment shown in the embodiment illustrated in Figs. 11 to 15 and it being noted that such restraining means may be interchangeably employed in the different embodiments of the invention. Thus, in the embodiment shown in Figs. 1 to 10 each rocking plate 60 has a laterally projecting arm 82 fixed thereon, and at its end, each arm 82 has a foot-bar 83 projecting laterally with respect to such bar 82. Thus when the operator desires to clamp and lift articles such as a group of boxes B, he presses downwardly on one of the foot-bars 83, and at the same time initiates upward movement of the chain 52. The levers 82 thus actually operate to rock the engaging means toward an engaging relationship, but the primary function is to restrain the carriage 21 against upward movement and hence the transmitting head 75 moves upwardly with respect to the carriage 21, while such carriage remains substantially at rest. This attains the desired clamping action, and as soon as such clamping action is attained, further upward movement of the chain produces upward movement of the carriage 21 and the operator, of course, releases the downward forces that have been applied to the arm 82. In the course of such upward movement of the carriage 21 it will be observed that there is a constant clamping force applied to the clamping means.

When the carriage 21 is lowered and the boxes or other articles placed in position, as for example, on top of a stack of such articles, the chain 52 is lowered and after the load has been set upon the supporting surface, continued downward or lowering movement of the chain 52 permits the transmitting head 75 to move downwardly with relation to the carriage 21, and this causes the clamping means to be moved to its released position by the action of the return springs 70 and 80.

The present invention may, of course, be employed in other kinds and types of lifting and stacking trucks, and in Figs. 11 to 15, the invention is illustrated as embodied in a hand truck of the general type shown in our prior Patent No. 2,560,131, patented July 10, 1951. Thus as shown in Figs. 11 to 15, the hand truck embodies spaced apart frame members 110, which, as best shown in Figs. 11 and 12, are formed of angle iron and which are arranged to have corresponding of their flanges 110F disposed in a common plane while the other flanges are parallel and extend rearwardly. A cross brace 112 extends between the inwardly disposed flanges of the frame members 110 substantially midway in the extent thereof and is secured to the frame members in any suitable manner as by welding. A further cross member 113 in the form of an angle iron is extended between the frame members 110 adjacent to the lower ends of these members and this cross member 113 is also secured to the frame members

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in a suitable manner as by welding. Arms 114 are respectively secured to the frame members 110 and extend rearwardly therefrom and afford a support for an axle 115 on which wheels 116 are mounted. Braces as 118 are respectively extended between the axle 115 and the side frame members 110. The frame members 110 are pivotal about the axle 115 so as to be supported from the wheels 116 while allowing the hand truck to be tilted in the usual manner.

The usual tongue 118 is in this instance replaced by spaced arms provided at the lower ends of the frame members 110 and extending forwardly so that they may extend on opposite sides of a load that is to be lifted and moved. The arms 118 afford a stable support which when rested on the floor serves as a base to hold the members 110 in an upwardly extending relation or position, and it will be observed that when the base of the truck is normally resting on the floor the members 110 slope slightly to the rear. A handle 119, desirably formed from a cylindrical bar or tubular material, is provided at the upper end of the truck, such handle being substantially U-shaped and having the free ends thereof respectively secured to the upper ends of the side frame members 110 near the upper ends thereof.

In accordance with our invention, a carriage 121 is mounted for up and down movement along the members 110 which serve as a guideway therefor. As illustrated, this carriage 121 is formed by a plate 121P which extends across the front faces of the members 110, and which has upper rollers 148 and lower rollers 149 engaging the rear and front faces respectively of the flanges 110F so as to guide the carriage 121 for movement along the guideway.

In the form of the invention shown in Figs. 11 to 15, inclusive, the carriage 121 is moved along side frame members 110 under the control of a hydraulic jack generally indicated by 150. The jack 150 includes an operating handle H which, when manipulated, is effective to cause the piston 150P of the jack to move outwardly with respect to the cylinder 150C thereof, and the usual relief valve means are afforded to govern downward movement. The cylinder 150C of the jack 150 has the lower end thereof rested on the upwardly disposed flange of the angle iron cross brace 113 and desirably a stud 150S, at the lower end of the cylinder 150C is passed through an opening in said upwardly disposed flange to thereby prevent relative movement between the angle iron 113 and the cylinder 150C. A cable 152 has one end thereof secured to the upper end of the cylinder 150C and this cable passes about a pulley 151 mounted in a suitable bracket provided at the free end of the piston 150C. From the pulley 151 the cable 152 is extended downwardly and is operatively associated with the carriage 121 and the clamping means in substantially the same way as in the previously described embodiment.

In the hand truck shown in Figs. 11 to 15, the article clamping means take the same form and are mounted on the plate 121P in the same manner as the article clamping means are mounted on the plate 21 on the form shown in Figs. 1 to 10, and the elevating cable 152 is operatively connected to the transmitting block 175 in the same general manner as the chain 52 is connected in the previously described embodiment.

It will be observed, of course, that the tubes 162 are disposed in parallel relation to the base elements 118, and are thus disposed at a light angle to the face of the plate 121P. In Figs. 11 to 15, the corresponding parts are identified by the same reference characters as in Figs. 1 to 10, but in each instance the number "1" is added as a prefix. It will be observed that in the form of the invention shown in Figs. 11 to 15, the levers 82 have been omitted, and friction brake means have been afforded on the carriage 121 whereby upward movement of the carriage 121 may be restrained while the elevating means are effective to move the clamping elements to their load-clamping relation.

Such braking means are afforded by a pair of levers **182** that are pivoted on a rearward extension of the carriage on each side thereof, and so as to extend in a front to rear direction. At its forward end, each such braking lever **182** has a mounted brake shoe **182B** pivoted thereon at **182P** so that such shoe may be frictionally engaged with the rear face of the flange **110F** to hold the carriage **121** against movement along the guideway. The brake shoes **182B** are normally engaged with a slight force with the guideway, and when the operator wishes to clamp a load, he applies downward pressure to one or the other of the two levers **182**, thus to hold the carriage **121** against upward movement, and the lifting means are then operated so that in the first upward movement thereof the clamping means are moved through clamping movements and, thereafter, the lifting means are effective to elevate the carriage **121**. The operator, of course, removes the braking pressure as soon as the article clamping operation has been completed, and the carriage **121** may thus move freely in the desired elevating direction. The friction braking means shown in Figs. 11 to 15, may of course, be used interchangeably with the levers **82** of Figs. 1 to 10, and the use of such friction braking means is advantageous where the truck must be operated in warehouses where only narrow aisles are afforded.

Another type of lifting and stacking truck embodying the principles of the present invention is illustrated in Figs. 16 through 23 as embodied in a truck **220** which in construction is quite similar to the truck **20**, described hereinabove in connection with Figs. 1 to 11. Thus, the lifting and stacking truck **220** includes a vertically extended frame structure **222** which comprises a pair of forward vertical angle bars **225** and a rearward vertical frame structure **228** in the form of a pair of spaced apart tubes, each consisting of a vertical section **228V** and a forwardly inclined upper section **228A** that is connected at the top to the frame angles **225** through a common connecting bar. Reinforcing bars **226** are afforded, and the frame members **225** and **228** are secured at their bottoms to a common base plate **229**, which constitutes the top of a box-like base structure **230**, Figs. 16, 17 and 30.

The lifting truck **220** is adapted for movement about the shop or factory by means of a wheel structure which includes a pair of rear caster wheels **233**, Fig. 16, which are mounted for pivotal movement to the underside of the box-like base **230** in a known manner. In the present instance, a pair of forward wheels **236** are mounted each in respective streamlined pants **235**, which are removably mounted on the truck **220**. The pants **235** are each of an elongated shape, as best illustrated in Fig. 16, and the wheels **236** are each mounted therein. As best shown in Fig. 18, a pair of open ended tubes **234R** and **234F** are welded to the inner sides of the pants **235**, and these open ended tubes are adapted to be telescopically mounted on a corresponding pair of tubes **237R** and **237F**, Fig. 23, which are secured in position at the underside of the base structure **230** in any desired manner. The relationship between the tubes **234R** and **F** on one hand and tubes **237R** and **F** on the other is of such that the pants **235**, with the forward wheels **236** mounted therein, may be manually slipped onto and removed from the opposite ends of the tubes **237F** and **237R**. As illustrated in Figs. 16 and 18, the opposite ends of the pants **235** are tapered back to afford, together with rounded top sides, a streamlined housing for the wheels **236**. In this connection, it may be pointed out that the truck **220** is adapted for tilting movement in and about small spaces, and for quick pivoting movement, through a roller **231**, Figs. 16 and 18, which is journally mounted in and supported by a pair of mounting brackets **231** which are secured to the rear side of the base **230**. Thus, the operator may exert a leverage on the truck **220** such that the truck is tilted backward, as viewed in Fig. 16, on the roller **231**, and under such conditions the truck **220** may

be turned relatively quickly from left to right as the case may be.

It will be recalled from the description in connection with Figs. 1 to 15 that the lifting truck of the present invention may be operated through a lifting piston that is adapted for hydraulic actuation. This same type of action is utilized in the truck **220**, and accordingly a hydraulic output cylinder **250C** is secured in vertical relation to the base **229** and houses a vertically extending output piston **230P** at the upper end of which is secured a sprocket **251**. A chain **252** is pulled through the action of the piston **250P** and the sprocket **251** to lift carriage **221** in a manner similar to that described in connection with the lifting truck **20** of Figs. 1 to 11. However, as will be described below, the clamping arrangement for the carriage **221** in the present instance is somewhat different as is the manner in which the hydraulic system is energized and de-energized.

A platform **233**, Fig. 16, is arranged on the frame **222** well above the base plate **229**, and a hydraulic unit **240** and a driving motor **241** are mounted on this platform. A battery **242** is mounted on the base plate **229** below the platform **233** and, through an electrical connection of a known type, is adapted to supply an energizing current to the motor **241**. Such energization is accomplished through movement of a toggle switch **SW**, Fig. 16, which is operated in turn by handle **243**. The handle **243** may be moved in either a forward or rearward direction to actuate the switch accordingly, depending upon whether the carriage **221** is to be lifted or allowed to drop from an elevated position.

It will be observed in connection with the truck **20** of Figs. 1 to 12 that the corresponding handle **43** is in a somewhat remote position from the standpoint of certain positions that the operator of the truck **20** may be in at the moment it is desired to energize the motor. Accordingly, the truck **220** embodies a means whereby such handle is rendered immediately accessible, and this means includes a relatively long and vertically extended handle **243H** that extends upwardly along one of the frame elements **228**, as shown in Fig. 17, in position for immediate actuation. An L-shaped link **243L** is rigidly attached to the bottom of the handle **243H** so as to first extend from left to right, as viewed in Fig. 17, and then forwardly toward the handle **243**, as shown in Fig. 16. At the forward end of this forwardly projecting portion, the L-shaped link **243L** is connected to the handle **243**, and in this manner the handle **243** may be actuated forwardly or rearwardly, as the case may be, by a corresponding movement imparted by the operator to the handle **243H**.

It will also be recalled that the carriage **21** of the truck **20** is arranged for vertical up and down lifting or lowering movement relative to the angles **25**, and the same general movement is provided for in the truck **220**. However, a somewhat different mounting arrangement is afforded for the rollers which are to eliminate friction between the carriage **221** and the vertical frame **222**. The main plate of the carriage **221**, **221P**, is similar in function and arrangement to the plate **21P** of the truck **20**, and a pair of vertically extended plates **244** are welded to the forward face of the plate **221P** in spaced relation at either side thereof. At the upper end of the plates **244** a pair of rollers **248** are journally mounted in position to engage the forward flanges **225F**, Fig. 18, of the frame angle members **225**. Another pair of rollers **249** are journally mounted at the bottom of the plates **244** in position to roll against the back side or face of the flanges **225**. In this manner the carriage **221** may easily slide relative to the vertical frame structure of the truck **220** during up and down movement, and it will be appreciated, of course, that the rollers **248** and **249** move with, and are carried by, the main plate **221P** of the carriage **221**.

The truck **220** is also adapted for an article clamping action so that the articles to be transported by the carriage

221 will move accordingly as the carriage 221 is lifted or lowered by the action of the hydraulic piston 250P. In contrast to the arrangement in Figs. 1 to 11, the article clamping means in the present instance is somewhat more simplified, and embodies a pair of oppositely working arms 260 which are pivoted at 261 to the forward face of the main plate 221P. That is, the arms 260, when viewed from the position of Fig. 17, may be caused to turn inwardly toward one another about their respective pivots 261. This inward turning movement, as in the case of the truck 20, occurs during the initial movement of the chain 252, a lost motion arrangement similar to that described hereinabove in connection with the truck 20 being afforded between the chain 252 and the plate 221P. Since this lost motion connection has already been described in detail, further description at this point is deemed unnecessary other than to call attention to the head 275 and the shoulder 275S thereon, Fig. 17, which correspond to the head 75 and shoulder 75S respectively in Fig. 8, and the springs 280, Fig. 18, which correspond to the springs 80 previously described in connection with Fig. 5 of the drawings. In this connection, it should also be pointed out that the upper ends 260A of the clamping arms 260 engage the shoulder 275S so that these arms will be turned upon movement of the head 275. Thus, if a braking action be applied to the plate 221P to hold the same against vertical movement by the chain 252, the head plate 275 alone will be caused to move, due not only to the lost motion arrangement but also to the fact that the chain 252 is connected thereto rather than directly to the plate 221P, as has also been pointed out in connection with the truck 20.

As is best shown in Fig. 18, article clamping action in the truck 220 is afforded by means of a pair of forwardly extended arms 262 that are secured to the lower ends 260E of the oppositely acting clamping plates or arms 260, and it will be seen that when the head plate 275 is effective to cause an inward pivoting movement of the ends 260E of the arms 260, the arms 262 will undergo a similar inward movement. Secured to the inside faces of the arm 262 are a pair of clamping bars 262B that are adapted to directly engage and lock the opposite sides of the articles to be lifted.

During lifting or lowering action of the carriage 221 it is, of course, necessary to eliminate as much as possible any sliding friction between the rear faces of the articles on the carriage 221 and the forwardly facing flanges 225F. This feature is present in the form of a tilted frame, carried by the main plate 221P of the carriage 221, constituted and arranged to hold the articles away from engagement with the frame 222. Thus, as best shown in Fig. 17, a pair of tubes 246 are connected to the upper edge of the plate 221P so that the lower ends thereof are spaced away from the frame structure 222. A cross bar 247 interconnects the tubes 246 at their upper ends to afford a relatively rigid rearwardly tilted frame which will tilt with the carriage 221 and hold such articles as may be stacked thereon away from the flanges 225F.

Under and in accordance with the invention as embodied in Figs. 16 to 23, the plate 221P is held against vertical movement during initial actuation of the chain 252 by a relatively long brake 290, Fig. 16, and the arrangement, as will be described below, is such that the brake 290 may be manually actuated to permit a clamping movement to be imparted to the arms 260 immediately prior to the instant that the lost motion arrangement is completely taken up between the plate 221P, the head plate 275 and the lower end of the chain 252. The brake 290 is mounted in position to be manually moved into frictional engagement with the back side of the plate 221P, adjacent one side thereof as shown in Fig. 17.

To permit the brake 290 to be selectively moved forwardly toward and rearwardly away from the plate 221P, a series of small link bars 291 are used to connect the brake 290 to the side face of one of the angle members

225 of the frame 222, and an actuating lever 292 is arranged to impart forward and rearward movements to the brake 290. The actuating lever 292 is connected at one end at 294 to the brake 290, and is pivotally connected at 293 to the vertical frame structure of the truck 220. The actuating lever 292 is normally urged to an upward limit position by a compression spring 292S, as shown in Fig. 19, to thereby hold the brake 290 in a disengaged position away from engagement with the plate 221P. It will be recognized, however, that by pivoting the lever 292 in a clockwise direction from the position shown in Fig. 19 to that shown in 220, the brake 290 will be thereby moved toward the plate 221P, and the relationship is such that an actual engagement occurs between these latter two members. In order that the brake 290 may be readily accessible for such movement, the actuating lever 290 is extended back almost to the corresponding tubular frame member 228. A relatively short handle 295 in the form of a tube is mounted concentrically on the section of the tubular frame member 228 corresponding to the general location of the lever 292, and is provided with an annular disk 295D that is of a diameter to overlap the free or rear end 292E of the actuating lever 292. It will be seen that when the handle 295 is urged downward on the frame element 228 against the action of the spring 292S, the lever 292 will undergo the aforesaid clockwise movement that defines an engaging movement of the brake 290. A yoke 296 is located on the frame structure immediately beneath the lever 292 so as to afford a guide and holder for the lever 292.

From the foregoing description it will be apparent that the present invention affords an improved clamp-type lifting and stacking truck, and that the structure in operation of the improved truck is extremely simple. It will also be evident that through the present invention, the elevating means of the truck are able to perform both the clamping operation and the elevating operation, and such clamping and elevating operation are performed in immediate sequence, so as to simplify and improve the operation and use of such trucks. In connection with the embodiment of the invention illustrated in Figs. 16 to 23, it is to be pointed out that the brake 290 is such as to permit a holding action to be applied to the carriage 221 when the latter is at any point relative to the frame 222.

Thus, while we have illustrated and described the preferred embodiments of our invention, it is to be understood that these are capable of variation and modification, and we therefore do not wish to be limited to the precise details set forth, but desire to avail ourselves of such changes and alterations as fall within the purview of the following claims.

We claim:

1. In a lifting and stacking truck, a base, means on said base affording an upwardly extending guideway, a carriage mounted for up and down movement along said guideway, clamping members including clamping levers mounted on said carriage in spaced relation and arms on said levers for clamping movement toward each other for clamping articles to be lifted, a transmitting head mounted on said carriage for limited lost motion in an up and down direction with respect to said carriage, lifting means on said base operatively connected to said head for imparting upward movement to said head, and extensions on said levers operated by said head as an incident to movement of said head upwardly on said carriage to impart clamping movement to said clamping members, the lost motion in said head accounting for said clamping movement prior to said head being effective to lift the carriage.

2. In a lifting and stacking truck, a wheeled base affording a stable floor mounted support, means on said base affording an upwardly extending guideway, a carriage mounted for up and down movement along said guideway, laterally spaced clamping members in the form of a pair of levers pivotally mounted on said carriage for clamping movement toward each other and having

attached thereto for movement therewith arms for clamping articles to be lifted, a transmitting head mounted on said carriage for limited lost motion in an up and down direction with respect to said carriage, lifting means on said base operatively connected to said head for imparting upward movement to said head, extensions on said levers operatively connecting said head and said clamping members and operated by said head as an incident to movement of said head upwardly on said carriage to impart clamping movement to said clamping members, said head being operable by said lifting means after completion of the clamping movement of said clamping members to impart lifting movement to said head and the load clamped by said clamping members.

3. In a lifting and stacking truck, a base, means on said base affording an upwardly extending guideway, a carriage mounted for up and down movement along said guideway, a pair of levers mounted on said carriage for pivotal movement forwardly projecting clamping arms attached to said levers in laterally spaced relation and for clamping movement with said levers toward each other for clamping articles to be lifted, pivoted load engaging elements mounted on the respective forward ends of said arms, a transmitting head mounted on said carriage for limited lost motion in an up and down direction with respect to said carriage, lifting means on said base operatively connected to said head for imparting upward movement to said head, and integral extensions on said levers when engaging said head and controlled by the lost motion of said head as an incident to movement of said head upwardly on said carriage to impart clamping movement to said clamping members before the carriage is lifted.

4. In a lifting and stacking truck, a base, means on said base affording an upwardly extending guideway, a carriage mounted for up and down movement along said guideway, clamping members including a pair of levers mounted on said carriage in spaced relation and having attached thereto for movement therewith a pair of arms arranged for clamping movement toward each other for clamping articles to be lifted, a transmitting head mounted on said carriage for limited lost motion in an up and down direction with respect to said carriage, spring means urging said head downwardly on said carriage and said clamping members toward unclamped positions, lifting means on said base operatively connected to said head for imparting upward movement to said head and extensions on said levers adapted to be operated by said head as an incident to said lost motion movement of said head to impart clamping movement to said clamping members.

5. In a lifting and stacking truck, a base, means on said base affording an upwardly extending guideway, a carriage mounted for up and down movement along said guideway, laterally spaced clamping members including a pair of levers pivotally mounted for clamping movement toward each other for clamping articles to be lifted, a transmitting head slidably mounted on said carriage for limited lost motion movement in an upward direction before engaging said carriage into upward limit position to lift the carriage, lifting means on said base operatively connected to said transmitting head clamping members to impart lifting movement to said transmitting head and carriage and to impart clamping movement to said clamping members before and independently of said lifting movement, and a normally released manually operable friction brake mounted on said carriage and engageable with said guideway to restrain said carriage against upward movement and thereby assure full and complete clamping of the load prior to lifting thereof.

6. In a lifting and stacking truck, a base, means on said base affording an upwardly extending guideway, a carriage mounted for up and down movement along said guideway, a pair of rocking plates pivoted on said carriage and having operating arms thereon extending toward each other, clamping members mounted on the respective

plates and extending from said carriage in spaced relation and for clamping movement toward each other when said arms are moved upwardly to effect clamping of articles to be lifted, a transmitting head mounted on said carriage for limited lost motion in an up and down direction with respect to said carriage, and operatively connected to said arms for rocking said plates, spring means urging said head downwardly on said carriage and said rocking plates in unclamping directions, lifting means on said base operatively connected to said head for imparting upward movement to said head to move said head upwardly on said carriage and thereby impart clamping movement to said clamping members and to thereafter elevate said carriage.

7. In a lifting and stacking truck, an article lifting carriage mounted for up and down movement on the truck, laterally spaced and normally open clamping members in the form of levers mounted on the carriage for movement with the carriage and in toward one another in a closing relation to grip opposite sides of an article, lifting means on the truck having a connection to the carriage for lifting the carriage in an upward direction on the truck, said connection for lifting the carriage during said vertical movement, ends of said levers resting on said plate so that upward movement of the plate during its lost motion is effective including a plate slidable on the carriage for vertical movement and having lost motion relative to the carriage, to first move the clamping members in a closing relation prior to any lifting movement being imparted to the carriage by said plate.

8. In a lifting and stacking truck, an article lifting carriage mounted on the truck for up and down movement in lifting and lowering relation, laterally spaced and normally open article clamping members including members mounted on the carriage for pivotal movement toward one another in a closing relation to clamp the opposite sides of an article to be lifted, a lifting head on the carriage adapted to lift the carriage but having a lost motion movement thereon, before lifting the carriage means on the truck to advance said head through said lost motion movement and to thereafter impart lifting movement through the head to the carriage, and the article clamping levers being arranged with the ends thereof in engagement with said head so that these members are pivoted in a closing relation during the lost motion movement of the head and prior to the lifting movement of the carriage.

9. In a lifting and stacking truck, an article lifting carriage mounted on the truck for up and down movement in lifting and lowering relation, laterally spaced and normally open article clamping levers mounted on the carriage for pivotal movement toward one another in a closing relation to clamp the opposite sides of an article to be lifted, and means on the truck including a lifting head having a lost motion connection to the carriage so as to advance the latter through lifting movement on the truck, after the lost motion travel ends of said levers being engaged with said lifting head so that the lifting head in its lost motion movement is effective to pivot said clamping levers in a closing relation prior to being effective to lift the carriage.

10. In a lifting and stacking truck, a base, means on said base affording an upwardly extending guideway, a carriage mounted for up and down movement along said guideway, a pair of laterally spaced clamping members pivotally mounted on said carriage for clamping movement toward each other for clamping opposite sides of an article to be lifted, lifting means on said base including a lost motion transmitting head common to both of said clamping members and operatively associated therewith first to impart clamping movement to said clamping members and then to impart lifting movement to said carriage, and brake means on said carriage engageable by the operator to assure full and complete clamping of the load prior to lifting thereof.

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11. In a lifting and stacking truck, a base, a vertically extending frame mounted on said base affording an upwardly extending guideway, a carriage mounted for up and down movement along said guideway, a pair of rocking plates pivoted on said carriage and having operating arms thereon extending in a forward direction, clamping means mounted on said arms for clamping movement toward each other when said arms are moved inwardly toward one another, to effect clamping of articles to be lifted, a transmitting head mounted on said carriage for limited lost motion in an up and down direction with respect to said carriage, and operatively connected to said plates, spring means urging said head downwardly on said carriage and said rocking plates in unclamping directions, lifting means on said base operatively connected to said head for imparting upward movement to said head to move said head upwardly on said carriage and

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thereby impart clamping movement to said clamping plates, arms and clamping means, a normally released friction brake for holding said carriage against movement, and lever means mounted on said frame to permit said brake to be manually engaged.

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