This invention relates to apparatus for stacking and unstacking longitudinally extending members, as pipe which can be picked up from the ground and loaded on a platform, trailer or base to which the apparatus may be attached. For instance, the apparatus may be attached to a wheeled trailer and the like to be transported from location to location by a prime mover, as a motor vehicle.

The primary object of the invention is to provide such apparatus which may be quickly extended into stacking and unstacking position or which may be retracted to a protective position when the platform, trailer or mechanism carrying the apparatus is to be moved or when such may not be in operation.

It is also another and further object of this invention to provide pipe stacking and unstacking apparatus of this class which is constructed in manner that at all times at least one arm or linkage holds the pipe positioning means in position while at least one arm or linkage supports the pipe.

It is also a further object of this invention to provide pipe stacking and unstacking apparatus of this class which is adaptable to be supported from any number of extendable or retractable positions between the vertical and a lowestmost pickup or delivery position.

It is yet another object of this invention to provide pipe stacking and unstacking apparatus of this class which may be put in operation in a plurality of elevated positions.

It is yet another object of this invention to provide pipe stacking and unstacking apparatus of this class including a pipe contacting shoe which is adjustable as to the angular dimension between the contact elements thereof.

It is yet another further object of this invention to provide pipe stacking and unstacking apparatus of this class with pipe contacting shoe adapted to be extended transversely with relation to the longitudinal axis of the stock.

Other and further objects will be apparent when the specification herein is considered in connection with the drawings, in which:

FIG. 1 is an isometric view of a trailer having one embodiment of pipe stacking and unstacking apparatus mounted thereon at the respective locations indicated therefor;

FIG. 2 is a transverse sectional elevation taken along line 2—2 of FIG. 1;

FIG. 3 is an isometric view of the pipe positioning arm and of the elements associated therewith in moving the pipe positioning means between expanded and retracted positions;

FIG. 4 is a rear view sectional elevation of the engine and pump required to operate the apparatus;

FIG. 5 is a large scale sectional elevational view of the extension means of the pipe contacting shoe shown manually extended in FIG. 2;

FIG. 6 is a transverse sectional elevational view taken through the extension means shown in FIG. 5, when such is in retracted position;

FIG. 7 is an elevational view showing hydraulic cylinder comprising the operational arm of this invention;

FIG. 8 is a sectional elevational view taken through the pipe positioning arm shown in FIG. 3;

FIG. 9 is a view, part in section and substantially diagrammatic, showing valve operation as indicated; the handles and manifolds of the valves indicated being shown to smaller scale in FIG. 1;

FIG. 10 is a transverse sectional view taken along line 10—10 of FIG. 3; and

FIG. 11 is a transverse sectional view taken along line 11—11 of FIG. 3.

Referring in detail to the drawings, in which like reference numerals are assigned to like elements in the various views, a trailer 10 is shown in FIG. 1 as a means on which the pipe stacking and unstacking apparatus generally designated by the reference numeral 11, is carried.

The trailer 10 shown is of the conventional make in which the rear portion is supported by tandem wheels 12 with the forward end being adapted for connection by means of a wheel base, not shown, for operation with a prime mover, as a truck or similar motor vehicle, also not shown.

The apparatus connected at a forward station 13 and a rearward station 14 includes at each station two support bars 15a and 15b which are connected to the side 16 of the trailer bed 17 by means of bolts and nuts, as indicated by reference numeral 18. Such bars 15a, 15b are connected at their lower ends to an angle 19 which extends across the top of the outer ends of two spaced apart channels 20a, 20b with webs outwardly.

The channels 20a, 20b extend transversely across the bed 17 and are connected to the undersides of longitudinal members, not shown, but which comprise the support means by which the trailer bed 17 is supported above the trailer axle 21 and forward support, not shown.

The view of FIG. 3, is supported by FIGS. 10 and 11, and shows an arrangement of apparatus 11, applicable at both the forward station 13 and rearward station 14, as indicated in FIG. 1. FIG. 3, in isometric projection, shows an arm 22 or concentric assembly of cylinders converted to a connection bracket 23 mounted on the inside thereof. The connection bracket 23 comprises two parallel, spaced apart, plates 23a, 23b, connected to the housing included by the arm 22. Opposed linkages 24 are provided and pivotally connected to the respective plates 23a, 23b by pivots 25. As shown in FIG. 10, bolts 102a, 102b extend from within the plates 23a, 23b, outwardly therethrough and through pivot sleeves 25a, 25b, in which the bolts are journaled. Outwardly of the journal sleeves 25a, 25b, the ends of the bolts 102a, 102b, are turned down and threaded outwardly to receive nuts 85a thereon with cotter pins 103 being inserted through the nuts and bolt ends to latch them against coming loose in service, thereby completing the pivots 25. The other ends of the linkages 24 are similarly latched to the channels 20a, 20b by pivots 26 comprising of elements corresponding with those shown in FIG. 10, but with the bolts passing through the webs of the channels 20a, 20b instead of through the plates 23a, 23b.

This same arrangement occurs at both stations 13 and 14, the apparatus 11 at station 14 being disposed rearwardly of the tandem wheels 12 and the axle 21 therefor, visible in FIG. 1, whereas in FIG. 1 the inner ends of the linkage 24 and the pivots 26 therefor are not visible.

Also at each station a linkage 29 is connected at its forward end by a pivot 29" to the plates 23a, 23b and at its rearward end to the axle 34 for rollers 31 which run on a trackway on top of the channels 20a, 20b, as will be hereinbelow described.

Additionally at each station the forward end of a rod 37 from the piston within a hydraulic cylinder 38, is pivotally connected by a pivot 37" to the plates 23a, 23b. This construction is shown in FIG. 10, as applicable to the pivot 29", the construction for the pivot 37" being identical.

In detail, a bolt 35 extends through the plate 23a, and
through a T member 28 to the central leg of which the forward end of the linkage 29 is connected, the bolt having in a cylindrical turned down and threaded outwardly to extend through the plate 23b and to have a nut 85a and cotter pin 103 installed thereon to terminate the assembly. Similarly in the pivot 37, a T member 36 receives a bolt 35 therethrough, while the forward end of the rod 25 is connected to the central leg of the T member 36.

As shown in FIGS. 3, 11, and 15, angle tracks 32a, 32b are welded to the top of the channels 20a, 20b, with the forward ends closed by fixed closures or stops 33a, 33b, and with the rear stops 33c, 33d being removable, as indicated in FIG. 3. The rollers 31 which ride within the tracks 32a, 32b and upon the upper flanges of the channels 20a, 20b, have flanges 31a on the inner side thereof to bear gradually against the upper, inner edges of the angle tracks as spaced by the T member 30 to which the inner end of the linkage 29 is connected.

As shown in FIGS. 3 and 11, the end of the cylinder 38 opposite the rod end has a clevis 39 connected thereto to receive a tubular spacer tube 40 therethrough, and a rod 41 extends through the tube 40 and into the channels 20a, 20b at the opposed ends of the spacer tube 40, to complete the pivot 42 for the inner end of the hydraulic cylinder 38.

As shown in FIG. 1, a pump-reservoir 43 and a gasoline engine 46, as a prime mover, are mounted to be supported by the rear portion of the trailer body below the trailer bed 17. As shown in FIG. 4, the pump-reservoir 43 includes a pump 45 and a reservoir 44 from which the pump draws to discharge through a conduit 45* to deliver operational fluid into a supply manifold 52, as shown in detail in FIG. 9, such manifold comprising part of a fluid control box 53 mounted on an apron 54 at the rear end 26 of the trailer bed 17 shown in FIG. 4.

The gasoline engine 46 includes radiation fins 105, a muffler 106, and a fuel reservoir 107, and has a pulley 47 mounted on its shaft 48 and a pulley belt 49 extends therearound and over a pulley 50 to drive the pump 45. In order to indicate the disposition of the hydraulic fluid in the closed system, a glass sight glass 51 is provided to indicate the fluid level in the reservoir 44.

The pump 45 delivers the hydraulic fluid from the reservoir 44 through the conduit 45* to the fluid supply manifold 52 of a fluid control box 53, as aforesaid; the apron 54 supporting the control box 53, being in turn supported by a U-frame 55 therebelow. The fluid from the supply manifold 52 passes to operate two-way or three-way valves within the control box 53, as indicated in FIG. 1 by their handles 56, and thence by way of conduits 108a, b, c, d, to operate respectively the rear and forward station cylinders 38 and arms 22 to move the arms respectively outwardly and successively upwardly.

Upon reversal of the valves the fluid passes back through return conduits 109a, b, c, and d to return manifold 57, also included by the fluid control box 53, and thence back through a conduit 110 to the reservoir 44.

The arm or cylinder assembly 22, as shown in FIG. 8, comprises an outer housing 55 having outwardly a rectangular or square cross-section. Such housing 58 is bored and underreamed to provide an inlet fluid chamber 59 into the lower end thereof and an opposed, fluid return chamber 60 outwardly thereabove. The cylinder 61 is bored and counterbored to receive an inner cylinder 64 through its bore, with such inner cylinder 64 having a head 65 on the lower end thereof, and with the counterbored space above the head providing a displacement space 71 communicating with the atmosphere through suitable vents 72 provided in the upper end of the cylinder 61 above the counterbore therein. In this manner the head 65 rides slantly in the counterbore of the cylinder 61, as will be hereinbelow described.

The piston 62 has an inner tube 66 threaded therethrough to extend slidably upwardly within the inner cylinder 64 and to leave a fluid compartment 67 therein short of the upper end of such inner cylinder.

On upstroke fluid enters an inlet 68 into the fluid chamber 59 and lifts the piston 62 from the shoulder 63 to slide upwardly within the outer housing 58 whereby the central cylinder 61, the inner cylinder 64, tube 66 and the piston 62 are all lifted together until the top of the piston 62 is at maximum elevation against the outer housing stop shoulder 69. As the inner cylinder 64 is lifted the space above its head 65 vents to the atmosphere as aforesaid.

When the fluid pressure has lifted the cylinders 61 and 64 to the elevation B shown in FIG. 8, the supply of fluid may be shut off and this level will be maintained. However, if fluid pressure continues to be exerted after level B has been reached, it will urge upwardly through the bore 70 in and into the inner tube 66 of the cylinder 64, thereby lifting the inner cylinder 64 to an uppermost position C as shown in FIG. 8. Thus, the piston assembly 22 takes the disposition shown in FIG. 2 and as indicated in dotted lines in FIG. 8. In this case the small bore 70 through the tube 66 acts as a check valve, so that the inner tube 66 will not start moving upwardly until the central cylinder 61 and housing 58 have reached the level B, or optionally a downwardly seating check valve, with or without a downwardly urging spring may be installed normally to close the upper end of the bore 70.

As shown in FIGS. 2, 3, 6 and 8, the upper end 74 of the inner cylinder 64 is threaded, preferably with large threads of large pitch, to receive therein a shoe assembly 75 which actually establishes contact with the objects, as pipe to be handled, as, for instance, to be stacked or unstacked. Such a shoe assembly is shown connected to the upper end 74 of the cylinder 64 in FIGS. 2, 6 and 8, and indicated in dotted lines in FIG. 7.

As shown in assembly in FIG. 2, the shoe assembly 75 comprises a slide assembly 76, and a pipe contacting shoe 77. The shoe 77 includes two transversely spaced apart runners or gussets 78a, 78b which are welded to the under side of the shoe plate 73 which contacts the outer side of the pipe or objects to be handled.

The slide assembly 76 includes a slide housing 83 and the opposed apron or apron plates 82a, 82b which extend downwardly from the opposite sides of the slide housing 83, and provide an arc comprising three equally angular spaced apart adjustment holes 94a, 94b, 95a, 95b, 96a, 96b; centered from opposed center holes 97a, 97b.

Two longitudinally spaced apart spacer tubes 80a and 80b are welded to the gussets 79a, 79b, and extend therebetween, and a pivot bolt 81 extends through the spacer tube 80a and the gussets 79a, 79b, and through the center holes 97a, 97b, with the bolt head bearing on one side against the apron plate 82a. The pivot bolt 81 has its end 84 turned down to extend through the opposed center hole 97b, and a nut 85 threaded on the end of the bolt effects pivotal connection of the shoe 77 and the slide assembly 76, which includes the aprons 82a, 82b and the slide housing 83.

The shoe 77 is selectively positioned by means of a positioning bolt 92 which is shown extending through the adjustment hole 94a in the apron 82a and through the gusset tube 80b with turned down head to pass through the adjustment hole 94b, a nut 85 being threaded onto the end of the bolt 92 to latch the shoe 77 with relation to the slide assembly 76.

The slide housing 83 of the slide assembly 76 includes
opposed slide tracks 86 formed by bending the lower parts of its downwardly extending opposed sides to extend horizontally and rebent upwardly to provide downwardly opposed, parallel slide runners 88 to be received in the side tracks 86 of the slide housing 83. Also the slide runners 88 provide upwardly slide tracks 89 to receive therein slide runners 90 provided on the opposed sides of an outer slide 91 comprising a plate to the sides of which the slide runners 90 are welded.

The outer slide 91 has a stop bar 92a on the inner end thereof to lodge against end stop plates 93a across the opposed slide tracks 89 of the central slide 87 and against a downwardly extending stop bead 98a from the upper, outer end of the central slide 87. Also the central slide 87 has a stop bar 92b on the inner end thereof to lodge against end stop plates 93b across the opposed slide tracks 86 of the slide housing 83, and against a downwardly extending stop bead 98b from the upper, outer end of the central slide 87.

The opposed slide tracks 86 of the slide housing 83 are tied together by a support and connection plate 99 to the under side of which is connected a connection flange 100 to which the outer end 74 of inner cylinder 64 is threadably connected. Optionally, or additionally, or in the alternative, a connection pin or cotter pin 101 may be employed as the means of connecting the slide assembly connection flange 100 to the cylinder assembly inner cylinder outer end 74.

The operation of the invention is controlled by an operator provided just to the rear of the fluid control box 53. When in transit, and while not in operation, the arms 22 are in an inoperative position, with the shoe assemblies 75 removed therefrom. Let it be assumed that the prime mover, not shown, for the trailer 16, has transported the trailer, full-loaded with pipe, to a predetermined location where it may be unloaded with the pipe. Let it further be assumed that the prime mover may be needed in another location during the period the pipe is to be unloaded.

In this case the prime mover, or truck, as the case may be, is unhooked from the trailer 10 and the forward end of the trailer is placed upon the support of a conventional support means, as a central support post, not shown, but which is lowered from a central position below the forward end of the trailer. Then the load of pipe, which stands on the pipe several layers high, as say five layers high, as support by the raised tail gate, forward end of the trailer, and side uprights not shown, is ready to be unloaded.

The side uprights have been removed from between the supporting strap 111 outwardly of the trailer bed sides 16, and the tail gate and forward end lowered.

The shoe assemblies 75 may now be raised to a position sidewardly of the pipe 112 to place them in position 22 to handle the pipe in a proficient manner. This is accomplished by first taking the shoe assemblies 75 from storage, as forward of the apron 54, and threadably connecting them to the outer ends 74 of the inner cylinders 64 of the arms 22. After a shoe assembly 75 has been threaded and latched into position upon an arm 22, then its shoe 77 is so positioned with relation to the slide assembly 76 that the shoe plate 73 extends at a proper angle with relation to the upper surface 113 of the slide housing 83. This may be accomplished by holding the 81b out of the shoes 77 and the shoe plate 73 is tilted at a desired angle with relation to the top surface of the slide housing 83 to accommodate the diameter of the pipe being handled.

Then the bolt 81b is inserted, as shown in FIG. 2, to pass through the adjustment hole 94a in apron 82a, through the gusset tube 80b, and through the adjustment hole 94b in apron 82b, and a nut 85 and cotter pin 103 are installed on the near side end of the bolt 81b, thereby setting the angle at which the pipe contacting plate 73 extends with relation to the slide housing 83, as required by the diameter of the pipe to be handled.

The operator at the rear of the trailer 10 now starts the engine 46 to drive the pump 45 to deliver hydraulic fluid through the conduit 45 to the supply manifold 52. The operator then goes to the fluid control box 53 and turns the handles 56a and 56c to the right, as shown in FIG. 1, thereby shifting valves 114a and 114c to the position shown in FIG. 9, so that fluid from the supply manifold 52 passes through the ports 119 of the valves 114a and 114c and by way of the conduits 108a, 108c to enter the inner ends of the hydraulic cylinders 38 through inlets 115 to urge their pistons 116 outwardly. At the same time fluid from within the cylinder 38 outwardly of the pistons 116 is forced out the return ports 117 to return by way of conduits 109a and 109c to the ports 120 of the valves 114a and 114c, and the return fluid manifold 57 and thence by way of the return conduit 118 to the reservoir 44 of the pump 45.

It is of great importance at this point to give consideration to the particular arrangement of the hydraulic cylinders 38 with relation to the linkages 24, pivoted at each end, and the linkages 29, pivoted at their connection bracket ends and floatable within the tracks 32a, 32b on the other ends thereof. As the piston rods 37 are extended the pivots 37' having the bolts 35 as axles, move through an arcuate course from innermost points as indicated in dotted lines in FIG. 2 to outermost points as shown in full lines in FIGS. 2 and 3. During this course the rods 37 first have a component of thrust mainly active in moving the arms 22 outwardly while a lesser component of thrust supports the arms 22 above the ground. Then the piston rods 37 approach outermost position there is still a lesser component of force directed in supporting the arms while a greater component of force is directed in spacing the arms a predetermined distance from the trailer.

As regards the movement of the pivots 25' of the linkages 24, they at first have limited components which support the arms 20 above the horizontal and another component, initially of substantially small degree, which, in a way, resists the outer movement of the arms 22. Such a component is not very effective in urging the arms 22 outwardly but rather it carries the arms 22 downward as counteracted by whatever vertically supporting components the piston rods 37 may have there in.

As this occurs the linkages 29 support the arms 22 above the horizontal as the wheels 31 ride upon the top of the channels 28a and 28b. As movement continues the linkages 24 change position to relinquish any support functions whatever but simply must be urged outwardly in the same capacity as the rods 37 to position the arms 22 finally in upright positions outwardly of the side of the trailer. Thus, the piston rods 37 in course of movement change from carrying out support functions to carrying out positioning functions. Also, the linkages 24 change from carrying out mainly a support function to carrying out movement resisting functions. On the other hand, the linkages 29 first carry out positioning functions, then carry out substantially no functions and finally shift to carrying out support functions.

As it is not desirable that the linkages should be carrying out functions in opposition, the feature by which the wheels 31 on the inner ends of the linkages 29 may float within a closed track, results in the pots 26 following their paths of change from support functions to positioning functions while the linkages 29, during most of this travel, are exercising no functions in opposition thereto.

Thus, it may be said that the construction of linkages 24 and 29, with relation to their pivots 25' and 29' on the bracket 23 of the arm 22, and with relation to the pivot 26' in the channels 28a and 28b, plus the floatability of the wheels 31 on the channels 28a, 28b, result in com-
ponents of force being either active in the desired direction or inactive through being floatable.

As shown by the pivots 29', 25', and 37' are plotted in FIG. 2, and demonstrate the results obtainable by the arrangement disclosed. Trajectory X shows the travel of the pivot 25' in passing from an initial retracted position of the arm 22, as shown in dotted lines in FIG. 2, to an extended operation position. This trajectory is substantially a semi-circle, and the pivot 25' must travel upon the periphery of a circle having as a center pivot 26'.

Trajectory Y is the trajectory of the pivot 29' which is of acute angle position since this pivot must swing as limited by its fixed elements from the axle 34, and is directly within the limits of horizontal movement of the axle 34 from a forward to a rearward stop position.

The trajectory Y is that of the pivot 37' which must move on a slight arc from its retracted position adjacent the outer end of the hydraulic cylinder 50, when the arm 22 is unsupported in substantially horizontal position beneath the trailer bed, to a position at only a slightly lower elevation when the arm 22 has gone through movement from retracted position with axis horizontal to extended position with axis vertical.

The trajectory Z from the lower, outer corner of the arm 22 in horizontal position to the corresponding upper, outer corner of the arm 22 in vertical position, gives a general graphic idea of the positions which the arm 22 must take responsive to the outward urging of the piston rod 37 as prescribed by the permissible movement of the linkages 24 and 29.

It can be seen that when first urged the outer ends of the arms 22 turn downwardly and in this position it is possible to cut off the flow of fluid by turning the handles 56a, 56c to a neutral position and then extending the arms 22 to position their central cylinders 61 outwardly with the shoe assembly 75 attached thereto and the shoe plate 73 in selective position. Thus it is possible to begin picking up work for stacking a further handling at this position. Thereafter the outward movement of the piston rods 37 can lift the arms to the vertical with the work picked up from the ground carried thereby, when the arms 22 with the shoe assemblies 75 connected to the inner cylinders 64, have been extended to the vertical position, it is only necessary to turn the handles 56a, 56c to neutral thereby locking the pivot rods 37 in full outward position.

Then by turning the handles 56b, 56d may be turned so that fluid from the supply manifold chamber 52 may flow through the ports 119 of the valves 114b and 114d and through the conduits 108b and 108d to the inlets 68 into the cylinder housing 58 of the arms 22 thereby to urge upwardly on the piston heads 62 therewithin. The fluid thus displaced from the fluid chambers 60 will pass out the ports 121 in the cylinder housings 58 and back through the return conduits 109c, 109d to the port 120 in the valves 114b and 114d, to the return manifold 57 and thence by way of the return conduits 118 to the fluid reservoir 45 of the pump-reservoir 43.

As the picking up of pipe from lower levels and depositing it at higher levels continues, row after row of pipe may be built upon the trailer bed 17 as workers on the trailer bed 17 may roll a first deposited pipe 112, as indicated in FIG. 2, to a position across the trailer bed from the loading side. Pipe after pipe may follow successively until a layer is completed as it is evident that the central cylinder 61 and the inner cylinder 64 may be lifted to and locked at various desired elevations simply by turning on and then cutting off the supply of fluid to the arms.

As a succeeding layer of pipe is in staggered relation with regard to a preceding layer, it is evident that the pipes above nests between the two pipes below to either side of its vertical center line, the width of a stack of pipe decreases with each increase of a layer in height. Thus the slide assembly 76 included by each shoe assembly 75 may be employed as the stacks rise and the stack width decreases. As this occurs, it is necessary first to pull out the outer slide 91 by manual operation or by a pull out means, not shown, which may be provided, preferably from the outer end face thereof.

Then as the stack becomes successively higher, or wider if unstacking, the central slide 87 may be pulled out in addition, as needed, as shown in FIG. 2. Optionally, an automatic fluid control arrangement, corresponding with the arrangement by which the cylinders within the arm 22 are extended, may be provided whereby the slides 87 and 91 may be extended by hydraulic operation, thereby requiring the addition of two more valves in the fluid control box 53, two more supply conduits, two more return conduits, with two more control handles therefor.

The return of the apparatus from the fullest extended view of all devices, as shown in full lines in FIG. 2, to fully retracted position, can be quickly accomplished, first by forcing the outer slide 91 back into the inner slide 87. Then by forcing the inner slide 87, with outer slide 91 thereon, back into the slide housing 83. Then by turning the handles 56b and 56d to the right or opposite position from the position shown in FIG. 1, whereby to shift the valve ports 119 and 120 of the valves 114b and 114d to that position where the cylinders 64 are extended, the slide 87 then extends out as the arms 22 go back into the passages 121 thereby to urge downwardly on the upper faces of the pistons 62 to retract the central cylinders 61 from their elevation B to elevation A as the inner cylinders 64 are lowered therewith to elevation B. The inner cylinders 64 thereafter may be lowered to position A, by virtue of their own weight or by virtue of their own weight plus the weight of the shoe assembly 75, if such has not been previously removed. In this regard, it should be noted that a vent 122 must be provided in the head 65 of the inner piston 64 so that compartment 60 pressures are neutralized.

As features of construction, the handles 56a, b, c, d may be moved through different angles than the valves 114a, b, c and d, but handles and valves are conventionally correlated so that handle movement causes the proper valve movement. Also it should be noticed that the engine-pump apparatus is mounted on a base 124 which may be built into the rear end of the trailer below the bed 17.

The invention can readily be employed on a pole type trailer by connecting first station apparatus to the fifth wheel bolster and second station apparatus to the rear of the dolly for the tandem wheels 18.

It is obvious that the apparatus of the invention may handle a vast variety of longitudinally extending objects other than pipe casing, tubing and the like. This is especially true when it is appreciated that the shoe assemblies 75 are adapted to pick-up and handle bundles and other than tubular stock.

Also, it is obvious that the apparatus is susceptible to flexibility in operation since, if desired, the apparatus at one station may be operated at a different elevation than the apparatus at the other station. Also, as the shoe assemblies 75 are adjustable, the dimensions of the objects handled may vary between the two stations without causing difficulty of operation. For instance, tapered or frusto-conical objects may be handled. Accordingly, the degree or extent of transverse extension of the slide elements may be varied between stations as necessary.

Furthermore, it is usually possible to change the longi-
tudinal distance between stations as the only points of connection are those where the bars 15a and 15b are connected by bolts and nuts 18 to the side of the trailer bed and the points of connection, not shown, where the channels 20a and 20b are connected to the frame or structural parts of the trailer which supports the trailer bed.

The invention is thus not limited to the structures hereinabove described and disclosed in the drawings but a variety of other structures and combinations of apparatus may be included, as such may fall within the broad spirit of the invention, and within the broad scope of interpretation claimed for, and merited by the appended claims.

What is claimed is:

1. Apparatus for stacking or unstacking longitudinally extending objects such as pipe and the like and comprising a frame, two longitudinally spaced apart stations on said frame having track means mounted thereon, an arm including a removable and adjustable handling shoe on an end thereof, a hydraulic cylinder pivotally connected at its cylinder end to said frame means and having its piston rod end pivotally connected to said arm, a swing linkage with ends pivotally connected respectively to said arm and to said frame means, and a float linkage pivotally connected at one end to said arm and having anti-friction means on the other end thereof to ride in said track means, said arm being extendable by outer movement of said piston rod from a retracted position under said frame support by said linkages and said rod through a trajectory first supported by said swing linkage and said rod as said float linkage floats, and finally supported by said float linkage as said rod and swing linkage hold arm vertically in pipe lifting position, whereby during most of said trajectory said float linkage has no thrust component opposing rod and swing linkage movement.

2. Apparatus as claimed in claim 1 in which said track means comprises two spaced apart structural members between which said hydraulic cylinder is pivotally mounted, and between which said float linkage extends.

3. Apparatus as claimed in claim 1 in which said track means comprises two spaced apart structural members with said swing linkage including a linkage pivotally mounted outwardly of said respective structural members.

4. Apparatus as claimed in claim 1 in which said arm includes a bracket to which said linkages and said rod are pivotally mounted.

5. Apparatus as claimed in claim 1 in which said track means provide stop means at either end thereof to limit movement of said anti-friction means.

6. Apparatus as claimed in claim 1 in which said arm includes at least two cylinder concentrics therewithin, and in which said apparatus includes hydraulic fluid pressure means to lift said cylinders successively from outer to inner cylinder.

7. Apparatus as claimed in claim 1 in which said handling shoe includes concentric slides therein extendable successively in transverse direction toward the longitudinal axis of said frame.

8. Apparatus as claimed in claim 1 in which said frame comprises a trailer which is selectively disconnectable from the prime mover thereof.

9. Apparatus as claimed in claim 1 in which said frame comprises a trailer which includes means to support the bed thereof in level position when said trailer is disconnected from the prime mover thereof.

10. Apparatus as claimed in claim 1 in which said handling shoe includes concentric slides therein and in which said apparatus includes hydraulic fluid pressure means to extend said slides successively in transverse direction toward the longitudinal axis of said frame.

11. Apparatus as claimed in claim 1 in which said apparatus includes hydraulic pressure fluid means for extending said arm and said rod and located on the rear of said frame outwardly thereof where an operator may control said hydraulic pressure fluid means while looking in the same direction at the pipe being handled.

12. Apparatus as claimed in claim 1 in which said frame comprises a pole type trailer and in which one station is located forwardly adjacent the trailer wheel base frame portion and in which the other station is located rearwardly against the tandem wheel frame portion.

13. Apparatus for handling longitudinally extending objects from place to place comprising at two longitudinally spaced apart stations, frame means mounting track means thereon, an arm including a removable and adjustable handling shoe on an end thereof, a hydraulic cylinder pivotally connected at its cylinder end to said frame means and having its piston rod end pivotally connected to said arm, a swing linkage with ends pivotally connected respectively to said arm and to said frame means, and a float linkage pivotally connected at one end to said arm and having anti-friction means on the other end thereof to ride in said track means, outer movement of said rods extending said arms from horizontally disposed positions under said frame means as supported by said linkages and said rods through a trajectory first supported by said swing linkage and said rod as said float linkage floats, and finally supported by said float linkage as said rod and swing linkage hold arm vertically in handling position, whereby during most of said trajectory said float linkage has no thrust component opposing rod and swing linkage movement.

14. Apparatus for handling longitudinally extending objects and comprising at each of two longitudinally spaced apart stations, frame means mounting track means thereon, an arm including a removable and adjustable handling shoe on an end thereof, a hydraulic cylinder pivotally connected at its cylinder end to said frame means and having its piston rod end pivotally connected to said arm, a swing linkage with ends pivotally connected respectively to said arm and to said frame means, and a float linkage pivotally connected at one end to said arm and having anti-friction means on the other end thereof to ride in said track means, said arm thus being extendable by outer movement of said piston rod from a position under said frame means supported by said linkages and said rod, when supported by said swing linkage and said rod as said float linkage floats, and finally supported by said float linkage as said rod and swing linkage hold arm vertically in handling position, said rod and said swing linkage thereby moving through their trajectories substantially unopposed by any float linkage components of thrust.

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