May 31, 1949. W. A. ROSS 2,471,901

LOAD-LIFTING APPLIANCE

Filed April 25, 1945 2 Sheets-Sheet 1

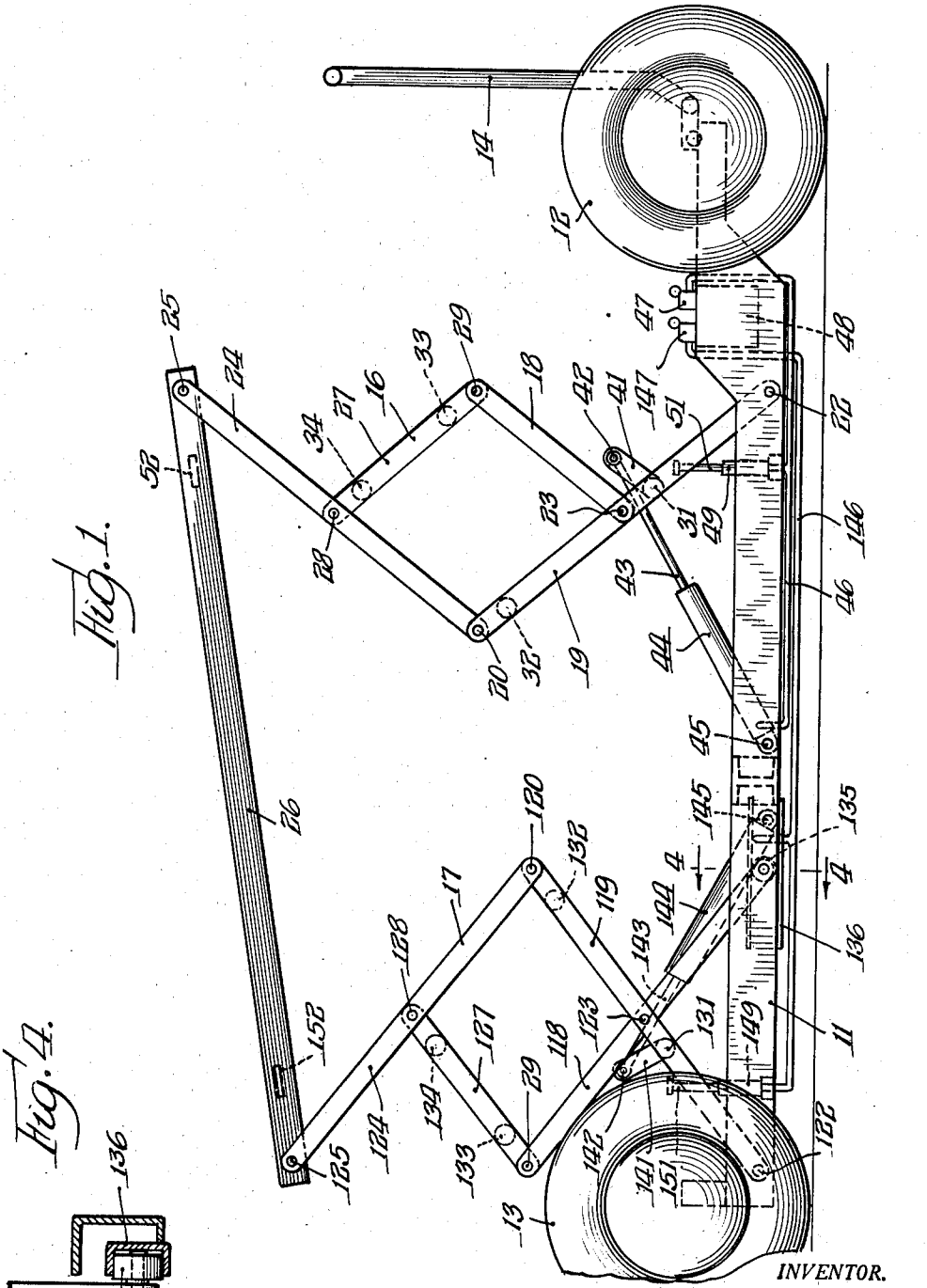

Fig. 1.

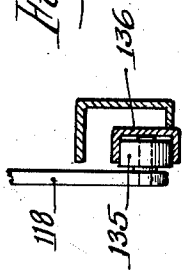

Fig. 4.

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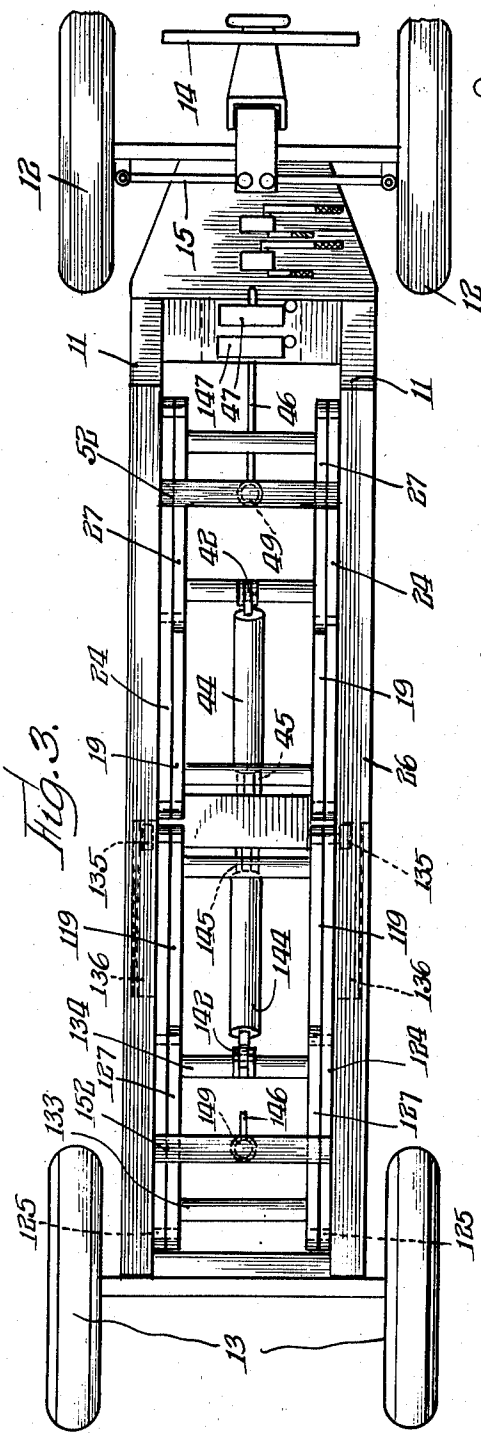

Fig. 3.

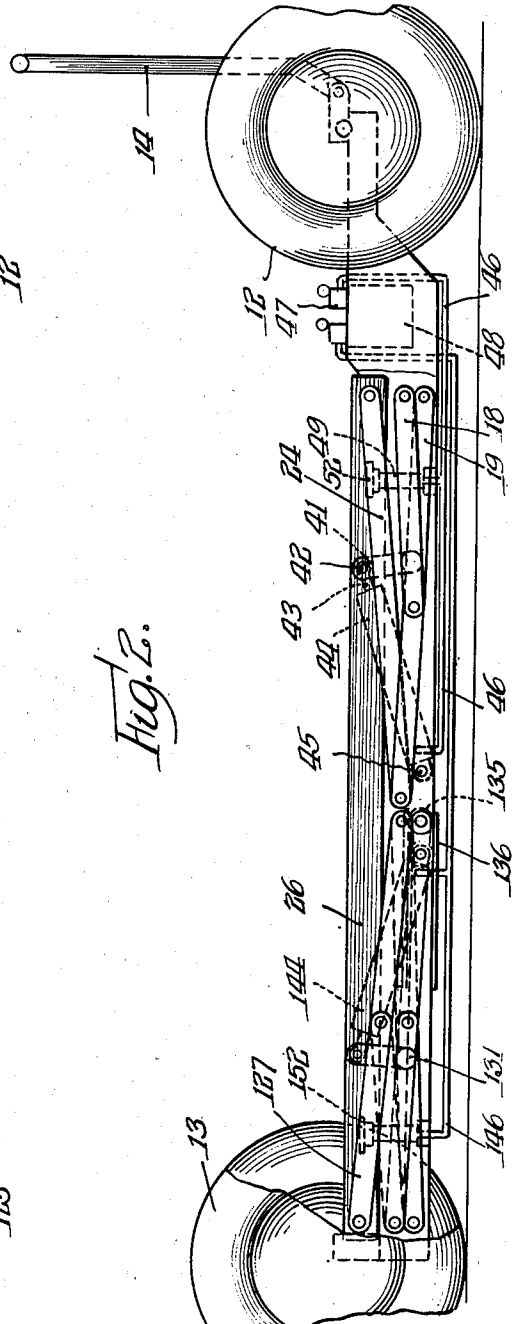

Fig. 2.

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LOAD-LIFTING APPLIANCE

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3 Claims. (Cl. 254—9)

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This invention concerns certain novel structural and functional features in load-lifting appliances, whereby to provide improved constructions involving more excellent operative properties as to efficiency and effectiveness, which desirable characteristics will become apparent from the following detailed description of a present preferred embodiment of the invention, fully illustrated in the accompanying drawings, forming a part of this specification and to which reference should be had, and throughout the views of which, for the sake of simplicity, like reference numerals have been employed to designate the same structural elements or parts.

Among the various objects of this invention may be mentioned the provision of a portable load-lifting device capable of raising a load between very low and very high levels and having a wide range of lift in proportion to its lowest or collapsed height, one of such constructions having a collapsed height of sixteen inches and capable of raising a load to a maximum level of eighty-four inches.

Another aim of the invention is to so arrange the lifting element that either end of a substantially long load carrying carriage can be raised or lowered independently of the opposite end.

A further design of the invention is to provide a means of moving the load carrying carriage and thus the load a substantial amount to either side of its normal central position.

In these drawings:

Figure 1 is a side representation of the new and improved lifting apparatus with the load-elevating saddle or carriage in raised position;

Figure 2 is a similar view with the carriage or saddle in its lowermost relation;

Figure 3 is a plan view of the structure; and

Figure 4 is a fragmentary cross-section on line 4—4 of Figure 1.

By reference to these drawings, it will be perceived that the novel device includes a metal chassis or base-frame 11 mounted on four carrying-wheels 12, 12 and 13, 13, the former being manually steerable by an appropriate pulling handle 14 and suitable connecting operating means 15 (Figure 3).

Twin or duplicate, transversely-registered, four-link pantograph-mechanisms, characterized as a whole 16, 16, are mounted on the front portion of the chassis-frame, and a pair of similar, analogous or comparable four-link linkages 17, 17 are carried by the rear portion of the chassis.

Each of these two side-mechanisms, in lateral register with one another, includes a one-half

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length link 18, and a full length link 19, hinged together at the middle point 23 of the latter link which at its lower end is rockingly mounted at 22 on the corresponding chassis side-bar.

The upper end of each of the two links 19 is hinged at 20 to the lower end of an upper link 24 of the same length pivotally connected at its top end at 25 to the side of the forward portion of an appropriately shaped and formed load-carriage 26 which may be of any suitable design, depending upon the type of load which it is to support and elevate, another link 27, one-half the length of element 24, being hinged to the center of each of the latter at 28 and at 29 to the upper end of the corresponding link 18, all as is most clearly depicted in Figure 1.

The parts of these two laterally-registered linkages are cross-connected together at various points by metal-rods 31, 32, 33 and 34 welded at their opposite ends to the inner faces of the links.

The rear actuating or operating mechanism is of substantially the same form, but of reversed construction, its elements being supplied with the same reference numerals as those employed above supplemented by 100, the material difference between the forward and back structures residing in the fact that each link 118 is of full length and it is supplied with a roller 135 disposed and arranged to travel lengthwise the chassis in a straight, guiding, channel-member 136 mounted fixedly on the inner surface of the corresponding side-bar of the chassis.

Rod 31, uniting the twin-links 19, has fixed thereto a pair of parallel, laterally-outstanding arms 41 between and to which, at 42, is hinged or pivoted the end of a piston-rod 43 whose piston, not shown, is reciprocatory in an elongated cylinder 44 hinged at its lower end at 45 on a cross-member of the chassis, the interior of the lower end portion of such cylinder being connected by a flexible pipe or conduit 46 to a hand-operated oil-pump 47 of known construction at the forward end of the appliance which receives its oil from a supply tank or receptacle 48, such conduit 46 being also joined to the interior of an upright, auxiliary or supplemental, booster cylinder 49 fixedly mounted on the chassis in the center, longitudinal, vertical plane thereof and having a piston, not shown, and its upstanding piston-rod 51 with an enlarged flat head or end.

The rear linkage for the carriage has a comparable hydraulic operating means supplied with like reference numerals plus 100.

As will be readily understood, the principal lift-

ing forces transmitted to the front and rear pantograph-linkages is applied thereto separately or simultaneously through the two hydraulic cylinders 44 and 144, their pistons and piston-rods 43 and 143 and the arms 41 and 141 of the two links 19 and 119, the oil for operating such members being pumped manually from the supply vessel 48 into the cylinders either independently or both at the same time.

For illustration purposes reference will be made to the forward pantograph lifting-mechanism, since the action of the rear one is much the same as that of the front one.

The piston or plunger in cylinder 44 acts through piston-rod 43 at point 42 on the off-set torque-lugs 41 of the front links 19, but, owing to the difficulty encountered at the point of substantially-zero lift when the carriage or saddle 26 is in its lowermost position, as depicted in Figure 2, it has been found to be practical and desirable to employ the associated "booster" cylinder 49 and its piston and piston-rod 51 acting in oil-supply parallel-relation to the main cylinder 44.

Carriage 26 is supplied with two cross-bars 52 and 152, which in the lowest position of the carriage are directly above the upper ends of the two, respective, complementary, vertical cylinders 49 and 149.

Thus, when the upward travel of the carriage is initiated, the two piston-rods 51 and 151 aid the main cylinders and their piston-rods until the limits of travel of the former have been reached at which time the main hydraulic means will be in such angular relation as to be properly effective to complete the lifting movement of the carriage.

Stated somewhat otherwise, the primary use of these "booster" or supplementary, upright, hydraulic means is to aid the "breaking" or starting of the upward motion of the pantograph-linkages when force is applied thereto by the primary hydraulic means at the point 42 or 142.

This advantage is easily recognized by noting in Figure 1 that the maximum lifting force exerted by the oil in cylinder 44 or the maximum torque position around axis 22 is not reached until the axis of such cylinder 45—42 and the force it exerts is perpendicular to the lengthwise dimension of link 19.

The "booster" cylinder 49 applies a direct, vertical component of total lifting force in the early stages of the elevating operation and thus helps to reduce excessive horizontal components in the pantograph-links.

The lowering of the load-carriage is accomplished in the usual manner by means of release-valves of conventional design associated with the pumps and not shown.

As to the action of the pair of rear linkages, the vertical straight line displacement of the carriage points 125, 125 is brought about during the elevation of the rear portion of the carriage by the constraining action of the rollers 135 in their guides 136.

Due to the fact that the corresponding points 25, 25 at the front portion of the carriage are free after a short lift, the carriage may be tilted from the horizontal if desired, this being accomplished by raising the two mechanisms to different heights and, therefore, the paths of the points 25, 25 are substantially that of radii about the two points 125, 125 when the two mechanisms are raised to unequal heights.

Those acquainted with this art will readily understand from this illustration and description that the invention is not necessarily limited to the precise and exact details of structure set forth and that reasonable modifications and changes may be resorted to without departure from the heart and essence of the invention as defined hereinafter and without the loss or sacrifice of any of its material benefits and advantages.

I claim:

1. In a load-lifting appliance having a base, a load-carriage, a carriage elevating-and-lowering mechanism between said base and carriage at each the front and the rear of the carriage each including a pair of transversely registered pantograph-linkages hinged to said base and carriage, the novel combination of an arm rigidly outstanding laterally from each of the lowermost of the links of said linkages hinged to the base, a pair of hydraulic cylinders and their piston-rods hinged on said base facing one another and extending forwardly and rearwardly of the base, means rockingly connecting said piston-rods to the corresponding arms of said links, and means to govern fluid under pressure into and from said cylinders to expand and contract said linkages to elevate and lower said carriage, said arms extending upwardly from their links in the lowermost position of the latter.

2. The novel combination in a load-lifting appliance set forth in claim 1, including in addition in said novel combination erect "booster" hydraulic means on said base directly below said carriage in the lowest position of the latter adapted to assist by coaction with said carriage in the first portion only of the elevation of said carriage, and means to control the admission of fluid into and from said booster hydraulic means.

3. In a load-lifting appliance having a base, a load carriage, a carriage elevating-and-lowering mechanism between said base and carriage at each the front and the rear of the carriage, each including a pair of transversely-registered pantograph-linkages hinged to said base and carriage and hydraulic-means to actuate said pantograph-linkages to elevate and lower said carriage, the novel combination of a plurality of erect booster hydraulic-means on said base directly below said carriage in the lowermost position of the latter adapted to assist in the first portion only of the elevation of said carriage, and means to control the admission of fluid into and from said booster hydraulic-means.

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