Jan. 28, 1930. R. T. ROMINE 1,745,045

PORTABLE CRANE

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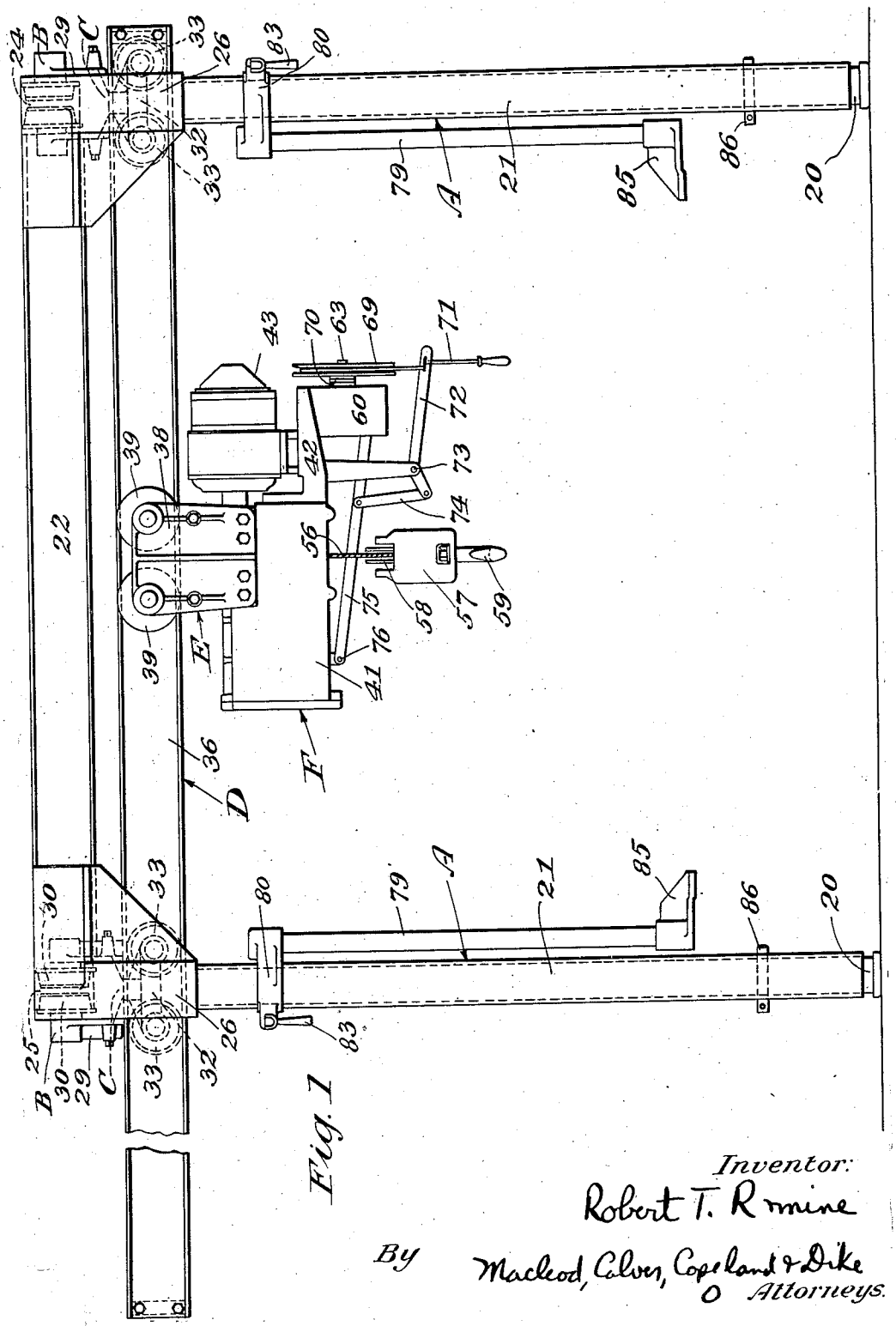


Fig. 1

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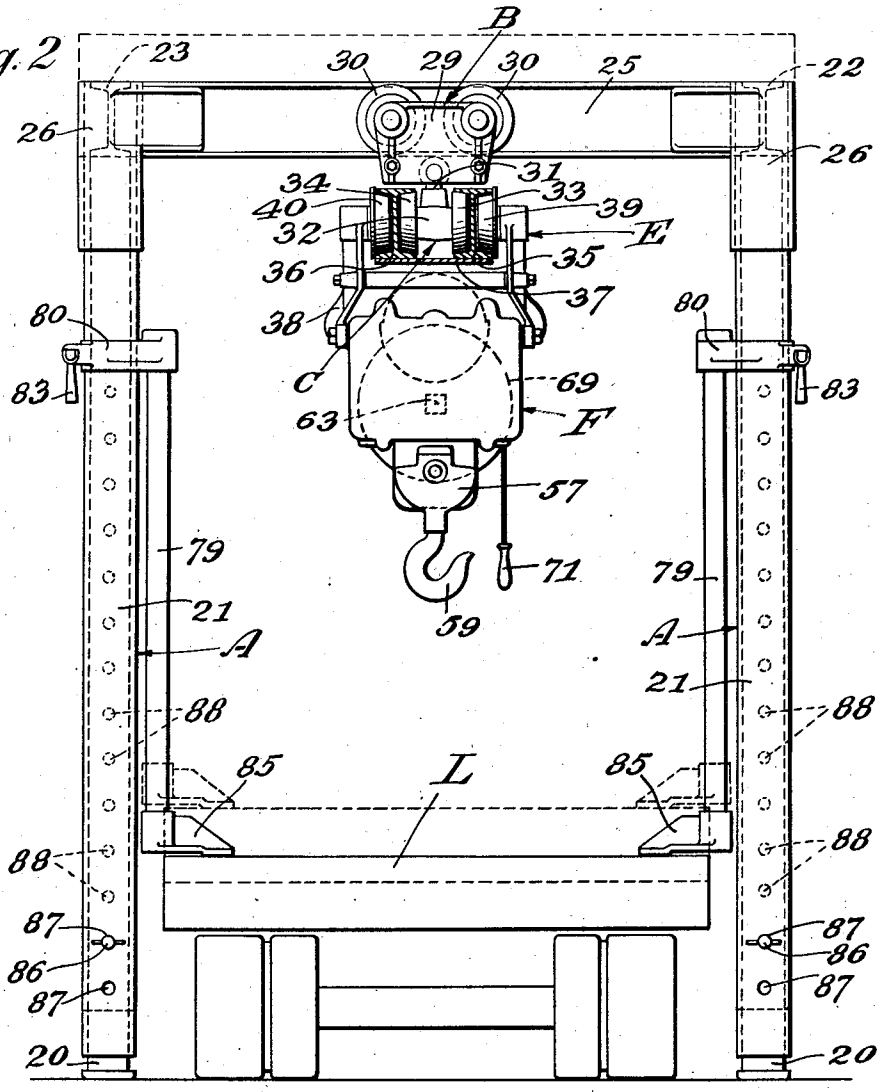
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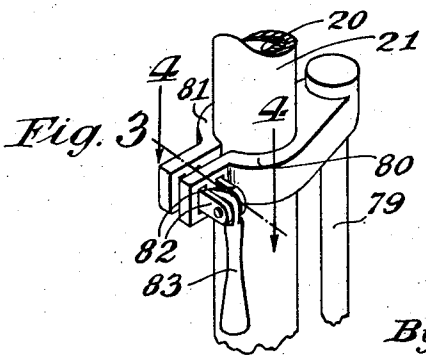
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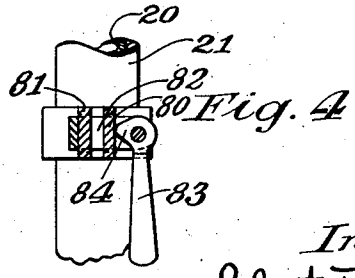
PORTABLE CRANE

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Fig. 2







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Fig. 5

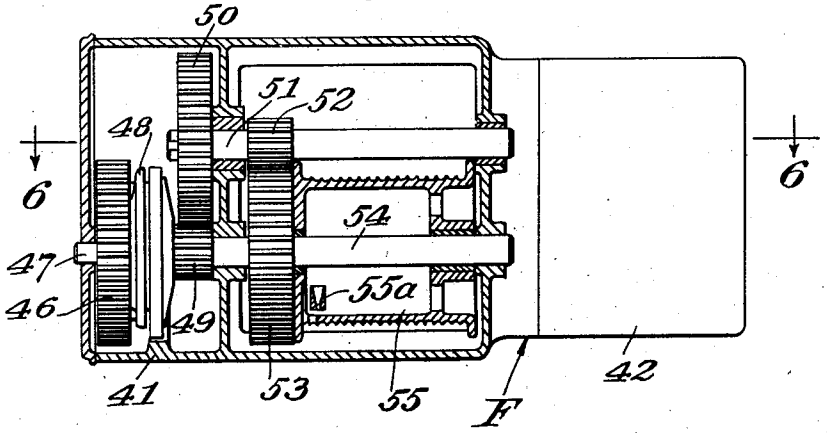


Fig. 6

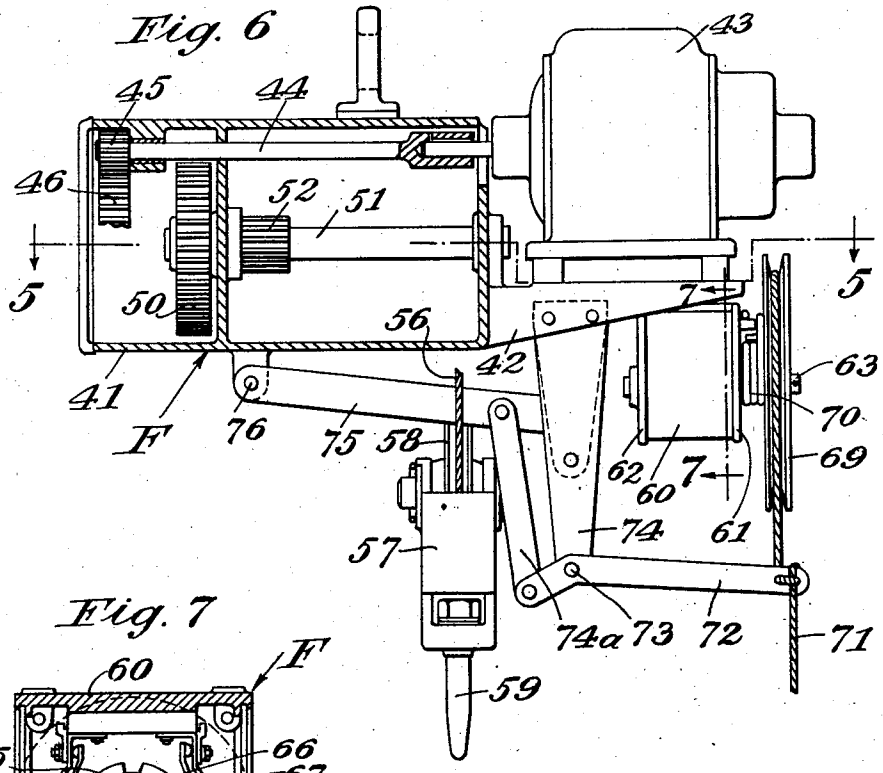
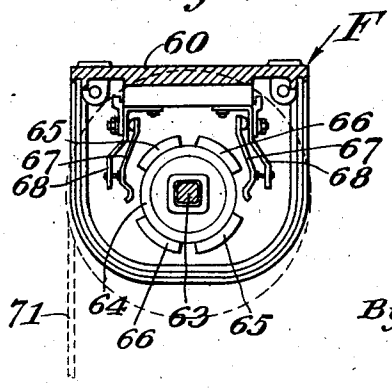


Fig. 7



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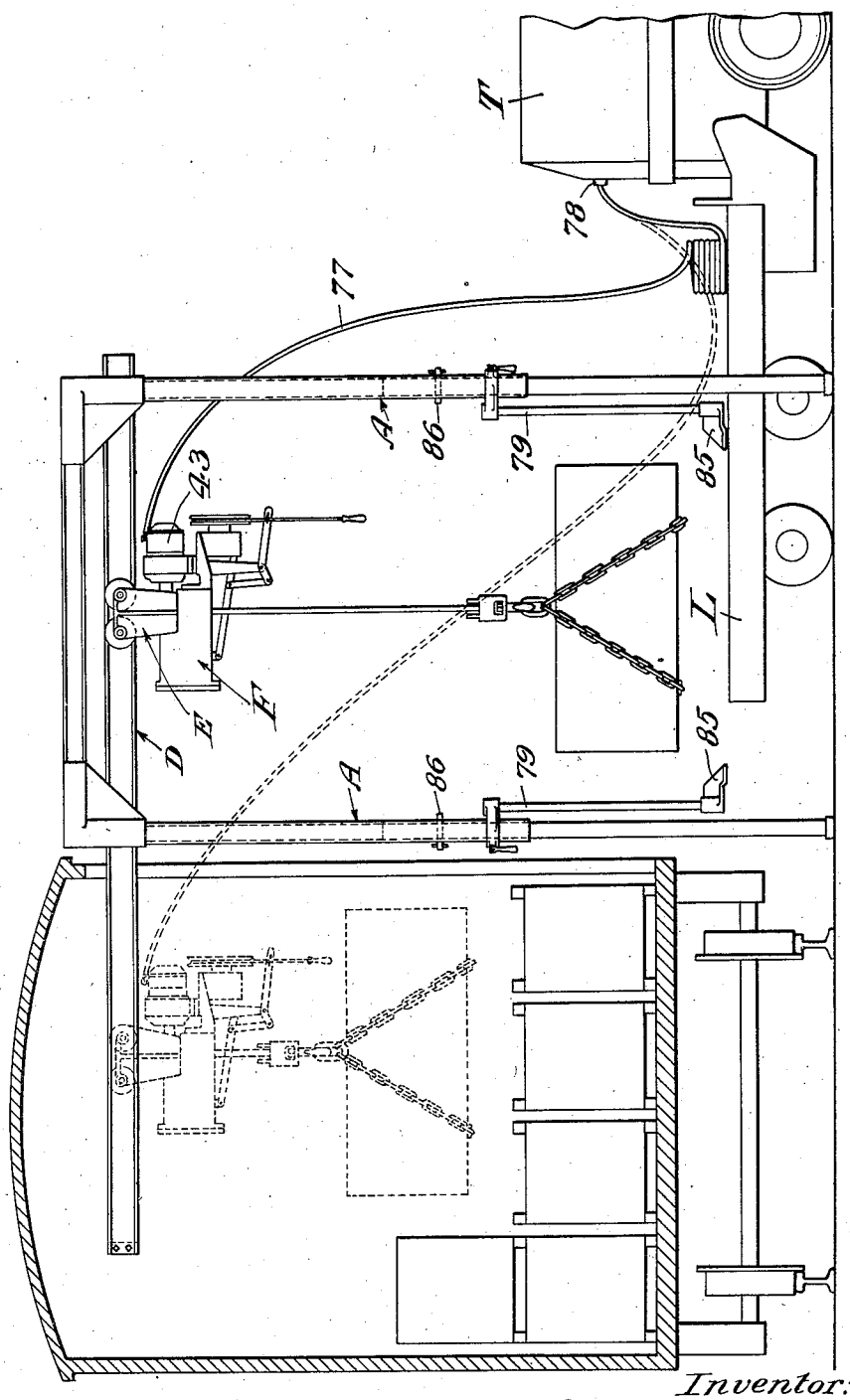
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Fig. 8



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Fig. 9

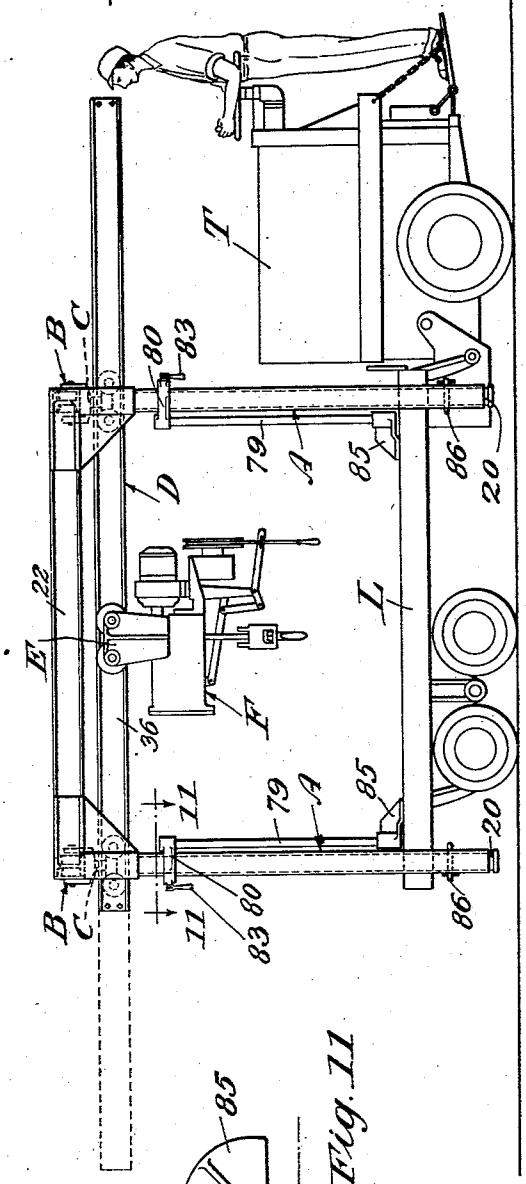


Fig. 10

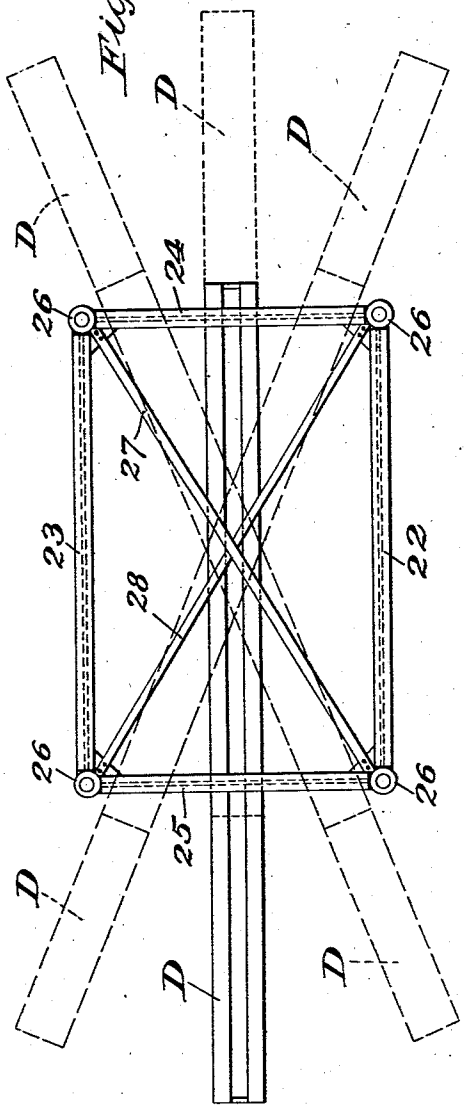
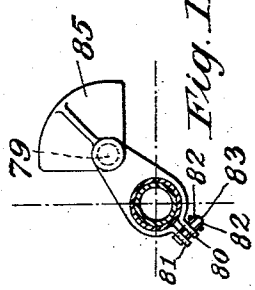


Fig. 11



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UNITED STATES PATENT OFFICE

ROBERT T. ROMINE, OF MOUNT CLEMENS, MICHIGAN

PORTABLE CRANE

Application filed August 14, 1926. Serial No. 129,139.

This invention relates to portable cranes or stack lifters, an object of the invention being to provide a crane capable of handling heavy loads efficiently, while at the same time being compact and strong in construction to enable it to be effectively used in many places where heavy or bulky material is to be handled. The present improved crane or lifter is especially adapted for use in restricted spaces or areas, or where the material is relatively inaccessible, such as in a freight car or ship, and where it is impossible or impracticable to employ the usual overhead cranes or power cranes of the well known swinging boom type.

An important object and purpose of the invention is to provide a crane or stack lifter of relatively light and compact construction capable of being used in restricted areas, and adapted to be positioned to straddle the load as well as the load carrying or receiving support, such for instance as a portable platform or the lift platform of an elevating truck, and in which the crane may be transported from point to point by means of the lift truck.

A further object is to provide a portable crane having means for picking up or hoisting a load between its supports, carrying the load and depositing it at various points beyond the crane, and vice versa, and in which the crane is so constructed that when carried on a lift truck it will occupy substantially no greater space or area than the truck itself, thereby enabling the crane to be used not only in any place large enough for the lift truck, but also in conjunction with the lift truck, or in conjunction with a portable load platform carried on the lift truck platform.

Another object of this invention is to provide a compact crane which may be transported on a lift truck, and in which the height of the crane may be varied by means of the lift truck thereby increasing its range of effective use, and also enabling the crane to be transported through relatively low doorways while permitting its height to be adjusted to the desired extent wherever greater overhead room is available.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification, wherein like references designate corresponding parts in the several views.

Fig. 1 is a side elevation of a crane or stack lifter embodying my invention.

Fig. 2 is an end elevation of the construction shown in Fig. 1, showing the truck beneath the overhead frame.

Fig. 3 is a detail view showing the lifting leg and its locking and adjusting means.

Fig. 4 is a detail section taken on line 4—4 of Fig. 3.

Fig. 5 is a sectional plan view taken on lines 5—5 of Fig. 6.

Fig. 6 is a sectional elevation taken on lines 6—6 of Fig. 5.

Fig. 7 is a sectional view taken on lines 7—7 of Fig. 6.

Fig. 8 illustrates one use of the crane in loading or unloading a freight car and showing a modified construction of framework for the crane.

Fig. 9 is a side elevation illustrating the crane when transported on the lift platform of an industrial truck.

Fig. 10 is a diagrammatical plan view illustrating various positions of the traversing hoist beam of the crane.

Fig. 11 is a detail section taken on lines 11—11 of Fig. 9 showing the normal position of one of the lifting dogs.

Before explaining in detail the present invention, and the method or mode of operation embodied therein, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practised or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention beyond the terms of the several claims hereto appended or the requirements of the prior art.

The framework of the portable crane or stack lifter comprises in the present instance four vertically extending legs or supports A,

each comprising a stationary inner leg or column 20 which may be formed of tubular steel, or other structural material. Each of the supports A in the present form also comprises an outer leg or column 21, which may be of tubular steel, and telescoped over the inner column 20, forming therewith slidable extensible sections adapted to be adjusted with relation to each other as hereinafter described. At their upper ends the legs are rigidly joined, through the medium of corner ties 26, to opposite longitudinal frame members 22 and 23 and to transverse end frame members 24 and 25. Each of these frame members is of structural steel in the form of an I-beam. The upper corners of the framework, as shown in Fig. 10, are diagonally braced and united by means of tie bars 27 and 28.

Each transverse I-beam 24 and 25 at opposite ends of the framework forms a track for a trolley B, and in the present instance the trolleys B are identical in construction and hence a description of one suffices for both. Each trolley B comprises a suitable carrier block 29 adapted to embrace or straddle opposite sides of the I-beam 24 or 25, and journalled in the upper part of the carrier block are two pairs of trolley wheels 30, one pair at each side of the I-beam, and located between the flanges of the beam to travel freely on the lower flange.

Swiveled at 31 to the lower part of each carrier block 29 and suspended therefrom is a trolley C, comprising a carrier block 32 in which are journalled two laterally spaced pairs of trolley wheels 33 and 34. A horizontal traversing hoist beam or boom D is hung on the sets of trolley wheels 33, 34 of the front and rear trolleys C. This boom comprises a pair of spaced parallel I-beams 35 and 36 rigidly secured together along the bottom thereof by suitable tie plates 37, see Figure 2. As will be seen from Fig. 2 the inner flanges of the I-beam 35 embrace and travel on the trolley wheels 33, and in the same manner the I-beam 36 cooperates with the trolley wheels 34.

From the foregoing it will be noted that the hoist beam D extends beneath the upper frame of the crane and between the side supports thereof. This beam is capable of a longitudinal traversing movement beyond opposite ends of the framework by virtue of the trolleys C. Since the latter are suspended from and swiveled to the upper trolleys B, the hoist beam D is capable of traversing movement laterally and also a swinging movement diagonally of the framework, as shown in Fig. 10.

A hoisting mechanism is suspended from the beam D by means of a trolley E to permit the mechanism to travel independently on the beam. This trolley comprises a carrier block 38 constructed as shown in Figure 2 so as to straddle opposite outer sides of the I-beams 35 and 36. Journalled in the upper part of this carrier block are two pairs of trolley wheels 39 and 40 cooperating with the outer flanges of the I-beams 35 and 36 respectively, and adapted to travel freely thereover.

Rigidly bolted to the lower part of the carrier block 38 and supported beneath the hoist beam D is a hoisting or load lifting mechanism, generally designated at F. This hoisting unit is capable of independent travel over the beam D from one end thereof to the other and in any position of the beam. Suitable stops are provided at the extreme ends of the beam D to limit the travel of the trolley E carrying the hoisting unit.

Referring to Figures 5, 6 and 7 the hoisting unit F comprises a casing or housing 41 carrying the hoisting drum and gear reduction mechanism. Projecting from this casing is a bracket 42 upon which is mounted an electric motor 43. Coupled to the armature shaft of this motor is a shaft 44 mounted in the upper part of the housing 41 and carrying at its outer end a spur gear 45 meshing with a large spur gear 46 secured to a short shaft 47 mounted in the lower part of the casing. The gear 46 drives a gear 49 through a suitable friction brake 48, and the gear 49 meshes with a large spur gear 50 secured to the end of a shaft 51 journalled in the casing. The shaft 51 carries a small spur gear 52 meshing with a large spur gear 53 secured to the drum shaft 54. This shaft carries a hoisting drum 55 upon which is adapted to be spirally wound and unwound a hoisting cable 56, one end of which is anchored to the casing 41 and the other end secured to the drum at 55^a. The cable 56 cooperates with a sheave or pulley wheel 58 carried by a sheave block 57, and swiveled to the lower end of the latter is a hook 59.

The electric motor 43 is controlled by means of mechanism carried by a controller box or casing 60 bolted to the bracket 42. The front and rear ends of this box or casing are closed by means of covers 61 and 62 bolted thereto. Mounted in suitable bearings in the cover plates 61 and 62 is a controller shaft 63 carrying a drum 64 provided around its periphery with suitable segments 65 and 66. Upon rotation of the drum 64 the segments are adapted to be moved at predetermined times into contact with contact fingers 67 carried by suitable spring holders 68.

On the outer end of the controller shaft is secured a controller or operating wheel 69 grooved around its periphery to receive an operating rope 71 for rotating the wheel. A tension spring 70 is interposed between the wheel 69 and cover 61 and secured thereto at its ends so as to control the normal position of the wheel and hence the controller

segments and contacts 65—67. The operating rope 71 is connected to the outer end of a lever 72 fulcrumed at 73 to a bracket 74 secured to the bracket 42. The opposite end of the lever 72 is connected by means of a link 74ª to a contact lever 75 pivoted at 76 to a lug projecting from the bottom of the casing 41. This contact lever extends into position above the sheave block 57 so as to be engaged thereby when the block with its load has been hoisted to a predetermined height.

With the sheave block 57 in the position shown in Figure 6, and the controller in neutral position shown in Figure 7, when the operator grasps the rope 71 and pulls downwardly on it, the controller wheel will be turned or rotated counterclockwise against the tension of spring 70, moving the segments 65 into contact with the fingers 67. This will result in operating the motor so as to unwind the cable 56 from drum 55, and lowering the sheave block 57. After the operator has connected the sheave hook 59 with the bundle or load to be hoisted, upon releasing the operating rope 71, the recoil action of spring 70 will result in rotating wheel 69 clockwise, bringing segments 66 into contact with fingers 67. The motor will then be reversed, rotating drum 55 so as to wind the cable 56, and elevating the sheave block with its load. When however the sheave block 57 strikes at the upper end of its travel the lever 75, the outer end of lever 72 will be depressed, resulting in pulling down on rope 71 sufficiently to bring the controller into neutral position with all the segments 65 and 66 held out of contact with fingers 67. At this time the operating wheel 69 is held in this neutral position against the tension of spring 70. Thus it will be seen that the tendency of spring 70 at all times is to rotate wheel 69 and controller shaft 63 into position to bring segments 66 in contact with fingers 67 and thereby operating the motor to hoist the sheave block 57. The sheave block, however, at its highest hoisted position will normally maintain the motor disconnected through engagement with the contact lever 75.

The crane is especially adapted for use in conjunction with an electric lift truck T having a lift or load elevating platform L. This truck is preferably constructed in the manner shown and described in my copending application, Serial Number 118,584, filed June 25, 1926. The legs or supports A of the crane are spaced apart to permit the lift platform L of the truck to be introduced between any pair of legs at any side of the crane, thereby greatly facilitating the positioning of the crane in restricted spaces and enabling trucks to be introduced at any side for loading and unloading and without interfering with each other. The truck T carries power mechanism for raising and lowering the platform L and for driving the rear wheels thereof, and also a battery for operating this mechanism. In the present invention the motor 43 of the hoisting mechanism is operated from the battery of the electric truck T, power being conducted thereto by means of a cable 77 of required length which may be plugged into the truck battery at 78, see Figure 8.

Each leg or support A of the crane carries a lifting leg or device for the purpose of enabling the crane to be lifted and transported on the platform of the lift truck. Each of these devices comprises in the present embodiment a vertical leg portion 79 clamped at its upper end to one of the outer columns 21 by means of a pair of spring jaws 80 and 81 embracing the column. The jaw 81 (see Figures 3, 4 and 11) is provided with a pair of inwardly projecting ears 82 extending freely through a pair of slots in the end of the jaw 80. A lever 83 is pivoted between the ears 82 and has a cam projection or eccentric 84 adapted when moved into the position shown in Figure 4 to force the jaws together and frictionally clamp the leg 79 to the column 21. When the lever 83 is swung up to release the cam 84, the jaws will automatically spring apart, permitting the leg to be readily adjusted vertically or horizontally on the column 21. Each lifting leg 79 carries at its lower end a projecting foot or dog 85, segmental in construction as shown in Figure 11, and adapted to project over the platform L of the lift truck when introduced between the supports of the crane.

Referring to Figure 2 and also Figure 9, when the truck platform has been introduced between the legs of the crane and beneath the dogs 85, as shown in full lines in Figure 2, the truck platform may be elevated through its own mechanism thereby picking up the entire crane as shown in Figure 9. The crane may be constructed with all four legs equally spaced, as in Figure 8, so that the dogs 85 will project over the truck platform when the latter is introduced at any of the four sides of the crane. It will be noted from Figure 11 that each dog 85 is segmental or fan-shaped, and the axis thereof is diagonal to the framework, thus enabling the dog normally to overlie the truck platform when the latter is introduced at either the sides or the ends of the crane.

It will be noted that the supports or legs A of the crane are extensible, which construction enables the height of the crane to be varied, and this is accomplished in accordance with the present invention by means of the lift truck. Referring to Figures 2 and 8, each pair of telescoping columns 20 and 21 may be locked by means of a pin 86 extending through either of a pair of holes 87 in the outer column and through any one of a vertical series of holes 88 in the inner column 20. The

truck platform L is introduced beneath the dogs 85, the pins 86 then removed, and upon elevating the truck platform from the full line position of Figure 2 to the dotted line position the outer columns or legs 21 will be elevated relatively to the inner members 20 which remain on the ground. The locking pins are then replaced and the truck platform lowered below the dogs 85. The crane may be raised successive steps in height by repeating the foregoing operation, first loosening the clamps 80—81 and adjusting the dogs downwardly into engagement with the truck platform. The crane may thus be adjusted or elevated in height step by step, by means of the lift truck, from its lowest position shown in Figure 9 to a position of considerable height as shown in Figure 8.

It will be particularly noted that the crane or stack lifter normally occupies substantially the same space as is required for the electric truck. Thus when the crane is carried on the truck platform from point to point, as shown in Figure 9, the framework occupies but slightly more than the area of the truck platform, and the traversing beam D may be moved rearwardly so as to overlie the truck housing in rear of the lift platform L. In addition the height of the crane when carried on the truck is not substantially greater than the height of an operator of average size when standing on the rear platform of the truck. The crane may be operated therefore in practically any place accessible to the electric lift truck, may be propelled directly through the doorway of a freight car, and operated within the car to load or unload material. Where the railroad tracks are on the same level as the loading dock, and the floor of the car above the dock, the crane may be extended in height as shown in Figure 8 and material loaded or unloaded in the manner shown, this being but illustrative of one of the many ways of operating the crane particularly in conjunction with the lift truck.

What I claim is:

1. In a portable crane the combination of an overhead frame having depending spaced pairs of supports, mechanism carried by the overhead frame for lifting or supporting a load between the supports, means adapted to cooperate with a lift truck when introduced between a pair of said supports for enabling the truck to lift and carry the crane, and means adapted to be adjusted on said supports independently of the load supporting mechanism for positioning and fixing said last mentioned means in an operative position.

2. In a portable crane the combination of an overhead frame having depending spaced pairs of supports, mechanism carried by the overhead frame for lifting or supporting a load between the supports, and device adapted to project over the elevating platform of a lift truck when the latter is introduced between a pair of said supports for enabling the truck to lift and carry the crane on its elevating platform, and means adjustable relative to the supports for supporting said devices and fixing the same in an operative position, said means being adjustable independently of the load supporting mechanism.

3. In a portable crane the combination of a framework including an overhead frame having depending spaced pairs of supports, mechanism carried by the framework for lifting or supporting a load between said supports, said supports comprising extensible sections, and means carried by the supports exteriorly thereof and adapted to project over a lifting device for enabling the latter to extend said sections.

4. In a portable crane the combination of a framework including an overhead frame having depending spaced supports, mechanism carried by the framework for lifting or supporting a load, said supports comprising extensible sections, and means carried by the supports and adapted to project over the elevating platform of a lift truck when the latter is introduced between said supports for enabling the truck to extend said sections.

5. In a portable crane the combination of a framework comprising legs at opposite sides forming an unobstructed passageway therebetween in two transverse directions, an upper frame connecting the upper portions of said legs, hoisting mechanism carried by the framework for lifting or lowering a load, and means carried by the legs and adjustable in different positions to permit a lift truck to be introduced between different pairs of legs to lift and transport the crane.

6. In a portable crane the combination of an upper transverse frame having depending spaced supports, a laterally and longitudinally movable and swinging hoist beam carried by said frame, and hoisting mechanism carried by said beam.

7. In a portable crane the combination of an upper transverse frame having depending spaced supports, a laterally and longitudinally movable and swinging hoist beam carried by said frame, and a hoist device mounted on said beam for independent travel thereover.

8. In a portable crane the combination of a framework including an overhead frame having depending spaced supports, a hoist beam beneath said frame, hoist mechanism carried by the beam, and means for supporting said beam for longitudinal travel, lateral travel, and swinging movement.

9. In a portable crane the combination of a framework having side supports spaced to permit a lift truck platform to be straddled by said supports, a hoist boom carried by the framework for movement into position to overlie the truck in rear of the truck platform when in position between said supports, hoist

mechanism carried by the boom, and means for supporting the crane on said platform.

10. In a portable crane the combination of a framework, a horizontal beam extending beneath the top of said framework, means at opposite ends of the framework for supporting said beam for longitudinal and lateral traversing movement, and hoist mechanism supported on the beam for independent travel thereon.

11. In a portable crane the combination of a framework, a horizontal beam extending beneath the upper part of said framework, a trolley at each end of the framework and supporting the beam for lateral movement, a trolley swiveled to each of said first named trolleys and supporting the beam for longitudinal and swinging movement, hoist mechanism, and a trolley mounted on said beam and supporting the hoist mechanism for independent travel on said beam.

12. In a portable crane, an arched frame having depending spaced supports, hoisting mechanism carried by the frame, said supports comprising outer and inner relatively extensible sections, and means cooperating with the outer sections for permitting a lift truck to extend the outer sections relatively to the inner sections.

13. A portable crane and power driven lift truck combination, comprising a lift truck having an upright housing at one end and a forwardly projecting low elevating platform, an arched frame having supports to straddle said platform, shiftable means cooperating with the supports and platform to permit the crane to be transported as a unit with the truck, a sliding hoist boom longer than the arched frame and supported thereby for movement into position to overlie said housing, and a hoist unit supported for independent travel on the hoist boom between the supports and above said platform.

14. A portable crane and power driven lift truck combination, comprising a lift truck having an upright housing at one end and a forwardly projecting low elevating platform, an arched frame having supports to straddle said platform, shiftable means cooperating with the supports and platform to permit the crane to be transported as a unit with the truck, a sliding hoist boom supported for movement within the arched frame and above said truck platform, and a hoist unit independently movable along the boom above the truck platform.

15. A portable crane and power driven lift truck combination, comprising a lift truck having an upright housing at one end and a forwardly projecting low elevating platform, an arched frame having supports to straddle said platform, shiftable means cooperating with the supports and platform to permit the crane to be transported as a unit with the truck, a hoist boom independently shiftable within the arched frame longitudinally and laterally relative thereto, and a hoist unit independently shiftable along said boom.

In testimony whereof I affix my signature.

ROBERT T. ROMINE.