April 25, 1933. F. BOYER 1,905,434

HOPPER CRANE OF THE MOVABLE AND TRAVELING TYPE

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Fig. 1

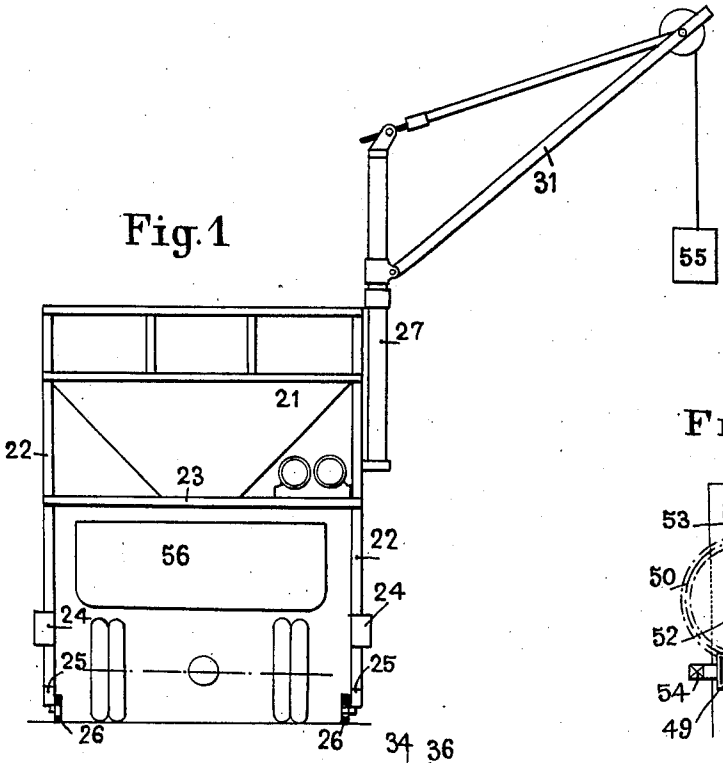


Fig. 4

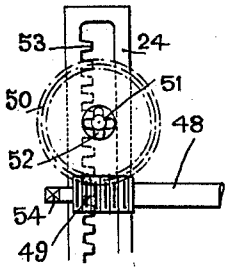
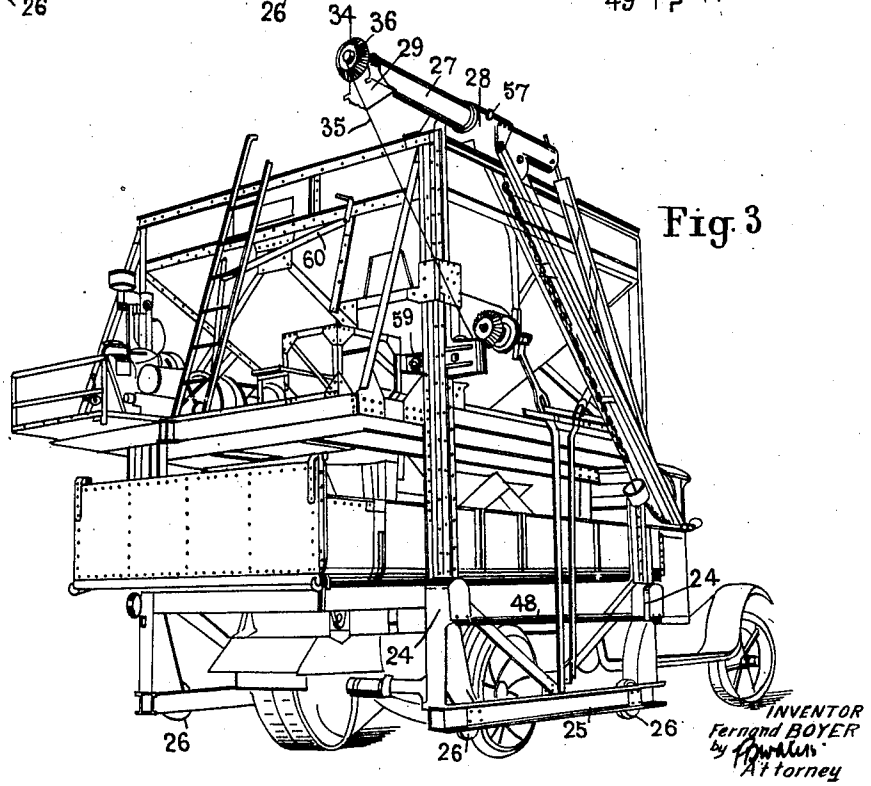


Fig. 3



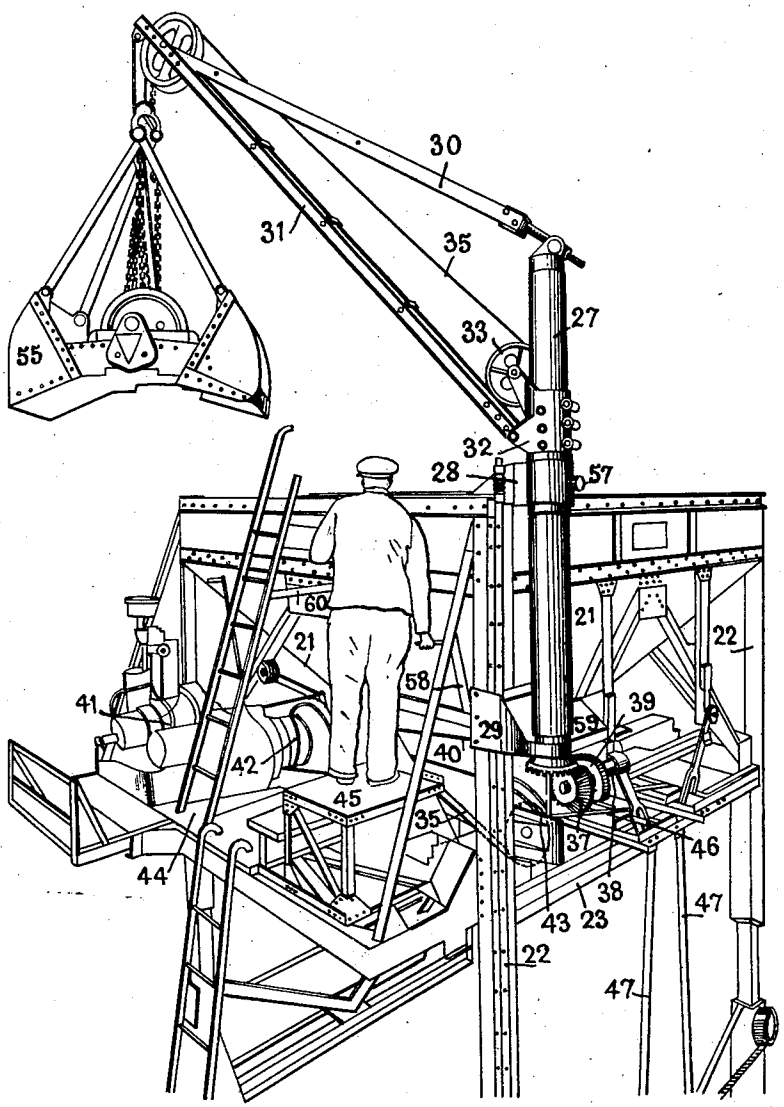
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HOPPER CRANE OF THE MOVABLE AND TRAVELING TYPE

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Fig. 2



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Fig. 5

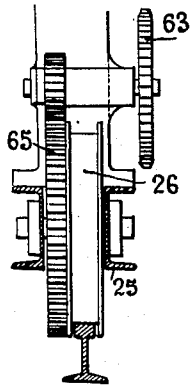


Fig. 6

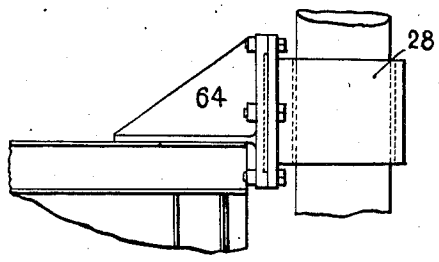


Fig. 7

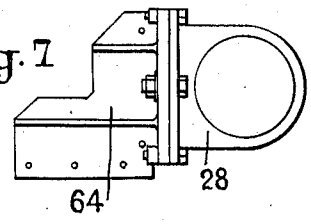
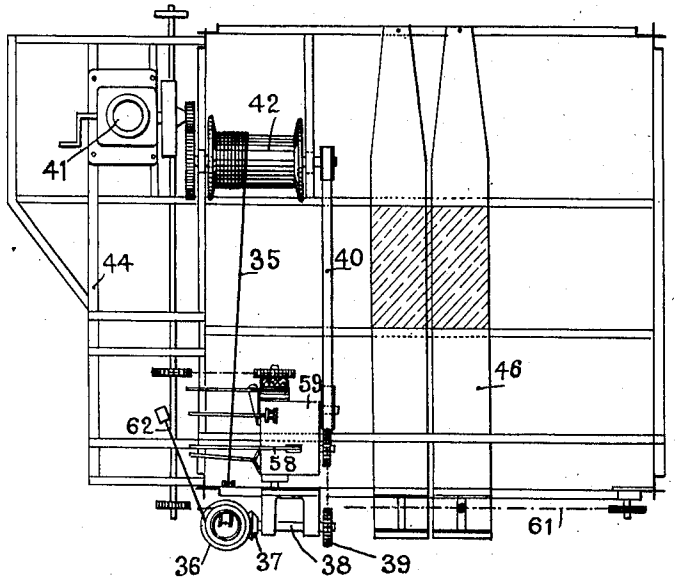


Fig. 9



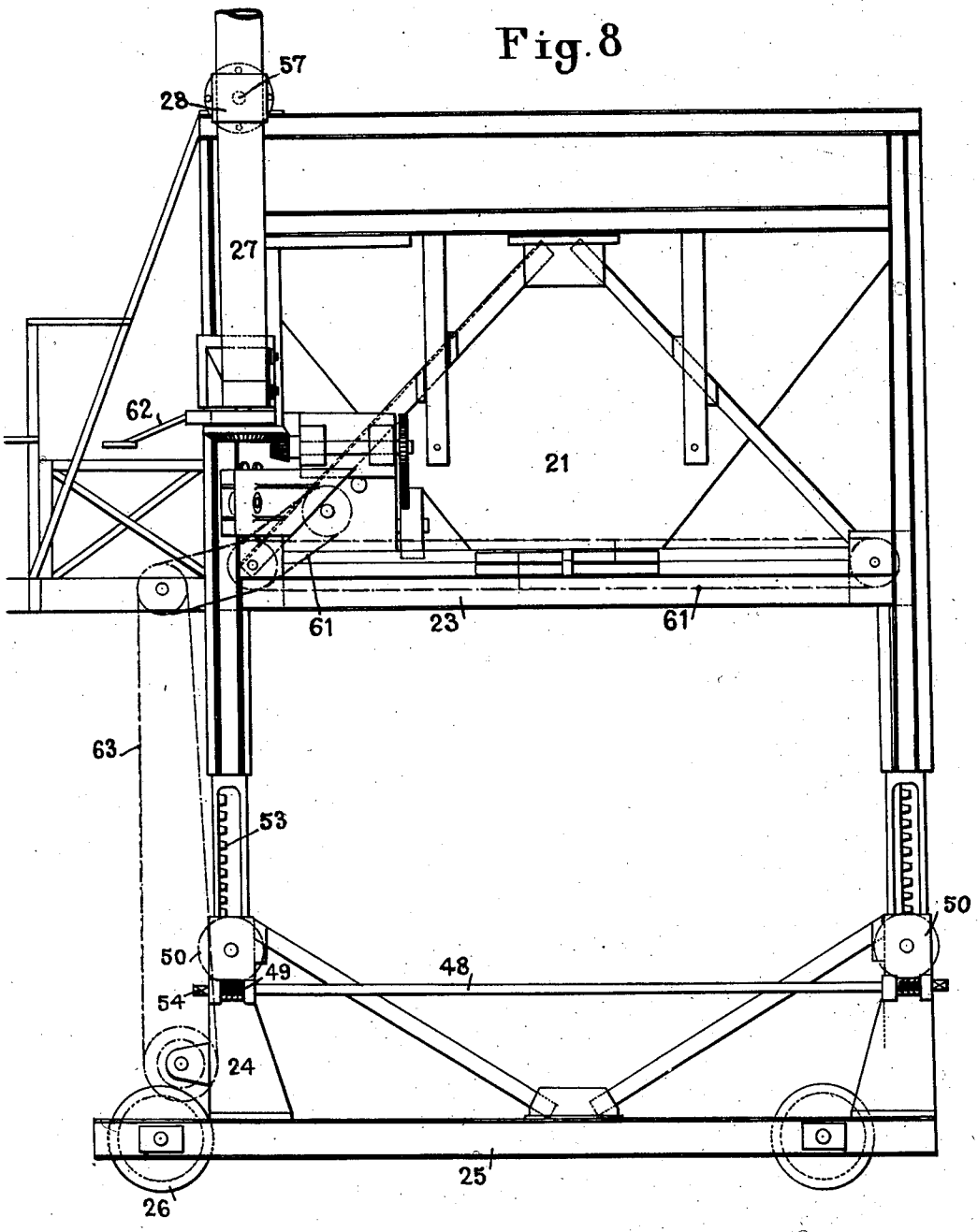
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HOPPER CRANE OF THE MOVABLE AND TRAVELING TYPE

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Fig. 8



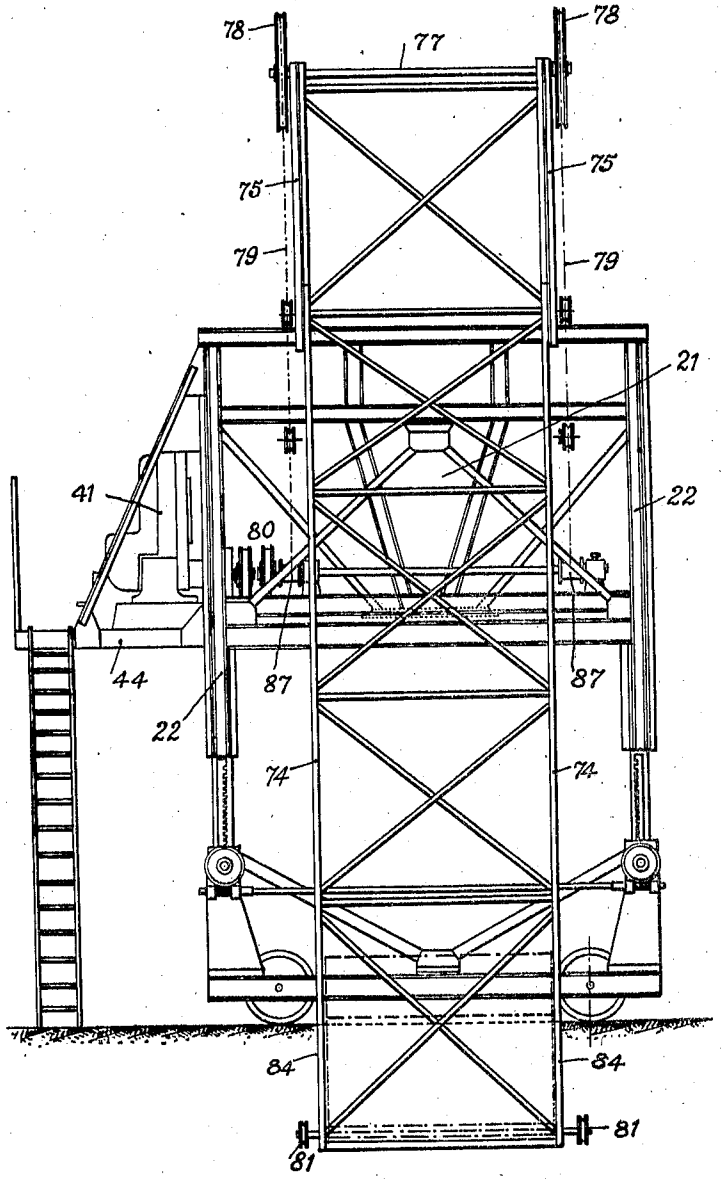
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HOPPER CRANE OF THE MOVABLE AND TRAVELING TYPE

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Fig. 10



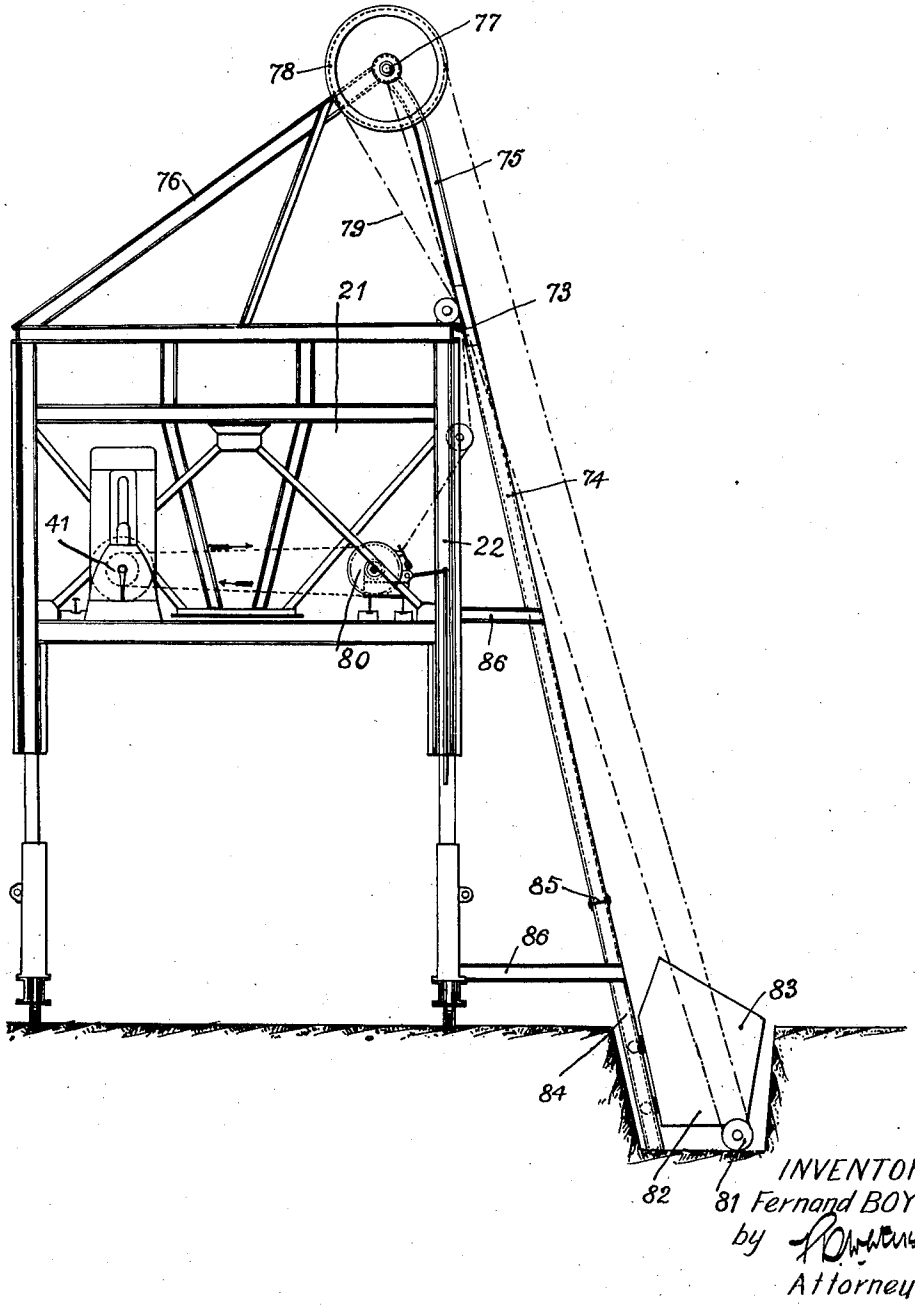
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HOPPER CRANE OF THE MOVABLE AND TRAVELING TYPE

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Fig. 11

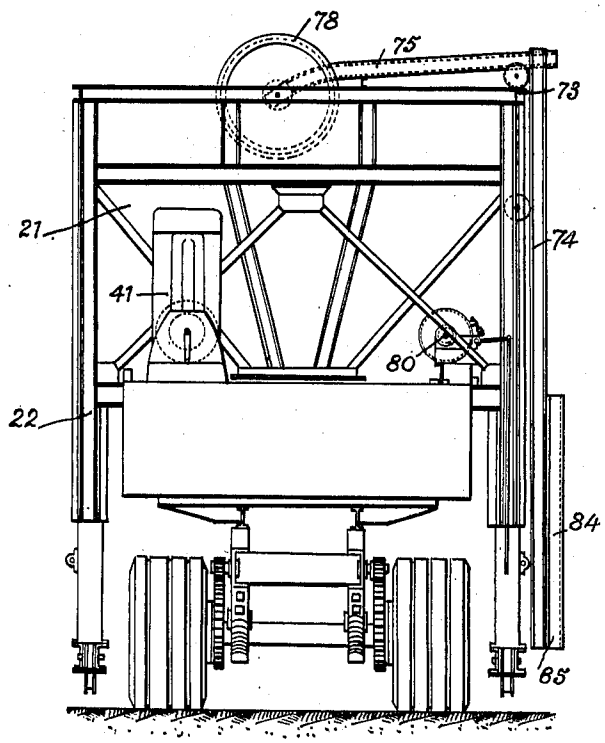


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HOPPER CRANE OF THE MOVABLE AND TRAVELING TYPE

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Fig. 12



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1,905,434

UNITED STATES PATENT OFFICE

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HOPPER CRANE OF THE MOVABLE AND TRAVELING TYPE

Application filed July 19, 1930, Serial No. 469,134, and in France May 1, 1930.

The present invention relates to a loading and handling apparatus which includes a combined hopper and crane of the movable and traveling type adapted for all classes, of earthwork, loading, unloading and the like, which may for instance be employed for unloading in piles, on wagons or boats, and for rapid loading upon motor lorries, tipping carts, wagons, spoil cars or other vehicles.

According to one form of construction the hopper comprises a crane which is pivoted directly to the frame of the hopper, said hopper thus forming its balancing counterweight, and said crane may be brought down upon the hopper for purposes of travel, thus affording an apparatus of minimum size which can be readily transported as a whole, and is very steady when in the operating position, whilst the use of the hopper as a counterweight, permits to reduce the size and weight of the whole apparatus to a minimum.

The said movable and traveling hopper-crane may also be combined with a device for operating a crane bucket or grab, and said device, comprising for instance the guide, the traction elements such as cables, chains or the like, and the crane grab, can be brought down upon the hopper, thus reducing the size of the apparatus, while forming an outfit adapted for all necessities of use, the grab lifting device as well as the crane being removably mounted on the grab.

In the accompanying drawings which show various constructional forms of portable apparatus according to the invention:

Fig. 1 is a diagrammatic general view of the apparatus including a folding crane permanently associated therewith.

Fig. 2 is a perspective view of a constructional form of the apparatus shown in Fig. 1, in the working position.

Fig. 3 is a like view of the same apparatus mounted on a motor lorry in order to constitute a combined traveling apparatus.

Fig. 4 is a detail view of a prop supporting the whole apparatus.

Fig. 5 is a detail view of a roller.

Figs. 6 and 7 are details of the pivoting support of the crane.

Figs. 8 and 9 are diagrammatic elevational and plan views showing the mechanical means for the horizontal movement and for the operating of the unloading devices.

Fig. 10 is a general elevational view of a modification, comprising a lifting device in the working position.

Fig. 11 is a corresponding side view.

Fig. 12 is a view analogous to Fig. 11, but showing the parts in the road travel position, the apparatus being placed on the motor lorry which is to transport it.

In the construction shown in Figs. 1 to 9, the hopper 21 consists of a sheet metal recipient having the form of a truncated pyramid or the like which is mounted upon four reinforced uprights 22, suitably spaced apart by cross-pieces 23, which also support an intermediate flooring upon which the operating and controlling parts are mounted.

Each upright 22 is mounted on a powerful jack 24 of the rack and pinion type (Figs. 3 and 4), and the two jacks 24 positioned on the respective sides of the crane are connected together by substantial base plates 25 which may consist of section iron members and support the axles of rollers 25 (Fig. 5) operating upon suitable rails (not shown). The uprights are thus, in effect telescoping and extensible.

The pillar 27 of a crane is mounted upon one side of the hopper, and said pillar may consist of a steel tube resting upon the crane at its upper part by means of a pivoting support 28 (Figs. 6 and 7) mounted upon an axle 57 pivotally mounted in a base plate 64 and adapted to asume the vertical position shown in Fig. 2 or the horizontal position as shown in Fig. 3. The said pillar 27 rests at its bottom part upon a step bearing 29 provided with roller or ball bearings and permanently secured to the corresponding upright 22 by bolts which are readily accessible.

Upon the upper end of the pillar 27 is adjustably mounted the end of the tension member of the jib 30 whose overhung beam 31 is pivoted to a collar 32 mounted on the said pillar, and said collar has also mounted

thereon the axle of the supporting pulley 33 of the crane.

At the lower end of the pillar 27 is mounted a hollow shaft 34 traversed by the lifting chain or cable 35 and carrying a bevel gear ring 36 which in the operating position shown in Fig. 2 engages a pinion 37 keyed to the shaft 38 which is driven by a roller chain and a pinion 39, the same being provided with suitable friction disks.

The power of the motor 41 which may be an internal combustion or electric motor, or the like, is in the first place imparted to the winch 42 by gearing which is covered by a sheet metal protecting member. A pulley mounted on the shaft of the winch drives—by a belt 40—a speed reduction and reversing device which is contained in a casing 59 secured to the main frame of the hopper.

A lever 58 controls the rotation of the crane pillar 27 and a lever 60 controls the winch 42.

The said motor and its operating devices are mounted on the control platform 44 which is preferably positioned upon the cross-pieces 23 and has a sufficient size to allow the operation of the different devices, and upon said platform may be mounted a stool 45 enabling the operator to more readily observe the functioning of the crane.

However, the platform is mounted below the hopper edge so that the latter is clear and free of any possible obstructions to the swiveling and operation of the crane.

The levers 47 facilitate the operating of the arms 46 by which the hopper can be opened by means of sliding doors. Said devices are known per se and can be operated from the ground or from the platform 44 by the clutch action of a controlling device 61 connected to the mechanism 59.

Suitable driving gear 63 (Fig. 8) may be mounted between the mechanism contained in the casing 59 and the supporting rollers 26, for the control of the straight motion of the combined hopper and crane, by the use of gear wheels 65 keyed to the axle of said rollers (Fig. 5). Like gear can be interposed between the mechanism and the device controlling the jacks 24 which comprise as shown in Figs. 4 and 8 a shaft 48 common to both jacks mounted on each side of the crane and provided with a worm 49 engaging a worm wheel 50 keyed to the shaft 51 of a pinion 52 cooperating with the rack 53 of the corresponding jack. On each shaft 48 is a square end 54 upon which may be fitted a handle for manual control.

The crane is operated by the motor 41 in the known manner by a clutch connection between the motor and the drum 42 for raising the crane bucket 55 which may be a grab as herein represented, or by connecting the motor to the shaft 38 for the rotation of the pillar 27 by which the load is displaced. A brake is obviously provided in order to hold the load in the fixed position during the rotation of the motor, also employing a pedal brake 62 to hold the said pillar when the crane bucket rises or descends.

The casing of the said hopper 21 has a certain size in order that it may serve as a storage recipient, and thus when the material is to be handled it is simply necessary to bring below the crane bucket a wagon 56 in the position shown in Fig. 1, then opening the lower part of the bucket for the automatic loading of the wagon, and the filling of the hopper continues even while the wagon is being loaded.

In order to transport the whole apparatus, by a motor wagon or the like, the crane is first lowered into the position shown in Fig. 3; for this purpose the bolts maintaining the step bearing 29 and the bolts of the support 28 are removed, and said support is turned on its axle 57 in such manner as to bring the pillar 27 of the crane into the horizontal position, and the end of the jib is held in place by a suitable support, not shown.

A motor wagon of sufficient size is then brought under the hopper in the position shown in Fig. 1, and the jacks 24 are then operated in order to lower the hopper casing 21 until it rests upon the wagon in the position shown in Fig. 3, the lower ends of the vertical members being suitably raised or telescoped (Fig. 3) in order to avoid all obstacles on or contact with the ground.

To place the apparatus in the position of service, the motor wagon carrying the hopper and crane device as shown in Fig. 3 is brought into the proper position at the working point, and the jacks 24 are operated in the contrary direction whereby to extend the corner posts downward in order to bring the rollers 26 into contact with the ground or preferably with the rails adapted to receive them, and the operator continues to act upon said jacks in such manner as to raise the hopper recipient 21 and to disengage it from the wagon which supports it. The pillar 27 of the crane is then brought into the position shown in Fig. 2, and it is held in place by securing the step bearing 29 and support 28 to the main frame of the hopper, and the whole is now ready to operate in the usual manner.

The hopper 21 may have any shape and capacity, and the crane may have any desired disposition.

In the modification shown in Figs. 10 to 12, the hopper with its lifting device are alone represented, the crane having been removed to avoid complication in the drawings.

A frame 74 is pivotally mounted on an axle 73 provided at the upper part of the hopper frame, and herein the said frame consists

of two parallel side pieces, suitably cross-braced, which extend above the hopper 21—22 by means of arms 25 provided with pivoted props 76 and supporting a transverse axle 77 having at the ends the respective pulleys 78. On each pulley is mounted a suitable traction element such as a cable, chain or the like 79 which is wound upon a winch 80 driven by the motor 41 of the apparatus through suitable gear.

Each cable 79 whereof one end is attached to said axle 77, proceeds upon a pulley 81 mounted on a lifting frame 62 carrying a pivoting bucket 83, known per se.

In order to receive the said lifting frame 82, an appendage 84 has been provided at the lower end of the frame 74, it being suitably pivoted at 85, and the whole device consisting of the frame 74 and the extension pieces 84—75 is provided with spacing props 86, properly removable or pivoted.

The operation is as follows, with the parts in the position shown in Figs. 10 and 11: The bucket 83 mounted on the lifting frame 82 is raised by the cables 79 wound upon the pair of drums 87 of the winch 80, and the descent of the bucket can be regulated by a suitable brake, known per se; the winch can be controlled from the platform 44 of the hopper-crane apparatus, or from the ground by suitable gear, not shown.

For traveling on the ground, the operator moves aside the props 86, then folds the lower extension piece 84 upon the frame 74, and turns the upper extension piece 75 after moving aside its props 76, and the whole device thus has the position shown in Fig. 12, so that it can be readily transported.

The device comprising the lifting bucket might be mounted on the hopper beside the crane, or the crane and the said bucket may be positioned on the respective sides of the hopper. As shown in the drawings either the lifting bucket alone, or the crane alone, can be mounted on the frame of the hopper.

The frame which serves to guide the bucket 83 and its lifting frame 82 may have any desired length, and may consist of sections which are suitably pivoted together, and may rest during the functioning upon the hopper frame or on the walls of the trenches or like excavations for which the grab is used.

The said invention can be employed in public works, and chiefly for earthwork, and for all other purposes, such for instance as the loading and unloading of all material contained in wagons or cars, or piled on the ground, or contained in any suitable container.

Variations may be resorted to and parts may be used without others within the scope of the invention.

What I claim is:

1. A portable and self contained loading and handling apparatus which may be condensed into compact condition, including the combination, with a supporting frame surmounted by a hopper and a folding crane permanently associated with said hopper, of extensible posts upon said frame having telescoping members which may be extended downward whereby to support said hopper at such distance from the ground as to afford clearance for vehicles to pass freely beneath the same, and which members may also be telescoped upward to lower said apparatus as a whole upon a truck for transportation.

2. A portable and self contained loading and handling apparatus which may be condensed into compact condition, including the combination, with a supporting frame surmounted by a hopper and a folding crane permanently associated with said hopper, said crane being pivotally secured adjacent to said hopper so as to normally extend above the level of the upper edge of the latter in operative position, of an operating platform fixed intermediate the lower portions of said frame and the level of the upper edge of said hopper in order to simultaneously afford appropriate location for machinery to operate said crane and clearance below said platform and hopper for unobstructed passage of vehicles therebeneath and also unobstructed field of operation for said crane above the upper edge of said hopper.

3. A portable and self contained loading and handling apparatus which may be condensed into compact condition, including the combination, with a supporting frame surmounted by a hopper and a folding crane permanently associated with said hopper, of means for rendering said apparatus portable which includes a pillar for said crane horizontally pivoted to said hopper so as to provide for swinging down said crane in situ, means for erecting said pillar in situ about its horizontal pivot and means for retaining said crane in position for use, there being means for operating said crane when erected into operative position.

4. A portable and self contained loading and handling apparatus which may be condensed into compact condition, including the combination, with a supporting frame surmounted by a hopper and a folding crane permanently associated with said hopper, of means for rendering said apparatus portable which includes a pillar for said crane swingably connected to said hopper so as to provide for swinging down said crane in situ, means for swinging up and thereby erecting said pillar, means for retaining said crane in position for use, there being means for operating said crane when erected into operative position, extensible posts upon said frame having telescoping members which may be extended downward whereby to support said hopper at such distance from the ground as to afford clearance for vehicles to pass freely beneath

the same, and which members may also be telescoped upward to lower said apparatus as a whole upon a truck for transportation.

5. In a self contained portable and combined loading and handling apparatus having a hopper and a crane permanently associated with said hopper, a horizontally pivoted hollow pillar forming part of said crane, means for erecting said pillar and retaining said crane in position for use, and means for operating said crane when erected into operative position, including a shaft within the pillar of said crane, driving machinery stationarily located in association with said frame and having a driving gear whose axis is eccentric with respect to the pivotal mounting of said pillar, and a gear secured to said shaft normally meshing with said driving gear in erected position of the crane and which gear is disengaged from said driving gear when said crane is folded down out of use.

6. A portable and self contained loading and handling apparatus which may be condensed into compact condition, including the combination, with a supporting frame surmounted by a hopper and a folding crane permanently associated with said hopper, of a pillar for said crane horizontally pivoted to one side of said hopper so as to swingably associate the entire crane with the hopper and provide for the crane to be swung into idle collapsed position beside said hopper and said frame generally below the level of the upper edge thereof and also to be swung into erected operative position so as to extend a distance above said upper edge and provide a free and unobstructed field above the latter edge for the operation and swiveling of said crane while utilizing said entire frame and hopper as a counterweight during operation thereof.

7. A portable and self contained loading and handling apparatus which may be condensed into compact condition, including the combination, with a supporting frame having downwardly extending rigid members and surmounted by a hopper fixed thereon, and a crane associated with said hopper, of a pivotal mounting upon said hopper for said crane providing for folding down the latter into idle position, downwardly extensible members associated with said rigid members and upwardly rectractible to lower said apparatus as a whole upon a vehicle for transportation thereof, and an operating platform secured to said frame intermediate the lower extremities of said extensible members and the level of the upper edge of said hopper in order to simultaneously afford appropriate location for driving machinery for operating said crane when in erected operative position and clearance beneath said platform for unobstructed passage of vehicles thereunder as well as a free and unobstructed field above the upper edge of said hopper for operation and swiveling of said crane.

In testimony whereof I have hereunto set my hand at Paris this eighth day of July, 1930.

FERNAND BOYER.