

May 30, 1933.

H. C. MILLER ET AL

1,911,918

LIFTING AND LOWERING APPARATUS

Filed June 6, 1929

4 Sheets-Sheet 1

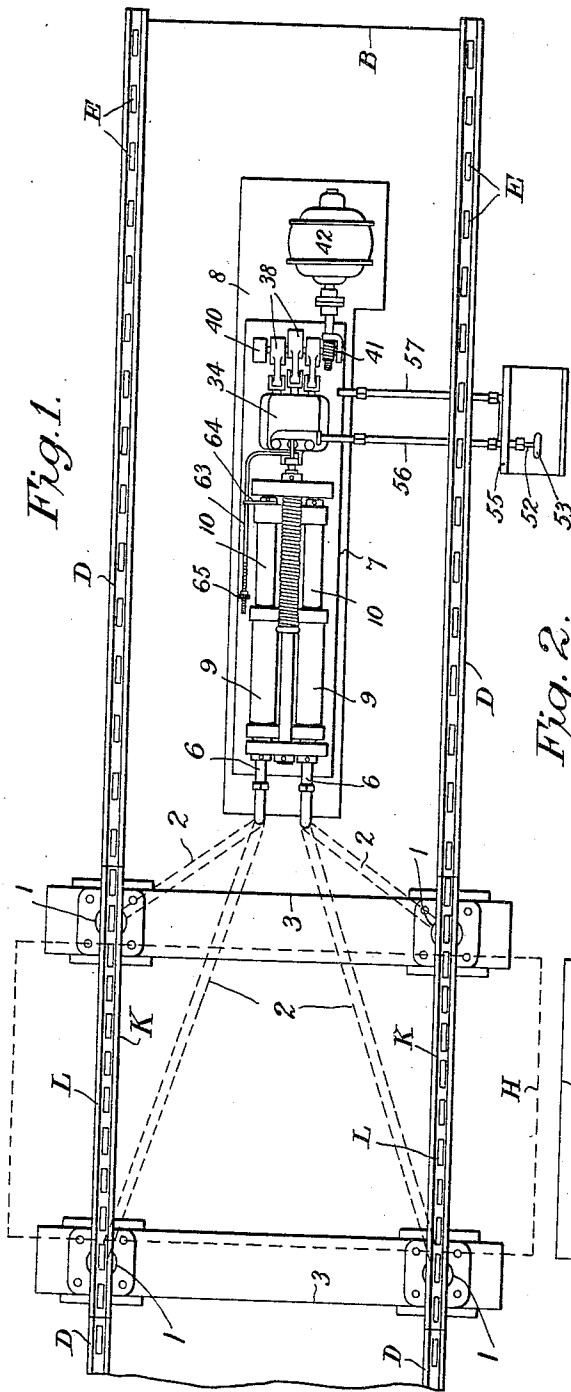
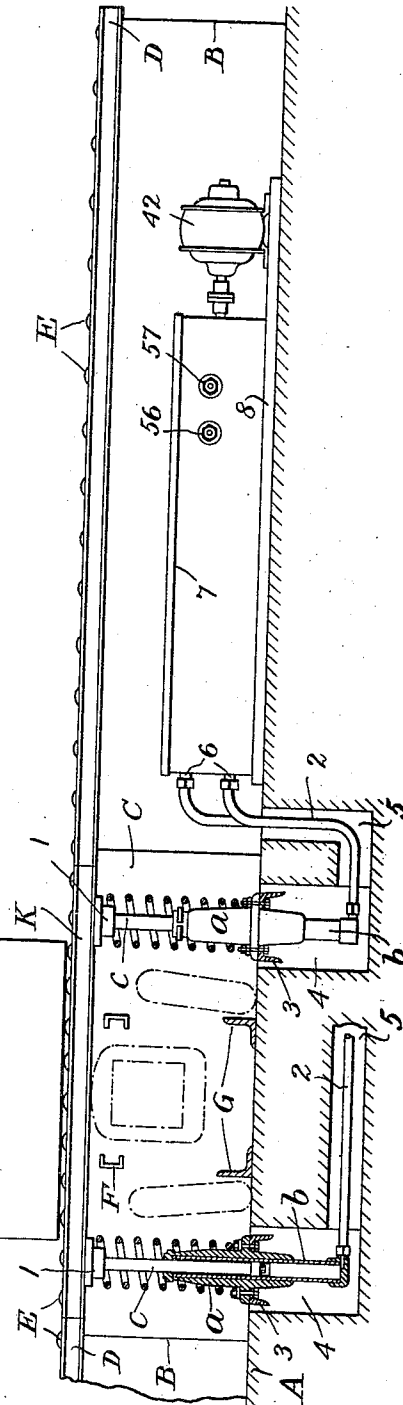


Fig. 2.



INVENTORS.
HENRY CHIPMAN MILLER.
EDGAR HARRY DAINTON.
By: *W. R. Bowden*
ATTORNEY.

May 30, 1933.

H. C. MILLER ET AL

1,911,918

LIFTING AND LOWERING APPARATUS

Filed June 6, 1929

4 Sheets-Sheet 2

Fig. 5.

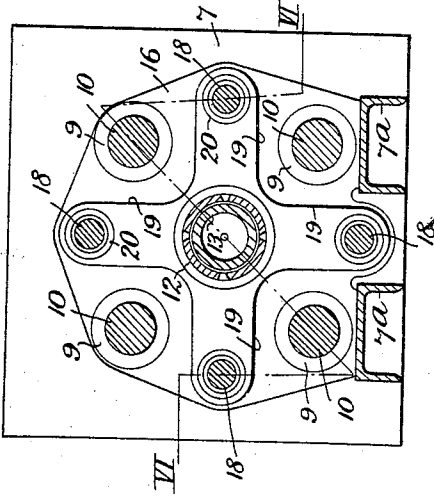


Fig. 4.

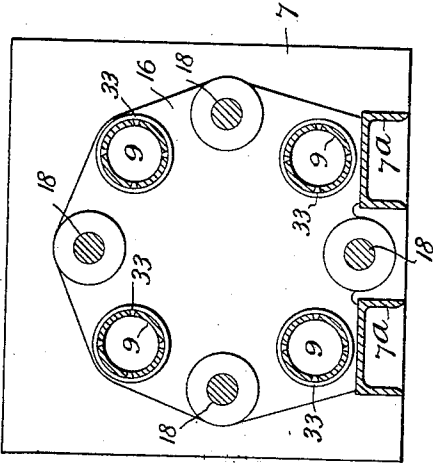
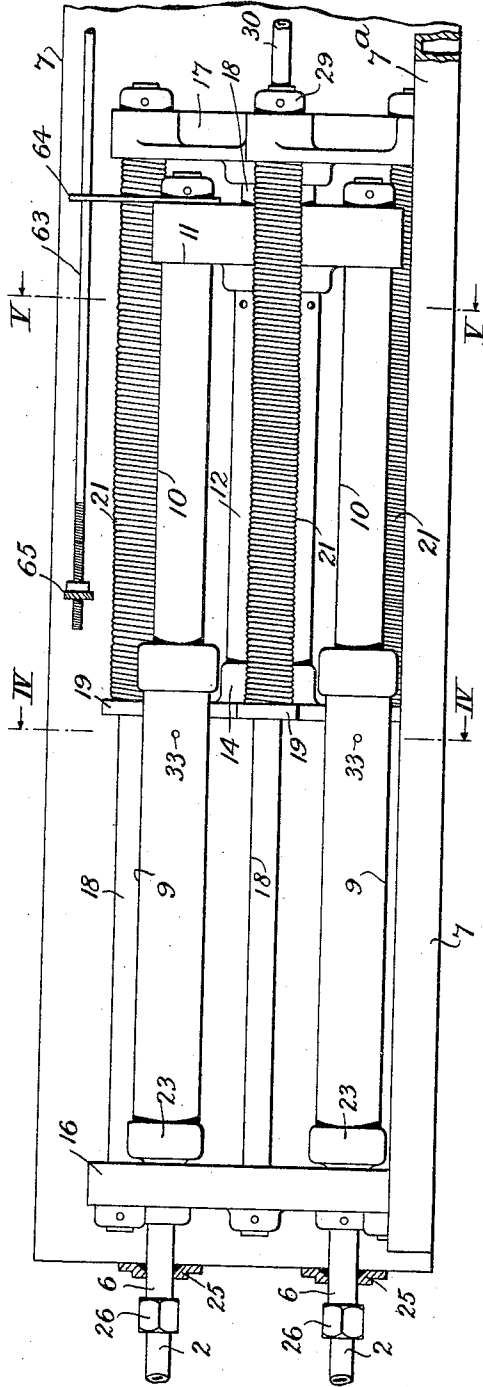


Fig. 3.



INVENTORS
HENRY CHIPMAN MILLER
EDGAR HARRY DRAINTON.
By: *V. R. Bowden*
ATTORNEY.

May 30, 1933.

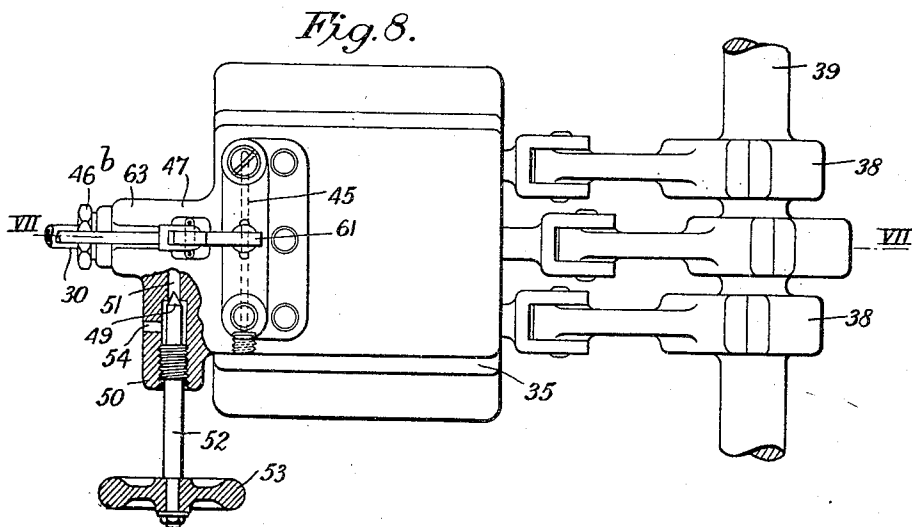
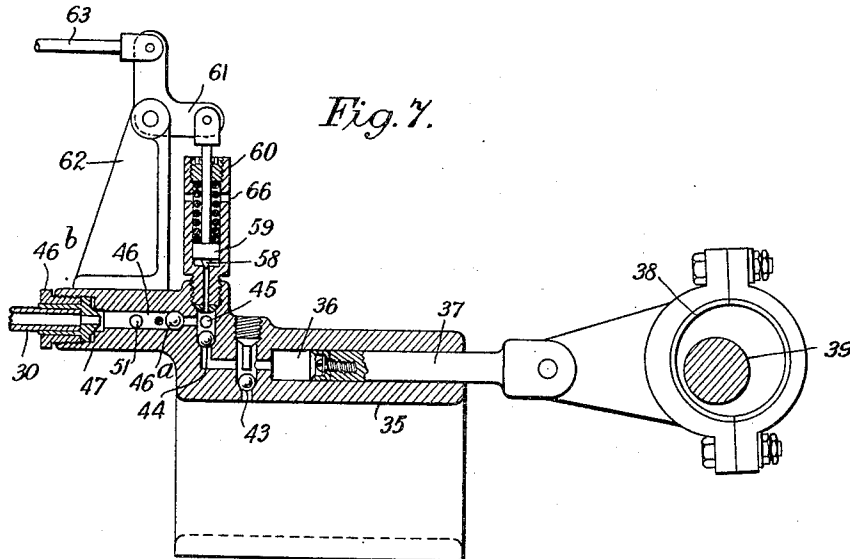
H. C. MILLER ET AL

1,911,918

LIFTING AND LOWERING APPARATUS

Filed June 6, 1929

4 Sheets-Sheet 4



INVENTORS.
HENRY CHIPMAN MILLER
EDGAR HARRY DRAINTON
BY: *VR Bowden*
ATTORNEY.

UNITED STATES PATENT OFFICE

HENRY CHIPMAN MILLER AND EDGAR HARRY DANTON, OF LONDON, ENGLAND

LIFTING AND LOWERING APPARATUS

Application filed June 6, 1929, Serial No. 368,926, and in Great Britain June 13, 1928.

This invention relates to lifting and lowering apparatus applicable for use in connection with the loading and unloading of road and other vehicles, particularly those provided with removable bodies, platforms and the like that are used in association with loading banks, quays and platforms for the transshipment of the goods.

The object of the present invention is to provide a new and improved system of lifting and lowering apparatus of the kind referred to, whereby the handling of goods is greatly facilitated.

According to this invention lifting and lowering apparatus comprises a plurality of hydraulic jacks which are connected to a common control ram through corresponding compressor cylinders and distributing rams by means of which the oil or other motive fluid is circulated to the jacks so that these latter operate simultaneously at the same rate for the purpose of evenly lifting or lowering a vehicle body, platform or the like irrespective of the distribution of the load.

The control ram may be either hydraulically or mechanically operated and is coupled to the distributing rams which operate one in each of the compressor cylinders that are individual to the several jacks, so that as the control ram operates it forces the distributing rams into the compressor cylinders from which the oil or other motive fluid is circulated under pressure to the jacks which are thus operated simultaneously, while each of the compressor cylinders may be furnished with independent release valves or the like by means of which the operation of the corresponding jack may be separately controlled if desired.

The control ram is preferably hydraulic and co-operates with a suitable pressure cylinder to which oil or other motive fluid is supplied under pressure by means of a pump, accumulator or the like for the purpose of operating the control ram and the distributing rams coupled therewith, the control ram cylinder being furnished with a release valve or the like to enable the motive fluid to escape from the cylinder on the return stroke

of the control and distributing rams for the purpose of lowering the jacks.

In a convenient construction the control and the distributing rams together with the compressor cylinders and the cylinder of the control rams are mounted in a heavy framework which is submerged in a tank of oil together with a suitable force pump by means of which oil from the tank is forced through non-return valves into the cylinder of the control ram.

The several jacks are installed in any convenient manner adjacent to a loading bank or platform or in any other desired position, and are each connected by feed pipes to one of the compressor cylinders in the oil tank.

The compressor cylinders are of larger capacity than the cylinders of the jacks to which they are connected and are each provided with inlet apertures which are uncovered when the distributing rams are withdrawn from the compressor cylinders to their fullest extent so as to admit oil from the tank which fills all the compressor cylinders and the system of pipes connecting the same to the several jacks.

The control ram is firmly coupled to the distributing rams by a suitable cross-head and carries a slide that works over guide rods comprised in the framework, which rods carry coiled springs that are each anchored at one end to the slide working thereon and at their opposite ends to the framework.

The pump is driven in any convenient manner by means of an electric or other motor and may be provided with a by-pass valve to enable the motor to be started up without load. After the motor has been started the valve is closed so that oil is forced by the pump past suitable non-return valves into the cylinder of the control ram, thus operating such ram, the movement of which forces the distributing rams into the compressor cylinders connected to the several jacks so that these latter are simultaneously operated.

The control ram operates against the resistance of the coiled springs carried by the guide rods, the reaction of which springs serves to return the control ram together with the distributing rams coupled therewith

when the release valve of the control ram cylinder is opened so as to allow the oil to return to the tank.

The lift of the jacks may be regulated as desired by means of an adjustable automatic trip gear which is connected to a by-pass valve arranged in the pump circuit. Such trip gear may be operated by the movement of the controlling ram so as to open the by-pass valve, upon which the pump returns the oil to the tank instead of delivering it to the cylinder of the control ram.

When a mechanically operated control ram is employed it may comprise a screw shaft that is operated by a motor through worm or other suitable gearing. The shaft is mounted in suitable bearings and is adapted to engage with a nut arranged in a cross-head which works up on guides and carries the distributing rams.

The jacks are conveniently carried by girders which are secured to the ground or floor, the ram cylinders of the jacks being accommodated in pits which are bridged by the supporting girders, while the feed pipes of the jacks may be housed in trenches connected to the pits.

For the purpose of lifting vehicle bodies or the like the jacks are conveniently arranged in pairs so that the lifting heads of the jacks register with the opposite ends of transverse bearers placed between the chassis and the removable vehicle body.

Alternatively, the rams of the jacks may be provided with pivotally mounted cantilever members that can be swung into and out of operative lifting positions.

When the jacks are simultaneously operated as above described the vehicle body or the like is evenly raised to the required level as for example to the top of the loading quay, platform or the like, or until the bearers carrying the load register with run-ways or the like so as to enable the vehicle body to be readily transferred thereto. A fresh body may then be placed on the bearers carried by the raised jacks which are then lowered by the corresponding operation of the control and distributing rams connected therewith so as to place the fresh body upon the vehicle chassis to which the body may be secured in known manner by locating pins and bolts.

The lifting jacks may be provided in known manner with coil springs by which the rams of the jacks are retracted when the motive fluid pressure is released from the jack cylinders.

The invention is illustrated by way of example in the accompanying drawings wherein similar references indicate corresponding parts.

Figures 1 and 2 are diagrammatic views in plan and elevation respectively illustrating one application of lifting and lowering ap-

paratus according to the present invention to a loading bank or quay provided with vehicle bays and run-ways.

Figure 3 is a detail view on an enlarged scale illustrating the construction and arrangement of the control and distributing rams and compressor cylinders which control the lifting jacks shown at Figures 1 and 2.

Figures 4 and 5 are cross-sectional views taken on the lines IV—IV and V—V respectively of Figure 3.

Figure 6 is a sectional plan view taken on the irregular line VI—VI (Figure 5) and drawn to an enlarged scale, further illustrating the construction and arrangement of the control and distributing rams and compressor cylinders shown at Figures 1 and 3.

Figure 7 is a sectional elevation on the line VII—VII (Figure 8) and Figure 8 a plan view further illustrating the construction and arrangement of the pump shown in Figure 1 for operating the control and distributing rams.

Referring first to Figures 1 and 2:—A indicates the ground level, B a loading bank, quay or platform constructed with a vehicle bay C and provided with run-ways D formed by girders furnished with anti-friction rollers E to facilitate handling the load. F (Figure 2) indicates the chassis of a motor vehicle run into the bay C, the roadway of which is furnished with rails G to guide the vehicle into the bay.

Such quay or platform is furnished with a system of lifting and lowering apparatus constructed in accordance with the present invention.

As illustrated, the lifting and lowering apparatus comprises four separate hydraulic jacks 1 which are installed in the vehicle bay C and are connected through feed pipes 2 one to each of the compressor cylinders of four distributing rams by means of which oil or other suitable motive fluid is circulated to and from the jacks 1 for the purpose of operating the same as previously described.

As shown the four jacks 1 are disposed in opposed pairs on either side of the vehicle bay C so as to register with the opposite ends of transverse bearers K placed between the chassis F and the removable body H of the lorry or other vehicle which is run into the bay C so as to bring the ends of the bearers K into alignment with the jacks 1.

The bearers K are furnished with anti-friction rollers L and when raised by the jacks are adapted to register with the run-ways D so that the vehicle body H raised with the bearers can be readily transferred to the runways.

The jacks 1 are mounted upon channel section girders 3 which are secured in the ground so as to bridge the pits 4 in which the cylinders of the jacks 1 are housed.

The jacks each comprise a flanged pedestal

a that carries the cylinder b in which the ram c works as usual, the pedestals being designed to form supporting guides for the ram and to take into apertures in the girders 3 to which the pedestals are bolted so that the cylinders b are suspended in the pits 4 as indicated, while the feed pipes 2 are housed in trenches or the like 5 connected to the pits 4.

The feed pipes 2 are each connected at one end to the cylinder b of one of the jacks, while their opposite ends are connected to corresponding tubes 6 that lead to the compressor cylinders housed in the tank 7 that is filled with oil and serves as the reservoir for the motive fluid for operating the jack.

As shown the tank 7 is mounted on a base 8 arranged beneath the runways D, but may be installed in any other convenient manner or position.

9 indicates the four compressor cylinders corresponding to the four lifting jacks, and 10 the distributing rams which work in such cylinders and are carried by a cross-head 11 that is securely mounted upon the control ram 12 (see Figures 3 and 6).

The control ram 12 is mounted externally of its cylinder 13 and is closed at one end by a flanged cover 14 in which it is screwed as indicated at 15.

Such control and distributing rams together with their respective cylinders are mounted in a heavy frame comprising end members 16 and 17 which are connected together by tie-rods 18. Such frame is submerged in the oil contained in the tank 7 wherein it is disposed horizontally upon supporting girders 7a as indicated at Figure 3.

The cover 14 on the control ram is provided with perforated arms 19 furnished with tubular bosses 20, which bosses slidably engage the tie-rods 18 and form bearings for the adjacent ends of coiled springs 21 which are carried by the tie rod to which their opposite ends are anchored by means of grooved sleeves 22 secured by the tie rods.

The compressor cylinders 9 are each closed at one end by flanged caps 23 into which they are screwed (see Figure 6).

The flanged caps 23 are provided with tubular extensions 6 that are secured in the frame member 16 and pass fluid-tight through stuffing boxes 25 arranged up on the adjacent wall of the tank 7 so as to extend externally of the latter and form screw bearings for unions 26 which connect the feed pipes 2 of the corresponding jacks.

The cylinder 13 of the control ram is secured in the frame member 17 and is closed by a screw plug 27 furnished with a tubular extension 28 by which it is coupled through a union 29 to a supply pipe 30 leading to the pump. The opposite end of such cylinder 13 is provided with a tubular guide 31 and cup leather or the like 32 for the control ram which slides thereover.

The inner ends of the distributing rams 10 that work in the compressor cylinders 9 are each furnished with a cup leather or the like 32 to form a fluid-tight joint, while the compressor cylinders 9 are of larger capacity than the cylinders b of the lifting jacks to which they are respectively connected.

The compressor cylinders 9 are provided with inlet apertures 33 which are uncovered by the cup leathers 32 of the distributing rams when these are withdrawn to their fullest extent, as indicated at Figure 6, so as to admit oil from the tank 7 which fills the compressor cylinders and the feed pipes connecting the same to the several lifting jacks 1.

As illustrated, oil is supplied to the cylinder 13 of the control ram by a three-throw pump 34 which is submerged in the oil contained in the tank 7 wherein it is supported by the girders 7a.

The pump comprises a saddle-shaped casing 35 which contains the three pump barrels 36 wherein the pump plungers 37 work as usual. The pump plungers 37 are operated by means of eccentrics 38 mounted upon a driving shaft 39 which journals in bearings 40 (see Figure 1), and is operated through worm gearing 41 by an electric motor 42 arranged externally of the tank 7.

The pump barrels 36 are each connected to a non-return inlet valve 43 and delivery valve 44 (Figure 7), the delivery valves 44 being connected by a cross duct 45 to an outlet passage 46 formed in a boss 47 of the pump casing.

The outlet 46 is provided with a non-return inlet valve 46a and is connected by a union 46b to the supply pipe 30 leading to the cylinder 13 of the control ram.

When the pump is operated it forces oil past the delivery valve 44 and the outlet passage 46 to the cylinder 13 of the control ram, thus operating the same against the resistance of the springs 21 on the rods 18. The movement of the control ram 12 forces the distributing rams into the compressor cylinders 9, thus driving the motive fluid through the feed pipes 2 to the lifting jacks 1 and simultaneously operating the latter.

The ram cylinder 13 is provided with safety outlets 48 (see Figure 6) which are uncovered by the cup leather 32 of the ram cylinder when the ram reaches the limit of its stroke so as to allow the motive fluid to automatically return to the tank 7 and thus prevent overdriving of the control ram 12 and of the distributing rams 10 connected thereto.

The control ram 12 together with the distributing rams 10 are returned to their initial positions by the reaction of the coiled springs 21 when the motive fluid is released from the cylinder 13 by opening a release valve 49 (see Figure 8) which is connected to such cylinder.

As shown at Figure 8 the release valve 49 is mounted in a tubular boss 50 of the pump casing and is connected by a passage 51 to the outlet passage 46 leading to the control ram cylinder 13.

The release valve 49 is carried by a screw spindle 52 which works in the boss 50 and is provided with a hand wheel 53 for operating the valve.

When the outlet valve is opened it allows motive fluid to escape from the control ram cylinder 13 through the passage 46 past the release valve 49 to a vent 54 through which the motive fluid returns to the tank 7.

In the construction illustrated at Figure 1 the release valve is arranged in a separate valve case 55 which is connected to the boss 50 of the pump casing by a tube 56, the escaping motive fluid being returned from the valve case 55 through an escape pipe 57 to the tank 7.

The lift of the jacks 1 is regulated as desired by means of a by-pass valve 58 mounted upon the pump casing (see Figures 7 and 8).

The by-pass valve 58 is carried by a spring-controlled plunger 59 that works in a tubular casing 60 screwed into the pump casing so as to communicate with the cross duct 45 which connects the pump delivery valves 44 to the inlet valve 46a which leads to the cylinder 13 of the control ram.

The plunger 59 is pivoted to one end of a bell-crank lever 61 mounted upon a standard 62 secured to the pump casing. The other end of the bell-crank lever is pivoted to a connecting rod 63 which is engaged by a slotted arm 64 (see Figure 6) mounted upon the cross-head 11 of the control ram 12.

The connecting rod 63 is screw-threaded and carries a nut 65, the position of which can be adjusted upon the connecting rod so that when the control ram 12 is operated it brings the slotted arm 64 into engagement with the nut and thus opens the by-pass valve 58 so that the motive fluid from the pump escapes past the open by-pass valve and returns to the tank 7 through the outlet apertures 66 in the by-pass valve casing 60.

As the distributing rams 10 are retracted in their cylinders 9 the motive fluid in the cylinders of the jacks 1 passes back to the cylinders 9 through the feed pipes 2, so that the lifting rams of the jacks are simultaneously lowered under the influence of the load, if any, carried thereby, the retraction of the jack rams being assisted by retracting springs *d* with which the jacks are provided in known manner.

To enable the jacks 1 to be separately operated if desired, each of the corresponding compressor cylinders 9 of the distributing rams 10 may be furnished with a release valve 67 (see Figure 6).

As illustrated the flanged caps 23 of the compressor cylinders are each provided with

a tubular boss 68 which forms the casing for the release valve 67 that is carried on a screw spindle 69 that works in the boss 68 and is provided with a handle 70.

The release valve 67 normally closes an outlet 71 which leads to the compressor cylinder 9. On opening the valve 67 oil escapes from the compressor cylinder, past the open valve and returns to the tank 7 through the escape vent 72, thus lowering the corresponding jack connected to the compressor cylinder.

By the present invention a simple and effective means is provided for rapidly handling loaded trucks or for changing the bodies of chassis or merely for repair work by the judicious control of the lifting jacks to raise the body wholly or partially according to the inspection and repairs necessary.

We claim:—

Lifting and lowering apparatus comprising a frame having end members, rods extending longitudinally of the frame and connecting the end members, a control ram comprising an inner cylinder having one end secured to one end member of the frame and provided with an inlet duct and an outer cylinder movable on said inner cylinder, a cross head to which one end of said outer cylinder is secured, a plurality of distributing rams arranged on opposite sides of the control ram and each secured at one end to the cross head, compressor cylinders in which the distributing rams reciprocate, each compressor cylinder being secured the outer end to the other end member of the frame, a movable member having openings in which the compressor cylinders are longitudinally movable, said movable member covering and being secured to the inner end of the outer cylinder of the control ram, a pump to supply liquid under compression to the inner cylinder of the control ram, ducts leading from the compressor cylinders, means to supply liquid to the compressor cylinders and springs on the said guide rods active to move the distributing rams outwardly from the compressor cylinders and the outer cylinder of the control ram inwardly on the inner cylinder thereof.

In testimony whereof we affix our signatures.

HENRY CHIPMAN MILLER.
EDGAR HARRY DANTON.