March 4, 1952 C. F. BRERETON 2,587,690

HOIST FOR CONVEYING LOADS TO MOVING PLATFORMS

Filed Sept. 22, 1943 3 Sheets-Sheet 1

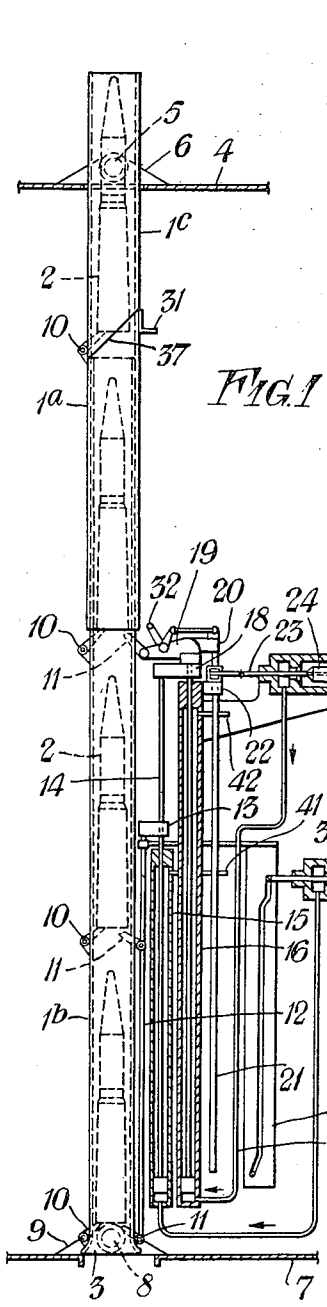

FIG. 1

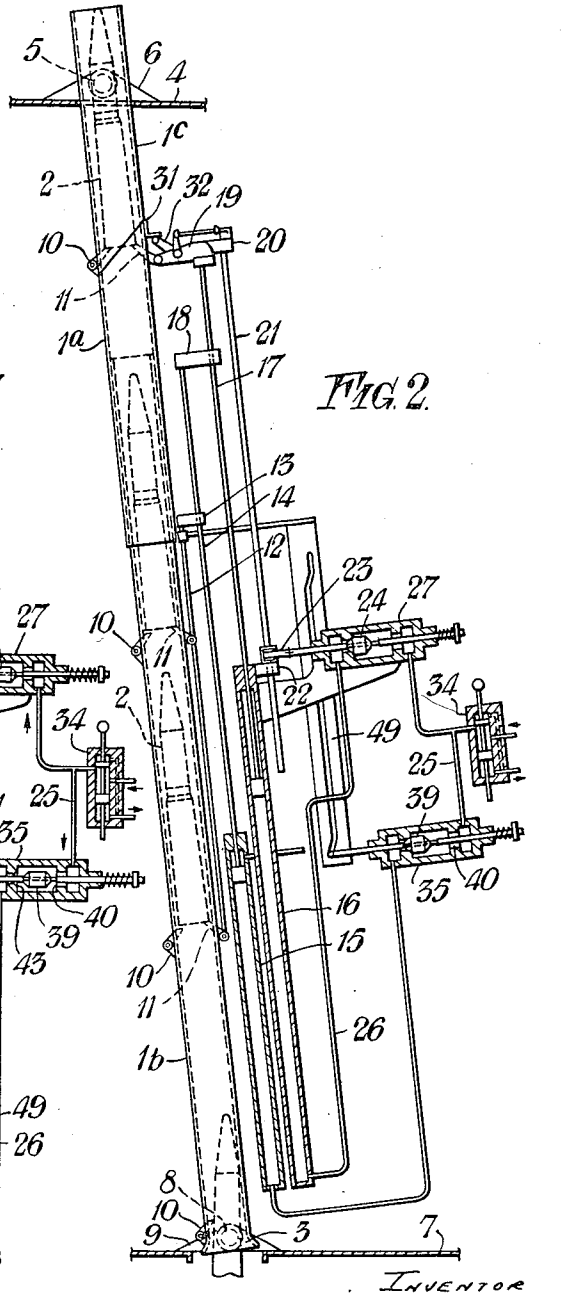

FIG. 2

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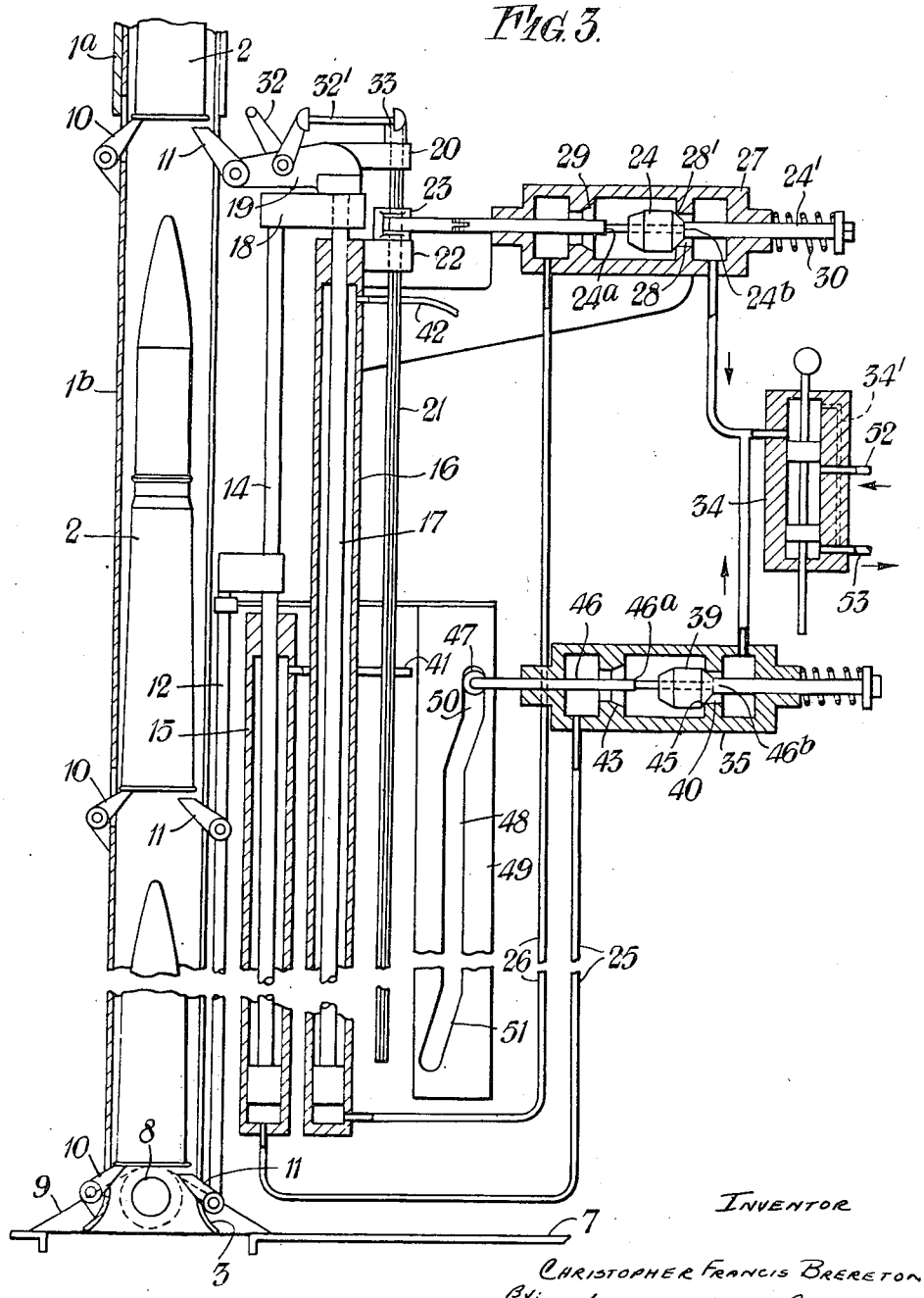
FIG. 3.



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HOIST FOR CONVEYING LOADS TO MOVING PLATFORMS

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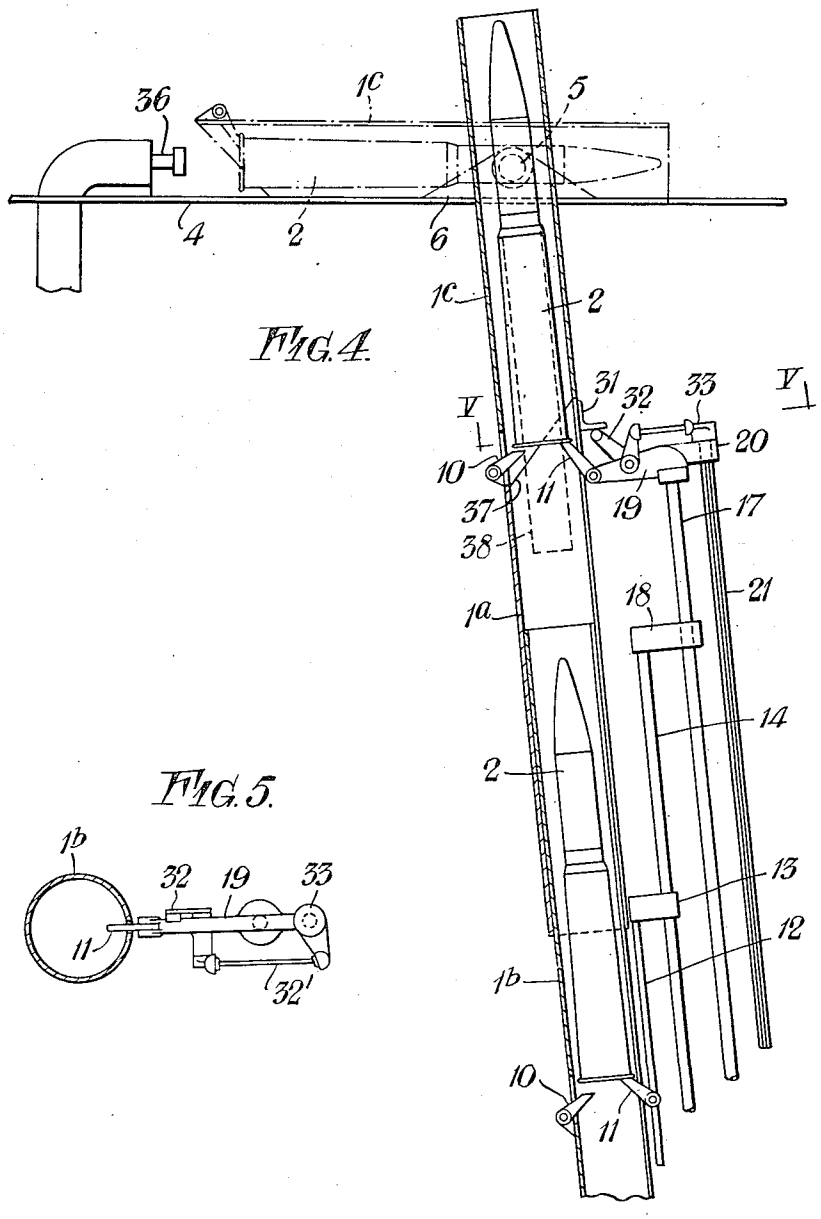

FIG. 4.

FIG. 5.

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HOIST FOR CONVEYING LOADS TO MOVING PLATFORMS

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8 Claims. (Cl. 198—225)

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This invention relates to hoists for conveying loads to moving platforms which are adapted to be displaced relatively to the supply end of the hoist so as to change the effective distance between the platform and supply end, e. g. as in gun mountings of ships, in which the gun mountings are stabilised to take care of rolling of a ship when the gun is in the fore-and-aft direction, or alternatively "pitching" when the gun is abeam. That is to say, the present invention is particularly useful in the elevating of rounds of ammunition from a magazine or hold of a ship to a gun platform displaceable relatively to the ship as aforesaid, but also the invention may be adapted to the elevating of other heavy loads in which the conditions are analogous to those which obtain with gun mountings as aforesaid, e. g. in the elevating of heavy loads to an elevated laterally displaceable platform where it is required to have some latitude in adjusting the position of the platform without at the same time having to displace the position of the elevating apparatus on the ground or other supply position, such a condition quite conceivable obtaining in building operations, dock yard work and ship building. However, for the purpose of describing the invention, the hereinafter relation matter will be concerned primarily with the application of the invention to the elevating of rounds to a moving gun platform.

According to the present invention, the hoist embodies a guide connected across a lower loading point and an elevated unloading structure such as e. g. a gun platform, adapted to be displaced relatively to the loading point so as to vary the distance between the loading and unloading point, the guide being free to change its effective length automatically to take care of such change in distance between the loading and unloading point, means to feed loads in succession along the telescopic guide in such manner as to create a train or succession of loads along the interior of the guide, and means automatically adjusting the effective range or length of operation of the feeding means in sympathy with the changes in effective length of the guide.

In order that the invention may be clearly understood and readily carried into effect, drawings are appended hereto illustrating somewhat diagrammatically an embodiment thereof, and wherein,

Figure 1 is a side elevation showing the hoist in the vertical or minimum lift position and with the load feeding means in its lowermost position with the valves of the hydraulic system set to initiate the "up" stroke.

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Figure 2 is a side elevation showing the hoist inclined to take care of displacement of the load receiving means or upper end, and with the load feeding means at the upper end of its stroke.

Figure 3 is a broken sectional elevation of Figure 1 to a larger scale, but with the valves set as for the end of the "down" stroke.

Figure 4 is a broken sectional elevation of the upper part of the hoist showing the manner of transferring the uppermost load to the unloading position, and

Figure 5 is a detail sectional plan view on the line V—V of Figure 4.

Referring to the drawings, which show the invention as applied to the feeding of rounds to a gun turret, the aforesaid guide is of telescopic tubular form and the rounds **2** are adapted to be fed along it substantially co-axially, with slight annular clearance between the base flanges of the cases and the inner wall of the guide. Normally, a pair of tubes **1***a* and **1***b* is sufficient to provide a telescopic tubular guide, the upper tubular element **1***a* being disposed slidably about the upper end of the lower tubular element **1***b*, the lower end of the lower tubular element being flared as at **3** or coned for guiding therein the vertically disposed rounds.

A short distance below the upper extremity of the upper tubular element **1***a* is provided means for anchoring the guide to the gun turret **4**, e. g. a co-axial pair of radial bosses or pintles **5** journalled in a pair of brackets **6** fixed to the base of the gun turret, the lower end of the guide being likewise connected to a deck plate **7** or other upper structure of the magazine by bosses **8** engaged in brackets **9** in order that the rounds may be fed upwardly into the flared lower end of the guide.

Arranged at intervals along the interior of the guide tubes **1***a*, **1***b* are a number of pivoted pawls **10** adapted to act as abutments against the flanged bases of the cartridge cases in well known manner, the rounds being fed along the guide by relatively translatively movable pawls **11** diametrically opposed to the aforesaid pawls **10**.

The pawls **10** are pivoted externally of the telescopic guide and the guide is slotted longitudinally to receive the pawls **11** which push the rounds upwardly, these latter pawls being actuated hydraulically by means which partly follows the well known practice of the hydraulic pusher hoist mechanism at present adopted in feeding rounds along chutes to gun platforms. However, the hydraulic pusher hoist mechanism in the present invention is modified to take care of the changes in effective length of the tubular guide,

and for this purpose some, e. g. two as shown, of the pawls 11 which push the rounds along the guide are carried by a vertical rod 12 disposed closely against and parallel with the periphery of the lower tubular element of the guide, a convenient arrangement comprising, as shown, a pawl pivoted to the lower end of this rod 12 and a further pawl pivoted to the rod approximately midway between its upper end and median position. The upper end of this rod 12 has a lateral cross head 13 disposed radially with respect to the tubular guide and fixed to the rod 14 of a ram 15 disposed closely alongside the rod 12 carrying the aforesaid lower two pawls 11, whereby these pawls have a fixed stroke adapted to carry simultaneously along the lower portion of the guide two rounds spaced axially apart to avoid contact of the cartridge cases with the noses of the trailing rounds.

To take care of the changes in effective length of the hoist, a second ram 16 is provided parallel with and close alongside the aforesaid ram 15 and having a longer stroke, its rod 17 being guided through a lateral cross head 18 carried by the upper end of the piston rod 14 of the first mentioned ram 15 so that the rod of the longer stroke ram 16 may slide relatively to rod 14 of the other ram 15. The upper end of the rod 17 of the longer stroke ram 16 also carries a cross head 19 to the inner end of which, (i. e. the end which is nearer the guide) is attached the uppermost pivoted pawl 11 sliding in the slot in the guide the latter pawl acting upon the uppermost round 2 in the chute. Forming an outer end part of this latter cross head is a lug 20 in which is journalled a square or splined shaft 21 guided through a lateral lug 22 at the upper end of the longer stroke cylinder 16 the squared or splined shaft sliding through but having driving engagement with a crank or eccentric 23 disposed upon the latter mentioned lug 22 and operating the valve element 24 of a cut-off valve 27 of the shuttle type, in which the valve element 24 has relative motion to its rod 24' between stops 24*a* and 24*b* on the rod, for giving a quick reverse motion to the two rams, opposite ends of the cylinder of the valve 27 being connected by leads 25 and 26 to the lower ends of the ram cylinders 15 and 16, the valve element 24 moving between a pair of seatings 28 and 29, the seating 28 having a bleed opening 28' to control the speed of lowering the rams, the valve rod 24' being prolonged beyond the outer end of the cylinder of valve 27 where it is loaded by a spring 30 to yieldingly oppose its actuation to the left of the position shown in Figures 1 and 3 from the aforesaid shaft 21. The effort of the spring 30 is overcome automatically to move the stop 24*a* well within the seating 29 to enable the shuttle valve element 24 to move into the seating 29 (see Figure 2) when the hydraulic ram mechanism has been extended the amount required to locate the uppermost round at the discharge position. This axial displacement of the valve rod followed by endwise movement of the valve element 24 into the seating 29 is obtained by providing upon the exterior of the upper tubular section 1*a* a radial abutment 31 which engages a lever 32 on the inwardly directed portion of the cross head 19 of the piston rod 17 of the longer stroke ram 16, this lever having a link connection 32' to a crank 33 on the upper end of the squared or splined shaft 21, whereby a partial rotation is imparted to this shaft 21, at the appropriate moment to apply a driving action to the valve rod 24', the splining of the shaft through the crank or eccentric 23 connected to the valve rod 24' providing for the desired remote control of the valve element 24 at predetermined extension of the hoist.

The connection of the two rams 15 and 16 to the source of hydraulic pressure is obtained by means of a control valve 34 located in the pipe line 25 leading from one end of the aforesaid spring loaded valve to the lower end of the shorter stroke ram 15, the stem of this control valve being operated directly or by a manually operated lever or a remote control device, e. g. a solenoid, and the valve 34 being interposed between the valve 27 and a further cut-off valve 35, so that the control valve 34 admits hydraulic pressure to the cylinder of valve 27 containing the valve 24 element and to the other cut-off valve 35, the pressure in the line 25 moving the shuttle valve element 39 off the seating 40 to allow free passage of pressure fluid to the cylinder 16. The supply line from the source of hydraulic pressure is indicated at 52 and the return line at 53. The spindle 46 of valve element 39 of valve 35 has abutments 46*a*, 46*b* in the same manner as with valve spindle 24', and the spindle 46 is operated positively by a roller 47 on one end thereof tracking in a cam slot 48 in a cam bar 49 carried relatively fixedly by the rod 12 and formed at the ends of its vertical slot with oppositely directed motion imparting inclined parts 50 and 51 to actuate the spindle 46.

Upon the control valve 34 admitting hydraulic pressure to the other pair of valve housings 27 and 35 the valve element 24 is urged against the stop 24*a* (see Figure 3) which previously will have been occupying the position shown in Figure 3, and hydraulic pressure flowing in the direction of the arrows in Figure 1 is admitted to both of the rams 15 and 16 causing the rod 14 of the shorter stroke ram 15 to move through a full stroke, whilst the rod 17 of the longer stroke ram 16 moves until the aforesaid lever 32 carried by the cross head of this piston rod 17 engages the fixed abutment 31 on the upper tubular section 1*a* of the hoist 1 to overcome the aforesaid spring 30 of, and operate, the valve rod 24' so as to move the stop 24*a* into the seating 29 so that valve element 24 seats against seating 29, and the valve element 39 seats against seating 43 as shown in Figure 2 and thereby the longer stroke ram 16 is brought gently to rest. Fluid displaced from the upper ends of the cylinders passes directly into a reservoir via lines 41 and 42 these lines being in permanent communication with the fluid in such reservoir. On the control valve 34 being actuated to the position shown in Figure 3 to exhaust the spaces in the rams 15 and 16 beneath the pistons therein, the shuttle valve elements 24 and 39 are first displaced to a position midway between seatings 28, 29 and 40, 43 respectively so as to allow free passage of the fluid through the valves 27 and 35 into valve 34 in the direction of the arrows in Figure 3, a branch passage 34' in the housing of valve 34 connecting the lines 25 and 26 to exhaust line 53. As the rams are now returned to their collapsed or fully retracted positions by reason of the constant pressure above the ram pistons the shuttle valve elements 24 and 39 are pressed onto the seatings 28 and 40 respectively as shown in Figure 3 and bleed opening 28' of valve 27 and a like bleed opening 45 of valve 35 afford the desired restriction to ensure a slow steady return of the rams to the fully lowered position.

It will be appreciated from the foregoing that the stroke of the longer stroke ram is such that it will always deliver a round to the uppermost pivoted pawl 10 carried by the hoist irrespective of the position of the platform or gun turret.

The function of the lateral arm or lug 18 carried by the upper end of the piston rod 14 of the shorter stroke ram 15 is to prevent the shorter stroke ram moving past the longer stroke ram, otherwise it could be possible for two of the rounds in the hoist to come into collision.

It is preferred to provide means at the upper end of the guide to obtain automatic or power operated positioning co-axially of the uppermost round 2 with the gun breech to obviate manual lifting of the round into the usual trough or breech guide aligned with the rammer 36, and this can be effected by splitting the upper tubular guide element of the hoist diagonally as at 37 (e. g. at 45° with respect to the tube's axis) to produce an upper section 1c containing the uppermost round which can swivel about the upper pivot 5 of the telescopic guide, the remainder of the guide being maintained connected to the pivot 5 by a pair of side plates 38 fixed to the section 1a of the divided upper tubular element. The upper section 1c of the upper tubular element can now act as the means for swinging the round contained therein into co-axial alignment with the breech, i. e. so that such round containing section becomes located between the usual rammer and the gun breech. Alternatively this tubular section can carry the round ramming means. With such an arrangement the upper pivot of the tubular guide can be carried by a pair of brackets projecting rearwardly from the gun cradle. In this connection although heretofore the part 4 has been described as the base of the gun turret, it will be appreciated that if the upper section of the guide 1 is divided into the parts 1a and 1c, the part 4 will be above the base of the turret and, if desired, can act as a trough or a breech guide.

It is preferred to provide for lateral tilting of the gun platform or cradle relatively to the hoist 1 or vice versa, and this can be taken care of by forming the journals for the pivot pins 5 of the upper end of the hoist in opposed segments or a ring which can oscillate about the axis of the gun barrel, or by any other suitable form of universal joint, changes in gun elevation and lateral tilt also being taken care of by the telescopic action of the guide.

I claim:

1. A load conveying hoist for carrying loads from a loading point to a relatively higher unloading point displaceable relatively to the loading point so as to vary the distance between the loading and unloading points, comprising a telescopic guide, means pivotally connecting it across the lower and upper loading points, a lower stage load feeding means which drives the loads along the guide from the lower end of the guide partly up the guide, an upper stage load feeding means transferring the loads in succession from the upper terminus of the lower stage load feeding means along the guide to the upper end of the guide, so that the loads are fed in succession along the telescopic guide in such manner as to create a train or succession of loads along the guide, and means automatically adjusting the effective length of operation of one of the said feeding means in sympathy with the changes in effective length of the guide.

2. A load conveying hoist for conveying loads from a loading point to a relatively higher unloading point displaceable relatively to the loading point so as to vary the distance between the loading and unloading points, comprising a guide with upper and lower sections slidable one relative to the other telescopically, means articulating one end of the guide to a lower load receiving point and at the other end to load receiving means, load engaging and pushing abutments disposed at intervals along the guide for conveying the loads by a succession of pushing operations along the interior of the guide, a hydraulic appliance with a fixed stroke and another with a variable stroke to compensate for changes in effective length of the hoist actuating said load engaging and pushing abutments, one of said hydraulic appliances serving a portion of the abutments which are disposed at the lower end of the tubular guide and the other hydraulic appliance serving the remainder of the abutments and which operate in the upper end of the guide, valve means for controlling the supply of hydraulic pressure fluid to the hydraulic appliances, a stroke limiting member on the upper part of the hoist and remote control means for said valve means with the variable stroke hydraulic appliance adapted to engage and be actuated by said stroke limiting member to automatically operate the valve means to arrest upward displacing of the abutments when the uppermost load in the hoist reaches the top of the hoist.

3. A hoist according to claim 2, wherein the said tubular telescopic guide comprises a lower section open at its lower end to receive the loads and pivotally supported at such lower end, and an upper tubular section slidable axially relatively to the lower tubular section and pivoted at its upper end to the displaceable load receiving means, the lower tubular section receiving a set of load engaging abutments, and the upper tubular section also receiving a set of load engaging abutments, one of said hydraulic appliances comprising a ram having a fixed predetermined stroke for translating the lower set of abutments along the lower tubular section, and the other hydraulic appliance comprising a ram having a variable stroke for translating the other set of abutments along the upper tubular section of the guide, and having combined therewith and moving with the upper set of abutments the said remote control means adapted to transmit controlling motion to the valve means for arresting its stroke when the upper most load reaches the unloading position, stroke limiting member which actuates said valve controlling means comprising a stop provided with the upper tubular guide element.

4. A hoist according to claim 2 including means preventing the fixed stroke ram overrunning or moving beyond the variable stroke ram in the load raising direction.

5. A hoist according to claim 2, including with the variable stroke hydraulic ram a relatively displaceable valve actuating member adapted to engage the said stroke limiting member, motion transmitting means with said variable stroke ram connecting said valve actuating member to the said valve, and self-adjusting means with said motion transmitting mechanism compensating for changes in the distance of said valve actuating member upon the valve due to variations in stroke of the variable stroke hydraulic ram.

6. A hoist according to claim 2 wherein the valve means actuated automatically when the uppermost load reaches the unloading position is a shuttle-type valve in which the valve member

reciprocates across two seatings relatively to and upon a valve rod having two abutments for limiting the travel of the valve member, spring means urging said valve rod in one direction and the said valve actuating member driving the valve in the other direction.

7. A hoist according to claim 4 in which the said hydraulic rams are actuated to return the said abutments towards the load receiving end of the guide by constant hydraulic pressure and by hydraulic pressure in the opposite direction, a control valve additional to said valve means being provided to connect both rams effectively to the source of hydraulic pressure when a load is to be raised, the connection of said source to the variable stroke ram being via the said valve means, a cut-off valve in addition to the said valve means and control valve and the connection to other ram being via said cut-off valve.

8. A hoist according to claim 2 wherein the upper section of the guide is divided into two parts disposed one above the other, means pivotally supporting the upper part for swinging about the upper axis of articulation of the hoist relatively to the guide for changing the direction of the load in order that the load may be transferred to the gun or other load receiving means.

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