

June 22, 1937.

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2,084,376

HYDRAULIC HOIST

Filed June 6, 1936

2 Sheets-Sheet 1

Fig. 1

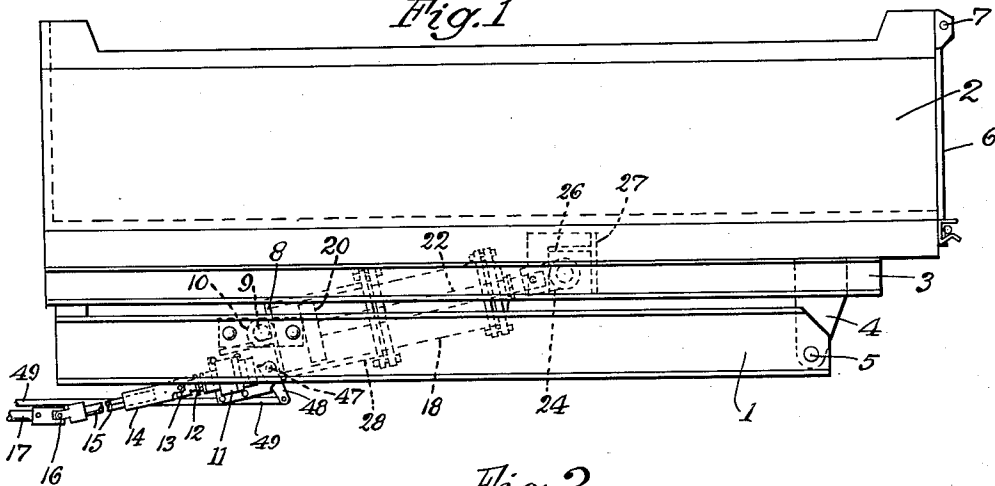
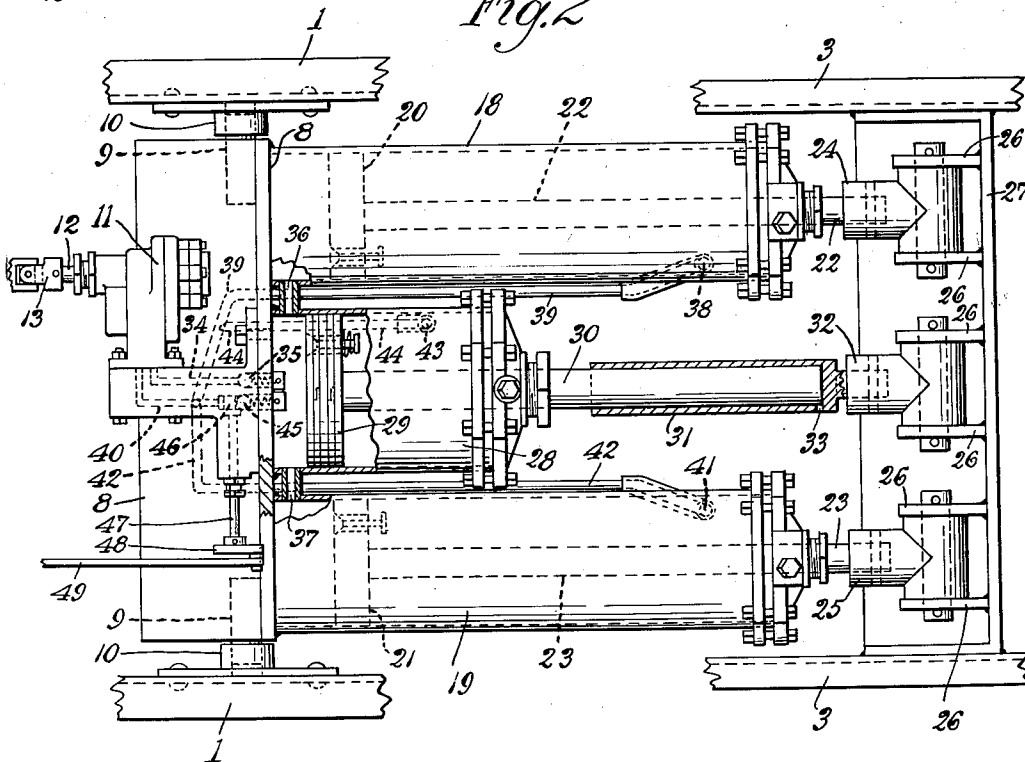


Fig. 2



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Fig. 3

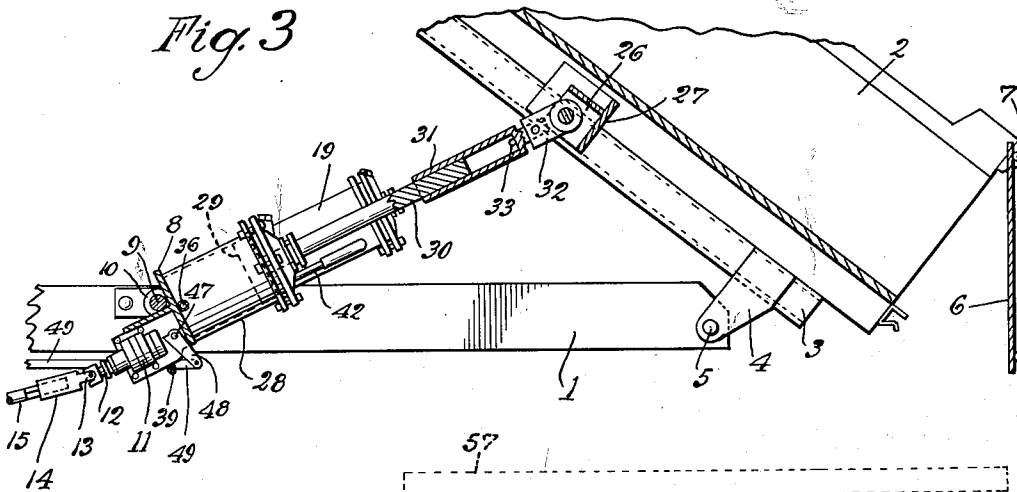


Fig. 4

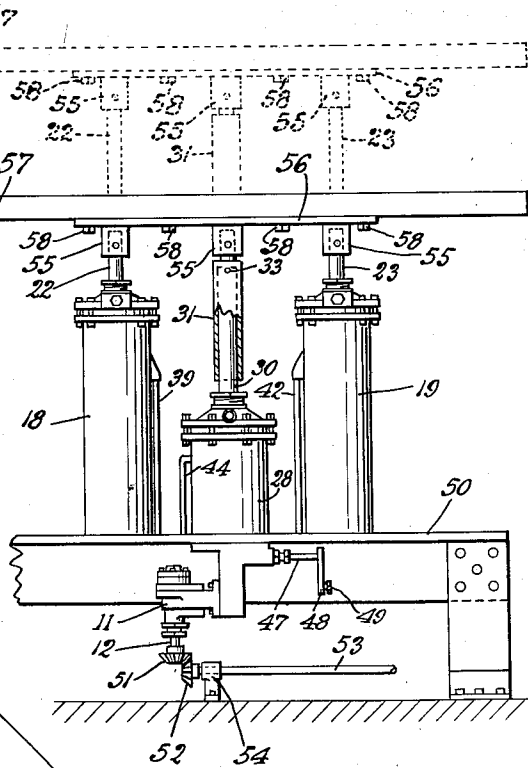
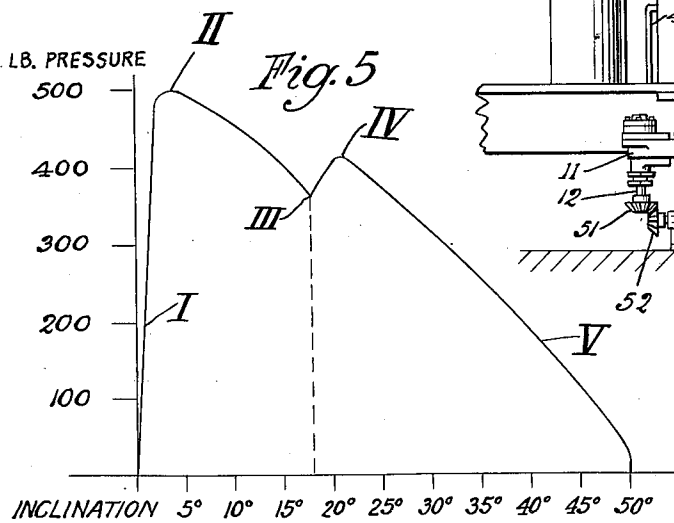


Fig. 5



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UNITED STATES PATENT OFFICE

2,084,376

HYDRAULIC HOIST

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7 Claims. (Cl. 298—22)

This invention relates to a hoist and in one form to a hoist adapted for use on vehicles equipped with dumping or tipping bodies. In another form it is adaptable for use as a hoist for raising or tipping or moving any suitable article.

One object is to provide means for doing a piece of work in which in the initial stages greater powers or greater pressures are required than those required in later stages. It has for an object, therefore, to provide means for automatically furnishing the maximum moving force at the time necessary and for automatically diminishing the moving force when a diminishing force is suitable for the remainder of the work to be done.

Other objects will appear from time to time in the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a side elevation of a portion of a dumping body;

Figure 2 is a plan view on an enlarged scale, with parts broken away and parts in section, illustrating the hydraulic cylinder mechanism;

Figure 3 is a longitudinal vertical sectional view, showing the hoist after a portion of its excursion;

Figure 4 is a vertical elevation with parts broken away and parts in section, showing a hoist not mounted upon or associated with a dumping body; and

Figure 5 is a diagram illustrating the relationship between the pressures and the inclination of the body.

Like parts are designated by like characters throughout the specification and drawings.

1 is a portion of a body framework upon which a dumping body 2 is pivoted. The body may be carried on a sub-frame 3 from which members 4 depend to be pivoted at 5 upon the frame 1. In the form shown the body may be equipped with a tail gate 6 pivoted or hung as at 7. The particular form and arrangement of the body and the tail gate form no essential part of the present invention as the device may be associated with any suitable body or load carrying mechanism.

As shown in detail, particularly in Figure 2, the cylinder assembly is mounted at one end upon a carrying or frame member 8 which may be of any suitable shape, which is here shown as of generally T-section and is provided with trunnions 9 mounted in bearings 10 supported on the frame 1.

A pump 11 is mounted on the member 8 and is provided with a suitable shaft 12 which extends

outwardly from the pump housing and is connected by means of a universal joint 13 with a slip connection 14 which engages a shaft 15. This shaft, by a second universal joint 16, is connected to a driving shaft 17 which may be driven from any suitable source, in one example, from the power take-off mechanism of an engine which drives a truck upon which the body and hoist are mounted. The particular details of the driving means for the pump form no essential part of the present invention as the pump may be driven in any manner. Any suitable linkage between the pump and a power source is within the contemplation of the invention. For some purposes a flexible shaft might be used.

Mounted upon the member 8 are two hydraulic cylinders 18 and 19 within which are mounted, respectively, pistons 20 and 21 from which piston rods 22 and 23 project. These rods are secured at their outer ends to members 24 and 25 which are pivoted between ears 26 secured to a cross member 27 which is itself mounted upon or secured to the body or other sub-frame members 3.

Mounted also on the member 8 and preferably between the cylinders 18 and 19 is a third cylinder 28. This cylinder as shown is preferably larger in diameter and shorter than the other two cylinders. It is provided with a piston 29 from which a rod 30 extends outwardly beyond the cylinder to engage a telescopic slip connection member 31 which is secured at its outer end to a member 32 generally similar to the members 24 and 25, previously mentioned. This member 32 is likewise pivoted between ears 26 on the cross member 27. An air escape perforation 33 may be made in the slip connection member 31.

Any suitable pressure conduits may be provided by means of which fluid under pressure from the pump passes to the three cylinders, which cylinders are all in circuit. Therefore, the pressure in the cylinders is equal.

The form of fluid conduit arrangement shown in Figure 2 in detail may be considered as one possible arrangement. As there shown fluid under pressure flows from the pump through the conduit 34, past the check valve 35 into the interior of the cylinder 28. It flows thence through a passage or opening 36 into the cylinder 18 and also equally through a passage or opening 37 into the cylinder 19. Thus the several pistons are all connected to the pump and are in pressure circuit with each other. The cylinder 18 is provided with an overflow opening 38 which connects to a return conduit 39 which in turn is connected to the fluid return conduit 40

through which fluid returns directly to the pump. Similarly the cylinder 19 has an overflow port 41 connecting with a return conduit 42 which communicates with the return passage 40. The cylinder 28 has an overflow port 43 connecting with a return conduit 44 which also communicates with the return passage 40. Thus each of the three cylinders is provided with a port through which fluid flows when the piston has completed its outward excursion. Thus excess movement of the pistons is prevented and they may be held in the outward position under pressure as long as desired to hold the body or other article which has been moved or raised in its desired position.

A return check valve 45 is positioned to control the return passage 40. A valve operating or lifting member 46 is carried on a shaft 47 at the outer end of which a crank or lever 48 is positioned and this member is secured to an operating rod 49. By means of the member 46 the return flow valve 45 may be unseated and thus fluid pressure will be short circuited and will pass from the pump through the passage 34 to the cylinder 28, but instead of raising any of the pistons will return directly past the valve 45 through the passage 40 and into the pump. By this means the pump may remain in operation and may circulate the fluid without moving the piston. Consequently, therefore, the operation of the pistons is controlled through the valve 45 by the rod 49 and associated parts.

In Figure 4 the same general cylinder arrangement is shown and the same pump and conduit system may be used. To simplify the description the cylinders in this form of the invention carry the same reference numerals as the cylinders shown in the earlier figures, because as shown they are identical in construction. The cylinders, however, instead of being mounted on the movable member 8 are mounted on a fixed member 50 which may be carried on any suitable supports and since the cylinders do not move, the pump drive may be simplified. In the present case the shaft 12 carries at its outer end a bevel gear 51 meshing with a bevel gear 52 carried on a shaft 53 which shaft may be journaled at 54 and driven from any suitable power source.

The piston rods instead of being movably or pivotally secured at their upper ends to a member such as the member 27 by means of ears 26, may be mounted in sockets 55 attached to or formed with a plate 56 which is itself secured to a platform or bar 57 by screws 58 or otherwise. It is to be understood that this arrangement is only diagrammatic and illustrative of one form of the invention. The pistons need not be in vertical position but may be in any position, thus being used for lifting, for tilting or for accomplishing any other movement.

The diagram of Figure 5 is not drawn to scale but illustrates with reasonable accuracy the effect accomplished. The vertical scale at the left indicates pounds of pressure per square inch. The horizontal scale at the right indicates degrees of inclination of a tipping body. Because of the arrangement and disposition of the parts the greatest pressure or the greatest moving force is necessary during the first few degrees of inclination. For that reason the three cylinders are used and one of them is provided with a reduced excursion. The line I which indicates the pressure, rises rapidly during the first few degrees of tipping or inclination or other movement and reaches its maximum as nearly as possible

at the start of movement. Because the work required to continue the movement decreases almost from the start, the pressure reduces after the peak II. In the particular body shown, the excursion of the piston within the center cylinder 28 terminates at a point at which the body has accomplished between 15° and 20° of tipping. This point is indicated at III. The pressure may momentarily rise thereafter to a peak IV and then declines along the section V until the maximum degree of tipping or movement has been accomplished.

It will be realized that whereas I have herewith shown and described a practical operative device, nevertheless many changes might be made in the size, shape, number and disposition of the parts without departing from the spirit of the invention and I wish, therefore, that my showing be taken as in a sense diagrammatic.

In particular the shape and arrangement and number of cylinders might be varied considerably. There might be only two cylinders or there might be many more, but whatever the arrangement, there will be at least two pistons, one of which has a longer excursion than the other. A particular variation of the present invention would be one in which there were three cylinders, two having a short travel and one having a longer travel. The particular arrangement of cylinders and pistons is, therefore, widely variable and depends largely upon the particular type of work which must be done, but in general and normally the arrangement is such as to provide a greater lifting or moving power during the initial stages of moving than that available in later stages.

It is obvious also that in an installation in which the cylinders are all of the same length, means might be provided whereby one piston has a shorter excursion than the others. Therefore, where in the specification and claims a shorter cylinder is referred to, this language is to be taken as covering a mechanism in which the cylinders might be all of the same length but in which the travel of one of the pistons is shorter than that of another piston. Where this is done for most purposes it would be convenient to have a shorter cylinder but the invention is not limited to this construction and may be embodied in any arrangement in which there is a provision for a piston having a relatively short excursion and another piston having a relatively longer excursion.

The use and operation of the invention are as follows:

With the parts shown in the position of Figure 1 the pump may or may not be in operation. If it is in operation, and tipping is not desired, the return flow valve 45 is moved through the control rod 49 and associated mechanism into the short circuiting position and fluid merely circulates from the pump to the cylinder 28 and returns directly to the pump. When it is desired to tip the body the valve is operated to stop short circuiting and fluid under pressure then flows to the cylinder 28, from it to the other cylinders and the three pistons move outwardly in unison. When the center piston has accomplished its maximum movement it stops, but the others continue until they have accomplished their maximum movement and the tip is completed.

After the center piston has stopped and while the movement of the other pistons continues, the telescopic member 31 moves outwardly and approaches or reaches the position shown in Figure 3. Upon return movement of the body to

the untipped position, the member 31 moves downwardly again and finally reaches its original position with respect to the piston rod 30 which position is indicated generally in Figure 1 and in detail in Figure 2.

The use and operation of the form of the device shown in Figure 4 is generally the same. Such a device has many uses, one of which might be to raise the end of a tank or other containing member so as to tip it, but this form of the invention is not limited to that particular use.

I claim:

1. In combination in a dumping body, a support, a body mounted thereon for movement with respect thereto, and hydraulic means for moving said body, said means comprising a plurality of hydraulic cylinders in hydraulic circuit with each other, a piston in each cylinder, a rod extending outwardly therefrom, all of said rods connected to the body, positive means for automatically terminating the excursion of one of said pistons prior to the termination of the excursion of the other of said pistons whereby all of the pistons are effective in dumping the body during an early portion of its movement and one of the pistons reaches the limit of its excursion before the completion of movement.

2. In combination in a dumping body, a support, a body pivotally mounted thereon for tipping movement with respect thereto, and hydraulic means for tipping said body, said means comprising a plurality of hydraulic cylinders in hydraulic circuit with each other, one cylinder being shorter than the other, a piston in each cylinder, a rod extending outwardly therefrom, all of said rods connected to the body, positive means for automatically terminating the excursion of one of said pistons prior to the termination of the excursion of the other of said pistons whereby all of the pistons are effective in dumping the body during an early portion of its movement and one of the pistons reaches the limit of its excursion before the completion of tipping.

3. In combination in a dumping body, a support, a body mounted thereon for tipping movement with respect thereto, and hydraulic means for tipping said body, said means comprising a plurality of hydraulic cylinders in hydraulic circuit with each other, a piston in each cylinder, a rod extending outwardly therefrom, all of said rods connected to the body, positive means for automatically terminating the excursion of one of said pistons prior to the termination of the excursion of the other of said pistons whereby all of the pistons are effective in dumping the body during an early portion of its movement and one of the pistons reaches the limit of its excursion before the completion of tipping.

4. In combination in a dumping body, a support, a body mounted thereon for tipping movement with respect thereto, and hydraulic means for tipping said body, said means comprising a plurality of hydraulic cylinders in hydraulic circuit with each other, a piston in each cylinder, a rod extending outwardly therefrom, all of said rods connected to the body, positive means for automatically terminating the excursion of one

of said pistons prior to the termination of the excursion of the other of said pistons whereby all of the pistons are effective in dumping the body during an early portion of its movement and one of the pistons reaches the limit of its excursion before the completion of tipping.

5. In combination in a dumping body, a support, a body mounted thereon for tipping movement with respect thereto, and hydraulic means for tipping said body, said means comprising a plurality of hydraulic cylinders in hydraulic circuit with each other, a piston in each cylinder, a rod extending outwardly therefrom, all of said rods connected to the body, positive means for automatically terminating the excursion of one of said pistons prior to the termination of the excursion of the other of said pistons whereby all of the pistons are effective in dumping the body during an early portion of its movement and one of the pistons reaches the limit of its excursion before the completion of tipping, and a tiltable support pivoted to said vehicle support, a pump on said second support, said cylinders on said second support, hydraulic connections between said pump and said cylinders, and a valve control therefor adapted to control the operation of tipping.

6. In combination in a dumping body, a support, a body pivotally mounted thereon for tipping movement with respect thereto, and hydraulic means for tipping said body, said means comprising a plurality of hydraulic cylinders in hydraulic circuit with each other, one cylinder being shorter than the other, a piston in each cylinder, a rod extending outwardly therefrom, all of said rods connected to the body, positive means for automatically terminating the excursion of one of said pistons prior to the termination of the excursion of the other of said pistons whereby all of the pistons are effective in dumping the body during an early portion of its movement and one of the pistons reaches the limit of its excursion before the completion of tipping, and a tiltable support pivoted to said vehicle support, a pump on said second support, said cylinders on said second support, hydraulic connections between said pump and said cylinders, and a valve control therefor adapted to control the operation of tipping.

7. In combination in a dumping body, a support, a body mounted thereon for tipping movement with respect thereto, and hydraulic means for tipping said body, said means comprising a plurality of hydraulic cylinders in hydraulic circuit with each other, one cylinder being shorter than the other, a piston in each cylinder, a rod extending outwardly therefrom, the excursion of each piston being in proportion to the length of the cylinder within which it is mounted, all of said rods connected to the body, whereby all of the pistons are effective in dumping the body during a portion of its movement and one of the pistons reaches the limit of its excursion before the completion of tipping, and a telescopic connection between the piston of said shorter cylinder and said body.

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