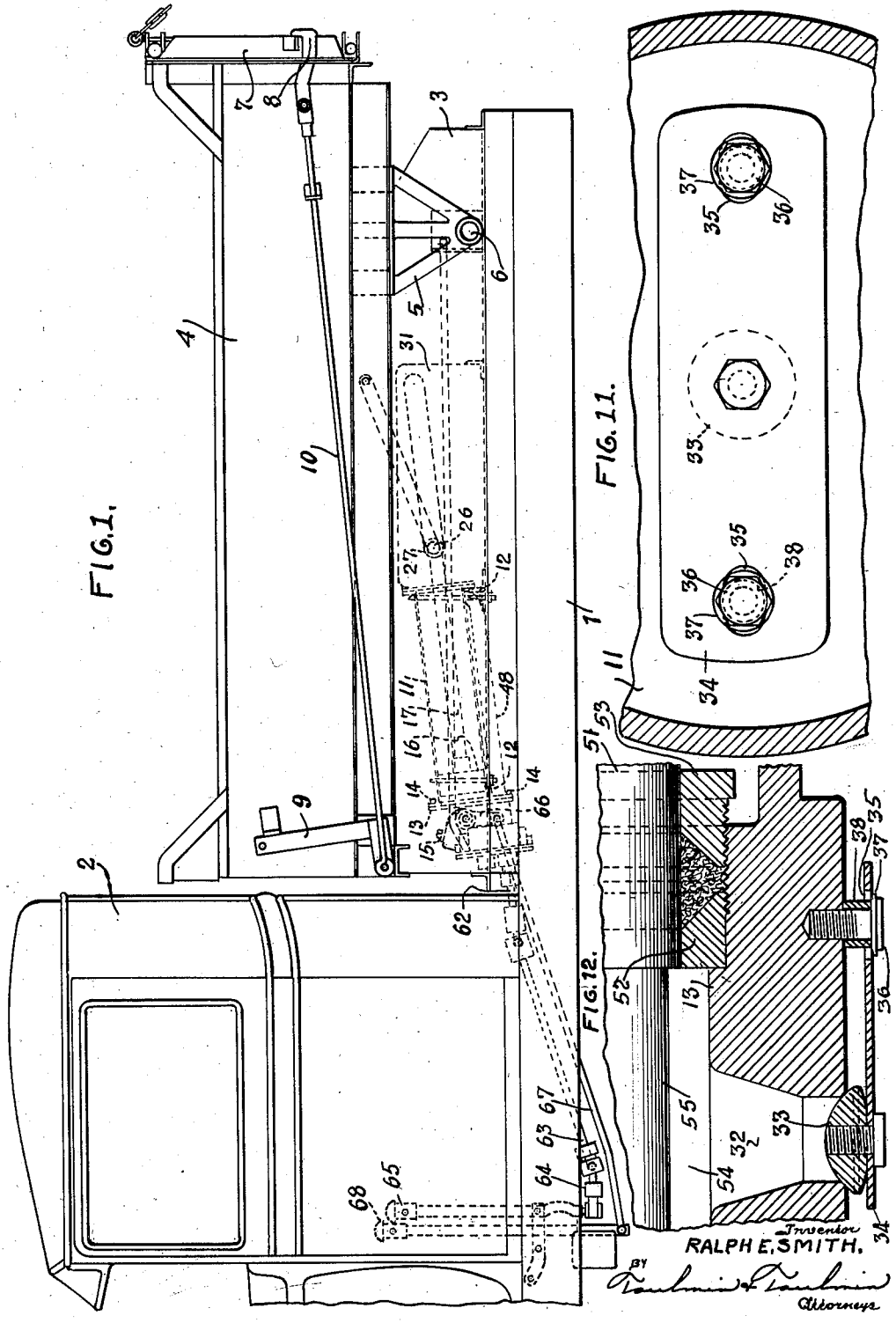
Jan. 7, 1936. R. E. SMITH 2,026,853

LIFTING MECHANISM

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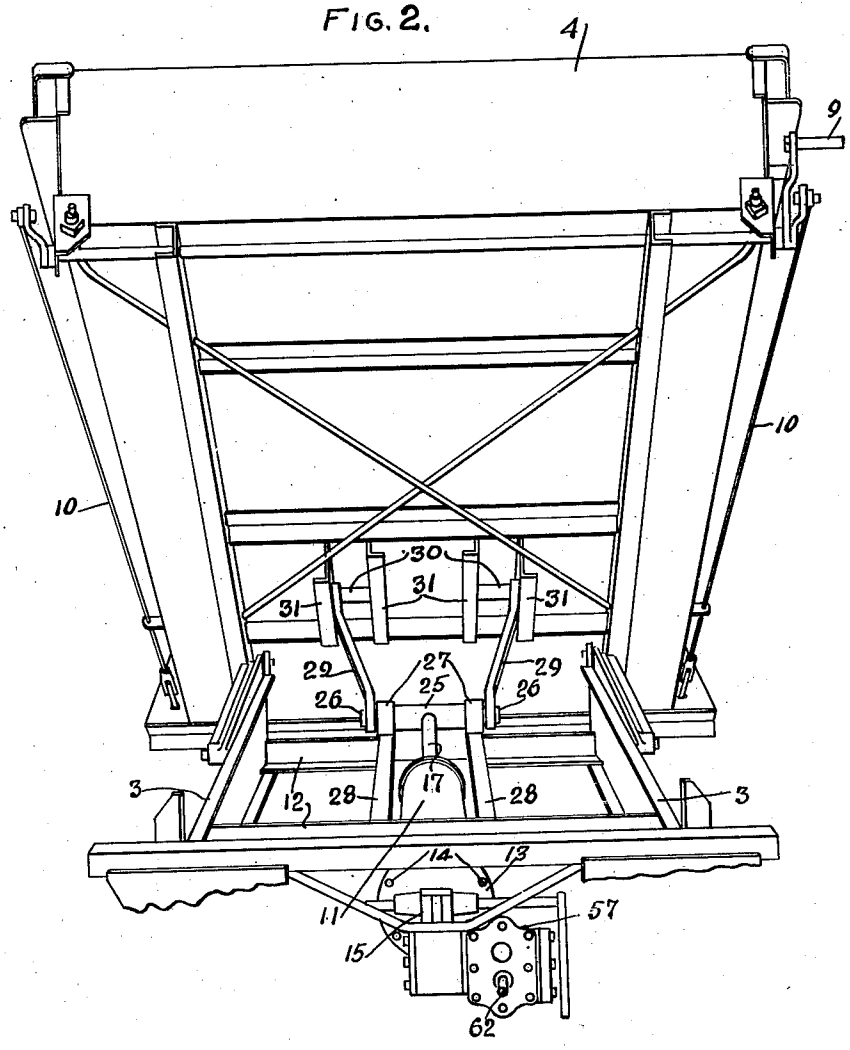


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LIFTING MECHANISM

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FIG. 2.



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LIFTING MECHANISM

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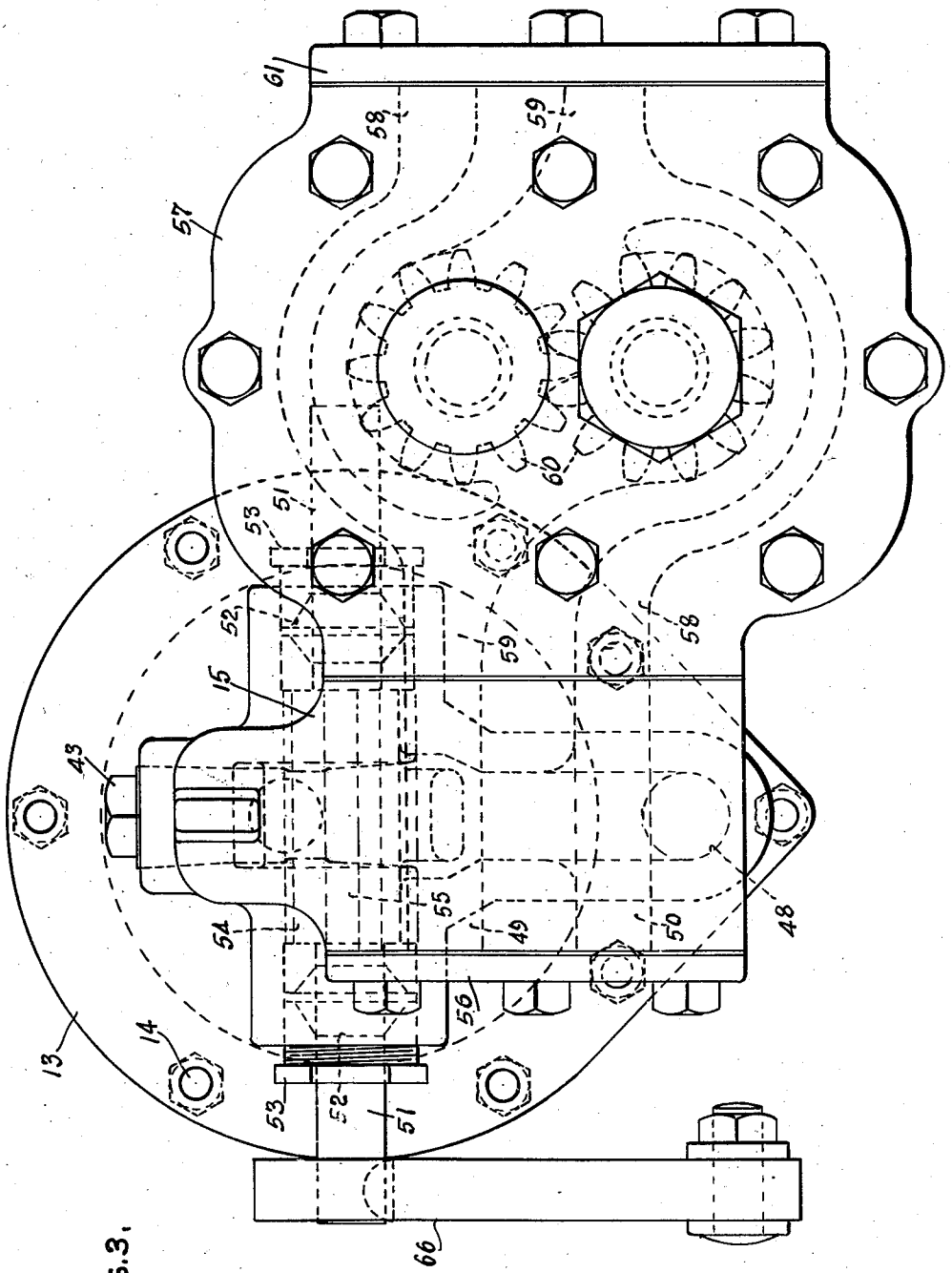


FIG. 3.

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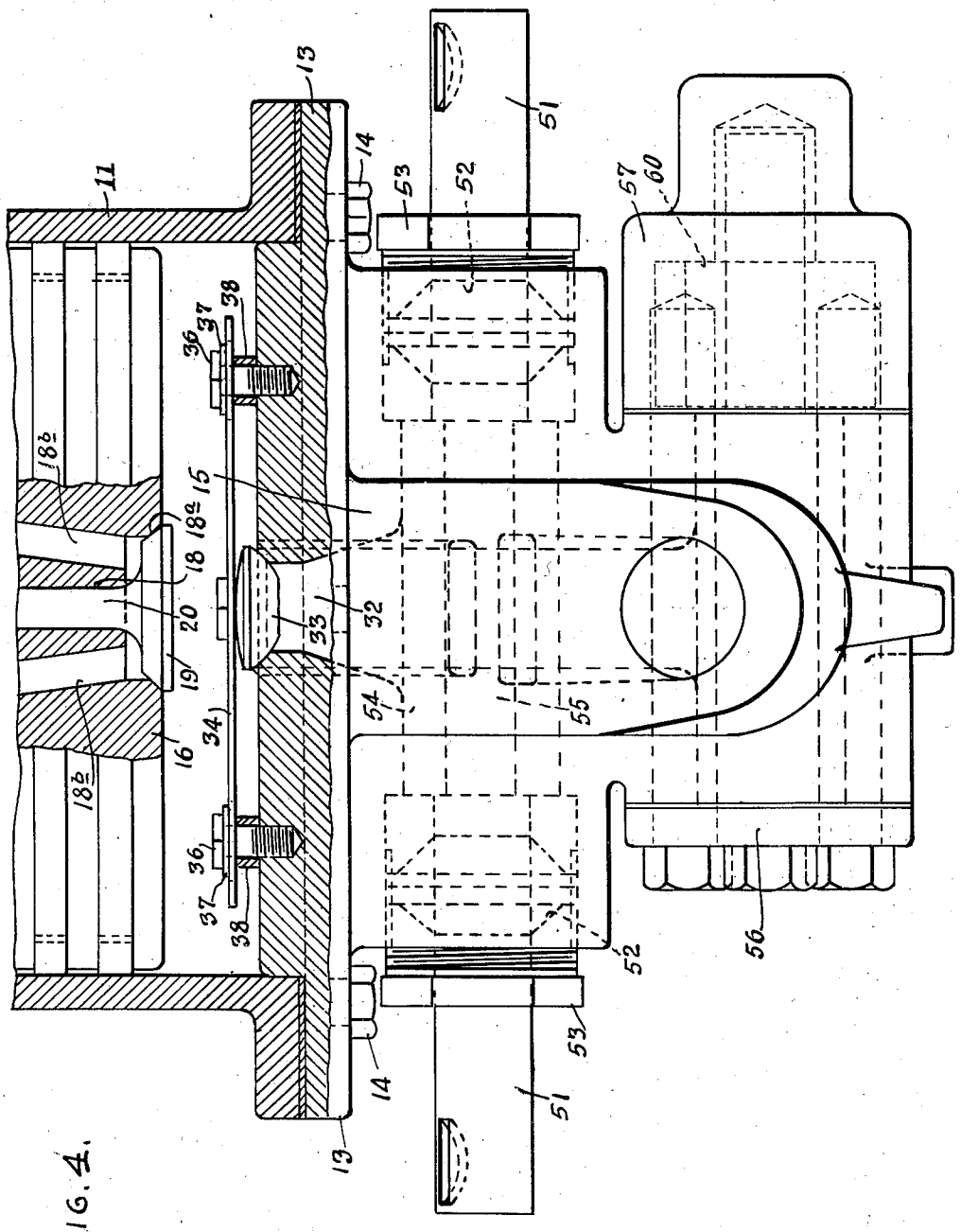


FIG. 4.

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LIFTING MECHANISM

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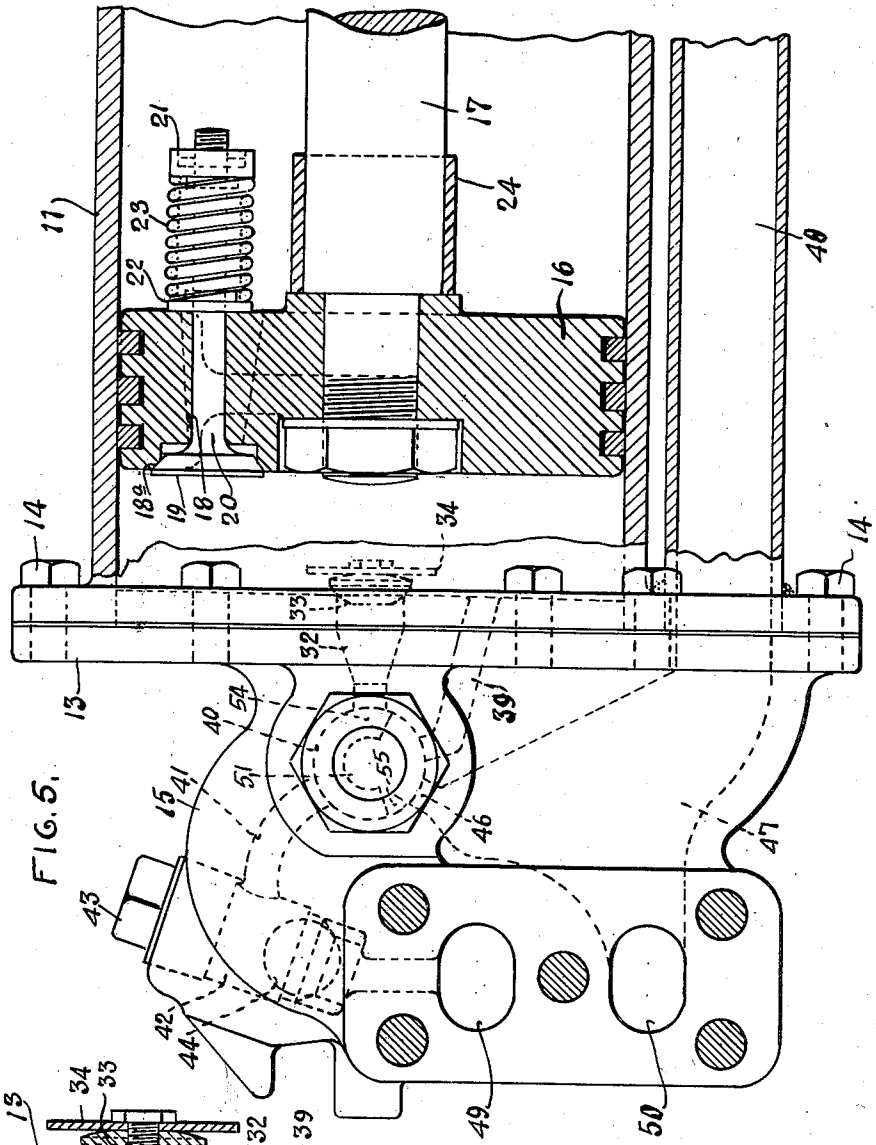


FIG. 5.

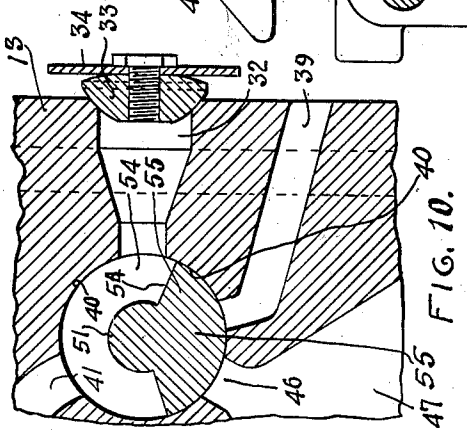


FIG. 10.

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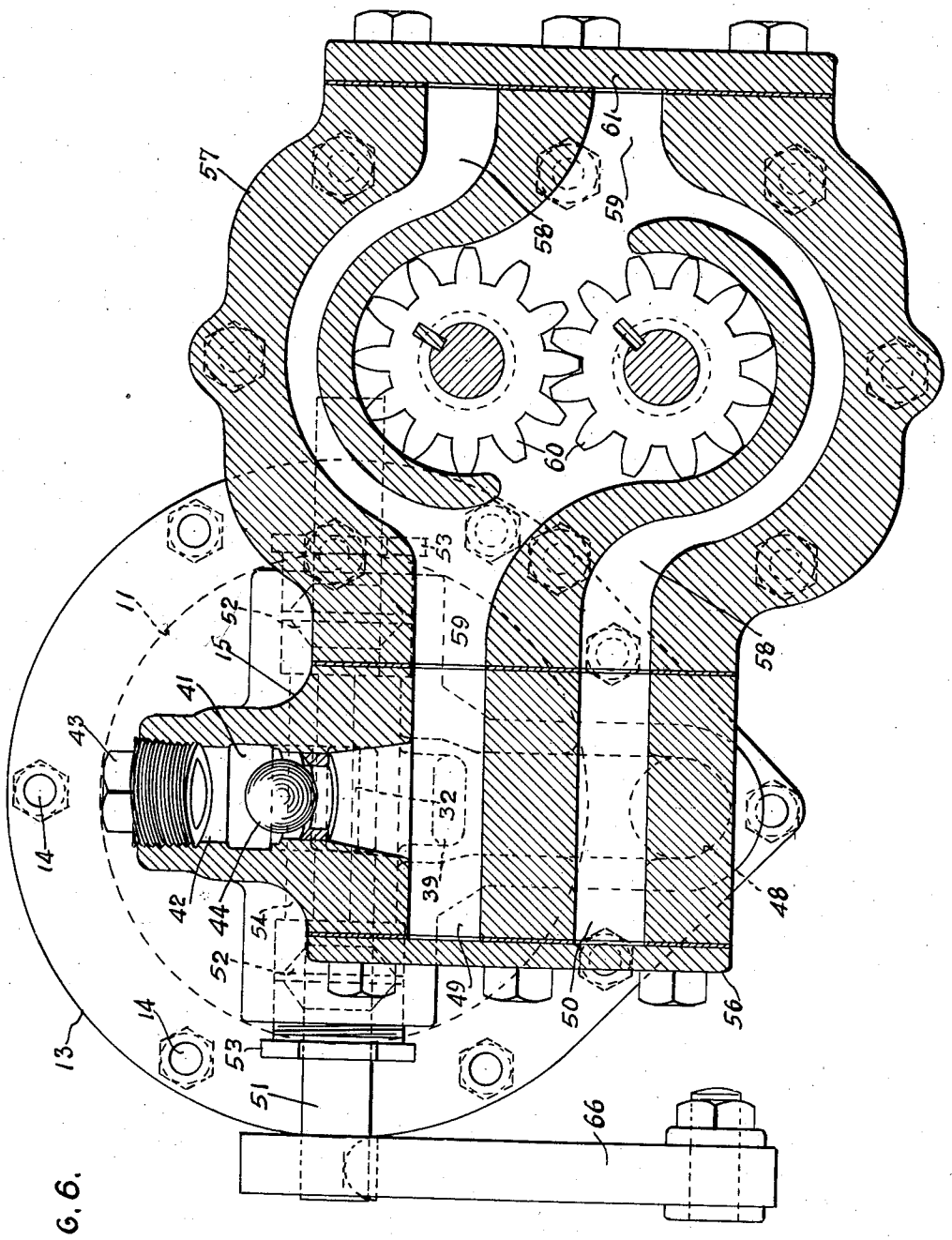


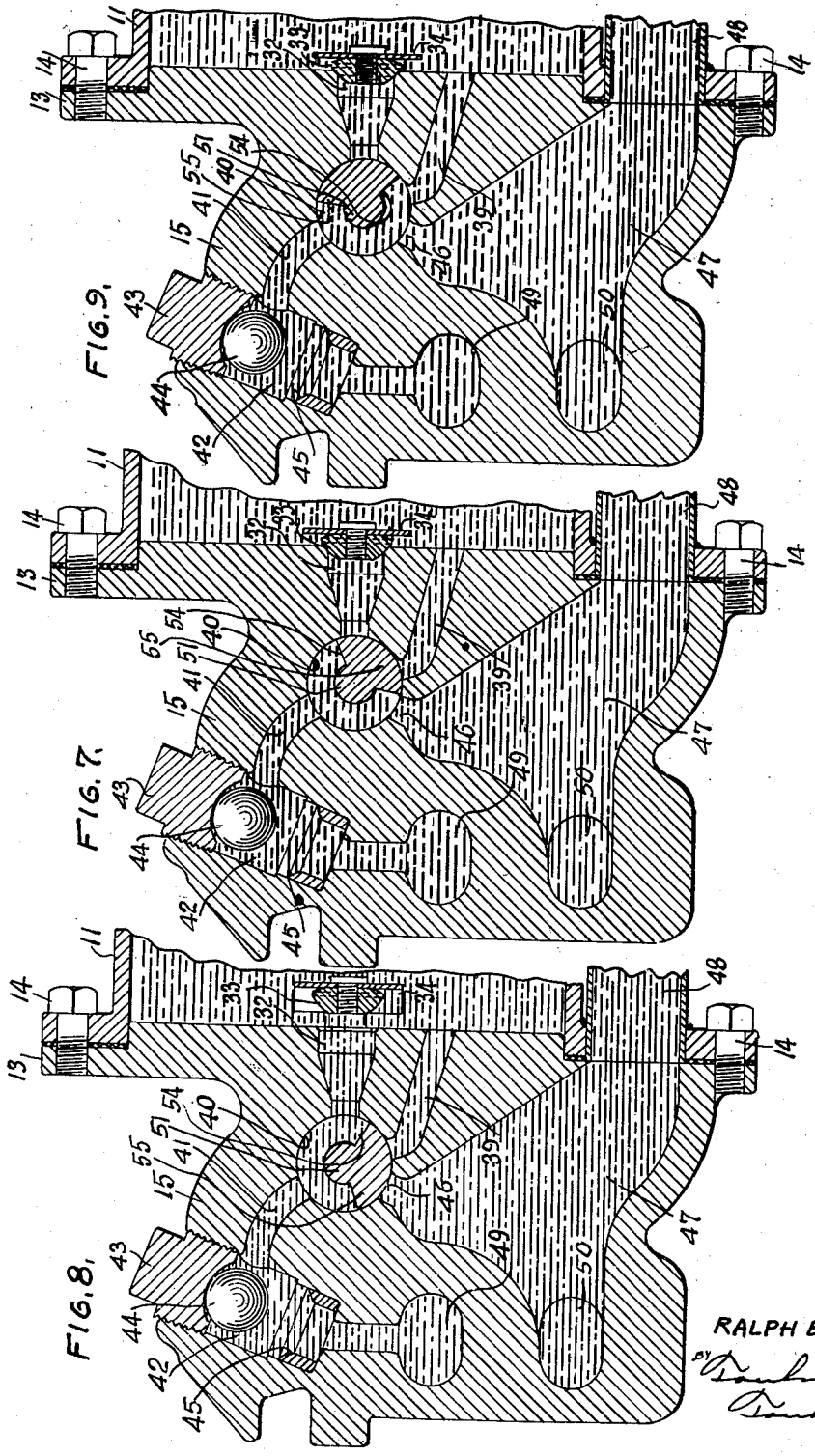
FIG. 6.

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LIFTING MECHANISM

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UNITED STATES PATENT OFFICE

2,026,853

LIFTING MECHANISM

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Application December 18, 1931, Serial No. 581,892

23 Claims. (Cl. 60—52)

The present invention relates to a lifting or hoisting mechanism adapted to be used in connection with dump trucks, but capable of being used for other purposes.

It has for its object to provide fluid operated means for hoisting a lifting mechanism and so controlling the fluid that the lifting mechanism may be adjusted in any position with relation to the load to be hoisted or the dump body to be dumped, and for this purpose there is provided a cylinder having therein a hoisting piston and a piston rod. To one end of this cylinder is attached means for delivering a fluid to the cylinder for moving the piston therein and means for cutting off the fluid in connection with the cylinder so that the piston may be maintained in any position of adjustment.

It is also an object of this invention to provide in connection with a hoisting cylinder and means for delivering the hoisting fluid to the cylinder, an inlet from the hoisting means to the cylinder and an outlet from the cylinder to the hoisting means and means for controlling the inlet and the outlet so that the flow of liquid to the cylinder may be regulated or entirely closed off, without stopping the pump.

It is a further object of this invention to provide, in connection with a hoisting cylinder with a piston therein, means to deliver the hoisting fluid to the cylinder and means in the cylinder to prevent the back flow of the hoisting fluid from the cylinder.

These and other advantages will appear from the following description taken in connection with the drawings.

In the said drawings

Fig. 1 is a side elevation of the rear end of a dumping truck body and a part of the frame supporting the body.

Fig. 2 is a perspective view showing the rear part of the truck frame with a body thereon in dumping position.

Fig. 3 is a front elevation of the cylinder head, showing the valve casing and the pump casing thereon.

Fig. 4 is a longitudinal section through one end of the cylinder and the cylinder head, showing the valve casing supported by the cylinder head.

Fig. 5 is a vertical section through a part of the cylinder adjacent one end and the piston showing the cylinder head with the valve casing thereon.

Fig. 6 is a view showing the cylinder head in front elevation with the valve casing and the pump casing in vertical longitudinal section.

Fig. 7 is a section through the cylinder head and the valve casing with the valve in neutral position so that the hoisting fluid is recirculated through the recirculating passageway.

Fig. 8 is a view similar to Fig. 7 with the valve in position to close the recirculating passageway, and directing the fluid from the pump through the inlet into the cylinder.

Fig. 9 is a view similar to Figs. 7 and 8 with the valve in position to permit the recirculation of the fluid and the discharge of the fluid from the cylinder through the outlet into the recirculating passageway.

Fig. 10 is an enlarged view of a fragmentary part of the cylinder head, showing the valve, the inlet from the valve chamber into the cylinder, the outlet from the cylinder into the valve chamber and a valve for closing the inlet to prevent the back flow of the hoisting fluid.

Fig. 11 is a fragmentary section of the end of the cylinder adjacent the cylinder head, showing the plate for supporting the valve to prevent the back flow of the hoisting fluid through the inlet.

Fig. 12 is a vertical longitudinal section through the cylinder head, showing a fragmentary view of the valve for controlling the passage of the hoisting fluid, together with the valve to prevent the back flow of the hoisting fluid through the inlet.

In Fig. 1, the relative positions of the various parts are shown with the dumping body supported in load carrying position. The operative mechanisms for causing the body to dump are shown in dotted lines. The truck frame is indicated by the numeral 1 and has on the front end a driver's cab 2. Immediately above the front of the truck frame and to the rear of the driver's cab is a sub-frame 3 which supports a body 4. When the body is in load carrying position as shown in Fig. 1, it rests on top of the sub-frame and is supported thereby. In order that the body may be tilted or dumped, there is provided adjacent each side near the rear end thereof a bracket 5. These brackets are V-shaped with their larger ends attached to the sides of the body, while their narrow ends are supported by means of shafts or bolts 6 on the sides of the sub-frame 3. The body is provided at its rear end with the usual gate 7 which may be latched in closed position by means of a latch 8 operated for releasing purposes by means of a release lever 9 connected to the latch by means of a rod 10.

A cylinder 11 is supported between the sides

of the sub-frame by means of cross bars or beams 12, attached in any suitable manner to the sides of the sub-frame and also to the cylinder. The cylinder is closed at one end by means of a cylinder head 13 attached to the cylinder by means of screws 14. Integral with the cylinder head is a valve casing 15.

Within the cylinder is a piston 16 which has extending therefrom a piston rod 17 that projects out from the cylinder at the end thereof opposite the cylinder head. This end of the cylinder is closed in any suitable manner.

Extending through the piston from a valve seat 18a is a plurality of passageways, one passageway 18 is for a valve stem 20, and the others are diverging passageways 18b for the fluid. For controlling these passageways, there is provided a valve 19 on one end of the stem 20. This stem is supported by means of a nut 21 on or adjacent the other end thereof. Around the stem and engaging the piston opposite to the valve 19 is a washer 22 free from the passageways 18b. Between this washer and the nut 21 is a spring 23 surrounding the stem and tending to hold the valve 19 seated in order to close the passageways 18b.

The valve 19 serves as a relief valve and is opened by the stem 20 contacting the end of the cylinder at the end of the lifting operation.

Around the piston rod 17 and adjacent the piston 16 is a sleeve 24 which acts as a stop when the piston is forced to its extreme position in the cylinder for hoisting purposes. This sleeve will engage the end of the cylinder remote from the head and serve as a stop after the cylinder end has engaged the valve stem 20 to open the valve 19.

On the end of the piston rod, remote from the piston 16, is a cross head 25 which has on each end a trunnion 26 that carries thereon a roller 27. There are two of these rollers, each engaging a track 28, suitably supported by the cross beams 12 or any other convenient structure. On the extreme outer ends of the trunnions and adjacent the rollers 27 are links 29, one end of each link engaging one of the trunnions 26, while the other end of each link is connected to the body by means of a pin or pins 30 attached to longitudinally extending plates 31 on the bottom of the body and beneath it. These parts are shown in Fig. 2 with the dump body in dumping position.

In the cylinder head 13 and the valve casing 15 which are one in structure, there is an inlet 32 closed by means of a head valve 33 supported in some suitable manner at the center or middle part of a plate 34 to prevent the back flow of fluid from the cylinder. This plate has at each end a slot 35 in which a screw 36 fits and is threaded into a suitable threaded hole in the cylinder head 13. Around each screw and between its head and the plate is a washer 37, while between each end of the plate and the cylinder head is a spacer 38. By means of this spacer, the plate is supported in spaced relation to the cylinder head and within the cylinder, with the head valve normally closing the inner end of the inlet.

This plate is resilient and permits the head valve 33 to open under the pressure of fluid passing into the inlet. But whenever the pressure is released, the back pressure on the inside of the cylinder will cause the head valve to close so that fluid cannot pass back through the inlet.

Adjacent the inlet and leading from the cylinder through the cylinder head is an outlet 39. This inlet leads from a valve chamber 40, while the outlet leads from the cylinder to the valve chamber 40. This valve chamber is in a recirculating or oil-flowing passageway 41. This passageway is composed of several parts, all entering into the formation of a complete recirculating passageway which may be suitably cut off for delivering an elevating or pressure applying fluid to the cylinder.

In one part of this passageway is an enlargement forming a chamber 42. This chamber is closed at one end by means of a plug 43 and houses a ball valve 44 adapted to close the passageway to prevent the back flow of oil to the pump and to prevent the reverse operation of the pump. There is provided in this chamber a valve seat 45 adapted to receive the ball valve 44. The recirculating passageway adjacent the valve chamber 40 constitutes an outlet 46 for receiving the oil from the chamber. This oil is delivered to the chamber either through the recirculating passageway beyond the valve chamber or from the outlet 39.

That part of the recirculating passageway between the valve chamber and a pump inlet 50 is designated by 47 and is in the nature of a chamber which has connected thereto one end of a pipe 48, the other end of which is connected to the end of the cylinder remote from the cylinder head 13. By means of this pipe, as the piston advances from the cylinder head, the oil or any other suitable fluid passes from in front of the piston through the pipe 48 into the chamber 47 and enters the recirculating passageway and is conveyed to the pump and forced through the passageway into the cylinder at the entrance end thereof.

As shown in Figs. 6, 7, 8 and 9, the recirculating passageway in the valve casing is composed of, in addition to the foregoing mentioned parts, the pump outlet 49. The valve for controlling the flow of the fluid through the recirculating passageway is indicated by the numeral 51 and is in the form of a shaft located in suitable bearings in the valve casing. There is provided in connection with each bearing a packing 52 held in position by means of a gland 53. The central part of this shaft between the two bearings is enlarged for valve purposes and has a cutaway part 54 to provide space through which the hoisting fluid may pass. There is also provided a valve sector 55 which acts as a valve structure proper for closing selectively the recirculating passageway, the inlet and the outlet.

The sector 55 under pressure of the fluid being forced from the pump into the cylinder, serves to form a seal for securely closing the outlet 39 and the outlet 46. In fact, this sector, under pressure of the fluid from the pump, serves to securely seal any part or passageway closed thereby, and when the pump is not operating the valve 44 serves to maintain the pressure on the sector by preventing back flow of the fluid into the pump.

Leading to this valve chamber is the pump outlet 49, and leading from the chamber 47 and the valve chamber is a pump inlet 50. This valve casing is symmetrical in structure as shown in Fig. 6 and is adapted to have attached to either side a pump casing. When the pump casing is attached to one side, the other side is closed by means of a plate 56, suitably attached thereto by screws as indicated in Fig. 6. The pump casing is indicated by the numeral 57 and is attached to the side of the valve casing opposite to that on which the plate 56 is attached.

This pump casing has on each side a pump inlet 58 and a pump outlet 59.

When in the position shown in Fig. 6, one of the inlets 58 is connected to the pump inlet 50 of the valve casing, while one of the pump outlets 59 is connected to the pump outlet 49 of the valve casing. The pump structure itself consists of a pair of pump gears 60 mounted on shafts supported by the pump casing 57. The side of the pump casing opposite to the valve casing is closed by means of a plate 61. This plate is supported on the pump casing by means of screws in the usual manner. The pump casing is supported on the valve by means of suitable screws that hold the parts together in the manner shown in Fig. 6.

When the pump gears are rotated, the hoisting fluid is taken into the inlet side of the pump and forced out at the outlet side of the pump through the valve chamber 42 into the valve chamber 40 where it is directed by means of the valve sector 55 and the cutaway part 54 in the proper and desired channels. The rotation of the pump takes in the fluid from the chamber 47 for recirculating purposes.

Each of the pump gears 60 has a supporting shaft 62. One of these shafts is extended for forming an operating shaft and has attached thereto in a suitable manner a shaft 63 as shown in Fig. 1. The end of the shaft 63, remote from the pump casing, has thereon a takeoff gear 64 which may be caused to mesh with a gear (not disclosed), on the truck operating shaft for the purpose of taking off power from the said shaft.

In order to operate the takeoff gear, there is provided a lever 65 located in the truck cab in some position convenient for the operator to operate. There is also provided on the valve shaft 51 an arm 66 for properly rotating the shaft to shift the valve sector 55 to control the passageway. To this arm 66, one end of a link 67 is attached, while the other end of this link 67 is attached to one end of a lever 68 supported in a similar suitable position in the cab where it may be operated by the truck driver.

When it is desired to operate the pump, the lever 65 is shifted to cause the takeoff gears 64 to mesh. When these gears are in mesh, the shaft 63 rotates and operates the pump mechanism.

When the valve sector 55 is in the position shown in Fig. 7, the operation of the pump causes a recirculation of the hoisting fluid. No hoisting action can take place. When it is desired to hoist the body or any other object to be hoisted, the lever 68 is operated so that the valve sector 55 is shifted to the position shown in Fig. 8. In this position, the outlet 39 is closed and so is the outlet 46 from the valve chamber 40. The oil is, therefore, forced to go or be diverted from the recirculation passageway through the inlet to the cylinder where it acts upon the piston to move the piston and the piston rod for hoisting purposes. After a sufficient amount of hoisting has been effected, the valve may be shifted again to the position shown in Fig. 7, whereby the piston is held against movement so that the load is held in an adjusted and desired position.

When it is desired to lower the apparatus, the valve sector is shifted to the position shown in Fig. 9 where it closes the inlet 32 and leaves the outlet 39 and the outlet 46 open so that there is a recirculation of the oil and also a release of the oil from the piston through the outlet 39 into the recirculating passageway.

During the reverse or lowering action, the hoisting fluid is forced out through the outlet and passes up through the pipe 48 to the other end of the cylinder.

It is also to be observed that by proper regulation of the valve sector, the amount of the openings in the various passageways may be controlled. This sector may be so positioned that only a part of the inlet 32 is opened, thereby causing a very gradual hoisting or lifting. The sector may be also positioned so as to only partly open the outlet 39 so that a very gradual lowering takes place.

Any degree of rapidity in hoisting and lowering may be effected and also the load may be sustained in any position by merely adjusting the valve to the position shown in Fig. 7.

I desire to comprehend within my invention such modifications as may be embraced within my claims and the scope of my invention.

Having thus fully described by invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a hoisting mechanism, a pump, a cylinder having a head, a piston in said cylinder, said head having a valve chamber with an inlet from the cylinder, a check valve therein and an outlet into the cylinder and an inlet from the pump and a single valve to close the inlets and the outlet.

2. In a hoisting mechanism, a pump, a cylinder having a head, said head having a valve chamber with an inlet and an outlet therein to the cylinder and an inlet from the pump, a piston in said cylinder, means to prevent the back flow of fluid through the cylinder inlet and a single valve to regulate the opening and the closing of the inlets and the outlet.

3. In a hoisting mechanism, a pump, a cylinder having a head with a casing thereon, said casing having a recirculation passageway therein to and from the pump, said head having an inlet to the cylinder from the passageway, a check value therein and an outlet from the cylinder to the passageway, and a single means to regulate the opening and the closing of the inlet and the outlet and the passageway.

4. In a hoisting mechanism, a pump, a cylinder, a closure for one end of the cylinder, having therein a recirculation passageway to and from the pump, an inlet to the cylinder from the passageway, a check valve therein and an outlet from the cylinder to the passageway, and a single valve adapted to close either the outlet and the passageway, or to close the inlet and the outlet.

5. In a hoisting mechanism, a pump, a cylinder, a closure for one end of the cylinder, having therein a recirculation passageway to and from the pump, an inlet to the cylinder from the passageway and an outlet from the cylinder to the passageway, a single valve to regulate the connections between the passageway and the inlet and the outlet, and means to prevent back flow through the inlet.

6. In a hoisting mechanism, a pump, a cylinder, a closure for one end of the cylinder having therein a recirculation passageway to and from the pump, an inlet to the cylinder from the passageway and an outlet from the cylinder to the passageway, a single valve to regulate the connections between the passageway and the inlet and the outlet, and means to prevent back

flow through the inlet, said means consisting of a valve located in the cylinder.

7. In a hoisting mechanism, a pump, a cylinder, a closure for one end of the cylinder having therein a recirculation passageway to and from the pump, an inlet to the cylinder from the passageway and an outlet from the cylinder to the passageway, a single valve to regulate the connections between the passageway and the inlet and the outlet, a valve to prevent back flow through the inlet and a plate loosely mounted within the cylinder for supporting the last named valve.

8. In a hoisting mechanism, a pump, a cylinder, a casing on one end of the cylinder having a recirculation passageway to and from the pump, an inlet to the cylinder from the passageway, a check valve therein, and an outlet from the cylinder to the passageway, a pipe connection between the other end of the cylinder and the passageway and a single means to regulate the connections between the passageway and the inlet and the outlet.

9. In a hoisting mechanism, a pump, a cylinder, a casing on one end of the cylinder having a recirculating passageway to and from the pump, an inlet to the cylinder from the passageway and an outlet from the cylinder to the passageway, a pipe connection between the other end of the cylinder and the passageway, means in the passageway to regulate the connections between the passageway and the inlet and the outlet, and means to prevent back flow from the cylinder through the inlet.

10. In a hoisting mechanism, a pump, a cylinder, a casing on one end of the cylinder, having a recirculating passageway to and from the pump, an inlet to the cylinder from the passageway and an outlet from the cylinder to the passageway, a pipe connection between the other end of the cylinder and the passageway, a valve to control the flow of fluid from the passageway to the inlet and from the outlet to the passageway, and a valve to prevent back flow through the inlet.

11. In a hoisting mechanism, a cylinder, a pump structure on one end of said cylinder, comprising a casing having a recirculation passageway, an inlet from the passageway to the cylinder, a valve to prevent back flow through the inlet, and an outlet from the cylinder to the passageway, and a valve in the passageway in one position to cut off the passageway and the outlet and connect the passageway to the inlet.

12. In a hoisting mechanism, a cylinder, a head on one end of said cylinder, a valve casing on said head, a pump casing on said valve casing, a pump therein, said casings having a recirculation passageway to and from the pump therein, an inlet to the cylinder, a check valve in said inlet and an outlet from the cylinder, the pump arranged to cause the flow of a fluid through the passageway and a valve in said passageway adapted to close the passageway and the outlet and open up a way between the passageway and the inlet.

13. In a hoisting mechanism, in combination with the frame, a load support, a cylinder on said frame having therein a piston and a piston rod, a connection between the piston rod and the load support, pump means supported on one end of the cylinder and leading therefrom and back thereto a recirculating passageway, an inlet from the recirculating passageway into the cylinder, a valve to prevent back flow through the inlet, and an outlet from the recirculating passageway to the cylinder and a valve for controlling said inlet and said outlet.

14. In a hoisting mechanism, in combination with the frame, a load support, a cylinder on said frame having therein a piston and a piston rod, a connection between the piston rod and the load support, pump means supported on one end of the cylinder and having leading therefrom and back thereto a recirculating passageway, an inlet from the recirculating passageway to the cylinder, and an outlet from the cylinder to the recirculating passageway, a valve for controlling said inlet and said outlet, and a valve within the cylinder for preventing back flow of fluid through the inlet.

15. In a hoisting mechanism, in combination with the frame, a load support, a cylinder on said frame having therein a piston and a piston rod, a connection between the piston rod and the load support, pump means supported on one end of the cylinder and having leading therefrom and back thereto a recirculating passageway, an inlet from the recirculating passageway to the cylinder, and an outlet from the cylinder to the recirculating passageway, a valve for controlling said inlet and said outlet, and a valve within the cylinder for preventing back flow of fluid through the inlet, said last named valve being supported within the cylinder by a loosely mounted spring plate.

16. In a hoisting mechanism, in combination with the frame, a load support, a cylinder on said frame having therein a piston and a piston rod, a link connection between the piston rod and the load support, pump means supported on one end of the cylinder and having leading therefrom and back thereto a recirculating passageway, an inlet from the recirculating passageway to the cylinder, and an outlet from the cylinder to the recirculating passageway, a valve for controlling said inlet and said outlet, and a valve within the cylinder for preventing back flow of fluid through the inlet, said last named valve having attached thereto a plate, said plate being attached to said valve at the middle point of the plate and having a slot in each end thereof and means extending through each slot and engaging a part of a cylinder for supporting the plate.

17. In a hoisting mechanism, in combination with a frame and a load support, a cylinder rigidly supported by said frame and having therein a piston and a piston rod, a connection between the piston rod and the load support, whereby movement of the piston will cause the load support to move, a head for said cylinder, a pump mechanism connected to said head and having a recirculating passageway with an inlet from the passageway to the cylinder, a valve to prevent back flow through the inlet, and an outlet from the cylinder to the passageway, and a valve in said recirculating passageway to control the recirculation of the fluid or to cut off the recirculation and direct the fluid into the recirculating passageway and the outlet from the cylinder.

18. In a hoisting mechanism, in combination with a frame and a load support, a cylinder rigidly supported by said frame and having therein a piston and a piston rod, a connection between the piston rod and the load support, whereby movement of the piston will cause the load support to move, a head for said cylinder, a pump mechanism connected to said head and having a recirculating passageway with an inlet from the passageway to the cylinder and an outlet from the cylinder to the passageway, a valve in said

recirculating passageway to control the recirculation of the fluid or to cut off the recirculation and direct the fluid into the cylinder through the inlet or cut off the inlet and open the recirculating passageway and the outlet from the cylinder, and valve means to prevent the back flow of fluid through the inlet.

19. In a hoisting mechanism, in combination with a frame and a load support, a cylinder rigidly supported by said frame and having therein a piston and a piston rod, a connection between the piston rod and the load support, whereby movement of the piston will cause the load support to move, a head for said cylinder, a pump mechanism connected to said head and having a recirculating passageway with an inlet from the passageway to the cylinder and an outlet from the cylinder to the passageway, a valve in said recirculating passageway to control the recirculation of the fluid or to cut off the recirculation and direct the fluid into the cylinder through the inlet or cut off the inlet and open the recirculating passageway and the outlet from the cylinder, and means located in the cylinder for automatically closing the inlet from back flow of the fluid, said means comprising a plate loosely mounted in the cylinder and a valve thereon, fitting in the inlet.

20. In a hoisting mechanism, in combination with the frame and a load support, and means mounted on the frame for moving said load support, said means including a cylinder, a pump having a recirculating passageway, said passageway being connected to the cylinder by an inlet and by an outlet, a valve to prevent back flow through the inlet, and a valve adapted to close the outlet and the recirculating passageway when in one position, adapted to close the inlet and the outlet when in another position, and also adapted to close only the inlet when in a third position.

21. In a hoisting mechanism, in combination with the frame and a load support, and means mounted on the frame for moving said load support, said means including a cylinder, a pump having a recirculating passageway, said passageway being connected to the cylinder by an inlet and by an outlet, and a valve adapted to close the outlet and the recirculating passageway when in one position, adapted to close the inlet and the outlet when in another position, and also adapted to close only the inlet when in a third position, and means in the inlet to prevent at all times a back flow of fluid from the cylinder into the recirculating passageway.

22. In a hoisting mechanism, in combination with the frame and a load support, and means mounted on the frame for moving said load support, said means including a cylinder, a pump having a recirculating passageway, said passageway being connected to the cylinder by an inlet and by an outlet, and a valve adapted to close the outlet and the recirculating passageway when in one position, adapted to close the inlet and the outlet when in another position, and also adapted to close only the inlet when in a third position, and means to prevent the back flow of the fluid from the cylinder through the inlet, said means comprising a plate loosely mounted at each end in the cylinder, and a valve supported intermediate the ends of the plate and adapted to close the inlet.

23. In a hoisting mechanism, in combination with the frame and a load support and means mounted on the frame for moving said load support, said means including a cylinder, a pump having a recirculating passageway, said passageway being connected to the cylinder by an inlet and by an outlet, and a valve adapted to close the outlet and the recirculating passageway when in one position, adapted to close the inlet and the outlet when in another position, and also adapted to close only the inlet when in a third position, means to prevent the back flow of the fluid from the cylinder through the inlet, said means comprising a plate loosely mounted at each end in the cylinder and a valve supported intermediate the ends of the plate and adapted to close the inlet, and a check valve between the pump and the first-mentioned valve adapted to prevent the return of liquid to the pump through the outlet passageway from the pump to the first-mentioned valve.

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