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LIFTING MECHANISM

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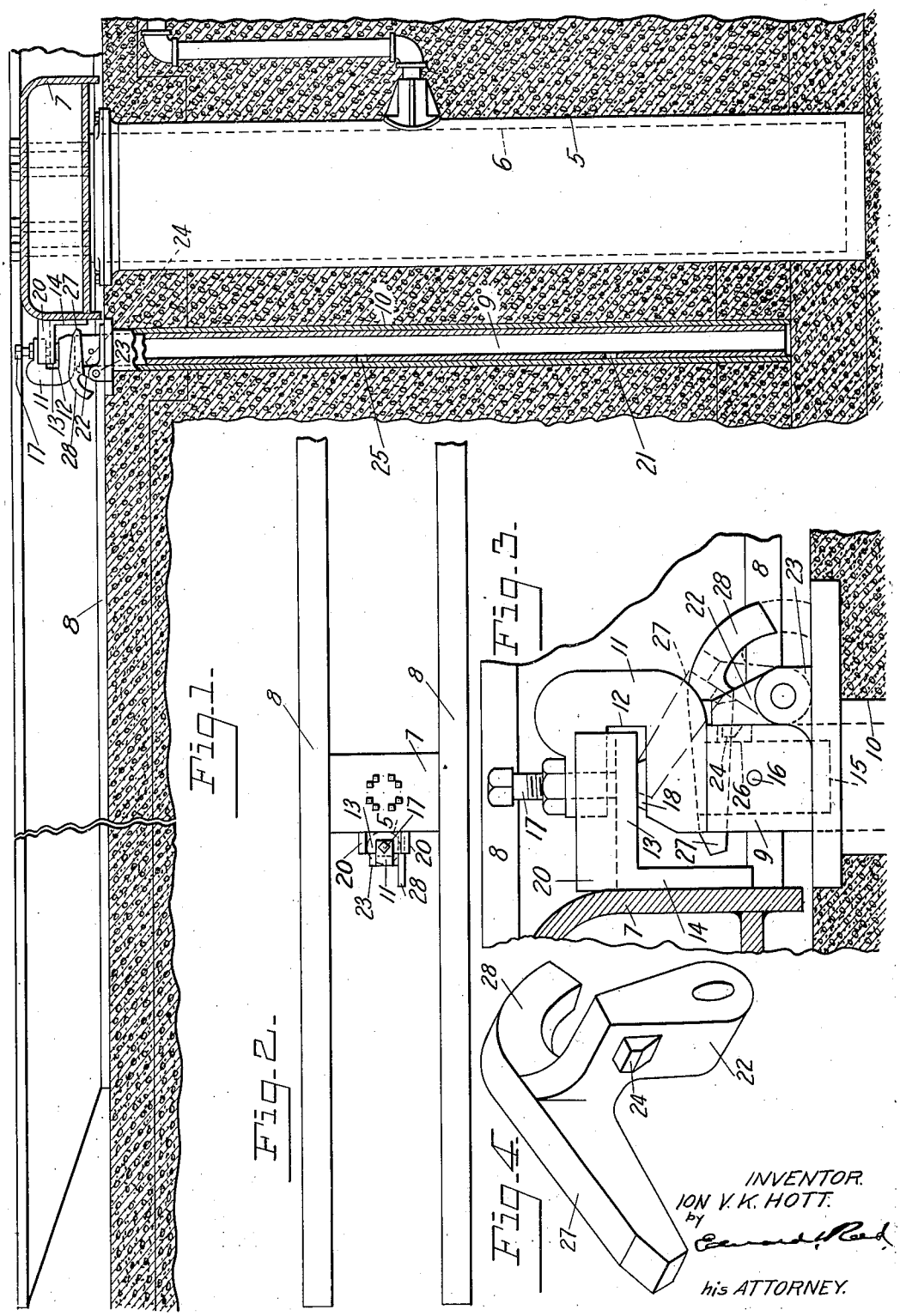


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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LIFTING MECHANISM

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This invention relates to a lifting mechanism and more particularly to a lifting mechanism of the type commonly employed for elevating an automobile to permit greasing, or otherwise servicing, the underneath parts thereof. Such a lift is ordinarily hydraulically operated and comprises a cylinder embedded in the ground, a ram mounted in the cylinder and a structure carried by the ram for supporting the automobile. The ram is usually rotatable in the cylinder, thus permitting the supporting structure to rotate. Under some conditions the rotation of the supporting structure is desirable but when, as is now customary, a series of lifts are arranged side by side within a building, the rotation of the supporting structure is seriously objectionable, because of the danger of one lift swinging into engagement with and damaging an automobile on an adjacent lift. However, when the lift is of the free wheel type, that is, when the supporting structure comprises rails to engage the axles of the automobile between the wheels, it is desirable that the supporting structure should be capable of some rotatory movement, because when the automobile is driven to a position above the rails it is not always exactly parallel with the rails and the latter must be moved to a position substantially parallel with the automobile before they will properly engage the axles. A hydraulically operated lift of this kind is usually retained in its elevated position by closing the valve which controls the admission and discharge of the fluid to and from the cylinder and should there be a break in the oil line, as for example if the packing should blow out, the lift would be permitted to suddenly drop, which might result in injury to an operator under the automobile or to the automobile itself.

One object of the present invention is to provide a lifting mechanism having means for controlling the rotation of the supporting structure.

A further object of the invention is to provide a lifting mechanism in which the controlling mechanism for the supporting structure will be of such a character as to permit of a limited rotary movement only of the supporting structure.

A further object of the invention is to provide such a lift with a safety device which will automatically control the downward movement of the ram independently of the oil line.

A further object of the invention is to provide a lifting mechanism in which the control for the rotary movement of the supporting structure and the safety device will be combined in a single mechanism.

Other objects of the invention will appear as the apparatus is described in detail.

In the accompanying drawing Fig. 1 is a side elevation, partly in section and partly broken away, of an automobile lift embodying my invention; Fig. 2 is a plan view of a free wheel lift with portions of the rails broken away; Fig. 3 is an elevation of the combined rotation controlling device and safety device looking in the direction opposite that shown in Fig. 1; and Fig. 4 is a detail view of the pivoted locking device.

In the drawing I have illustrated one embodiment of my invention and have shown the same applied to an automobile lift of a well known type. As here shown, this lift comprises a cylinder 5 embedded in the ground, the term "ground" being used to include a floor, pavement or the like. Mounted within this cylinder is a ram 6 on the upper end of which is mounted a supporting structure comprising a cross member 7 and parallel rails 8 carried by the cross member. In applying my invention to a lift of this kind I provide at one side of the cylinder and ram a vertically movable device which is connected with the ram in such a manner that it will have vertical movement substantially in unison therewith and this vertically movable device is so connected with the supporting structure that it will control the rotatory movement of the latter, and the safety device acts on the vertically movable device to lock the same against downward movement until such time as the safety device is moved to an inoperative position by the operator.

Preferably the vertically movable device is in the form of a rod, which may be of any suitable character, either in one part or a plurality of parts. As here shown, the rod 9 is tubular in form and is mounted in a vertical guideway 10 which is formed by embedding a tube in the ground alongside of and parallel with the cylinder. The rod has free sliding movement in the guideway but is held against lateral movement. The upper end of the rod is connected with the supporting structure in such a manner as to control the rotary or swinging movement of the supporting structure and this connection may take any suitable form. As here shown it is of such a character that the supporting structure may be held against all rotary movement or may be permitted to have a limited rotary movement. It is not necessary, however, that the connecting means should have both characteristics in one lift, but when the lift is of the runway type, in which the wheels of the vehicle are supported on

runways, a positive connection only may be desired. When the lift is of the free wheel type the positive connection may, if desired, be omitted and the connection arranged to permit of a limited movement of the supporting structure. However, it is desirable to combine both characteristics in one device as this will permit either type of supporting structure to be adjusted and then locked against rotation if and when desired.

In the particular construction here illustrated the rod is provided at its upper end with a part 11 having a lateral recess 12 facing toward the ram and this part is shown as a separate casting rigidly secured to the upper end of the tubular rod 9 and forming in effect a part of that rod. The supporting structure is provided with a laterally extending part which projects into the recess 12 and this part is here shown as a plate 13 having a depending flange 14 which is welded, or otherwise rigidly secured to, the transverse member 7 of the supporting structure. The transverse member 7 and the rod both being held against lateral movement it will be apparent that when the plate 13 has been inserted in the recess 12 it will be retained therein and the rod will be caused to move vertically with the ram. By making the casting 11 separate from the rod 9 it can be placed in proper engagement with the plate 13 and then secured to the body of the rod and, as here shown, the casting is provided with a shank 15 which extends into the upper end of the tubular rod and may be secured therein in any suitable manner, as by means of a pin 16. When the supporting structure is to be held against all rotatory movement the part 11 of the rod is rigidly secured to the part or plate 13 of the supporting structure and for this purpose an operable device has been provided for clamping together, or otherwise rigidly connecting, the parts 11 and 13. As here shown, a screw 17 is mounted in the part 11 above the recess 12 and when tightened down will clamp the plate 13 firmly against the part 11, the lower wall of the recess 12 being here shown as provided with an upwardly extending projection or pad 18 in line with the screw 7, so that the plate 13 is rigidly clamped against the screw and the pad. The plate is preferably of a width somewhat greater than the width of the part 11 of the rod, and by loosening the screw the supporting structure may, within certain limits, be adjusted about its axis.

In order that a limited rotatory movement may be imparted to the supporting structure the rod and the supporting structure are provided with spaced stops so arranged that when the supporting structure has been rotated to the desired limit these stops will engage one with the other and positively prevent further movement. In the present construction the plate 13 carried by the supporting structure is provided at its sides with upright bars or lugs 20 which extend above the recess 12 in the part 11 of the rod and are spaced apart a distance somewhat greater than the width of that portion of the part 11 which is arranged between the lugs 20. When these stops are provided the screw 17, or other fastening means, may be moved to an inoperative position, or entirely omitted, and the stops will prevent the supporting structure from being rotated in either direction to an objectionable extent. When it is desired to prevent all rotatory movement the screw is tightened down, with the parts 11 and 13 in their properly adjusted positions, thus rigidly connecting the parts one to the other.

If the rod and the ram are rigidly and permanently connected one to the other it is necessary either for the rod to be absolutely parallel with the ram or for the rod to have a slight tilting movement to prevent binding. The tilting of the rod is not desirable and true parallelism is difficult to attain in an installation of this kind. When the connecting parts, 11 and 13, can have a slight lateral movement with relation one to the other true parallelism is not essential because the connecting parts will automatically accommodate themselves to any slight divergence in the lines of movement of the rod and the ram.

Mounted near the upper end of the guideway 10 and preferably near the surface of the ground is a locking device adapted to engage the rod 9 and hold the same against downward movement, thereby preventing the downward movement of the ram. This locking device is of such a character that when in its operative position it will function automatically to prevent downward movement of the rod but it may be moved to and retained in an inoperative position to permit of the downward movement of the rod and of the ram. Preferably means are provided whereby the locking device will be automatically restored to its operative position as the ram nears the lower limit of its movement. This locking device may take various forms and may engage the rod in any suitable manner which will control its downward movement, but preferably the engagement is such as to positively prevent the downward movement of the rod. As here shown, the rod 9 is provided near its lower end with a recess 21 which is shown in the form of an aperture in the wall of the tubular rod. The locking device is in the form of a pawl 22 pivotally mounted on a bracket 23 with its axis transverse to the rod. This pawl is provided with a nose 24 adapted to enter the recess 21 in the rod when the latter is in its elevated position. So long as the usual locking mechanism for the ram is operative little or no weight will be imposed upon the pawl 22 but should the usual locking mechanism become inoperative the pawl will support the entire weight of the ram and of the supporting structure, together with the load thereon. I have also shown the rod 10 with a second or intermediate recess 25 adapted to be engaged by the pawl 22 to support the lift in an intermediate position, as when work is being done on the wheels, and the rod is also provided with a third recess 26 near the upper end thereof into which the nose of the pawl 22 may extend when the ram is in its lowermost position. The locking device or pawl 22 is, of course, movable into and out of its operative position and it is provided with means for automatically retaining the same in the position to which it has been moved. As here shown, this means comprises an arm 27 projecting inwardly from the upper end of the pawl and constituting a weight which tends to move the pawl toward the rod and to cause the nose thereof to enter the recesses when these are brought into line therewith by the movement of the ram. The arm 27 also extends outwardly beyond the axis of the pawl and has its end turned downwardly, as shown at 28, so that it may be readily engaged by the foot of the operator and the pawl moved about its axis to its inoperative position. The pawl and the parts carried thereby are so arranged that when the pawl is in its operative position the center of gravity will be on the inner side of the axis of the pawl and it will thus be automatically retained in its operative posi-

tion, but when the pawl is moved to its inoperative position the center of gravity is shifted to the outer side of the axis and the pawl will be held in its inoperative position with the arm 27 inclined upwardly and inwardly, as shown in dotted lines in Fig. 3. This arm is arranged at one side of and extends across the upper portion of the rod 9 but it lies in the path of the plate 13 on the supporting structure, so that when the pawl is in its inoperative position the plate will, as the ram approaches its lowermost position, engage the upper end of the arm 27 and move the locking device about its axis to shift the center of gravity thereof to the inner side of that axis, thus causing the device to be again automatically retained in its operative position. When the ram is in its lowermost position the nose of the pawl will enter the recess 26 and as the rod moves upwardly the nose will be forced out of the recess and will ride over the surface of the rod, but the movement imparted to the pawl will not be sufficient to shift the center of gravity to the outer side of the axis. Consequently when the lift has been moved to its elevated position the nose of the pawl will enter the recess 21, or 25, as the case may be, and will be in a position to positively prevent the downward movement of the ram. When the lift is to be lowered the operator moves the locking device to its inoperative position, in which position it remains until the ram has been lowered and the plate 13 has restored the locking device to its operative position. Thus the locking device is automatically restored to operative position independently of any action on the part of the operator and whenever the lift is elevated this locking device is operative.

While I have shown and described one embodiment of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

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

1. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a device mounted alongside of and connected with said ram for vertical movement therewith and having means to limit the rotary movement of said supporting structure, and means to secure said supporting structure against rotary movement when it has been adjusted to a selected position within said limit.

2. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a rod arranged at one side of said ram, connected with said supporting structure for vertical movement therewith and held against lateral movement, cooperating parts carried by said rod and said supporting structure and arranged to interrupt the rotary movement of said supporting structure after a predetermined rotary movement has been imparted thereto, and operable means associated with said parts to hold said supporting structure against all rotary movement.

3. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a vertically movable rod arranged at one side of said ram and held against lateral movement, and interengaging members carried respectively by said rod and said supporting structure to cause said rod to move vertically with said supporting structure, one of said members having parts arranged on opposite sides of the other member to limit the rotary movement of said supporting structure.

4. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a vertically movable rod arranged at one side of said ram and held against lateral movement, said rod having at its upper end a part provided with a lateral recess, said supporting structure having a part extending into said recess, means for rigidly connecting said parts one to the other to hold said supporting structure against rotary movement, and stops carried by one of said parts to engage the other of said parts and limit the rotary movement of said supporting structure when said connecting means is inoperative.

5. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a vertically movable rod arranged at one side of said ram and held against lateral movement, said rod having at its upper end a part provided with a lateral recess, said supporting structure having a part extending into said recess, and stops carried by one of said parts and arranged to engage the other of said parts and limit the rotary movement of said supporting structure.

6. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a vertically movable rod arranged alongside of said ram and held against lateral movement, means for connecting said rod with said supporting structure in such a manner that it will move vertically therewith and will control the rotary movement of said supporting structure, and a locking device movable into and out of engagement with said rod to hold the same against downward movement, said locking device having means to hold the same normally in engagement with said rod.

7. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a rod arranged at one side of said ram and connected with said ram for vertical movement therewith, and a device mounted on a fixed support for movement into engagement with said rod to control the downward movement of said ram.

8. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a rod arranged at one side of said ram and connected with said ram for vertical movement therewith, a device to engage said rod and control the downward movement of said ram, said device having means for moving the same to an inoperative position, and means controlled by the downward movement of said ram to restore the same to its operative position.

9. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a rod arranged at one side of said ram and connected with said ram for vertical movement therewith, and a locking device mounted for pivotal movement into and out of a position to lock said rod against downward movement and having means controlled by the position thereof to retain the same in the position to which it has moved, said device also having means for moving the same out of said locking position and means arranged to be engaged by a part carried by said ram to restore said device to its locking position.

10. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a rod arranged at one side of said ram and connected with said ram for vertical movement therewith, said rod having a recess, a pivoted locking device having a part arranged to enter

said recess and lock said rod against downward movement and having a gravity operated part movable across the pivotal axis of said device to hold the same in either its operative position or its inoperative position, and a part carried by said ram to engage the last mentioned part of said device when the latter is in its inoperative position and restore said device to its operative position when said ram moves to its lowermost position.

11. In a lifting mechanism comprising a cylinder embedded in the ground, a ram in said cylinder and a supporting structure carried by said ram, a guideway in the ground parallel with said cylinder, a rod slidably mounted in said guideway, means for connecting said rod with said supporting structure for vertical movement therewith, a locking device to engage said rod and hold the same against downward movement, said locking device having means to retain the same in either its operative position or its inoperative position, and means controlled by the downward movement of said ram to move said locking device to its operative position.

12. In a lifting mechanism comprising a cylinder embedded in the ground, a ram in said cylinder and a supporting structure carried by said ram, a guideway in the ground parallel with said cylinder, a rod slidably mounted in said guideway, means for connecting said rod with said supporting structure for vertical movement therewith, a locking device to engage said rod and hold the same against downward movement, said locking device having means to retain the same in either its operative position or its inoperative position, means controlled by the downward movement of said ram to move said locking device to its operative position, said rod and said supporting structure having parts cooperating to control the rotary movement of said supporting structure.

13. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a vertically movable rod arranged at one side of said ram and held against lateral movement, said rod having at its upper end a part spaced laterally from said supporting structure and provided with a lateral recess facing said structure, said supporting structure having a part extending into said recess, and means carried by said parts to retain the last mentioned part in said recess and thereby control the rotary movement of said supporting structure.

14. In a lifting mechanism comprising a ram, and a supporting structure carried by said ram, a device mounted alongside of said ram for vertical movement therewith and having means to control the rotary movement of said supporting structure, and a device mounted on a fixed support for movement into and out of a position to cooperate with said vertically movable device to prevent the downward movement of said ram.

15. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a vertically movable rod arranged alongside of said ram and held against lateral movement, means for connecting said rod with said supporting structure in such a manner that it will move vertically therewith and will control the rotary movement of said supporting structure, and a locking device mounted for movement into and out of a position to engage said rod and lock said ram in an elevated position, said locking device being held against bodily movement in the direction of movement of said rod.

16. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a device mounted alongside of and connected with said ram for vertical movement therewith, a second device mounted independently of said vertically movable device and cooperating therewith to prevent the downward movement of said ram, said second device being movable to an inoperative position to permit said ram to be lowered, and means controlled by the downward movement of said ram to automatically restore said second device to its operative position.

17. In a lifting mechanism, comprising a ram and a supporting structure carried by said ram, a device mounted alongside of and connected with said ram for vertical movement therewith, and a device pivotally mounted on a fixed support for movement into and out of a position to engage a part of said vertically movable device and hold said ram against downward movement.

18. In a lifting mechanism comprising a ram and a supporting structure carried by said ram, a device mounted alongside of and connected with said ram for vertical movement therewith, and a device pivotally mounted on a fixed support for movement into and out of a position to engage a part of said vertically movable device and hold said ram against downward movement, said pivoted device having means controlled by the movement thereof to retain the same either in said position or out of said position.

19. In an automobile lift comprising a ram and an elongated supporting structure carried by said ram to engage the axles of an automobile, a device mounted alongside of and adjacent to said ram for vertical movement therewith and having means to control the rotary movement of said supporting structure, said controlling means being arranged to permit a limited rotatory movement of said supporting structure to aline the same with said automobile and to positively limit said rotatory movement in both directions.

20. In an automobile lift comprising a ram and an elongated supporting structure carried by said ram and adapted to engage the axles of an automobile, a rod arranged at one side of and adjacent to said ram, connected with said supporting structure for vertical movement therewith and held against lateral movement, and cooperating parts carried by said rod and said supporting structure to positively limit the rotatory movement of said structure, said parts being so arranged that sufficient movement may be imparted to said supporting structure to aline the same with said automobile before it engages said axles.

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