July 2, 1935. E. R. GRADHE 2,007,140

PUMP MECHANISM

Filed May 6, 1931

Fig. 1.

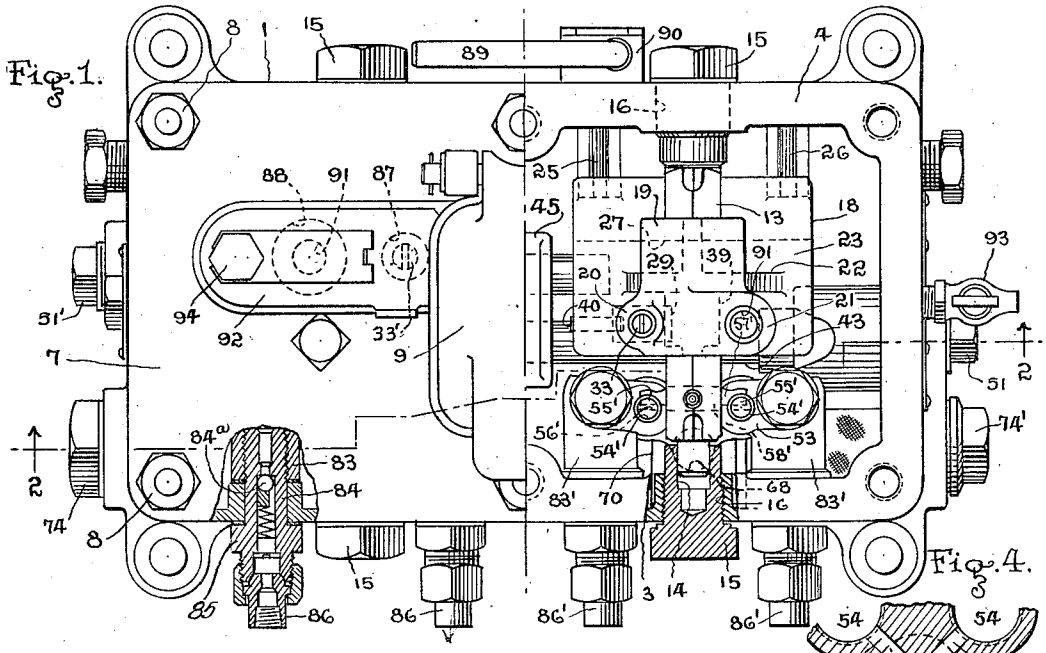


Fig. 4.

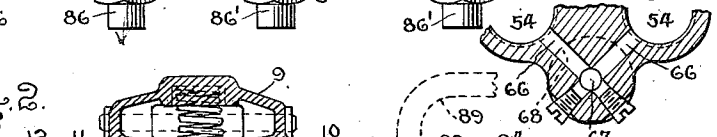


Fig. 2.

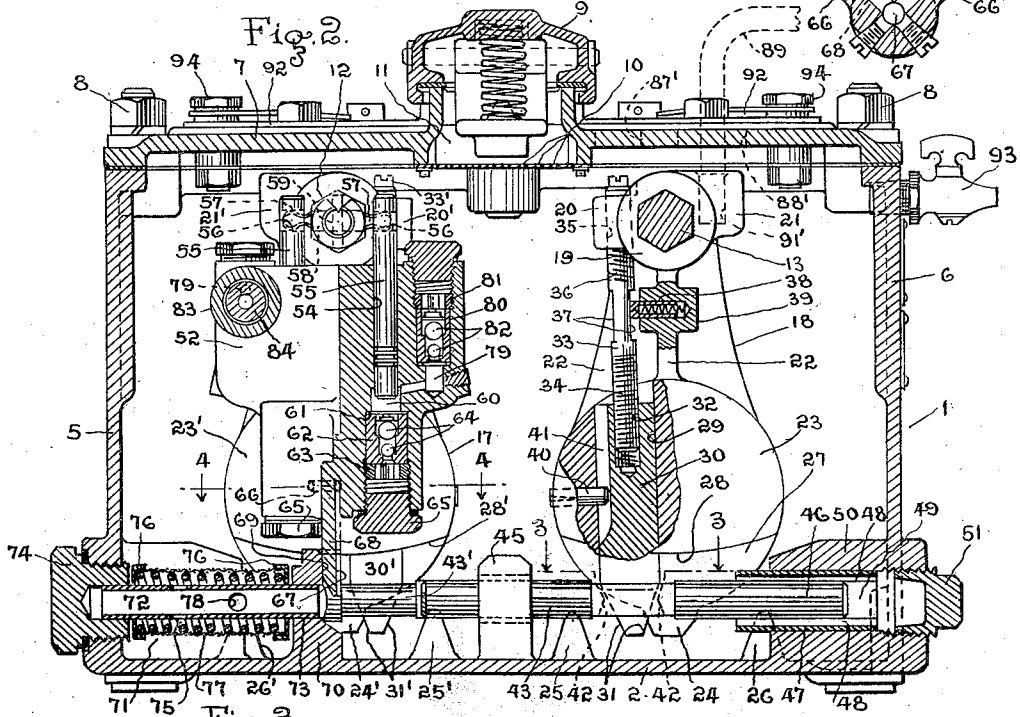
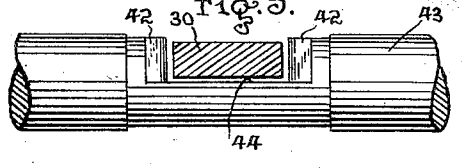


Fig. 3.



Eric Ragnar Gradhe INVENTOR

BY his ATTORNEY

C. G. Reichmann

Patented July 2, 1935 2,007,140

UNITED STATES PATENT OFFICE

2,007,140

PUMP MECHANISM

Eric Ragnar Gradhe, Detroit, Mich., assignor to Detroit Lubricator Company, Detroit, Mich., a corporation of Michigan

Application May 6, 1931, Serial No. 535,535

19 Claims. (Cl. 184—30)

My invention relates to new and useful improvements in pump operating mechanism, and more particularly to an automatically actuated pump such as is employed for feeding liquid lubricant under pressure to machine parts to be lubricated.

An object of my invention is to provide a pump driving means to be carried by the machine to be lubricated, and which will operate in response to the motion of the machine.

Another object is to provide means to regulate the length of the pump stroke.

Another object is to provide means to cushion or dampen overtravel of the pump actuating means.

Another object is to provide in a pump drive mechanism having a pendulous actuating member, a means to maintain the amplitude or stroke of the member substantially constant upon changes in the mean position of said member.

The invention consists in the improved construction and combination of parts, to be more fully described hereinafter, and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, I have fully and clearly illustrated a preferred embodiment of my invention, in which drawing—

Figure 1 is a top plan view of an oiler or lubricator embodying my invention, and having certain parts broken away and substantially half of the top wall or cover member removed to show the internal construction;

Fig. 2 is a view in section on the line 2—2 of Fig. 1, showing certain parts broken away for clarity;

Fig. 3 is a detail view substantially on the line 3—3 of Fig. 2, and

Fig. 4 is a detail sectional view on the line 4—4 of Fig. 2.

Referring to the drawing by characters of reference, 1 designates a tank or container, which is preferably substantially rectangular having a bottom wall 2 from which rise vertical front, rear and side or end walls 3, 4, 5 and 6, respectively. The top of the tank is closed by a top wall or cover member 7 removably secured to the vertical walls by studs and nuts 8, or the like. Substantially central of the cover member and hinged to the top face thereof, is a filler opening cap member 9. A strainer plate 10 is preferably positioned across the filler opening 11. Extending between and adjacent the upper edges of the front and rear walls 3, 4 and substantially equidistant from the side walls 5, 6, are substantially horizontal, parallel shafts 12, 13 which are journaled at their ends in axially alined bores or sockets 14 provided in bearing plugs or sleeve members 15 threaded or otherwise secured in alined apertures 16 in the front and rear walls. The shafts 12 and 13 are preferably polygonal in cross-section intermediate their ends, and have secured thereon, preferably by a press fit, pendulous weighted actuating members 17, 18, respectively, which are relatively offset somewhat longitudinally of shafts 12, 13 for the sake of compactness. The members 17 and 18 are similar, and therefore a description of one will suffice for both, the primes of the reference characters applied to member 18 designating like parts of member 17. The member 18 has at its upper end a sleeve portion 19, the bore of which conforms to and receives the shaft 13, and on portion 19 are oppositely positioned, lateral bosses 20, 21, for a purpose to be described. Depending from portion 19 and secured thereto by interposed and preferably integral and relatively perpendicular webs 22, is a substantially cylindrical weight element 23 having its axis parallel to shaft 13, and having at its lowermost point a depending stop or abutment member 24 cooperable with fixed stops 25, 26 rising from the bottom wall 2 and spaced to determine the maximum permissible swing or stroke of the member 18. The element 23 preferably has its front face undercut or recessed to a vertical plane 27, so that the forward portion of element 23 terminates downward in a substantially horizontal shoulder 28 to provide clearance for certain means to be described. Offset laterally from the vertical center line of member 18 is a substantially rectangular slot 29 which is inclined slightly toward said center line in a plane transverse to shaft 13, and which is open at its upper end, and which opens at its bottom end through the shoulder 28. The slot 29 is alined with the boss 20, and slidably fitting in said slot is a stop or wedge member 30, the lower end of which projects below the shoulder 28 and has upwardly inclined diverging side faces 31. Substantially centered in the top portion of member 30 is a longitudinally extending, upwardly open bore 32 in which is adjustably threaded the lower end of an adjustment rod 33 having external right-hand screw threads 34. The rod 33 extends upward through an aperture 35 in the boss 20, being adjustably threaded therein, preferably by left-hand screw threads 36, so that member 30 will have double the longitudinal movement of rod 33. Intermediate its ends the rod 33 has flat, substantially parallel faces 37 which cooperate with a spring-pressed plunger or pawl 38 reciprocably mounted in a boss 39 on one of the webs 22, and

which serves to indicate by clicks the number of half turns of rod 33, and also to hold the rod in adjusted position. A guide means is preferably provided for member 30 and comprises a pin 40 fitting in longitudinal groove 41 in the member 30.

The projecting end of member 30 is positioned between opposed abutments 42 spaced horizontally and transversely to shaft 13 and carried by a movable bar member 43. The abutments 42 preferably comprise the end wall portions of a cut-out portion or recess 44 in the rear face of member 43, and are preferably each formed by surfaces diverging from a horizontal plane, so as to provide substantially a line or knife-edge contact with the faces 31. Positioned substantially centrally of wall 2 is a bearing block member 45, in a horizontal bore of which is reciprocably supported and guided one end of member 43. The other end 46 of member 43 which serves as a piston, has a sliding fit in a sleeve member 47 having internal, longitudinally extending grooves or passages 48 which open into the tank, so that the chamber 49 within the sleeve, together with the piston 46, comprises an oil filled dash-pot or cushioning means providing an inert means for holding the bar 43 in normal fixed position and for absorbing or taking up increased kinetic energy of the weighted member. The sleeve member 47 is fixed in a substantially horizontal bore through a boss 50 and the tank side wall, the boss being preferably integral with the side and bottom tank walls. The outer open end of the chamber 49 is closed and sealed by a plug member 51 which may be threaded into the chamber bore. The wedge member 30' cooperates with a dash-pot structure similar to that described, and therefore like parts are designated by the primes of the reference characters applied to the described structure. It may be noted that the rod or bar member 43' is positioned rearwardly of member 43 and is supported in a second bore in the block member 45.

Between the weighted actuating members and the front wall 3 are substantially similar pump means or mechanisms 52, 53. The means 52 preferably comprises a member or housing substantially of block form having parallel vertical pump chamber bores 54 extending therethrough and which are on opposite sides of shaft 12 and substantially equidistant laterally therefrom in a plane parallel to wall 3. In the bores 54 are slidably fitted for longitudinal reciprocation, pump plungers 55 having circumferential oil grooves, and which extend upwardly to the top plane of shaft 12 and have horizontal notches or recesses 56 in their rear sides. Projecting laterally from the shaft 12 are rigid arms 57 which seat in the recesses 56, so that oscillation of shaft 12 will reciprocate the plungers 55. The arms 57 preferably comprise the end portions of a bar 58 which extends through and is held in a transverse horizontal aperture in the shaft 12 by a locking pin 59. Substantially midway, each bore 54 is enlarged to form a pump chamber 60 and also provides clearance around the lower pump end of its plunger 55. The bottoms of the chambers 60 are defined by a further enlargement of bores 54 to provide in each a downward facing, annular shoulder 61 against which is seated a check valve retainer sleeve 62 held in position by a ring nut 63 threaded into the bore 54. In each sleeve 62 is a double valve means 64, preferably ball checks, which controls the inlet to the pump chamber. The bottom ends of the bores 54 are closed and sealed by plug members 65. Opening into the bores 54 between rings 63 and plugs 65 are branch passages 66 from a common inlet passage 67 (Fig. 4), the passage 67 opening vertically downward through a depending cylindrical member 68 which fits in but terminates short of the bottom of a vertical bore 69 in a boss 70 rising from the wall 2. Positioned and supported by and between the boss 70 and wall 5, is a strainer means 71, preferably comprising a horizontal supporting tube or conduit member 72 fitting at one end in a port or passage 73 in the boss 70, the port opening into bore 69 below member 68. The other end of member 72 is supported in a plug member 74 threaded into and closing an aperture in the tank side wall. On the member 72 is a helical supporting means 75, preferably a coil spring, positioned between annular end plates 76, to the peripheries of which are secured and sealed the ends of a cylindrical strainer or filter element 77, preferably a screen of fine wire mesh, the element 77 being of a diameter less than plug 74, so that the means 71 may be removed through the plugged wall aperture. Through the wall of member 72 are inlet ports or apertures 78 for ingress of liquid lubricant from the tank. An outlet passage 79 leads from each pump chamber 60 and has positioned therein a check valve retaining sleeve 80 held in place by a ring nut 81, said sleeve containing a double valve means 82, preferably ball checks, controlling the outlet passage. On the front face of member 52 are outlet fittings 83 which are internally threaded to receive the externally threaded inner ends of clamping sleeve members 84 having flanges 85 to abut the outside face of wall 3, so that the member 52 may be rigidly supported by the wall 3 when members 84 are drawn up tightly. The bore of each of the members 84 is preferably provided with a control valve 84^a, such as a spring loaded ball check, opening automatically to permit feed from the tank. Piping or conduit means, not shown, may be connected to nipples 86 on the sleeve members 84 for conveying the lubricant to the point of application.

Through the tank cover or top wall 7 are apertures 87, 88 which aline vertically with the bosses 20', 21' so that the adjustment screw 33' is accessible through aperture 87. The aperture 88 is of sufficient area for manual operation of the shaft 12 by means of a bent lever 89 normally carried by a bracket 90 on the rear tank wall, and which may be inserted through aperture 88 and seated in a socket 91 in the boss 21', so that manual oscillation of lever 89 will rock or oscillate the member 17 to which it is applied and drive its pump means. A cover plate 92 swivelled on a screw 94 is provided for each of the pairs of apertures 87, 88. A pet cock 93 at the top of side wall 6 is employed as an indicator that the tank is full. The elements of mechanism 53 are designated by the primes of the reference characters applied to mechanism 52.

The operation of my apparatus is as follows: The tank 1 is mounted on the locomotive to be lubricated, with the shafts 12, 13 substantially parallel to the longitudinal center line of the locomotive near the front or rear end thereof and at sufficient height to receive the lateral sway of the locomotive in motion. The outlet nipples 86, 86' are connected by suitable piping (not shown) to the point of application of the lubricant, and the tank 1 is filled to the level of the pet cock 93. The rate of feed of the pump means is regulated or controlled by the wedge members 30, 30' which are adjusted by their respective ad-

justment screws 33, 33' to permit the desired maximum stroke of the members 17, 18 determined by the spacing of the faces 31, 31' from their respective pairs of abutments 42, 42'. When the locomotive is running, it will sway from side to side and also have a rocking motion, which motions are both dependent upon the condition of the track and the speed of the locomotive, and which will be increased on entering a curve or on an increase in speed. This swaying and rocking motion will be imparted to the pendulous weighted members 17 and 18 which will swing from side to side between the pairs of abutments 42' and 42, respectively, substantially in time with the impulses of the locomotive. The swinging or oscillation of members 17 and 18 will oscillate their respective supporting shafts 12, 13, causing substantially vertical simultaneous rise of one and fall of the other of the arms 56 on shaft 12 and arms 56' on shaft 13, so that one pump plunger 55 will move through its suction stroke as the other plunger 55 moves through its discharge stroke, and so likewise of plungers 55'. Should the swaying of the locomotive increase without changing the position of the normal mean positions of the members 17, 18, which are the positions in which they hang when the locomotive is at rest on straight track and level rails, the faces 31 of member 18 will alternately strike against the abutments 42, but the impacts will be cushioned by the dash-pot piston 46 drawing in and forcing out oil from chamber 49 through passages 48, and a similar cushioning action will take place with respect to member 17. Thus, the stroke of the pumps will be increased slightly, the stroke increasing as the engine speed increases up to the time when the abutments 42, 42' come into play to limit swinging movement of members 17 and 18. When the locomotive enters a curve, or if for any other reason the mean position of the members 17 and 18 is changed, the dash-pots will dampen overtravel or excess swing of their respective members 17 and 18 and at the same time permit relocation of the mean positions. Considering the member 18 and assuming that the mean position has shifted to the right facing Fig. 2, and although the rocking and swaying of the locomotive will have been increased, the piston 46 will gradually move to the right or into sleeve 47, but the piston movement will normally be by unbalanced reciprocations thereof due to the excess kinetic energy of the swing of member 18 toward the right which will be cushioned by the dash-pot means, so that the abutments 42 will be gradually and intermittently shifted toward the right thus serving to maintain the stroke of member 18 substantially constant as the new mean position is taken up. As the bar member 43 comes into its new position, with the abutments 42 spaced substantially equidistant from the new mean position, the dash-pot will again serve to hold the bar member normally stationary and fixed relative to the new mean position, so that the abutments 42 will continue to determine the limits of the stroke of the pendulous member 18. Should the tank be tilted out of its normal horizontal position beyond a predetermined maximum limit, the shifting of the bar member 43 by member 18 will be limited by the stop member 24 engaging the spaced fixed stops 25, 26.

In initial operation of the device, or upon the tank becoming empty during operation, the pump means will have to be primed to start the automatic operation by the pendulous members 17 and 18, and this is accomplished by manual operation with the lever 89.

It will thus be seen that I have provided an automatically actuated oiler or liquid feeding means which is operable to maintain the delivery substantially within desired maximum limits, irrespective of variations in the impelling force.

It is further to be noted that my apparatus provides for an automatically increased delivery of lubricant to the point of application at the times when an increase is desirable, namely, upon high speed and on curves, and also regulates the rate of feed to a minimum on straight track at low speeds.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A device of the character described, comprising pump means, a weighted member operatively connected to and for actuating said pump means upon movement of said weighted member, normally stationary movable means determining the normal limit of movement of said member in one direction, said member being movable beyond said normal limit upon movement of said movable means, and means to resist movement of said movable means and thereby of said weighted member beyond the normal limit of movement.

2. A device of the character described, comprising pump means, a weighted member operatively connected to and for actuating said pump means upon movement of said weighted member, shiftable means normally acting to limit movement of said weighted member, and means to cushion said shiftable means against the impact of said weighted member, said cushioning means acting to absorb the excess kinetic energy of a change in the mean position of said weighted member, said weighted member acting to shift the position of said shiftable means upon predetermined change in the mean position of said weighted member whereby to maintain the stroke of said weighted member substantially constant.

3. A device of the character described, comprising pump means, a swingingly supported weighted member operatively connected to and for actuating said pump means upon oscillation of said weighted member, normally stationary movable means operable to limit the actuating stroke of said weighted member, said movable means moving with said weighted member upon predetermined change in the mean position of said weighted member whereby to maintain the actuating stroke of said weighted member substantially constant irrespective of change of the mean position thereof, and means to dampen the movement of said movable means.

4. A device of the character described, comprising pump means for delivery of lubricant under pressure, a swingingly supported weighted member operatively connected to and for actuating said means upon swinging movement of said weighted member, a movable abutment member normally held against movement, and means rigid with said weighted member cooperable with said abutment member to limit swinging movement of said weighted member in one direction, said abutment member moving with said weighted member upon predetermined change in the mean position of said weighted member, said abutment member and said last-named means being relatively adjustable whereby to regulate the amplitude of said weighted member.

5. A device of the character described, com-

prising pump means for delivery of lubricant under pressure, a swingingly supported weighted member operatively connected to and for actuating said means upon swinging movement of said weighted member due to lateral impulses of the member supporting means, means normally operable to confine the stroke of said weighted member between predetermined limits, said last-named means being movable upon excessive lateral impulses to increase the limits of swinging movement of said weighted member, and means to dampen the movement of said last-named means.

6. A device of the character described, comprising pump means for delivery of lubricant under pressure, a swingingly supported weighted member operatively connected to and for actuating said means upon swinging movement of said weighted member due to lateral impulses of the member supporting means, means normally operable to confine the stroke of said weighted member between predetermined limits, said last-named means being movable upon excessive lateral impulses to increase the limits of swinging movement of said weighted member, and dash-pot means operable to dampen the movement of said last-named means.

7. A device of the character described, comprising pump means for delivery of lubricant under pressure, a swingingly supported weighted member operatively connected to and for actuating said means upon swinging movement of said weighted member due to lateral impulses of the member supporting means, spaced abutment members normally operable to confine the stroke of said weighted member between predetermined limits, said abutment members being movable upon excessive lateral impulses to increase the limits of swinging movement of said weighted member, and means to dampen the movement of said abutment members.

8. A device of the character described, comprising pump means for delivery of lubricant under pressure, a swingingly supported weighted member operatively connected to and for actuating said pump means upon swinging movement of said weighted member, a stop member carried by said weighted member and having a face inclined to a vertical plane normal to the plane of movement of said weighted member, and an abutment member cooperable with the inclined face of said stop member to limit the amplitude of said weighted member, said stop member and said abutment member being relatively adjustable whereby to regulate the amplitude of said weighted member.

9. A device of the character described, comprising pump means for delivery of lubricant under pressure, a swingingly supported weighted member operatively connected to and for actuating said pump means upon swinging movement of said weighted member, an adjustable stop member carried by said weighted member and having a face inclined to a vertical plane normal to the plane of movement of said weighted member, an abutment member cooperable with the inclined face of said stop member to limit the amplitude of said weighted member, and means to move said stop member relative to said abutment member thereby to regulate the distance at the mean position of said weighted member between said inclined face and said abutment member.

10. A device of the character described, comprising pump means for delivery of lubricant under pressure, a swingingly supported weighted member operatively connected to and for actuating said pump means upon swinging movement of said weighted member, said weighted member having a substantially vertical guide slot therein, a member vertically adjustable in said slot and projecting from the lower end thereof, the projecting end portion of said adjustable member having upward diverging stop faces normal to the plane of swinging movement, and abutment members cooperable with said stop faces to limit the amplitude of said weighted member.

11. A device of the character described, comprising pump means for delivery of lubricant under pressure, a swingingly supported weighted member operatively connected to and for actuating said pump means upon swinging movement of said weighted member, a stop member carried by said weighted member, a plunger member supported for reciprocation substantially parallel to a tangent to the path of said weighted member at the normal mean position thereof, said plunger member having spaced abutment members cooperable with said stop member to limit the amplitude of said weighted member, and a dash-pot chamber cooperable with said plunger member to resist movement thereof by said weighted member.

12. A device of the character described, comprising a liquid holding tank, pump means for delivery of liquid from said tank, a depending swingingly supported weighted member positioned in said tank and operatively connected to said means to actuate said means upon swinging movement, a plunger member having abutment means normally limiting the amplitude of said swinging member, a sleeve member fixed in said tank and reciprocably receiving in the bore thereof one end of said plunger member, the bore of said sleeve member being closed at one end to provide therein a dash-pot chamber, and said sleeve member having a longitudinally extending internal groove for passage of liquid between said tank and said chamber whereby said plunger member is movable by said weighted member.

13. A device of the character described, comprising pump means for delivery of lubricant under pressure, a swingingly supported weighted member operatively connected to and for actuating said means upon swinging movement of said weighted member due to lateral impulses of the member supporting means, spaced abutment members normally operable to confine the stroke of said weighted member between predetermined limits, said abutment members being movable by said weighted member upon excessive lateral impulses, adjustable means carried by said weighted member and cooperable with said abutment members to regulate the amplitude of said weighted member, and means to dampen the movement of said abutment members.

14. A device of the character described, comprising pump means, a swingingly supported weighted member operatively connected to and for actuating said pump means upon oscillation of said weighted member, movable means engageable upon movement of said weighted member and normally acting to limit movement of said weighted member, and means to cushion movement of said limiting means due to the impact of said weighted member thereagainst.

15. A device of the character described, comprising pump means, a weighted member operatively connected to and for actuating said pump means, movable means normally acting to confine movement of said weighted member between predetermined limits of movement, and dash-pot means normally acting to hold said movable

means in fixed position, said dash-pot means acting upon increased kinetic energy of said weighted member to dampen movement of said movable means.

16. A device of the character described, comprising a container for liquid, pump means for delivery of liquid from said container, a reciprocable member operatively connected to and for actuating said pump means, a plunger member cooperable with said reciprocable member to limit the stroke thereof, and a dash-pot chamber receiving said plunger member and cooperable therewith to cushion the impact of said reciprocable member against said plunger member.

17. A device of the character described, comprising a container for liquid, pump means for delivery of liquid from said container, a reciprocable member operatively connected to and for actuating said pump means, a plunger member cooperable with said reciprocable member to limit the stroke thereof, and a dash-pot chamber receiving said plunger member and cooperable therewith to cushion the impact of said reciprocable member against said plunger member, said dash-pot chamber having communication with said container whereby movement of said plunger member is controlled by transfer of liquid between said chamber and said container.

18. A device of the character described, comprising pump means, a swingingly supported weighted member operatively connected to and for actuating said pump means upon oscillation of said weighted member, and normally stationary shiftable means normally acting to confine the stroke of said weighted member within predetermined limits, said normally stationary means shifting with said weighted member upon predetermined change in the mean position of said weighted member whereby to reestablish said predetermined limits for the new mean position of said weighted member.

19. A device of the character described, comprising pump means, a swingingly supported weighted member operatively connected to and for actuating said pump means upon oscillation of said weighted member, means normally engageable by and operable to regulate the length of stroke of said weighted member, and substantially inert means operable upon predetermined change in the mean position of said weighted member to absorb the increased kinetic energy due to the change in mean position of said weighted member.

ERIC RAGNAR GRADHE.