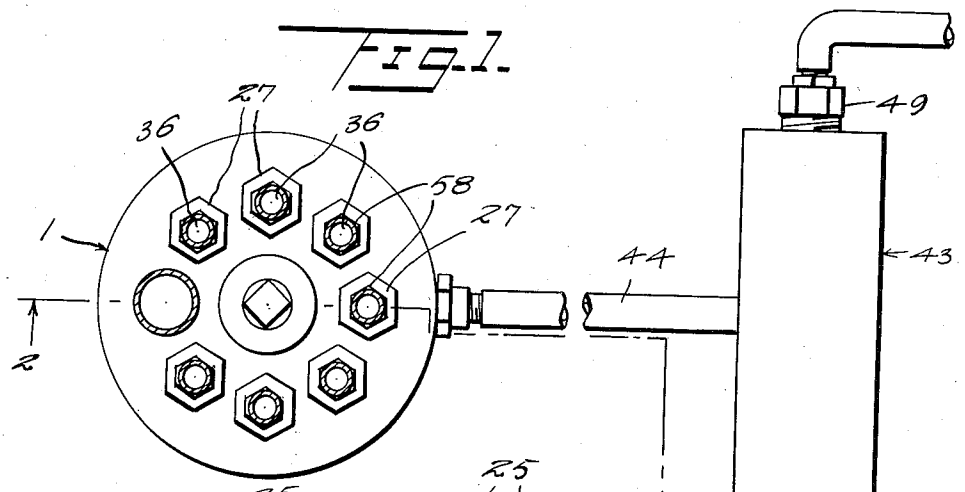
June 18, 1940. H. E. ANDERSON 2,204,878

FORCE FEED LUBRICATOR

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Fig. 1.



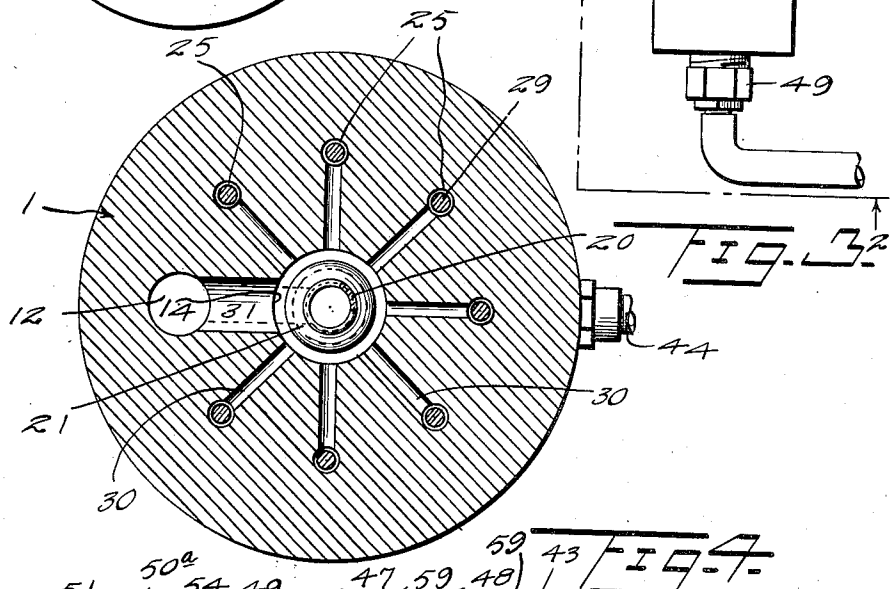
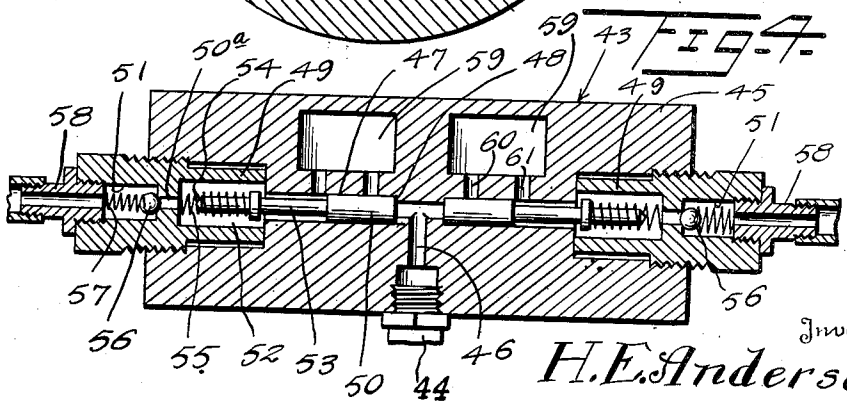


Fig. 3.

Fig. 4.



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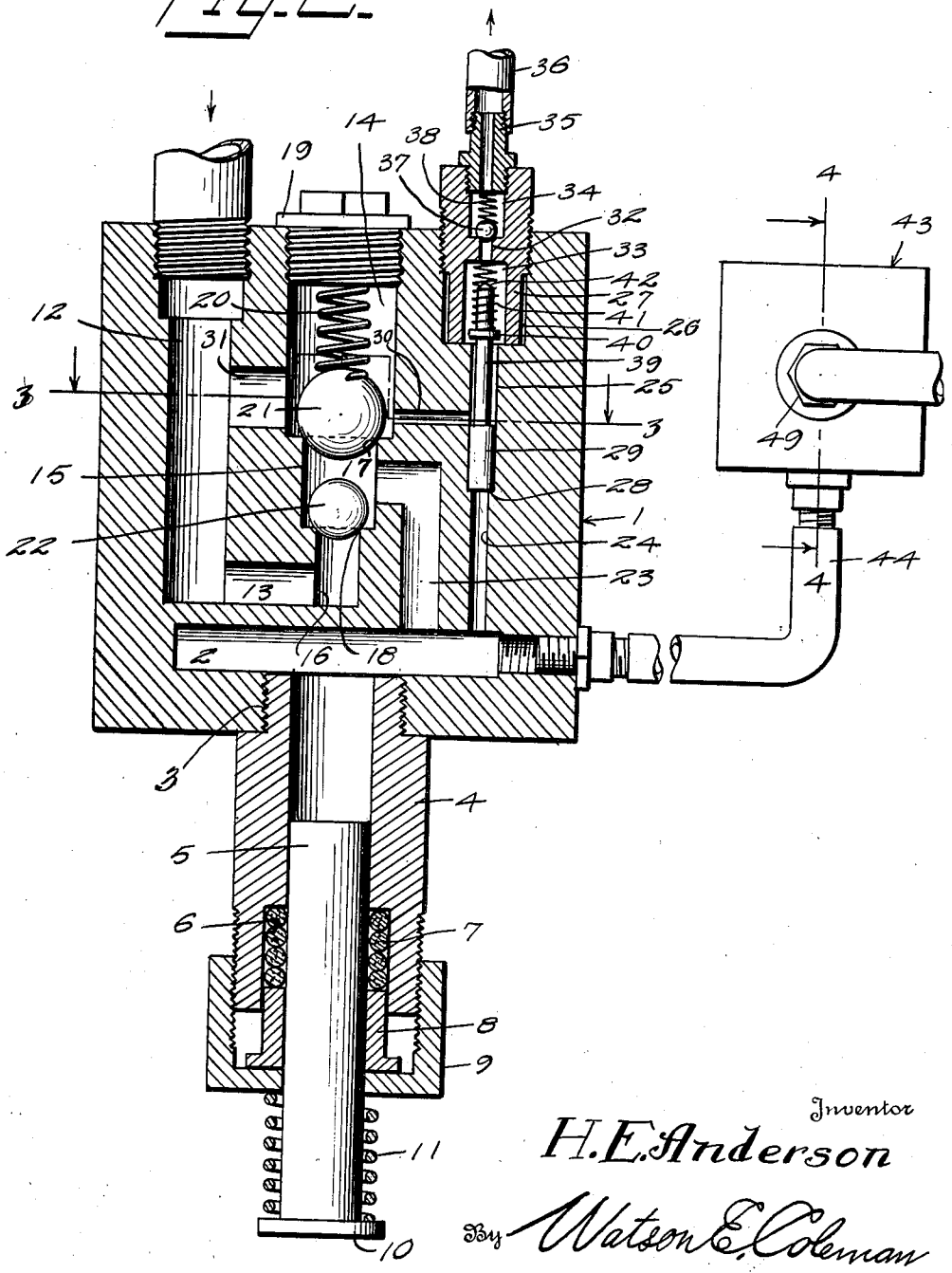
Attorney

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FORCE FEED LUBRICATOR

Filed March 8, 1938 2 Sheets-Sheet 2

Fig. 2.



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2,204,878

FORCE FEED LUBRICATOR

Harry E. Anderson, La Junta, Colo.

Application March 8, 1938, Serial No. 194,699

12 Claims. (Cl. 184—7)

This invention relates to the class of fluid distribution and pertains more specifically to improvements in force feed lubricators.

The present invention has for its primary object to provide an improved force feed lubricator having a novel construction whereby the distribution of fluid in jets or pulses to a number of distributing lines may be accomplished and whereby a better lubrication of mechanical movements connected with the device may be obtained without requiring that the lubricator be given any special attention other than to see that it is constantly provided with a supply of lubricant.

Another object of the invention is to provide a novel force feed lubricator having novel means associated therewith whereby a number of feeds may be served from one supply pipe.

Still another object of the invention is to provide a force feed lubricator having in addition to a primary pump or piston unit designed to establish a necessary pulsating pressure against a body of fluid, individual or supplementary pistons operated by the pulsations established by the primary pump to move the fluid through distributing lines in regulated quantities.

A still further object of the invention is to provide in a structure of the above described character, a novel means whereby the supplementary pistons serve the double function of pushing the fluid through the distributing lines connected with the lubricator and of shutting off the in-flow of fluid to the chambers from which it is ejected by the supplementary pistons.

Another object of the invention is to provide in a force feed lubricator, a novel means for regulating the quantity of fluid ejected from the main body of the lubricator into the feed or distributing lines connected therewith.

Still another object of the invention is to provide in a force feed lubricator, a novel supplementary structure adapted to be coupled with a distributing line leading from the main lubricator structure, by which the fluid passing through said line may be divided into a number of streams for distribution, the said supplementary structure including a novel means of supplying the several distributing lines with regulated or predetermined quantities or charges of the fluid.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming part of this specification, with the understanding, however, that the invention is not to be confined to any strict conformity with the showing of the drawings but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a view in top plan of the force feed lubricator embodying the present invention, showing the split feed unit coupled therewith.

Figure 2 is a vertical section taken on the line 2—2 of Figure 1.

Figure 3 is a sectional view on the line 3—3 of Figure 2.

Figure 4 is a sectional view taken on the line 4—4 of Figure 2.

Referring now more particularly to the drawings, the numeral 1 generally designates the body of the force feed lubricator from which a plurality of distributing lines extend to the points of distribution as will be hereinafter more fully described. This body 1 is here shown as being of circular cross section and is provided with a fluid pressure chamber 2 in its lower part which opens into the threaded bore 3 in which is threadably engaged one end of a pump sleeve 4. Reciprocably disposed within the sleeve 4 is the pump piston 5 and the outer end of the sleeve 4 is interiorly enlarged, as indicated at 6, to receive packing 7 which is retained in place by the collar 8 which fits into the enlarged area 6 and the cap 9 which is centrally apertured for the passage of the piston 5 therethrough and which is threadably engaged over the outer end of the sleeve 4 and bears against the collar 8 to compress the packing 7 in the manner shown. Thus, a fluid tight connection is established between the piston 5 and the sleeve 4.

The outer end of the piston 5 has a head 10 and between this head and the end of the cap 9 is an expansion spring 11 which normally tends to move the piston outwardly from the sleeve.

Any suitable means may be employed for operating the piston 5, such as a mechanically actuated unit in the form of a cam or the like.

The body 1 has a fluid inlet duct 12 leading downwardly thereinto from the top thereof and the lower end of this duct communicates with a cross passage 13, which opens into the lower end of the central longitudinally extending chamber 14 which, at its inner end, has the two successive reductions in diameter, as indicated at 15 and 16, whereby are formed the two ball valve supporting sets 17 and 18. The chamber 14 opens at its upper end through the top of the body

1 and is closed by the plug 19 and this plug presses against the upper end of a valve ball seating spring 20, which, at its other end, bears against the ball valve 21 which rests upon the seat 17. This ball valve 21 constitutes a pressure relief valve, the operation of which will be hereinafter more fully described.

Beneath the pressure relief valve 21 is located the smaller ball valve 22 which rests upon the seat 18 and which constitutes a means for controlling the flow of fluid from the inlet duct 12 to the pressure chamber 2, the fluid, after escaping from beneath the check valve 22, passing around through the passage 23 and into the chamber 2, as illustrated.

As shown, the pressure chamber 2 extends laterally from the longitudinal center of the body 1 beyond the point of entrance of the passage 23 and disposed in circular order around the longitudinal center of the body and vertically thereof are the fluid outlet conduits, each of which is generally designated by the numeral 24. Each of these conduits opens at its lower end into the chamber 2, as illustrated, and each has two successive enlargements, which are indicated by the numerals 25 and 26, the greater one of these enlargements being at the upper end of the conduits, as shown, and being threaded to receive an outlet check valve carrying plug 27 which also serves as a means of governing or regulating the quantity of fluid passing through the conduit into a distributing line.

In each of the conduits 24, where the first enlargement 25 begins or joins with the narrower portion of the conduit, there is formed a shoulder 28 which operates as a means for limiting the movement in one direction of a free floating piston 29, which is formed to fit snugly in the intermediate portion 25 of the conduit. This piston is relatively short as compared with the portion 25 of the conduit in which it is located and there is formed in the body 1, adjacent each conduit, the radial fluid supply passage 30 which establishes communication between the chamber 14 above the ball valve seat 17 and the portion 25 of the adjacent conduit above the end of the piston 29 therein.

The chamber 14 above the valve seat 17 is supplied with fluid through the port 31 which leads from the duct 12.

The plug 27 which closes the upper and outer end of each conduit is tubular, as shown, and has intermediate its ends, the centrally apertured web 32 so that there is formed at the inner end of the plug, the spring chamber 33 and at the outer end the outlet check valve chamber 34. The chamber 34 has a coupling nipple 35 inserted thereinto with which a fluid distributing line 36 is connected. Within the chamber 34 is the outwardly opening ball check 37 which is maintained on its seat by the spring 38 which has one end engaging the ball 37 and the other end engaging the inner end of the nipple 35.

In each conduit 24 there is located a reciprocable feed control plunger rod 39 which has one end extended into the intermediate portion 25 of the conduit, while its other end extends therefrom into the spring chamber 33 of the feed control plug 27 and intermediate its ends this rod has a collar 40 which serves as an abutment for one end of the control spring 41, which surrounds the outer end of the rod and has its other end engaging the inner face of the web 32. The inner end of the aperture through the web 32 of the plug 27 serves as a seat for the tapered tip or point 42 of the control rod 39.

In the operation of the lubricator structure thus far described, a supply pipe leading from a suitable fluid supply source is connected in the outer end of the duct 12, the pipes 36 leading from the several plugs 27 are connected with the terminals which are to be supplied with the fluid. Upon the operation of the pump plunger 5, fluid will be drawn into the pressure chamber 2 past the one-way valve 22 when the plunger 5 is retracted and, at the same time, fluid will flow into the chamber 14 and through the passages 30 to fill the area between the lower end of each plunger rod 39 and the wall of the portion 25 of the conduit in which it is located. When the piston 5 is pushed upwardly, the fluid in the chamber 2 will be subjected to pressure and this pressure will be transmitted through the fluid in each of the narrower inner end portions of the conduits 24 to the free floating pistons 29 causing them to be projected upwardly or forwardly in their respective conduits and to push ahead of them the rods 39 until the tapered forward ends of the rods 42 seat against the inner end edges of and close the passages through the webs of the plugs 27. During this movement of each piston 29 the fluid contained in the conduit above the piston, that is in the upper part of the intermediate portion of the conduit and in the chamber 33 of the plug, will be forced upwardly so that a portion of the fluid will be forced past the outlet check valve 37. It will also be noted that as soon as the piston 29 in a conduit moves a short distance, it will close the fluid inlet passage 30 so that none of the pressure exerted by the piston 29 can escape into the fluid chamber 14.

By moving the plugs 27 outwardly or inwardly, it will be noted that the extent of travel of the rods can be increased or decreased so that the quantity of fluid ejected through each plug can be regulated.

By the provision of the relief valve above the inlet passage 23, it will be seen that if excessive pressure is built up in the chamber 2, which cannot be relieved by the movements of the pistons 29, it may be relieved by the escape of the compressed fluid past the valve ball 21 and into the duct 12.

The numeral 43 designates a split feed unit which may be used in association with the force feed lubricator and which is adapted to be coupled with a pipe line 44 having one end connected with the body 1 to receive fluid from the pressure chamber 2, as illustrated. By means of this split feed attachment a single fluid line may be run to a desired point and there coupled with the split feed attachment to facilitate dividing the fluid and carrying the divisions to serve individual lines to adjacent distributing points.

While the attachment 43 may be constructed so as to take care of any number of feed lines, it is here illustrated as being adapted to be coupled with two lines. As shown, the split feed attachment comprises the elongated body 45 having the fluid inlet passage 46 which, at its outer end, is adapted to be coupled with the pipe 44 through a suitable nipple coupling. This passage 46 leads into two oppositely directed passages 47 each of which has a shoulder 48 adjacent the point of connection with the passage 46 and is enlarged at its outer end to receive the adjustable plug 49. As will be readily recognized, these passages 47 are analogous to the conduits 24 in the body 1 and as is the case in connection with

each of the conduits **24**, the shoulder **48**, which is analogous to the shoulder **28**, supports a free moving piston **50**.

The plugs **49** are each of tubular form like the plugs **27** and have a centrally apertured web **50***a* dividing each plug **49** into an outer valve chamber **51** and an inner spring housing chamber **52**. A plunger control rod **53** is located in each passage **47** and has an end extended into the narrower part of the passage for contact with the adjacent piston **50** while the outer end is tapered to form the point **54** which is adapted to enter the aperture in the web **50***a* of the adjacent plug to close the same when the rod is projected outwardly by the piston **50** with which it is engaged. Each rod **53** is forced inwardly away from the apertured web **50** by the spring **55**.

The valve chamber **51** of each plug **49** houses the ball valve **56** and the spring **57** by which it is held seated, and this spring is retained in the chamber by the nipple **58** which facilitates coupling a distributing pipe with the split feed attachment.

In the body **45** there is formed adjacent each passage **47** and upon the opposite side thereof from the inlet passage **46**, the fluid receiving chamber or reservoir **59** which is connected with the adjacent passage **47** by an inlet **60** and an outlet **61**. As shown, the inlets **60** for the fluid reservoirs **59** are each covered by a piston **50** when the latter is seated on its supporting shoulder **48** and the outlet passage **61** is so disposed that it will at this time be uncovered by the piston so that fluid may escape from the chamber into the area between the wall of the passage **47** and the inner end of the rod **53**. The rods **53**, and also the rods **39** which are in the conduits in the body **1** of the force feed lubricator, are of a diameter which will provide a substantial fluid area between them and the walls of the passages or conduits in which they are located.

In use, the split feed attachment is disposed so that the chambers **59** are above the passages **47** and thus when the piston **5** of the pump unit compresses fluid in the chamber **2**, this fluid will be ejected through the pipe **44** and into the passage **46** to force the free floating pistons **50** toward the outer ends of the passages, moving the rods **53** against the tension of the springs **55**. As soon as the pistons **50** have moved sufficiently far to uncover the inlet ports **60** for the chambers **59**, the fluid will pass into and fill these chambers and at this time the pistons **50** will be in position to cover the outlet ports or openings **61**. When the pressure is relieved, the springs **55** in forcing the adjacent pins **53** back will return the pistons **50** to the seats or shoulders **48** and the fluid in the chambers **59** will then flow through the outlet ports **61** into the area between the adjacent rod **53** and the wall of the chamber or passage in which it is located. When the second pressure impulse is imposed on the fluid in the chamber and in the line **44** leading to the passage **46**, it will be seen that the pistons when projected forwardly by this pressure will cover the outlet openings **61** of the chambers **59** and propel a part of the fluid which has run into the chambers **52**, past the valves **56** and into the distributing lines which are coupled with the nipples **58**. As soon as the tips **54** of the rods **53** enter the passages in the webs of the adjacent plugs **49** to close the passages, further discharge of the fluid into the lines will be stopped and the back pressure built up will cause the fluid behind the pistons **50** to enter the chambers **59** to replenish the same and any remaining pressure in the chamber **2** and line **44** will be relieved by the valve **21**, as previously described.

From the foregoing it will be readily apparent that there is herein disclosed a novel form of force feed lubricator in which the fluid propelled thereby will be ejected through the distributing lines in short spurts which may be controlled conveniently so that the quantity of fluid injected into each line with each pressure impulse applied by the piston **5** may be accurately controlled.

It has been previously stated that the piston **5** may be operated in any suitable manner as by a mechanically actuated cam or the like and in this connection it is to be understood that the pulsating pressure of air, water, steam or any other fluid may be used to operate the piston if found desirable.

What is claimed is:

1. In a force feed lubricator, a body having a fluid pressure chamber, a fluid inlet duct leading to the chamber and having a one-way valve therein opening toward said chamber, means for subjecting fluid in the chamber to a pulsating pressure working against said valve and maintaining the same seated, a fluid outlet conduit leading from the chamber, a one-way outlet valve in said conduit, a piston in the conduit between the outlet valve and chamber and movable longitudinally of the conduit by the pulsation of pressure on the fluid, and means for introducing fluid into the conduit between the piston and said outlet valve to be forced past the outlet valve upon the movement of said piston by a pressure pulsation of the fluid.

2. In a force feed lubricator, a body having a main fluid chamber, a fluid duct leading into said chamber from a source of fluid supply, a one-way valve in said duct permitting fluid flow only toward said chamber, pump means communicating with the chamber and operating to draw fluid thereinto and compress the fluid therein, the fluid when under compression in the chamber maintaining said valve seated, a fluid conduit having one end in communication with the chamber, a check valve in said conduit permitting fluid flow through the other end thereof only in a direction away from the chamber, a piston in said conduit having movement through a predetermined range and moved by and upon the compression of fluid in the chamber, and means for introducing fluid into the conduit direct from the fluid duct between said piston and check valve to be ejected from the said other end thereof past the check valve by the piston.

3. In a force feed lubricator, a body having a fluid pressure chamber, a one-way valve controlled fluid inlet duct leading to the chamber, means for subjecting fluid in the chamber to a pulsating pressure working against the valve and maintaining the same closed, a conduit connected with the chamber, a one-way valve in said conduit opening away from the chamber, a piston in the conduit between the one-way valve and chamber and movable longitudinally of the conduit by the pulsation of pressure on the fluid, means for introducing fluid into the conduit between the piston and said one-way valve to be forced past the latter valve upon the movement of said piston by a pressure pulsation of the fluid, and means for relieving excess pressure in the pressure chamber.

4. A force feed lubricator comprising a body having a fluid pressure chamber therein, a conduit leading fluid into said chamber, a fluid out-

let conduit connected with the chamber, one-way valve means controlling the flow of fluid through said first conduit into said chamber, means for imparting pressure to the fluid in the chamber and simultaneously forcing said valve to closed position, piston means in said outlet conduit, means for shunting fluid across said valve from said first conduit into the second conduit ahead of said piston means, and an outlet check valve in said conduit past which the fluid therein is forced by said piston means, said piston means being actuated by the pressure applied to the fluid in said chamber.

5. A force feed lubricator, comprising a body having a fluid pressure chamber therein, a fluid inlet duct leading to said chamber, a one-way inlet valve in said duct, means for imparting pulsating pressure upon the fluid in the chamber, said pressure acting to maintain said valve closed, a fluid conduit in the body having one end in communication with said chamber, the other end of said conduit constituting a fluid outlet, a one-way valve in said conduit adjacent the outlet end thereof, a fluid moving piston in said conduit and actuated by pressure pulsations of the fluid in said chamber, and means for introducing fluid into the conduit between said piston and the outlet valve.

6. A force feed lubricator, comprising a body having a fluid pressure chamber therein, an inlet duct leading to said chamber, a one-way inlet valve in the duct, means for imparting pulsating pressure to fluid in the chamber, a pressure release chamber in the body and having an opening communicating with the pressure chamber, a fluid pressure actuated release valve normally closing said opening, said pressure release chamber being connected with the inlet duct between the inlet end of the same and the one-way valve therein, a conduit in said body having one end in communication with said pressure chamber, the other end of the conduit forming a fluid outlet, a piston in said conduit, an outlet valve in said conduit adjacent the outlet end thereof, and means for introducing fluid from said pressure relief chamber into the conduit between said piston and the outlet valve, said piston being actuated by pulsations of pressure imparted to the fluid in the pressure chamber.

7. A force feed lubricator, comprising a body having a fluid pressure chamber therein, a fluid inlet duct leading to the body, a valve in the duct permitting flow of fluid only toward the chamber, means for imparting pulsating pressure upon the fluid in said chamber, a conduit in the body having one end in communication with said chamber, the other end of the conduit forming an outlet for fluid and being of greater diameter than the said one end, the conduit being of intermediate diameter midway of its ends, an outwardly opening valve unit secured in the outlet end of the conduit and adapted to have a fluid conducting pipe connected therewith, a piston slidable in the portion of the conduit of intermediate diameter, means for introducing fluid into the conduit between said piston and said outlet valve carrying unit, a member in said conduit between the piston and said unit and bearing on and moving with the piston and operating to govern the length of movement of the piston in the conduit and to close the conduit at the end of such movement, and means for regulating the piston movement governing capacity of said means for increasing or decreasing the quantity of fluid ejected from the conduit by the piston.

8. A flow dividing means for connection with a fluid carrying pipe, comprising a body having an inlet port for connection with an end of said pipe, said body having a plurality of conduits therein arranged to receive fluid in one end from said inlet port, a one-way outlet valve in each of said conduits, means for coupling a fluid conducting pipe with the other end of each conduit, a movable piston in each of said conduits adapted to be actuated by the pressure of fluid entering the conduit through said port, means for by-passing fluid from the port into each conduit between the piston therein and the outlet valve whereby the movement of the piston under the pressure of fluid will eject the introduced fluid from the conduit, and a pin in each conduit engaged by the piston and moved thereby toward the outlet valve and acting to limit said piston movement and to close the conduit at the limit of such movement.

9. A flow dividing means for connection with a fluid carrying pipe, comprising a body having an inlet port for connection with an end of said pipe, said body having a plurality of conduits therein arranged to receive fluid in one end from said inlet port, a one-way outlet valve in each of said conduits, means for coupling a fluid conducting pipe with the other end of each conduit, a movable piston in each of said conduits adapted to be actuated by the pressure of fluid entering the conduit through said port, a fluid receiving chamber in the body for each of said conduits, each chamber having an inlet port leading thereinto from the adjacent conduit and an outlet port leading therefrom into the adjacent conduit, each conduit having the piston therein normally disposed to cover the inlet port to the adjacent chamber and to uncover the outlet port thereof, said pistons when shifted under pressure of fluid entering the first mentioned inlet port of the body uncovering the adjacent chamber inlet port and covering the adjacent chamber outlet port, and adjustable means movable in each of said conduits with the piston for regulating the extent of movement of the piston therein whereby the quantity of fluid ejected from each conduit may be regulated and for closing the conduit simultaneously with the limiting of such movement.

10. In a force feed lubricator, a body having a fluid receiving chamber therein, means for supplying fluid to said chamber, means for imparting a pulsating pressure to the fluid in the chamber, a conduit in the body having an end communicating with said chamber, the other end of the conduit constituting the outlet end, said conduit having an intermediate portion of a diameter different from the inlet end whereby a piston movement limiting shoulder is formed, a piston movable in said intermediate portion and adapted to engage said shoulder, means for supplying said intermediate portion of the conduit with fluid between the piston and said outlet end, a body inserted into the said outlet end of the conduit and having a passage longitudinally therethrough alined with the conduit, means for connecting a fluid distributing pipe to said last body, said last body including a centrally apertured web, a ball check valve normally closing the aperture of said web upon the side thereof remote from said piston, a pin member disposed in the conduit between the web and the piston and having one end engaging the piston, the other end of said pin being adapted to engage in said aperture in the other side of the web, resilient means normally separating said pin and web,

and said pin operating as a movement limiting means for the piston and a closure means for the web when forced outwardly by the piston.

11. In a force feed lubricator, a body having a fluid receiving chamber, means for supplying fluid to the chamber, means for impressing a pulsating pressure on the fluid in the chamber, an outlet conduit in the body having an end communicating with the chamber, said conduit having an intermediate portion of enlarged diameter and an outer end portion of maximum diameter, a piston movable in said intermediate portion by the pulsating movements of fluid against one end thereof, means for introducing fluid into said intermediate portion ahead of the other end of the piston, a plug in the portion of the conduit of maximum diameter and having a passage longitudinally therethrough, said plug passage being divided by a centrally apertured web, means for connecting a distributing pipe with the outer end of the plug, an outwardly opening ball check valve between said last means and the web and adapted to close the web passage, a pin member having an end extended into the portion of the conduit of intermediate diameter and engaging the piston and having its other end disposed in said plug in spaced relation with said web passage, means normally tending to separate said pin from said apertured web, and said pin having its outer end formed to close the web passage when the pin is forced outwardly by the piston, said plug being longitudinally adjustable in the conduit to vary the extent of movement of the pin by the piston.

12. A force feed lubricator comprising a body having a fluid receiving chamber, means for imparting a pulsating pressure to fluid within the chamber, a supplemental chamber in the body, a fluid inlet passage in the body having two points of communication with said supplemental chamber, a pair of ball valve seats in said suplemental chamber between said two points of communication, a supply passage leading from said supplemental chamber between said valve seats to said first chamber, a gravity actuated ball valve disposed upon one of said seats, a spring pressed ball valve disposed upon the other of said seats, an outlet conduit communicating at one end with said first chamber, an outwardly opening ball check valve in the other end of the conduit, a fluid actuated piston in the outlet conduit, and means for conveying fluid from the supplemental chamber into said outlet conduit between the piston and the outlet check valve, said spring pressed ball being adapted to relieve excessive pressure in the first mentioned chamber to permit the fluid thereof to flow back to the fluid inlet passage.

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