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FORCE FEED OILER.

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968,929. **Patented Aug. 30, 1910.**

Fig. 1.

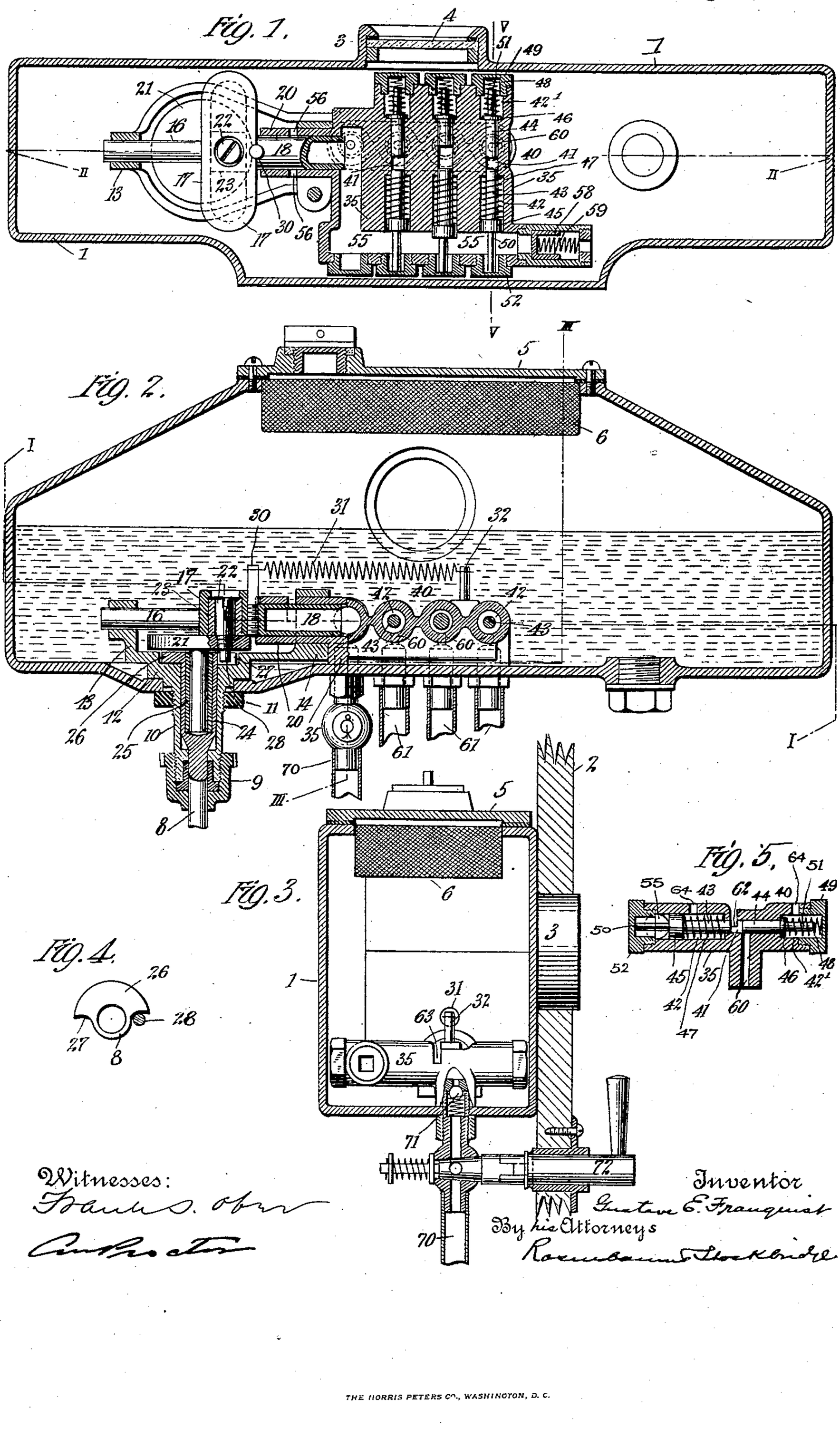

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

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FORCE-FEED OILER.

968,929. Specification of Letters Patent. **Patented Aug. 30, 1910.**

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To all whom it may concern:

Be it known that I, GUSTAVE E. FRANQUIST, a citizen of the United States, residing at the city of New York, in the borough of the Bronx and State of New York, have invented certain new and useful Improvements in Force-Feed Oilers, of which the following is a full, clear, and exact description.

This invention relates to force feed oilers of the type which are commonly employed in motor vehicles for insuring a proper, constant, reliable supply of lubricant to the various journals and bearing surfaces of the mechanism.

The ordinary construction of precision force feed oiler makes use of small mechanically operated pumps for each separate feed, and which operate with a reliability which is dependent upon the proper working of their valves. As a measure of precaution, the oil is commonly caused to flow through sight feeds, so that any interruption of the flow may be noted and remedied. It is evident that this visual indication is not wholly satisfactory, however, because the driver has his attention concerned with many things and may fail in the constant supervision required, and even if the stoppage of flow is noted, it is frequently not remedied at once because of the trouble involved.

It is the principal object of my invention to provide a force feed oiler with no valves except piston valves in those portions of the mechanism upon the proper working of which the oil feed is dependent. I also provide for delivering different, precise quantities of oil in the different feeds, as is usually required, and insure great certainty in the force or pressure of the flow.

A further feature of my invention lies in the manner of mechanically displacing the pistons of the various pumps which force the oil through the separate feeds.

In a generally stated aspect, the present invention includes a plurality of small pump cylinders submerged in a reservoir of oil and each having two pistons which are caused to describe such movements relative to one another as to, first, suck in a supply of oil, second, displace such supply or body to a point in the cylinder where it is opposite a discharge port, and third, eject said oil forcibly through such discharge port into the outlet duct or pipe. In the different pumps the separate pistons, being of different dimensions, fix the supply of oil which is fed at each actuation. As a practical means for deriving the necessary movement of the pistons, I make use of a fluid power transmission from a main operating plunger or power source.

With the foregoing and other objects in view my invention consists in the features of construction and combination as hereinafter set forth and claimed.

In the drawings: Figure 1 is a horizontal sectional view of a force feed oiler embodying the principles of my invention; this section is taken on the line I—I of Fig. 2. Fig. 2 is a vertical sectional view of the same on the line II—II of Fig. 1. Fig. 3 is a transverse sectional view on the line III—III of Fig. 2. Fig. 4 shows a detail of the power transmission. Fig. 5 is a partial section on the line V—V of Fig. 1.

Referring to the drawings in which like parts are designated by the same reference sign, 1 denotes a casing forming an oil reservoir, and which is adapted to be secured behind the usual dash 2 of an automobile, having a protruding portion 3 with a window 4 which is observable through a hole of the dash. The reservoir has the usual cover 5 and strainer 6, through which the oil is initially supplied. The level of the oil is observable at all times through the window 4.

8 denotes a shaft rotated by the engine or other power source and which projects vertically upward through the bottom of the casing 1, having any suitable gland or stuffing box 9 to prevent the escape of the oil. I prefer to have a journal box 10 for the shaft 8, which is separate from the body of the tank, being secured thereto by a nut 11, which coöperates with the shoulder 12 of the journal box. The box 10 is extended to form an arm 13 and a frame part 14 within the casing 1, which support and guide the operative mechanism.

16 is a spindle with a slotted cross-head 17 fixed thereto, the cross-head also having a plunger 18 in rigid alinement with the spindle 16. The spindle 16 is guided to have a longitudinal movement in the arm 13, and the plunger 18 fits snugly into a sleeve or cylinder 20.

21 denotes a crank disk which is driven by the driving shaft 8 and which has a crank pin 22 in a block 23 sliding in the cross-

head 17. The cross-head has a lower flat face resting on the crank disk 21, and is guided thereby to reciprocate in a horizontal plane. It is evident that the cross-head, together with the plunger 18, has a to and fro motion corresponding to the throw of the crank pin 22 when the shaft 8 is rotated. In my preferred construction I prefer to have a lost motion connection between the crank disk 21 and the driving shaft 8, amounting to say, half a revolution. This is readily accomplished by swiveling the crank disk 21 to the driving shaft 8 through an intermediate stud 24 on the crank disk fitting into an interior sleeve or bushing 25 of the shaft.

26 denotes a flange on the shaft which is cut-away on one side at 27, and the crank pin 22 is projected at 28 below the under side of the crank disk 21, so as to enter this cut-away portion 27 of the flange 26.

30 denotes a pin on the cross-head 17 to which is attached the end of a strong spring 31, anchored at its other end 32 and which is designed to draw the pin 30 with a force and direction to impel the plunger 18 into its containing cylinder or sleeve 20.

The sleeve or cylinder 20 forms part of a block 35 which is formed and chambered to receive the various pumps, etc., for the individual oil feeds. Three such separated pumps are illustrated, it being evident that any number may be provided as desired. These mechanisms are similar in construction but vary slightly in dimensions to obtain different quantities of oil in the different feeds. The broad principle of operation of each pump is comparatively simple, but certain novel results are obtained by which effective working is insured regardless of wear or other unfavorable condition. In order to make this plain, I shall consider the principles involved rather fully in order to show that the action is reliable under all circumstances. Each pump, broadly denoted 40 in the drawings, has a bore 41 extending transversely through the block 35, and expanded at each end into larger bores or cavities 42, 42′.

43 and 44 denote pistons within the bore 41 and which have heads 45 and 46, respectively, fitting within the enlarged bores 42, 42′. The head 45 fits closely in its bore forming a piston therein, and also forming a flange for the engagement of a spring 47 which impels said piston outwardly. The piston 44 is impelled inward by a spring 48 engaging the flange 46. The outer end of this spring rests against an abutment cap 49 screwed into the open end of the bore 42′.

Each of the pistons 43 and 44 above described, have protruding stems at their ends denoted 50 and 51 respectively. These stems abut against removable caps, the stem 50 engaging a cap 52 and the stem 51 engaging the cap 49, already described. By means of these stems and caps, the movement of the pistons in an outward direction from the central bore is limited. The inward movement of piston 43 is limited by its engagement with the other piston 44 when the latter is impelled to its limiting position against the cap 49. The inward movement of piston 44 is limited by its flange 46. The bores 42 are in free communication with a common recess or cavity 55, into which the plunger 18 previously described, works. This plunger 18 moves outward until its inner end passes the ports 56 in the cylinder or sleeve 20, and oil is free to enter these ports and fill the partial vacuum in the cavity 55, which is occasioned by such movement of the plunger 18. On the return or inward movement of said plunger, the fluid in the cavity 55 is strongly put under pressure, dependent as will later appear, on the strength of the spring 31.

58 is a relief piston impelled inward by a strong spring 59, which prevents possible breakage by excessive pressure under abnormal conditions.

It will be observed that each piston 45 is in a position to be impelled inward by the fluid pressure in the cavity 55, which is periodically developed by the plunger 18 as just described. As a result of this force the pistons 43 are depressed inward and any body of oil or fluid which is within the bores 41 between the two pistons 43 and 44 is carried along in a cylindrical mass, also serving to displace the inner piston 44. This movement may continue until the inner pistons engage the caps 49, at or before which time the inner pistons uncover ports 60 leading to the feed discharge pipes 61. At this time the full effective pressure of the depression of the pistons 43 is available to expel the oil into the discharge passages. The outward movement of the plunger 18 produces a partial vacuum, and the various pistons return under the influence of the suction and their impelling springs. These movements continue to the limits of throw of the various pistons, as shown in Fig. 1. When the various pistons 43 arrive fully outward they uncover ports 62 formed by a deep narrow slot 63 (see Fig. 3) cut down in the block 35 to establish communication from the oil reservoir to the various bores 41. Oil rushes downward through the ports 62 to fill the partial vacuum between the various pistons 43 and 44, after which the cycle of operations just described is ready to be repeated.

It is to be noted that the bores 42 and 42′ have small vent ducts 64 leading into the oil reservoir to permit the escape of oil from these cavities during the inward movements of the pistons as above described, and vice

versa, the admission of oil to these cavities during the outward movements of the pistons as above described.

The above is the simple theory of operation of the feed pumps. It is necessary, however, to consider more than this simple theory of operation in order that its objects and advantages may be made apparent. Two things are required in each individual oil feed, first a definite quantity of oil, and second, a definite fairly high pressure. Suppose that one gram of oil at 100 pounds available pressure is required at each stroke in a given feed. The two pistons of this particular pump would be filed off so as to inclose a cavity between them which should contain as much more than one gram of oil as the displacement of the piston passing the port 62. Under these circumstances, the body of oil which was confined and actually displaced in their movement would be exactly one gram and its entire amount would obviously be expelled into the discharge port. The latter would then be promptly closed by the return movement of the inner piston. These functions are dependent upon practically nothing except the perfectness with which the ports or valves are closed. The pistons, of course, fit nicely in the bore when they are new, and the wear is slight. Nevertheless, wear in continued service must be considered. Each piston tends to run on the side of the bore toward the inlet or the discharge port respectively, on account of the unbalancing of the pressure at such ports; in other words, each piston tends to rub over its ports like the slide valve of a steam engine, due to the fluid pressure. The engagements of the pistons on the ports therefore, automatically wear tight and continue tight. The valve action therefore maintains itself perfect. Considering now any leakage past the pistons, it is to be noted that at the time of the pressure actuation, oil is being put under pressure in the cavity 55 and in the bores or cavities 42 and 42′. The pressures attained in these various cavities is dependent only upon the force of the plunger 18 and the smallness of the relief ducts 64. There is therefore no possibility of loss of pressure by reason of wear of the pistons because they are wholly submerged in and surrounded by the fluid pressures on all sides. The apparatus works with unvarying efficiency regardless of wear of the pistons, as long as they merely fit well enough to be displaced in the action as just described. It is hardly conceivable that any wear can take place to such an extent that the pistons would allow the oil to run past them rather than yield against their light springs. All factors, at least so far as I am aware, have been considered in the above analysis except the possibility of wear of the plunger 18. But this last is a single plunger abundantly large and strongly made and having such a considerable displacement that the leakage of more than the entire capacity of the separate feed pumps therepassed would be a negligible consideration. Thus all possibilities of failure, except by actual breakage of the driving shaft, or possible clogging of the oil inlets, are overcome. These latter possibilities are so remote as to render any special provision for them practically unnecessary, especially as the driving shaft is strongly made and the oil inlet ports 62 are very large, being deeply slotted as shown at 63.

As a practical feature of my invention it may be mentioned that an oil pipe 70 is led off through a check valve 71 from the chamber or cavity 55, and which I run to the engine cylinders. The pulsating pressure in the cavity 55 can be depended upon to deliver the oil to the delivery pipe 70 when required. I provide a valve 72 for cutting off this feed at times when the splash lubrication is sufficient.

The use and operation will be sufficiently clear from the foregoing description. The cross-head 17 is reciprocated by the shaft 8 and the corresponding movements of the plunger 18 produce the pulsations of the pressure in the cavity 55 and the separate feed pump actuations, as already described. As a final means of precaution against the effects of leakage, etc., the inward movement of the plunger 18 is made to occur abruptly by spring actuation instead of slowly by the regular harmonic motion of a uniformly rotating crank. The mutilated flange 26 on the crank shaft, forms part of the mechanism for effecting distortion of the spring, and the consequent storage of energy in the same, and the continued rotation of said shaft abruptly removes restraint from said spring which snaps the plunger 18 inward through its entire throw, as soon as the shaft rotates past its dead center.

What I claim, is:—

1. A force feed oiler comprising a tank, a pump submerged therein and having a bore with inlet and discharge ports, a pair of pistons in said bore, means for normally separating the pistons by a predetermined space, a conduit, said conduit being also submerged in said tank and normally containing fluid, a portion of such fluid contacting with one of said pistons, and a pump for applying pressure to said fluid whereby said piston may be operated.

2. A force feed oiler comprising a tank, a pump submerged therein and having a bore with inlet and discharge ports, a pair of pistons in said bore, means for normally separating the pistons by a predetermined space, a conduit, said conduit being also submerged in said tank and communicating

with the pump bore aforesaid, and a reciprocating plunger in said tank for periodically applying pressure to the fluid in said conduit.

3. A force feed oiler comprising a pump having a bore with inlet and discharge ports, a pair of pistons in said bore, means for normally separating the pistons by a predetermined space opposite said inlet port, a conduit, said conduit normally containing fluid, pressure upon such fluid being communicable to one of said pistons, a spring impelled plunger for intermittently applying pressure to said fluid, a crank for reciprocating said plunger, and lost motion connection for operating said crank.

4. A force feed oiler comprising a pump having a bore with inlet and discharge ports, a pair of pistons in said bore, means for normally separating the pistons by a predetermined space opposite said inlet port, a conduit, said conduit normally containing fluid, pressure upon such fluid being communicable to one of said pistons, an oil duct leading from said conduit, a check valve therefor, and means for intermittently applying pressure to said fluid.

5. A force feed oiler comprising a pump having a bore with inlet and discharge ports, a pair of pistons in said bore, means for normally separating the pistons by a predetermined space opposite said inlet port, a conduit, said conduit normally containing fluid, pressure upon such fluid being communicable to one of said pistons, a mechanism for affording relief from excess of pressure in said conduit, said mechanism comprising a spring pressed plunger, and means for intermittently applying pressure to said fluid.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

GUSTAVE E. FRANQUIST.

Witnesses:
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