Feb. 20, 1940. J. RETSEMA 2,190,908

LIQUID DISPENSING APPARATUS

Filed March 18, 1939 4 Sheets-Sheet 1

FIG. I.

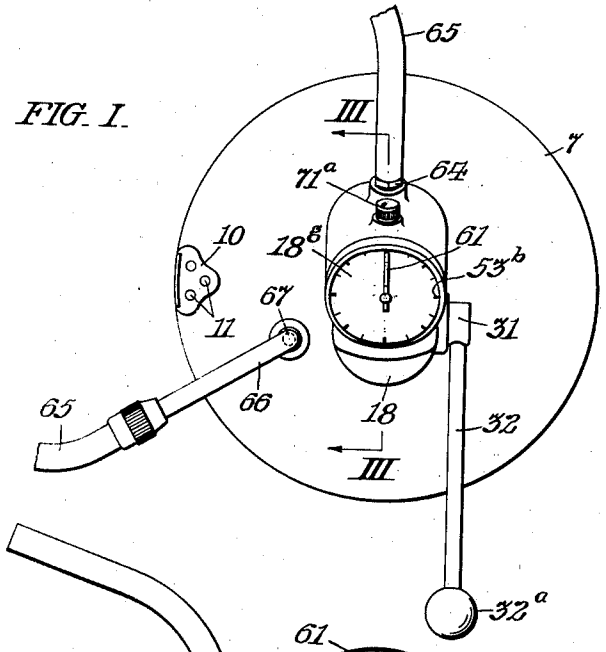
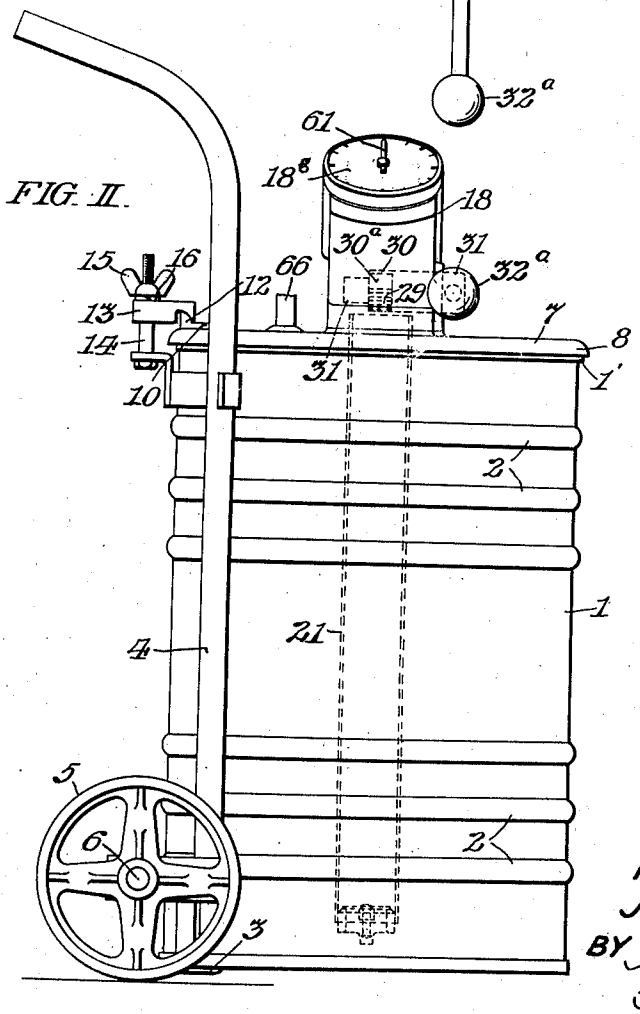


FIG. II.



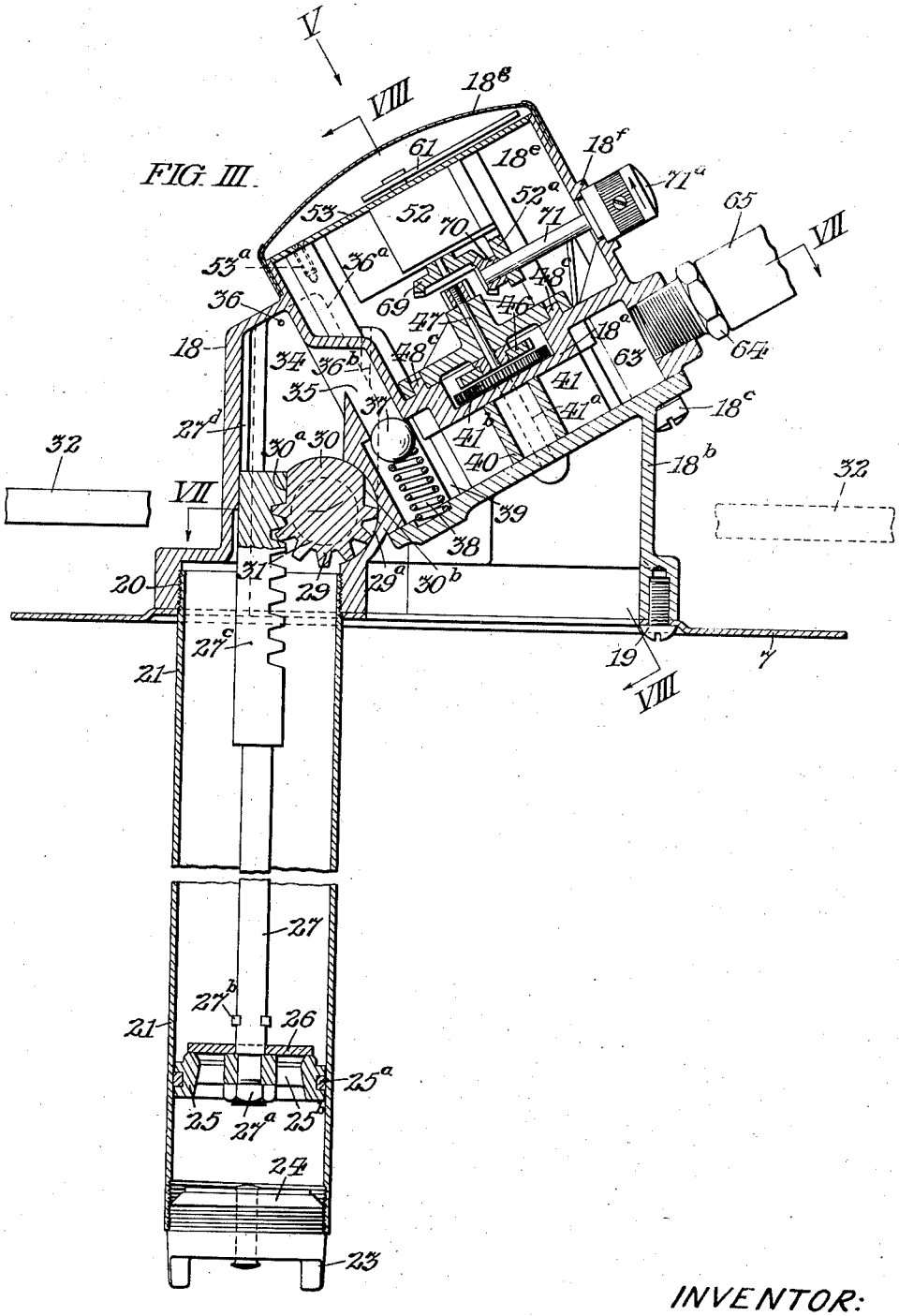
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Filed March 18, 1939 4 Sheets-Sheet 2

FIG. III.



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LIQUID DISPENSING APPARATUS

Filed March 18, 1939 4 Sheets-Sheet 3

FIG. IV.

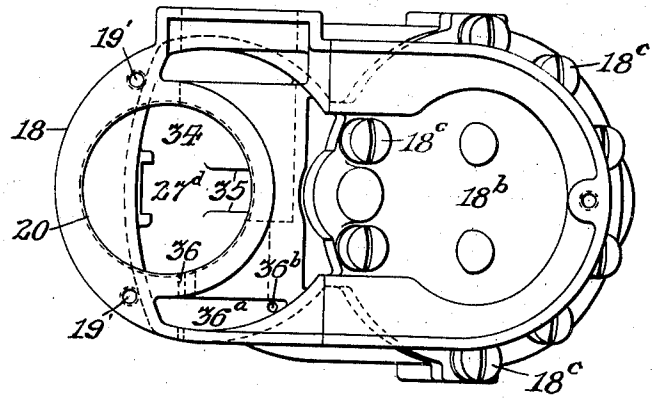


FIG. V.

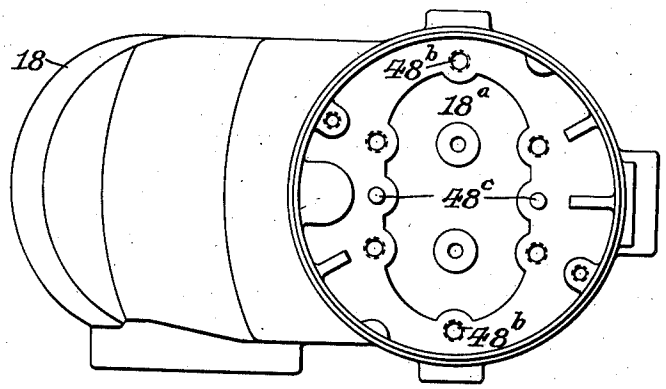
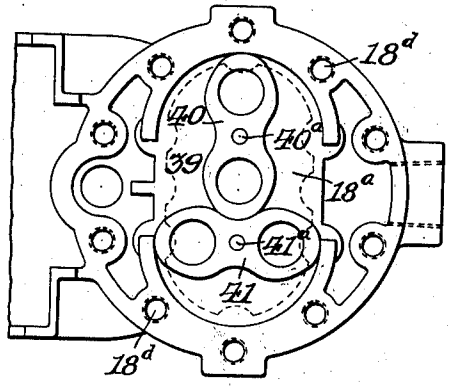


FIG. VI.



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Feb. 20, 1940. J. RETSEMA 2,190,908

LIQUID DISPENSING APPARATUS

Filed March 18, 1939 4 Sheets-Sheet 4

FIG. VII.

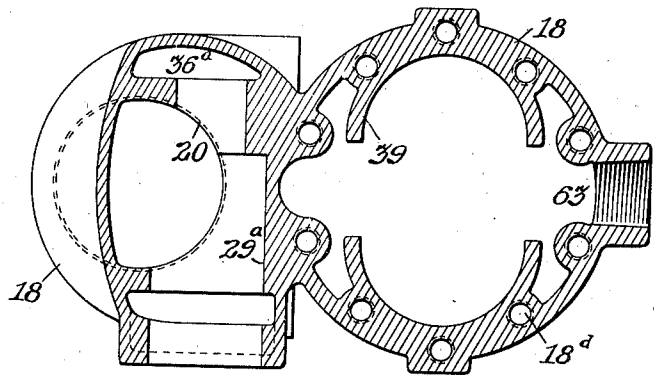
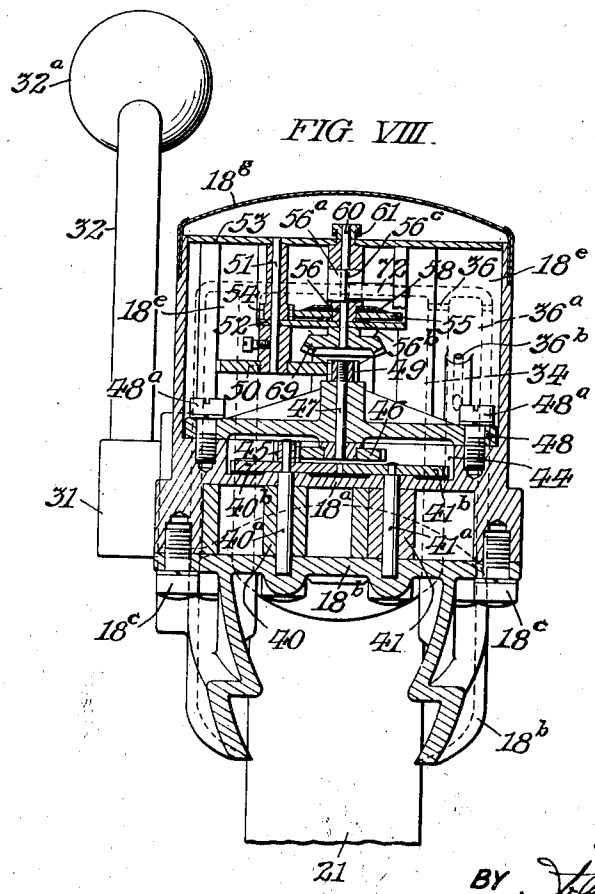


FIG. VIII.



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Patented Feb. 20, 1940 2,190,908

UNITED STATES PATENT OFFICE

2,190,908

LIQUID DISPENSING APPARATUS

Jay Retsema, Muskegon Heights, Mich., assignor to John Wood Manufacturing Company, Inc., Conshohocken, Pa., a corporation of Delaware

Application March 18, 1939, Serial No. 262,597

5 Claims. (Cl. 221—103)

My invention is particularly applicable to metering pumps for dispensation of viscous liquids such as lubricating greases, adapted to be interchangeably connected with portable containers of different forms. The liquid is elevated from such a detachable container by a reciprocatory piston provided with a rack in mesh with a sectoral gear; which gear is operatively connected with a lever, the oscillatory movement of which is limited to not more than one hundred eighty degrees by the arcuate extent of said sectoral gear. The liquid is thus progressed step by step through a displacement meter including rotary elements having their axes parallel and each including projections which mesh with the other. One of said rotary elements is operatively connected with a rotary index pointer which traverses a circular scale, having graduations indicating volumetric units.

As ordinarily constructed, apparatus for the purpose of dispensing such lubricants includes one or more stuffing boxes containing packing means which must be frequently adjusted to prevent the escape of the lubricant. One advantageous feature of my invention is that it does not require any such packing means. Another advantageous feature of my invention is that the pump actuating gear, its shaft, said rotary elements of the displacement meter, the indicating means, the gearing connecting them, and a spring pressed valve which retains the liquid under pressure until any air or gases occluded therein are eliminated, are all contained in a single metal casing, so designed that it may be readily formed of a single die-casting.

My invention includes the various novel features of construction, arrangement, and method of operation hereinafter more definitely specified.

In said drawings;

Fig. I is a plan view of liquid dispensing apparatus conveniently embodying my invention, on the removable lid of a portable liquid container.

Fig. II is an elevation of said apparatus, as seen from the lower side of Fig. I; detachably connected with a lubricant container mounted upon a wheel truck.

Fig. III is a fragmentary vertical sectional view taken on the line III, III in Fig. I, in the direction of the arrows on that line, but on a larger scale.

Fig. IV is an inverted plan view of the mechanism casing shown in Fig. III.

Fig. V is an oblique plan view of the upper portion of said casing shown in Fig. III, as seen in the direction of the arrow on that figure.

Fig. VI is a fragmentary inverted plan view of the casing shown in Fig. V, with the base cover of the meter chamber removed to show the pair of inter-meshing rotary displacement members, by which the metering indicating mechanism is actuated.

Fig. VII is an irregular plan sectional view of said casing taken on the line VII, VII in Fig. III, showing the bearing for the fulcrum shaft of the pump operating lever.

Fig. VIII is an oblique sectional view taken on the line VIII, VIII in Fig. III, in the direction of the arrows on said line, showing the gearing train connecting one displacement member with the indicator, a drain port from the register chamber, and the restricted passageway through which air and other gases may be eliminated from the liquid and discharged from said casing into the container subjacent thereto.

The container 1, shown in Fig. II, is an open-topped cylindrical sheet metal vessel with annular corrugations 2 pressed therein to stiffen it. Said container 1 is conveniently rendered readily portable by supporting it upon the flange 3 of the truck frame 4 which is supported by a pair of wheels 5 having the axle 6 in said frame. Said container 1 is temporarily closed at its upper end by the removable cover 7 which has the downward turned rim 8 overhanging the top edge 1' of said container, so that said cover may not be displaced laterally with respect to said container. Said cover has the keeper plate 10 convenienetly fixed thereon by rivets 11, shown in Fig. I, and said plate has the upwardly extending flange 12 which, as shown in Fig. II, is adapted to be engaged by the hook block 13 which is carried by the bolt 14 in said truck frame 4 and adjustably secured by any suitable means, for instance, the wing nut 15 and the lock washer 16, shown in Fig. II, with the effect of rigidly clamping said container and its cover 7 in closed position on said truck frame.

Said removable cover 7 carries the entire metering pump and dispensing structure, contained within the casing 18. Said casing is conveniently detachably connected with said cover 7 by a circular series of three screws 19, one of which is shown at the right of Fig. III. The holes 19' for the other two screws are shown in Fig. IV.

As shown in Fig. III, said casing 18 has the screw threaded socket 20 at the bottom thereof engaged with the upper end of the pump cylinder 21 which extends to the bottom of the

liquid containing space in the container 1. Said cylinder has at its lower end the casing 23 in which the foot valve 24 is mounted for vertical reciprocation to admit liquid to said cylinder when the valve is raised and prevent the escape of liquid when the valve is lowered.

The piston 25 is mounted to reciprocate in said cylinder 21 with the piston ring 25a in contact therewith. Said piston has a circular series of ports 25b extending vertically therethrough, which are normally closed by the piston valve 26 which is a disk mounted to reciprocate vertically on the piston rod 27, which is rigidly connected with said piston 25 by the nut 27a. Said rod 27 has lateral projections 27b which limit the vertical reciprocation of said piston valve 26. That construction is such that when the piston is drawn upwardly the valve 26 is closed and the valve 24 is opened and the liquid drawn into the cylinder 21. However, upon downward movement of said piston 25 by the rod 27 the valve 24 is closed to trap the liquid in the cylinder 21 and the valve 26 is opened to permit the liquid to pass through the piston ports 25b above the piston, so that when the piston is again raised liquid is not only drawn into the cylinder below the piston, but the liquid above the piston is discharged from the upper end of said cylinder.

Such reciprocation of the piston 25 is effected by providing the upper end of said rod 27 with the gear rack 27c, shown in Fig. III, which is mounted to slide in the bearing 27d in said casing 18. As shown in Fig. III, the teeth of said rack 27 are engaged with the sectoral gear 29 which is mounted to turn through an arc of one hundred eighty degrees in the bearing 29a in said casing 18, so that the extent of the vertical reciprocation of said piston is limited by the arcuate extent of the teeth of said sectoral gear 29.

As shown in Fig. III, said sectoral gear 29 has in unitary relation therewith the cam 30 having opposite parallel plane abutment surfaces 30a and 30b. The downward movement of said piston rack 27c is limited by the encounter of said abutment surface 30a with the upper end of said rack. When said piston is raised, the opposite abutment surface 30b encounters the lower end of said rack 27c and limits the upward movement thereof. It may be observed that such means for limiting the reciprocation of the piston are not only positive in operation, but extremely rugged in construction, and consequently durable.

I find it convenient to form said sectoral gear 29 and cam 30 in unitary relation with the fulcrum shaft 31 of the lever 32, shown in Fig. II. Said lever is provided at its free end with the handle 32a for convenient manual oscillation through an arc of one hundred eighty degrees from the position of said lever indicated in full lines in Fig. III, in which the piston 25 is at the lower limit of its stroke, to the position indicated in dotted lines in Fig. III, in which the piston is at the upper limit of its stroke.

The lubricant liquid with more or less air and other gas occluded therein thus raised from the container 1 through the cylinder 21 is squeezed through the air separator chamber 34, shown in Fig. III. Said chamber has the liquid discharge port 35 and the restricted discharge vent 36 for the lighter fluids, including air and other gases which are separated from the viscous liquid as the latter is squeezed in said chamber 34 by the pressure of said piston on each of its upward strokes.

As shown in Fig. VIII; said restricted vent 36 is in communication with the passageway 36a extending downwardly through said casing 18, and opening through said cover 7 into the interior of said container 1, so that any liquid carried out with the extruded lighter fluids is returned to the mass of fluid in said container.

The liquid port 35 from said separator chamber 34 is normally closed by the ball valve 37 under pressure of the helical spring 38 which is designed to offer the proper amount of resistance to the passage of liquid through said port to effect the elimination of the lighter fluids from the liquid which is to be dispensed. Said port 35 leads to the meter chamber 39 which, as shown in Fig. VI, contains the pair of similar rotary displacement elements 40 and 41 respectively rigidly connected with shafts 40a and 41a. The upper ends of said shafts are journaled in the diaphragm 18a of said casing 18, and the lower ends of said shafts are journaled in the base member 18b of said casing 18 which serves as an abutment for the lower end of said spring 38 and as a cover for said chamber 39. Said base member 18b is rigidly connected with said casing 18 by a circular series of ten screws 18c, the head of one of which is shown at the right of Fig. III. The ten holes 18d in the casing 18 in which said screws are engaged are shown in Fig. VI.

As shown in Fig. VIII; said shafts 40a and 41a are respectively rigidly connected with the intermeshed gears 40b and 41b in the gear chamber 44. The pinion 45, which is rigidly connected with said shaft 40a, is in mesh with the gear 46 on the shaft 47 which is journaled in the plate 48 which forms the top wall of said gear chamber 44. Said plate 48 is rigidly connected with said casing 18 by six screws 48a; of which two are shown in Fig. VIII. The holes for said screws are shown at 48b in Fig. V. Said plate 48 is precisely located, in said casing 18, by two studs 48c on said casing which project into holes in said plate, as shown in Fig. III.

As shown in Fig. VIII; said shaft 47 is rigidly connected with the pinion 49 in mesh with the gear 50 in the register chamber 18e of said casing 18. Said gear 50 is rigidly connected with the register driving shaft 51 journaled in the register casing 52 and in the dial plate 53; which latter is held in said casing 18 by screws 53a and carries said casing 52. The pinion 54 in said casing 52 is rigidly connected with said shaft 51 and in mesh with the friction driving gear 55 of the register mechanism. Said gear 55 is journaled on the sleeve 56 between the reset cam 56a and the friction ring 56b, which latter is fixed on the end of said sleeve. The dished plate spring 58 bears against the lower end of said cam 56a and its perimeter presses said gear 55 into frictional engagement with said ring 56b. Said sleeve 56 is rigidly connected with the indicator shaft 60 which carries the rotary index pointer 61; so that turning movement of said friction driving gear 55 normally turns said pointer 61 which traverses the circular scale of graduations 53b on said dial plate 53.

The arrangement of said registering and indicating mechanism is such that the latter manifests the quantity of liquid which the pump pushes past said rotary displacement elements 40 and 41, through said chamber 39, its outlet

port 63 and the hose coupling 64. For instance, the graduations 53b indicate volumetric units, conveniently pints and fractions thereof. However, the dial 53 may be graduated to indicate the quantity of grease dispensed in liters, pounds, or other units.

Said coupling 64 is connected with the flexible dispensing hose 65 which has at its free end the nozle 66 provided with the check valve 67 to prevent dripping of the liquid from said nozle in the intervals between dispensing operations.

In order to zeroize said pointer 61 with respect to said scale 53b, I rigidly connect the bevel gear 69 with said shaft 60. As shown in Fig. III, the bevel pinion 70 is in mesh with said bevel gear 69. Said pinion is fixed on the zeroizing shaft 71 which is journaled in the bearing bracket 52a on the casing 52 and adapted to be manually turned by the knob 71a on said shaft 71, only in the direction of the arrow on said knob, to return said pointer 61 to zero. Said knob 71a is journaled in the bearing 18f in said casing 18, and engages said shaft only by a pawl within the knob, so that the latter cannot be turned to advance said pointer by engagement with shaft 71. The pawl 72, shown in Fig. VIII, has its outer end connected with said register casing 52 and its inner end engages the single ratchet tooth 56c of said reset cam 56a and stops said sleeve 56 and the pointer 61 at zero position, when the latter is turned counterclockwise by the manual rotation of the knob 71a, in the direction of the arrow on said knob in Fig. III, despite the frictional engagement of said spring 58 with said gear 55, which turns said pointer clockwise.

Such a zeroizing operation should be manually effected after each dispensing operation; when said gear 55 is idle and is held stationary by the then stationary liquid compressed in the meter chamber 39, which then holds stationary the displacement elements 40, 41 and the gearing train connecting them with said gear 55.

As the shafts 40a, 41a, and 47 are not provided with any packing means, it is possible that after continued use, the liquid being dispensed may seep into the register chamber 18e. Therefore, I find it convenient to provide the drain hole 36b drilled in the casing 18 from said chamber 18e into the drain port 35a, as shown in dotted lines in Fig. III; so that any such surplus liquid may escape back into the subjacent container through said drain port 36a.

I prefer to provide said casing 18 with the readily removable transparent cap 18g, conveniently formed of Bakelite, Pyrolin, or other flexible resilient plastic material. However, the indicator may, of course, be used without any cover.

Therefore, I do not desire to limit myself to the precise details of construction, arrangement, or method of operation herein set forth, as it is obvious that various modifications may be made therein without departing from the essential features of my invention as defined in the appended claims.

I claim:

1. In liquid dispensing apparatus, including a pump cylinder, a piston mounted to reciprocate in said cylinder, a rod rigidly connected to said piston at one end, a gear rack rigidly connected with the other end of said rod, a gear in mesh with said rack, and a shaft carrying said gear; the combination with a single cast metal casing including a socket rigidly connected to one end of said cylinder, a slide bearing for said rack, a journal bearing for said gear and shaft, a separator chamber for liquid and lighter fluids, a vent from said separator chamber for lighter fluids, a meter chamber, a port from said separator chamber to said meter chamber, a register chamber, and a gear chamber between said meter chamber and register chamber; of a spring pressed check valve, in said meter chamber, normally closing said port; an outlet port from said meter chamber, through which liquid is dispensed; a pair of intermeshed rotary displacement meter members, in said meter chamber; two shafts, respectively rigidly connected with said meter members, journaled in parallel bearings in said casing, and extending from said meter chamber into said gear chamber; registering mechanism, in said register chamber; intermeshed gears in said gear casing, respectively rigidly connected with said shafts; a pinion on one of said shafts, in said gear chamber; and a train of gearing in said gear chamber, and extending in said register chamber, operatively connecting said pinion with said register mechanism.

2. In liquid dispensing apparatus, including a pump cylinder, a piston mounted to reciprocate in said cylinder, a foot valve in said cylinder, a check valve in said piston, and a rod rigidly connected to said piston at one end; the combination with a gear rack rigidly connected with the other end of said rod, having a series of gear teeth and two toothless abutment surfaces, respectively at opposite ends of said series; of a sectoral gear having an arcuate series of teeth continually in mesh with said rack teeth; and a cam integral with said gear and having two abutments, respectively at the opposite ends of said series of gear teeth, adapted to alternately contact with said abutment surfaces on said rack; a fulcrum shaft in integral coaxial relation with said gear and cam; and a hand operative lever, rigidly connected with said shaft; whereby, the movement of said lever is limited to less than one revolution of said shaft, and the extent of the stroke of the piston is positively limited by said cam.

3. In liquid dispensing apparatus, including a pump cylinder having a foot valve at one end thereof, a piston mounted to reciprocate in said cylinder, a check valve carried by said piston, a piston rod having one end rigidly connected with said piston, and a gear rack rigidly connected with the other end of said rod; of a casing having a socket rigidly connected with the end of said cylinder opposite to said foot valve; a fulcrum shaft bearing in said casing; a fulcrum shaft journaled in said bearing; a sectoral gear carried by said shaft and in mesh with the teeth of said rack; a cam carried by said shaft, having means for limiting the reciprocatory movement of said piston by encountering said rack; a handle lever rigidly connected with said fulcrum shaft, whereby said shaft and sectoral gear may be oscillated through an arc of less than one revolution and positively stopped by said cam at each end of its movement; a separator chamber in said casing; whereby the liquid to be dispensed may be drawn into said cylinder past said foot valve and squeezed from said cylinder into said separator chamber by oscillation of said lever and consequent reciprocation of said piston; a restricted vent opening from said separator chamber for the escape of lighter fluids squeezed from the liquid to be dispensed; a liquid outlet port from said separator chamber; a spring pressed

check valve normally closing said liquid outlet port; a meter chamber in said casing in communication with said outlet port from said separator chamber; an outlet port from said meter chamber and a hose coupling leading from said outlet port; a flexible dispensing hose connected with said coupling; a pair of displacement rotary elements mounted in said meter chamber with their axes parallel and each including projections which mesh with the other; respective axial shafts rigidly connected with said rotary elements and journaled in said casing; a gear chamber in said casing adjoining said meter chamber, and into which the shafts of said rotary elements project; respective gears fixed on said shafts in said gear chamber and in mesh with each other; whereby said rotary elements are rotated in opposite directions by the passage of the liquid through said meter chamber under pressure from said piston; a pinion fixed on the shaft of one of said rotary elements in said gear chamber; indicating mechanism including a rotary index pointer, in coaxial relation with a circular scale having graduations indicating volumetric units; registering mechanism operatively connected with said pointer and including a driving gear; a train of gearing connecting said pinion with said driving gear, whereby the quantity of liquid dispensed through said meter chamber is measured and registered by said indicating mechanism; and means, journaled in said casing, for zeroizing said registering mechanism.

4. In liquid dispensing apparatus, including a pump cylinder having a foot valve at one end thereof, a piston mounted to reciprocate in said cylinder, a check valve carried by said piston, a piston rod having one end rigidly connected with said piston, and a gear rack rigidly connected with the other end of said rod; of a casing having a socket rigidly connected with the end of said cylinder opposite to said foot valve; a fulcrum shaft bearing in said casing; a fulcrum shaft journaled in said bearing; a sectoral gear carried by said shaft and in mesh with the teeth of said rack; a cam carried by said shaft, having means for limiting the reciprocatory movement of said piston by encountering said rack; a handle lever rigidly connected with said fulcrum shaft, whereby said shaft and sectoral gear may be oscillated through an arc of less than one revolution and positively stopped by said cam at each end of its movement; a separator chamber in said casing; whereby the liquid to be dispensed may be drawn into said cylinder past said foot valve and squeezed from said cylinder into said separator chamber by oscillation of said lever and consequent reciprocation of said piston; a restricted vent opening from said separator chamber for the escape of lighter fluids squeezed from the liquid to be dispensed; a liquid outlet port from said separator chamber; a spring pressed check valve normally closing said liquid outlet port; a meter chamber in said casing in communication with said outlet port from said separator chamber; an outlet port from said member chamber and a hose coupling leading from said outlet port; a flexible dispensing hose connected with said coupling; a pair of displacement rotary elements mounted in said meter chamber with their axes parallel and each including projections which mesh with the other; respective axial shafts rigidly connected with said rotary elements and journaled in said casing; a gear chamber in said casing adjoining said meter chamber, and into which the shafts of said rotary elements project; respective gears fixed on said shafts in said gear chamber and in mesh with each other; whereby said rotary elements are rotated in opposite directions by the passage of the liquid through said meter chamber under pressure from said piston; a pinion fixed on the shaft of one of said rotary elements in said gear chamber; indicating mechanism including a rotary index pointer, in coaxial relation with a circular scale having graduations indicating volumetric units; registering mechanism operatively connected with said pointer and including a driving gear; a train of gearing connecting said pinion with said driving gear, whereby the quantity of liquid dispensed through said meter chamber is measured and registered by said indicating mechanism; means, journaled in said casing, for zeroizing said registering mechanism; a base member for said casing forming a detachable cover for said meter chamber; means detachably rigidly connecting said base member with said casing; a cover for a container for the material to be dispensed, having an opening; and means detachably securing said casing and base member in rigid relation with said cover with the vent for lighter fluids in said casing in registry with the opening in said container cover; whereby the fluids escaping through said vent in the separator chamber are discharged through said container cover.

5. In liquid dispensing apparatus, the combination with a pump cylinder having a foot valve at one end thereof; of a piston mounted to reciprocate in said cylinder; a check valve carried by said piston; a piston rod having one end rigidly connected with said piston; means on said rod limiting the opening movement of said piston valve; a gear rack rigidly connected with the other end of said rod; a casing having a socket rigidly connected with the end of said cylinder opposite to said foot valve; a fulcrum shaft bearing in said casing; a fulcrum shaft journaled in said bearing; a sectoral gear carried by said shaft and in mesh with the teeth of said rack; a cam carried by said shaft forming abutment means for limiting the reciprocatory movement of said piston by said abutment means alternately encountering said rack; a handle lever rigidly connected with said fulcrum shaft, whereby said shaft and sectoral gear may be oscillated through an arc of less than one revolution and positively stopped by said abutments at each end of its movement; a separator chamber in said casing; whereby the liquid to be dispensed may be drawn into said cylinder past said foot valve and squeezed from said cylinder into said separator chamber by oscillation of said lever and consequent reciprocation of said piston; a restricted vent opening from said separator chamber for the escape of lighter fluids squeezed from the liquid to be dispensed; a liquid outlet port from said separator chamber; a valve for said liquid outlet port; a spring in said casing normally closing said port by said valve; a meter chamber in said casing in communication with said outlet port from said separator chamber; an outlet port from said meter chamber, through which the liquid is dispensed; a hose coupling leading from said outlet port; a flexible dispensing hose connected with said coupling; a pair of displacement rotary elements mounted in said meter chamber with their axes parallel and each including projections which mesh with the other; respective axial shafts rigidly connected with said rotary elements and journaled in said

casing; a gear chamber in said casing adjoining said meter chamber, and into which the shafts of said rotary elements project; respective gears fixed on said shafts in said gear chamber and in mesh with each other; whereby said rotary elements are rotated in opposite directions by the passage of the liquid through said meter chamber under pressure from said piston; a pinion fixed on the shaft of one of said rotary elements in said gear chamber; indicating mechanism including a rotary index pointer, in coaxial relation with a circular scale having graduations indicating volumetric units; registering mechanism operatively connected with said pointer and including a driving gear; and a train of gearing connecting said pinion with said driving gear, whereby the quantity of liquid dispensed through said meter chamber is measured and registered by said indicating mechanism.

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