Dec. 7, 1943. J. M. ALEXANDER 2,336,383

LIQUID DISPENSING MECHANISM

Filed May 17, 1941 5 Sheets-Sheet 1

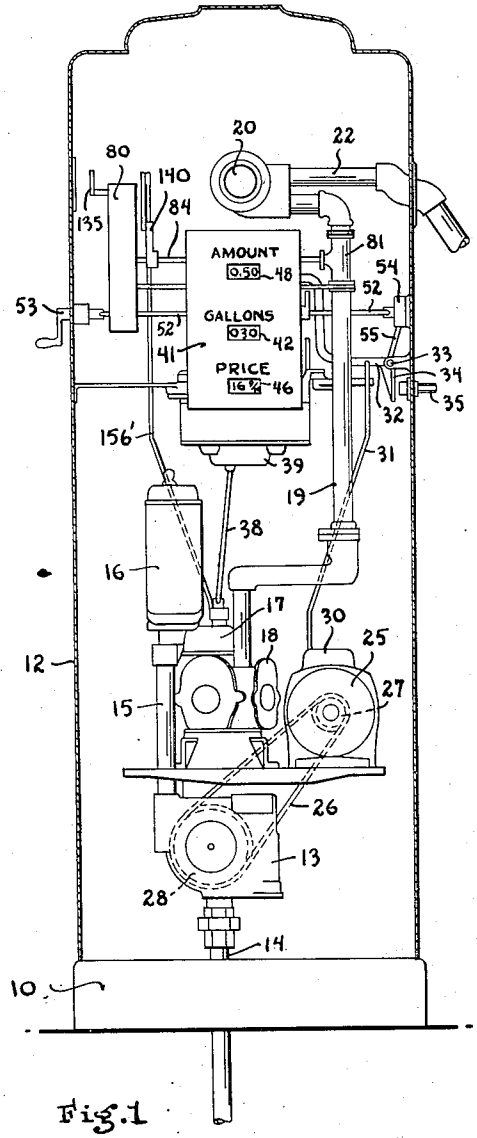


Fig. 1

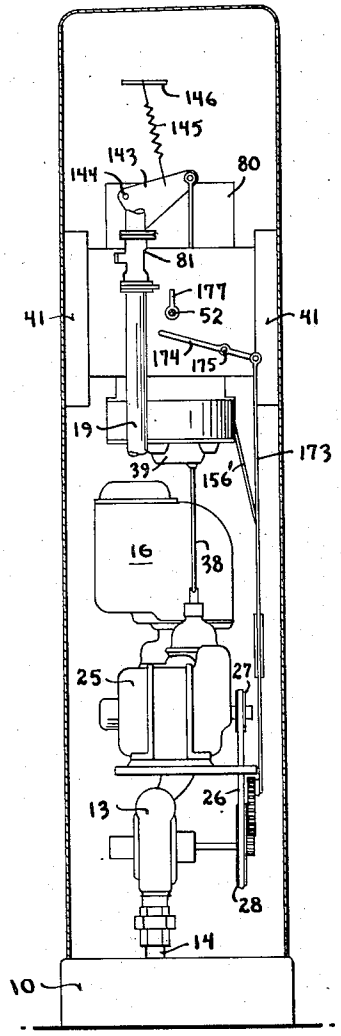


Fig. 2

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Dec. 7, 1943. J. M. ALEXANDER 2,336,383

LIQUID DISPENSING MECHANISM

Filed May 17, 1941 5 Sheets-Sheet 2

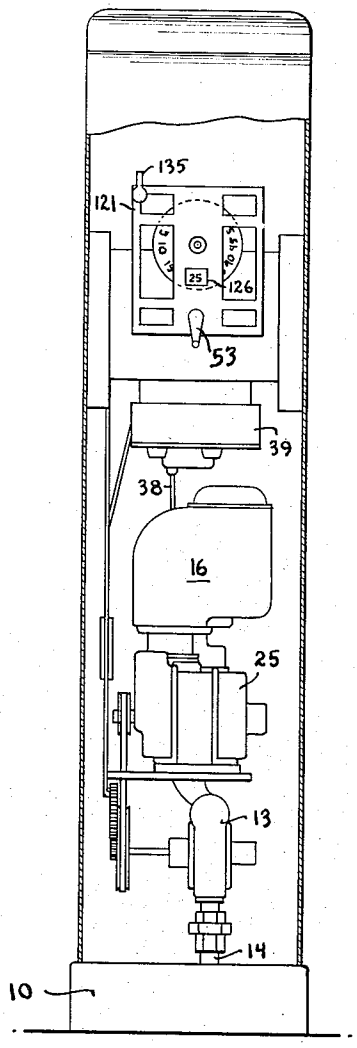


Fig.3

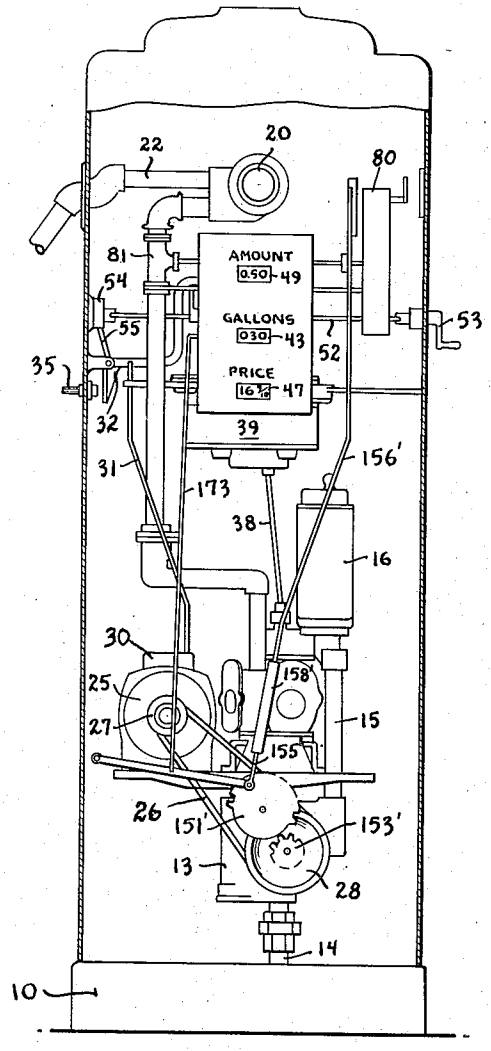


Fig.4

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LIQUID DISPENSING MECHANISM

Filed May 17, 1941 5 Sheets-Sheet 3

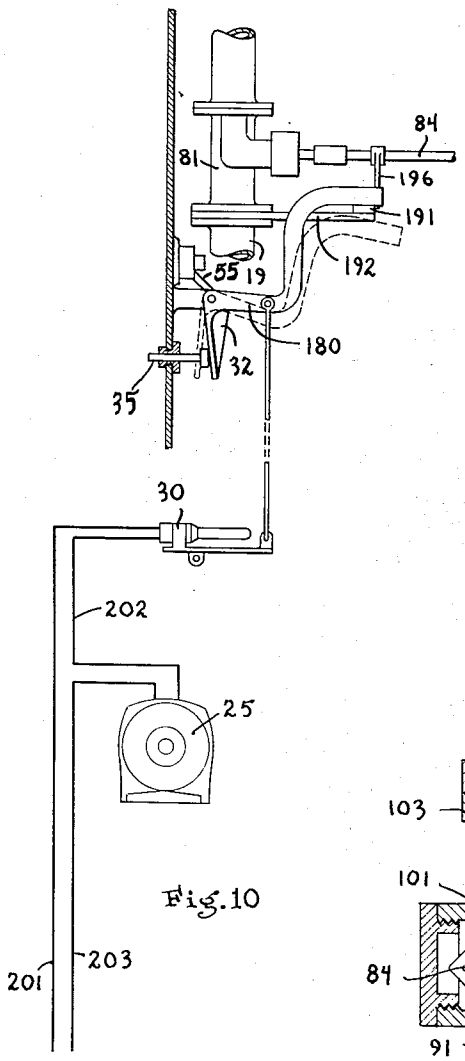


Fig. 10

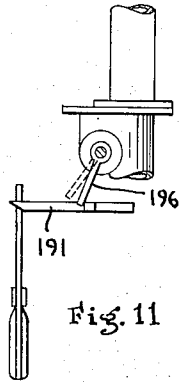


Fig. 11

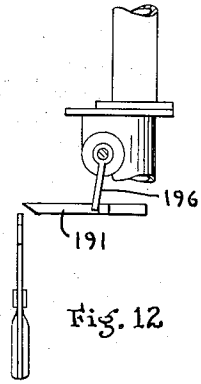


Fig. 12

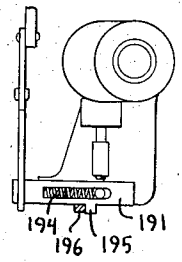


Fig. 13

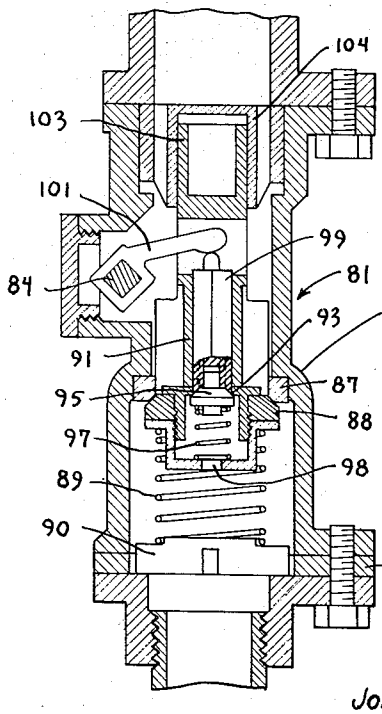


Fig. 5

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Dec. 7, 1943. J. M. ALEXANDER 2,336,383

LIQUID DISPENSING MECHANISM

Filed May 17, 1941 5 Sheets-Sheet 4

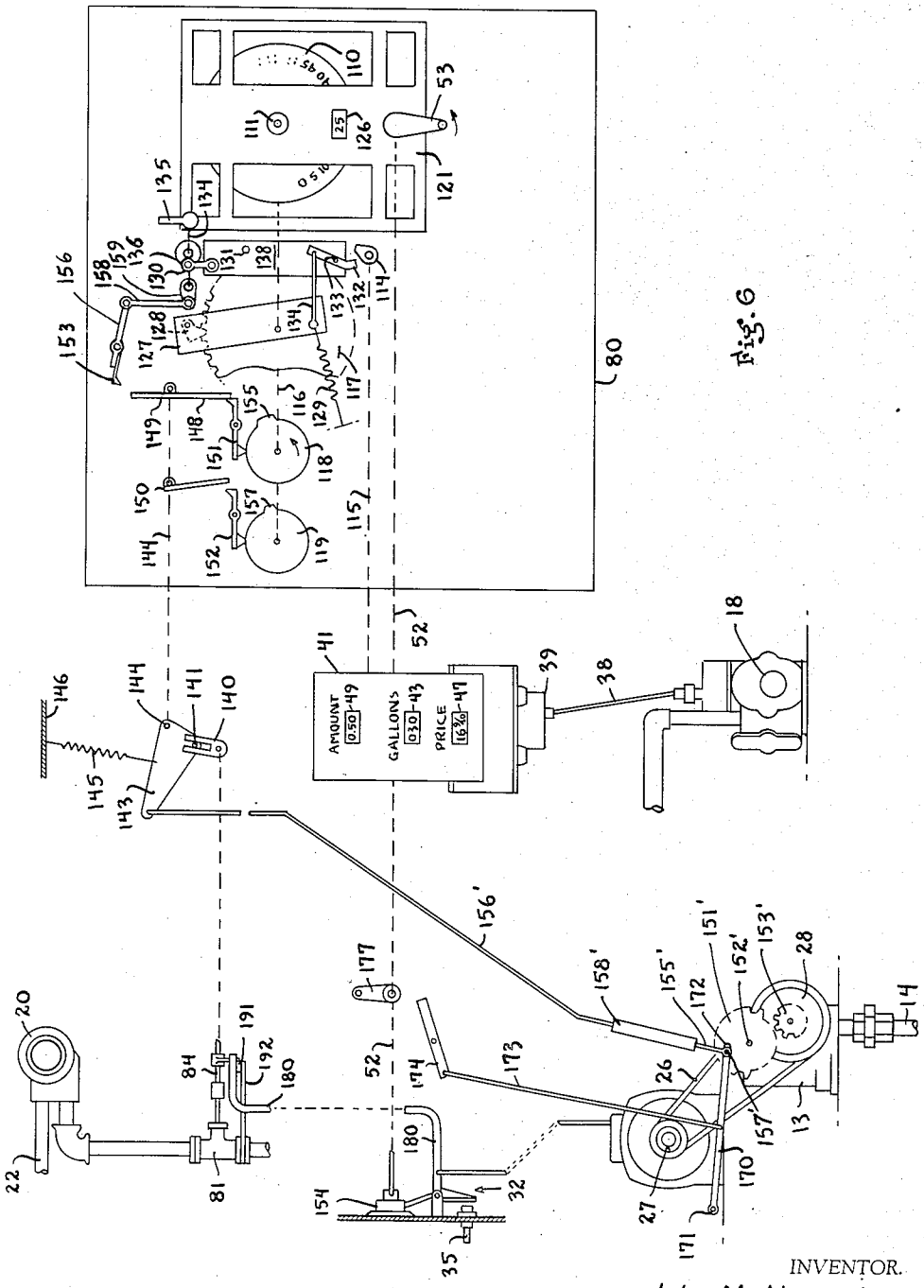


Fig. 6

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Dec. 7, 1943. J. M. ALEXANDER 2,336,383

LIQUID DISPENSING MECHANISM

Filed May 17, 1941 5 Sheets-Sheet 5

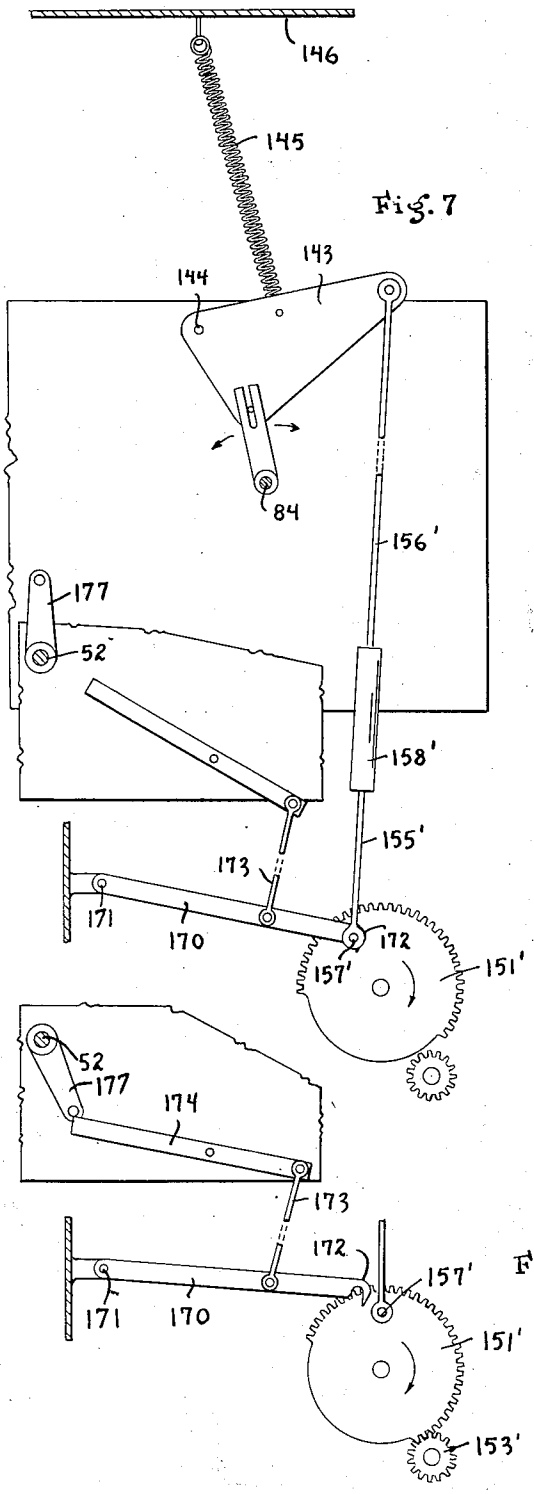


Fig. 7

Fig. 8

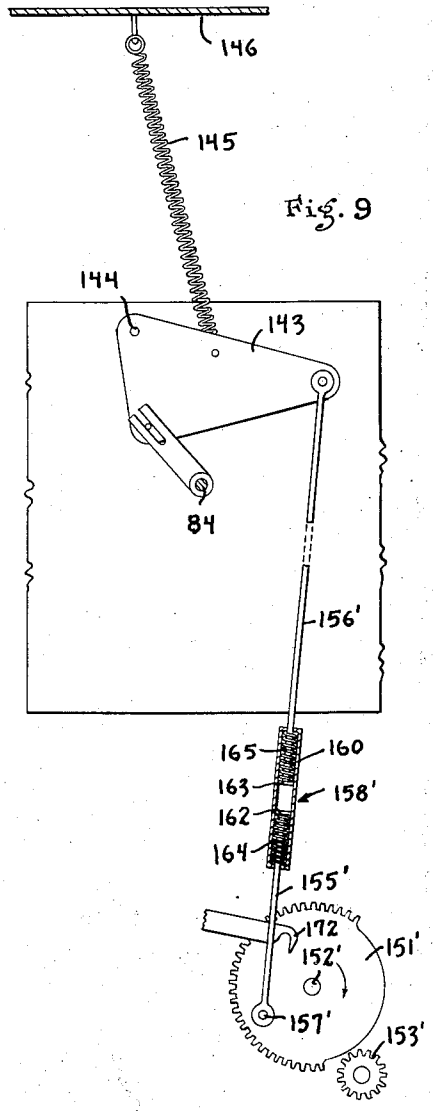


Fig. 9

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2,336,383

UNITED STATES PATENT OFFICE

2,336,383

LIQUID DISPENSING MECHANISM

John M. Alexander, Lincoln, Nebr.

Application May 17, 1941, Serial No. 393,971

14 Claims. (Cl. 221—101)

The present invention is concerned with a liquid dispensing mechanism and more particularly mechanism of the type in which it is possible to preselect the amount of liquid which will be delivered.

It has been proposed to provide liquid dispensing mechanisms in which it is possible to set a preselector means for delivery of a predetermined amount of gasoline and have this preselecting means close a valve in the fluid line after this amount of gasoline has been dispensed. In prior devices of this type, it has been necessary for the operator to manually open the valve at the beginning of each dispensing operation and in many cases it has been necessary for the operator to manually open a switch to stop the operation of the pump.

It is generally an object of the present invention to provide a liquid dispensing apparatus of the type discussed in which the number of operations required of and under the control of the operator is reduced to a minimum.

A further object of the present invention is to provide a liquid dispensing apparatus in which the delivery of fluid is automatically terminated by the closure of a valve when the amount of fluid delivered corresponds to the initial setting of the preselecting mechanism and in which means is provided for automatically reopening the valve when the pumping operation is again started.

A still further object of the present invention is to provide such a liquid dispensing apparatus in which the valve opening means is effective to only momentarily open the valve and wherein the valve is subsequently held open by the preselecting means until the amount of liquid dispensed corresponds with the original setting of the preselecting means.

A still further object of the invention is to provide such an arrangement in which the valve is connected to the motor driving the pump by means which is only temporarily effective and is thereafter rendered inactive for the duration of the pumping operation.

A further object of the invention is to provide an arrangement such as set forth in the last object in which the connection between the motor and the valve is again rendered effective by the means for resetting the registering means and incidental to the resetting operation.

A further object of the invention is to provide means for maintaining the motor switch in switch closed position as long as the valve is open.

A further object of the present invention is to provide the features above discussed in connection with a dispensing apparatus in which the valve is first closed to a minimum flow and finally closed to a no-flow position and in which the means for opening the valve is effective to open the valve to a full flow position.

Other objects of the invention will be obvious from the accompanying specification, claims and drawings of which:

Figure 1 is an elevational view of the improved pump, partly in section;

Figure 2 is a side elevational view of the improved pump, also partly in section;

Figure 3 is a side elevational view, partly in section, of the pump as viewed from the opposite side to that from which Figure 2 is viewed;

Figure 4 is an elevational view of the pump, as viewed in the opposite direction from which Figure 1 is viewed;

Figure 5 is a sectional view of the valve of the improved pump;

Figure 6 is a schematic view of the preselecting mechanism showing its cooperation with the various other elements of the apparatus;

Figure 7 is a side elevational view of the means for automatically opening the valve, the parts being shown in the valve closed position;

Figure 8 is a view of a portion of the valve opening mechanism wherein the action of the reset mechanism in rendering effective the connection between the motor and the valve operating means is shown;

Figure 9 is a view similar to Figure 7 but showing the parts in the position assumed while the valve is being opened;

Figure 10 is a view of the motor switch actuating mechanism and the motor control circuit;

Figure 11 is a view of a portion of the motor switch actuating mechanism with the elements shown in full open and partly open position of the valve;

Figure 12 is a view similar to Figure 11 but showing the parts in valve closed position; and

Figure 13 is a plan view corresponding to the elevational view of Figure 11.

Referring to Figures 1 to 4 in which the general organization of the liquid dispensing apparatus is illustrated, the reference numeral 10 indicates a base supporting a casing 12. Mounted within the casing is a pump 13, the suction side of which is connected to a pipe leading to a suitable source of liquid supply such as an underground tank of gasoline (not shown). The outlet side of the pump is connected to piping 15, which is connected to an air separator 16. The

outlet side of the air separator is connected at 17 to the inlet side of a liquid meter 18. The outlet side of the meter 18 is connected by piping 19 to the visible gage 20 which in turn is connected to a pipe 22 leading to a hose (not shown).

The pump is adapted to be operated by means of a motor 25, said motor being connected by means of a belt 26 and pulleys 27 and 28 to the pump 13. Associated with the motor 25 is a switch 30, which switch is actuated by a rod 31. The rod 31 is in turn connected to and actuated by a bell crank lever 32 pivotally mounted in the casing at 33. The lever 32 has a downwardly extending arm 34 in the path of a push button 35 extending outwardly through the casing. If the lever is not restrained from movement by any of the various means to be described later, the inward movement of push button 35 tilts the lever 32 in a clockwise direction (as viewed in Figure 1) to cause actuation of rod 31 in switch closing direction.

Connected to and driven by the meter 19 is a meter shaft 38 which in turn is connected to a variator 39, such as shown in the patent to Slye No. 2,111,996 granted March 22, 1938. Such a variator is employed for driving the price wheels of the register commonly used on pumps of the type with which the present invention is primarily concerned. Such registering mechanism is indicated in connection with the present invention by the reference numeral 41. This register is of the well known numeral wheel or direct reading type. It includes a lower bank of numeral wheels for registering the gallons as they are dispensed. The registering mechanism 41 is housed in a casing with an opening 42 in one side and a similar opening 43 in the opposite side, these openings being adjacent the gallon indicating wheels. It will be understood that these gallon indicating wheels of the registering mechanism are driven directly by the meter shaft 38. The variator mechanism such as described in the above mentioned Slye Patent 2,111,996 is provided with price indicating wheels which are visible through the windows 46 and 47. Also associated with the registering mechanism is a pair of amount indicating wheels. These wheels are driven by the variator mechanism at a speed with respect to the gallon indicating wheels which is dependent upon the setting of the variator. This setting, of course, is determined by the price. The amount indicating wheels are visible through the windows 48 and 49.

The registering mechanism is provided in the conventional manner with a reset shaft 52 which is designed to be actuated by a crank 53 on the outside of the casing. The action of this reset shaft as far as the registering mechanism is concerned is entirely conventional. When the reset shaft is rotated through an angle of 360°, then 45° further, and then back to the 360° position all of the registering wheels, with the exception of the price wheels, of course, return to the zero position. The reset shaft is connected at its end opposite the crank 53 to an interlocking mechanism 54 which has a depending arm 55 designed to interengage a portion of the bell crank lever 32 and prevent actuation of the bell crank lever to close the switch 30 if the wheels of the registering mechanism are not in the zero position. Such interlocking mechanisms are well known and a detailed description and showing is deemed unnecessary.

Further associated with the registering mechanism is a preselecting mechanism generally indicated by the reference numeral 80. This preselecting mechanism is designed to control the operation of a valve 81 interposed in the line 19 between the outlet of the meter 18 and the visible gage 20. The valve 81, as will be described later, is a two stage valve comprising two valves which are serially closed and opened. The valve is actuated by valve actuating shaft 84 positioned by the preselecting mechanism 80 and other mechanism to be described. It is in connection with the novel means for actuating this valve, that my invention is primarily concerned.

The details of the valve 81 are shown in Figure 5. Referring to this valve, reference numeral 86 indicates the valve housing. This valve housing has a main valve seat 87 on which seats the main valve member 88. Valve member 88 is biased into engagement with the seat 87 by a spring 89, the upper end of which bears against the valve member 88 and the lower end of which bears against the spider 90. The main valve 88 is provided with a guiding stem 91, which extends upwardly and is provided with a dribble valve seat 93. A dribble valve 95 seats against this seat 93, being biased into engagement therewith by a spring 97. An opening 98 is provided through the main valve to permit access of the fluid to the dribble valve 95. The dribble valve stem 99 is of different cross-sectional area than the sleeve 91. For example, the sleeve 91 may be of circular cross section and the dribble valve stem 99 of square cross section. This difference in cross section provides passages between the dribble valve stem and the guiding stem 91. The valves are actuated by a lever 101 which is secured to a square portion of the shaft 84. The upper end of the stem 91 is provided with an extension 103 which slidably extends into the cylindrical member 104 disposed in the valve housing. The extension 103 and the cylindrical sleeve 104 cooperate to provide a dashpot action.

From the foregoing description, it will be obvious that upon clockwise rotation of arm 101, as viewed in Figure 5, the dribble valve 95 is first moved away from its valve seat. This is the case because this movement of the dribble valve is opposed only by the relatively light spring 97. Upon continuing clockwise movement of lever 101, the dribble valve stem reaches the end of its range of movement with respect to the guiding stem 91 and the guiding stem 91 is thereupon moved to move the main valve 88 against the action of the spring 89. Thus, upon clockwise rotation of shaft 84 and lever 101, the dribble valve 95 is first moved away from its seat to establish a minimum flow of fluid and the main valve is then moved away from its seat to establish full flow. Conversely, upon counterclockwise movement of shaft 84 from the valve open position, the main value is first closed and then the dribble valve is closed.

The preselecting mechanism 80 is employed in closing the valve 81. This preselecting mechanism is shown schematically in Figure 6. In general, this preselecting mechanism comprises a dial 110 which bears suitable indicia such as various monetary sums. In one contemplated form, the dial is provided with numerals up to $2.25, in multiples of five cents. This dial 110 may either be set by a manually operable knob 111 or by some coin operated means. The cam 114 secured to a shaft 115 coupled to the amount indicating dials of the amount registering 41, is effective to retract the dial 110 by mechanism which will be later explained. This mechanism

is effective to cause the dial 110 to return to the zero position at the same time that the registering mechanism records the amount for which the dial was set. When the dial 110 has been moved back to within a predetermined amount of the zero position, the shaft 84 of valve 81 is moved so as to close the main valve but allow the dribble valve to remain open. This reduces the flow of gasoline through the valve and hence the meter to such a low value that the preselecting dial is very slowly returned. This avoids any possibility of over-shooting. When the preselecting dial reaches the zero value, at which time the desired amount of gasoline has been dispensed, the dribble valve 81 is also closed.

The particular details of the preselecting mechanism and the subtracting mechanism associated therewith in themselves are not part of the present invention. In other words, while the present invention is particularly concerned with a mechanism wherein a preselecting mechanism of this type is employed, the novelty is in the general combination and not in the particular details of the preselecting mechanism itself. For example, the preselecting mechanism and the subtracting mechanism therefor may be of the type shown in the co-pending application of Sherwood Hinds, Serial No. 309,502, filed December 15, 1939. In order to illustrate generally the operation of this preselecting mechanism, it has been shown schematically in Figure 6, to which reference was previously made.

In this figure, the various shafts are indicated in dotted lines and the various elements carried by these shafts have been rotated through an angle of 90° to be within the plane of the paper. It will be noted that the dial 110 is rigidly secured to a shaft 116. Also rigidly secured to the shaft 116 is a subtracting ratchet 117, and a pair of cams 118 and 119. The shaft 116 is journalled at its forward end in a frame 121. This frame 121 has an opening 126 through which the numerals on the wheels can be viewed. Rotatively secured to the same shaft is a pawl carrier plate 127. Pivotally secured to this plate and biased into operative relation with the subtracting ratchet 117 is a pawl 128. A spring 129 acts to bias the pawl carrier plate 127 in a clockwise direction. A lever carrier plate 138 is pivotally secured to a fixed support at 131. Pivotally carried by the lower end of this plate 138 is a lever 132, the lower end of which is designed to cooperate with the cam 114, previously mentioned. Secured to the opposite end of the lever 132 from its pivot point 133 is a rod 134. The end of the rod 134 opposite to the end which is secured to the lever 133, is secured to the plate 127. Secured to the upper left hand end of the plate 138 is a lever 130 connected eccentrically to a disc 136. This disc is secured to shaft 134 which in turn is connected to a change over lever 135. When the lever 135 is in the position shown, the plate 138 is in the position shown, in which the lever 132 is designed to be engaged by the toe of cam 114. When the lever 135 is rotated in a clockwise direction to approximately a horizontal position, the plate 138 is tilted in a clockwise direction sufficiently to move the lever 132 out of cooperative relation with the cam 114.

When the parts are in the position shown, each rotation of cam 114 due to the gasoline flowing through the meter turns the lever 132 in a clockwise direction, moving the rod 134 and hence the lower end of plate 127 to the right. This movement of the lower end of plate 127 causes it to move in a counterclockwise direction against the biasing action of spring 129. Each time that the plate 127 is so moved, the pawl 128 is moved sufficiently to advance the ratchet 117 the distance of one tooth. Each time that the toe of cam 114 moves off of the cam follower portion of lever 132, the spring 129 is effective to tilt the plate 127 back in a clockwise direction to move the pawl into the next adjacent notch.

It will be seen from the above that as gasoline flows through the meter, the subtracting ratchet 117 is moved in a counterclockwise direction. This movement, moreover, causes movement of the shaft 116 and the dial 110 in a counter-clockwise direction. At the same time, cams 118 and 119 are rotated in a counter-clockwise direction. These two cams are designed to control movement of the valve to the minimum flow position and the closed position, respectively, at the desired times.

Secured to one end of the valve actuating shaft 184 is a lever 140 having a forked upper end. The two legs of the forked end are designed to straddle a pin 141 secured to a triangular plate 143. This plate is non-rotatably secured to shaft 144 journalled in the preselector mechanism housing 80. A spring 145 is fastened at its lower end to the plate 143 and is fastened at its upper end to a fixed portion 146 of the pump casing. Spring 145 serves to bias lever 143 in a clockwise direction and hence to bias the shaft 144 in a counterclockwise direction (as viewed in Figure 6). Clockwise movement of the shaft 84 tends to close valve 81. Thus, the spring 145 serves to bias shaft 84 in valve closing direction. Secured to shaft 144 within the preselecting casing 80 are arms 148, 149, and 150, arms 148 and 149 being integral. These arms are secured to the shaft in different angular positions as is clearly evident from Figure 6. The arms 148 and 150 are designed to cooperate with levers 151 and 152 which in turn cooperate with the cams 118 and 119. Levers 151 and 152 are biased into engagement with the cams 118 and 119 by gravity or any suitable biasing means. In the position of the parts shown, the end of the arm 148 bears against the end of lever 151 and thus restrains clockwise movement of shaft 144 by spring 145 and hence counterclockwise movement of shaft 84. The cam 118 has an elongated toe portion 155, the forwardmost portion of which is so located with respect to dial 110 that it engages the cam follower portion of lever 151 just as the dial 110 reaches the five cent mark. In other words, the cam toe 155 coacts with lever 151 when an amount within five cents of the desired amount of gasoline has been dispensed. When the cam toe engages the lever 151, it tilts the latter in a clockwise direction to move the right hand end thereof out of the path of movement of arm 148. This permits spring 145 to rotate shaft 144 in a clockwise direction and hence to cause rotation of shaft 144 in a counterclockwise or valve closing direction. This rotation of shafts 144 and 84 is limited by the engagement of arm 150 with the right end of lever 152. The arms 149 and 150 are so spaced in angular position that the movement of shaft 144 permitted when arm 149 is released, results in shaft 84 being rotated sufficiently to cause closure of the main valve member 88 while leaving the dribble valve member 95 open. This results in the flow of liquid through meter 18 being decreased materially so that the amount indicating wheels and conse-

quently the cam 114 moves at a much lower speed. Eventually, however, the ratchet 117 will be moved to a position at which the numeral zero appears behind the window 126. When this occurs, the desired amount of gasoline has been dispensed. At just this time, the cam follower 157 of cam 119 engages the cam toe portion of lever 152, tilting this lever in a clockwise direction and thus releasing the arm 150. The spring 145 is now capable of rotating shaft 144 and consequently shaft 84 in a closing direction to cause closure of the dribble valve as well as the main valve. The valve 81 is now completely closed and all further flow of gasoline is stopped.

The arm 149, which as previously explained, is formed as an integral continuation of arm 148 is designed to cooperate with an abutment member 153 resiliently carried by a lever 156 which is connected by a link 158 to a lever 159. The lever 159 is secured to shaft 134 to which is secured the changeover lever 135. When this lever is moved clockwise to the substantially horizontal position in which lever 132 is out of the path of cam 114, lever 156 is rotated counterclockwise to bring the abutment member 153 into the path of movement of arm 149. The substantially horizontal position of the lever 135 is the manual position in which the pump is operated without the aid of the preselector mechanism. Since the preselector dial 110 would, under these conditions, be at the zero position in which levers 151 and 152 are both held by their associated cams out of engagement with arms 148 and 150, it is necessary to provide a further latch to hold the valve open under these circumstances. As soon as the lever 135 is moved to its normal position, as shown, the abutment member 153 is moved out of the path of lever 149 to cause closure of the valve.

In other devices of this general type, it is necessary manually to reopen the valve 81 after it has been closed. The provision of some such means raises the possibility of the operator holding the valve open after the predetermined amount of gasoline has been dispensed. This is particularly undesirable in connection with a coin operated type of machine where the operator is usually the customer and it is desired that only the amount that he has paid for be dispensed. As a result, it has been proposed to provide various complicated interlocking mechanisms to prevent holding the valve open after the preselector valve has returned to its zero position. The present invention solves the difficulty by rendering the valve operating mechanism inaccessible to the customer and providing means for automatically opening the valve when the dispensing operation is first started. This apparatus will now be described.

A segment gear 151' is journalled on a stub shaft 152' secured to the housing of pump 13. The teeth of this segment gear 151' are adapted to mesh with a pinion gear 153' secured to the pulley 28 and rotatable therewith. Connecting means including a lower rod 155' and an upper rod 156', extends between a pin 157' secured to the segment gear 151' and the plate 143. The upper section of the rod 156' is bent around the variator and registering mechanism, as best shown in Figure 4. The two sections of the rod are connected together by a strain release connection 158', best shown in Figure 9. This strain release connection 158' comprises a cylindrical sleeve 160 closed at each end except for apertures through which the rods 155' and 156' extend. The rods 155' and 156' are provided with flanges 162 and 163 at their adjacent ends and springs 164 and 165 are interposed between these flanges and the ends of the tube 160. It will be obvious that the strain release connection 158 functions in the usual manner to permit the extension of the connection including the rods 155' and 156'.

The spring 145 and the springs 164 and 165 of the strain release connection 158' all cooperate and tend to rotate the segment gear 151' to a position in which the pivot pin 157' is on a straight line between the stub shaft 152' and the pivotal connection of rod 156' with lever 143. In this position of the segment gear 151', the teeth of the gear are in mesh with the gear 153' connected to the pulley 28. Since in the normal running operation, it is undesirable to have the teeth so in mesh, means are provided to restrain the movement of the segment gear by the various biasing springs to the position referred to. This means consists of a lever 170 which is pivotally secured to a fixed portion of the casing at 171. The right hand end of the lever (as viewed in Figures 6, 8, and 9) is in the form of a hook 172 which is designed to engage the pivot pin 157' and prevent clockwise movement of the segment gear. The lever 170 is shown in this restraining position in Figures 6 and 7. The lower end of a rod 173 is pivotally connected to an intermediate point thereof, as indicated at 175. The upper end of rod 173 is connected to a lever 174. The end of the lever 174 opposite the point connected to the shaft 173 is adapted to be engaged by an arm 177 carried by the reset shaft 52. The reset shaft 52 is moved in a counterclockwise direction (as viewed in Figure 2). Upon the reset shaft being rotated to reset the numeral indicating wheels of the register 41, the lever 174 is tilted so as to move the rod 173 upwardly. This in turn causes lever 170 to be moved upwardly to disengage the hook 172 from the pivot pin 157'. This action is best shown in Figure 8. It will be obvious that immediately upon the hook being disengaged from pin 157', the springs 145, 164, and 165 are effective to rotate the segment gear 151' in a clockwise direction to cause engagement of the teeth thereof with the pinion gear 153'. The apparatus is now in condition for starting.

Upon the motor being initially energized, the pinion gear 153' is effective to rotate the segment gear in a clockwise direction thereby moving rods 155' and 156' downwardly, as indicated in Figure 9. This downward movement of these rods rotates the lever 143 in a clockwise direction (as viewed in Figure 9) to move the valve to open position. The valve is thereafter retained in open condition by latching arms 148 and 150, or arm 149, as previously discussed.

My invention further contemplates means for retaining the motor switch in closed position as long as the valve is open and automatically closing the same as soon as the valve is closed. This, moreover, is accomplished without the use of a switch additional to the main motor switch. As previously pointed out, a rod 31 is operatively connected to the motor switch 30 at one end and at its other end is connected to the bell crank lever 32 to rock the bell crank lever in switch closing direction. The bell crank lever is designed to be engaged by push button 35. As previously pointed out, an arm 55 extending from the interlocking mechanism 54 prevents this

movement of the bell crank lever if the numeral carrying wheels of the register 41 have not been reset. This feature is conventional in the prior art. I further provide an extension to the bell crank lever 32 in the form of an arm 180 which extends horizontally then vertically and finally horizontally again to cooperate with a catch 191. This catch 191 is slidably secured on the supporting plate 192 clamped between the valve 81 and the lower section of pipe 19. As indicated in Figure 13, the catch 191 is biased by means of a spring 194 into a position in which it extends under the forwardly extending portion of arm 180. As also best indicated in Figure 13, a lug 195 projects from one side of the catch 191. This lug is designed to cooperate with an arm 196 carried by the valve operating shaft 84. The three possible positions of this arm 196, corresponding to the three positions assumed by shaft 84, are shown in Figures 11 and 12. Figure 11 shows in dotted lines the position which the arm 196 assumes when the valve is in open position. The full line position of the arm 196 in Figure 11 in the position the arm assumes when the main valve is closed but the dribble valve is open. In other words, this position corresponds to the minimum flow position of the valve shaft 84. The full line position shown in Figure 12 is the position which the lever 196 assumes when both valves are completely closed and all flow of fluid through the valve is interrupted.

It will be obvious from Figures 10 to 13, in view of the foregoing discussion that when the valve is in closed position, the arm 196 is effective to retract the catch 191 to a position where it is out of the path of movement of arm 180 of lever 32. This position is that shown in Figure 12. With the parts in this position, that is, the valve closed position, it is possible to close the switch 30 of the motor 25 but it is impossible to hold the switch closed except by holding the push button inwardly. As will be explained in connection with the operation, if the preselector dial is in other than the zero position, the initial energization of the motor causes the valve to be opened and to remain open until the preselector dial has again assumed the zero position. Under these conditions, the arm 196 is in the dotted line position of Figure 11, while the spring 194 is effective to bias the catch 191 to the position wherein it is able to retain the arm 180 in a raised position in which the switch 30 is closed.

Operation

The various elements are shown in the position assumed when the pump is in operation dispensing gasoline. It will be noted from Figures 1 and 4 that fifty cents' worth of gasoline has been dispensed this being the amount appearing in the amount windows 48 and 49. It is also noted that the preselector dial is at the twenty-five cent position. This indicates that all but twenty-five cents' worth of the gasoline has been dispensed. In other words, the preselector dial 110 was originally set for seventy-five cents' worth of gasoline and fifty cents of this amount has already been dispensed. The hook 172 of lever 170 is engaged over the pivot pin 157 so as to hold the segment gear 151' in the position shown in the drawings in which the teeth of the segment gear are out of engagement with pinion gear 153'. The switch 30 associated with the motor 25 is held closed by reason of the upper horizontal arm of lever 32 being retained in its uppermost position by the catch 191. With the switch in this closed position, a circuit is established to motor 25 as follows: from conductor 201 extending from any suitable source of power (not shown) through switch 30, through conductor 202, motor 25 and conductor 203 back to the source of current supply. With the parts in this position, both the main valve 88 and the dribble valve 95 are in open position.

Due to the liquid flowing through the meter, the amount dials are being continuously turned and the shaft 115 coupled therewith is likewise continuously turning causing the continuous turning of the cam 114. Each time that the toe of the cam 114 engages the lower end of lever 132, this lever is rocked in a clockwise direction. The clockwise movement of lever 132 is transmitted through rod 134 to pawl carrying plate 127 so as to cause this plate to move in a counter-clockwise direction. The engagement of pawl 128 with the retracting ratchet causes the retracting ratchet to be moved in a counter-clockwise direction the distance of one tooth each time that this action takes place. The number of teeth of retracting ratchet 117 preferably corresponds with the number of numerals on dial 110. As indicated, these numerals are preferably spaced at intervals of five cents. Thus there is one tooth on the subtracting ratchet for each five cent interval. Thus, each time that the lever 132 is rocked, to move in turn the subtracting ratchet 117 in a counter-clockwise direction, the shaft 115, the dial 110 and the cams 118 and 119 are all moved in a clockwise direction a distance corresponding to five cents on the dial 110. It will be obvious that after four such advancements of the subtracting ratchet in dial retracting direction the numeral 5 will appear opposite the window 126. When this happens, the toe portion 155 of the cam 118 will engage the left hand end of the lever 151 tilting this lever in a clockwise direction. This causes the right hand end of lever 151 to be lowered, permitting the arm 148 and shaft 144 to move in a clockwise direction. As previously explained, this movement of shaft 144 is caused by the biasing action of spring 145. Movement of shaft 144 in a clockwise direction causes it to rotate the shaft 84 in a counter-clockwise direction (as viewed in Figure 6). This counter-clockwise movement of shaft 84 causes valve 81 to be moved toward closed position. As previously explained, the movement of shaft 84 in this manner is limited by engagement of arm 150 with the right hand end of lever 152. The arm 150 is so spaced angularly with respect to arm 149 that when arm 150 engages the right end of lever 152, the main valve 88 will have engaged the seat 87 thereby cutting off the main flow of gasoline through the valve. The dribble valve 95 will be open, however, to permit a reduced flow of gasoline to the delivery hose.

Upon the next revolution of cam 114, the subtracting ratchet 117 is moved an amount corresponding to another five cents on the dial. In other words, the dial is moved to the zero position. When this occurs, the toe 157 of cam 119 engages the left hand end of lever 152 rocking the same in a clockwise direction and thereby moving the right hand end thereof away from the arm 150. When this occurs, the biasing action of spring 145 is unrestrained so that the valve 81 can be moved to completely closed position as shown in Figure 5.

As soon as the valve 81 is moved to a com-

pletely closed position, the lever 196 is effective to retract the slide latch 191 to the position shown in Figure 12. The bell crank lever 32 is thereupon effective to rotate in a clockwise direction (as viewed in Figure 10) so as to permit switch 30 to likewise rotate in a clockwise direction to switch open position. This causes interruption of the energizing circuit to motor 25 so as to stop operation of the pump. It is to be noted, however, the flow of gasoline ceased as soon as the valve 81 is closed. In this manner, a much more accurate measurement of the dispensed gasoline is obtained than where the motor alone is shut off when the predetermined amount of gasoline has been dispensed.

At this stage of the operation, the preselector dial 110 is in the position where the numeral zero appears behind the window 126 as previously explained. The wheels of the registering mechanism 41 are in such a position that the amount of seventy-five cents appears in the amount window. This is the amount for which the preselector dial was originally set. Regardless of what may have been the original setting of the preselector dial, the amount indicated in windows 48 and 49 when the dispensing operation is completed will be the value for which the preselector dial was originally set. In other words, the substracting mechanism is so correlated with the registering mechanism that the subtracting mechanism moves the dial back to zero simultaneously with the registering wheels arriving at the desired value.

In order to obtain more gasoline, it is necessary to reset the registering means. It is impossible to close the switch 30 before this is done, because of the interlocking mechanism 54. This resetting operation is accomplished by the reset shaft 52 which is actuated by the handle 53 in a counter-clockwise direction (as viewed in Figure 6). As far as the action on the registering mechanism is concerned, the rotation of the shaft 52 is entirely conventional. In other words, the shaft 52 is rotated through an angle of 360°, then 45° further, and then back to the 360° position. When this operation is completed, the numerals of the amount and gallon indicating wheels will all be at zero. With the pump of the present invention, this movement of the reset shaft performs certain other functions. When the shaft 52 is so moved, the arm 177 carried thereby is similarly moved and engages the free end of lever 174 to rock this lever about a pivot. The operation of this is perhaps best shown in Figure 8 as previously explained. When the arm 177 engages the free end of lever 174, (in Figure 8, the left hand end thereof) the resulting rotation of lever 174 causes lever 170 to be rocked upwardly freeing the hook 172 from the pin 157'. The combined biasing action of springs 145, 164, and 165 is then effective to rotate the segment gear 151' in a clockwise direction (as viewed in Figure 8) until the teeth thereof are in engagement with the teeth of pinion gear 153'.

The apparatus is now in position for being operated again. The numeral wheels are all at zero. The teeth of segment gear 151' are in engagement with pinion gear 153'. Let it now be assumed that the operator desires to dispense 60 cents worth of gasoline. The dial 110 is moved to a position where the figure 60 appears behind the window 126. In the form illustrated, this will have to be done manually. It is to be understood, however, that as far as the present invention is concerned means can be provided for setting the position of the dial, in accordance with the value and number of various coins placed in suitable coin receiving devices.

As soon as the preselector dial 110 has been set at some value other than zero, it is possible to place the pump in operation. This is accomplished by pressing the push button 35 inwardly against the downwardly extending arm of bell crank lever 32, rocking the same in a counter-clockwise direction (as viewed in Figures 4, 6, 10). Such counter-clockwise movement of the lever 32 causes switch 30 to be closed to establish the circuit to motor 25 previously traced. As soon as motor 25 is thus energized, the pulley 28 is rotated to start operation of the pump. At the same time, the pinion gear 153' is rotated and since this pinion gear is in mesh with the teeth of segment gear 151', the segment gear 151' is rotated in a clockwise direction until the teeth of the segment gear have cleared the pinion gear. When this happens, the parts are in the position shown in Figure 9. From an examination of Figure 9, it will be noted that the pivot point 157' has passed beyond the line extending between the stub shaft 152' and the pivotal connection of rod 156' with lever 143, so that the biasing action of spring 145 is now effective to continue the clockwise movement of segment gear 151'. This movement continues until the pivot pin 157' engages the hook 172, whereupon further movement of the segment gear is prevented. The parts will now again be in the position shown in Figure 7. Because of this movement of segment gear 151', during which movement the pivot pin 157' passed through the lowermost possible position, the lever 143 was rocked in a clockwise direction (as viewed in Figures 7 and 9) to cause a counter-clockwise movement of shaft 84. Referring to Figure 6 (in which shaft 144 and the parts carried thereby are viewed from the opposite direction to that in which the parts are viewed in Figures 7 and 9) it is to be observed that this movement of shaft 84 (clockwise in Figure 6) is in valve opening direction. At the same time, the movement of shaft 144 in a counter-clockwise direction (as viewed in Figure 6) moves the arms 149 and 150 to a position wherein they are held by the levers 151 and 152, the arms riding over the inclined edges adjacent the right hand ends of these levers. Had the push button 35 been pushed inwardly before the preselector dial was moved from the zero position, the movement of valve shaft 84 to a valve open position would have had no effect due to the fact that there would be nothing to hold the valve open. This is the case because the toes 155 and 157 of cams 118 and 119 hold the levers 151 and 152 in their inoperative positions, when the preselector dial is in its zero position. As a result all that would have happened would be that the valve would be momentarily opened and then immediately closed. Since, however, the preselector dial is not in a zero position, the valve is held open by the engagement of arm 148 with the lever 151 (as shown in Figure 6). The various elements are now in the position shown except for the particular setting of the dial and the registering mechanism. As the gasoline is dispensed, the subtracting ratchet 117 will be periodically moved one notch until the value of five cents appears behind the window 126. The action of first moving the valve 81 to a minimum flow position and then to a complete shut-off

position will be repeated in the manner described.

The operation which has just been described is that which occurs when it is desired that an amount of gasoline be dispensed in accordance with the setting of the preselecting mechanism. It is contemplated that pumps of this type will be employed in stations where at certain times, the services of an attendant are available. In such cases, it is usually more satisfactory to have the attendant operate the pump in the normal manner. In such cases, it is only necessary to rotate the lever 135 to approximately a horizontal position. When the lever 135 is so rotated, the link 136 is effective to rock the lever carrying plate 138 in a clockwise direction to move the lever 132 out of the path of movement of cam 114. It will be evident that the effect of this is to disconnect effectively the preselecting mechanism from the registering mechanism. The movement of lever 135 also causes lever 156 to be rocked in a counter-clockwise direction to cause the abutment 153 to be moved within the path of arm 149. This enables the valve to be held open when opened by the automatic valve opening means of the present invention even though the preselector dial is at its zero position. It will be evident then that the valve 81 will remain permanently in open position in order that the gasoline will be entirely controlled by the push button 35 and the usual manual valve on the nozzle until the lever 135 is returned to its automatic position.

It is to be noted that the lever 135 is located within the case 12. It is the usual practice on these pumps to provide doors with internally located catches. A small door under lock and key is provided to enable access to these catches only by authorized persons. In as much as such a construction is quite conventional in the art, it is not illustrated or described in connection with the present invention.

Conclusion

It will be noted that I have provided in a pump having a preselector dial for determining the amount of gasoline to be dispensed and a subtracting mechanism for returning the dial to zero position and cutting off the flow of gasoline when the desired amount of gasoline has been dispensed, means for automatically opening the valve so as to eliminate any attention on the part of the operator to the operation of the valve. I have further provided means for automatically terminating the flow of gasoline by both shutting the valve in the fluid line and also opening the circuit to the motor driving the pump. While I have shown certain specific mechanism, it will be understood that this is for purpose of illustration only and that the invention is to be limited in scope only by the appended claims.

What I claim as my invention is:

1. In combination, a liquid flow line, a pump for supplying liquid to said flow line, a meter for measuring the liquid passing through said flow line, registering means for indicating the passing of liquid through said flow line, a valve in said flow line, means operatively associated with said pump effective automatically to open said valve when said pump is first placed in operation, preselector means controlled by said regsitering means for maintaining said valve open until a predetermined amount of liquid is indicated, said preselector means including indicating means adapted to be set to a predetermined selected amount and subtracting mechanism for returning the indicating means to a predetermined position, and operative connections between said registering means and subtracting means whereby when said indicating means has reached said predetermined position, the registering means has reached the predetermined amount.

2. In combination, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for measuring the liquid passing through said flow line, registering means for indicating the passing of liquid through said flow line, a valve in said flow line, means for opening said valve, means connecting said valve opening means to said motor means for interrupting said connection after said valve has been opened, preselector means controlled by said registering means for maintaining said valve open until a predetermined amount of liquid is indicated, said preselector means including indicating means adapted to be set to a selected amount and subtracting mechanism for returning the indicating means to a predetermined position, and operative connections between said registering means and subtracting means whereby when said indicating means has reached said predetermined position, the registering means has reached the predetermined amount.

3. In combination, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for measuring the liquid passing through said flow line, registering means for indicating the passing of liquid through said flow line, a valve in said flow line, means for opening said valve, means connecting said valve opening means to said motor, means for interrupting said connection after said valve has been opened, preselector means controlled by said registering means for maintaining said valve open until a predetermined amount of liquid is indicated, means for resetting said registering means to a predetermined initial position, and means associated with said resetting means and operative upon said registering means being reset to restore said connection between said motor and said valve opening means.

4. In combination, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for measuring the liquid passing through said flow line, registering means for indicating the passing of liquid through said flow line, a valve in said flow line, means for opening said valve, means connecting said valve opening means to said motor, means for iinterrupting said connection after said valve has been opened, and preselector means controlled by said registering means for maintaining said valve open until a predetermined amount of liquid is indicated.

5. In combination, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for measuring the liquid passing through said flow line, registering means for indicating the passing of liquid through said flow line, a valve in said flow line, a pinion gear driven by said motor, a sector gear designed for a portion of a revolution thereof to mesh with said pinion gear, means connected to said sector gear for opening said valve as said gear is revolved, means for holding said sector gear in a position in which said pinion gear is not in mesh therewith after said valve has been opened, and preselector means controlled by said registering means for maintaining said valve

open until a predetermined amount of liquid is indicated.

6. In combination, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for registering the liquid passing through said flow line, a valve in said flow line, a pinion gear driven by said motor, a further gear designed in certain positions thereof to mesh with said pinion gear, means connected to said further gear for opening said valve as said gear is revolved, means for holding said further gear in a position in which said pinion gear is not in mesh therewith after said valve has been opened, preselector means controlled by said registering means for maintaining said valve open until a predetermined amount of gasoline is indicated, means for resetting said registering means to a predetermined initial position, and means associated with said resetting means and operative upon said registering means being reset to release said holding means, and further means effective upon release of said holding means to move said pinion and further gears into mesh.

7. In combination, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for registering the liquid passing through said flow line, a valve in said flow line, a pinion gear driven by said motor, a sector gear designed for a portion of a revolution thereof to mesh with said pinion gear, means connected to said sector gear for opening said valve as said gear is revolved, means for holding said sector gear in a position in which said pinion gear is not in mesh therewith after said valve has been opened, preselector means controlled by said registering means for maintaining said valve open until a predetermined amount of gasoline is indicated, means for resetting said registering means to a predetermined initial position, means associated with said resetting means and operative upon said registering means being reset to release said holding means, and biasing means effective upon release of said holding means to rotate said sector gear into mesh with said pinion gear.

8. In combination, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for registering the liquid passing through said flow line, a valve in said flow line, a pinion gear driven by said motor, a sector gear designed for a portion of a revolution thereof to mesh with said pinion gear, means connected to said sector gear for opening said valve as said gear is revolved, a pivotally mounted hook designed to engage a portion of said sector gear after said valve has been opened to hold said sector gear in a position in which said pinion gear is not in mesh therewith, preselector means controlled by said registering means for maintaining said valve open until a predetermined amount of gasoline is indicated, means for resetting said registering means to a predetermined initial position, means associated with said resetting means and operative upon said registering means being reset to move said hook out of engagement with said portion of said sector gear, and biasing means effective upon release of said holding means to rotate said sector gear into mesh with said pinion gear.

9. In combination, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for registering the liquid passing through said flow line, a valve in said flow line, a pinion gear driven by said motor, a sector gear designed for a portion of a revolution thereof to mesh with said pinion gear, means connecting said sector gear to said valve for successively opening and then closing said valve as said gear is revolved, said connecting means including a strain release device, means for holding said sector gear in a position in which said pinion gear is not in mesh therewith after said valve has been opened and closed unless otherwise held, and, preselector means controlled by said registering means operative when said valve is opened by said connecting means to hold said valve open against the action of said strain release device until a predetermined amount of gasoline is indicated.

10. In combination, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for registering the liquid passing through said flow line, a valve in said flow line, a pinion gear driven by said motor, a sector gear designed for a portion of a revolution thereof to mesh with said pinion gear, means connected to said sector gear for opening said valve as said gear is revolved, means for holding said sector gear in a position in which said pinion gear is not in mesh therewith after said valve has been opened, preselector means controlled by said registering means for maintaining said valve open until a predetermined amount of gasoline is indicated, further holding means for holding said valve open independently of said preselecting means, and manually operable changeover means effective in one position to render said preselecting means operative and in a second position to render said preselecting means inoperative and said further holding means operative.

11. In combination, a liquid flow line, a pump for supplying liquid to said flow line, means for driving said pump, a meter for registering the liquid passing through said flow line, a valve in said flow line, a pinion gear secured to said pump and driven therewith, a sector gear designed for a portion of a revolution thereof to mesh with said pinion gear, means connected to said sector gear for opening said valve as said gear is revolved, means for holding said sector gear in a position in which said pinion gear is not in mesh therewith after said valve has been opened, and preselector means controlled by said registering means for maintaining said valve open until a predetermined amount of gasoline is indicated.

12. In combination, a liquid flow line, a pump for supplying liquid to said flow line, an electric motor for driving said pump, a switch controlling the energization of said motor, manually controlled means for closing said switch, a meter for measuring the liquid passing through said flow line, registering means for indicating the passing of liquid through said flow line, a valve in said flow line, means for opening said valve, means connecting said valve opening means to said motor, means for interrupting said connection after said valve has been opened, and preselector means controlled by said registering means for maintaining said valve open and said switch closed only until a predetermined amount of liquid is indicated.

13. In liquid dispensing apparatus, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for measuring the liquid passing through said flow line, registering means for indicating the passing of liquid through said flow line, a valve in said flow line, means operated by said motor for automati-

cally opening said valve when said motor is first placed in operation, and preselector means controlled by said registering means for maintaining said valve open until a predetermined amount of liquid is indicated.

14. In liquid dispensing apparatus, a liquid flow line, a pump for supplying liquid to said flow line, a motor for driving said pump, a meter for measuring the liquid passing through said flow line, registering means for indicating the passing of liquid through said flow line, two stage valve means in said flow line, means biasing said valve means to its completely closed position, means operated by said motor for automatically opening said valve means to its full flow position when said motor is first placed in operation, and preselector means controlled by said registering means for maintaining said valve means in said full flow position until all but a predetermined amount of the desired amount of gasoline has been dispensed and thereafter maintaining said valve means in its low stage position until the desired amount of gasoline has been dispensed.

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