

Sept. 11, 1945.

J. M. ALEXANDER

2,384,585

COIN CONTROLLED LIQUID DISPENSING APPARATUS

Filed Sept. 2, 1941

5 Sheets-Sheet 1

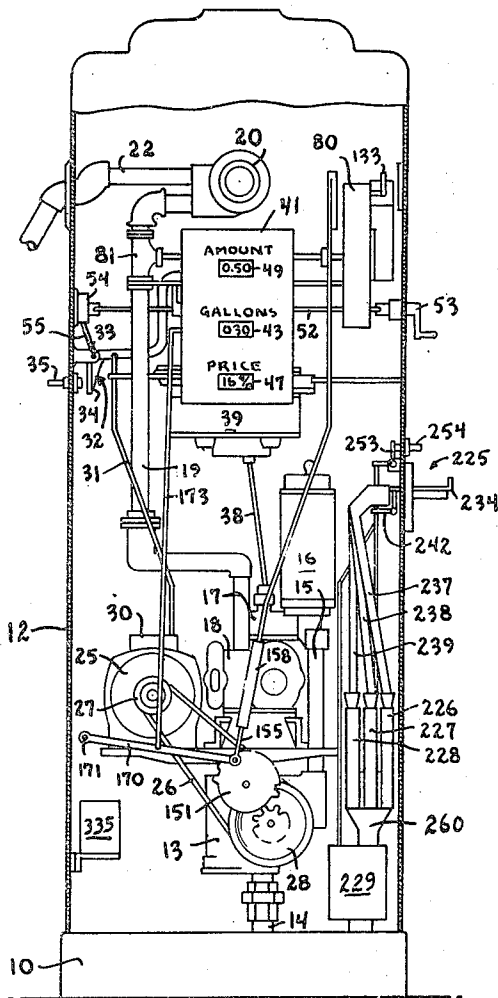


Fig. 1

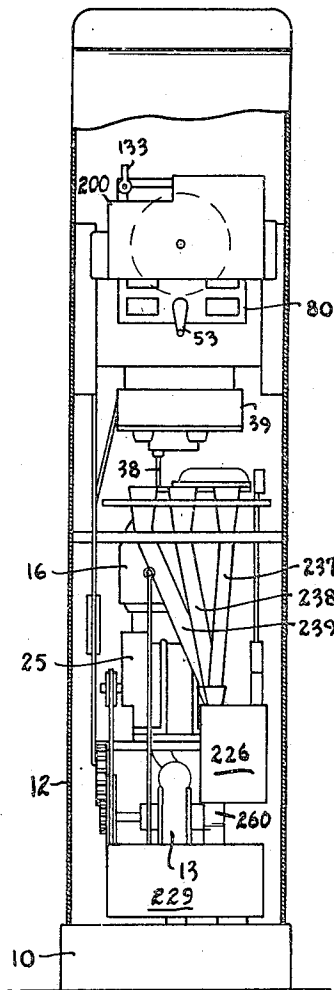


Fig. 2

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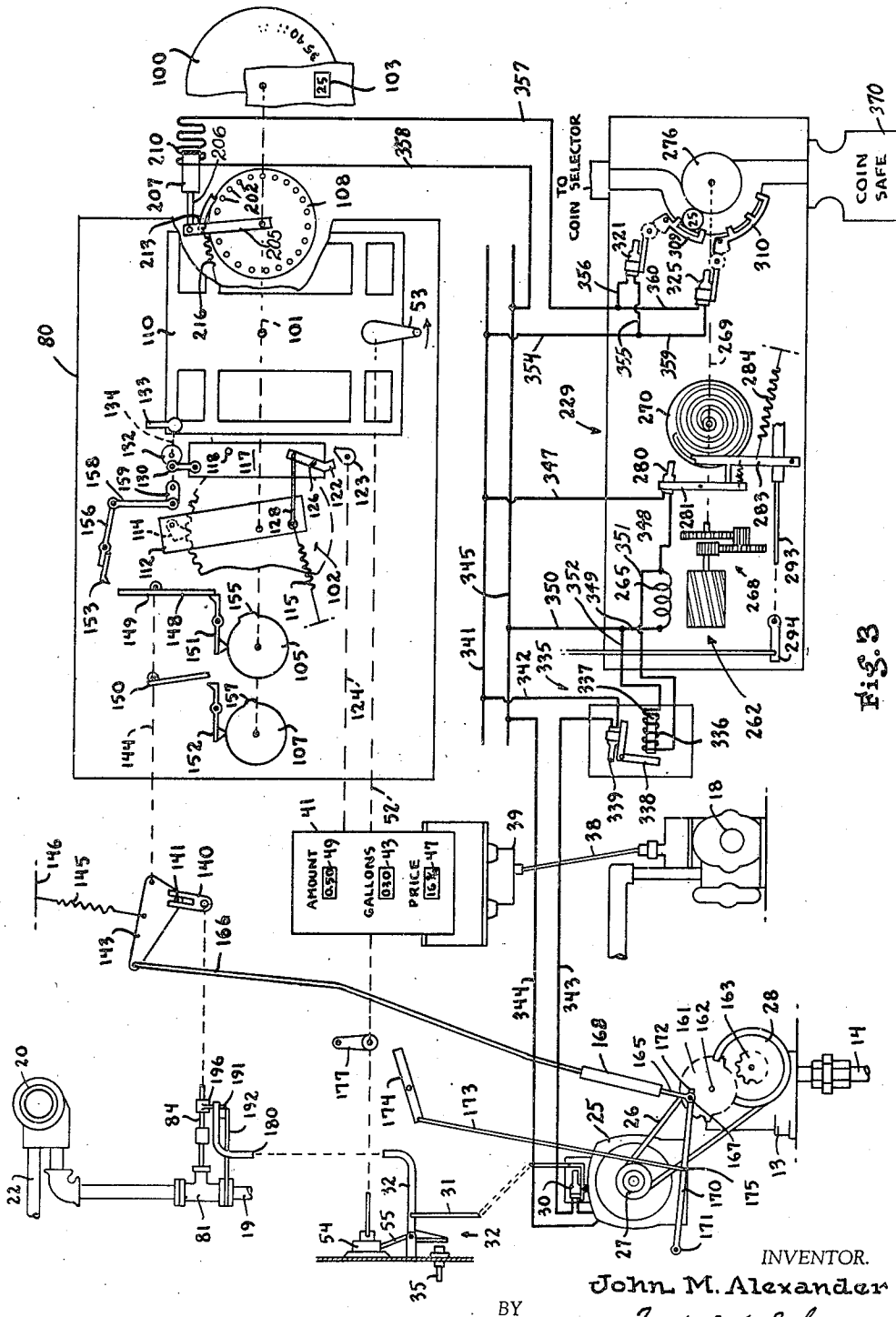
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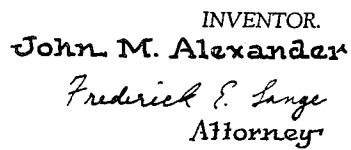
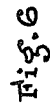
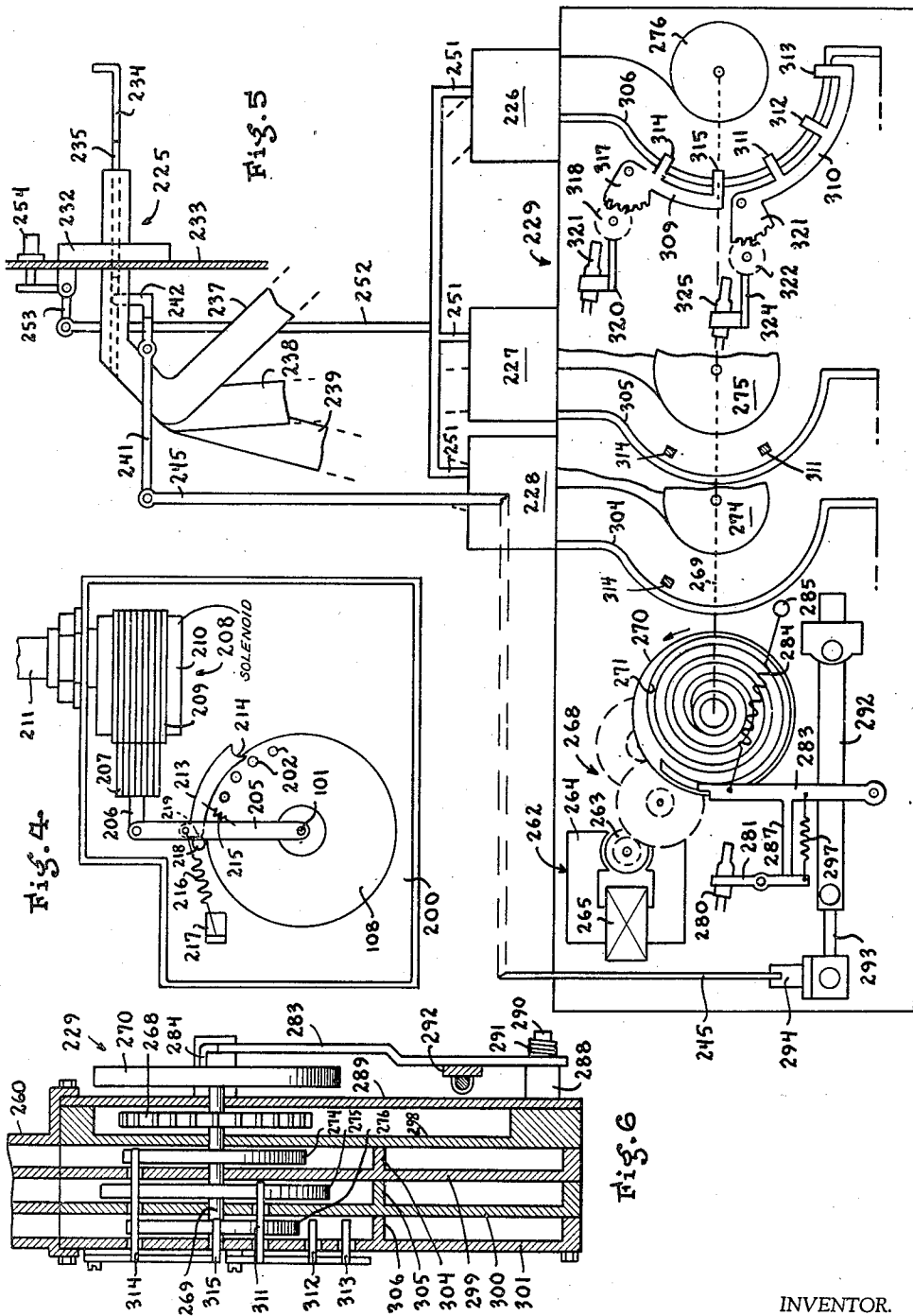
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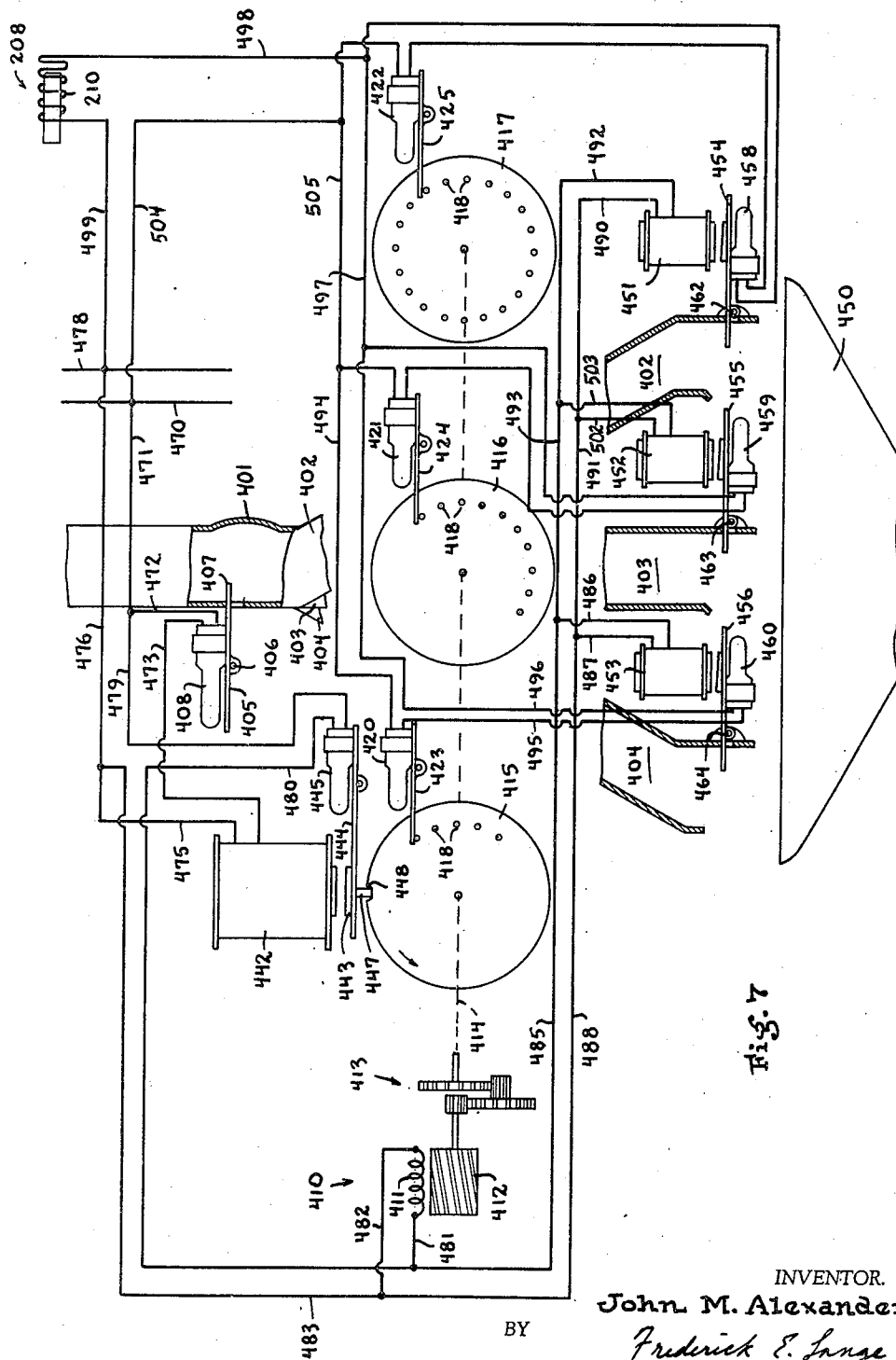
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COIN CONTROLLED LIQUID DISPENSING APPARATUS

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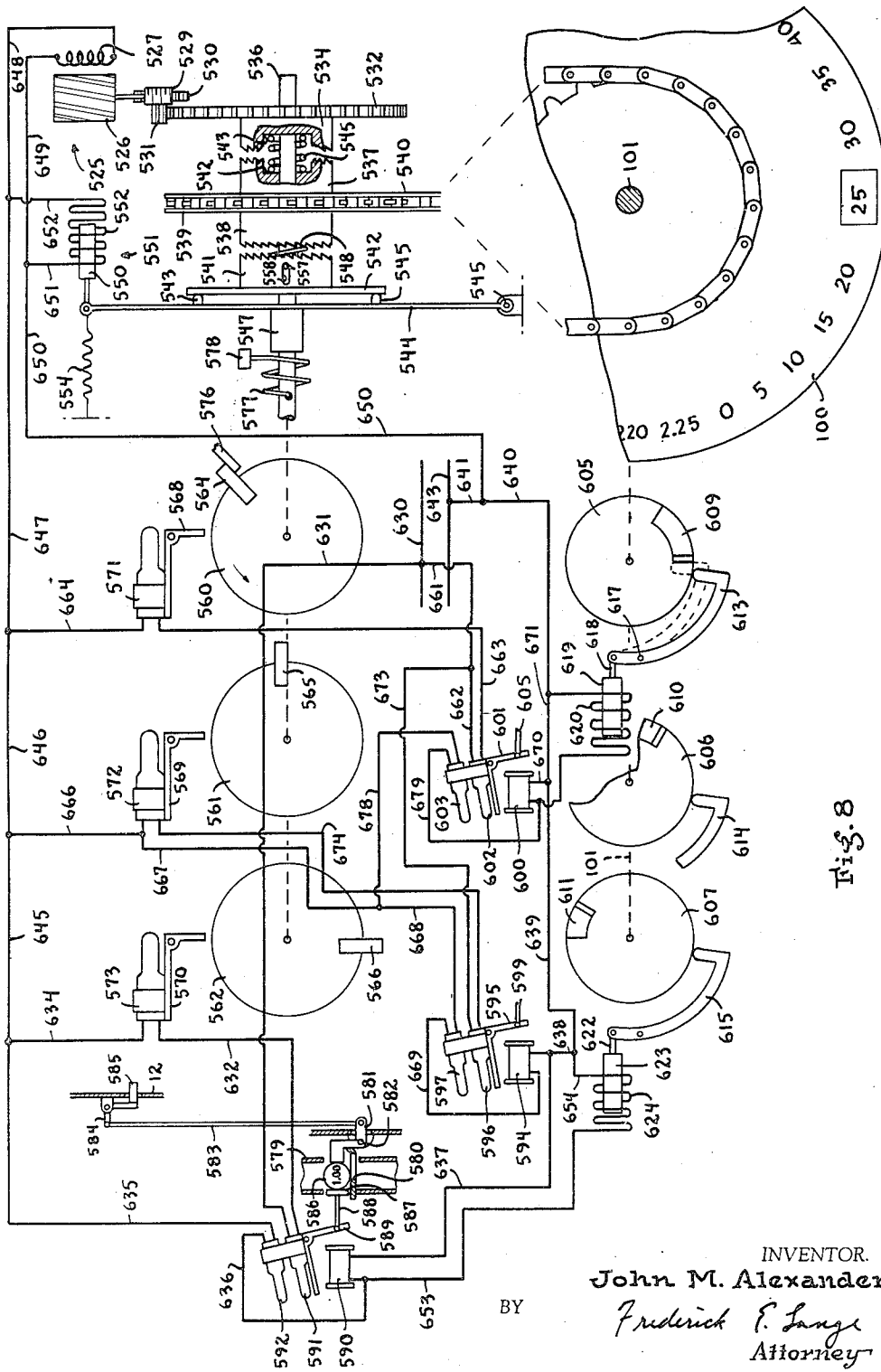
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COIN CONTROLLED LIQUID DISPENSING APPARATUS

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UNITED STATES PATENT OFFICE

2,384,585

COIN-CONTROLLED LIQUID DISPENSING
APPARATUS

John M. Alexander, Lincoln, Nebr.

Application September 2, 1941, Serial No. 409,213

18 Claims. (Cl. 194—13)

The present invention relates to a coin controlled liquid dispensing mechanism and more particularly to one in which the flow of liquid is stopped by the operation of a preselector mechanism and in which the preselector mechanism is automatically set by the insertion of one or more coins.

It has been proposed to provide a gasoline vending machine wherein a preselector mechanism is gradually retracted by a subtracting mechanism and is operative to shut off the flow of gasoline and terminate the operation of the gasoline pump motor when the amount of gasoline which has been dispensed corresponds to the original setting of the preselector mechanism. In certain types of such machines, the preselector mechanism was set by hand. This led to the disadvantage that the operation of the pump still required the attention of an attendant to be sure that the preselector mechanism was correctly set. It was accordingly further proposed to provide arrangements for setting such mechanism manually in which the extent of the setting permitted was determined by the value of the inserted coin. With such arrangements, it has been impossible to provide adequate slug detecting mechanism. Furthermore, the setting operation, due to being associated with the operation of inserting the coin, often necessitated the exertion of considerable effort upon the operator.

An object of the present invention is to provide in a coin controlled liquid dispensing mechanism having a preselector mechanism for terminating the liquid dispensing operation when the amount of liquid dispensed equals the original setting of the preselector mechanism, motor means for automatically setting said preselector dial in accordance with the value of one or more coins inserted therein.

A further object of the present invention is to provide such a dispensing machine in which a motor is at all times disconnected from the preselector mechanism when the motor is not in the process of setting the same so as to permit free retraction of the preselecting mechanism by the subtracting means as the liquid is dispensed.

A further object of the present invention is to provide such an arrangement in which the subtracting means is effective to retract the preselecting mechanism at uniform predetermined increments and in which the motor is effective to advance said preselecting mechanism by increments of the same amount or multiples thereof.

A further object of the invention is to provide such a liquid apparatus in which a solenoid and

pawl are employed for advancing the preselecting mechanism and in which the solenoid is energized a number of times equal to the value of the inserted coin divided by a monetary sum equivalent to the uniform increments by which the solenoid and pawl advance the mechanism each time the solenoid is energized.

A further object of the present invention is to provide in conjunction with the mechanism previously described, novel means for effecting the periodic energization of the solenoid a number of times corresponding to the value of the inserted coin.

A still further object of the invention is to provide such a means for periodically energizing the solenoid which comprises a plurality of disks, one associated with each coin passage, and designed to cause actuation of switching means a number of times corresponding to the value of the coin.

A still further object of the invention is to provide an arrangement such as is set forth in the last paragraph in which the disks act to propel the inserted coins past one or more switch actuating members depending on the value of the coin.

A still further object of the invention is to provide an arrangement such as set forth in the second preceding object in which the disks comprise a plurality of switch actuating pins, the number of such pins corresponding to the value of the coin.

A further object of the invention is to provide an arrangement in which a motor associated with the preselector mechanism is continuously energized upon the insertion of a coin until the motor has driven the preselector mechanism to a position corresponding to the value of the coin.

A still further object of the present invention is to provide an arrangement such as is set forth in the last paragraph in which an electrically operated clutch is effective to connect the motor with the preselecting mechanism only when the motor is energized.

Other objects of the invention will be apparent from a consideration of the accompanying specification, claims, and drawings, in which:

Figure 1 is a front elevational view of my improved dispensing means with a portion of the front cover removed to show the relation of various parts;

Figure 2 is a side elevational view of the dispensing machine, also with a portion of the cover removed;

Figure 3 is a schematic view showing the rela-

tionship of the various novel elements of my apparatus;

Figure 4 is an elevational view showing the mechanism of one form of the motor means for advancing the dial of the preselecting mechanism;

Figure 5 is a view, largely schematic, of the mechanism for periodically energizing the motor means of Figure 4;

Figure 6 is a transverse sectional view of a portion of the mechanism shown in Figure 5;

Figure 7 is a schematic view of a modified form of a mechanism for periodically energizing the motor of Figure 4;

Figure 8 is a modified form of motor means for setting the preselector dial.

Referring to Figures 1 and 2 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 14 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 liquid meter 18. The outlet of meter 18 is connected by pipe 19 to visible gage 20. This, 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 rod 31. The rod 31 is, in turn, connected to 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 counter-clockwise direction (as viewed in Figure 1) to cause actuation of rod 31 in switch closing direction.

Connected to and driven by the meter 18 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 registering mechanism 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 windows on opposite sides. Adjacent the gallon indicating wheels are windows, the window on the side from which Figure 1 is viewed being given the reference numeral 43. 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 Slye Patent No. 2,111,996 is provided with price indicating wheels which are visible through a pair of windows, only window 47 of which is shown. 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 oppositely disposed windows, only window 49 of which is shown.

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 employed 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 is a two-stage valve comprising two valves which are serially closed and opened upon rotation of a valve actuating shaft 84. Thus upon rotation of valve actuating shaft 84 in valve closing direction, a main valve is first closed to reduce the flow to a minimum value permitted by a small flow valve. Upon further rotation of the valve actuating shaft 84, this small or bleed valve is closed to completely terminate flow of fluid through valve 81. Inasmuch as such valves are old in the art, it is believed unnecessary to specifically show the details of the valve.

The valve shaft 84 is positioned by the preselecting mechanism 80 and by other mechanisms to be described. In general, the valve is automatically opened upon the initiation of the dispensing operation and is closed when an amount of fluid has been dispensed corresponding in value to the coin or coins inserted into the machine.

The preselecting mechanism 80, as previously explained, is employed in closing the valve 81. This preselector mechanism is initially set by coin controlled means which forms a portion of my present invention. When the amount of gasoline that has been dispensed corresponds to the original setting of the preselecting mechanism, this mechanism operates to close the valve and interrupt the further flow of liquid to the nozzle of the pump. In general, the preselecting mechanism comprises a dial 100 with suitable indicia indicating various monetary sums. In one contemplated form, the dial is provided with numerals up to two dollars and twenty-five cents (\$2.25) in multiples of five cents. This dial 100 is automatically set by any of several coin controlled mechanisms forming part of the present invention and particularly designed for setting of the dial 100. In general, these mechanisms operate in response to the insertion of coins of various denominations to set the dial to a position corresponding to the value of the total number of coins inserted. These coin operated mechanisms, furthermore, are adapted for the incorporation of

highly effective types of slug detecting mechanisms.

The dial 100 is periodically retracted by subtracting mechanism to be described later. As the dial reaches a predetermined position within a predetermined amount of the zero position, the valve actuating shaft 84 is automatically rotated from valve open position to minimum flow position. During this rotation, the main valve is closed, only the small flow valve being allowed to remain open. Upon the dial 100 reaching the zero position, the valve is allowed to move to full closed position. The use of a two-stage valve causes the final operation to be sufficiently slow that there is no overshooting. In other words, when the main valve is closed, the flow of gasoline is very materially reduced, and the entire subtracting mechanism is operated very slowly.

While the invention is particularly concerned with the coin operating means for setting a preselecting mechanism of the type briefly discussed above, the actual details of the preselecting mechanism itself do not form part of the present invention. In other words, while the invention is concerned with a method of setting such a preselecting mechanism, the novelty is in the general combination and not in the details of the preselecting mechanism. For example, the preselecting mechanism and the subtracting mechanism 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 is shown schematically in Figure 3, 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 for the most part rotated through an angle of 90° to be within the plane of the paper. The dial 100 is rigidly secured to shaft 101. Also rigidly secured to the shaft 101 is a subtracting ratchet 102, a pair of cams 105 and 107, and a pin disk 108. The pin disk forms part of the mechanism for setting the dial 100 and will not be described at the present time. The shaft 101 is journaled in a frame 110. Rotatably secured to shaft 101 is a pawl carrier plate 112. Pivotaly secured to this plate and biased into cooperative relation with the subtracting ratchet 102 is a pawl 114. A spring 115 acts to bias the pawl carrier plate 112 in clockwise direction. A lever carrying plate 117 is pivotaly secured to a fixed support at 118. Pivotaly secured to the lower end of this plate 117 is a lever 122, the lower end of which is designed to cooperate with a cam 123 secured to a shaft 124. The shaft 124 is operatively connected to the amount indicating wheels of the registering mechanism 41. In other words, the shaft 124 is rotated in accordance with the movement of the amount indicating wheels, the numerals of which are visible through window 49. Lever 122 is pivoted at an intermediate point thereof to the lever carrier 117 as indicated at 126. The upper end of the lever 122 has secured thereto a rod 128. The left hand end of rod 128 is in turn connected to a pawl carrier plate 112. Secured to the upper end of the plate 117 is a link 130 connected eccentrically to a disk 132. This disk is secured to shaft 134 which, in turn, is connected to the change-over lever 133. When the lever 133 is in the position shown, the plate 117 is in the position shown in which the lever 122 is designed to be engaged by the toe of cam 123. When the lever 133 is rotated in a clock-

wise position to approximately a horizontal position, the plate 117 is tilted in a clockwise direction sufficiently to move the lever 122 out of cooperative relation with the cam 123.

When the parts are in the position shown, each rotation of cam 123 due to the gasoline flowing through the meter, turns the lever 122 in a clockwise direction, moving the rod 128 and hence the lower end of plate 112 to the right. This movement of the lower end of plate 112 causes the plate to move in a counter-clockwise direction against the biasing action of spring 115. Each time that the plate 112 is so moved, the pawl 114 is moved sufficiently to advance the ratchet 102 the distance of one tooth. Each time the toe of cam 122 moves off of the cam follower portion of lever 123, the spring 115 is effective to tilt the plate 112 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 102 is moved in a counter-clockwise direction. This movement, moreover, causes the movement of the shaft 101 and the dial 100 in a counter-clockwise direction. At the same time, cams 105 and 107 are rotated in a counter-clockwise direction. These two cams are designed to control movement of the valves to minimum flow position and closed position respectively at the desired times.

Secured to one end of the valve actuating shaft 84 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 a shaft 144 journaled in the preselector mechanism housing 80. A spring 145 is fastened at its lower end to the plate 143 and at its upper end to a fixed portion 146 of the pump casing. Spring 145 serves to bias lever 143 in a clockwise direction (as viewed in Figure 3) and hence cause counter-clockwise movement of the shaft 84, which tends to close valve 81. Thus the spring 145 serves to bias shaft 84 in valve closing direction. Secured to shaft 144 within the case of preselecting mechanism 80 are arms 148, 149, and 150, arms 148 and 149 being integral. These arms are secured to the shaft at different angular positions as clearly evident from Figure 3. The arms 148 and 150 are designed to cooperate with levers 151 and 152 which in turn cooperate with the cams 105 and 107. Levers 151 and 152 are biased into engagement with the cams 105 and 107 by gravity or any suitable biasing means. With the parts in the position shown, the end of the arm 148 bears against the end of lever 152 and thus restrains clockwise movement of shaft 144 by spring 145 and hence counter-clockwise movement of shaft 84. The cam 105 has an elongated toe portion 155, the forwardmost portion of which is so located with respect to dial 100 that it engages the cam follower portion of lever 151 just as the dial 100 reaches the five cent position. 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 end thereof out of the path of movement of arm 148. This permits spring 45 to rotate shaft 144 in a clockwise direction and hence to cause rotation of shaft 144 in counter-clockwise or valve closing direction. This rotation of shaft 144 is limited by the engagement of arm 150 with the right hand end of

lever 152. The arms 149 and 150 are so placed in angular position that the movement of shaft 144 permitted when arm 148 is released, results in shaft 84 being rotated sufficiently to cause closure of the main valve member while leaving the minimum flow valve member open. In other words, the valve is moved to its minimum flow position. This results in the flow of liquid through meter 18 being decreased materially so that the amount indicating wheels, and consequently the cam 123 moves at a much lower speed. Eventually, however, the ratchet 102 is moved to a position at which the numeral zero appears behind the window 103. When this appears, the desired amount of gasoline has been dispensed. At this time, the cam toe 157 of cam 107 engages the cam follower portion of lever 152, tilting this lever in a clockwise direction and thus releasing the arm 150. The spring 145 is now able to rotate shaft 144 and consequently shaft 84 in valve closing direction to cause closure of the minimum flow valve as well as the main valve. Valve 81 is now completely closed and all further flow of gasoline is stopped.

The arm 149, which as previously explained, is formed integral with 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 change-over lever 133. When this lever is moved clockwise to the substantially horizontal position in which lever 122 is out of engagement with cam 114, lever 156 is rotated counter-clockwise to bring the abutment member 153 into the path of movement of arm 149. The substantially horizontal position of the lever 133 is the manual position in which the pump is operated without the aid of the preselector mechanism. Since the preselector dial 100 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 this further latch to hold the valve open under these circumstances. As soon as the lever 133 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.

Means are provided for automatically reopening the valve after it has been closed. This means is operative upon the initiation of the dispensing operation. This apparatus will now be described.

A segment gear 161 is journaled on stub shaft 162 secured to the housing of the pump 13. The teeth of this segment gear 161 are adapted to mesh with a pinion gear 163 secured to the pulley 28 and rotatable therewith. Connecting means including a lower rod 165 and upper rod 166 extends between a pin 167 secured to the segment gear 161 and the plate 143. The upper section of the rod 166 is bent around the variator and registering mechanism as best shown in Figure 1. The two sections of the rod are connected by a strain release connection 168. In general this strain release connection is of conventional construction comprising a sleeve and resilient means against which the rods 165 and 166 may be extended. The strain release connection 168 functions in the usual manner to permit a resilient extension of the connecting means including rods 165 and 166.

The spring 145 and the resilient means of the strain release connection 168 all cooperate to tend to rotate the segment gear 161 to a position

in which the pivot pin 167 is on a straight line between the stub shaft 162 and the pivotal connection of rod 166 with lever 143. In this position of the segment gear 161, the teeth of the gear are in mesh with the gear 163 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 movement of the segment gear by the biasing means previously referred to. This means consists of a lever 170 which is pivotally secured at 171 to a fixed portion of the casing. The right hand end of the lever is in the form of a hook 172 which is designed to engage the pivot pin 167 and prevent clockwise movement of the segment gear. Lever 170 is shown in this restraining position in Figure 3. The lower end of the rod 173 is pivotally connected to an intermediate point of lever 170 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 rod 173 is adapted to be engaged by an arm 177 carried by the reset shaft 52. The reset shaft 52 is moved in a counter-clockwise direction as indicated by the arrow opposite handle 53. 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 allows lever 170 to be moved upwardly to disengage the hook 172 from the pivot pin 167. It will be obvious that immediately upon the hook being disengaged from pin 167, spring 145 and the strain release connection 168 are effective to rotate the segment gear 161 in a clockwise direction to cause engagement of the teeth thereof with the pinion gear 163. The apparatus is now in condition for starting.

Upon the motor being initially energized, the pinion gear 163 is effective to rotate the segment gear in a clockwise direction thereby moving rods 165 and 166 downwardly. This downward movement of the rods rotates the lever 143 in a counter-clockwise direction to move the valve to open position. The valve is thereafter retained in open position by latching arm 148 or arm 149, as previously discussed.

My invention further contemplates 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 the other end is connected to the bell crank lever 32. As previously pointed out, an arm 55 extending from the interlocking mechanism 54 prevents the 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 of bell crank lever 32 in the form of an arm 180 which extends horizontally, then vertically, and finally horizontally again to cooperate with the catch 191. This catch is slidably secured on a supporting plate 192 clamped between the valve 81 and the lower section of pipe 19. The catch 191 is suitably biased by means not illustrated into a position in which the catch extends under the forwardly extending portion of arm 180. The catch is designed to be actuated by arm 196 carried by valve actuating shaft 84. As long as valve shaft 84 is in either the full flow or minimum flow position, the catch 91 is held by the biasing

means under the end of arm 180. Upon the valve actuating shaft 84 moving to valve closed position, however, the arm 196 is effective to retract the catch 191 to permit the lever 32 to move to switch open position. Thus as long as the valve is open, the switch is held in closed position. As soon as the valve is closed, however, switch 30 is opened to stop operation of the pump motor.

The apparatus which has been described so far corresponds to that shown in my copending application Serial Number 393,971, filed on May 17, 1941, for Liquid dispensing mechanism. For further understanding of the details of the mechanism described so far, reference is made to the said application. The novel mechanism of the present application will now be described.

Referring specifically to Figure 4, a motor for setting the dial 100 is shown in detail. Rigidly secured to the shaft 101 is a disk 108, previously referred to. This disk and the other actuating means therefor is located within a housing 200. The location of this housing with respect to the pump mechanism is shown in Figure 2. The disk 108 comprises a series of pins 202. The number of these pins corresponds to the number of notches on the subtracting ratchet 102 and the number of numerals on disk 100. In one form of the mechanism, I have employed forty-five pins on the disk 108. In this form, accordingly, provision is made for dispensing two dollars and twenty-five cents worth of gasoline. Pivotaly secured to shaft 101 is a lever 205. This lever is pivotaly connected at its upper end to the stem 206 of a solenoid core 207. This solenoid core 207 forms part of a solenoid 208 of conventional form. The fixed core of the solenoid is indicated by the reference numeral 209 and the winding by the reference numeral 210. Secured to the case 200 is a conduit 211 to accommodate wires leading to the winding 210 of the solenoid 208.

Pivotaly secured to the lever 205 is a pawl 213. The forwardmost end of this pawl is notched as at 214 to engage the teeth 202. A spring 215 extends between the pawl 213 and the lever 205 and tends to bias the pawl 213 in a clockwise direction into the path of the pins 202. A spring 216 is connected between a stationary support 217 and the lever 205. This spring 216 serves to bias lever 205 in a counter-clockwise direction. In other words, the spring 216 tends to bias the core in a direction opposite to that in which it is moved by the solenoid. A fixed pin 218 is secured to the base 210 and lies in the path of a heel portion 219 of the pawl 213. As will be obvious from the drawings when the heel 219 of pawl 213 engages the stop 218, the pawl is rotated in a clockwise direction against the biasing action of spring 215 to move the notched portion 214 of the pawl out of the path of pin 202. This feature is very important inasmuch as it permits movement of the disk 108 and consequently shaft 101 without interference by the pawl 213.

It will be obvious from the previous description of the structure, that each time that the solenoid winding 210 is energized, the movable core 207 is moved to the right to rotate the lever 205 in a clockwise direction. As soon as lever 205 has moved sufficiently to permit heel 219 to move away from stop pin 218, the spring 215 is effective to rotate the pawl 213 in a clockwise direction to move the notched portion 214 into the path of the next pin 202. As the solenoid core moves into the fixed core portion 209, the disk 108 is rotated the distance between two of the teeth 202 in a clockwise direction. Upon deenergization of the sole-

noid winding 210, the spring 216 is effective to retract the lever 205 in a counterclockwise direction and at the end of this movement, the heel 219 of the pawl 213 engages the stop pin 218 to rotate the pawl 213 in a counter-clockwise direction out of the path of pins 202. The means for periodically energizing the solenoid winding 210 in accordance with the amount of money deposited in the machine will now be described.

Referring to Figure 5, the reference numeral 225 indicates slide mechanism for the insertion of coins, the reference characters 226, 227, and 228 designate slug detectors for the various denominations of coins which the machine is adapted to receive, and reference characters 229 indicates a motor driven coin operated switch. In general, the coin receiving slide mechanism 225 has a number of slides corresponding to the number of denominations of coins which it is designed to have the machine receive. Each slide is adapted to introduce the respective coin into a tube which leads to the particular slug detector designed to receive that particular denomination of coin. If the coin is successfully passed by the slug detector, it passes to the appropriate chute of the coin operated switch 229. The process of actuating the coin has started the motor of this switch and as the coin passes through the motor driven switch, one or more switches are actuated in accordance with the denomination of the coin. For example, if the coin is a five cent piece, the switches of the unit 229 will be actuated once. If it is a dime, they will be actuated twice, and if a quarter, they will be actuated five times. In other words, the switching mechanism is pulsed once for every five cents of the total denomination of coins inserted. As will be explained later, moreover, no matter how many coins of the same denomination are inserted, the motor driven switch will eventually pulsate the associated switches in accordance with the total value of the inserted coins. The switches associated with the switching mechanism 229, are electrically connected in parallel to the winding 210 of the solenoid 208 so that each time these switches are closed, the solenoid is energized to advance the disk 108 the distance between two pins.

The slide mechanism 225, as previously indicated, comprises three slides or more as desired, depending upon the number of coins which it is desired to have the machine receive. The construction of these slides is largely conventional. They are secured in a bracket structure 232 which is secured to the wall 233 of the pump casing 12. Each slide 234 has an opening 235 adapted to receive a coin of the desired denomination. When this slide 234 is pushed forwardly, the coin is moved inwardly toward an opening communicating with a tube. The tubes associated with the three slides are identified by the reference numerals 237, 238, and 239, respectively. Pivotaly secured to the bracket 232 is a lever 241. The right hand end of this lever has an upstanding arm 242 which extends into the path of the coin placed in the coin opening 235. The slide 234 is provided with a slot communicating with the opening 235. The arm 242 normally projects into this slot. When the slide is moved in, in the absence of a coin, the arm 242 merely travels along the slot and into the coin opening 235 so that the position of lever 241 is not disturbed in any way. If a coin is in the opening 235 when the slide is pushed inwardly, however, the engagement of arm 242 with the coin causes this arm to be depressed to rock the lever 241 in a

clockwise direction. The left-hand end of lever 241 is pivotally connected to a rod 245 which leads into the motor operated coin switch mechanism 229. As will be explained later, the tilting of lever 241 in a clockwise direction, with the resultant movement of the rod 245 upwardly causes the motor of the mechanism 229 to be placed into operation. In other words, the insertion of a coin causes this motor to be placed in operation. It is to be understood that while only one arm 242 is referred to, lever 241 is provided with a plurality of such arms each extending into a slot of the associated coin slide.

The tubes 237, 238, and 239 lead to slug detectors 226, 227, and 228. Each of these slug detectors is designed to test a coin of a predetermined denomination and which would normally be introduced into the slide connected to it. Slug detectors 226, 227, and 228 may be of any conventional form. Preferably, however, they are of the type employing a combination of tests including those of testing the hardness, the weight, the size, and the conductivity of the metal in the coin. Typical of the slug detectors which may be employed are those shown in the patent to Gotfriedt No. 2,073,261, issued March 19, 1937, and the patent to Frye No. 2,094,788, issued October 5, 1937. By using a slug detector of this type, a coin is subjected to much more rigid test than is possible when a slide type of slug detector is employed.

Slug detectors of the type which I propose to use customarily employ magnets for testing the conductivity of the coins. Where the inserted slug is excessively magnetic, it often happens that this slug is retained in the slug detector. Consequently slug detectors of this type employ some means for mechanically forcing the slug out of the slug detector. In the present case, the slug rejectors for the various slug detectors 226, 227, and 228 are actuated by plungers 251. These three plungers are all connected together to a single rod 252, the upper end of which is connected to a lever 253. The lever is a bell crank lever and has an upwardly extending arm which is engaged by a button 254 extending through the pump casing. When button 254 is pushed inwardly, the bell crank 253 is rocked in a counter-clockwise direction to move the rod 252 and the plunger 251 downwardly. Upon such downward movement, any slugs that may be retained in the slug detectors 226, 227, and 228 are automatically rejected.

After the coin has left the slug detector, it passes through a passage in a connection neck 260. In this case, reference is made to Figures 1 and 6. This connection neck has three passages, corresponding to the three slug detectors and the tubes 237 to 239. The coin passes through the passage in neck 260 connected to the slug detector through which it has passed.

The motor driven coin switch 229 is shown schematically in the lower portion of Figure 5. Figure 6 is a transverse sectional view of this switch. A portion of the switch is also shown schematically in the general schematic view of Figure 3. Referring first to the schematic showing at the lower portion of Figure 5, the switching unit 229 comprises a motor 262. This motor is of conventional construction comprising a rotor 263, a core structure 264, and a field winding 265. The rotor 263 is connected by means of a reduction gear train 268 to a shaft 269. Secured to the shaft 269 is a switch actuating disc 270 having a spiral track 271. Also secured to the

shaft 269 are three coin actuating disks 274, 275, and 276. These three discs are associated with coin passages connecting with the slug detectors 226, 227, and 228 respectively. The discs are preferably of a rubber-like material such as "Neoprene," a substance which can be obtained commercially on the market by that name. The structure associated with these discs will be discussed in more detail later.

Referring again to the motor 264, the energizing circuit for this motor is controlled by a mercury switch 280. The mercury switch is secured to a lever 281 pivoted at an intermediate point thereof. Pivotally secured to a fixed portion of the switch housing is a lever 283. This lever as best indicated in Figure 6 has a turned-in lip 284 which projects into the spiral groove 271 of disk 270. The spiral is so arranged that as disk 270 is turned in a counter-clockwise direction, the tongue 284 engaged in the spiral is forced outwardly carrying the upper end of lever 283 to the left. This movement of the lever 283 is resisted by a spring 280 extending between the upper end of the lever and a fixed support 285. Secured to the lever is an abutment portion 287, the left hand end of which bears against the lower end of lever 281. Thus, upon lever 283 being moved to the left, the abutment post 287 tends to rotate the lever 281 and the switch 280 in a clockwise direction. When so moved, the switch 280 is moved to switch open position. Thus upon the disk 270 being rotated in a counter-clockwise direction (the direction produced by energization of motor 262), mercury switch 280 is moved to switch open position in which position it is shown in the drawings. As best indicated in Figure 6, lever 283 is pivotally secured with a loose fit over a pivot screw threaded into a post 288 projecting from a plate 289 forming part of the housing of the motor switch mechanism. Interposed between the pivot screw 290 and the lever 283 is a coil spring 291. By reason of this coil spring, the lever 283 can be swung outwardly so that the tongue 284 is moved out of the spiral groove of disk 270. A bar 292 is secured to a rod 293, the bar 292 and rod 293 being journaled at their opposite ends. An arm 294 is secured to the left hand end of rod 293 and is pivotally connected to the rod 245 so that upon upward movement of rod 245, the arm 294 is moved upwardly to rock the shaft 293 and plate 292. Such rocking movement of bar 292 which bears against the lever 283, causes the lever to be tilted outwardly thereby moving the tongue 284 out of the spiral groove on disk 270. When this happens, a biasing spring 284 is effective to move lever 283 in a clockwise direction (as viewed in Figure 5) until it engages the hub of disk 270 or some other suitable stop. Upon release of the arm 294, spring 291 forces lever 283 inwardly to cause the tongue 284 to enter the spiral groove. The tongue is now in the spiral groove close to the center of the disks, however. Extending between the levers 281 and 283 is a spring 297. This spring serves to cause the lower end of lever 281 to follow the path of movement of lever 283. Thus when lever 283 is moved in a clockwise direction by reason of the tongue 284 being released from this spiral groove adjacent the outer periphery thereof, the spring 297 is effective to rotate the lever 281 in a counter-clockwise direction to move switch 280 to its closed position. As previously explained, the rod 245 is moved upwardly each time that a coin is inserted in one of the slides 234. Thus each time that such a

coin is inserted, the rod 245 is moved upwardly to rock the lever 283 and release the tongue 284 from the outermost portion of the spiral so that the lever 283 assumes a position adjacent the innermost portion of the spiral. This means that the switch 280 is reclosed and remains in this position for a predetermined period of time which is the time required for the tongue 283 to ride to the outermost portion of the spiral groove. This period of time is sufficient for a coin of any denomination to travel through its coin track.

Referring now to Figure 6, it will be noted that the mechanism 229 comprises a plurality of plates 298 (previously referred to), 298, 299, 300, and 301. Plates 299, 300, and 301 are all provided with integral ridges to space the plates from each other and to provide inclosures therebetween. Between plates 298 and 289, the gear train 268, previously referred to, is located. It is to be understood from the previous description that this gear train is connected with the motor 262 and shaft 269. Disks 274, 275, and 276 are located between the plates 298, 299, 300, and 301. The plate 299 is provided with a rib 304. The path of this rib is best shown in Figure 5. Similarly, plates 300 and 301 are provided with integral ribs 305 and 306. It will be noted from Figure 5 that these ribs along with cooperating ribs and the disks 274, 275 and 276 form passages for the coins. In each case this passage is of a width corresponding to the diameter of the coin. Thus the rib 304, referring to Figure 5, forms a passage of a width corresponding to the diameter of a five cent piece. Similarly, the rib 305 forms a passage corresponding in width with the diameter of a dime. Similarly, the passage formed by rib 306 and disk 276 is adapted for the reception of a twenty-five cent piece. In each case, the width is such that the coin in question fits snugly within the passage and firmly engages the disks. Inasmuch as the disk is formed of a yieldable material, it is able to firmly engage the coin and yet allow for any minor variations in the diameter thereof due to wear. It will be obvious that as the disks 274, 275, and 276 are rotated in a counterclockwise direction by the action of motor 262, each disk will roll any coin in its associated passage through said passage at a uniform rate depending upon the speed of the rotation of the disk. In the case of the twenty-five cent passage, a coin is shown in Figure 3 in the process of being rolled through the passage.

As the coins are rolled through the passage, they are designed to actuate switch positioning arms. Referring to Figure 5, these arms are indicated by the reference numerals 309 and 310. It will be noted that arm 310 has three fingers 311, 312, and 313. Similarly arm 309 has two fingers 314 and 315. The arm 309 has secured thereto a sector gear 317. This gear meshes with the gear 318 rigidly secured to an arm 320 carrying a mercury switch 321. The mercury switch is shown in Figure 5 in its circuit open position. Upon the arm 309 being rotated in a clockwise direction, however, the arm 320 is rotated in a counterclockwise direction to move switch 321 to circuit closed position. It will be obvious that arm 309 is so located that each time that one of the fingers 314 or 315 is pushed outwardly by the engagement of the coin therewith, the arm 309 is rocked clockwise to close the switch. Arm 310 similarly has secured thereto a sector gear 321 which meshes with a gear 322 rigidly secured to an arm 324 which arm carries a mercury switch 325.

Thus, each time that a coin engages one of the fingers 311, 312, or 313, the arm 310 is rocked in a clockwise direction to rock arm 324 in a counterclockwise direction and close switch 325.

As will be apparent from Figure 6, fingers 311 to 315 project varying distances into the switching mechanism 229 and hence varying numbers of these contact with the different coins. As finger 314 extends through all three compartments thereof, it is engaged by a coin passing through any of the coin tracks. Finger 315 extends through only the outer or twenty-five cent track. Finger 311 extends through the ten cent track and the twenty-five cent track so that it is engaged by either a dime or a quarter. The fingers 312 and 313 extend only through the outer or twenty-five cent track. Thus, a five cent piece going through its track contacts only finger 314 so that the lever 309 is moved once by the passage of the five cent piece therethrough. A ten cent piece contact both fingers 314 and 311 so that levers 309 and 310 are each actuated once to cause switches 321 and 325 to be each closed once. A quarter passing through its track causes all of the fingers to be moved outwardly so as to cause switches 321 and 325 to be closed five successive times. Since switches 321 and 325 are connected in parallel to solenoid 208, the solenoid is energized a number of times corresponding to the number of times the fingers are engaged by the coin passing through.

It is obviously undesirable for pump motor 25 to be operated at the same time as the switching mechanism 229 is being operated. If both the pump motor and the switching mechanism 229 are operated at the same time, there is a tendency for the liquid flowing through the meter 18 to cause the preselecting dial 108 to be retracted in position while at the same time the coin passing through the switching mechanism 229 causes the periodic energization of solenoid 208 to periodically advance the dial 108. Thus, there is one means acting to retract the dial and another means acting to advance it. Due to the fact that the solenoid is capable of exerting only a limited amount of power, this is not likely to cause serious injury. Nevertheless, it is desirable to provide some means for preventing this simultaneous actuation of the dial advancing means and the dial retracting means. A relay 335 is provided for this purpose. This relay comprises a relay coil 336, a relay core 337, an armature 338, and a mercury switch 339 positioned by said armature. When the relay coil 337 is deenergized, the armature assumes the position shown in the drawing to which it is biased by any suitable means, not shown. In this position, the switch 339 is in circuit closed position. Upon energization of the relay coil 336, the armature 338 is moved clockwise to move switch 339 to circuit open position. As will be explained later, the relay coil 336 is connected in parallel with the field winding 265 of motor 262 and switch 339 in series with the pump motor 25. Thus, whenever the motor 262 of the switching mechanism 229 is energized, the relay winding 336 is energized to cause switch 339 to be moved to circuit open position to prevent operation of the pump motor 25.

Operation of species 1 to 6

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 3 that fifty cents worth of gasoline has

been dispensed, this being the amount shown in the amount window 49. It is also to be 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 100 was originally set for seventy-five cents worth of gasoline and fifty cents worth of gasoline has already been dispensed. The hook 172 of lever 170 is engaged over the pivot pin 167 so as to hold the segment gear in the position shown in the drawing in which the teeth of the segment gear are out of engagement with the pinion gear 163. The switch 30 associated with the motor 25 is held closed by reason of the horizontal arm of lever 32 being retained in its uppermost position by the catch 191. With the switch in this closed position and with the relay 335 deenergized, a circuit is established to motor 25 as follows: from conductor 341 extending from any suitable source of power (not shown) through conductor 342, switch 339, conductor 343, switch 30 and conductor 344 back to conductor 345, the other of the two conductors leading from the source of power. With the parts in this position, both the main valve and minimum flow valve of valve 81 are in open position. Due to the liquid flowing through the meter, the amount dials are being continuously turned and the shaft 124 coupled therewith is likewise continuously turning, causing the continuous turning of the cam 123. Each time that the toe of the cam 123 engages the lower end of the lever 122, this lever is rocked in a clockwise direction. The clockwise movement of lever 122 is transmitted through rod 128 to pawl carrying plate 112 so as to cause this plate to move in a counter-clockwise direction. The engagement of pawl 114 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 102 corresponds to the number of numerals on dial 110, as previously explained. Thus, there is one tooth on the subtracting ratchet for each five cent interval just as there is one pin on disk 108 for each five cents of the inserted money. Each time that lever 122 is rocked, to move in turn the subtracting ratchet in a counter-clockwise direction, the shaft 101, the dial 100, the disk 108 and the cams 105 and 107 are all moved in a clockwise direction, the distance of five cents on the dial 100. The movement of the disk 108 is possible by reason of the feature by which pawl 213 is withdrawn from the path of movement of the pins 202. It will be obvious that after four such advancements of the retracting ratchet in dial retracting direction, the numeral "5" will appear opposite the window 103. When this happens, the toe portion 155 of the cam 105 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 out of the path of the arm 148 so that shaft 144 can 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 3). This counter-clockwise movement of shaft 84 causes valve 81 to be moved towards closed position. As previously explained, the movement of the shaft in this manner is limited by the 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 the arm 150 engages the right hand end of lever 152, the main valve will have engaged its seat thereby cutting off the main flow of gasoline through the valve. The minimum flow valve will be open, however, to permit a small amount of gasoline to flow to the delivery hose. As a result, the operation of the meter is slowed down and consequently the operation of shaft 142 and cam 123 is similarly slowed down.

Upon the next revolution of cam 123, the subtracting ratchet 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 107 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 soon as the valve 81 is moved to a completely closed position, the lever 196 is effective to retract the slide latch 191 to permit bell crank lever 32 to rotate to a position in which switch 30 is open. 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 was 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 100 is in the position where the numeral "zero" appears behind the window 103 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 window 49 when the dispensing operation is completed, will be the value for which the preselector dial was originally set. In other words, the subtracting 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 3). 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. When the arm 177 engages the free end of lever 174, the resulting rotation of lever 174 causes lever 178 to be

rocked upwardly freeing the hook 172 from the pin 167. The combined biasing action of spring 145 and the springs of the strain release connection 168 is then effective to rotate the segment gear 161 in a clockwise direction (as viewed in Figure 3) until the teeth thereof are in engagement with the teeth of pinion gear 163.

The apparatus is now in position for being operated again. The numeral wheels are all at zero. The teeth of segment gear 161 are in engagement with pinion gear 163. Let it now be assumed that the customer desires to purchase forty cents worth of gasoline. This involves the depositing in the coin slots of the machine of coins totaling forty cents. This, of course, can be accomplished by any combination of five cent, ten cent, and twenty-five cent pieces. Let it be assumed that a customer desires to use a twenty-five cent piece, a ten-cent piece, and a five cent piece. Let it be further assumed that he first deposits the twenty-five cent piece in that coin slide of the coin mechanism 225 which is adapted to receive a twenty-five cent piece. The coin is deposited in the opening 235 and the slide 234 is shoved inwardly. As the slide is shoved inwardly, the lever 241 is rocked in a clockwise direction to rock arm 294 and move the tongue 284 of lever 283 out of the spiral track 271, all as previously explained. The spring 284 is thereupon effective to rotate lever 283 back in a clockwise direction until it engages the hub of the disks 270. As the slide is pulled outwardly again, the arm 294 is rocked back upwardly and tongue 284 is allowed to move into the spiral track 271 adjacent the hub of the disk 270. This rotation of lever 283 tilts switch 280 so that the switch is now closed. As result of the closure of this switch a circuit is established to field winding 265 as follows (as shown in Figure 3): from conductor 341, through conductor 347, switch 280, conductor 348, field winding 265, and conductors 349 and 350 to the other line wire 345. At the same time, an energizing circuit is established to relay winding 336 as follows: from line wire 341 through conductor 347, mercury switch 280, conductors 348 and 351, relay winding 336, and conductors 352 and 350 to the other line wire 345. As a result of the establishment of the above circuits, both the motor 262 and the relay 335 are energized.

The energization of the motor 262 results in the disks 274, 275, and 276 being driven in a counter-clockwise direction along with the spiral disk 270. Let it be assumed that the twenty-five cent piece which has been inserted is a genuine twenty-five cent piece and is not defective in any way. The coin will then pass down the tube 237 and will pass through the slug detector 226 without any delay. The coin will then enter the coin track formed by rib 306 and disk 276 and will be propelled through this track by the action of disk 276 which firmly engages the twenty-five cent piece. As the twenty-five cent piece rolls through this track, it successively engages fingers 314, 315, 311, 312, and 313. The successive engagement with fingers 314 and 315 causes the switch 321 to be closed twice. Each time that switch 321 is closed, a circuit is established to solenoid winding 210 as follows: from line wire 341 through conductors 354 and 355, switch 321, conductors 356 and 357, solenoid winding 210, and conductor 358 to the other line wire 345. Each time that such a circuit is established, the solenoid core 207 is drawn to the right so as to cause pawl 213 first to be lowered into the path of pins 202 and then to engage the pins and ro-

tate the disk 108 the distance between two pins. It will be obvious that switch 325 is connected in parallel with switch 321 by conductors 355, 359, 360 and 356. Thus, as the twenty-five cent piece successively engages fingers 311, 312, and 313, and thus actuates switch 325, the energizing circuit to solenoid 310 is closed three successive times. Thus, the passage of the twenty-five cent piece through the coin track bounded by rib 306 results in the energization of solenoid winding 310 five successive times to advance the disk the distance of five spaces between the pins. As previously pointed out, the distance between any two pins results in the dial being moved ahead the distance of five cents on the dial. Thus, the insertion of a twenty-five cent piece causes the dial 100 coupled to disk 108, to be moved to the twenty-five cent position.

After the twenty-five cent piece has passed the last finger, it passes outwardly into a suitable coin receiving safe 370. At this time, the tongue 284 will have been carried sufficiently far out into the spiral track as to rock switch 280 to the position shown in Figures 3 and 5 in which the mercury switch is in circuit open position. This causes deenergization of the motor 262 and the relay winding 335.

During the time relay winding 335 was energized, the switch 339 was open. Since, as previously explained, this switch is in the energizing circuit of motor 25, it was impossible while motor 262 was in operation to cause energization of the motor 25. Since relay 335 is now deenergized, it is possible for the pump to be placed in operation as desired. Since, however, only twenty-five cents worth of gasoline will be dispensed and it is desired to dispense forty cents worth, the customer will wish to deposit further coins.

Let it be assumed that the customer now deposits a ten cent piece in the appropriate slide. When this is done, the lever 241 is again rocked in the process of inserting the coin with the result that the motor 262 is again energized for a predetermined period of time. The ten cent piece, if genuine and not defective in any respect, will pass through tube 238, through the slug detector 227, and will enter the coin track bounded by rib 305 and disk 275. In passing through the coin track it will deflect fingers 311 and 314 causing switches 321 and 325 each to be closed once. Each time that these switches are closed, the winding 210 is energized to advance the dial 100 the distance of five cents. The result of the deposit of the ten cent piece following the deposit of the twenty-five cent piece is that the dial will now assume the thirty-five cent position.

It will be assumed that the operator now deposits a five cent piece. Even if this deposit is made before the motor 262 has stopped running, there will be no damage since the depositing of the coin will automatically throw the lever 283 back to the inner portion of the disk 270 and insure a full cycle of operation. The five cent piece will pass through the tube 239 and, if not defective in any respect, through the slug detector 228 and the coin track bounded by rib 304 and the disk 274. As the coin passes through this coin track, it engages the finger 314 to close the switch 321 and hence energize the solenoid winding 310 once. This causes the dial 100 to be further advanced the distance of five cents so that the numeral "40" now appears through the window 103.

As soon as the finger 284 of lever 283 reaches the outer portion of spiral track 271 so as to cause

deenergization of lever 262 and relay 305, the pump can be placed into 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. 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 163 is rotated and since this pinion gear is in mesh with the teeth of segment gear 161, the segment gear 161 is rotated in a clockwise direction until the teeth of the segment gear have cleared the pinion gear. When this happens, the pivot pin 167 will have passed beyond the line extending between the stub shaft 162 and the pivotal connection of rod 166 with lever 143, so that the biasing action of spring 145 is now effective to continue the clockwise movement of segment gear 161. This movement continues until the pivot pin 167 engages the hook 172, whereupon further movement of the segment gear is permitted. The parts will now again be in the position shown in Figure 3. Because of this movement of segment gear 161, during which movement the pivot pin 167 passed through the lowermost possible position, the lever 143 was rocked in a counter-clockwise direction to cause a clockwise or valve opening movement of shaft 84. At the same time, the movement of shaft 144 in a counter-clockwise direction (as viewed in Figure 3) 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 105 and 107 hold the levers 151 and 152 in their inoperative position, 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 3). 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 102 will be periodically moved one notch until the value of five cents appears behind the window 103. 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 with the result that when forty cents worth of gasoline has been dispensed, the flow of gasoline will be abruptly terminated.

It will be seen that my liquid dispensing mechanism provides for delivery of an amount of gasoline dependent upon the total value of the inserted coins. Moreover, this is done without in any way restricting the type of coin insertion means or slug detecting means which is employed.

Species of Figure 7

In Figure 7, there is shown a modified form of a motor driven coin operated switch. It is to be understood that this switch mechanism as shown

in Figure 7, takes the place of switching mechanism 229 in the previously described species. The switching mechanism of Figure 7, as will be clear from the following description, is somewhat simpler than the switching mechanism 229 and furthermore, is more adaptable for use of coins of larger denomination.

Communicating with tubes 237, 238, and 239, which as will be recalled, lead from the slug detectors, are the tubes 402, 403, and 404. Associated with these tubes is a mercury switch bearing lever 405. This lever is pivoted at its midpoint as indicated at 408, with a plurality of fingers 407 projecting into the tubes 402, 403, and 404. Secured to the lever 405 is a mercury switch 408 which is shown in circuit open position. Upon a coin being inserted in any one of the tubes 402, 403, or 404, the coin engages the finger 407 projecting into that tube and tilts the lever 405 in a clockwise direction, thereby tilting the mercury switch to closed position. It is to be noted that the lever 405 is mounted so that the weight thereof is only slightly unbalanced so that a very small force is required to tilt the lever. It will be further noted that the tubes 402, 403, and 404 are curved at 401 to facilitate passage of the coin after it has tipped the lever 405. Thus, each time that a coin is inserted in any one of the tubes 402, 403, and 404, the switch 408 is momentarily closed.

The switch 408 indirectly controls the energization of a motor 410. This motor comprises the usual field winding 411 and a rotor 412. The rotor 412 is connected to a reduction gear train 413 which is in turn secured to a shaft 414. Secured to this shaft are three disks 415, 416, and 417. Each of the disks 415, 416, and 417 carries a plurality of pins 418. The disk 415 is shown as having five pins 418, the disk 416 as having ten pins 418, and the disk 417 as having twenty pins 418. In the particular embodiment of the invention described in this specification, each of these pins corresponds to five cents of the inserted money. Thus, the disk 415 is intended to be used in connection with twenty-five cent pieces, the disk 416 in connection with fifty cent pieces, and the disk 417 in connection with one dollar pieces. It will be obvious that any other disks with suitably spaced pins can be provided, if desired. As indicated by an arrow adjacent the disk 415, the disks 415, 416, and 417 are driven in a counter-clockwise direction by the motor 410.

Associated with the disks 415, 416, and 417 are switches 420, 421, and 422. These switches are carried by switch carrying arms 423, 424, and 425. The arms 423, 424, and 425 are only slightly unbalanced upon their pivots so that a relatively small force is required to tilt them in a clockwise direction to closed position. The left hand ends of the levers 423, 424, and 425 are associated with the pins of the respective disks. Thus, as the disks 415, 416, and 417 are rotated, each of the switches 420, 421, and 422 is tilted for each revolution of the disks as many times as there are pins on the disk associated with the switch. Thus, upon one revolution of disk 415, switch 420 is tilted five times. Similarly, switch 421 is tilted ten times for each revolution of disk 416 and switch 422 twenty times for one revolution of disk 417.

The movement of disks 415, 416, and 417 is controlled by a solenoid 442. Associated with this solenoid 442 is an armature 443 which is carried on the left hand end of a lever 444. The lever 444 carries a mercury switch 445, pivoted at a point such that the lever is substantially bal-

anced about its pivot point. Thus, the solenoid is capable of moving the armature 443 up into engagement therewith. Projecting downwardly from the left hand end of lever 444 is a pin 447 which projects into a notch 448. When the pin is in the position shown in the drawings, the pin is effective to retard the movement of disk 415 and hence also disks 416 and 417. When the solenoid 442 is energized, the pin 447 is raised out of the notch 448 and the disks 415, 416, and 417 are all free to be driven by the motor 410. When the solenoid 442 is energized, and the pin 447 is moved out of the notch 448 as previously described, switch 445 is moved to closed position. As will be explained later, the switch 445 controls the energization of motor 410 so that upon solenoid 442 being energized, the circuit to motor 410 is closed.

Each of the lower ends of tubes 402, 403, and 404 are designed to permit the exit of the associated coin into a central funnel 450 leading to the coin receiving safe. Associated with the lower ends of these tubes are solenoids 451, 452, and 453. Each of these solenoids controls the position of a mercury switch carrying lever, these levers being designated by the reference numerals 454, 455, and 456. Carried by levers 454, 455, and 456 are mercury switches 458, 459, and 460. The mercury switches are so positioned with respect to the pivot points 462, 463, and 464 of the levers that the mercury switches tend to bias the levers away from the solenoids. Due to this biasing action of the mercury switches and due to the spacing of the armatures from the solenoid, the solenoids are incapable by themselves of moving their associated armatures into engagement therewith. In other words, the mere energization of one of the solenoids 451 to 453 does not insure that it will pull its associated armature into engagement therewith. Thus, the energization of the solenoid alone does not change the circuit closing position of the respective switch of the switches 458, 459, and 460. Accordingly, further means are provided for aiding the solenoids. It will be noted that the left hand end of each of the levers 454 to 456 projects into the end of the coin chute in such a way that any coin passing through the chute will have to deflect this lever in a counter-clockwise direction. Such counterclockwise deflection of the lever will momentarily move the armature into engagement with the electromagnet. The solenoid is thereupon effective to hold the armature after it has been so moved.

Operation of species of Figure 7

The mechanism of Figure 7 is shown in the position it assumes when no coin is passing through it. Let it be assumed that a twenty-five cent piece is inserted in the tube 239, which as previously explained, connects with the tube 404. As this twenty-five cent piece passes finger 407 projecting into the tube, it tilts lever 405 to close the switch 408. This closure of switch 408 is maintained for a brief interval of time during which the twenty-five cent piece is rolling around the curved portion 401. As soon as the switch 408 is closed, a circuit is established to the solenoid 442 as follows: from line wire 470 through conductor 471, conductor 472, switch 408, conductor 473, solenoid 442, and conductors 475 and 476 back to the other line wire 478. The energization of solenoid 442 causes lever 444 to be rocked in a clockwise direction, as previously ex-

plained, causing pin 447 to be moved out of the slot 448 and causing mercury switch 445 to be closed. The moving of pin 447 out of slot 448 causes the disks 415, 416, and 417 to be free to rotate. The moving of switch 445 to circuit closed position establishes a circuit to the motor 410 as follows: from line wire 470 through conductors 471 and 479, switch 445, conductors 480 and 481, field winding 411, and conductors 482, 483, and 476 back to line wire 478. Motor 410 is thereupon energized to cause rotation of disks, 415, 416, and 417. The moment these disks start to rotate, the slot portion 448 moves from underneath the pin 447 thereby preventing pin 447 from dropping down. This prevents return movement of lever 444 and the opening of switch 445. In other words the insertion of the coin closes the switch 408 to energize the solenoid 442. The energization of this solenoid in turn closes the switch 445 to start the motor and move the disk 415 to a position at which lever 444 is held in switch closing position, thereby insuring continued operation of motor 410 until the pin 447 again is over the slot 448.

As the disks 415, 416, and 417 rotate, the mercury switches 420, 421, and 422 are periodically closed, as previously described. These are connected to the solenoid winding 210 of solenoid 208. Their connection, however, is controlled by the mercury switches 458, 459, and 460 to prevent all but one of the switches 420 to 422 from affecting the energization of solenoid winding 210.

Thus continuing with the case of a twenty-five cent piece, after the twenty-five cent piece has passed the lever 405, producing the action previously described, the coin passes further down the tube 404 until it reaches the exit, at which time it engages the left-hand end of lever 456. Upon so engaging the left hand end of lever 456, it tilts this lever in counter-clockwise direction causing the armature to be moved into proximity to the core of solenoid 453. When this happens, the armature is retained by this solenoid inasmuch as the solenoid is now energized by the following circuit established when switch 445 was closed. From the line wire 470 through conductors 471, 479, switch 445, conductors 480, 485, and 486, solenoid 453, conductors 487, 488, 483, and 476 to the other line wire 478. It will be observed that solenoids 451 and 452 are connected in parallel with solenoid 453 by conductors 490, 502, 491, 493, 503, and 492. Thus, at the same time that solenoid 453 is energized by the closure of switch 445, solenoids 451 and 452 are likewise energized. Due to the fact that the solenoids are unable to attract the armature unaided, only those switches will be closed, however, in which the coin has passed through the associated chute. Thus, if a twenty-five cent piece is the only piece that has been inserted at a given time, the arm 456 will be the only one that is tilted into a position at which the solenoids can attract the armature. Thus, the mercury switch 460 will be the only one that is closed. As previously indicated, the mercury switches 458, 459, and 460 control the connection of switches 422, 421, and 420, respectively, with the solenoid 208. Thus, the circuit between the solenoid winding 210 and the switch 420 is as follows: from line wire 470, through conductors 504, 505, and 494, switch 420, conductor 495, switch 460, conductors 496, 497, and 498, solenoid winding 210, and conductor 499 back to the line wire 478. Inasmuch as switch 460 is closed, this circuit is closed each

time that switch 420 is closed or, in other words, each time that the arm 423 is engaged by one of the pins 418 of disk 415. As previously explained, since there are five pins 418 on disk 415, the switch 420 will be closed five times in connection with the passage of the coin through the apparatus.

The motor 410 will continue to revolve the disk 415 until such time as the notch 448 again comes under the pin 447. Inasmuch as the solenoid is only momentarily energized, it exerts no attractive force on armature 443 and as soon as the slot 448 does come into the position just mentioned, the pin 447 will drop down in this slot rocking the lever 444 in a counterclockwise direction and thereby causing the opening of switch 445. The opening of switch 445 automatically deenergizes the motor 410 and the solenoid 416. The locking of pin 448 prevents any overshooting when the motor 410 closes. Thus, when the disk has completed its rotation, it is instantly stopped and the motor driving the same is at the same time deenergized.

It is believed unnecessary to describe in detail the operation in connection with the fifty cent and dollar pieces. When a fifty cent piece is inserted, it tilts the switch 408 in the manner which has been previously described in connection with twenty-five cent pieces. The same sequence of operation is initiated whereby the disks are placed in motion. In this case, the fifty cent piece tilts the lever 455 causing the switch 459 to be closed. As a result of the closure of this switch, the pulsations of switch 421 are the ones which control the energization of solenoid winding 210. Due to the fact that there are ten pins 418 on disk 416, the solenoid winding will be energized ten times. When, on the other hand, a dollar coin is inserted in the machine, the switch 458 will be closed and inasmuch as this switch is in circuit with switch 422, it is the switch 422 that controls the current to solenoid winding 210. In this case, the winding 210 will be energized twenty times corresponding to the twenty five cent divisions in a dollar.

The species of Figure 7 has the advantage that it is capable of being adapted to coins of almost any denomination. It will be readily observed that all that it is necessary to do is to change the number of pins 418 in connection with the disks 415, 416, and 417.

Species of Figure 8

In Figure 8, I have shown a further motor driven means for setting dial 100. In the two previously described species, a pawl is associated with a pin disk secured to shaft 101 and this pawl is actuated by a solenoid which is periodically energized in accordance with the value of the coins inserted. In the present species, a motor is connected through releasable clutch means to the dial and this motor is continuously energized until the dial is set at the value corresponding to the value of the coin inserted.

Referring specifically to Figure 8, the reference numeral 525 is employed to indicate a motor which sets the dial 100. This motor which may be of the ordinary induction type, comprises a rotor 526 and a winding 527. The rotor has secured thereto a worm gear 528. The worm gear 529 meshes with a worm wheel gear 530 which has associated therewith a spur gear 531 of smaller diameter meshing with a spur gear 532 of larger diameter. The worm gear 529 and the gears 530, 531, and 532 form a speed reduction mechanism

between the rotor 526 and a collar 534 secured to gear 532. The collar 534 is rigidly secured to gear 532 so as to be movable as a unit therewith. The collar 534 and gear 532 are freely mounted on a shaft 436. The left hand face of collar 534 is serrated to cooperate with serrations on the right hand face of a collar 537. The collar 537 is associated with a sprocket wheel 538 and a further serrated collar 539. The sprocket wheel 539 is connected by means of a sprocket chain 540 to a sprocket wheel associated with dial 100. The sprocket wheel 539 and the collars 537 and 538 are secured together as a unit and are also freely mounted on shaft 536. The serrated collar 538 is adapted to cooperate with a serrated collar 541 which is secured to a disk 542. The disk 542 and the collar 541 are longitudinally slidable on shaft 536, the sliding movement being limited by a pin 557 secured to shaft 536 and projecting through a slot 558 in collar 541.

The serrated disks 534 and 537 have opposing recesses 542 and 543 designed to receive a coil spring 545. The purpose of the coil spring is to bias the collars 534 and 537 apart and thereby prevent engagement between the teeth of the respective collars. A similar spring 548 is located between collars 538 and 541. It is to be understood that these collars are similarly provided with opposing recesses to receive the spring 548.

Cooperating with the collar 542 is a further unit comprising a lever 544. This lever is pivoted at 545 at its lower end and carries two nipples 543 and 545. The nipples are designed to engage the disk 542 when lever 544 is moved in a clockwise direction. A collar 547 secured to lever 544 and freely slidable on shaft 536 guides this movement of lever 544. The lever is operatively connected to a solenoid core 550 of a solenoid 551. Associated with the core 550 is a winding 552. Upon energization of solenoid winding 552, the core 550 is moved to the right. This action is opposed by a spring 554. It will be obvious that when the upper end of lever 544 is moved to the right, the disks 541, 538, 537, and 534 are moved together so that the teeth thereof are brought into mesh. Under these conditions, the rotation of collar 534 by the motor 526, will cause the rotation of collars 534, 537, 538, and 541.

The pin and slot connection comprising pin 557 and slot 558 permits the longitudinal movement of collar 541 necessary to clutching and declutching the collars 534, 537, 538, and 541 but prevents rotation of shaft 436 relative to collar 541. Thus, upon collar 541 being rotated, the shaft 536 is similarly rotated.

Secured to the shaft 536 are three disks 560, 561, and 562. The disks 560, 561, and 562 are all rigidly secured to shaft 536 so that upon rotation of shaft 536, the disks are correspondingly rotated. Each of the disks has a lug secured thereto, the lugs being designated by the reference characters 564, 565, and 566, respectively. These lugs are designed to cooperate with mercury switch carrying levers 568, 569, and 570. These levers carry mercury switches 571, 572, and 573, respectively. Switches 571, 572, and 573 are normally in a circuit closed position. Upon the lug engaging the downwardly extending arm of one of the switch carriers, however, the corresponding switch is tilted to circuit open position. The lugs 564, 565, and 566 are so spaced on their respective disks that they engage the downwardly extending arms of the associated

switch carriers when the preselecting dial reaches the twenty-five cent, the fifty cent, and the dollar positions. A stop 576 is shown in connection with the lug 564. This stop is designed to engage lug 564 and limit return movement of the shaft 536. The shaft is biased by a helical spring 577 surrounding and secured to shaft 536 at one end and secured to a fixed member 578 at its other end.

A plurality of conventional coin receiving tubes are provided, one for each of the coins for which the machine is adapted to receive. In the embodiment described in Figure 3, the machine is adapted to receive twenty-five cent, fifty cent, and one dollar coins. Any suitable slug detecting mechanism may be provided. The slug detecting mechanism incorporated is substantially the same as that of the species of Figures 1 to 6. At the lower end of each of the coin receiving tubes, I provide a relay armature actuating means which has been illustrated only in connection with the dollar coin. Closing off the tube at a predetermined point is a gate 580. This gate is adapted to be swung outwardly through a slot adjacent thereto by any suitable automatic means as will be mentioned later. Upon the coin reaching this gate, its further progress is stopped. Associated with the tube immediately above this gate is a lever 581 which is pivoted at 582. The outer arm of this lever is connected with a rod 583 connected with an inwardly projecting arm of a bell crank lever 584 pivoted to the casing 12. Cooperating with the bell crank lever 584 is a push button 585 which projects through the casing 12. Upon push button 585 being pushed inwardly, the bell crank lever 584 is rocked in a clockwise direction to move rod 583 upwardly. The bell crank lever 581 has an upwardly extending arm provided with a coin engaging portion adapted to extend through a slot in the coin tube adjacent the coin which has been indicated by the reference numeral 586. Opposite the slot through which the coin engaging portion of lever 581 extends is a further slot into which extends a pusher disk 587. The pusher disk 587 is connected through rod 588 to an armature 589 cooperatively associated with a relay coil and core 590. The relay armature 589 carries a pair of mercury switches 591 and 592. These switches are shown in their circuit open position. When the armature 589 is moved into engagement with the relay 590, the two switches 591 and 592 are moved to circuit closed position. As will be explained later, upon the armature being so moved, the closure of switches 591 and 592 causes a holding circuit to be established to the relay coil 590. It is to be noted that the coin 587 in effect forms a link in the means for actuating the armature 589 by means of push button 585. Thus, unless a coin is present in the space between the coin engaging portion of lever 581 and the pusher disk 587, the actuation of button 585 has no effect upon the magnet.

It is to be understood that a similar armature actuating means is provided in connection with each of the coin receiving tubes. For purposes of simplicity, only the relays and the armatures have been shown in connection with the coin receiving apparatus for the other coins. The relay 594 is provided with an armature 595 which armature carries mercury switches 596 and 597. These switches are normally in circuit open position but upon the armature being moved into engagement with the electromagnet, both of these switches are closed. The armature 595 has connected

thereto a rod 599 which, it will be understood, is associated with apparatus similar to that with which rod 588 is associated.

Similarly, relay 600 cooperates with an armature 601, which carries mercury switches 602 and 603. Similarly the armature 601 is connected to a rod 605 which is designed to cooperate with suitable actuating mechanism such as is shown in connection with the dollar coin mechanism.

The mechanism for actuating the gates 580 may take any suitable desired form in which means are provided for automatically opening these gates after an operation initiated by the insertion of the coin has been started. Thus, the gate may be opened by means driven by motor 525 or by the meter 18.

Secured to shift 101 are three stop disks 605, 606, and 607. The purpose of these stop disks is to insure that the dial 100 stops exactly at the desired position. While, as will be explained later, the mechanism is designed to deenergize the motor 525, and to declutch the disks 560, 561, and 562 when the dial 100 has reached the desired position, it is possible in some cases for there to be a slight amount of over travel due to wear of the mechanism. In order to prevent this and to insure that the dial stops at exactly the desired position, the stop disks 605, 606, and 607 are provided. Each of these stop disks carries a lug, these lugs being designated by the reference characters 609, 610, and 611. It is to be noted that these lugs are secured to the disks at different angular positions. These positions correspond to the desired rotation of dial 100 for the various denominations of coins to be inserted. Associated with each of the stop lugs 609, 610, and 611 is a stop arm, these arms being designated by the reference numerals 613, 614, and 615. Only the stop arms 613 and 615 have been illustrated in detail. It will be noted that the stop arm 613 is pivoted at 617. The upper end of the arm 613 is connected by a link 618 to a solenoid core 619 with which is associated a solenoid winding 620. It will be obvious that upon energization of the solenoid winding 620, the core 619 is moved to the left, thereby rocking the stop lever 613 in a counter-clockwise direction to the dotted line position in which the right hand upturned end of the stop lever 613 is in the path of the stop 609. As will be explained later, the winding 620 is energized when the relay coil 600 is energized. Relay coil 600 is energized only when a twenty-five cent coin is inserted. It will be obvious therefore, that the stop lever 613 is in its motion arresting position only when a twenty-five cent coin has been inserted.

In order to simplify the description, the solenoid actuating mechanism for stop arm 614 has not been illustrated. This solenoid mechanism, however, corresponds to that previously described in connection with arm 613 and comprises a solenoid winding energized whenever the relay 594 is energized.

The actuating mechanism of stop lever 615 is shown as comprising a link 622 connected to a solenoid core 623. Associated with the solenoid core is a solenoid winding 624. As in the case of lever 613, energization of the solenoid causes the lever 615 to be rotated in a clockwise direction into the path of the stop 611. The solenoid 624 is connected in parallel with the relay 590 so as to be energized whenever this relay is energized, or, in other words, to be energized whenever a dollar coin has been inserted.

Operation of species of Figure 8

The various elements are shown in the positions corresponding to those of the other figures, in other words, the preselector disk 100 is shown in the position in which only twenty-five cents worth of gasoline remains to be dispensed. The subtracting mechanism is operating to periodically retract this dial until the valve is completely closed and the pump motor is stopped.

Let it now be assumed that a purchaser desires to purchase a dollar's worth of gasoline. In this event, a dollar coin is inserted in the proper coin receiving tube designated in the drawings by the reference numeral 579. The coin is stopped in its passage by the gate 580 and the push button 585 is then pushed inwardly to move the coin, which is designated by reference numeral 586, to the left to move the armature 589 into engagement with the coil 590. This movement of the armature causes switches 591 and 592 to be closed, as previously explained. The closure of switches 591 and 592 causes a holding circuit to be established to relay coil 590 as follows: from line wire 630 through conductor 631, switch 591, conductor 632, switch 573, conductors 634 and 635, switch 592, conductor 636, relay coil 590, and conductors 637, 638, 639, 671, 640, and 641 back to the other line wire 643. The energization of relay coil 590 by the circuit just traced causes the relay coil to hold the armature in engagement therewith even after the button 585 is released and the coin is allowed to pass on through the tube by the opening of the gate 580.

As previously indicated, each of the solenoid windings of the solenoids which actuate arms 613 to 615 is connected in parallel with the associated relay. Thus, at the same time a circuit is established to relay coil 590, a circuit is established to solenoid winding 624 as follows: from line wire 630 through conductor 631, switch 591, conductor 632, switch 573, conductors 634 and 635, switch 592, conductors 636 and 653, relay coil 624, and conductors 654, 639, 671, 640, and 641 back to the other line wire 643. Thus, at the same time relay 590 is energized, solenoid winding 624 is energized to move the right hand end of stop arm 615 into the path of movement of stop lug 611.

The closure of switch 591 also establishes a circuit to motor 525 as follows: from line wire 630 through conductor 631, switch 591, conductor 632, switch 573, conductors 634, 645, 646, 647 and 648, field winding 527, and conductors 649, 650, and 641 back to the other line wire 643. The establishment of this circuit causes energization of motor 525 and the consequent rotation of the gear train including worm 529 and gear 532.

It will be noted that the solenoid winding 552 is connected in parallel with the motor field winding 527 by conductors 648, 649, 651, and 652. Thus, at the same time that motor field winding 527 is energized, solenoid winding 552 is also energized.

The energization of solenoid winding 551 simultaneously with that of motor field winding 527 causes collar 541 to be moved to the right into engagement with collar 538 and collars 537 and 534 to be moved into engagement with each other. The result of this is that the rotation of motor 525 is imparted to shaft 536 causing the disks 560, 561, and 562 to be turned in a counter-clockwise direction as viewed in Figure 8. The sprocket wheel 539 is also rotated so as to rotate through the sprocket chain 540 the preselector

dial 100. The preselector dial is rotated in a clockwise direction so as to bring successively higher numbers behind the window.

Movement of the preselector dial is terminated by the engagement of stop arm 615 with stop lug 611. It will be recalled that this arm 615 was moved into the path of lug 611 at the same time as the relay coil 590 was energized.

At just the instant that the stop lever 615 engages the stop lug 611, the lug 566 of disk 562 engages the downwardly extending arm of the switch carrier 570. The result of this is that the switch carrier is tilted in a clockwise direction moving mercury switch 573 to circuit open position. It will be recalled that switch 573 was in the circuit of the motor field winding 527 and the solenoid winding 552 as well as that of the relay 590 and the stop actuating solenoid 624. Thus, at the same time that further movement of preselector dial 100 is stopped by the engagement of the stop lever 651 with stop lug 611, the solenoid 551, the relay 590, and the solenoid winding 624 are all deenergized. The deenergization of the solenoid 551 results in the declutching of shaft 535 and sprocket wheel 539 from motor 525. It is very important that these be declutched so that the preselector dial is free to turn through the action of the subtracting mechanism. It is to be recalled that it is necessary for this subtracting mechanism to periodically retract dial 100 and if some declutching means were not employed, the subtracting mechanism would be ineffective.

The deenergization of relay winding 590 insures that switches 591 and 592 are moved to open position to require the insertion of a further coin to cause their reclosure.

As soon as the solenoid 55 is deenergized so as to result in a declutching of shaft 536, the coil spring 577 is effective to immediately rotate shaft 536 in a clockwise direction until the lug 564 engages the stop 576. This is desirable because the disk should be returned to the stop position to be ready for the insertion of another coin.

If the operator desires to purchase only twenty-five cents worth of gasoline, a twenty-five cent coin is inserted and by means of a suitably actuated push button not shown, the armature 601 is moved into engagement with the electromagnet 600. When this happens, switches 602 and 603 are closed. The closure of these switches results in the establishment of an energizing circuit to motor field winding 527 as follows: from line wire 630 through conductors 661 and 662, switch 602, conductor 663, switch 571, conductors 664, 647, and 648, motor field winding 527, and conductors 649, 650, and 641 back to the other line wire 643. At the same time, an energizing circuit is established to the solenoid winding 552 which is connected in parallel with motor field winding 527.

The closure of switches 602 and 603 also results in the establishment of an energizing circuit through the solenoid 600 as follows: from the line wire 630 through conductors 661 and 662, switch 602, conductor 663, switch 571, conductors 664, 648, 666, 667, and 678, switch 603, conductor 679, solenoid 600, and conductors 670, 671, 640, and 641 to the other line wire 643. The establishment of the last circuit also establishes a circuit to solenoid winding 620 which is connected in parallel with the solenoid 600. It will be obvious that the operation is the same except with stop lug 609 that terminates movement of that it is now the engagement of stop arm 613 preselector dial 100. Similarly, it is the engage-

ment of the lug 564 with the downwardly extending arm of switch carrier 568 and the resultant tilting of switch 571 to circuit open position which deenergizes the solenoid 620, the solenoid 600, the motor 525, and the solenoid 551.

When a fifty-cent coin is inserted, it is the armature 595 which is pushed into engagement with the electromagnet 594 and it is the switches 596 and 597 which are closed. In this case, the energization circuit to the motor field winding 526 is from line wire 630 through conductors 561 and 573, switch 596, conductor 674, mercury switch 572, conductor 666 and from that point on, the same as in the previously traced circuits for motor 525. The circuit to the electromagnet winding 594 is from line wire 630 through conductor 661 and 673, switch 596, conductor 674, switch 572, conductors 667 and 668, switch 597, conductor 669, solenoid winding 594 and conductors 636, 639, 671, 640, and 641 to the other line wire 643. Since the solenoid winding (not shown) associated with stop arm 614 is connected in parallel with the solenoid 594, the stop arm 614 will be moved into stopping position when the electromagnet 594 is energized. It is believed that the action in this case is otherwise obvious from the description in connection with the insertion of a dollar and twenty-five cent pieces.

It will be seen that in this embodiment, provision can be made for any denominations of coin. All that is necessary to do is to provide the various stops in necessary locations with respect to their dials.

When the stop mechanism comprising arms 613, 614, and 615 is employed, it will be obvious that the preselector dial can be set at a position corresponding only to the value of one coin. In other words, the machine cannot be set for the cumulative value of several coins. In many cases, this offers no objection whatsoever. This is particularly true with the machine of the type described and which is adapted to receive twenty-five, fifty and one dollar coins. In such cases, this amount of gasoline is usually sufficient. However, where it is desired that the machine operate in accordance with the cumulative value of a plurality of coins, the stop mechanism comprising arms 613, 614, 615 can be eliminated. The only restriction which is then necessary to place upon the user is to insure that the preselector dial has been advanced to a value corresponding to the value of the previously inserted coin before another coin is placed in the machine. If this is done, the preselector dial can be advanced to any position corresponding to the cumulative value of a large number of coins inserted in the machine.

Conclusion

From the foregoing description, it will be seen that I have provided in a gasoline vending pump of the type employing a preselector dial and subtracting mechanism for periodically retarding this preselecting dial until a valve is closed, motor means for setting this preselecting dial and means for automatically controlling the operation of the motor means in accordance with the value of coins inserted within suitable coin receiving mechanism.

In all three forms of my invention, no restriction is placed upon the slug detecting or the coin slide mechanism which may be employed. Furthermore, in all forms, the connection means between the motor and the preselector dial is such that the motor is normally disconnected

from the dial so as not to interfere with the operation of the subtracting mechanism.

While I have shown certain specific embodiments of my invention for purposes of illustration, it is to be understood that the invention is limited only by the scope of the appended claims.

I claim:

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 passage of liquid through said flow line, a valve in said flow line, 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 predetermined selected amount and subtracting means driven by said registering means for returning the indicating means to a predetermined position in uniform increments corresponding in magnitude to a predetermined monetary sum, an electric motor means, means for operatively connecting said motor means to said indicating means and effective upon energization of said motor to advance said indicating means an amount corresponding to one of said increments, means for receiving any one of a plurality of predetermined denominations of coins, means operative to energize said motor means periodically a number of times equal to the value of any inserted coin divided by said predetermined monetary sum so as to cause said motor to set said indicating means to an amount corresponding to the value of said coin, said registering means and being effective to drive said subtracting means in such a manner that 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 meter for measuring the liquid passing through said flow line, registering means for indicating the passage of liquid through said flow line, a valve in said flow line, 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 predetermined selected amount and subtracting means driven by said registering means for returning the indicating means to a predetermined position in uniform increments corresponding in magnitude to a predetermined monetary sum, an electric motor means, means for operatively connecting said motor means to said indicating means and effective upon energization of said motor to advance said indicating means an amount corresponding to one of said increments, means operative each time that said motor is deenergized to render said connecting means ineffective so as to leave said indicating means free for movement independently of said motor means, means for receiving any one of a plurality of denominations of coins, means operative to energize said motor means periodically a number of times equal to the value of any inserted coin divided by said predetermined monetary sum so as to cause said motor to set said indicating means to an amount corresponding to the value of said coin, said registering means being effective to drive said subtracting means in such a manner that when said indicating means has reached said predetermined position, the registering means has reached the predetermined amount.

3. In liquid dispensing apparatus, a liquid flow line, a pump for supplying liquid to said flow line, means controlling the flow through said line, a meter for measuring the liquid passing through said flow line, registering means for indicating the passage of liquid through said flow line, preselector means controlled by said registering means for causing said flow controlling means to interrupt the flow of liquid through said line when a predetermined amount of liquid has passed through said meter, said preselector means including indicating means adapted to be set to a predetermined amount and subtracting means driven by said registering means for returning the indicating means to a predetermined position in uniform increments bearing a definite relation to a predetermined monetary sum, electric motor means, means for operatively connecting said motor means to said indicating means and effective upon energization of said motor means to advance said indicating means an amount corresponding to said predetermined monetary sum, a plurality of passages, each designed to receive a different predetermined denomination of coin, switching means associated with said passages, means extending into said passages operative to actuate said switching means a number of times equal to the value of the inserted coin divided by said predetermined monetary sum, and electrical connections between said switching means and said motor means effective each time said switching means is so actuated to cause energization of said motor means.

4. In liquid dispensing apparatus, a liquid flow line, a pump for supplying liquid to said flow line, means controlling the flow through said line, a meter for measuring the liquid passing through said flow line, registering means driven by said meter for indicating the passage of liquid through said flow line, preselector means controlled by said registering means for causing said flow controlling means to interrupt the flow of liquid through said line when a predetermined amount of liquid has passed through said meter, said preselector means including adjustable means adapted to be set to a predetermined amount and subtracting means also driven by said motor for returning the adjustable means to a predetermined position in uniform increments bearing a definite relation to a predetermined monetary sum, electric motor means, means for operatively connecting said motor means to said adjustable means and effective upon energization of said motor means to advance said adjustable means an amount corresponding to said predetermined monetary sum, a plurality of passages, each designed to receive a different predetermined denomination of coin, a disk associated with each of said passages, means for revolving said disks, switching means associated with said disks, means to actuate said switching means a number of times equal to the value of the inserted coin divided by said predetermined monetary sum, and electrical connections between said switching means and said motor means effective each time said switching means is so actuated to cause energization of said motor means.

5. In liquid dispensing apparatus, a liquid flow line, a pump for supplying liquid to said flow line, means controlling the flow through said line, a meter for measuring the liquid passing through said flow line, registering means driven by said meter for indicating the passage of liquid through said flow line, preselector means controlled by

said registering means for causing said flow controlling means to interrupt the flow of liquid through said line when a predetermined amount of liquid has passed through said meter, said preselector means including adjustable means adapted to be set to a predetermined amount and subtracting means also driven by said meter for returning the adjustable means to a predetermined position in uniform increments bearing a definite relation to a predetermined monetary sum, electric motor means, means for operatively connecting said motor means to said adjustable means and effective upon energization of said motor means to advance said adjustable means an amount corresponding to said predetermined monetary sum, a plurality of passages, each designed to receive a different predetermined denomination of coin, a disk associated with each of said passages, an electric motor for revolving said disks, means operable upon the insertion of any coin to energize said last named motor until said disks have rotated a predetermined amount, switching means associated with said disks, means to actuate said switching means a number of times equal to the value of the inserted coin divided by said predetermined monetary sum, and electrical connections between said switching means and said first named motor means effective each time said switching means is so actuated to cause energization of said motor means.

6. In liquid dispensing apparatus, a liquid flow line, a pump for supplying liquid to said flow line, means controlling the flow through said line, a meter for measuring the liquid passing through said flow line, registering means driven by said meter for indicating the passage of liquid through said flow line, preselector means controlled by said registering means for causing said flow controlling means to interrupt the flow of liquid through said line when a predetermined amount of liquid has passed through said meter, said preselector means including adjustable means adapted to be set to a predetermined amount and subtracting means also driven by said meter for returning the adjustable means to a predetermined position in uniform increments bearing a definite relation to a predetermined monetary sum, a ratchet connected to said adjustable means, a pawl adapted to advance said ratchet and said adjustable means an amount corresponding to said predetermined monetary sum, a solenoid for actuating said pawl, a plurality of passages, each designed to receive a different predetermined denomination of coin, switching means associated with said passages, means to actuate said switching means a number of times equal to the value of the inserted coin divided by said predetermined monetary sum, and electrical connections between said switching means and said solenoid effective each time said switching means is so actuated to cause energization of said solenoid.

7. In combination, an adjustable member adapted to be set in any of a plurality of predetermined positions, electric motor means for setting said member, means for operatively connecting said motor means to said adjustable member and effective upon energization of said motor means to advance said adjustable member an amount corresponding to a predetermined monetary sum, a plurality of passages, each designed to receive a different predetermined denomination of coin, a disk associated with each of said passages, an electric motor for revolving said disks, means operable upon the insertion of any coin to energize said last named motor until said

disks have rotated a predetermined amount, a switch associated with each of said disks, each of said disks being provided with projections designed to actuate said switch, the number of projections on any disk being equal to the value of the coin received by the associated passage divided by said predetermined monetary sum, a further switch associated with each of said passages in series with the previously named switch and moved to closed position only on a coin passing through said passage, and a plurality of circuits between a source of energy and said first named motor means, each of said circuits including one of said first named switches and one of said second named switches in series.

8. In combination, an adjustable member adapted to be set in any of a plurality of predetermined positions, electric motor means for setting said adjustable member, means for operatively connecting said motor means to said adjustable member and effective upon energization of said motor member to advance said adjustable means an amount corresponding to a predetermined monetary sum, a plurality of passages, each designed to receive a different predetermined denomination of coin, a disk associated with each of said passages, an electric motor for revolving said disks, means operable upon the insertion of any coin to energize said last named motor until said disks have rotated a predetermined amount, a switch associated with each of said disks, each of said disks being provided with projections designed to actuate said switch, the number of projections on any disk being equal to the value of the inserted coin divided by said predetermined monetary sum, a further switch associated with each of said passages in series with the previously named switch, an electromagnet associated with each said switch and capable of holding said switch in closed position but not of moving it to closed position, means effective upon a coin passing through one of said coin passages to close the one of said second named switches which is associated with said passage, and a plurality of circuits between a source of energy and said first named motor means, each of said circuits including one of said first named switches and one of said second named switches in series.

9. In combination, an adjustable member adapted to be set at any of various predetermined angular positions, electric motor means for setting said adjustable member, a plurality of switches, a moveable switch actuating arm associated with each of said switches, means including a normally released clutch for operatively connecting said motor means to said adjustable member and said switch actuating arms upon closure of said clutch, a plurality of passages, each designed to receive a different predetermined denomination of coin, a switch associated with each of said passages, means for actuating said switch when a coin enters the passage, and means effective upon closure of any one of said last named switches to initiate energization of said motor and engagement of said clutch until the corresponding one of said first named switches is actuated by its associated switch actuating arm.

10. In combination, and adjustable member adapted to be set at any of various predetermined positions, electric motor means for setting said adjustable member, a plurality of switches, a movable switch actuating arm associated with each of said switches, means including a normally

released clutch for operatively connecting said motor means to said adjustable member and said switch actuating arms upon engagement of said clutch, a solenoid connected in parallel with said motor means for causing engagement of said clutch, a plurality of passages, each designed to receive a different predetermined denomination of coin, a switch associated with each of said passages, means for actuating said switch when a coin enters the passage, and means effective upon closure of any one of said last named switches to cause energization of said motor and solenoid until the corresponding one of said first named switches is actuated by its associated switch actuating arm.

11. In combination, an adjustable member adapted to be set at any of various predetermined positions, electric motor means for setting said adjustable member, a plurality of switches, a movable switch actuating arm associated with each of said switches, means including a normally released clutch for operatively connecting said motor means to said adjustable member and said switch actuating arms upon engagement of said clutch, a solenoid connected in parallel with said motor means for causing engagement of said clutch, a plurality of passages, each designed to receive a different predetermined denomination of coin, a switch associated with each of said passages, means for actuating said switch when a coin enters the passage, and means effective upon closure of any one of said last named switches to cause energization of said second motor means and engagement of said clutch until the corresponding one of said first named switches is actuated by its associated switch actuating arm.

12. In combination, an adjustable member adapted to be set at any of various predetermined positions, electric motor means for setting said member, a plurality of switches, a movable switch actuating arm associated with each of said switches, means including a normally released clutch for operatively connecting said motor means to said adjustable member and said switch actuating arms upon closure of said clutch, a plurality of variably spaced stop members, each effective when moved into its operative position to stop movement of said adjustable member at a position corresponding to the value of a predetermined denomination of coin, a plurality of passages, each designed to receive a different predetermined denomination of coin, a switch associated with each of said passages, means for actuating said switch when a coin enters the passage, and means effective upon closure of any one of said last named switches to cause energization of said motor, engagement of said clutch, and movement of the corresponding one of said stop members to its operative position until the corresponding one of said first named switches is actuated by its associated switch actuating arm.

13. 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, indicia carrying registering means for indicating the passage of liquid through said flow line, a valve in said flow line, 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 predetermined selected amount without affecting said registering means and subtracting means for returning the indicating means to a predetermined position, operative connections between

said registering means and said subtracting means for driving the latter by the former, said indicating means carrying indicia corresponding to the indicia carried by said registering means, an electric motor means operatively connected to said indicating means for setting the same, means for receiving any one of a plurality of predetermined denominations of coins, means operative to energize said motor means in accordance with the value of the inserted coin so as to cause said motor to set said indicating means so that the indicia thereon indicate an amount corresponding to the value of said coin, said operative connections between said registering means and subtracting means being effective to so drive said subtracting means that when said indicating means has reached said predetermined position, the indicia of the registering means indicate the predetermined amount.

14. 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, indicia carrying registering means for indicating the passage of liquid through said flow line, a valve in said flow line, 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 predetermined selected amount without affecting said registering means and subtracting means for returning the indicating means to a predetermined position, operative connections between said registering means and said subtracting means for driving the latter by the former, said indicating means carrying indicia corresponding to the indicia carried by said registering means, an electric motor means adapted to be operatively connected to said indicating means for setting the same, means for receiving any one of a plurality of predetermined denominations of coins, means operative to energize said motor means in accordance with the value of the inserted coin so as to cause said motor to set said indicating means so the indicia thereon indicate an amount corresponding to the value of said coin, means automatically operative to disconnect said motor means from said indicating means upon deenergization of said motor means so as not to interfere with the subsequent operation of said subtracting means, said operative connections between said registering means and subtracting means being effective to so drive said subtracting means that when said indicating means has reached said predetermined position, the indicia of the registering means indicate the predetermined amount.

15. 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, indicia carrying registering means for indicating the passage of liquid through said flow line, a valve in said flow line, 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 predetermined selected amount without affecting said registering means and subtracting means for returning the indicating means to a predetermined position, operative connections between said registering means and said subtracting means for driving the latter by the former, said indicating means carrying indicia corresponding to the indicia carried by said register-

ing means, an electric motor means adapted to be operatively connected to said indicating means for setting the same, means for receiving any one of a plurality of predetermined denominations of coins, means operative to energize said motor means in accordance with the cumulative value of the inserted coins so as to cause said motor to set said indicating means so the indicia thereon indicate an amount corresponding to the value of said coins, means automatically operative to disconnect said motor means from said indicating means upon deenergization of said motor means so as not to interfere with the subsequent operation of said subtracting means, said operative connections between said registering means and subtracting means being effective to so drive said subtracting means that when said indicating means has reached said predetermined position, the indicia of the registering means indicate the predetermined amount.

16. 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, indicia carrying registering means for indicating the passage of liquid through said flow line, a valve in said flow line, 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 predetermined selected amount without affecting said registering means and subtracting means for returning the indicating means to a predetermined position, operative connections between said registering means and said subtracting means for driving the latter by the former, said indicating means carrying indicia corresponding to the indicia carried by said registering means, an electric motor means including a solenoid operatively connected to said indicating means for setting the same, means for receiving any one of a plurality of predetermined denominations of coins, means operative to energize said motor means in accordance with the value of the inserted coin so as to cause said motor to set said indicating means so that the indicia thereon indicate an amount corresponding to the value of said coin, spring means automatically operative to disconnect said motor means from said indicating means upon deenergization of said solenoid so as not to interfere with the subsequent operation of said subtracting means, said operative connections between said registering means and subtracting means being effective to so drive said subtracting means that when said indicating means has reached said predetermined position, the indicia of the registering means indicate the predetermined amount.

17. A liquid dispensing apparatus comprising a pump for supplying liquid to said flow line, a first motor means for driving said pump, means controlling the flow through said line, preselector means for causing said flow controlling means to interrupt the flow of liquid through said line when a predetermined amount of liquid has been dispensed, said preselector means including adjustable means adapted to be set to a predetermined amount and subtracting means for returning the adjustable means to a predetermined position, a second electrical motor means effective when energized to advance said adjustable means a predetermined amount, a plurality of passages each designed to receive a different predetermined denomination of coin, third electric motor means, means operable upon the insertion of any

coin to energize said third motor means, switching means, means operated by said third electric motor means for actuating said switching means one or more times upon a coin passing through any one of said passages, the number of actuations being dependent upon the denomination of the coin, means for energizing said second motor means to advance said adjustable means said predetermined amount each time said switch means is energized, means for energizing said first motor means, and means for preventing energization of said first motor means by said last named means while said third motor means is energized.

18. A liquid dispensing apparatus comprising a pump for supplying liquid to said flow line, a first motor means for driving said pump, means controlling the flow through said line, preselector means for causing said flow controlling means to interrupt the flow of liquid through said line when a predetermined amount of liquid has been dispensed, said preselector means including adjustable means adapted to be set to a predetermined amount and subtracting means for returning the adjustable means to a predetermined position, a second electrical motor means effective

when energized to advance said adjustable means a predetermined amount, a plurality of passages each designed to receive a different predetermined denomination of coin, a disk associated with each of said passages and of such diameter with respect to its associated passage as to provide for the snug fit of a coin between said disk and the wall of said passage, third electric motor means for revolving said disks to roll the coins through said passages, means operable upon the insertion of any coin to energize said third motor means until said disks have rotated a predetermined amount, switching means, means for actuating said switching means one or more times upon a coin passing through any one of said passages, the number of actuations being dependent upon the denomination of the coin, means for energizing said second motor means to advance said adjustable means said predetermined amount each time said switch means is energized, means for energizing said first motor means, and means for preventing energization of said first motor means by said last named means while said third motor means is energized.

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