

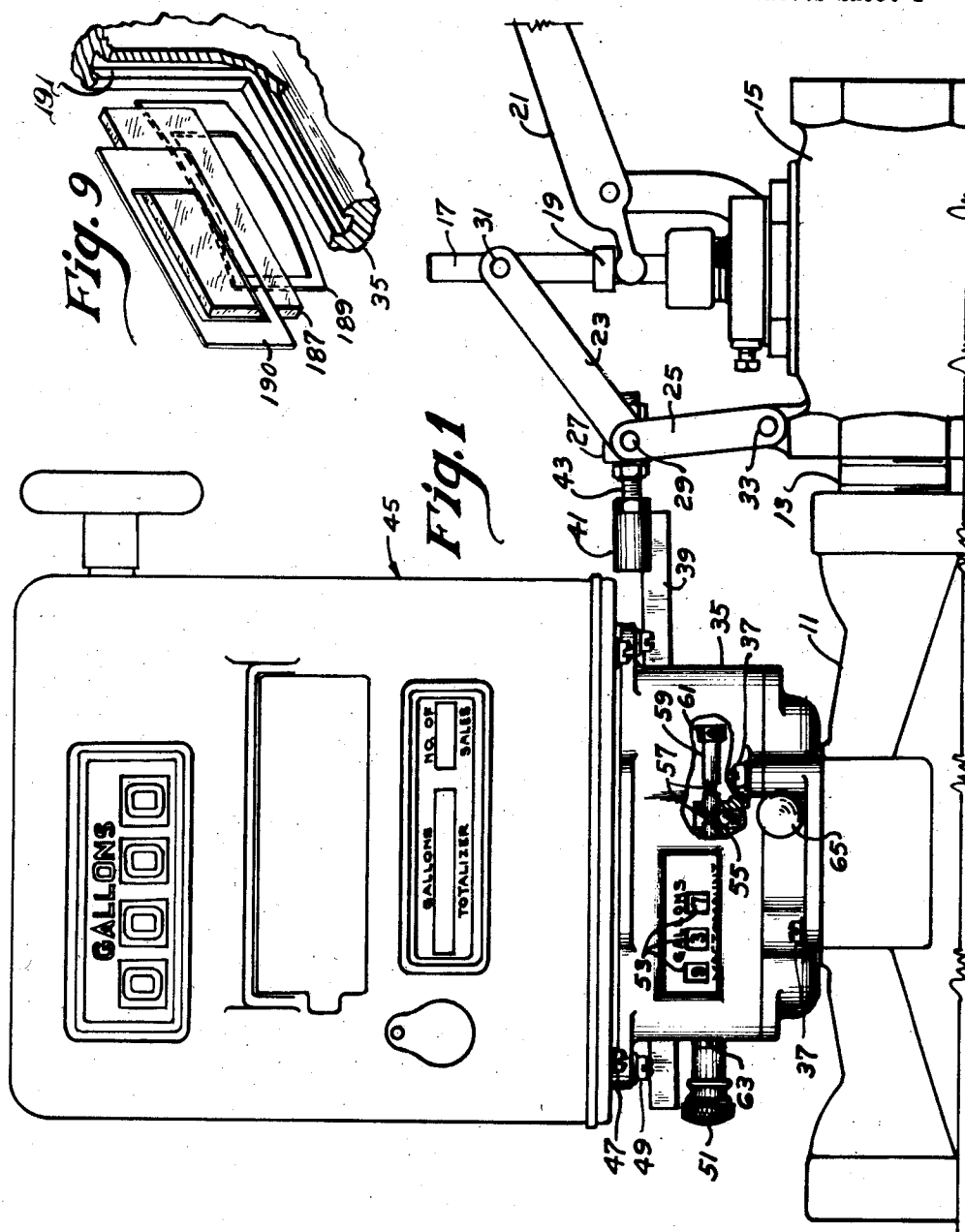
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C. P. GRIFFITH ET AL
PREDETERMINED STOP MECHANISM

2,228,820

Filed Oct. 21, 1937

4 Sheets-Sheet 1



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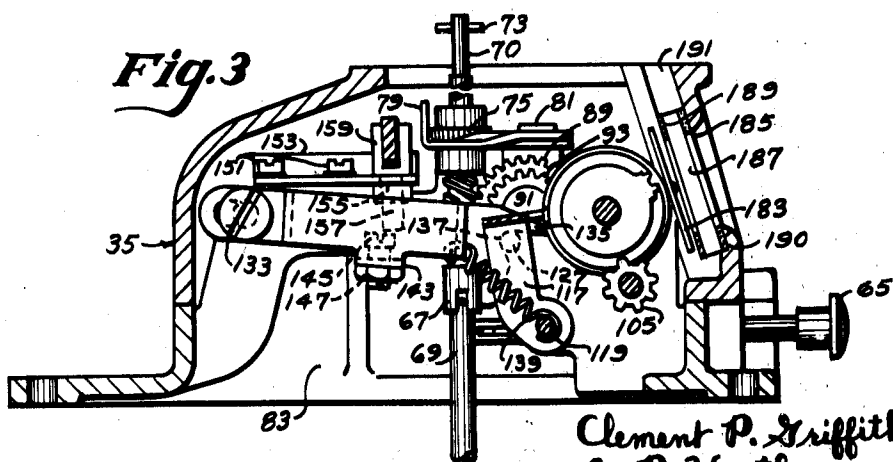
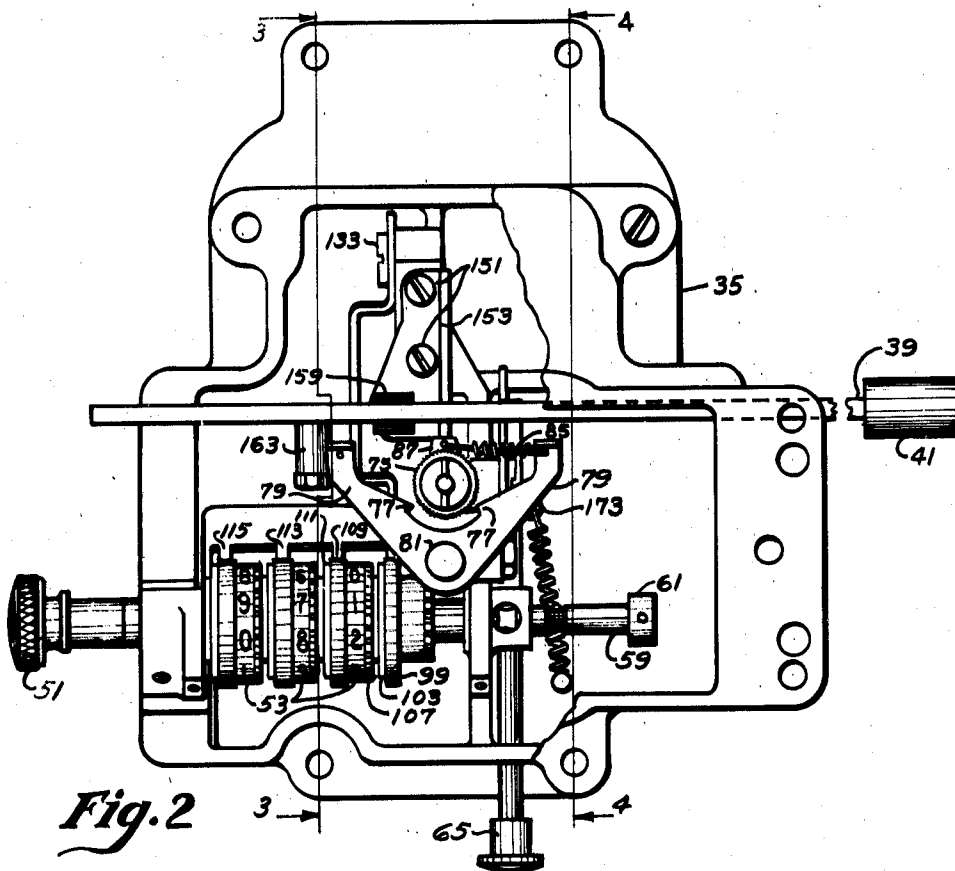
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PREDETERMINED STOP MECHANISM

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4 Sheets-Sheet 2



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PREDETERMINED STOP MECHANISM

Filed Oct. 21, 1937

4 Sheets-Sheet 3

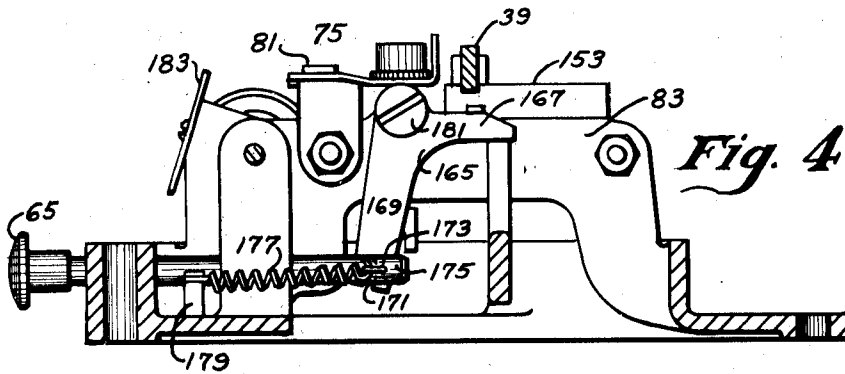


Fig. 4

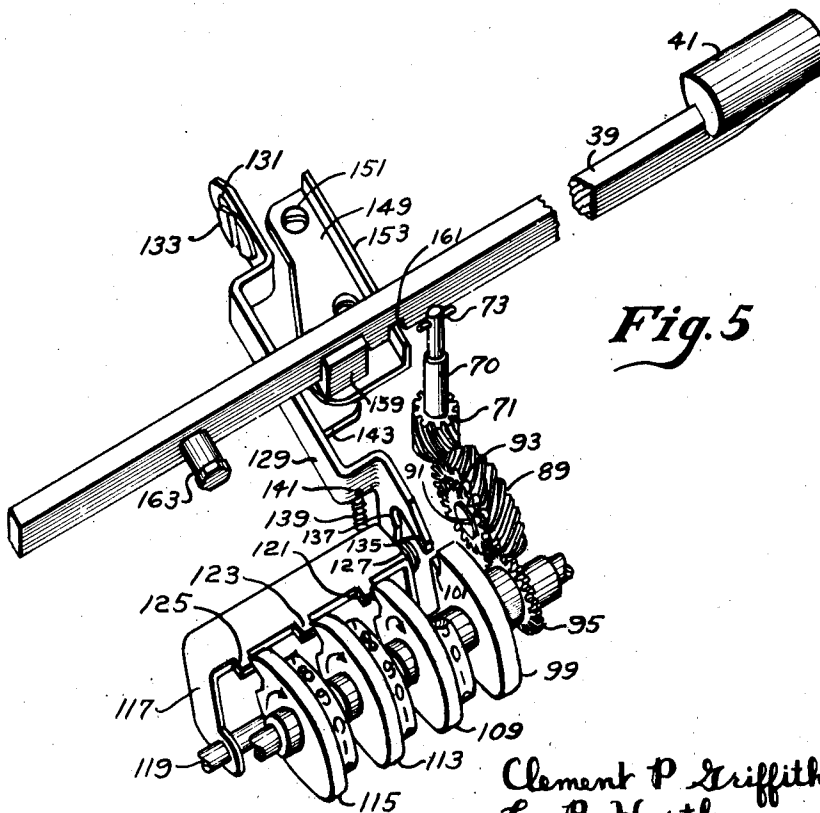


Fig. 5

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UNITED STATES PATENT OFFICE

2,228,820

PREDETERMINED STOP MECHANISM

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10 Claims. (Cl. 235—132)

Various predetermined stop mechanisms have been proposed in which a control bar is biased to move to operation stopping position but is latched against such motion until certain control elements function to permit a spring or impositively acting means to unlatch the bar. It often happens that, due to a condition or a combination of conditions which increase the resistance of the latching means against operation by the releasing means, the latter means are unable to operate at the appointed time with the result that the cycle of operation of the predetermined stop mechanism is not terminated as desired.

The stop mechanism in which the present invention is embodied is disclosed as being applied to a liquid control system and in such a system an overdelivery of liquid would result if the stop mechanism did not function at the appointed time with a possible attendant result that the receptacle to be filled would be overflowed and a fire hazard would be created.

Applicants provide positively operating power means to eliminate the difficulties outlined above.

It has been customary for members of the liquid handling industry to provide a single model of combined quantity predetermining and indicating mechanism which could be applied to any one of a number of meters. The choice of the customer was thus limited to a particular volume indicating mechanism when quite often he would have preferred to use a different type of indicating instrument in connection with the predetermining mechanism.

Applicants have increased the range of equipment open for selection by the customer by forming the predetermining mechanism as an independent mechanism upon which any one of a number of counters may be mounted.

One of the objects of this invention is to provide means for positively disabling the latching means for the control bar in a predetermining mechanism.

It is a further object of the invention to provide in connection with the control mechanism of the cam type, a follower which cannot become overloaded to the extent that it will not operate.

It is still another object of the invention to provide a positively operating unlatching mechanism for a device of the type disclosed.

Yet another object of the invention is to provide power means for unlatching the latching elements of the predetermining mechanism.

Still another object of the invention is to provide positively operated means for unlatching the

latching elements in each stage of a two stage type of mechanism.

A further object of the invention is to provide the positively operating unlatching mechanism for a device of the type disclosed.

Yet another object of the invention is to provide settable means which are adjustable by a single operator to control the length of cycle of the predetermining means.

A further object of the invention is to provide a latch tripping mechanism which comprises a rotating notched cam and a follower which is adapted to engage the notch of the cam to different depths so that the point of disengagement of the two elements will vary, resulting in a different amplitude of operation of the follower.

Still another object of the invention is to provide a latch tripping mechanism comprising a rotating notched cam and a follower adapted to engage the notch so as to be operated by the cam, and control means for permitting the follower to engage the notch of the cam to different depths depending upon the amplitude of motion desired in the follower.

It is another object of the invention to provide an emergency release mechanism for releasing said latching means prior to the operation of said predetermining mechanism.

Yet another object of the invention is to provide a predetermining mechanism housing which serves as an adapter between any of a series of meters and any of a plurality of registers.

Still another object of the invention is to provide a predetermining mechanism which transmits motions from a meter to a register.

Yet another object of the invention is to provide, in a predetermining mechanism adapted for use with resettable registers, means for preventing the removal of backlash from the gears of the predetermining mechanism during the resetting operation.

Still another object of the invention is to provide an efficient device for holding a frangible transparent dial or piece of glass in place over an opening in a housing. Another object is to provide a resilient element which is sprung into place behind a frangible piece of glass to hold it in sealing engagement with the edges of a sight opening.

Other objects will become apparent from a study of the following specification taken in connection with accompanying drawings in which:

Figure 1 is an elevation of the predetermining device mounted on a meter and connected to control a flow control valve and to operate a printing register.

Figure 2 is a plan view of the predetermining mechanism with parts of the housing broken away to show the interior parts.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2 showing the release mechanism in elevation.

Figure 4 is a sectional view taken on the line 4—4 of Figure 2 showing the emergency release mechanism.

Figure 5 is a perspective view showing the relation of the control bar, the control and actuator mechanism in the single stage device.

Figure 6 is a perspective view similar to Figure 5 except that it discloses a two stage mechanism.

Figure 7 is a sectional view taken on the line 7—7 of Figure 2 showing the stop mechanism and the adjusting means therefor.

Figure 8 is an exploded view showing a cam and indicator wheel assembly.

Figure 9 is a perspective view with parts broken away showing the means provided for holding a glass in sealing position over a sight opening in the housing.

Single stage mechanism

Referring to Figure 1 of the drawings, the numeral 11 indicates a liquid meter to which is connected by means of the nipple 13, a valve 15 which comprises a valve stem 17 provided with a collar 19 attached to be engaged by the yoke portion of an operating lever 21 so that depression of the lever will raise the valve stem and open the valve.

Links 23 and 25 are pivoted to a block 27 by means of the pin 29 while the opposite ends of the links are respectively connected to the valve stem and to a lug on the valve body by means of the pins 31 and 33.

The predeterminer body indicated generally by the numeral 35 is mounted by means of cap screws 37 upon the meter 11. A control bar 39 is mounted within the body and is provided at the end adjacent the valve 15 with a lug 41 which is internally threaded to receive a screw 43 upon which is mounted the block 27. Jam nuts are mounted on said screw 43 on either side of block 27 to permit adjustment of said block thereon to adjust for inaccuracies in manufacture and assembly of the cooperating parts, and a jam nut cooperates with lug 41 to permit dislocation of screw 43.

A register indicated generally by the numeral 45 is mounted on a predeterminer body by means of a flange 47 upon which the register 45 is seated and held by cap screws 49. The register shown in Figure 1 is of the resettable indicating and ticket printing type. However, any desired type of register having a base adapted to fit the flange 47 of the predeterminer body may be mounted upon the predeterminer to be driven by a shaft, later to be described, which forms a part of the predeterminer mechanism.

Shown also in Figure 1 is an adjustment knob 51 which is slidable longitudinally to successively engage the indicator dials 53 and to rotate them to indicate the setting of the predetermined stop mechanism.

A detent 55 is arranged to engage grooves 57 on the shaft 59 to insure that the shaft will be moved to and retained in adjusting relation with respect to a selected dial 53 during the process of setting the same.

A collar 61 pinned to the shaft 59 which engages a frame member to be described, limits a longitudinal motion thereof in one direction

while a collar 63 which engages a similar frame member limits longitudinal motion of the shaft in the opposite direction.

A push button 65 shown in Figure 1 is the operator of a manually operated emergency release device later to be explained.

Referring to Figure 3 a slotted coupling 67 is adapted to receive a meter shaft 69 so that the rotation of the latter during operation may be transmitted through shaft 70 to the worm 71. This shaft is extended beyond the worm 71 and carries a pin 73 which forms the driving portion of the connection between the predetermining mechanism and the mechanisms of register 45. A knurled friction wheel 75 is fixed to the shaft 70 and is adapted to cooperate with one or the other of teeth 77 on a double armed lever 79 which is pivoted at 81 on a fixed portion of the frame 83 of the predetermining mechanism. A spring 85 is connected at one end to a lever 79 and at its other end to a fixed portion 87 of the frame and urges one of the teeth 77 into engagement with the knurled wheel 75.

The element 75 cooperating with one or the other of the teeth 77, depending upon whether the bar 39 is assembled in the unit for right or left hand operation, is held against rotation in either direction until the load exceeds a predetermined magnitude. It is not desired to positively prevent rotation since this might result in damage to the mechanism in the event engagement of the parts is effected during the operation of the driving mechanism as might occur in the two stage mechanism to be described.

However, it is desired to hold the shaft against rotation in a reverse direction by torques below a predetermined magnitude since it has been found that the operation of resetting the indicators of mechanism 45 produces a limited torque on the shaft 70 tending to rotate the shaft reversely. Such rotation is possible due to lost motion in the connection 87 and in the parts of the driving mechanism and if the rotation is not prevented, the backlash or lost motion in gears 71, 89, 91 and 95 would be taken up in a reverse direction with the result that on the next operation of the apparatus the driving means, which we will assume is a meter, must rotate an amount sufficient to again take up the backlash and lost motion in the driving train leading to cam 99 before the latter will turn, and under such circumstances an amount of liquid greater than that recorded on the indicators 53 would be delivered. By maintaining the shaft 70 against backward rotation such over-delivery is prevented.

The worm 71 (Figures 3 and 5) drives the worm wheel 89 which is mounted for rotation upon a stud 91 carried by the frame 83 and has fixed to it a spur gear 93 which drives a spur gear 95. The latter is connected to a shouldered bushing 97 upon which is mounted a power cam 99 and a Geneva mutilated transfer gear 103. The cam is provided with a notch 101, the purpose of which will be later described, and is further formed integrally with a part 102 of the gear 103. The second portion 104 of the gear is attached to the first portion by means of rivets or any other suitable fastening.

Bushing 97 is mounted for free rotation upon shaft 59 and is held in spaced relation with respect to the bearing post of frame 83 (Figure 7) by means of a spacer 98.

The gear 103 is adapted to drive a transfer pinion 105 which is rotatably mounted on a shaft 109 fixed to the frame 83, and the gear is in

turn meshed with a gear 107 (Figures 7 and 8) which is rotatably mounted on one end of a bushing 106 which is mounted for free rotation on shaft 59.

Indicator dial 53 is recessed at 108 to receive a ratchet 110 which carries an axial flange in which the ratchet teeth are formed.

The portion 112 of the gear 103 which is formed integrally with cam 109 is cut away to receive a pawl 114 which is rotated in a counter-clockwise direction by a spring 116. The portion 118 of the gear 103 formed separately of the cam is adapted to overlap the pawl and spring just described to hold them in position. Rivets or other suitable fastenings are provided to hold the ratchet 110 and part 118 in position on the dial and cam to form a single unit of all of the parts just described and this unit is fixed upon the bushing 106 with the pawl 114 extending through a notch 120 in said bushing to engage the shaft 59.

A groove 122 is formed in shaft 59 and is adapted to be positioned for engagement with a pawl 114 of one of the dial units upon movement of shaft 59 axially to stations determined by the detent 55 and grooves 57 or the collars 61 and 63 and their cooperating frame members 83.

The gear 107 is provided with pawls 124 pivoted thereon and urged toward the periphery thereof by springs 126. The pawls are adapted for engagement with the teeth of ratchet 110 and are arranged to transmit clockwise rotation (Figure 8) to the dial unit at the same time the pawls will permit clockwise rotation of the dial unit under action of shaft 59, groove 122 and pawl 114 relative to gear 107 to permit setting of the dials and cams to a selected position.

The dial units incorporating cams 113 and 115 are constructed in a manner similar to that of cam 109 just described. The ratio of the transfer gearing is ten to one so that the right hand indicator dial 53 will indicate units, the intermediate dial will indicate tens and the left hand dial will indicate hundreds. It is obvious that any ratio of gearing and any number of dials may be used, if desired, and applicant accordingly does not desire to be held solely to that disclosed.

A ball 117 is mounted for rocking motion about a fixed shaft 119 which is supported in the frame 83. The ball extends longitudinally of the shaft 119 into position adjacent cams 109, 113 and 115 and is provided with projections 121, 123 and 125 which are adapted respectively to cooperate with notches formed in said cams.

The ball has fixed thereto at the end adjacent cam 109, a headed pin 127. A lever 129 is slotted at one end as shown at 131 to permit longitudinal motion thereof and is mounted with its slotted end upon a pivot screw 133 which is attached to a fixed portion of the frame 83. The lever is off-set as shown in Figure 5 and is provided with a projection 135 which lies in the plane of the cam 99 and is adapted under certain conditions to enter the notch 101 thereof. The lever is also provided with a recess 137 which is adapted to be received between the upright arm of ball 117 and the head of the pin 127.

A spring 139 (Figure 3) is hooked about shaft 119 and engages an opening 141 in said lever 129. The spring serves to urge lever 129 as viewed in Figure 3 toward its extreme right hand position so that the recess 137 will occupy the groove between the headed pin 127 and ball 117 and so that the lever will tend to follow any clockwise

motion of the ball 117 and will thus be brought into yielding engagement with the cam 99, that is, the lever 129 will yield in the direction of its axis in the event the surface of the cam is slightly irregular.

A bent-over ear 143 (Figures 3 and 5) is formed on the lever and a stop 145 is inserted in a threaded opening in said ear and is retained in place by a jam nut 147. This stop is adjustable by loosening the nut 147 and rotating the screw with respect to the ear 143.

A stop plate 149 is fixed by means of cap screws 151 to a fixed portion of the frame 83 and is provided with an upturn stop flange 153. An opening 155 is formed in the bottom portion of said plate to receive the shank 157 of bifurcated member 159. The shank fits freely in the opening 155 and is positioned above the stop 145 and is adapted to be raised thereby.

The control bar 39 is provided with a notch 161 which is adapted to receive stop flange 153 when the valve 15 is in its open position. The control bar lies in the slot of the bifurcated member 159, is adapted to slide back and forth therein and carries a stud 163 projecting horizontally therefrom which is adapted to engage one of the arms 79 of the friction mechanism to retain tooth 77 out of engagement with the knurled wheel 75 while the control bar is in its farthest right hand position as viewed in Figures 1, 2 and 5.

The emergency release mechanism shown in Figure 4 comprises a bell crank lever 165. One arm of the bell crank 167 projects underneath and transversely of the control bar 39 while the other arm 169 extends downwardly and is formed with a substantially vertical open ended slot 171 which is arranged to receive the pin 173 mounted on the stem 175 to which the emergency release push button 65 is attached. A spring 177 is attached at one end to a loop formed on said pin 173 and at the other end to a pin 179 which is fixed in the frame 83.

As viewed in Figure 4, the spring 177 tends to maintain a push button and its associated stem in the outermost or left hand position and maintains the arm 167 of the bell crank out of contact with the control bar 39. However, pressure exerted on said push button will result in arm 167 being rotated counter-clockwise about the pivot 181 until contact is established with control bar 39, whereupon the latter will be lifted and its notch 161 will be disengaged from the flange 153.

In Figures 1 and 3 is shown a plate 183 having sight openings therein which is mounted on the frame 83 in position to mask the indicator dials 53 and their accompanying elements. The sight openings in the plate 183 are so positioned that the indicia of the indicator dials 53 which are displayed in front of the sight openings will disclose the number of steps intervening between the position of notches in the predetermining cams and zero position of the notches, that is, the indicia on the indicators will disclose the setting of the predetermining cams. An opening 185 is formed in said housing 35 opposite said plate 183 and a piece of glass 187 is held in position in front of said opening by means of a spring frame 189 which is attached to be confined at its ends in grooves 191 so that it will exert a pressure against the piece of glass to hold it in place in the housing 35. A gasket 190 of cork or other suitable material is interposed between said piece of glass and the housing so as to form a seal to exclude moisture from the housing.

Operation

In operating the structure just described, the attendant will shift the knob 51 longitudinally to engage the dials 53 in succession and will rotate said knob to adjust said indicator dials 53, individually, to positions indicating the quantity desired to be delivered. Since the gears 107 are held by the meter, the ratchet 110 and pawls 124 will become disengaged to permit rotation of the dials.

Since each indicator dial 53 is attached to a cam 109, 113 or 115, the cam will be rotated away from its normal position in which the notch therein is in alignment with the projection on the bail 117, to a degree indicated by the numeral which appears in the sight opening in the plate 183.

In other words, if a dial indicates the numeral 5, a motion of the cam corresponding with the dial will be displaced substantially 180 degrees from the projection on the bail 117 which cooperates with the cam. The trailing wall of the notch is formed so that if the cam is rotated by means of shaft 59, it will cam the corresponding follower and the bail 117 in a counter-clockwise direction as viewed in Figure 3.

The connection formed between the bail and the lever 129 by the headed pin 127 causes the lever 129 to be displaced toward the left (Figure 3) by said counter-clockwise rotation of the bail to disengage the projection 135 from the cam 99, although this operation is resisted by spring 139. The parts will then assume the position in Figure 3 in which lever 129 is rotated to its farthest clockwise position by means of spring 139 acting thereon and in which the bifurcated member 159 will rest upon the stop plate 153. This permits the control bar 39 to pivot in a counter-clockwise direction about pin 29 so that it will rest under the action of gravity upon the flange 153.

The operator will, either before or after the sequence of operations just described, reset or perform such other operations as are necessary to condition the register 45 for an operation. He will thereupon depress the valve lever 21 to open the valve. Upon vertical displacement of the valve stem, the links 23 and 25 will approach axially aligned positions with the result that the control bar 39 will be displaced toward the valve 15 which is to the right in Figures 1, 2 and 5 until the notch 161 engages the flange 153. As the control bar is moved, stud 163 engages arm 79 and swings it in a clockwise direction (Figure 2) against the action of spring 85 to release tooth 77 from the knurled wheel 75.

If pressure on the valve lever 21 is released, the control bar and associated valve parts will be held in the operated position by the notch and flange above referred to against the pressure exerted by the valve spring which tends to shut the valve and consequently tends to displace the control bar in a left hand direction. Opening of the valve will result in operation of the meter 11 and the shaft 70 together with worm 71. Motion of the meter will also be transmitted to register 45 by means of the pin connection 73. The motion is transmitted from worm 71 through worm gear 89, spur gears 93 and 95 to bushing 97 and cam 99 and through the transfer and ratchet mechanisms connected with dials 53 to the various cams 109, 113 and 115.

As this operation continues, cams 109, 113 and 115 will again approach their normal positions

in the clockwise direction as indicated by the arrow in Figure 5 and the followers 121, 123 and 125 on ball 117. The cams 109 and 113 being faster than the cam 115 control of the ball will rest upon the cam 115 until the notch in this cam becomes aligned with the follower 125 of the ball whereupon control of the ball will be transferred to the cam 113.

Similarly, since the cam 109 is faster than the cam 113, control of the ball will be transferred to cam 109 when the follower 123 comes into alignment with the notch in cam 113. When the notch in cam 109, thereafter, comes into alignment with the follower 121, the bail 117 will be free to rotate in the clockwise direction about shaft 119 under the action of spring 139 and lever 129.

Under the same condition of operation, the lever 129 will be urged by spring 139 into a position with its projection 135 in engagement with a cam 99 so that when notch 161 in this cam engages the projection 135, the lever will be caused to pivot in a counter-clockwise direction (Figures 3 and 5) about pin 133 and stop 145 will engage the shank 157 and lift the bifurcated member 159 from its position of rest on the stop plate. This motion of the bifurcated member causes a clockwise rotation of the control bar 39 about pin 29 (Figure 1) and effects the release of notch 161 from the stop flange 153 to permit a leftward motion of the stop bar 39 (Figure 1) under the action of the valve spring, not shown. Thus, it will be seen a power mechanism was provided which will disengage the retaining means of the stop mechanism when the predetermined quantity has been dispensed.

It is obvious that the notch 161 in cam 99 will occupy the same angular position at the end of each operation since the time interval between the engagement of projection 135 in the notch and the closing of the valve will be substantially the same each time. It follows that the notch will occupy the same position at the end of a dispensing operation that it did at the start of that operation and thus only exact multiples of the quantity represented by a complete revolution of the cam will be dispensed. We will assume that this is one gallon although it may be any predetermined multiple or fraction thereof.

The final transfer of motion to cam 109 may occur at any point in the path of notch 161 after it has accomplished its penultimate passage of projection 135 and its ultimate passage of its final position. In practice the transfer mechanism is constructed and arranged to function shortly after said ultimate passage and consequently the notches in cams 109, 113 and 115 will be aligned and projection 135 will ride on the surface of cam 99 during the greater portion of its final revolution.

When the notch 161 reaches the projection 135 in this revolution, it will engage the same and actuate it to terminate the dispensing operation and when this is done the cam notch will occupy its original or starting position.

It is true that the indicators will read zero during the delivery of most of the final gallon but this does not affect the accuracy of the delivery. They will remain in the zero position until they are set again because no transfer occurs after projection 135 is actuated.

The indicators 53 will retrograde until at the time of release of the stop mechanism, they will indicate zeros in all positions. Should it be

necessary to terminate the dispensing operation before this is accomplished by the stop mechanism just described, the operator may displace the push button 85 inwardly to cause a counter-clockwise rotation of the bell crank 165 (Figure 4) which in turn will cause control bar 39 to rotate in a clockwise direction (Figure 1) and disengage notch 161 from the stop flange 153 to permit a leftward motion of the bar under action of the valve spring and to permit consequent closure of the valve and cessation of dispensing operation.

It will be noted that the lever 79 is formed symmetrically about the central axis through the pin 81 and is formed with two teeth 77. This is for the purpose of permitting the control bar 39 to be disposed in the predeterminer housing with the connecting lug 41 in either right or left hand positions so that the valve 15 may be mounted either to right or left of the predetermining mechanism without necessitating the rotation of the predetermining mechanism 180 degrees. When the lug 41 is disposed to the left of the predetermining mechanism as shown in Figure 2, the stud 163 will be disposed on the right hand side of lever 79 and the spring 85 will be connected to the left hand arm of lever 79 so that as the bar 39 moves to the left in opening the valve, the stud 163 will engage the right hand arm of the lever 79 to release the knurled wheel 75.

Two stage mechanism

It is, at times, desirable to stop the flow of liquid to the dispensing system in a series of stages. This is especially valuable when dispensing lines reach diameters of three inches or more.

A modified form of stop mechanism is shown in Figure 6 which is adapted to accomplish this result. In this view, shaft 185 drives the worm 189, worm wheel 191 and the spur gears 193 and 195 and transmit rotation to cam 197. In this case, however, cam 197 bears an indicator dial 199 which is fixed to move with it. The internal construction of the cam and indicator dial assembly is the same as shown in Figure 8. Further, the control assembly will be the same as that shown in Figure 7 except that the first cam unit will be replaced by a unit such as that shown in Figure 8 and the collar 63 will be omitted to permit shaft 59 to move far enough to the right to engage groove 122 with pawl 114 of the lowest order dial. An extra groove 57 may be provided in shaft 59 to take the place of the collar 63.

A cam 201 having two notches, 203 and 205, occupies the tens position and has attached to it a number wheel. The angular spacing of the notches determines the number of transfers between the units order and the tens order which occur before the final operation of the control bar and hence controls the number of gallons delivered at the slow rate of flow.

To describe this construction in a different manner, it will be understood that one revolution of the units cam 197 will effect one transfer and will move the tens cam one tenth of a revolution. If then we assume that the notch 205 was in position before the projections on balls 217 and 235 and that notch 105 is in advance of notch 203 by the amount which the cam is moved during a transfer, then one revolution of cam 197 will, in effecting one transfer, move notch 205 out of alignment with the projections on the

balls and will position notch 203 in alignment therewith. If then one revolution of cam 197 represents the delivery of ten gallons, there will be ten gallons delivered at the slow rate of delivery.

However, the notches may be so spaced that it will require from one to nine transfers to bring notch 203 into operation after notch 205 has been positioned. This means that if one revolution of cam 197 represents ten gallons, any amount from 10 to 90 gallons may be delivered at the slow rate, depending upon the formation of cam 201.

Cams 207 and 209 are also mounted for loose rotation upon the shaft 59 and are provided with notches 213 and 215, respectively, and with numeral wheels.

The ball 217 is mounted for rotation about the shaft 219 and is provided with headed pin 221. A lever 223 is pivoted on a pin 225 which passes through an axially elongated slot 227 in the lever so as to permit axial and rotative movement of the lever. At the end of the lever opposite the slotted end, a projection 229 is provided which is adapted to follow on the cam 197.

A recess 231 is formed below the projection and the edge of the lever forming the outline of the recess is adapted to engage in the recess formed by the ball 217 and the headed pin 221. A spring 233 connects the lever 223 with shaft 219 so as to bias the lever and its projection 229 toward a position in engagement with cam 197.

Contact between pin 221 and the edge of the lever transmits the pressure of the spring to the ball and urges it to rotate in a clockwise direction about shaft 219 into a position in engagement with the cams. A second ball 235 is mounted for rotation on shaft 219 and lies within the sides of the ball 217. The ball 235 is provided with follower projections similar to and underlying those on ball 217 and are adapted to engage the notches in the cams 201, 207 and 209 as they come into alignment with them.

A lever 237 is fixed to said ball 235 and carries a bent-over ear 239 which lies under the control bar 241. An adjustable stop 243 is threadably engaged with said ear and serves as a tappet which is adapted to engage the control bar. A spring 245 engages the arm 237 and a shaft 247 and biases said arm toward the position in which the tappet will engage bar 241.

Notches 249 and 251 of successively greater depths are formed in the lower side of said control bar 241 and are adapted to successively engage the flange 253 on the stop plate 255 which is fixed to the stationary frame member.

A yoke 257 is mounted for vertical motion in said member 255 and embraces the control bar 241. A depending stem on said yoke passes through said member 255 and is positioned to be contacted by a stop 259 which is threaded through an opening in a bent-over ear 261 of lever 223. The emergency release mechanism disclosed in Figure 4 may be used in conjunction with the stop mechanism just described.

Operation

Upon depression of the valve lever 21, the control bar 241 will be moved to the right in Figure 6 until the notch 251 engages the stop flange 253. Thereafter, the weight of the ball will maintain the parts in engaged position and when pressure on the lever 21 is released, the valve spring will force one edge of the notch in engagement when one side of the flange 253. This

operation is performed, of course, after the desired setting has been made on the cams 197, 201, 207 and 209 as indicated by the associated indicator dials.

5 Upon opening of the valve the shaft 185 will be rotated by the meter to transmit motion through gears 189, 191, 193 and 195 to the cam 197 and dial 199.

10 The described intermittent transfer mechanism transmits motion from cam 197 to adjacent cam 201 and similar transfer mechanisms transmit motion between adjacent pairs of cams 201, 207 and 209. As the desired quantity is discharged, cams 209, 207 and a notch 205 of cam 201 approach alignment with the followers on the bails 217 and 235, while the indicator dials approach zero indicating positions.

15 Upon alignment of said notches, a clockwise rotation of a bail 217 is effected by spring 233 and a similar rotation of bail 235 is effected by spring 245. This motion of bail 217 permits engagement of the projecting element 229 of lever 223 with cam 197 and as the notch in this cam comes into alignment with projection 229, the lever 223 is given a counter-clockwise rotation (Figure 6) by cam 197. This motion is transmitted to yoke 257 which in turn gives the bar 241 a clockwise rotation about pivot 29 (Figure 1) and this disengages notch 251 and stop flange 253 to permit a leftward motion of bar 241 under the action of the valve spring which motion will bring a shoulder of notch 249 into contact with the stop flange 253 and the bar 241 will be arrested before it reaches its home position so that the valve will be maintained partially opened. The dwell portion 253 of cam 201 intermediate notches 203 and 205 will permit continued engagement of cam 197 and follower 229 but since the axial motion of the follower toward the cam 197 is limited by the bail 217 by reason of the engagement of lever 223 with pin 221 on the bail, the amplitude of the actuation imparted to the follower by cam 197 is limited to that which is only sufficient to move notch 251 out of engagement with flange 253. Consequently, further actuations of the follower by the cam, being of the same amplitude, do not affect or operate the bar 241.

20 However, one or more additional transfers of motion from cam 197 to the cam 201 depending upon the angular distance between notches 203 and 205 will bring notch 203, which is deeper than notch 205, into alignment with the followers on the bails and consequently a deeper engagement of the projection 229 with cam 197. In the structure shown in Figure 6, three transfers are required, after notch 205 has been occupied by the followers, to bring notch 203 into operative position. Thus, thirty gallons will be delivered at the slow rate of delivery. The amplitude of operation of the follower is substantially increased and this is sufficient to effect a second operation of the yoke 257 so as to release the notch 249 in control bar 241 from the stop flange 253. Such release will permit a full return of said stop bar to its home position under the action of the valve spring and will permit complete closure of the valve.

25 The brake mechanism shown in Figure 2 is used with this modification of the device and it is to be noted that the brake becomes effective at the time of the motion of bar 241 from its fully open to its intermediate position. This fact is believed self-evident from a comparison of Figures 2 and 6. From Figure 2 it is plain

that the brake is not rendered ineffective until the latter portion of the valve opening stroke of bar 39, whereas in Figure 6 it is seen that the bar 241 moves a very substantial distance when it moves from its fast flow to its slow flow position.

5 In the event that the setting of the predetermining dials on cams is such that an amount less than the amount of liquid delivered at a slow rate is to be dispensed, it is desirable that the delivery be made at the slow rate of flow which obtains when the notch 249 is seated against the stop flange 253.

10 To accomplish this, it is necessary to prevent the notch 251 from engaging the stop flange 253 when the valve is open. The desired result is accomplished by the bail 235 and its associated arm 237. If the amount to be dispensed is within the range set forth, either notch 203 or 205 of cam 201 or the dwell portion 253 between them will be in alignment with the followers on bails 217 and 235.

15 This permits the bail 235 to assume either its intermediate or its farthest clockwise position under the action of spring 245 with the result that the lever 237 with the tappet 243 is elevated and engages the bar 241. The adjustment of tappet 243 is such that bar 241 will be raised high enough to prevent engagement of the notch 251 and flange 253 as the valve 15 is opened by depressing the lever 21.

20 Consequently when the lever 21 is depressed the valve will be completely open but as soon as pressure on the lever is released, the control bar 241 will return with the lever to a position with a shoulder of notch 249 in contact with the stop flange 253. Thus, it will be seen that delivery of liquid will take place at the slower rate and will be entirely stopped when the final actuation of the follower 229 occurs.

25 It is obvious that changes may be made in the form, construction and arrangement of parts without departing from the spirit of the invention and for this reason applicants do not desire to be limited to the specific forms of device which are disclosed for purposes of illustration but desire protection within the scope of the appended claims.

30 What we claim to be new and desire to protect by Letters Patent of the United States is:

1. In a predetermining stop mechanism, a control element displaceable from a home position to start a cycle of operation, latching means for retaining said element in displaced position, control mechanism for releasing said latching means after a cycle of operation of predetermined length, gearing for driving said control mechanism, brake means associated with said gearing to resist rotation thereof, and means, controlled by said element, for operating said brake means.

2. In a predetermined stop mechanism, a control element displaceable from a home position to start a cycle of operation, latching means for retaining said element in displaced position, control mechanism for releasing said latching means after a cycle of operation of predetermined length, gearing for driving said control mechanism, brake means associated with said gearing to resist rotation thereof, and means, operated by the control element upon displacement thereof, for releasing said brake means.

3. In a predetermined stop mechanism, a control element displaceable from a home position to start a cycle of operation, latching means for retaining said element in displaced position, con-

5 trol means for releasing said latching means after a cycle of operation of predetermined length, gearing for driving said control means, brake means for said gearing comprising a member ro-
 10 tatable with said gearing, a friction member movable to engage said rotatable member, and means on said control element for withdrawing said friction member from engagement with said rotatable member when said element is displaced from

15 4. In a multiple stage predetermining mechanism, a control element, mounting means for supporting said element for displacement in one direction from a normal position to start a cycle of operation, primary and secondary latching means for retaining said element in one or another of a plurality of displaced positions, said mounting means being adapted to support said element for movement to release said latching
 20 means, said secondary latching means being arranged to be engaged as said primary means are released upon one movement of said element and to be released upon another movement, a power driven element, a member mounted for travel in-
 25 to engagement with said power driven element for movement thereby, a power operated control mechanism associated with said member and adapted to regulate the engaging travel thereof, said power driven element and said member being formed and arranged to impart to said mem-
 30 ber, successive movements having amplitudes proportional to the degree of engagement, and means for transmitting the movements of said member to said control element.

35 5. In a multiple stage predetermining mechanism, a control element, means mounting said element for displacement from normal position to start a cycle of operation, primary releasable means for latching said element in one displaced
 40 position, secondary releasable means, operable after release of said primary means, for latching said element in a second displaced position, means for releasing said latching means comprising a power driven element, a member mounted for
 45 travel into engagement with said power driven element, means on said power driven element for imparting successive movements to said member and means operable by said member on each movement thereof for successively releasing said
 50 primary and secondary latching means.

55 6. In a multiple stage predetermining mechanism, a control element, mounting means supporting said element for full or partial displacement from a normal position to start a cycle of operation, latching means for retaining said element in fully displaced position, a power driven
 60 element, a member mounted for travel into engagement with said power driven element, means on said power driven element for moving said member upon engagement thereof with said member, means operated by movement of said member for releasing said latching means, additional
 65 latching means rendered operative, after said release, for retaining said element in partially displaced position, said additional latching means being released upon a subsequent movement of said member.

70 7. In a multiple stage predetermining mechanism, a control element, mounting means supporting said element for displacement in one di-

rection from a normal position to start a cycle of operation, means for latching said element in any of a plurality of displaced positions, said means comprising a stop and abutments of different heights adapted to engage said stop, said mounting means supporting said element for move-
 5 ment in another direction to disengage said abutments and stop, disengaging means comprising a power driven disk, a member mounted for travel into engagement with said disk and connected to
 10 actuate said element in a disengaging direction, means on said disk adapted to move said member through a distance proportional to the degree of engagement of said disk and element, means for controlling the degree of such engagement to
 15 provide successive actuations of said element of magnitudes sufficient to release said abutments in the order of their respective heights.

8. In a multiple stage predetermining mechanism, a control element, means mounting said ele-
 20 ment for displacement from normal position to start a cycle of operation, releasable primary means for latching said element in one displaced position, releasable secondary means, operable after release of said primary means, for latching
 25 said element in a second displaced position, means for releasing said latching means comprising a power driven element, a member mounted for travel into engagement with said power driven element, means on said power driven element for
 30 imparting successive movements to said member, a control mechanism associated with said member for preventing engagement of said member and said power driven element until a predetermined phase in said cycle of operation is reached.

35 9. In a multiple stage predetermining mechanism, a control element, mounting means supporting said element for displacement from a normal position to start a cycle of operation, means for latching said element in any of a plu-
 40 rality of displaced positions, said means comprising a stop and abutments of different heights adapted to engage said stop, means mounting said stop and abutments for relative disengaging movement, disengaging means comprising a power
 45 driven disk, a member mounted for travel into engagement with said disk and connected to effect relative disengaging movement of said stop and abutments, means on said disk adapted to move said member through a distance proportional to
 50 the degree of engagement of said disk and element, means for controlling the degree of such engagement to provide successive relative movements of said stop and abutments of magnitudes sufficient to release said abutments in the order
 55 of their respective heights.

10. In a device of the class described, the combination of a control element mounted for displacement from a home position, a predeterminer mechanism for governing the return of said ele-
 60 ment to home position, means for driving said mechanism, a register drive shaft connected with said driving means, brake means associated with said register drive shaft for resisting rotation thereof, and means associated with said control
 65 element for applying said brake means upon return of said element to home position.

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