

June 26, 1934.

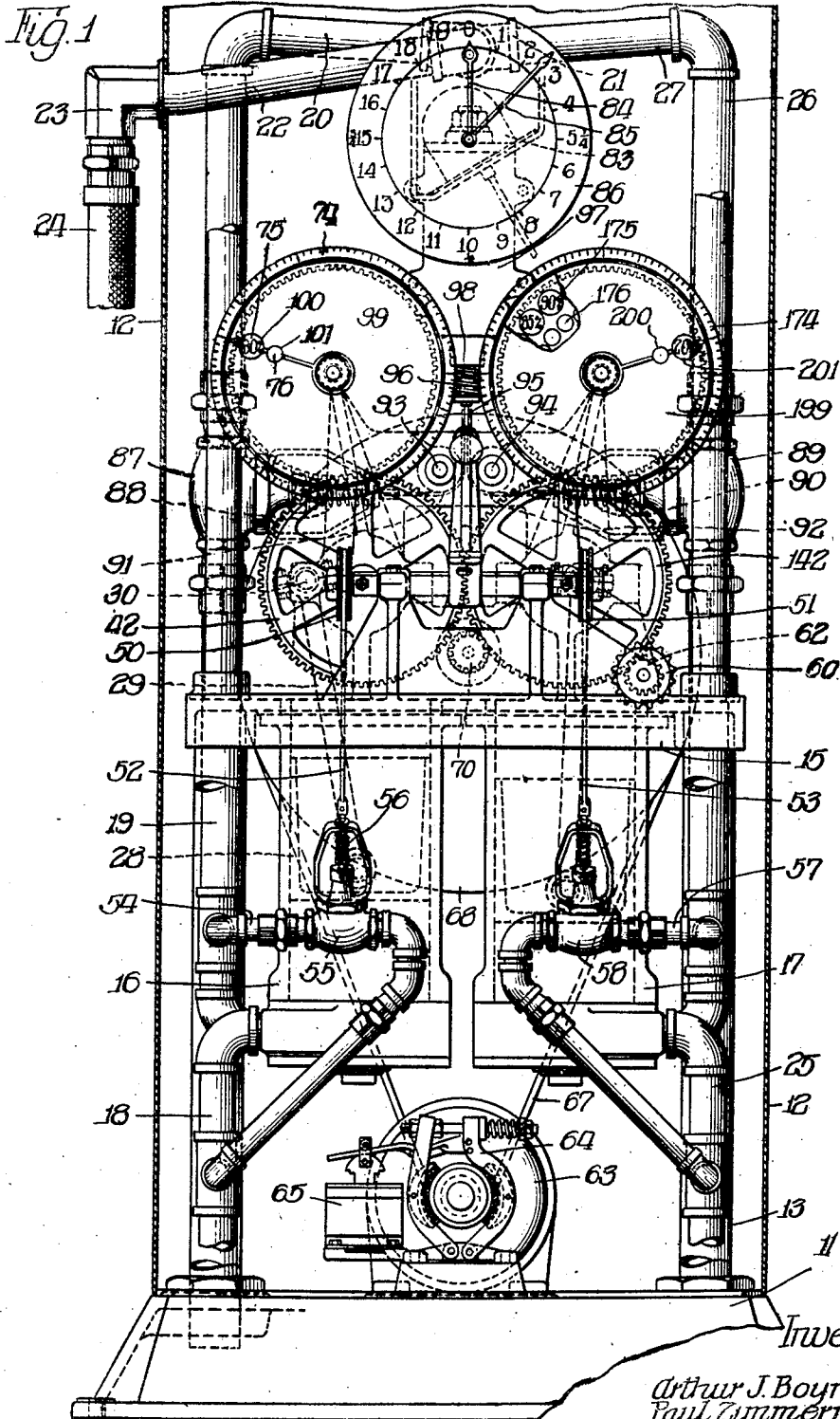
A. J. BOYNTON ET AL

1,964,028

PROPORTIONING PUMP CONSTRUCTION

Filed Nov. 18, 1932

4 Sheets-Sheet 1



Inventors:

Arthur J. Boynton,
Paul Zimmermann,
Clark E. Hague,

By *McKinnon, Hurling, Lym & Knight attys.*

June 26, 1934.

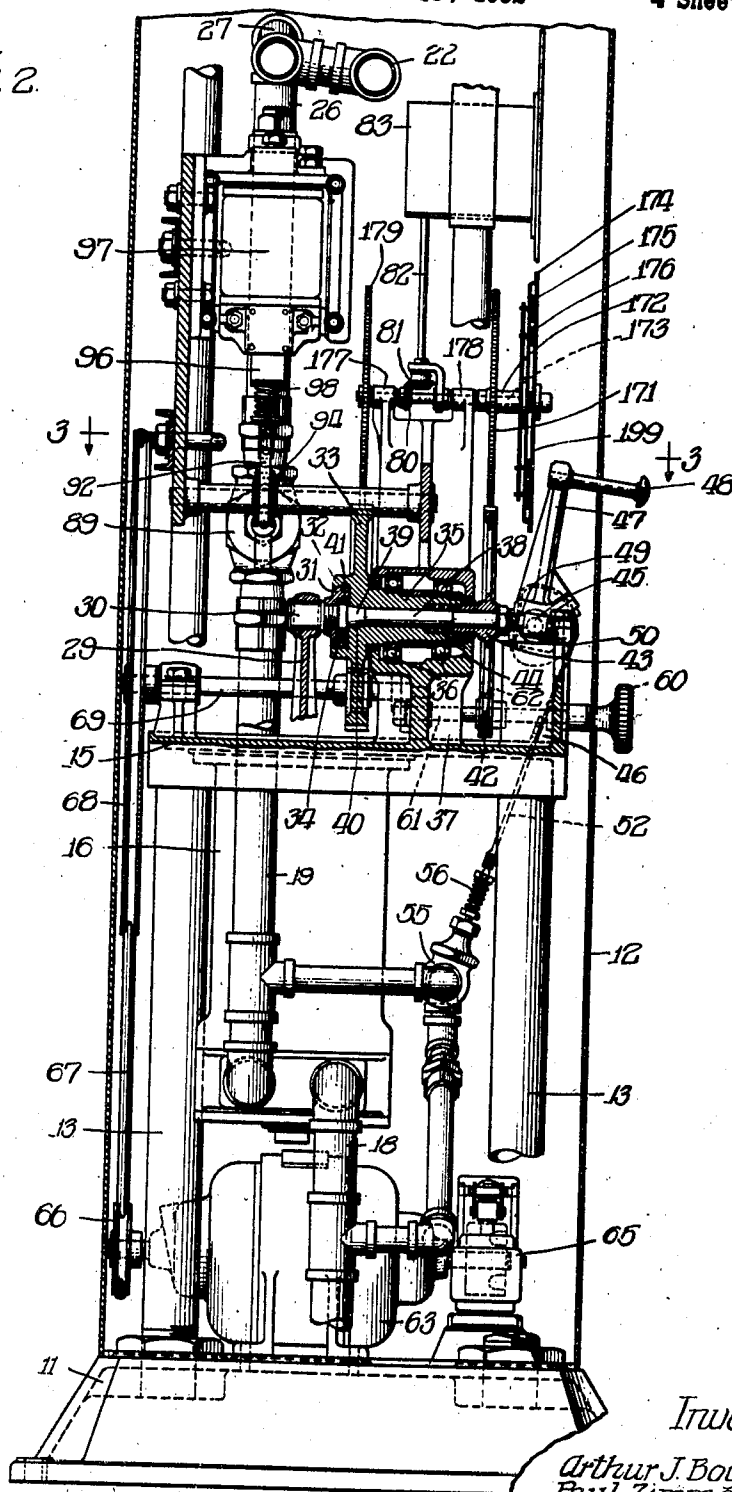
A. J. BOYNTON ET AL
PROPORTIONING PUMP CONSTRUCTION

1,964,028

Filed Nov. 18, 1932

4 Sheets-Sheet 2

Fig. 2.



Inventors:

Arthur J. Boynton,
Paul Zimmermann,
Clark E. Hague,

By *William H. Huxley* *Byron Huxley*

June 26, 1934.

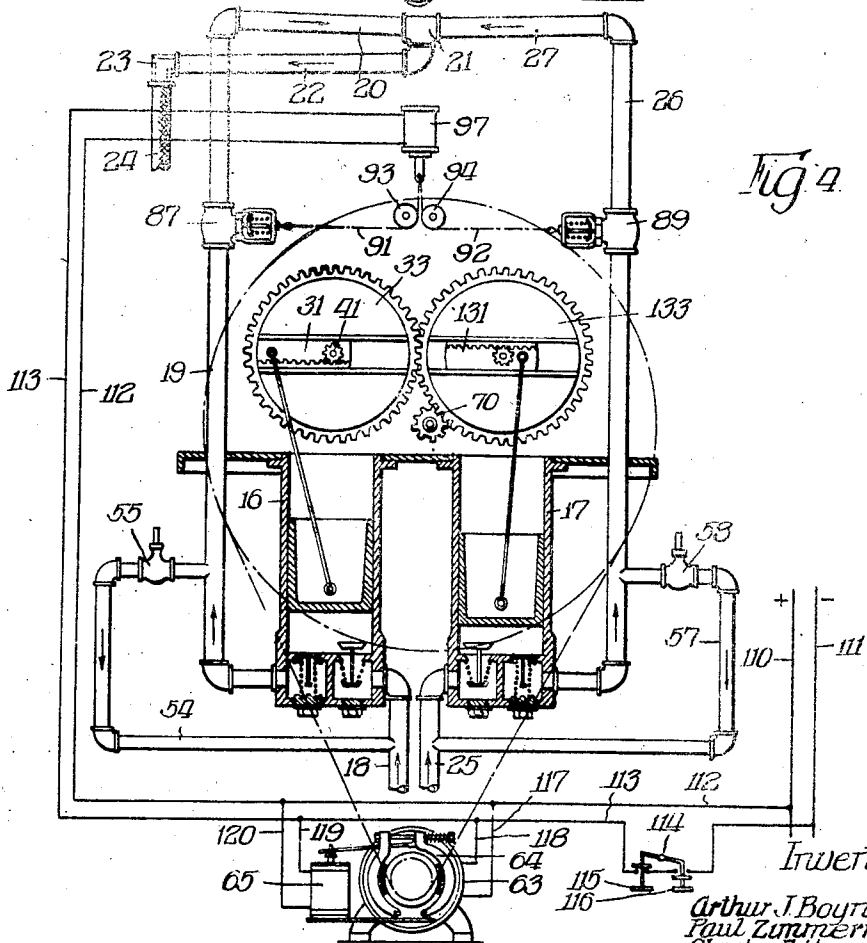
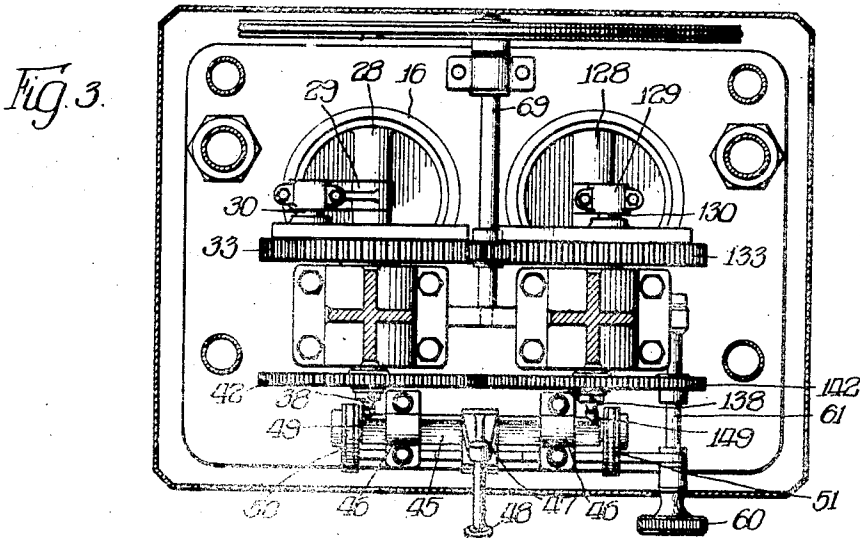
A. J. BOYNTON ET AL

1,964,028

PROPORTIONING PUMP CONSTRUCTION

Filed Nov. 18, 1932

4 Sheets-Sheet 3



Inventors

Arthur J. Boynton,
Paul Zimmermann,
Clark E. Hague.

By William Henry Rogers & Knight

UNITED STATES PATENT OFFICE

1,964,028

PROPORTIONING PUMP CONSTRUCTION

Arthur J. Boynton and Paul Zimmermann, Chicago, Ill., and Clark E. Hague, Cleveland, Ohio, assignors to H. A. Brassert & Company, Chicago, Ill., a corporation of Illinois

Application November 18, 1932, Serial No. 643,173

12 Claims. (Cl. 221-103)

This invention relates to a new and improved proportioning pump construction and more particularly to a pump assembly adapted to measure and deliver proportioned quantities of fluids.

A pump of this character is of use for a number of purposes where proportioned quantities of fluids are desired and where it is desired to change the proportions at will.

One use to which our construction is adapted is in the delivery of motor fluids. A large number of different fuels are available for motor use, the fuels varying in specific gravity, in anti-knock rating, and in cost. In addition certain of the fuels may be furnished with or without the addition of anti-knock compounds. In most gasoline stations it is customary to provide a plurality of pumps, each connected to a tank containing a fuel different from that connected to the others. This plurality of pumps makes the station equipment expensive to install and maintain.

Many motors now in use do not require a fuel of the highest rating for efficient operation but do not operate efficiently on the lower grades available. They will operate efficiently on a fuel of an intermediate rating, which fuel is not ordinarily obtainable. To obtain such a fuel it would be necessary to partly fill the vehicle fuel tank from one pump and then move the vehicle to another pump to supply the remainder of the fuel. Such movement of the vehicle and partial filling of the tank at two or more points is undesirable and causes users to operate with an unnecessarily expensive fuel, since they will not ordinarily go to this extra trouble to secure a suitable and lower priced fuel mixture.

With a proportioning pump constructed according to the present invention, it is possible to deliver to the vehicle tank in a single operation, a fuel mixture of the desired rating. The desired mixture may be defined by a stated proportion of each of two or more fuels, or the user may ask for a mixture of a certain price. The proper proportions of the cheaper and more expensive fuels may be delivered together so that the price per gallon of the mixture is at any desired point between the costs of the two fuels.

It is an object of the present invention to provide a new and improved proportioning pump adapted to selectively deliver predetermined proportions of fluids.

It is an additional object to provide a pump in which the total volume of the several fluid streams may be maintained constant throughout changes in proportions of the streams.

It is a further object to provide a pump in which the several streams are pumped by interconnected drive mechanism whereby the adjusted proportions are maintained constant.

It is also an object to provide a construction in which means are provided for indicating the proportions of the several fluids, the indicating means being so connected as to maintain an indication of the proportions throughout the operation.

It is a further object to provide a construction in which the sum total of the several flows is metered and indicated.

It is an additional object to provide a construction adapted to deliver separate proportioned fluid flows from a single fluid source.

It is also an object to provide a cylinder pump construction in which means are provided for adjusting piston displacement, with a simultaneous related adjustment of the displacement in several pump cylinders.

It is another object to provide a fluid pump construction with a fluid brake to prevent over-run of the pump.

It is a further object to provide a fluid pump construction in which the pistons may be moved in adjusting the piston displacement and in which by-pass means are provided for maintaining the fluid in the system constant during such adjustment.

Other and further objects will appear as the description proceeds.

We have shown certain preferred embodiments of our invention in the accompanying drawings, in which—

Figure 1 is a front elevation of one form of the apparatus, parts being broken away and other parts being shown in section in order to more clearly bring out the construction;

Figure 2 is a view taken from the left of Figure 1, certain parts being broken away and other parts in section;

Figure 3 is a horizontal section taken on line 3-3 of Figure 2;

Figure 4 is a diagrammatic showing of the pumping system together with the electric control circuits;

Figure 5 is a view generally similar to Figure 4 but showing a modified form of construction; and

Figure 6 is a view similar to Figure 5 and showing a further modified form.

Referring first to Figures 1, 2 and 3, the pump assembly comprises a base 11, housing 12, and columns 13 supported by the base and located within the housing for supporting the main por-

tion of the pumping and control mechanism. The columns 13 support a platform 15 below which are secured the pumping cylinders 16 and 17.

The pump cylinder 16 is provided with a suction or intake pipe 18 which is connected to a tank (not shown) located below the pump. The cylinder 16 is also provided with the discharge pipe 19 which goes upwardly within the housing until it joins the downwardly inclined pipe 20 which is connected to the T 21. The discharge pipe 22 for the entire pump assembly leads from the T 21 to the elbow 23 located outside the housing 12, and this elbow is shown as having connected thereto a delivery hose 24 which may be of any usual type.

The pump cylinder 17 is provided with an intake pipe 25 which leads from a tank (not shown) located below the pump, this tank being separate and distinct from that connected to the pumping cylinder 16. The cylinder 17 is also provided with an upwardly extending discharge pipe 26 which connects to the downwardly inclined pipe 27, this pipe in turn connecting to the T fitting 21.

The cylinder 16 is provided with a piston 28 actuated by the piston rod 29, which rod is connected to the crank pin 30. This construction is best shown in Figure 2. The crank pin 30 is carried upon a slide 31 fitted in an undercut guideway 32 carried by the gear wheel 33. The guideway 32 extends across a diameter of the wheel. The slide 31 is provided with an internal rack 34. The wheel 33 is formed integrally with the hub 35 which is carried in bearings 36 upon the standard 37, this standard being carried by the platform 15. The hub 35 has an axial opening extending therethrough into which is fitted a shaft 38. This shaft has a tapered portion 39 fitting against a tapered seat 40 formed in the hub 35. The shaft 38 also carries the pinion 41 which engages the rack 34 formed on the slide 31.

The gear wheel 42 is keyed to the shaft 38 and has a hub 43 which engages a spring 44, which is fitted about the shaft 38 and into a recess formed in the hub 35. The spring 44 is normally under compression and serves to retain the tapered portion 39 of shaft 38 against the seat 40 formed in the hub 35. The cylinder 17 is provided with the piston 128, piston rod 129, crank pin 130 and gear wheel 133, exactly similar to that described in connection with the cylinder 16.

The cross shaft 45 is carried from the platform 15 by the brackets 46. This shaft carries an operating arm 47 having a handle 48 projecting through the housing 12 for manual operation of the arm and shaft. The shaft 45 carries a lug 49 which bears against the end of the shaft 38 and a similar lug 145 bearing against shaft 138. A movement of the shaft 45 in the counterclockwise direction caused by pressing inwardly the handle 48 serves to move the shafts 38 and 138 to the left, as seen in Figure 2, a sufficient distance so that the tapered portion 39 of the shaft and the corresponding portion of shaft 138 are lifted from the tapered seat 40 and the corresponding seat in the gear 133. This permits the shaft 38 to be rotated independently of the hub 35 and gear 33, and shaft 138 to be similarly rotated.

The shaft 45 is also provided with a pair of members 50 and 51, the member 50 being located adjacent the cylinder 16, and member 51 being located adjacent the cylinder 17. Cables 52 and 53 are carried by and extend from these members.

The by-pass pipe 54 connects the discharge pipe 19 of cylinder 16 with the suction or intake

pipe 18 of the same cylinder. The valve 55 is located in pipe 54, this valve being normally held closed by spring 56. An upward pull upon the cable 52 unseats the valve against the resistance of the spring 56. The cylinder 17 is similarly provided with the by-pass pipe 57 connecting the discharge pipe 26 and intake pipe 25. This pipe 57 is provided with the valve 58 similar to valve 55 and operated in the same manner by the cable 53.

The gear 42 associated with the drive mechanism of cylinder 16 meshes with a similar gear 142 associated with the mechanism of the pump cylinder 17. The handle 60 is located on the outer end of the shaft 61, this shaft carrying the gear 62 which meshes with the gear 142. Consequently when handle 48 is pushed inward, both gears 42 and 142 are released for movement independent of their supporting hubs and by turning the handle 60 these gears are simultaneously rotated in opposite directions. Also at this time the by-pass valves for both cylinders are opened. It will be apparent that rotation of the gears 42 and 142 will serve to move the slides carrying the crank pins for the piston rods connected to the two cylinders. These slides will be moved the same distance and in the same direction.

The drive mechanism for the pumps includes an electric motor 63 provided with the brake 64 adapted to be released by the solenoid 65. The motor 63 drives a pulley 66 about which passes a belt 67. This belt 67 also passes about the main drive wheel 68 carried on shaft 69. This shaft 69 carries the drive gear 70 which meshes with the gear 133 associated with cylinder 17, which gear corresponds to and meshes with the gear 33 associated with cylinder 16. Thus by the rotation of shaft 69 and of gear 70 both pumps are simultaneously driven at a uniform speed.

It should be noted that the gear 33 and gear 42 are of the same diameter and are rotated about the same axis at the same speed during the pumping operation. The gears 133 and 142 are similarly operated. The gear 142 meshes with the gear 171 carried by sleeve 172 loosely fitted on shaft 173. The disc 174 is also positively secured to the sleeve 172 and rotates with that sleeve. This disc 174 carries a plurality of indicia 175 and 176. The shaft 173 is carried in the bearings 177 and 178 and at its left end, as shown in Figure 2, is provided with the gear 179 which meshes with the gear 133.

The dial 199 is keyed to shaft 173 and rotates with that shaft. This dial has openings 200 and 201 adapted to register with indicia carried by disc 174. Dials 74 and 99 are similarly driven from gears 33 and 42, openings 100 and 101 exposing indicia 75 and 76.

The gear 179 is keyed to the shaft 173 and rotates with that shaft. The shaft 173 carries the bevel gear 80 which meshes with the bevel gear 81 at the lower end of shaft 82. This shaft 82 extends within the housing 83 where it drives a dial mechanism of usual construction, actuating the pointers 84 and 85 moving over the face of the dial 86.

The discharge pipe 19 is provided with the valve 87 which is normally held closed by the spring 88. The discharge pipe 26 is provided with a similar valve 89 normally held closed by the spring 90. The cables 91 and 92 lead from these two valves around pulleys 93 and 94 and are connected at 95 to the rod 96 which is connected to the plunger of the solenoid 97. The

plunger is normally held depressed by the spring 98.

Figure 4 is a diagrammatic showing of the construction which has been described in connection with Figures 1, 2 and 3, and the parts have been numbered in Figure 4 to correspond to the reference characters given in Figures 1, 2 and 3.

In Figure 4 the electrical wiring necessary for operating the pump has been shown diagrammatically. The power line is indicated by wires 110 and 111. It is connected to the lines 112 and 113 leading to the pump operating mechanism. The double push switch 114 is shown in line 113, this switch having the push buttons 115 and 116. The wires 117 and 118 lead to the motor 63. The wires 119 and 120 lead to the solenoid 65 for releasing the brake 64. The wires 112 and 113 then lead on to the solenoid 97 for opening valves 87 and 89.

Referring next to the form of construction shown in Figure 5, the pump cylinders 16 and 17 are shown with the intake pipes 210 and 211 which lead from pipes 212 and 213 respectively. The pipe 212 leads from a liquid reservoir 214 and includes the rotary pump 215. Similarly pipe 213 leads from liquid reservoir 216, the line being connected through the rotary pump 217. The pipe 212 also leads through pipe 218 to the spring-pressed valve 219. The other side of the valve 219 is connected by means of pipe 220 to the liquid reservoir 214, the end of pipe 220 being located below the liquid level. Similarly pipe 213 leads through pipe 221 through spring-pressed valve 222 to pipe 223, the latter being connected below the liquid in reservoir 216.

The pumps 16 and 17 are provided with the discharge pipes 224 and 225. Pipes 224 and 225 are shown leading through any suitable form of metering devices 226 and 227 to pipes 228 and 229. These pipes 228 and 229 join in the discharge fitting 230 which has a discharge nozzle 231 for discharging together the streams of liquid supplied through the two pipes. The end of pipe 228 is closed by the spring-pressed valve 232 and pipe 229 is similarly closed by the spring-pressed valve 233. The resistance of the springs on these valves is such as to overcome the weight of a column of liquid in the pipes or tubes, but to be overcome in turn by the pressure of the liquid flowing through the pipes when the pumps are in operation. The pump cylinder 16 is further provided with a by-pass pipe 234 controlled by valve 235, this pipe connecting the intake and discharge pipes of the pump cylinder. The other pump cylinder 17 is similarly provided with the by-pass passage 236 controlled by valve 237.

In Figure 6 we have shown a form of construction in which the pump cylinders draw from a common source of supply and discharge separate streams which may be proportioned by the apparatus shown. The pump cylinders 16 and 17 are provided with the common suction passage 240 and with independent discharge passages 241 and 242. These discharge passages are shown as controlled by the valves 243 and 244 respectively, both of which valves are operated by the solenoid 245. The by-pass passages 246 and 247 are provided for the two cylinders, these being controlled by valves 248 and 249.

In the operation of the form of apparatus shown in Figures 1 to 3, the pumps may be jointly set to give any desired proportion of liquid from the two sources of supply. This setting is accomplished by pushing in on lever 48 which releases the conical surface 39 from its seat 40 and cor-

respondingly releases the similar surface in the gear wheel 133. Then by rotating the hand wheel 60, the wheels 42 and 142 are rotated together with the shaft 38 and the corresponding shaft on the wheel 133. This causes the gear 41 to move the rack 34 to move the slide 31 carrying with it the crank pin 30. A similar movement is simultaneously transmitted to the crank pin 130. Thus the rotation of the hand wheel 60 adjusts the crank pins relative to the axes of rotation of the gear wheels carrying the pins. It will be seen that this adjustment of the two pins will be in opposite direction since the two gears 42 and 142 mesh with each other and therefore rotate in opposite directions. The parts are so proportioned that the crank pin may be moved exactly on the axis of the rotating wheel 33 or 133, or may be moved out adjacent the rim of the wheel. With one crank pin on the axis of rotation of its wheel there will be no movement of the piston in the corresponding pump. The other pump will be operated at its full capacity and the flow will be entirely from the latter pump. At any intermediate point of adjustment the flow will be partially from each of the two pumps.

The proportion from each pump is indicated upon the dials 74 and 174 by the percentage which shows through the openings in the superposed dials 99 and 199. The second series of indicia on the dials may carry a price for a mixture of the indicated proportion. It will be understood that the dials 74 and 99 will rotate together during the pumping operation, and similarly the dials 174 and 199 will rotate together. During the adjustment, however, the dials 74 and 174 are rotated while the dials 99 and 199 remain held in stationary position. This will be apparent from a consideration of Figure 2. It will be seen that the gear wheel 179 does not rotate during the adjustment and this gear is keyed to shaft 178 to which also is keyed the front dial 199.

Since the sum of the discharge from the two pumps is always constant, the dial 86 and its indicating hands will indicate the total discharge from the pump assembly. It is not necessary to have more than a single drive to this indicator as it does not indicate the amount pumped by either pump individually, but the total discharge of the joint pumping action.

During the adjustment movement the adjustment of the location of the crank pins will cause some movement of the connecting rods and of the pistons. The amount of movement will, of course, vary depending on where the apparatus has come to rest at the time of the adjustment. In order to permit this adjustment without disturbing the column of liquid in the intake and discharge passages the by-pass passages 54 and 57 have been provided. It will be apparent that while one piston is moving upwardly during the adjustment the other piston will move a corresponding amount downward. When the lever 48 was pressed inwardly this automatically opened the by-pass valves 55 and 57 so that as the pistons were moved during the adjustment, one piston would force some fluid out through the by-pass passage back to the intake passage, while the other piston would draw in fluid from this intake passage. The cylinders will normally be maintained full of liquid at all times, as will the intake and discharge passages. The solenoid operated valves 87 and 89 serve to retain the column of liquid in the discharge passages.

In operating the pump after it has been ad-

justed to deliver the desired proportion of the two fluids, the discharge pipe or hose 24 is located to deliver the desired amount of fluid to whatever receptacle is to receive it. The switch button 116, shown diagrammatically in Figure 4, is then pressed inwardly to close the circuit. This closure of the circuit simultaneously does three different things. It operates the solenoid 97 to open valves 87 and 89, it releases the brake 64 by operating solenoid 65, and it starts the motor 63. The motor 63 drives the two pump cylinders through the pulleys 66 and 68 and their connecting belts 67. The pumps will deliver a flow to the discharge pipes 19 and 26 and this flows downwardly through pipes 20 and 27 to the pipe 22 and thence to the discharge hose 24. The dial 84 may be watched by the operator and when it indicates the desired amount of liquid has been pumped the electric circuit may be opened by pressing button 115. This opening of the electrical circuit stops the motor 63 and releases the brake 64 which prevents over-run of the motor. Breaking the circuit also releases the plunger in solenoid 97 and the valves 87 and 89 are closed. The closing of these valves immediately stops the movement of the column of fluid in the discharge pipes 19 and 26 and the column of fluid itself acts as a hydraulic brake against further pumping movement of the pump pistons.

It will be apparent from the construction of the discharge pipes that at no time does there remain in the pipes a mixture of the two fluids being pumped. Each discharge pipe will maintain the fluid being handled by that pump at a point level with the overflow into the downwardly inclined discharge pipe 20 or 27. Consequently the proportion may be changed at any time without there being any residue of an incorrect mixture in the apparatus.

The operation of the form of apparatus shown in Figure 5 differs from that described in connection with Figures 1 to 4, in that the different fluids extend in the pipes all the way to the discharge fitting 231. The spring-pressed valves 232 and 233 take the place of the solenoid operated valves 87 and 89 to the extent that they close automatically when the pumping is stopped, and are sufficiently strong to maintain a column of liquid in the discharge pipes. Here again, however, the discharge from these pipes will be dependent upon the adjustment of the corresponding pump cylinder so that the adjustment may be changed at any time and the discharge through nozzle 231 will immediately become that of the proportion indicated by the new adjustment.

Another feature of difference in the form of construction shown in Figure 5 lies in the fact that the intake to the two cylinders is designed to operate under a slight pressure, rather than under the suction necessary to lift the liquid to the level of the pump cylinder. Additional rotary or centrifugal pumps are provided which will maintain a continuous column of liquid rising to a level slightly above that of the intake of the pump cylinders. Any excess pumped by the rotary pumps over that withdrawn by the cylinder pumps is by-passed through the valves 219 and 222 back through pipes 220 and 223 to the liquid reservoir. This assists in maintaining an accurate delivery from the two cylinders and avoids any slight losses which might occur due to loss of suction or variation in suction due to leakage.

Figure 6 indicates diagrammatically another use of the proportioning pump of the general design shown in the earlier figures. According to

Figure 6, the proportioning pump may be used to draw liquid from a single reservoir and to deliver proper proportions of it to separate points of discharge. The pumps and the method of proportioning the flow from each are the same as that of the previous forms of construction.

While we have shown certain preferred embodiments of our invention, these are to be understood to be illustrative only as it is capable of further change and variation to meet differing conditions and requirements and we contemplate such changes and modifications as come within the spirit and scope of the appended claims.

We claim:

1. In a reciprocating pump, a pump cylinder, a piston therein, a crank for operating the piston, a rotating member having a radial slideway formed therein, a slide in said slideway, said slide carrying the piston operating crank, a rack on said slide, a bearing for the rotating member, a shaft extending through the axis of the member, and a gear on said shaft meshing with the rack on the slide for adjustment of the slide.
2. In a reciprocating pump, a pump cylinder, a piston therein, a crank for operating the piston, a rotating member having a radial slideway formed therein, a slide in said slideway, said slide carrying the piston operating crank, a rack on said slide, a bearing for the rotating member, a shaft extending through the axis of the member, a gear on said shaft meshing with the rack on the slide for adjustment of the slide, and means for locking the shaft against rotation relative to the rotating member.
3. In a reciprocating pump, a pump cylinder, a piston therein, a crank for operating the piston, a rotating member having a radial slideway formed therein, a slide in said slideway, said slide carrying the piston operating crank, a rack on said slide, a bearing for the rotating member, a shaft extending through the axis of the member, a gear on said shaft meshing with the rack on the slide for adjustment of the slide, a tapered seat in the rotating member, a tapered portion on the shaft, resilient means normally maintaining the tapered shaft portion against the tapered seat whereby the shaft is restrained against rotation relative to the rotating member, and means for moving said tapered portion clear of said tapered seat.
4. In a proportioning pump construction, a plurality of pump and drive assemblies, an indicia bearing dial for each pump assembly, an indicia indicating means for each dial, and means for jointly rotating the indicia bearing dial and the indicia indicating means.
5. In a proportioning pump construction, a plurality of pump and drive assemblies, an indicia bearing dial for each pump assembly, an indicia indicating means for each dial, means for moving the indicia indicating means relative to the dial indicia, and means for jointly rotating the indicia bearing dial and the indicia indicating means.
6. In a proportioning pump construction, a plurality of pump and drive assemblies, an indicia bearing dial for each pump assembly, an indicia indicating means for each dial, means for moving the indicia indicating means relative to the dial indicia, means interlocking the indicia indicating means of the several pump and drive assemblies whereby they are movable jointly in predetermined relation, and means for jointly rotating the indicia bearing dial and the indicia indicating means.

7. In a proportioning pump construction, a plurality of pump and drive assemblies, an indicia bearing dial for each pump assembly, an indicia indicating means for each dial, means for moving the indicia indicating means relative to the dial indicia, means interlocking the indicia indicating means of the several pump and drive assemblies whereby they are movable jointly in predetermined relation, means for jointly rotating the indicia bearing dial and the indicia indicating means of each pump assembly, and means for jointly rotating all the dial assemblies of the several pump assemblies.
8. In a cylinder pump, a pump cylinder, a piston therein, an electric drive for the piston, a discharge pipe from the pump cylinder, a valve in said discharge pipe, a solenoid actuated control for said valve, and a connection between the electric drive and solenoid circuits whereby the valve is opened as the pump is put in operation and is closed when the pump is stopped.
9. In a cylinder pump, a pump cylinder, a piston therein, intake and discharge pipes connected to the pump cylinder, a drive for said piston, means for adjusting the connection of the piston to the drive, a by-pass connection between the intake and discharge pipes, a valve in said by-pass, and valve control means operated by the adjusting means.
10. In a proportioning pump, a plurality of pump assemblies having separate cylinders, pistons and intake and discharge pipes, a valve controlled by-pass between the intake and discharge pipes of each pump assembly, means for jointly adjusting the displacement of the several pistons, means for locking the displacements at the selected adjustment, and means whereby unlocking action of the locking means opens the by-pass valves.
11. In a cylinder pump, a pump cylinder, a piston therein, a discharge pipe for the pump cylinder, a spring seated valve in said discharge pipe, said valve constituting a brake for the pump, a drive for said pump piston, and means whereby the valve is opened when the drive is put in operation.
12. In a proportioning pump, a plurality of pump assemblies having separate cylinders, pistons and intake and discharge pipes, a valve controlled by-pass between the intake and discharge pipes of each pump assembly, yieldable means for normally holding the by-pass valve in closed position, means for jointly adjusting the displacement of the several pistons, means for locking the displacements at the selected adjustment, and means whereby unlocking action of the locking means opens the by-pass valves.
- ARTHUR J. BOYNTON.
PAUL ZIMMERMANN.
CLARK E. HAGUE.

80

85

90

95

100

105

110

115

120

125

130

135

140

145

150