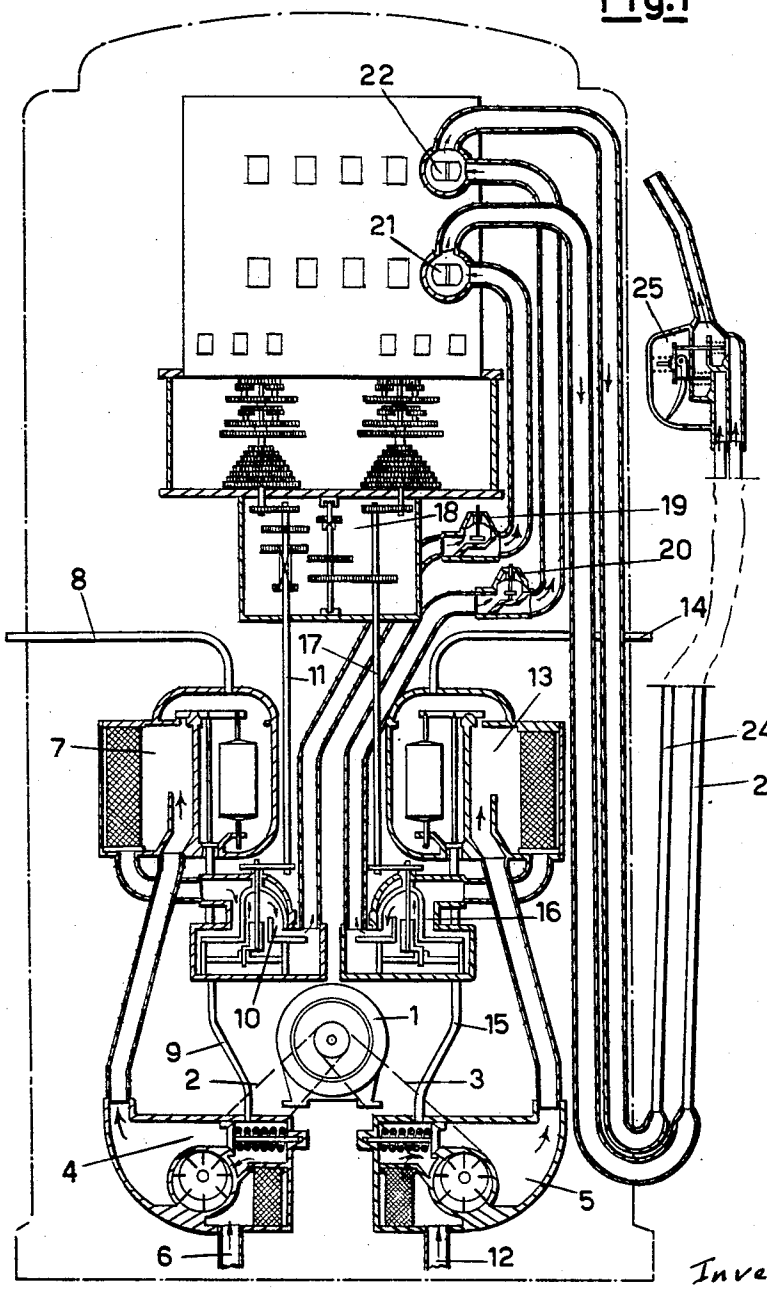
Aug. 22, 1961 S. DANIELE 2,997,209

VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

Filed June 27, 1958 10 Sheets-Sheet 1

Fig.1



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VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

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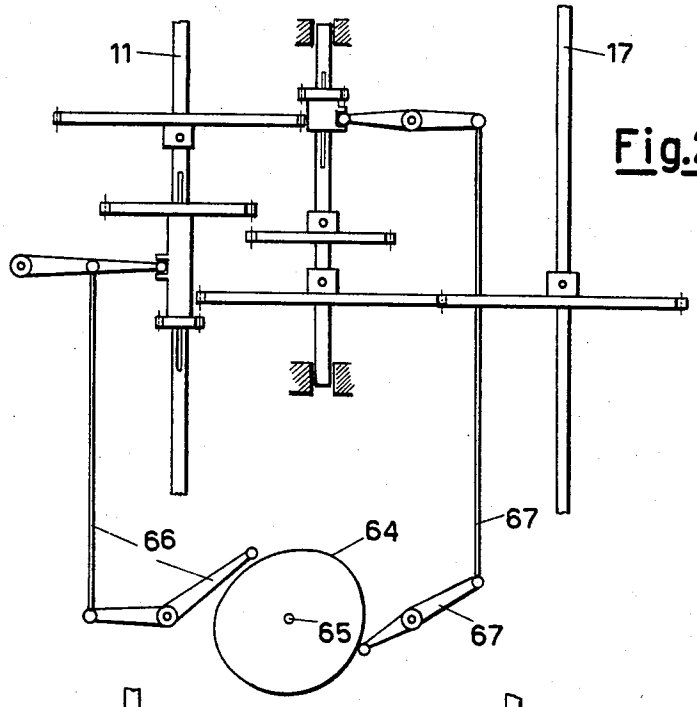

Fig.2

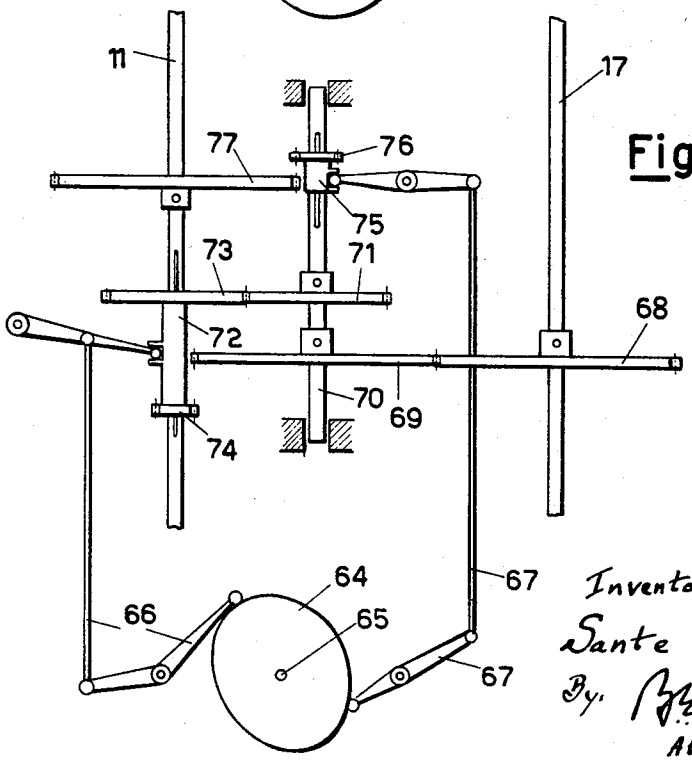

Fig.3

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VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

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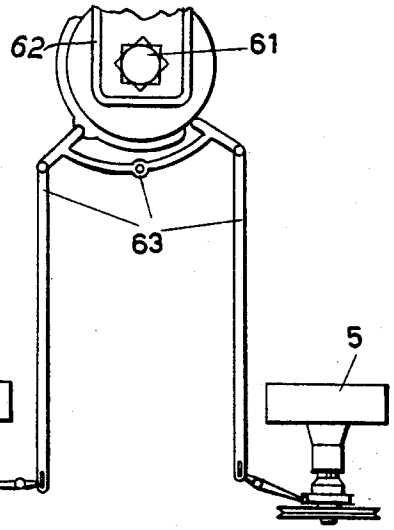

Fig.4

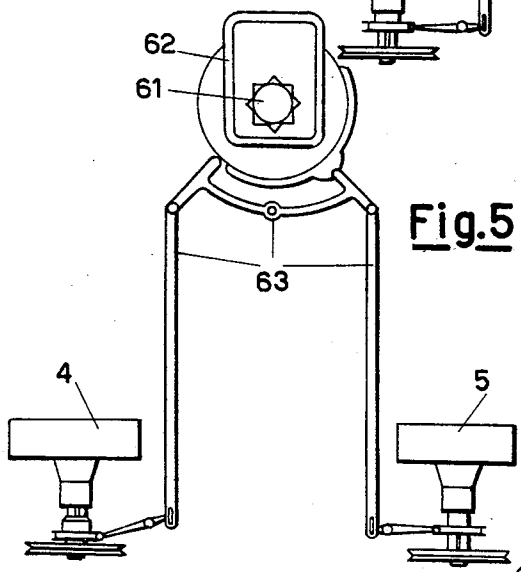

Fig.5

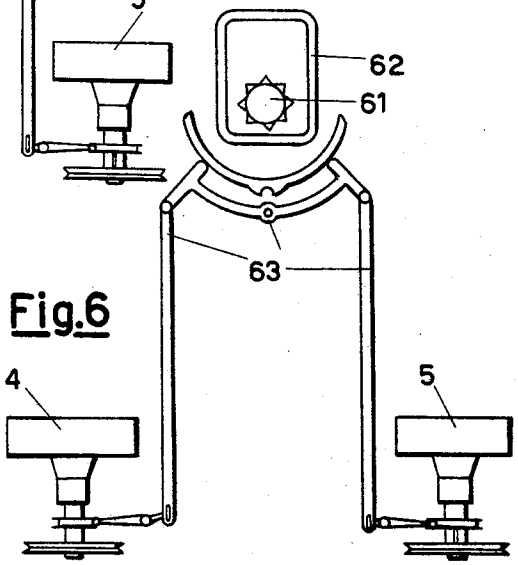

Fig.6

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VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

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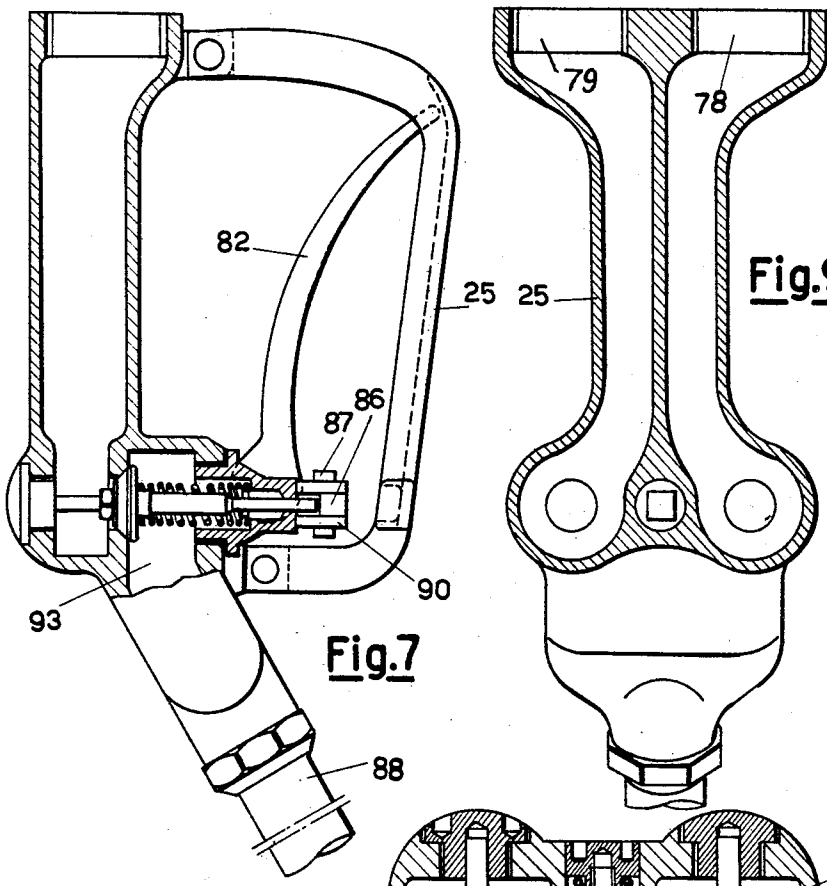

Fig.9

Fig.7

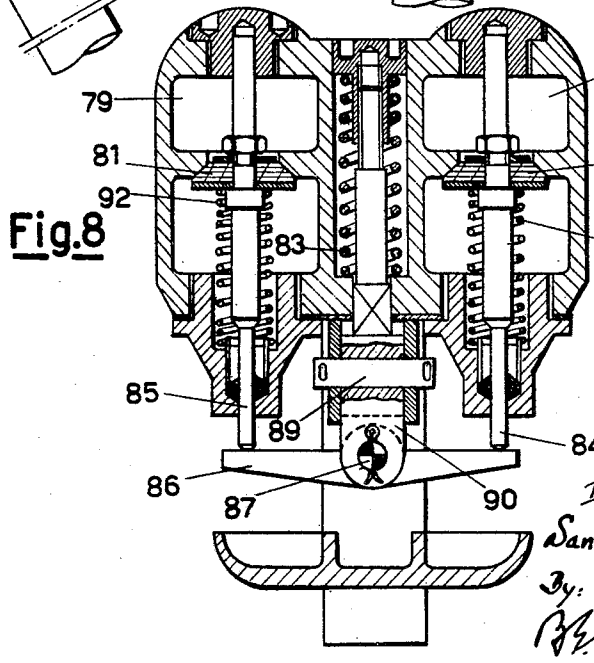

Fig.8

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VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

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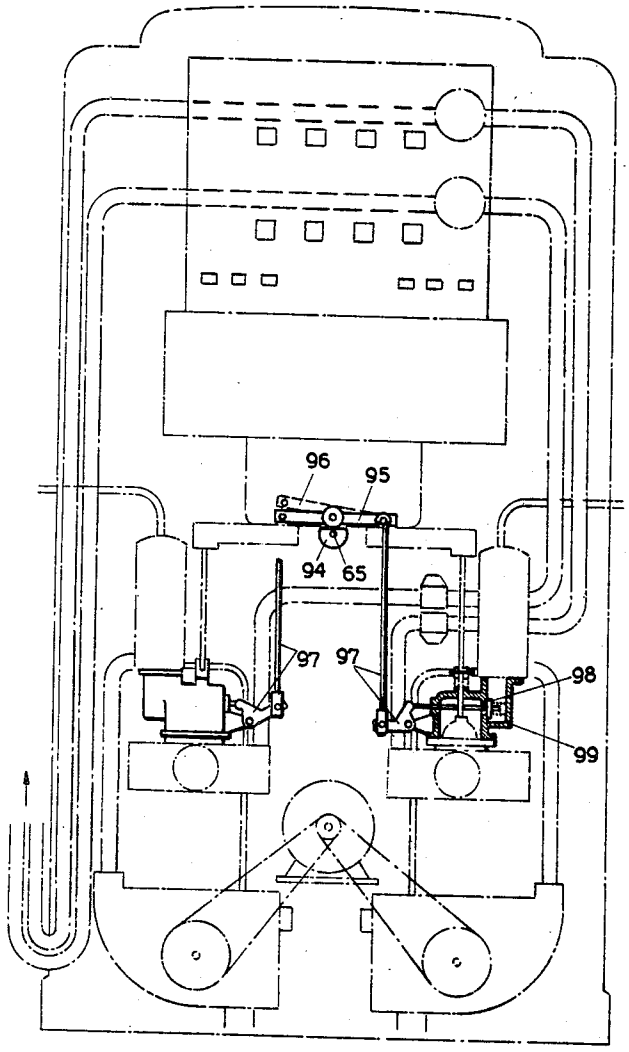
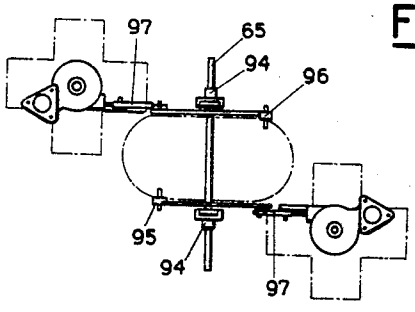


Fig.10



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VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

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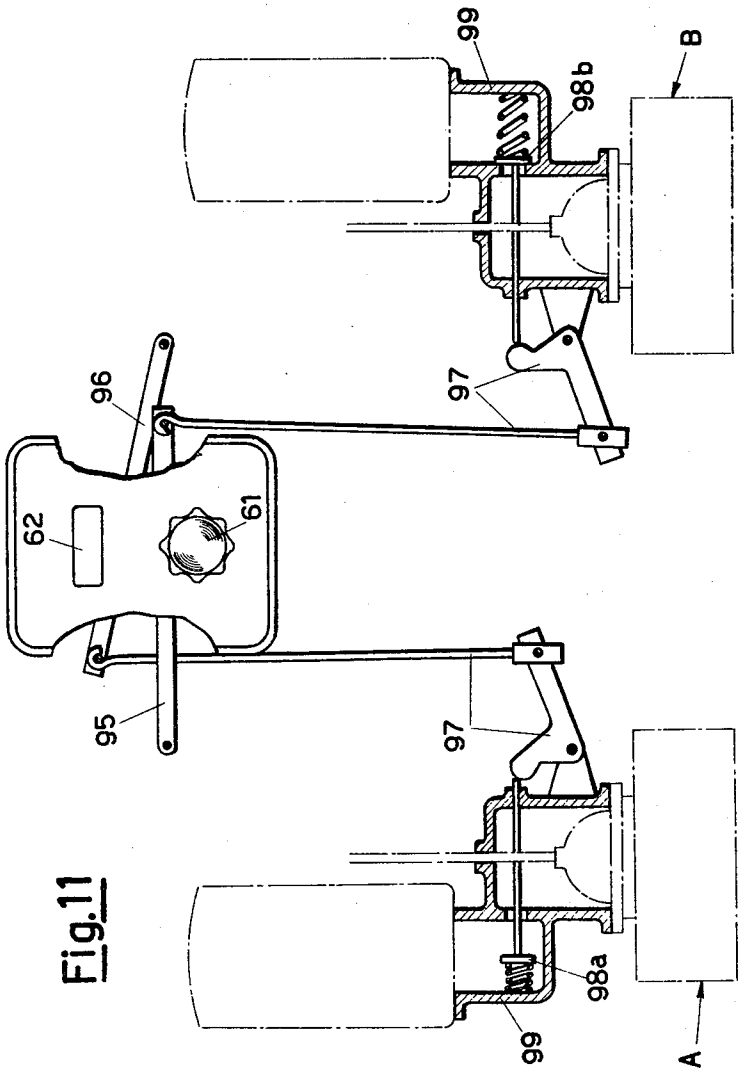

Fig.11

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VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

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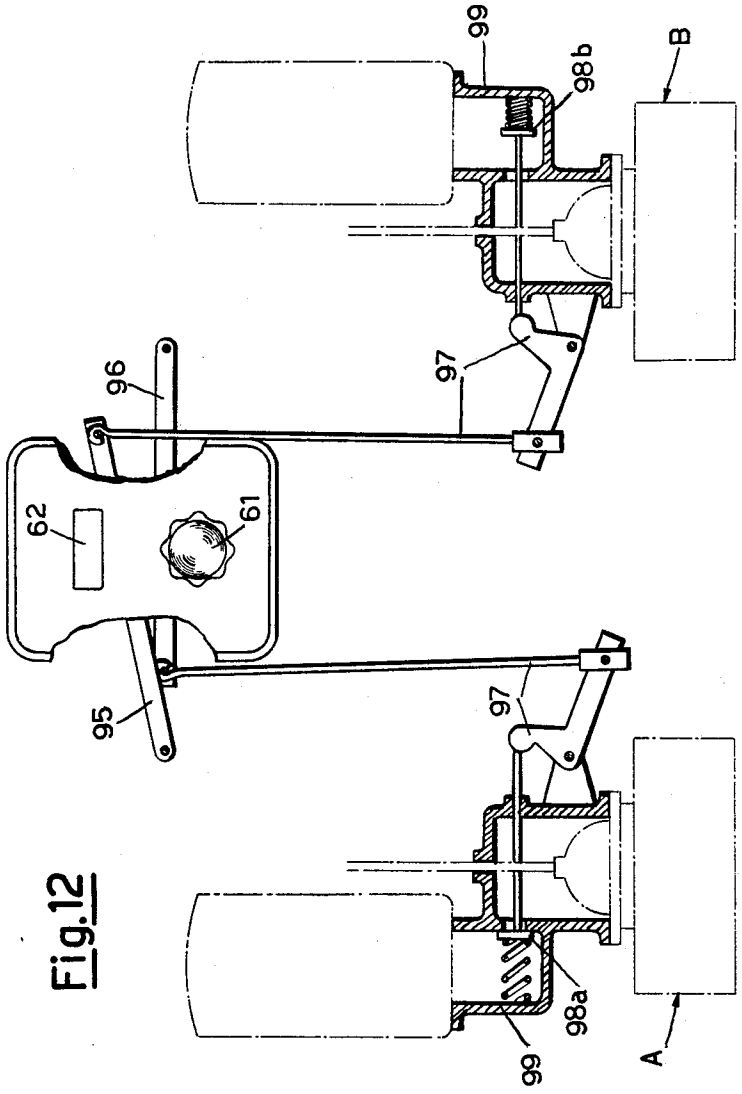

Fig.12

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VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

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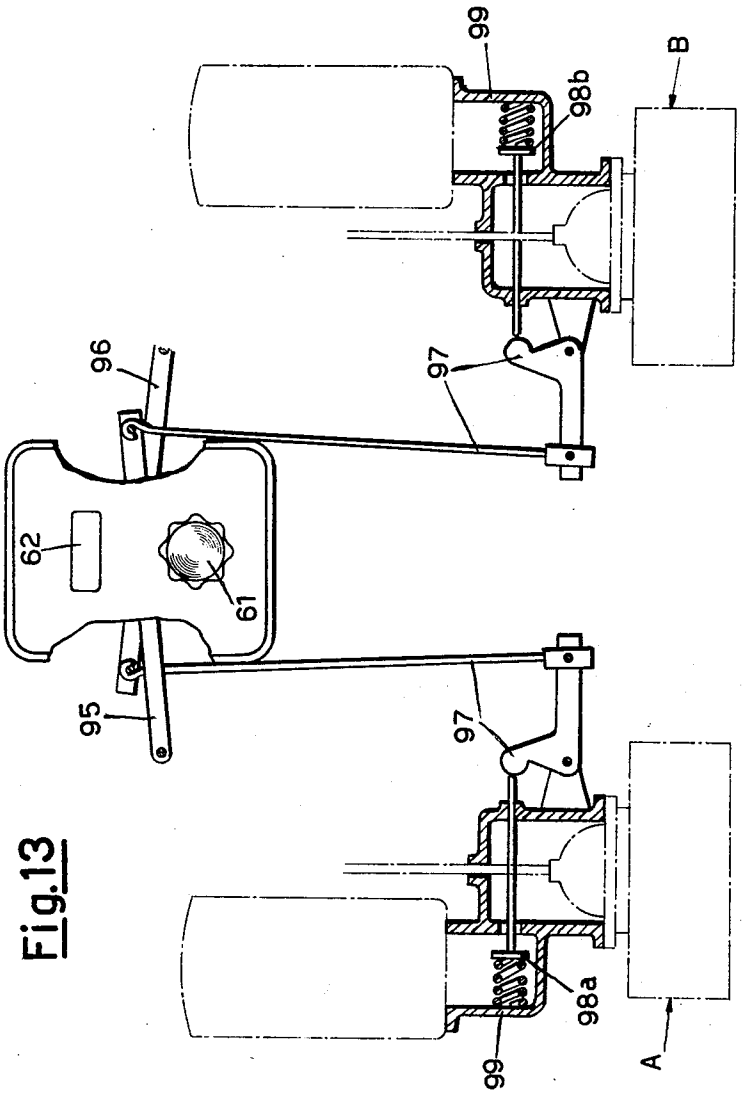

Fig.13

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VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

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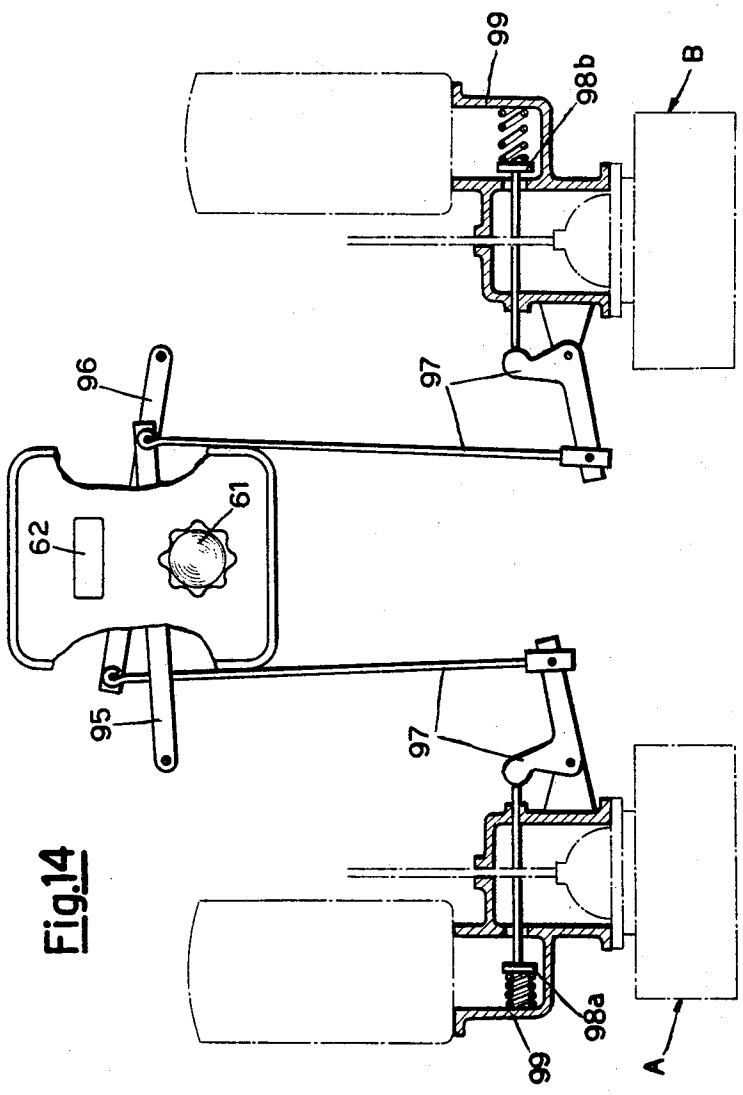

Fig.14

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VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

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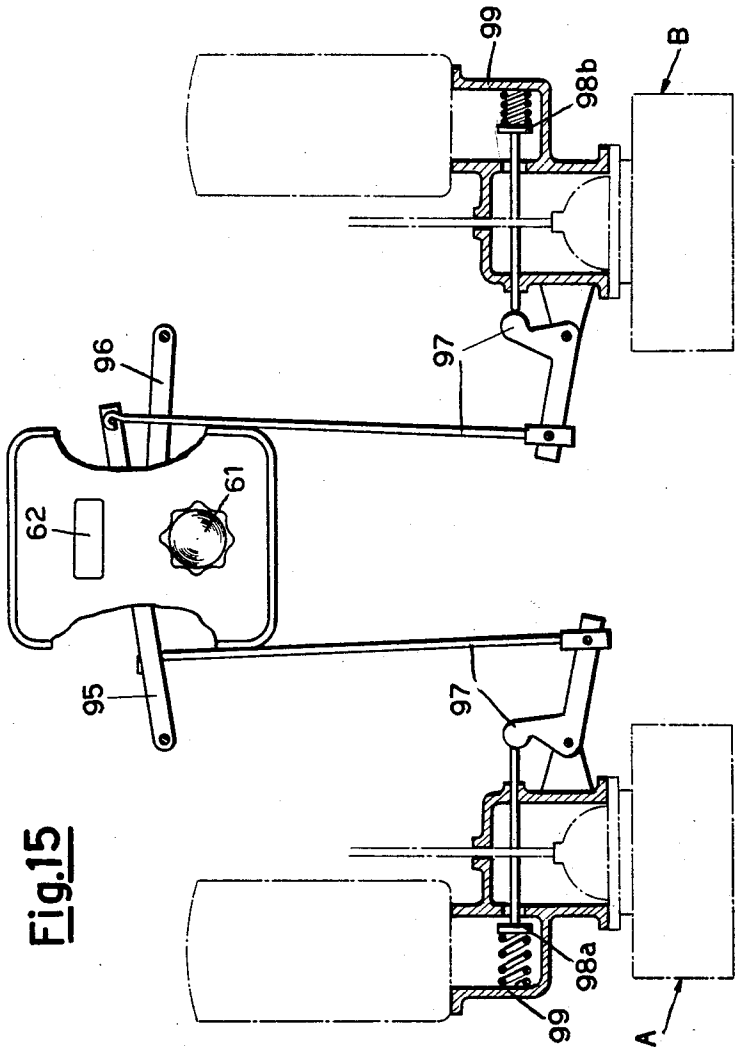

Fig.15

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United States Patent Office 2,997,209 Patented Aug. 22, 1961

2,997,209

VARIABLE OCTANE RATING GASOLINE (PETROL) PUMP

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Filed June 27, 1958, Ser. No. 744,953
Claims priority, application Italy June 28, 1957
8 Claims. (Cl. 222—71)

It is an object of the present invention to provide a distributing apparatus adapted to deliver gasoline (petrol) with variable octane ratings obtained by mixing according to predetermined variable volumetric ratios two types of gasoline (petrol) which have fixed octane ratings, and which are contained in two distinct tanks.

Conventional distributors for gasoline (petrol) and oil mixtures wherein the oil may amount to a maximum proportion of about 10% with respect to gasoline (petrol), have proved to be useless for the delivery of mixtures of two types of gasoline (petrol) A and B having different octane ratings, particularly where the percentages of the two types in a mixture may vary between 100% of A+0% of B, and 0% of A+100% of B, passing for instance through the following proportions: 75% of A+25% of B, 50% of A+50% of B, 25% of A+75% of B.

This is mainly due to the fact that the two measuring devices compelled by the dosing or mixture-adjusting mechanism to rotate at very different speeds, create a sensible difference in the pressures and in the speeds of the two liquids in the respective delivery conduits and consequently create a difference in the accuracy of measurements such as to surpass the tolerances admitted by law.

The gasoline (petrol) pump or distributor of the present invention has the purpose of eliminating the inconveniences mentioned above. In the present invention the gasoline (petrol) flows from the two measuring devices to a single delivery gun or nozzle which is provided with means for balancing and compensating automatically the pressures and, therefore, the speeds of the two liquids at the respective outlet orifices. According to one preferred embodiment of the invention said means consist in a rocker cooperating with the stems of valves arranged at the outlet of the two conduits into the gun in such a way as to vary in reversed ratio the apertures of the outlet orifices thereby compensating for variations of pressure.

A gasoline (petrol) pump for variable octane ratings, the delivery gun whereof is provided with the aforesaid balancing means, is very well suited for delivery of small amounts in unit of time.

With increasing delivery amounts per unit of time the outflow unbalance (as created by the two feed pumps which both tend to push the same amount of liquid, even if the two measuring devices are obliged to turn at a certain ratio, for instance 25/75 or vice versa) becomes proportionally greater and greater and such that from a certain limit on they can be balanced and compensated only by the aforesaid balancing means provided in the delivery gun.

To extend the field of application of the distributor also to medium and big per unit of time delivery amounts, while always keeping the accuracy of delivery within the range of the prescribed tolerance of ±3%, the present invention provides in those cases a special mechanism, which is called for brevity "outflow proportioner" ("outflow proportioning device") hereinafter and which solves the problem of the accuracy of delivery at any amount of delivery per unit of time, for which the distributor is dimensioned. This outflow proportioner,

which is supplied in addition to the particular delivery gun characterised above, has therefore the task of correcting unbalance of outflow as caused by the delivery of medium and large delivery amounts, to restore the easily adjustable, accurate control that governs deliveries of small amounts and that is governed by the balancing mechanism with which the delivery gun is equipped.

Said outflow proportioner as provided for distributors dimensioned for the delivery of medium and large amounts per unit of time, is substantially characterized, according to the present invention, by two substantially equal valves interposed respectively in the outflow conduits of the two gasoline (petrol) measuring devices, and by means for adjusting the outlet orifices of said valves in such a manner that the ratio between the orifices equals or at least is proportional to that of the components of the mixture to be delivered.

Another characteristic feature of the invention, which too has the task of avoiding any considerable inaccuracy in measuring, is the use in the dosing mechanism of change gears symmetrically arranged with respect to central gears which provide the ratio 1 to 1. Also this arrangement avoids the introduction of elements which might prevent measuring beyond the admissible limits of tolerance.

The invention will be more fully understood with reference to some embodiments illustrated merely by way of example in the accompanying drawings wherein:

FIG. 1 represents diagrammatically in vertical section the various parts constituting the distributor (gasoline pump, petrol pump);

FIG. 2 and FIG. 3 represent two positions of the gears of the doser during the delivery of the mixture;

FIGURES 4, 5 and 6 represent three positions of the controls for the delivery of only one of the two types of gasoline (petrol) or of a mixture thereof;

FIGURES 7, 8 and 9 represent various sections of the delivery gun;

FIG. 10 represents diagrammatically the mechanism for proportioning the outflow as applied to the gasoline (petrol) pump or distributor for delivery of medium and big amounts per unit of time and

FIGS. 11 to 15 represent the various positions of the proportioning mechanism for delivery of mixture at various octane ratings.

The gasoline or petrol pump illustrated in FIG. 1 is arranged for delivering gasoline (petrol) with five different octane ratings, by drawing these from the mixture or non-mixture of two basic types of gasoline (petrol) contained in two tanks laid underground, not illustrated, wherein are submerged the suction pipes of the two pumps of the apparatus.

In the course of the description, for simplicity, the two basic gasoline (petrol) types will be called respectively "Type 860" and "Type 1000," corresponding in reality to the two types of commercial gasoline (petrol) having respectively 84/86 octane rating and 98/100 octane rating.

Hence the apparatus illustrated is arranged to deliver the five types of gasoline (petrol) constituted as follows:

	Type 860, percent	Type 1000, percent
(1) Type 860	100	0
(2) Type 895	75	25
(3) Type 930	50	50
(4) Type 965	25	75
(5) Type 1000	0	100

Of course the apparatus may be arranged to deliver a range of seven or nine or more types of gasoline (petrol), by varying the ratios of the doser.

The apparatus is essentially formed by a base of cast iron whereon there are mounted four rigidly connected uprights forming the framing that supports the various members. These are enclosed in a housing that renders the whole weather-proof.

The motor **1**, by means of the V-belts **2** and **3**, drives simultaneously two identical pumps **4** and **5** for the type 860 and the type 1000 gasoline (petrol) respectively.

The pump **4** sucks from the tank of type 860 gasoline (petrol) an amount of liquid equal to about 40 liters per minute through the conduit **6** and pushes it into the air separator **7**. The air contained in the gasoline (petrol) is ejected by the separator through the small pipe **8**, whereas any possible moist residue returns are returned into the pump through the small pipe **9**. The deaerated gasoline (petrol) passes into the volumetric measuring device **10** that has pistons counterposed two by two, which at each of their strokes permit the passage of an amount of gasoline (petrol) equal to ½ litre, while the shaft **11** simultaneously turns by one revolution so that the ratio between the amount of gasoline (petrol) measured and the revolutions of the shaft **11** will be ½ liter each revolution.

For the type 1000 gasoline (petrol) the operation is similar, namely, the pump **5** sucks through the conduit **12** the same amount of gasoline (petrol) and pushes it into an air separator **13** similar to separator **7**, which through the small pipes **14** and **15** ejects the impurities therefrom prior to passing the gasoline into the measuring device **16**. This device too is like the device **10**. It always measures the same amount with the same ratio of ½ liter at each revolution of the shaft **17**.

The revolutions of the shafts **11** and **17** corresponding to the amount of gasoline (petrol) measured, will be translated into revolutions-litres and revolutions-dollars or cents (pounds or shillings) on the drums of the head through the box of the dosing or adjusting gear **18** which renders the two pump mechanisms interdependent as will set forth hereinafter.

The amounts of gasoline (petrol) of different types, which have been measured by their own respective measuring devices, are pushed upwards and through the non-return valves **19** and **20**, respectively, into the inspection globes the small fans **21—22** whereof signal delivery is starting. Then, always separatedly, the two liquid columns flowing in the flexible tubes **23** and **24**, arrive at the gun-shaped delivery cock **25**.

To summarize, there are two columns of gasoline (petrol) of different types, pumped separately up to the delivery gun or nozzle in two equal and distinct systems and these two different types are delivered by the gun to the outside as one single gasoline (petrol) of predetermined kind.

It is obvious that if one of the two pumps is shut off, one will get delivery through one system only, that is, delivery with type 860 gasoline (petrol) if the pump of type 1000 is shut off and vice versa delivery of type 1000 gasoline (petrol) if the pump of type 860 is shut off.

In FIG. 2, the two shafts **11** and **17** have no constraint at all and can turn each independently or one can remain standstill while the other one turns and vice versa.

In fact, if one wishes to deliver type 860 gasoline (petrol) only, one turns the knob **61** (FIGS. 4, 5 and 6) until appearance in the special dial, of the number corresponding to the kind of gasoline (petrol) wanted and contemporaneously, by means of a cam on the knob and a system of levers **63** and of a clutch actuated thereby one excludes the pump **5**, as shown in FIG. 4, and, consequently, the whole system of type 1000 gasoline (petrol), while only that of type 860 is operated.

The knob **61** is rigid with the shaft **65** (FIGS. 2 and 3) onto which there is fitted fixedly a cam **64** suitably shaped so that simultaneously, through a system of levers **66** and **67**, the control parts are brought to the position of FIG. 2, that is to say, with the shafts **11** and **17** released from constraint. In this case, however, the counter head will be moved only by the shaft **11** since pump **5** for the type 1000 gasoline (petrol) is shut off, and its system is at a standstill.

If only type 1000 gasoline (petrol) is to be delivered, the knob **61** is rotated until appearance of the corresponding number on the dial **62**, namely to the position shown in FIG. 5, and, consequently, the pump of the type 860 gasoline (petrol) will be declutched, while the position of the dosing mechanism owing to the particular shape of the cam is not varied with respect to the preceding one and the shaft, that will transmit the revolutions to the counter head, will be only the shaft **17**.

If one wishes to deliver gasoline (petrol) of intermediate types, for example of type 930, the knob **61** is adjusted until the corresponding number appears on the dial **62** and the system of levers **63** will be oriented in such a way that the two pumps will be both engaged simultaneously (FIG. 6). Both types of gasoline in the percentage of 50% each will be obtained by means of the gear **68** (FIG. 3) which is fitted on the shaft **17** of the measuring device and engages with the gear **69** fitted on the loose shaft **70**. This shaft in turn carries a gear **71** fitted thereon which will engage the gear **73** of the sleeve **72**. Sleeve **72** is displaceable axially along a spline groove in shaft **11** and controlled by the system of levers **66** guided by the cam **64**. In this position of the dosing mechanism one gets a connection at a ratio of 1/1 between the shaft **17** and at the idler shaft **70** and a ratio of 1/1 between this shaft and the shaft **11** and, definitely, a connection between the two shafts of the measuring devices at a ratio of 1:1, so that to a same amount of gasoline (petrol) measured at the same time by the two measuring devices, one gets a corresponding number of revolutions of the two shafts **11** and **17** which are equal. One will thus get a delivery of type 860 gasoline (petrol) equal to 50% and delivery of type 1000 gasoline(petrol) also equal to 50%, the resulting gasoline (petrol) being equivalent to 100% type 930 gasoline (petrol).

To deliver type 895 gasoline (petrol) one will have a percentage of 75% of type 860 and 25% of type 1000, equal to a ratio 3/1 which will have to be achieved by adjustment of the dosing mechanism. On the doser dial there will appear the number 895, the two pumps will remain both engaged, the shaft **17** will steadily mesh with the idler shaft **70** through the gears **68** and **69**, while by adjustment of the sleeve **72** the gear **74** will be brought into mesh with gear **69**, and determine thereby a ratio 1/3 between the shaft **17** and the shaft **11**, so that for every revolution of the measuring device for the type 1000 gasoline (petrol) the one for the type 860 gasoline (petrol) will perform three revolutions thereby establishing the adequate proportion for a delivery of type 895 gasoline (petrol).

Finally, if delivery type 965, the two pumps will remain engaged, on the dial there will appear the corresponding number, while the lever **67** that controls the slidable sleeve **75** on the idler shaft **70**, will engage the gear **76** with the gear **77**, thereby determining a ratio of 3/1 so that if the measuring device for the type 860 gasoline (petrol) performs one revolution, the one for the type 1000 will perform three revolutions.

The gun-cock **25** or nozzle (FIGS. 1, 7, 8 and 9), with automatic balance of pressures, which forms an integral part of the present invention, provides at every instant, during the delivery at any operating conditions, slow or quick, constant outflow-speed of the two liquids, by adjusting automatically the opening of one valve with respect to the other valve in relationship with the ratio of rotation of the two measuring devices as previously established.

Through the two pipes **23** and **24** one or the other type or both types of gasoline (petrol) arrive contemporaneously in the same proportion or with different proportions, separately at the two ducts **78** and **79** in the gun.

If the two cycles are at rest, the two liquid columns not having any kinetic energy, do not influence at all the two valves **80** and **81** which remain closed, but during the starting of the two pumps there is determined a certain pressure head that tends to open them.

The opening or non-opening of said valves, while the pumps are in operation, depends on the control by hand of the small lever **82** which in its natural lowered position permits the central spring **83** to oppose the pressure upon the two valves, which cannot open since their rods **84** and **85** rest upon the planes of a rocker **86** pivoted at **87** which is held by said spring **83**.

In this case, there being no liquid flow in the part above the two measuring devices, these remain at a standstill.

After introduction of the terminal spout **88** into the tank to be filled, one raises the small lever **82**. This lever is fulcrumed eccentrically at **89** on the fork **90** which supports the rocker **86**. If one loads the lever **82** at its upper part, then one lowers said rocker **86** thereby releasing the two valves **80** and **81** against the resistance of the spring **83**.

These valves being pressed in their upper part by the pressure of the liquid columns, each independently of the other one, they open against the resistance of the springs **91** and **92**, which constantly urge them, respectively, to closed positions; and the delivery of the measured fuel begins.

If one or the other type of gasoline (petrol) is delivered, only one or the other valve will open and vice versa; if the two types of gasoline (petrol) are delivered in equal percentage (50%) the two valves will open both and will create thereby an orifice of equal section each, to determine the outflow of equal amounts of gasoline (petrol) of the two different types into the chamber **93** to form gasoline (petrol) with octane rating 91/93, that is of type 930.

If the percentage of the two basic types is different, that is, mutually of 25% and 75%, the two measuring devices compelled by the dosing mechanism to rotate at different speeds, create a sensible difference of pressure in the two conduits. The intervention of the rocker **86** adjusts automatically the opening of the two valves **80** and **81** permitting thereby the delivery of gasoline (petrol) of the two distinct types with the accuracy required.

With reference to FIGURES 10–15 there will now be described the application of the particular mechanism for proportioning outflow in the cases where delivery is involved of medium and large amounts in the unit of time.

By means of the knob **61**, which controls the various ratios of gasoline (petrol), as visible in the special dial **62**, the two cams **94** (FIG. 10) are controlled, which are fitted fixedly onto the shaft **65**.

Said cams actuate the two rockers **95** and **96** which by means of levers **97** adjust the opening of the two valves **98***a* and **98***b* (FIGURES 11–15) placed each on the cap **99** of the two measuring devices A and B in such a manner that the amount of liquid outflowing in the unit of time from the deaerators to said measuring devices, will be directly proportional to the ratio with which they are compelled to rotate.

For instance, if one wants to deliver type 860 gasoline (petrol), the suction pump in the tank of gasoline (petrol) type 1000 will be disengaged to avoid useless waste of power; at the same time (see FIG. 11), the valve **98***b* of the measuring device B, will be closed, while the other valve **98***a* will be opened with full outflow; and vice versa, if one wants to deliver type 1000 gasoline (petrol), the pump for the type 860 gasoline (petrol) will be declutched and (see FIG. 12), the valve **98***b* of the measuring device B of the type 1000 gasoline (petrol) will be at full outflow while the other one **98***a* will be completely closed.

In the case of 930 gasoline (petrol), where the percentages of the two basic types are 50%, both pump systems will be operating, and the openings of the two valves **98***a* and **98***b*, proportioning the outflow, will be equal so as to allow passage in both measuring devices A and B of the 50% of the liquid to be delivered (see FIG. 13).

If 895 gasoline (petrol) is to be delivered, which is equal to 25% of type 1000 and 75% of type 860, the two measuring devices A and B are compelled to rotate with a ratio 75/25, that is to say, at every revolution of the measuring device B of type 1000 there will be three revolutions of the measuring device A of type 860 and, therefore, the two valves **98***a* and **98***b* will have their openings proportional in the same ratio (see FIG. 14).

If delivering 965 gasoline (petrol), equivalent to a ratio of 25/75, respectively, of type 860 gasoline (petrol) to type 1000 gasoline (petrol), the opening of the valve **98***b* of the measuring device B of gasoline (petrol) 1000 will be three times greater than the other **98***a* (see FIG. 15).

I claim:

1. Gasoline pumping apparatus for pumping simultaneously two liquids in selectively variable proportions, comprising two pumps for pumping the two liquids, respectively, from separate sources of supply, means for driving the two pumps, a nozzle having a single delivery outlet, a pair of conduits connected, respectively, to the two pumps for conveying the separate liquids from the respective pumps to said nozzle, a pair of valves mounted movably in said nozzle to control, respectively, the flow of the separate liquids from said conduits into said outlet, spring means for closing each valve when there is no pressure of liquid in the associated conduit, a rocker member pivotally mounted intermediate its ends on said nozzle and engaging said valve to control the amounts, which the two valves are opened against the resistance of said spring means, in proportion to the respective pressures of the two liquids on the two valves, a spring mounted in said nozzle for constantly urging said rocker member to a position in which said rocker member holds both valves closed, a manually-operable lever mounted on said nozzle for moving said rocker member to valve-releasing position to permit opening of each valve under the pressure of the liquid flowing in the associated conduit, and adjustable measuring devices for measuring the rates of flow of liquid from each pump into the two conduits, respectively.

2. Gasoline pumping apparatus as claimed in claim 1, wherein said measuring devices are manually adjustable to position them in accordance with the desired proportion of each liquid in the mixture delivered by said nozzle, and wherein manually-operable means is provided for selectively coupling said driving means to one or both of said pumps, and a single manually-operable member is provided for simultaneously operating said coupling means and adjusting said measuring devices.

3. Gasoline pumping apparatus as claimed in claim 1, wherein two additional valves are provided for separately controlling, respectively, the rates of flow of the two liquids from the pumps into their respective conduits, and manually-adjustable means is provided for adjusting the amounts of opening of the two additional valves simultaneously to selectively vary the ratio of rates of flow of the liquids into the two conduits.

4. Gasoline pumping apparatus as claimed in claim 3 wherein manually-operable means is provided for selectively coupling said driving means to one or both of said pumps, and a single manually-operable member is provided for simultaneously operating said coupling means and the means for adjusting the amounts of opening of said two additional valves.

5. Gasoline pumping apparatus as claimed in claim 2 wherein two additional valves are provided for separately controlling, respectively, the rates of flow of the two liquids from the pumps into their respective conduits, manually-adjustable means is provided for adjusting the

amounts of opening of the two additional valves simultaneously to vary selectively the ratio of rates of flow of the liquids into the two conduits, and wherein said single manually-adjustable member also operates said means for adjusting the amounts of opening of said two additional valves.

6. Gasoline pumping apparatus for pumping simultaneously two liquids in selectively variable proportions, comprising two pumps for pumping the two liquids, respectively, from separate sources of supply, means for driving said pumps, a nozzle having a single delivery outlet, a pair of conduits connected, respectively, to the two pumps for conveying the separate liquids from the respective pumps to said nozzle, a pair of valves reciprocably mounted in parallelism in said nozzle to control, respectively, the flow of the separate liquids from said conduits into said outlet, separate spring means for closing the two valves when there is no pressure of liquid in the associated conduits, a stem integral with each valve, a forked member pivotally mounted on said nozzle, a rocker member pivotally mounted intermediate its ends on said forked member between said stems for rocking movement about an axis extending at right angles to the pivotal axis of said forked member and engaging at its opposite ends against the ends of the stems of the respective valves, a spring acting upon said forked member to urge said rocker member to a position to hold both said valves closed, a lever secured to said forked member for rocking said forked member about its pivot against the resistance of said spring, thereby to permit said two valves to open, respectively, in proportion to the respective pressures of

the two liquids on the two valves, and a manually-adjustable flow-proportioning mechanism in said conduits for controlling the ratio of the rates of flow of the two liquids in their respective conduits.

7. Gasoline pumping apparatus as claimed in claim 6, wherein manually-operable means is provided for selectively coupling said driving means to one or both of said pumps, and a single manually-operable member is provided for simultaneously operating said coupling means and adjusting said flow-proportioning mechanism.

8. Gasoline pumping apparatus as claimed in claim 7, having separate flow-measuring means for measuring the rates of flow of the liquids in the two conduits, manually-operable means for adjusting the flow measuring means relative to each other so that they operate in proportion to the ratio of rates of flow of the two liquids in the two conduits, and wherein said single manually-operable member adjusts said flow-measuring means simultaneously with operation of said coupling means and adjustment of said flow-proportioning mechanism.

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