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APPARATUS FOR MAKING PROPORTIONAL LIQUID ADDITIONS TO MEASURED QUANTITIES OF LIQUID

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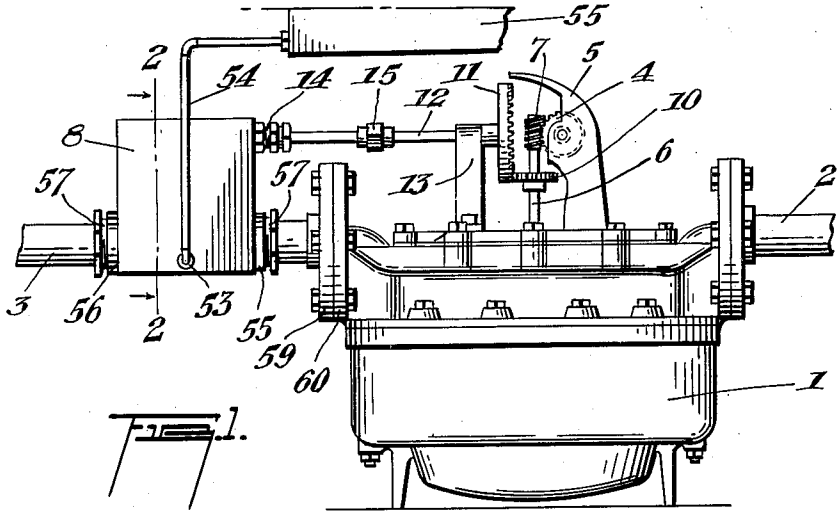


Fig. 1.

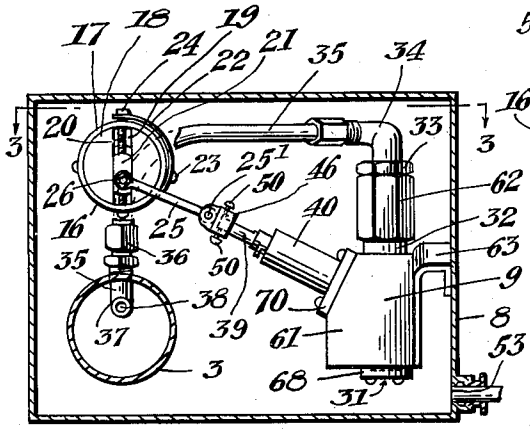


Fig. 2.

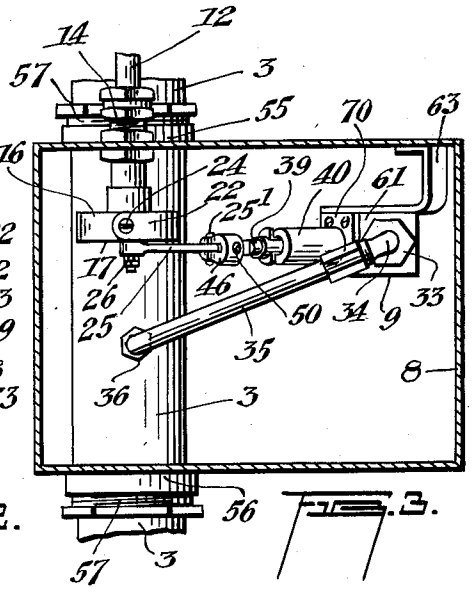


Fig. 3.

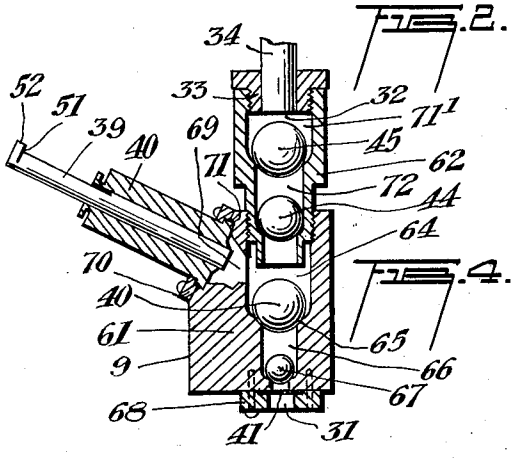


Fig. 4.

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APPARATUS FOR MAKING PROPORTIONAL LIQUID ADDITIONS TO MEASURED QUANTITIES OF LIQUID

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In Canada July 14, 1939

1 Claim. (Cl. 137—165)

The present invention relates to an apparatus for making proportional liquid additions to measured quantities of combustible liquid petroleum products such as gasoline, kerosene, distillate and fuel oil, and may be particularly employed in the dyeing of these products. It has particular utility in the dyeing of these products where dyed products are used as a means of control in taxation methods.

It has been proposed to dye petroleum products as a means of establishing a more efficient method of control over the problem of tax exemption where these products are used for specified purposes notably agricultural purposes.

Various methods have been proposed for dealing with the problem hitherto resulting from the exemption from taxation of petroleum products which are to be used for certain purposes, notably agricultural purposes. For instance, it has been proposed that persons using gasoline for the purposes in question, be given a rebate thereon according to the amount used for the specified purposes. Such a method has proven unsatisfactory because of the obvious difficulty in obtaining reliable information on the amounts so used. The only available information is that provided by the person who is buying and using the products. A further method involving the use of coupons, permits and the like, by which an estimate is made of the amount of the products which could be used by a given person for the tax exempt purposes, and coupons are issued entitling that person to the exemption. In this case similar uncontrollable and substantial abuses have arisen, the coupons being used for the purchase of other articles sold by the vendors of petroleum products.

The most recent proposal to overcome these disadvantages is to dye the products. Up to the present dyeing has been used solely for distinguishing one grade of product from another. Rigid control has not been necessary and, for example, it has been satisfactory if a given quantity of dye is added to a given quantity of gasoline by an operator or by means of a machine controlled by an operator.

This has given rise to two serious main objections insofar as dyeing for taxation is concerned. According to the taxation method using dyed petroleum products the authorities are empowered to inspect the fuel being used for any internal combustion engine or other purpose to determine if it is dyed or not. They can punish a person who uses coloured fuel for non-permitted purposes. It will be appreciated that according to this system it is possible for an operator to dispose of the dye for a given quantity of product without dyeing it and sell the product tax-free in the uncoloured state. It can then be used for any desired purpose.

The second objection is that the dyeing proposal would require additional storage space; for instance, a petroleum distributor who usually distributes six kinds of petroleum products, of which three can be used for taxable as well as tax exempt purposes, would have to increase his storage space by 50%.

The object of the present invention is to overcome these difficulties by providing an apparatus which dyes the products completely automatically, so that it is impossible to tamper with the dyeing mechanism and so that it is insured that every gallon of product measured is recorded and dyed automatically.

It is a further object of the invention to provide an apparatus which can be attached to the outflow of any of the existing storage tanks and can even be applied conveniently to retail gasoline pumps so that the dyeing of the gasoline or similar products does not require the provision of any extra storage space.

The invention is illustrated in the accompanying drawing, which shows an embodiment thereof in which—

Figure 1 is an elevation of the whole apparatus with the dye reservoir partially broken away,

Figure 2 is an enlarged section of part of the apparatus taken along the line 2—2 of Figure 1 and showing the pump mechanism in elevation,

Figure 3 is a section taken along the line 3—3 showing the pump mechanism in plan,

Figure 4 is a sectional elevation of the pump itself.

Referring to the drawing, 1 indicates a meter such as is used commonly in petroleum refineries and storage yards for measuring the liquid in gallons as it is removed from a tank. It has an inlet and an inlet conduit 2 as well as an outlet and outlet conduit 3. A recording mechanism 4 carried in a housing 5 is driven by a vertical shaft 6 which has a worm gear 7 at its upper end. The worm gear 7 meshes with a gear on the recording mechanism. Flow of liquid through the meter causes the shaft 6 to rotate and its revolutions are recorded on the recording mechanism. Meters of this kind are well known. They all have at least one vertical shaft corresponding to the shaft 6 which transmits the motion of the measuring mechanism of the meter to the recording mechanism.

The vertical shaft 6 is operatively connected with a pump 9 enclosed in tank 8 which surrounds a length of the outlet conduit 3. The pump is shown in Figures 2 and 3 and in detail in Figure 4. The operative connection of the vertical shaft with the pump is effected by means of a horizontal gear wheel 10 rigidly mounted on the shaft 6 and rotating with it. Gear wheel 10 meshes with a vertical toothed wheel 11 which is fixed on the end of shaft 12. The shaft 12 is supported at one end by the bearing bracket 13 which is mounted on the meter and at the other by a bearing and packing gland arrangement 14 in one wall of the tank 8. The shaft 12 for convenience in assembling the apparatus can be formed in two sections joined by a coupling 15.

Referring to Figures 2 and 3 a solid wheel 16 is mounted on the end of the shaft 12 within the tank 8. It consists of a rim 17 and a solid central portion 18 which has a diametrical slot 19. A threaded rod 20 extends through the rim within the slot and to the opposite side of the rim. It carries a lug 21 which is threaded on the rod. The lug 21 is movable in the slot by rotation of the rod 20. The rod 20 is, in turn, kept from rotation when the lug has been adjusted to the desired position by means of a spring 22 which has one end fixed by a rivet or stud, 23. The other end bears against the nut-like formation 24 on the end of the rod 20. A piston rod 25 is connected to the lug 21 by means of a nut and bolt connection 26. The piston rod is pivotally connected at its other end to the piston 39 of the pump 9.

In operation liquid entering the meter 1 by the inlet conduit 2 drives the measuring mechanism of the meter and the motion of the measuring mechanism is transmitted by the vertical shaft 6 to the recording mechanism. Rotation of the vertical shaft 6 causes, by means of the horizontal gear wheel 10 and vertical toothed wheel 11, the rotation of the shaft 12. The shaft 12 in turning carries with it the solid wheel 16 and the lug 21 being eccentric of the solid wheel moves the piston rod 25 which reciprocates the piston 39.

The piston rod 25 is connected to wrist pin 25' in a collar 46 which is clamped to the piston 49 by two set screws 50 one of which engages the rounded surface of the piston and the other oppositely disposed, bears against the surface 51 formed by a small cut out portion 52 on the piston. This pump construction is of a type which is commonly used as an injection pump. For purposes of this invention its essential feature is that it must be of simple construction and easy operation. The power required to operate it and overcome the friction of the various parts of the pump must by reason of the pump construction be such that the driving of the pump will not interfere with the accuracy of the recording mechanism by causing wear and undue strain upon the parts of the latter.

The pump 9 has an inlet 31 and an outlet 32. The outlet 32 has connecting means consisting of coupling 33, elbow 34 and pipe 35 which connect it with the conduit 3. The pipe 35 in Figure 2 is partially broken away in order to illustrate the drive mechanism for the pump. It extends into a packing gland 36 which leads to the inside of conduit 3 where it is connected with a nozzle 37 whose opening 38 opens down stream of the outlet from the meter.

Referring to Figure 4 it will be seen that the pump or injector is of simple construction being composed of a base portion 61, a cylinder portion 40 and an outlet valve portion 62. The base portion is carried by a bracket 63 (Figures 2 and 3) which is welded or otherwise secured to the inside of the tank 8. The central part of the base portion is formed with a cylindrical cup shaped space 64 whose bottom has a hole 65 and provides a seat for the ball valve 43. The hole 65 opens into a smaller cylindrical space 66 whose bottom provides a seat for the ball valve 67 over the inlet opening 31 of the pump. An annular ring 68 is secured around the inlet opening and holds the screen 41 over it.

The cylindrical space 64 has an outwardly flared opening 69 in its vertical wall and the cylinder 40 fits into the wider end of it. The cylinder is tightly held over the opening by the collar 70 which engages a flange 71 on the cylinder.

The upper end of the space 64 is threaded to receive the outlet valve portion 62 which consists of three successive cylindrical portions the uppermost being of greatest diameter and the lowermost of least diameter. The bottom of the uppermost portion 71 forms a valve seat for the ball valve 45 over the mouth of the intermediate one 72. The bottom of the latter is the valve seat for the ball valve 44. The upper wall of the cylindrical portion 71 is threaded to accommodate the outlet coupling 33.

The tank 8 completely encloses the pump and that portion of the shaft 12 which carries a solid wheel 16. It also encloses a length of the outlet conduit 3 from the meter as well as the conduit 35 from the outlet of the pump to the outlet of the meter. The tank has an inlet opening 53 which is connected by a pipe 54 with a dye reservoir 55. The tank is kept filled with dye from the reservoir and the dye in the tank is injected into the conduit 3 by the action of the pump through its inlet 31, its outlet 32 and pipe 35. Because the nozzle 37 on the pipe 35 is directed so that the opening 38 faces down stream of the fluid flowing through the conduit 3, it aids the pump in its action. By this arrangement the fluid flowing through the conduit 3 has a venturi action at the opening 38 and thus lessens the power which is required to drive the pump.

The tank 8 is formed with opposed openings 55 and 56 to accommodate the conduit 3. The connection between the walls of the tank and the conduit 3 are fluid-tight. They can be made so by welding or as shown in Figure 1 by means of packing glands 57 which are threaded into the openings 55 and 56.

Referring to Figure 1 it will be seen that the conduit 3 is connected to the outlet meter by a flange 59 which is coupled to a corresponding flange 60 on the meter itself. Likewise, the shaft 12 is formed in two sections one of which carries the toothed wheel 11 and the other being connected to the pump 9. Accordingly, a known meter can be easily adapted to form part of the apparatus of this invention. The only additions which are necessary are the horizontal gear wheel 10 and the bearing bracket 13 both of which can be easily attached to the meter mechanism.

In small installations the reservoir 55 can be dispensed with and the openings 53 on the tank 8 can be formed through its top wall in such a manner that when closed it can be sealed with a tamper-proof seal. The complete apparatus including the recording mechanism of the meter is then small and compact and can be enclosed in a casing which in turn can be sealed with a tamper-proof seal so that access to the coupling

15 and the tank 3 is possible only by authorized persons.

We claim:

Apparatus for making measured additions of a secondary liquid to measured quantities of a primary liquid comprising a meter for the primary liquid provided with an outlet and a conduit leading therefrom, a closed tank for the secondary liquid enclosing a portion of said conduit, a pump mounted and wholly contained in said tank, a non-slipping drive from said meter to said pump, whereby flow of the primary liquid through said meter operates said pump, means provided in said drive and wholly within said tank for adjusting the ratio between the speed of said pump and that of said drive, and a connection wholly within said tank between the outlet of said pump and the portion of said conduit enclosed by said tank.

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