

June 10, 1930.

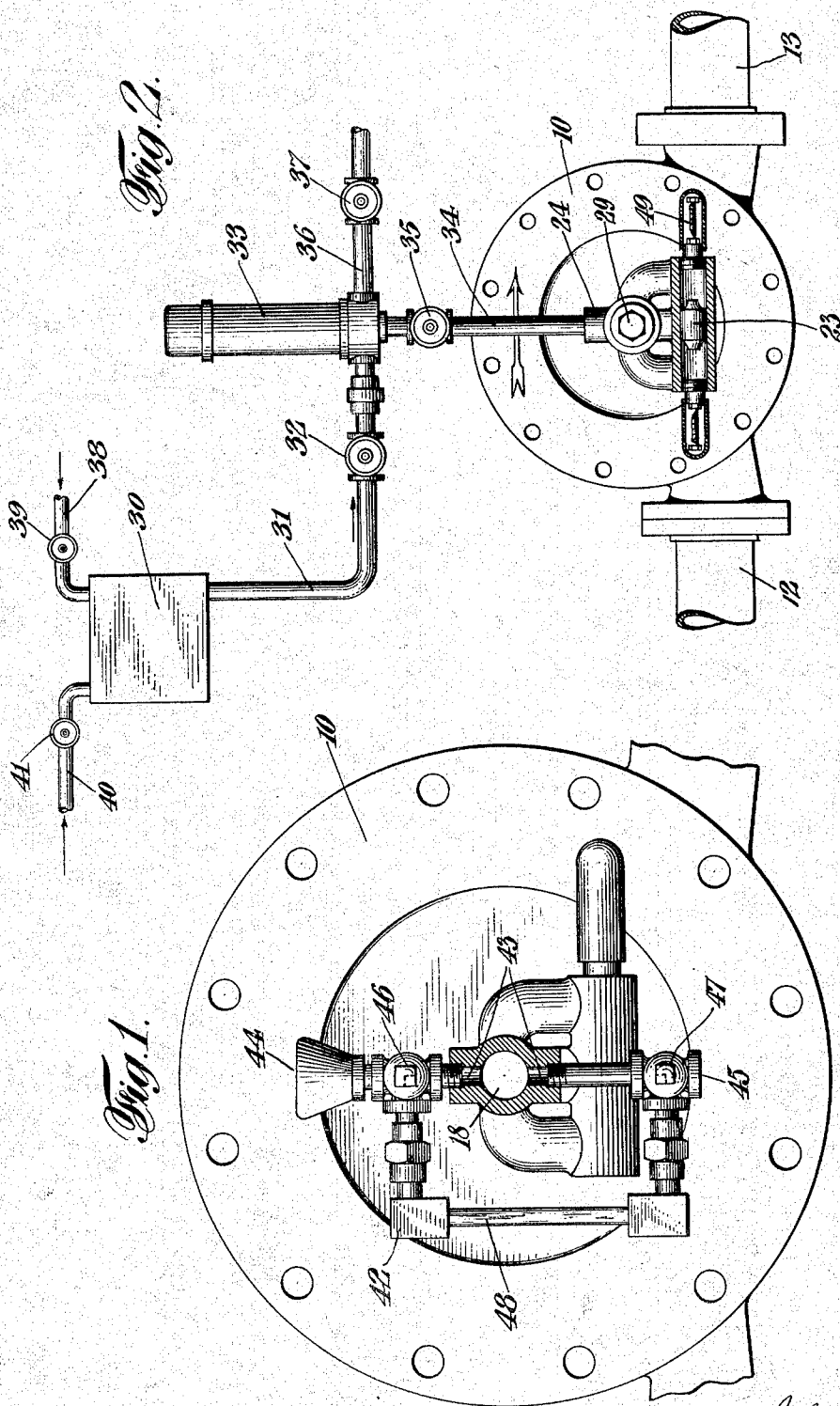
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1,763,335

LIQUID MIXING DEVICE

Filed Nov. 23, 1927

2 Sheets-Sheet 1



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Fig. 4.

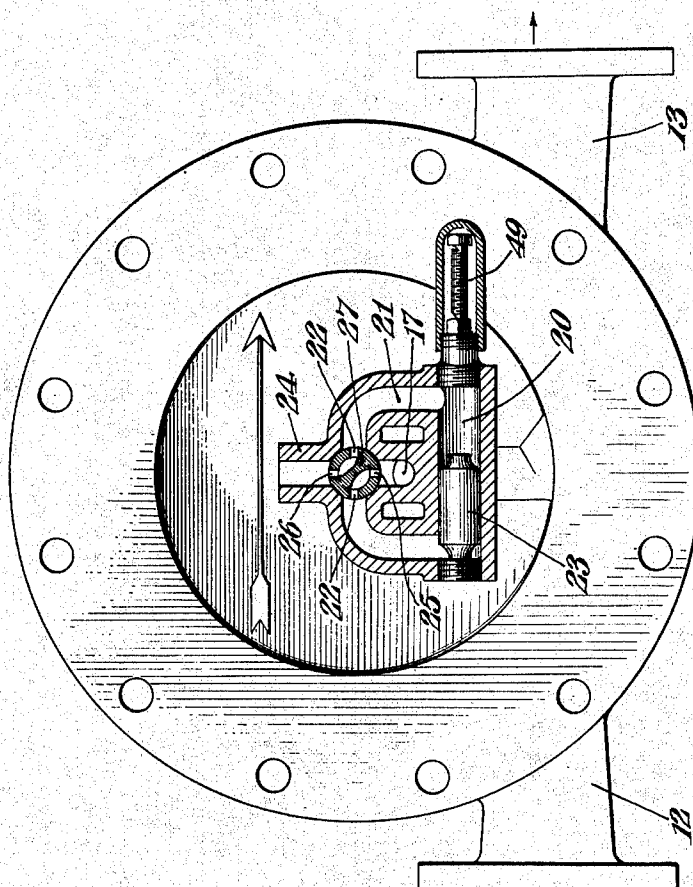
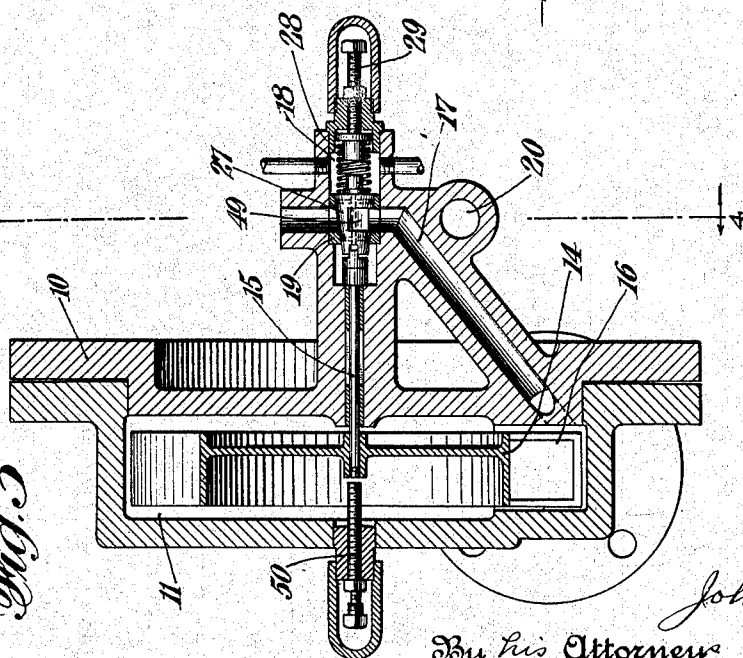


Fig. 3



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LIQUID-MIXING DEVICE

Application filed November 23, 1927. Serial No. 235,365.

This invention relates to liquid mixing devices and has for an object a device which will add to a continuously flowing stream of one fluid a definite proportionate amount of another fluid.

According to the invention, a stream of one fluid is caused to flow through a chamber in which is mounted a rotor operable by the liquid. The liquid to be added is contained under pressure in a tank or the like and connections including a liquid measuring device are provided for conveying liquid from the tank to the chamber. The operation of the liquid measuring device is controlled by operation of the rotor. Thus a predetermined amount of rotation of the rotor causes a definite predetermined amount of the second liquid to be added to the liquid flowing through the chamber. The ratio of the added liquid to that flowing through the chamber remains constant despite flow variations.

The device above described is of particular utility in treating hydrocarbon products such, for example, as gasoline with sulphuric acid. Heretofore sulphuric acid has been added to gasoline to be treated more or less by guess-work. It has been necessary to add a greater amount of sulphuric acid than was really necessary in order to make sure that enough was added. With the above described device, the ratio of sulphuric acid added to the gasoline is definitely controllable and it has been found that with this device a much smaller ratio of acid to gasoline accomplishes the desired treatment of the gasoline.

Other objects, novel features and advantages of this invention will be apparent from the following specification and accompanying drawings, wherein

Figure 1 is a side elevation of a device embodying the invention.

Figure 2 discloses the connections by means of which the acid is supplied to the device.

Figure 3 is a vertical section through the device; and

Figure 4 is a section on the line 4—4 of Fig. 3.

The device comprises a two-part casing 10, forming a substantially cylindrical chamber 11 communicating with a tangentially arranged conduit 11^a having an inlet 12 and an outlet 13, the chamber being of greater width than the conduit. Within the chamber a rotor 14 is mounted upon a shaft 15 which is journaled in a hub extending from one part of the casing 10. Buckets 16 are mounted on the periphery of the rotor and extend into the conduit 11^a. The buckets are slightly less in cross section than the conduit.

The casing is provided with a passageway 17, one end of which leads into the chamber 11 in the general direction of the flow of liquid therethrough. The other end of the passageway 17 leads into a tubular chamber 18 in which is mounted a cylindrical valve bushing 19. The casing is also provided with a cylinder 20, the opposite ends of which communicate through conduits 21 and ports 22 with the interior of the valve bushing 19. Within the cylinder 20 is provided a floating piston 23. A conduit 24 is provided leading from the chamber 18 at a point opposite the passageway 17. The passageway 17 communicates with the interior of the valve bushing through a port 25 and the passageway 24 communicates with the interior of the valve bushing through a port 26.

A valve 27 is rotatably mounted in the bushing 19 and is provided with two channels by means of which successive ports in the valve bushing are put in communication with each other. A spring 28 is provided for keeping the valve tightly seated in the bushing and an adjusting screw 29 permits varying the pressure exerted by the spring 28. The valve 27 is coupled to the shaft 15 for rotation with the rotor 14. As the valve rotates communication is alternately established between each end of the cylinder and the passageway 24 as well as between each end of the cylinder and the passageway 17.

In operation the casing 10 is connected in a pipe line as indicated in Fig. 4 and the conduit 24 is connected by suitable piping with a tank 30 or the like in which is

contained the liquid to be added to the liquid flowing through the pipe line. The connections between the tank and the conduit 24 may include a pipe 31 controlled by a valve 32 leading to the base of an air chamber 33. From the air chamber 33 a pipe 34 controlled by the valve 35 leads to the conduit 24. Drain pipe 36 controlled by the valve 37 is connected to the base of the air chamber 33. The tank 30 is provided with a filling pipe 38 controlled by a valve 39 and is also provided with an air pressure pipe 40 controlled by a valve 41. When the device is in operation the valves 39 and 37 are closed and the valves 41, 32 and 35 are open. Sufficient pressure is exerted on the liquid in the tank 30 to cause it to flow toward the chamber 14 at such times as the valve 27 permits flow. Liquid flowing through the chamber causes rotation of the rotor 14 which in turn causes rotation of the valve 27. With the valve in the position shown in Fig. 4, liquid flows from the tank 30 into the right end of the cylinder 20, thus forcing the piston 23 to the left. The liquid previously contained in the left portion of the cylinder 20 is forced through the passageway 17 into the chamber 11. Rotation of the valve 90° puts the tank 30 in communication with the left end of the cylinder 20 and puts the right end of cylinder 20 in communication with the passageway 17. The piston 23 is then forced to the right, thus delivering into the passageway 17 the liquid previously introduced into the right end of the cylinder 20. In this way a definite volume of liquid is conveyed from the tank 30 into the chamber 11 upon each rotation of the rotor 14. As the flow of liquid through the chamber varies, the rotational speed of the rotor varies with a consequent variation in the amount of the liquid forced into the passageway 17 per unit of time. The ratio of the added fluid to that flowing through the chamber therefore remains constant.

When the device is not in operation it may be advisable not to leave around the valve and in the cylinder the liquid added to the liquid flowing through the pipe line. This is especially true when the added liquid is acid. If the device is allowed to stand idle for some time with acid around the valve and the cylinder, the acid may cause the piston to become tight in its cylinder or the valve to become tight in its bushing. The acid may be removed by closing the valve 32 and opening the valve 37. Since the pipe 36 opens into the atmosphere there will be a pressure forcing liquid from the chamber out through the pipe 36. The liquid in flowing out this way will flush out the cylinder and chamber around the valve and leave the oil from the pipe line in its place, thus removing the acid and leaving

gasoline from the pipe line in its place. Corrosion of the working parts by the acid is thus avoided.

Means are provided for lubricating the valve 27. This means comprises a loop 42 which communicates with the chamber 18 through ports 43. The loop is provided with an inlet 44 and an outlet 45 and a pair of three-way valves 46 and 47 respectively. Also contained in and forming a part of the loop is a sight glass 48. Sufficient lubricating oil is introduced into the loop to fill it and the chamber 18. The valves 46 and 47 are set to form a closed passageway through the loop. The valve 27 is provided with conduits 49 by means of which oil is conveyed to the contacting surfaces of the valve in the valve bushing. As the oil works out of the chamber 18, acid seeps in to the chamber and falls to the bottom portion of the loop. As the acid fills up the loop it appears in the sight glass, thus indicating the amount of oil left. When the acid in the sight glass reaches approximately the level of the valve 27 it may be drained out by turning the valve 47 and additional oil introduced through the inlet 44 by properly turning the valve 46. In this way the lubricating oil may be replenished whenever necessary. An adjusting screw 49 is provided for varying the stroke of the piston 23 and thereby varying the volume of liquid forced through the passageway 17 at each rotation of the rotor 14. A screw 50 is also provided for applying pressure to the end of the shaft 15 to force the valve 27 off its seat should it become stuck thereto.

The above described apparatus insures a mixture of two fluids in definite and uniform proportions which proportions may be varied as desired. The amount of liquid added for each rotation of the rotor 14 is the same whatever the speed of the rotor. As the speed of the rotor is directly dependent upon the flow of liquid through the chamber, the ratio of the two liquids brought together by the device remains constant.

It is of course apparent that various structural modifications may be made without in any way departing from the spirit of the invention defined in the appended claim.

I claim:

In a device of the character described, a conduit, a substantially circular chamber above said conduit and communicating therewith, said chamber being of greater width than said conduit, a projection extending from one wall of said chamber, a shaft rotatably mounted in said projection, a rotor carried by said shaft and arranged within said chamber, vanes mounted on the periphery of said rotor to extend into said conduit, said vanes being slightly less in cross section than said conduit, a valve

chamber in said projection coaxial with said shaft, a cylinder provided in said projection, a piston reciprocable in said cylinder, passages in said projection leading to said valve chamber from opposite ends of the cylinder, a discharge passage in said projection leading from said valve chamber to said conduit, an inlet passage leading to said valve chamber, a valve rotatably mounted in said valve chamber for alternately connecting the inlet and discharge passages to the passages leading to the ends of the cylinder, and a driving connection between said shaft and said valve.

In testimony whereof, I have signed my name to this specification.

JOHN S. WATTS.

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