

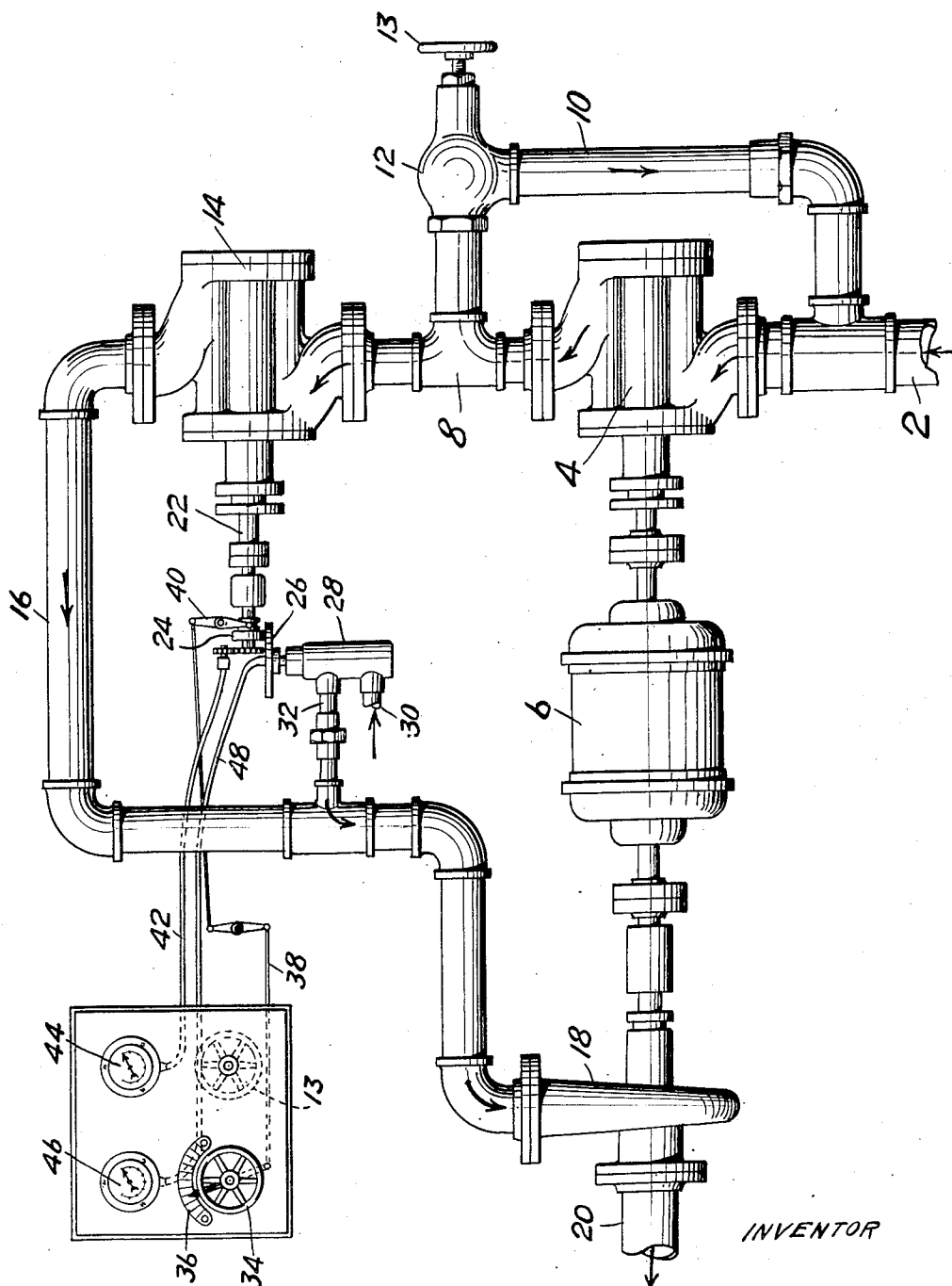
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F. W. KENNEDY

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FLUID PROPORTIONING DEVICE

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WITNESS:

Robt. P. Ritchel.

INVENTOR

Frank W. Kennedy

BY *Brown & Harding*
ATTORNEYS.

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FLUID PROPORTIONING DEVICE

Frank W. Kennedy, Trenton, N. J., assignor to
De Laval Steam Turbine Company, Trenton,
N. J., a corporation of New Jersey

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4 Claims. (Cl. 137—165)

This invention relates to a fluid proportioning device and particularly to a device of the character used for proportioning acid and oil in the treatment of the latter.

5 While the apparatus forming the subject matter of the invention will be specifically described in an embodiment adapted for feeding a predetermined amount of acid or other treating liquid to gasoline or lubricating oils, it will be obvious that similar apparatus within the scope of the invention may be provided for the proportioning of other fluids whether liquid or gaseous. If the fluids handled are in gaseous condition then it will be obvious that controls will be arranged for maintaining constant pressures or varying delivery in accordance with the pressures encountered.

The broad object of the present invention is to provide an arrangement in which a predetermined ratio of the volumes of two fluids will be maintained with a greater or less degree of constancy, the specific embodiment illustrated being adapted to maintain the ratio very nearly constant.

It is a further object of the present invention to provide an arrangement in which variation of the delivery of the major liquid may occur without disturbing the ratio of the liquids delivered. This is particularly useful in connection with oil treatment, since, as the acid and oil are mixed for treatment, the acid is eliminated by the use of purifiers of which there are provided a number for each proportioning and mixing device. If a purifier is shut down or the capacity of all of the purifiers is not necessary, it is of course desirable to vary the capacity of oil handled by the proportioning device while at the same time maintain constant the percentage of acid mixed with the oil.

Detailed objects of the invention will become apparent from the following description read in conjunction with the accompanying drawing in which the figure represents diagrammatically the layout of a preferred arrangement.

Assuming that the two liquids to be proportioned and mixed are oil and acid with the quantity of acid smaller than that of oil, the oil enters an inlet 2 into the primary pump 4 which may be of any suitable type. If large quantities are being handled the pump 4 may be of centrifugal type; or as in the present instance it may consist of a screw pump driven by a motor 6. If this pump is a screw pump, then for the sake of high efficiency it may desirably be of the form illustrated in the patent to Montelius 1,698,802 and may take the form illustrated in Montelius Patent 1,821,523 which comprises a plurality of screws one of which drives one or more of the others directly without the interposition of gearing. It is relatively unimportant what form this

primary pump takes but reference is made to the screw pump of the Montelius type primarily because a secondary pump and meter later described are preferably of this same type. A pump or meter in accordance with the Montelius patents just referred to has the characteristic that angular movements of the main shaft are directly proportional to the volume handled.

The pump 4 discharges into a T 8 connected with a by-pass 10 extending back to the inlet of the pump and containing a valve 12 which functions as a combined by-pass and relief valve, this valve being controlled by manipulation of a hand wheel 13.

The major portion of the liquid passed through the T enters a meter 14 preferably of the screw type referred to in the Montelius patents to which reference has been made. The meter may be identical in capacity with the pump 4 as indicated. From the meter 14 the oil passes through the conduit 16 to a centrifugal mixer of conventional type indicated at 18 driven by the same motor 6 which drives the primary pump 4. The oil together with the acid which is introduced into the conduit 16 is discharged at 20 from the mixer.

The shaft 22 of the meter 14 has an extension on which is splined a friction wheel 24 engaging the face of a friction disc 26 connected to the driving shaft of a pump 28 which is also preferably of the Montelius type. Acid enters this pump at 30 and is discharged at 32 into the conduit 16.

A hand wheel 34 mounted on a suitable control board and provided with a pointer movable over a scale 36 is connected by means of a linkage indicated at 38 with a lever 40 which has a pin engaging within a groove carried by the hub of friction wheel 24 so that by its oscillation it moves the friction wheel 24 in the direction of its axis radially with respect to the disc 26 so as to vary the ratio of the drive between the meter 14 and the pump 28. A flexible shaft 42 connected either directly or by gearing to the extension of shaft 22 operates a tachometer 44 to indicate the speed of rotation of the meter shaft. A similar flexible shaft 48 connects the shaft of the pump 28 with a second tachometer 46 also mounted on the control board. For the sake of simplicity the arrangement is shown in an expanded form. Preferably, however, the layout is such that the control wheel 13 of the by-pass valve 12 is also on the face of the control board as indicated in dotted lines. The entire arrangement may form a unit on a single base and be capable of control from a single control board which in addition to the device indicated may contain starting mechanism for the motor, etc.

Inasmuch as the capacities of the meter and pump are directly proportional to their speeds,

it will be obvious that with any given setting of the friction wheel 24 there will be a constant ratio between the amount of acid and the amount of oil entering the mixer 18. This ratio will be maintained in spite of the variation in the amount of oil delivered to the meter since if this amount decreases the speed of the meter shaft proportionately decreases; similarly, also, the speed of the pump 28. The by-pass connections are, in fact, arranged so that a constant speed motor 6 may be used thus eliminating elaborate electrical connections. This is particularly useful if a battery of purifiers is used and one or more of the purifiers are cut off resulting in a rise of pressure in the line feeding the purifiers which will cause the relief valve to open by-passing the excess fluid. It frequently happens that the variations in capacity are so great that it is not at all practical to obtain a variable speed motor, particularly in small sizes, and a constant speed motor is accordingly desirable, particularly since the most efficient alternating current motors operate at substantially constant speed. The power wasted by by-passing the excess liquid through the relief valve is more than offset by the simplicity and wide range of capacity of the proportioning unit.

In certain cases the mixing device which consists of a centrifugal pump may be eliminated, the mixing taking place in some ultimate receptacle. The acid may of course be discharged into this ultimate receptacle.

The tachometers 44 and 46 may be graduated directly in any suitable unit: for example, tachometer 44 may be graduated in barrels per hour in case the apparatus is being used in a refinery, while tachometer 46 may be graduated in pounds per hour. There may also be furnished a counting arrangement which will show the total amount of oil passed through the meter in any interval. A proper graduation of scale 36 will enable the device to be readily set for any predetermined proportion of acid to oil. This scale may be graduated, for example, in pounds of acid per barrel of oil. The control 13 of the combined by-pass and relief valve may be set to regulate the pressure in the purifier feed line. After a proper setting, however, it is usually not necessary to operate this manually at all.

The operator by glancing at the two tachometers can readily determine whether the proportions are proper. The scale 36 would in general be sufficiently accurate if used alone without the tachometers, but the tachometers furnish a check on this since extraordinary resistance to flow in the acid pump might cause a slippage in the friction drive. An adjustment of the hand wheel 34 will readily result in the proper proportioning.

If the primary pump is a centrifugal pump rather than a screw pump it should be of a type having a comparatively flat curve, that is, a head which increases but little with decreased capacity. In such cases it is possible to eliminate the relief valve. However, for very wide ranges of capacities the relief valve is desirable.

It will be obvious that the invention is applicable to the proportioning of various types of liquids or fluids in general. Furthermore, it is adaptable for the proportioning of more than two fluids merely by arranging drives between a meter for one of them and a plurality of pumps, the drives being independently adjustable to provide variable speed ratios.

In all of these cases the meter corresponding to that illustrated at 14 in this application functions as a motor for the pump or pumps corresponding to 28, that is, the meter not only drives an indicating mechanism but also supplies a substantial amount of mechanical power.

What I claim and desire to protect by Letters Patent is:

1. In combination, a pump, a motor for driving said pump, said motor being adapted to operate at a substantially constant speed, a by-pass for discharge from said pump, adjustable means for controlling flow through said by-pass, a meter receiving fluid from the pump, a second pump, adjustable connections whereby the meter drives said second pump so that the delivery of the second pump bears a predetermined adjustable ratio to the fluid passing through the meter, and means driven by said motor for agitating and mixing the discharges from the meter and second pump, said by-pass associated with the first pump serving for the adjustment of the delivery of fluid to the meter while said motor operates to drive the mixing means at a substantially constant speed.

2. In combination, a pump, a motor for driving said pump, said motor being adapted to operate at a substantially constant speed, a by-pass for discharge from said pump, adjustable means for controlling flow through said by-pass, a meter receiving fluid from the pump, a second pump, adjustable connections whereby the meter drives said second pump so that the delivery of the second pump bears a predetermined adjustable ratio to the fluid passing through the meter, said connections including a variable ratio friction disc drive, and means driven by said motor for agitating and mixing the discharges from the meter and second pump, said by-pass associated with the first pump serving for the adjustment of the delivery of fluid to the meter while said motor operates to drive the mixing means at a substantially constant speed.

3. In combination, a pump, a motor for driving said pump, said motor being adapted to operate at a substantially constant speed, a by-pass for discharge from said pump, adjustable means for controlling flow through said by-pass, a meter receiving fluid from the pump, a second pump, and adjustable connections whereby the meter drives said second pump so that the delivery of the second pump bears a predetermined adjustable ratio to the fluid passing through the meter, said by-pass associated with the first pump serving for the adjustment of the delivery of fluid to the meter while said motor operates at a substantially constant speed.

4. In combination, a pump, a motor for driving said pump, said motor being adapted to operate at a substantially constant speed, a by-pass for discharge from said pump, adjustable means for controlling flow through said by-pass, a meter receiving fluid from the pump, a second pump, and adjustable connections whereby the meter drives said second pump so that the delivery of the second pump bears a predetermined adjustable ratio to the fluid passing through the meter, said connections including a variable ratio friction disc drive, said by-pass associated with the first pump serving for the adjustment of the delivery of fluid to the meter while said motor operates at a substantially constant speed.

FRANK W. KENNEDY.