

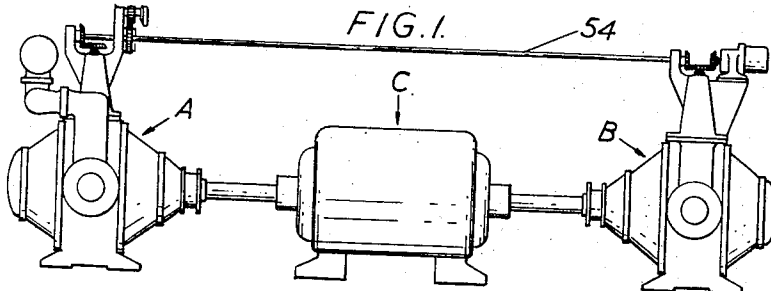
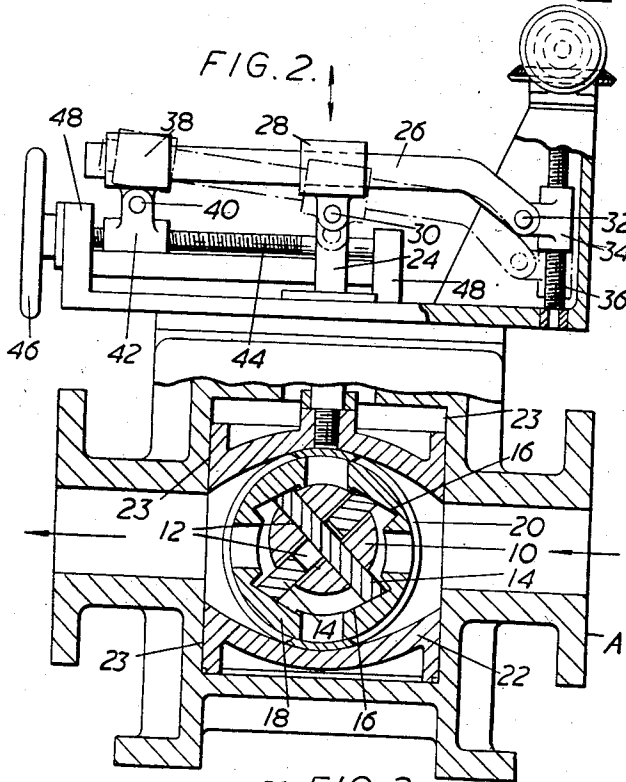
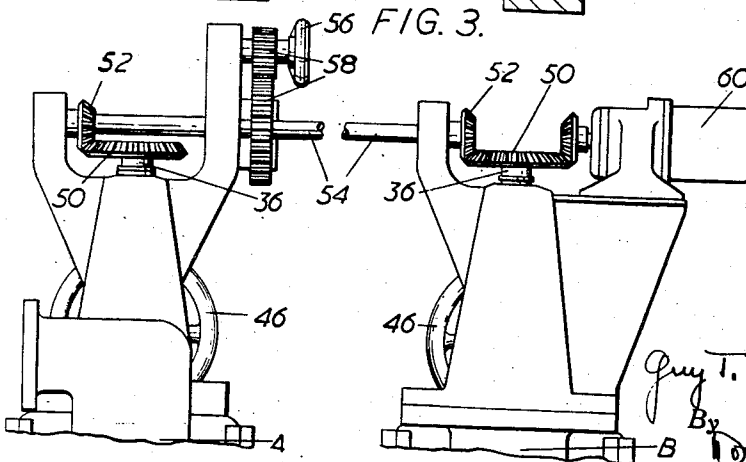
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PUMP INSTALLATION

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PUMP INSTALLATION

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3 Claims. (Cl. 103—6)

This invention relates to pumps, and is concerned with the problem of delivering a blend of two liquids, for example, light and heavy fuel oils, at a rate which can be varied without alteration of the ratio of the liquids to each other.

One object of the invention is to provide apparatus for the delivery of such a blend which comprises two variable capacity pumps driven by a common prime mover or driven at constant speeds by separate prime movers. Another object is the provision of control means for a pump installation having two pumps so as to enable the rate of delivery to be varied as desired without upsetting the ratio or proportionality of the deliveries from the two pumps. According to the invention, the capacity adjusting member of each pump is connected to a common control member through independently adjustable, variable-ratio transmissions. With such an arrangement, when the ratios of the transmissions have been adjusted so as to be in a particular ratio one to the other, the relative capacities of the two pumps will always be the same whatever may be the setting of the common control member.

The variable ratio transmissions can be of a very simple nature. They can, for example, comprise variable ratio levers, the ratio variation being effected by shifting the fulcrum of at least one of the levers.

In order that the invention may be thoroughly understood, a pump installation in accordance with it will now be described, by way of example, with reference to the accompanying drawings in which:

Fig. 1 is a side view of the installation;

Figure 2 is an enlarged side view partly in section of one of the pumps shown in Fig. 1 and

Figure 3 shows the upper parts of the pumps including the control means for varying the capacities of the pumps.

As shown in Figure 1, the two pumps A and B are driven by a single electric motor C mounted between them. It is to be understood that their shafts could, however, be driven at constant speeds by separate prime-movers. Both pumps are of the sliding vane type and are identical in construction as far as their pumping action is concerned. As shown in Figure 2, each pump has a shaft 10 having a pair of slots 12 lying on diameters of the shaft in which are mounted to slide a pair of vanes 14. The ends of the vanes 14 bear on plane surfaces 16 formed on the interior of the rotor proper shown at 18.

The rotor 18 is mounted within a bearing sleeve 20 carried by a cage 22 mounted for rectilinear, vertical movement along the slides 23 formed on the inside of the pump housing. As will be seen, vertical displacement of the cage 22 varies the extent of the sliding movement of the vanes 14 and, therefore, the capacity of the pump. This displacement of the cage is effected through a capacity adjusting control spindle 24 which extends up through the pump housing.

It is a feature of the present invention that the capacity-adjusting spindles 24 of each pump are controlled in such a manner that the rate at which the two pumps deliver the liquid blend can be varied without alteration of the

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ratio of the two liquids to each other. The means for controlling the spindles 24 will now be described.

Both pumps A and B are each provided with a variable ratio lever 26 having three pivotal connections, viz, one at its centre where a sleeve 28 slidable on the lever 26 is pivotally connected to the spindle 24 at 30; another at one end of the lever where it is pivotally connected at 32 to a nut or internally-threaded sleeve 34 carried on a vertical shaft 36; and a third to the fulcrum for the lever. The fulcrum comprises a sleeve 38 slidable on the lever 26 and pivotally connected at 40 to a nut or internally threaded sleeve 42 which can be moved longitudinally of the lever by rotation of a threaded shaft 44 extending alongside the lever on which the sleeve 38 is carried. A hand-wheel 46 is fixed to the shaft 44 on each pump, and the shaft 44 is journaled at each end in brackets 48 fixed to the pump housing.

The vertical shaft 36 on each pump is connected through gear wheels 50, 52 to a control shaft 54 extending between the two pumps. The control shaft may be rotated by means of a hand-wheel 56 through gearing 58 or by an electric motor 60 the shaft of which is geared to the gear wheel 50 on the pump B, or by any other convenient means.

For any given rotation of the control shaft 54, the sleeves 34 will be moved along the vertical shafts 36 and the control levers 26 will be turned through an angle depending on the setting of their fulcrum. If the fulcrum of one of the levers is set close to the control spindle 24, movement of the shaft 54 will have no effect on that spindle. The further the fulcrum is set away from the control spindle, the greater will be the movement of the control spindle for a given movement of the shaft 54.

If the two pumps are to deliver at the same rate, the two fulcrum 42 will be set in the same midway positions along the levers 26. If one is to deliver more than the other, the fulcrum of the lever of the one will be set away from the control spindle 24 and the other towards the control spindle. The relative settings of the fulcrum determine the relative rates at which the two pumps will deliver. The absolute rates of delivery are set by the hand wheel 56 or the electric motor 60 but rotation of shaft 54 does not alter the relative pump delivery rates because those rates are governed by the transmission ratios of the levers which have been set so that the relationship between them is that which is to exist between the delivery rates.

I claim:

1. A pump installation for delivering a blend of two liquids, comprising two variable capacity rotary pumps each having means for adjusting the capacity of the pump, means whereby said pumps may be connected to two separate sources of liquid, common means connecting each pump for rotationally driving said pumps at substantially constant predetermined co-related speeds, a common control member mechanically linked to said capacity-adjusting means for varying the rate of delivery of the blend, said control member comprising two lever transmission means, three pivotal connections on each of said lever transmission means, namely, a first pivotal connection at the centre thereof to said capacity-adjusting means on one of said pumps, a second pivotal connection at one of the ends thereof to a nut carried on a shaft turned by said common control member, and a third pivotal connection to the fulcrum of said lever, said fulcrum being shiftable longitudinally of said lever from its free end to said first pivotal connection.

2. A pump installation for delivering a blend of two liquids, comprising two variable capacity rotary pumps, means enabling said pumps to be connected to two separate sources of liquid, means connecting each pump for rotationally driving said pumps at substantially constant

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speeds, rectilinearly-movable means for adjusting the capacity of each of said pumps, a rotary control shaft extending between said pumps and rotatable independently of said pump driving means, and a pair of variable ratio transmission levers connected to said control shaft and to said capacity-adjusting means of each pump whereby the rate of delivery of the blend can be varied without alteration of the ratio of the two liquids to each other.

3. A pump installation comprising a first rotary pump and a second rotary pump, driving shafts on each of said pumps, a driving motor connected to both of said shafts whereby to drive said shafts at equal speeds of rotation, a rotor cage in each of said pumps, sliding vanes in each of said rotor cages, means in each pump for varying the position of said rotor cages relatively to said pump shafts whereby to vary the capacity of each of said pumps, a lever pivotally mounted on each of said pumps, a shiftable fulcrum for each of said levers, common connecting means between said cage-position varying means and said lever on each of said pumps, pivotally-mounted end-nuts

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on each of said levers, freely-rotatable, axially-fixed screw-threaded shafts in screw-threaded relationship with said end nuts on each of said pumps, gear wheels on each of said screw-threaded shafts, a rotatable control shaft extending between said gear wheels, gear wheels on said control shaft engaging with said gear wheels on said screw-threaded shafts, and means for rotating said control shaft independently of said pump driving motor.

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