

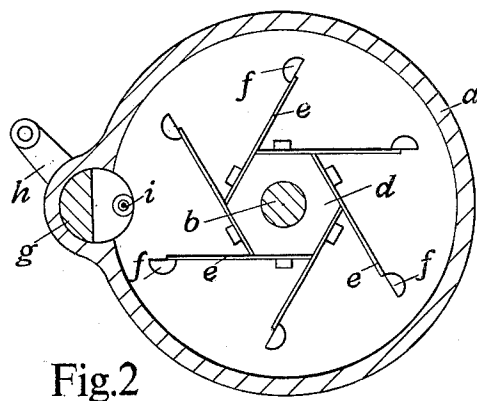
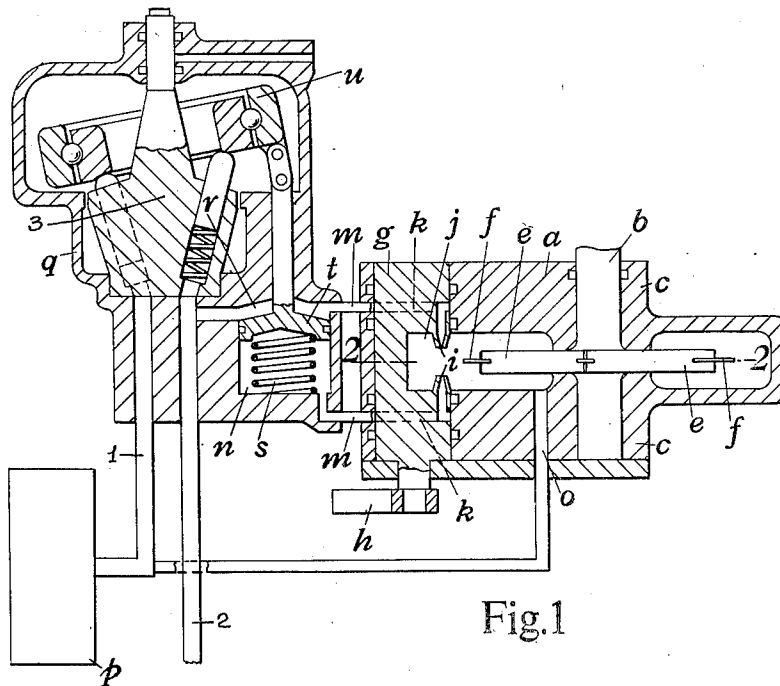
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MEANS FOR CONTROLLING A LIQUID-OPERATED SERVO MECHANISM

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MEANS FOR CONTROLLING A LIQUID-
OPERATED SERVO MECHANISM

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3 Claims. (Cl. 121—38)

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In a system for supplying liquid fuel to a prime mover such as a jet-engine or gas turbine, it is known to employ a liquid-operated servo-mechanism adapted to control a variable delivery fuel pump, throttle, by-pass or the like, the servo-mechanism being of the kind comprising a cylinder, and spring-loaded piston slidable in the cylinder, the piston being moved in one direction by the preponderance of liquid pressure acting on one of its faces, and in the opposite direction by the action of the spring on the opposite face. For varying the pressure of the liquid on the two faces of the piston it is known to interconnect the two ends of the cylinder by a passage in which is located a device responsive to the speed of the prime mover for setting up a difference of pressure at the two ends of the cylinder.

The present invention relates to a servo-mechanism of the kind and for the purpose above mentioned, and has for its object to provide improved means for controlling the action of the mechanism in response to the rate of working of the prime mover.

The invention comprises a rotary occulter adapted to receive motion from the prime mover, and to control the rate of flow of liquid between a pair of coaxial orifices adapted for connection to the servo-mechanism.

In particular the occulter comprises a plurality of resilient arms attached at their inner ends to a rotary body and each having at its outer end a shutter adapted to traverse a gap between a pair of coaxial orifices.

The invention also comprises an adjusting means comprising a rotatable member in which are provided the said orifices, the arrangement being such that rotation of the said member about its axis serves to vary the position of the orifices radially with respect to the occulter.

In the accompanying drawings, Figure 1 is a sectional side elevation showing diametrically an embodiment of the invention, and Figure 2 is a sectional plan on the line 2—2 of Figure 1 of the occulter.

Referring to the drawings there is provided a hollow body part *a* in which is rotatably mounted an occulter, this being mounted on a spindle *b* which is supported by suitable bearings *c* and being adapted to be driven by motion derived from a rotary part of the prime mover. The occulter consists in part of a hexagonally or other polygonally shaped member *d* formed on or secured to the spindle *b*. To each of the faces of the said member is attached the inner end of a spring blade *e*. At the outer end of each blade

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is formed or secured a thin shutter *f* of semicircular or other suitable form, the plane of which is at right angles to the axis of rotation. Also in the body part is formed a cylindrical bore which contains a rotary cylindrical member *g* which is angularly movable by a lever *h* at one of its ends, the lever being operable manually or automatically. In this member and parallel with its axis are formed a pair of co-axial passages *i*, which are separated by a gap *j* formed transversely across the periphery of the said member, the shutters *f* above mentioned being arranged to traverse this gap which is considerably wider than the thickness of the shutters, when a predetermined speed is attained. The adjacent ends of the said passages may be shaped to a convergent nozzle-like form.

The other ends of the said passages communicate with radial ports *k* in the angularly movable member, and the ports communicate with passages *m* in the body part which lead to the opposite ends of the cylinder *n* of the servo-mechanism. The chamber containing the occulter is provided with an outlet passage *o* which can be connected by a pipe or otherwise with a sump *p* or the inlet side of the fuel pump *q*.

The liquid required for actuating the servo-mechanism may be supplied by the fuel pump, and is received through a passage *r* by the end of the cylinder *n* of the servo-mechanism remote from the spring *s* which acts on the servo-piston. From this end of the cylinder the liquid can flow through the above described apparatus to the other end of the cylinder. At low rates of rotation of the occulter, liquid can flow without obstruction between the passages *i*, and the liquid pressure-difference in the two ends of the cylinder *n* is correspondingly small. Consequently the spring *s* can then move the piston in the direction for giving maximum fuel supply to the prime mover. In the example shown, this movement of the piston is utilised to move the angularly adjustable swash plate *u* of the pump to the position of maximum fuel delivery. But with increasing rate of rotation of the occulter and consequent interception of the flow between the passages *i*, the pressure-differences increase, and when the preponderating pressure acting on the upper side of the piston is sufficient to overcome the action of the spring *s*, the piston *t* is moved in the opposite direction for reducing the rate of fuel supply to the prime mover.

Fuel is drawn from the sump *p* through an inlet pipe *l* and is discharged through an outlet pipe *2* for delivery to the prime mover. The ro-

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tary member 3 carries spring loaded pistons as in the well known type of swash plate pump and the reciprocation of these pistons alternately draws fuel from the pipe 1 and discharges it through the pipe 2. The control of the inlet and outlet is controlled by kidney shaped ports in a well known manner.

The action of the occulter depends in part on the rate of its rotation, and the number of shutters. It also depends on the radial position of the shutters relatively to the passages *i*, which position varies during acceleration periods. Moreover, a further control is provided by the angularly movable member *g*, as by moving this member the passages *i* can be advanced radially inwards or outwards relatively to the shutters. Liquid intercepted by the shutters is returned to the system by the passage *o* communicating with the occulter chamber.

In the example above described, the orifices *i* are respectively connected to the opposite ends of the servo-cylinder. But this condition is not an essential feature of the invention, as one of the orifices could be connected to one end of the cylinder, and the other connected to any convenient source of liquid under pressure.

By this invention the desired control of the servo-mechanism in response to the rate of working of the prime mover or to manual or other action can be effected in a convenient and satisfactory manner.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. Means for controlling the supply of liquid fuel to a prime mover comprising, in combination, a liquid-operated servo-mechanism for varying the fuel supply having a cylinder, a spring-loaded piston slidable in the cylinder and arranged to be moved in one direction by a preponderance of liquid pressure acting on one of its faces and in the opposite direction by the action of the spring loading on its opposite face,

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a pair of coaxial orifices one of which is connected to one end of the cylinder and the other of which is connected to a source of liquid under pressure and arranged so that flow of liquid takes place from one orifice to the other and thereby acts upon the piston, and a rotary occulter disposed in the path of the liquid flow between the said orifices and comprising a rotary body, a plurality of resilient arms attached at their inner ends to said body, and a shutter attached to the outer end of each arm, the shutters being arranged to traverse a gap between the coaxial orifices and to interpose intermittently a resistance in said path whereby the pressure difference on opposite sides of the aforesaid piston will be varied in accordance with the speed of rotation of the occulter.

2. Means according to claim 1, in which the orifices are connected to opposite sides of the spring loaded piston.

3. Means according to claim 1, in which the coaxial orifices are formed in an angularly adjustable member so arranged that adjustment of said member varies the position of the orifices relatively to the occulter and thereby varies the resistance to liquid flow effected by the said occulter.

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