

Dec. 16, 1952

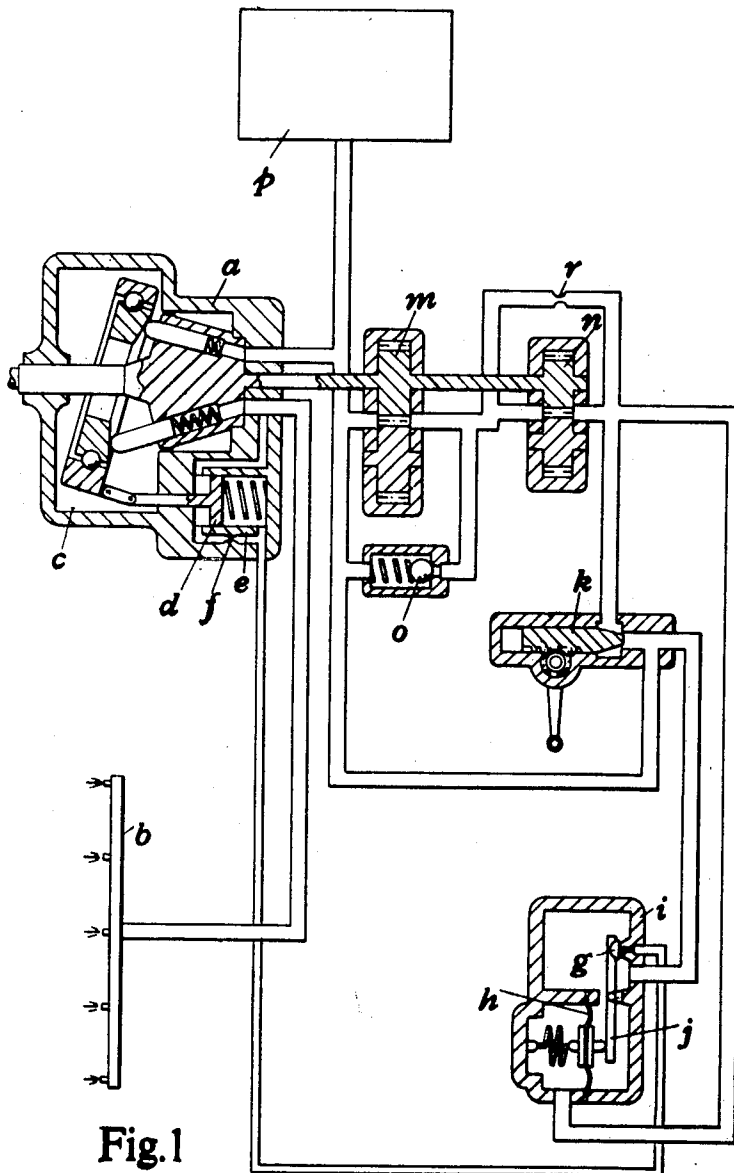
R. J. IFIELD

2,621,913

HYDRAULIC GOVERNOR FOR INTERNAL-COMBUSTION PRIME MOVERS

Filed July 17, 1950

2 SHEETS—SHEET 1



Inventor
R. J. Ifield
By *Grant Downing* Subst.
Attys

Dec. 16, 1952

R. J. IFIELD

2,621,913

HYDRAULIC GOVERNOR FOR INTERNAL-COMBUSTION PRIME MOVERS

Filed July 17, 1950

2 SHEETS—SHEET 2

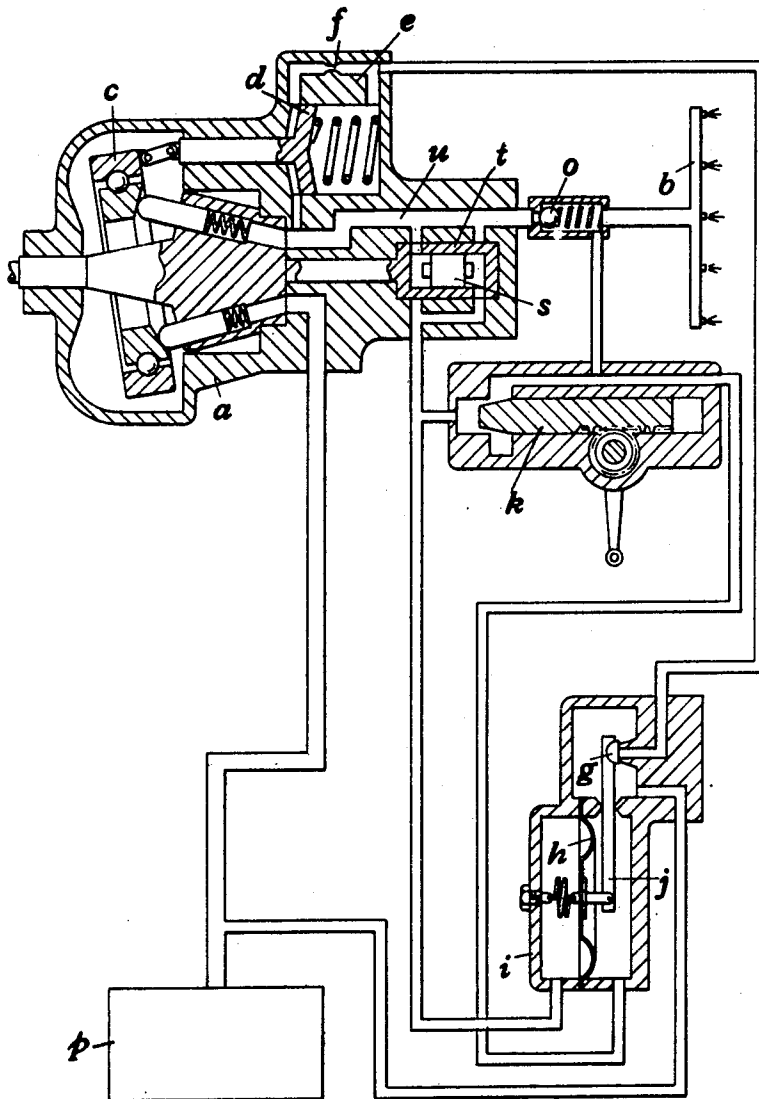


Fig.2

Inventor
R. J. Ifield
By *Glenn Downing* *Att'y.*

UNITED STATES PATENT OFFICE

2,621,913

HYDRAULIC GOVERNOR FOR INTERNAL-COMBUSTION PRIME MOVERS

Richard Joseph Ifield, Dural, New South Wales,
Australia, assignor to Joseph Lucas Limited,
Birmingham, England

Application July 17, 1950, Serial No. 174,208
In Great Britain July 26, 1949

1 Claim. (Cl. 264—14)

1

This invention relates to hydraulic governors for jet propulsion engines, gas turbines or other internal combustion prime movers, and of the type adapted to control a fluid-operated servo-mechanism, which latter serves to control a variable-delivery fuel pump, a throttle in the fuel supply system, or otherwise vary the rate of supply of fuel to the prime mover in response to variations of engine speed, the governors being also of the type adapted to utilise fluid supplied by a pump (which may be the fuel pump, or a pump whose sole duty is to supply the governor), and cause the fluid to pass through a variable throttle for setting up a pressure difference in the fluid at opposite sides of the throttle, this pressure difference being caused to act on opposite sides of a diaphragm (or piston) adapted to actuate a valve associated with the servo-mechanism.

It has been found that the performance of a governor of the type above specified is susceptible to the working condition of the pump on which it depends for its action. Thus leakage at the pump or in some associated part of the system (due, for example, to wear), may adversely affect the action of the governor. Also changes in the viscosity of the fluid employed (usually oil) may adversely affect the action of the governor.

The object of the invention is to enable the action of the governor to be rendered independent of the ordinary changes which may occur in the working condition of the pump, and of viscosity changes.

The invention comprises the combination with a governor of the type above specified, of a secondary pump adapted to receive fluid from another pump and supply it to the governor.

In the accompanying drawings:

Figures 1 and 2 are diagrams illustrating two typical applications of the invention.

Referring to Figure 1, the system there shown includes a fuel pump *a* of the swash plate type for supplying liquid fuel to a burner *b*. The swash plate *c* of the pump is angularly adjustable for varying the output of the pump by a servo-mechanism. This mechanism comprises a spring-loaded piston *d* slidable in a cylinder *e*, the ends of which are in communication with each other through a restricted orifice *f*. Liquid fuel from the pump *a* is by-passed to one end of this cylinder, and a vent at the other end is controlled by a valve *g*, as hereinafter described. The servo-mechanism may, however, be used to control the rate of supply of fuel to the burner

2

in other ways. Thus it may actuate a throttle in the pipe leading from the pump to the burner, or it may actuate a fuel bypass, or otherwise regulate the rate of fuel supply.

The governor comprises a flexible and spring loaded diaphragm (or piston) *h* contained in a chamber *i*, and movement of the diaphragm (or piston) is employed to actuate a lever *j* carrying the above mentioned vent valve *g*. Fluid is supplied at different pressures to opposite sides of the diaphragm (or piston) from the opposite sides of a manually operable control throttle *k* adapted to set up the desired pressure difference in the fluid. The fluid which acts on the diaphragm may be supplied by the fuel pump *a*, or by a separate pump whose sole duty (as above mentioned) is to actuate the governor. In the example shown in Figure 1, the fluid required for acting on the diaphragm is supplied by an associated primary pump *m* (in this example a gear pump) driven by the fuel pump, the capacity of the pump *m* being in excess of that required for supplying the secondary pump to be hereinafter described.

In applying the present invention to a governor as above described in the manner shown in Figure 1, there is arranged in communication with the entrance side of the throttle *k*, a secondary pump *n* of any convenient form. This may be a pump of the gear type as shown, or (and as shown in Figure 2) it may be a pump of the shuttle type contained in a rotary sleeve. In either case it is driven by the fuel pump, or any part driven by the engine. The secondary pump is required solely for actuating the governor, and as it has a less duty to perform than the primary pump *m* it can be of smaller size. Between the pumps *m*, *n* is arranged a spring loaded valve *o* for limiting the pressure of the fluid supplied to the secondary pump *n*, with the result that only a relatively small pressure difference need exist between the inlet and outlet sides of the pump *n*.

When in action, the pump *n* receives fluid from the pump *m* at a given pressure determined by the valve *o*. Liquid from the pump *n* passes to the throttle *k* and thence returns to a sump *p* and/or to the inlet side of the pump *m*. The two sides of the diaphragm *h* are respectively connected to the delivery sides of the pump *n* and throttle *k*. Variations in the difference of this pressure (at any given setting of the throttle) corresponding to variations in the speed of the engine, cause the diaphragm

3

h to vary the vent opening and so effect the desired control of the speed of the engine.

It will be understood that the servo-mechanism operates in known manner in response to the action of the vent valve *g*. When the latter is closed, the piston *d* moves under the action of its spring for increasing the rate of supply of fuel to the burner, on opening the valve the piston moves under liquid pressure against the spring for reducing the fuel supply.

By the combination with the governor, of a secondary pump as above described, the action of the governor is rendered substantially independent of any normal variations which may occur in the working condition of the pump *m* by which it is supplied.

The effect of viscosity changes in the motive fluid can be conveniently compensated by the provision of a by-pass across the pump *n* and containing a suitably restricted orifice *r*, so that variations produced in the fluid flow from the pump *m* to the secondary pump *n* by changes in the viscosity in the fluid, are accompanied by corresponding variations in the fluid flow through the restricted orifice *r*.

The example shown in Figure 2, is essentially similar to that shown in Figure 1 and differs mainly in the form of the secondary pump. In this example, the secondary pump receives liquid directly from the fuel pump *a* and comprises a shuttle-type piston *s* slidable in a hollow and rotatable cylindrical sleeve *t* which is driven by the fuel pump, or other suitable source of motion. Ports at opposite ends of the sleeve communicate alternately with ports in the surrounding cylindrical housing, the latter ports being respectively in communication with the discharge passage *u* of the fuel pump *a*, the throttle *k* and chamber *i* as shown. In other respects the description of Figure 1 applies also to Figure 2, excepting that the viscosity-com-

4

pensating by-pass *r* of Figure 1 is omitted, though this feature may be included when desired.

By this invention a desirable improvement can be effected in the reliability of governors of the type to which the invention relates.

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

- 10 A hydraulic governor for controlling an internal combustion prime mover to which fuel is supplied at a rate determined by a fluid-operated servo mechanism, comprising in combination a valve for controlling the servo mechanism, a pressure responsive member for actuating said valve, a duct for fluid under pressure, a variable throttle arranged in said duct to set up a pressure difference in the fluid flowing therethrough, a chamber divided by said pressure responsive member into two compartments, passages connecting said compartments to said duct at opposite sides respectively of said throttle so that said pressure responsive member depends for its action on said pressure difference, a
- 20 main fluid pump, and a secondary pump arranged to receive fluid from said main pump and to supply fluid to said duct.

RICHARD JOSEPH IFIELD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,006,865	Lake	July 2, 1935
2,369,397	Kostenick	Feb. 13, 1945
2,429,005	Watson et al.	Oct. 14, 1947
2,527,867	Whitehead	Oct. 31, 1950
2,532,856	Ray	Dec. 5, 1950