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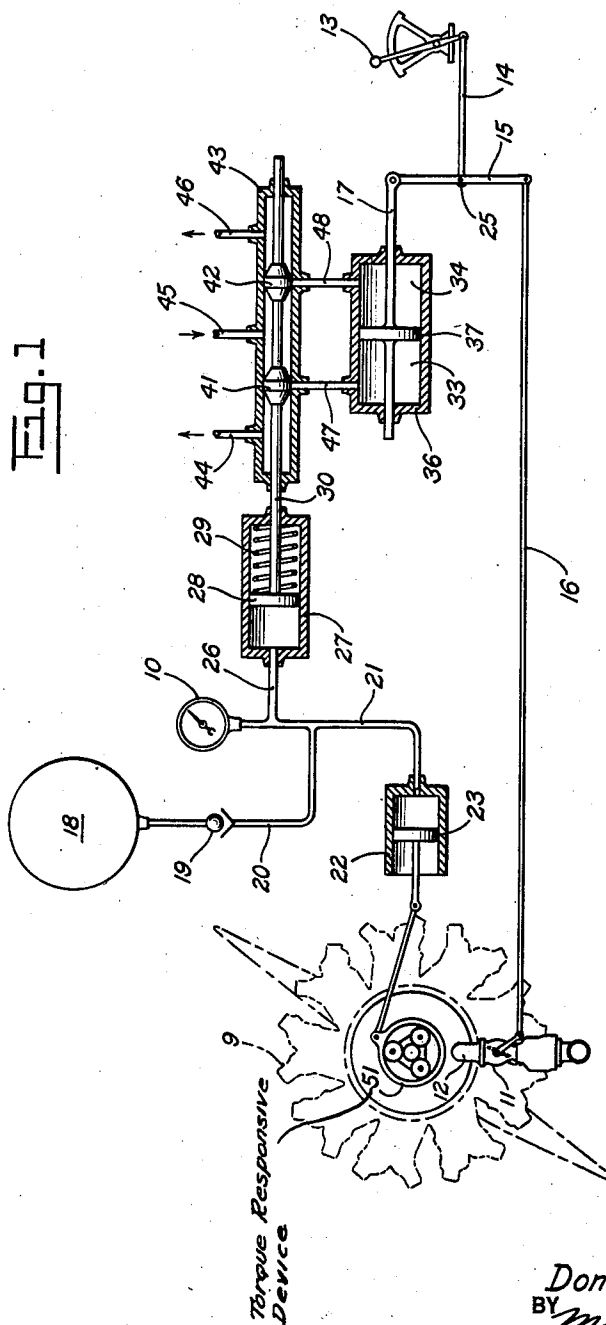
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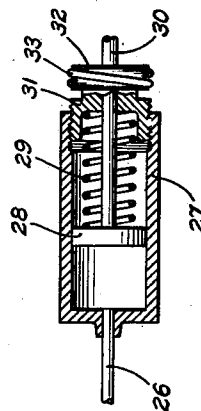
ENGINE CONTROL MECHANISM

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Fig. 1



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ENGINE CONTROL MECHANISM

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1 Claim. (Cl. 123—108)

This invention relates to internal combustion engines, and particularly to the control of the power developed by such an engine.

It is well understood that the throttle setting of an aircraft propelling internal combustion engine must be varied at frequent intervals during the flight of a craft, because of changes in the conditions which the craft encounters. Changes in altitude, for example, or in the angle of flight, impose new load conditions upon the propeller or propellers of a craft, and there is a consequent necessity for shifting the engine throttle (to supply a larger or smaller quantity of fuel, as the conditions may require) if the developed power of the engine is to be held constant.

I am aware of the existence of devices and systems for automatic regulation of throttle setting; but there is disclosed herein a novel system of throttle regulation which (as will appear more clearly as the description of the invention proceeds) possesses certain definite advantages over those of the prior art. Thus, for example, instead of connecting the control mechanism to the intake manifold, as is done with many of the prior art devices, the present invention involves taking advantage of the torque measuring appliance that is now a standard engine accessory, and providing throttle regulating means operating in parallel relationship to said torque measuring mechanism. Since the torque developed is in direct proportion to fuel supplied, it will be seen that a fuel regulating mechanism which functions directly in response to torque conditions, as measured on a torque-meter, will be just as accurate as one that involves tapping into the intake manifold. Moreover, the elimination of the need for physical contact with the intake manifold is a distinct advantage. In fact, for some time engineers have sought to obtain some means for getting automatic throttle regulation independently of tapping into the intake manifold, and therefore the present disclosure will be of definite utility in pointing out a new mode of achieving this objective.

Objects of the invention, therefore, are to provide a novel method of fuel regulation and an improved fuel regulating mechanism for internal combustion engines, the advantages of which method and mechanism are pointed out herein, to a certain extent, but include others which will suggest themselves to those skilled in the art, after examination of the accompanying drawing illustrating one embodiment of the invention described herein. It is to be understood, how-

ever, that the drawing is for the purpose of illustration only, and is not designed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In the drawing,

Fig. 1 is a view, partly diagrammatic and partly in mechanical section, of a system embodying the invention; and

Fig. 2 is a sectional view of a modified form of valve controlling cylinder.

In Fig. 1 there is shown diagrammatically, at 9, an internal combustion engine whose developed torque is measured by the customary torque-meter 10; the engine 9 having a throttle 11 located in the intake manifold 12, a manual control lever 13 for the throttle, and a linkage 14, 15, and 16 connecting said lever and throttle. The link 15 extends above and below the link 14 and at one end receives a pin for pivotal connection with a rod 17 constituting part of the novel throttle regulating mechanism now to be described.

The supply line 21 (leading from source 18 by way of one-way valve 19 in line 20) connects the torque meter 10 with the cylinder 22 (in which is located the engine-controlled piston 23 whose movement reflects the torque conditions, in the manner known in the art); and from said line 21 I propose to install a tap-off line 26, at the end of which line there is a cylinder 27 containing a piston 28, a spring 29, and a rod 30 of sufficient length to control flow of liquid, under pressure, to and from opposite chambers 33 and 34 of the servo-motor having a cylinder 36 containing a piston 37 in which the rod 17 is secured. To effect such control the rod 30 is supplied with valve elements 41 and 42 having fluid-tight, sliding relationship to a valve cylinder 43 from which lead the conduits 44, 45, 46, 47 and 48. Conduit 45 leads from a source of liquid under pressure, as for example, the engine oil pump; conduits 44 and 46 lead back to the oil sump or other pressure outlet; and conduits 47 and 48 lead to chambers 33 and 34 respectively.

With the foregoing arrangement it will be seen that as long as the developed torque is unchanged, valve rod 30 will not move from its setting as shown; the liquid pressure in the meter line being just balanced by the pressure of spring 29. In the setting shown ports 47 and 48 are both covered, hence there can be no fluid movement in cylinder 36 and therefore no movement of rod 17 or of the throttle linkage (except, of course, that manual intervention can cause the link 15 to swing, at any time, about its pivotal connection with rod 17). Now in the event of

a change in developed torque, for any reason, the corresponding change in the reaction upon stationary annulus gear 51 (of the conventional torque measuring mechanism) will create a change in pressure in cylinder 22 corresponding to the increase or decrease in developed torque; and this pressure change (as indicated on meter 10) will create an unbalance in cylinder 27, which unbalance will move valve rod 30 to allow liquid to flow from one chamber of cylinder 36, and a corresponding amount into the opposite chamber. The resulting movement of rod 17 will shift link 15 about its central pivot 25 and thus change the setting of throttle 11. The ensuing rise or fall in the developed torque (depending on the direction of throttle movement) will restore equilibrium and the ports 47 and 48 will again be covered, thus bringing movement of the piston 37 to an end. The throttle 11 will accordingly remain in the new position, assuring maintenance of the desired constant torque development by the engine, until such time as occurrence of some new condition necessitates a readjustment, at which time the above-described cycle of action will be repeated.

The spring 29 is actually in abutment with a spring adjusting member 31 (Fig. 2) rather than the end wall of the cylinder 27; the purpose being to afford the aircraft pilot with means for selecting the desired value of torque to be maintained, it being understood that the amount of

pre-compression of the spring 29 (by screw 31) will control the pressure at which the valves 41, 42 are balanced, and hence the torque intended to be developed (and held constant) by the engine. As shown in Fig. 2, there is a pulley 32 integrated with screw 31, and about this pulley there is wrapped a cable 33 leading to the cockpit of the craft, to afford the pilot with a more convenient means of adjusting the position of screw 31 and hence the degree of compression of the spring 29. Source 18, 19, 20 is the source of fluid for operation of the elements (23, 10, 27) connected to line 21. Fluid flows from 18 to 21, by way of 19 and 20, whenever there is a vacuum, complete or partial, in said line 21 or the chambers connected therewith.

What is claimed is:

An automatic torque regulator for an engine having an adjustable fuel control comprising a reversible hydraulic piston operatively connected with said fuel control, a housing for said piston and two conduits leading thereto, a second piston responsive to the torque developed by said engine, a single valve mechanically connected to said second piston to move therewith, a housing for said second piston, said housing including a rotatable closure plate, and means responsive to rotation of said closure plate to vary the torque value maintained constant by said automatic torque regulator.

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