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MECHANISM FOR CONNECTING ENGINE
GOVERNORS AND BY-PASS VALVES

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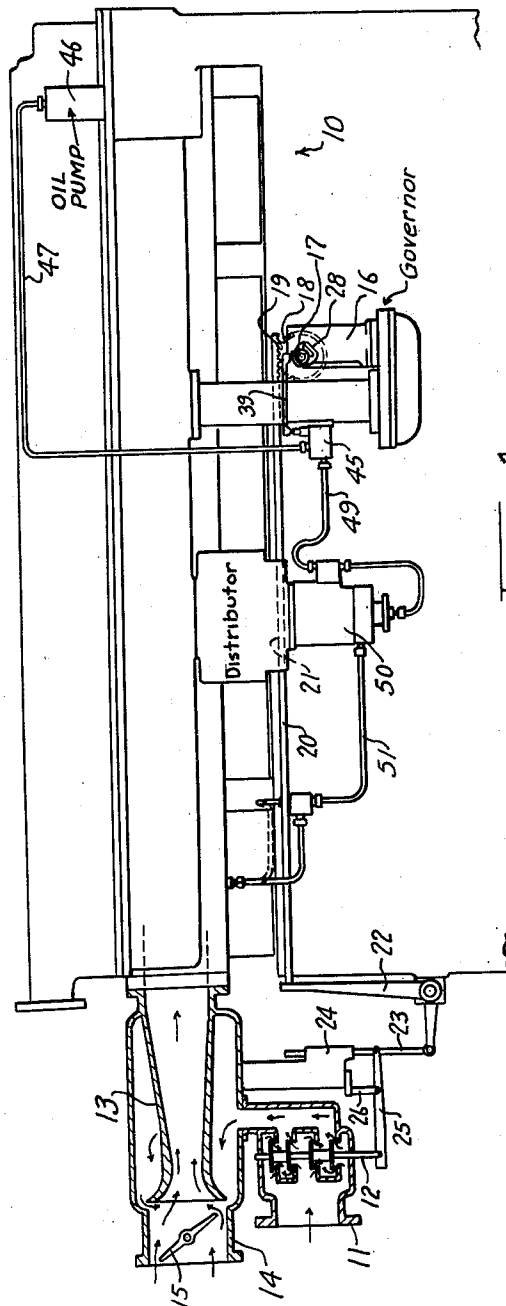


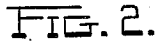
FIG. 1.

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MECHANISM FOR CONNECTING ENGINE GOVERNORS AND BY-PASS VALVES

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1 Claim. (Cl. 74-53)

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This invention relates to high compression internal combustion engines, but more particularly to such engines which are adapted to operate on gas and oil.

In engines of this character, it is desirable that the amount of oil injected into the cylinder be controlled in accordance with the load conditions or demands of service as well as the volume of gas available at the time. When producer gas is employed and since its volume not infrequently varies from time to time, it becomes necessary during the operation of the engine to increase the rate of oil supply when the supply of gas decreases, and on the other hand when the supply of gas increases, then the rate of oil supply should accordingly be decreased. Of course, when the engine is running idle at no load, the quantity of oil injected should be slightly less than that necessary to operate the engine, since the oil is utilized to ignite the gas. This will be readily apparent inasmuch as the temperature of compression is lower than the ignition temperature of the air-gas mixture but is higher than that of fuel oil.

Certain of the above variations can be automatically controlled within reasonable limits. However, it is a desideratum to produce a simple and efficient regulator by which the proper proportion of gas and oil is delivered to the engine, the same to be changed as the available supply of gas varies, so that the rate of oil delivery may be increased in the event the available gas is reduced. In this manner the engine can be kept running smoothly regardless of the load imposed upon it and the fuel or mixture of fuels supplied to it.

An object is to produce a new and improved mechanism for connecting a governor for a Diesel engine employing gas and oil and the by-pass valve thereby automatically to control the rate of oil injected into the engine in predetermined proportion to the quantity of gas delivered thereto.

Other objects and advantages will hereinafter appear and, for purposes of illustration but not of limitation, an embodiment of the invention is shown in the accompanying drawings, in which

Figure 1 is a diagrammatic side elevation, partly in section of a Diesel engine equipped with the usual variable speed governor and showing the attachment thereto for controlling the rate of oil delivered to the cylinders;

Figure 2 is an enlarged side elevation, partly in vertical section, showing the governor attachment, the oil bypass valve assembly and the operative connection therebetween;

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Figure 3 is a view of the governor attachment shown in Figure 2 but adjusted to a position by which the rate of oil delivery is increased; and

Figure 4 is a view of the governor attachment shown in Figure 2 adjusted to afford even greater rate of oil delivery than that shown in Figure 3.

The illustrated embodiment of the invention comprises a Diesel engine 10, only so much being shown as is necessary for an understanding of the invention. Gas is supplied to the engine through a valve casing 11 in which is mounted for vertical reciprocatory movements a multiple disc valve 12. From the valve casing 11, gas flows about a mixing throat 13, to which air is supplied through a pipe 14, containing a butterfly type control valve 15. Thus a mixture of air and gas pass to the engine cylinders through the inside of the mixing throat 13, which, as shown, has a bell mouth and a venturi adjacent thereto.

The engine 10 is equipped with a governor, indicated at 16, which is operatively connected to be driven by the engine. Detail description and illustration of the governor mechanism is not considered necessary to a clear understanding of the invention. Suffice it to say that the governor 16 is of the variable speed type equipped with a control shaft 17, which oscillates in accordance with the engine load conditions, in one direction when more fuel is required and in the other direction when a lesser quantity is needed to keep the engine speed uniform. Variable speed governors of this type are well known to those skilled in this art and are ordinarily available in the open market, one being produced by Woodward Governor Company, of Rockford, Illinois, and referred to as type U. S. 8 governor.

As shown the governor 16 is arranged within a housing and the oscillatable governor shaft 17 projects beyond opposite sides of the housing. Mounted on one end portion of the shaft 17 is a pinion 18, with which meshes a rack 19 forming a part of a horizontally disposed rack bar 20 slidably mounted in a guide 21. The opposite end of the rack bar abuts against the vertical arm of a bell crank 22, the horizontal arm of which is pivoted to a vertical link 23. The upper end portion of the link slides vertical in a guide 24 and pivoted to an intermediate portion of the link 23 is one end of a lever 25 intermediately pivoted to a post 26. The opposite end of the lever 25 is pivoted to the lower end of the stem of the multiple disc gas valve 12.

It will be manifest that rocking movement of the governor shaft 17 in one direction progressively moves the multiple disc valve 12 away from

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its seat, thereby to admit a greater volume of gas to the engine cylinders. Movement of the governor shaft 17 in the opposite direction operates to move the gas valve 12 toward its closed position.

Mounted on the opposite end of the governor shaft 17 is a disk 27, which is fixed for movements with the shaft. The disk 27 has an annular periphery, which has a nice rotatable fit within a larger disk 28, a portion of its lower peripheral surface being cut away, as indicated at 29. The disks 27 and 28 are eccentric to each other, it being observed that the disk 27 is mounted within the disk 28 above the center of the latter. Having bearing within the eccentric disk 28 is a shaft 30, on which is fixed a pinion 31 meshing with teeth 32 formed in a portion of the peripheral surface of the disk 27.

On the outer end of the shaft 30 is a handle 33, the turning of which rocks the outer or eccentric disk 28 in one direction or the other, the interengagement of the gear teeth retaining the eccentric disk in the position of adjustment. The inner disk 27 has a pointer mark, to which numbered calibrations on the eccentric disk can be selectively moved, as will hereinafter be explained.

Bearing against the top peripheral surface of the eccentric disk 28 is a shoe 34, the undersurface of which is arcuate to fit the rounded surface of the disk. In the upper portion of the shoe 34 and arranged centrally is a conical recess or bearing 35, into which extends the pointed end 36 of a vertical adjusting screw 37. A nut 38 locks the screw 37 in adjusted position in the end of an operating lever 39. The lever 39 is fulcrumed close to its opposite end at 40 and the adjacent end carries an adjustable contact screw 41, which abuts against a vertically disposed stem 42. The stem 42 is provided at its end with a bypass valve 43 and a spring 44 urges the valve away from its seat within the valve housing 45.

Oil is delivered to the bypass housing 45 by a constant delivery injection pump 46, which is operated in any suitable manner. From the pump 46 oil is forced thru a tube 47, which is connected to the housing 45 for delivery of oil to a passage 48, the latter communicating with a passage 48a through which oil passes through a tube 49 to the usual distributor 50 from whence oil is delivered to the engine cylinders in a well known manner, one tube 51 only being shown leading to one of the cylinders. Communicating with the passage 48a is a passage 52, which is controlled by the bypass valve 43 and which leads to the oil supply (not shown). It will be obvious that the quantity of oil, which is forced to the distributor 50, is determined by the position of the valve 43 and, since the delivery of the pump 46 is constant, excess oil is bypassed through the passage 52 to the oil supply, it being evident that the passage 52 beyond the valve 43 is larger so that the tendency is for the oil to flow there-through. The greater opening afforded by the bypass valve 43, the more the quantity of oil delivered to the cylinders is reduced.

In operation it will be understood that the set screw 37 is first adjusted for proper gas-oil operation, so that the quantity of oil is slightly less than that required to operate the engine on oil alone under no load condition. Adjustment is made of the eccentric disk 28 by actuation of the handle 33 in accordance with the prevailing gas supply. If the supply is large, then the

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eccentric disk 28 is turned so that the indicator mark on the inner disk 27 is on the smaller numbered calibration on the eccentric disk, such for example as at 2. In that position, the oscillating movement of the governor shaft 17, which is through an arc of the order of 42°, imparts substantially no change in the vertical position of the shoe 34. Thus, when additional fuel is required by the engine and called for by the governor, that is supplied by gas through operation of the rack bar 20 and associated parts, as above described.

However, in the event the available gas supply is reduced from that necessary for efficient engine operation, then the eccentric disk is adjusted so that a larger number on the calibrations registers with the indicator mark on the disk 27, such as shown on Figures 3 and 4. In such position, the oscillating movement of the governor shaft 17 and the disk 27 impart substantial change in the shoe 34, causing it to move up or down. Such motion is transmitted through the lever 39 to the bypass valve 43. Upward movement of the shoe 34 effects a closing movement to the valve 43, thereby causing more oil to be forced to the engine. Downward movement of the shoe 34 operates to open the valve and, as above explained, reduce the oil supply to the engine. Manifestly, the amount of adjustment of the eccentric disk 28 will be arrived at empirically for most satisfactory operation.

In some instances it may be desirable to operate the engine entirely on oil, and this may be accomplished by adjustment of the eccentric disk to a position, such as indicated on Figure 4, by which the oil supply is substantially increased.

From the above it will be manifest that I have provided an exceedingly simple device for controlling the delivery of both gas and oil to a Diesel engine. Its marked simplicity not only enables it to be operated by a comparatively unskilled person but it can be produced at a relatively low cost. The number of moving parts is reduced to a minimum, so that it may be installed readily and conveniently. Furthermore, it will be evident that adjustments may be effected either while the engine is in operation or is idle. It is unnecessary to stop the engine to make adjustments to reduce or increase the rate of oil delivery, since a slight turn of the operating handle quickly effects the desired result, both at no load condition, as well as at full load condition and intermediate conditions.

What I claim is:

55 An adjustable linkage for connecting an oscillatable control shaft to a mechanism to be actuated thereby comprising a lever having a fulcrum intermediate its ends, means for operatively connecting a first end of the lever to the mechanism in such manner that rocking movement of said lever about its fulcrum will actuate the mechanism, a first disc for mounting concentrically on the control shaft, a second disc having an eccentrically positioned aperture therein in which said first disc is positioned, a rotatable toothed pinion carried by one of said discs, teeth on the other of said discs meshing with the teeth of said pinion whereby rotation of said pinion causes relative rotation of said discs, a shoe riding on the periphery of said second disc, and an operative connection between said shoe and the second end of said lever.

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