Chapter 8

H.P. FUEL PUMP (GEAR TYPE) GP.1 SERIES

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LIST OF ILLUSTRATIONS

General

1. The pump unit comprises a gear type engine driven pump and a mechanically driven centrifugal overspeed governor which influences a flow control valve in the fuel system combined control unit. In the following description the annotation numbers are given in three figures; the first of these is the illustration number and the two remaining figures the number of the item to which reference is being made, so that 310 for example indicates item 10 of fig. 3.

2. Two weighted levers located in a rotor and driven at pump speed form the overspeed governor; at speed, the levers tend to lift a plunger and open a servo valve and this in turn controls the flow valve located in the fuel system combined control unit. The flow valve is described in detail in Sect. 13, Chap. 1, para. 9 of this Air Publication. Resistance to the centrifugal force generated by the weights is provided by an adjustable loading spring which sets the datum at which the weights, overcoming the spring loading, can open the half-ball valve to cause a limitation in fuel flow and therefore speed.

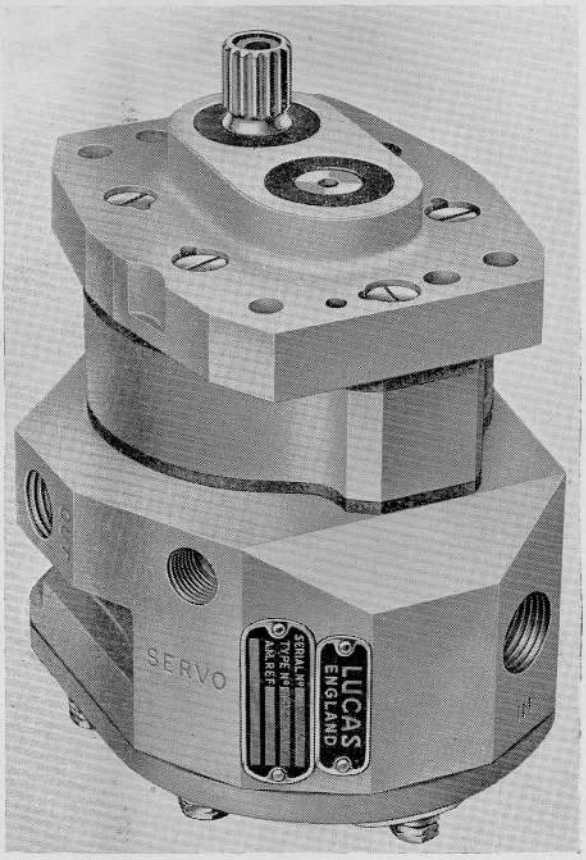

Fig. 1. General view of pump

Pump

3. Two coarse-pitch gears (311) form the pumping element and each is keyed to a separate shaft. The driving shaft (316) is splined at one end to take the drive from the engine whilst the driven-gear shaft (314) is extended at its upper end to drive the rotor (322) of the centrifugal governor.

4. A carbon bush at each side of the gear carries the driving shaft, the lower, or splined end, bush being sealed against leakage by a rubber sealing ring which is recessed into a groove in the lower end of the bush bore. An axial drilling (321) through the centre of the shaft conducts fuel from the governor chamber to a cross-drilling near the end of the shaft, the cross-hole permitting fuel to lubricate the bush bore. At its upper end the shaft, being open to the governor chamber, is lubricated by fuel seeping between the shaft and the upper bush. The fuel in the governor chamber is at pump inlet pressure.

5. The shaft of the driven gear (314) is carried in a carbon bush at the upper, or governor, end whilst the lower journal runs in a carbon sleeve (313) pressed into a bronze bush (312). The carbon sleeve does not extend the full length of the bush bore and the sealing ring for this shaft is carried in the portion of the bush which extends below the carbon. This arrangement provides a carbon bearing surface for the shaft but utilizes the higher thermal conductivity of bronze to dissipate the heat generated by the sealing ring.

6. Lubrication of the driven shaft lower journal is provided by the flow control valve servo pressure, fuel being led into the side of the pump casing and conducted by drillings to an annular groove in the bore of the carbon sleeve. A cross-hole in the shaft permits the servo fuel to pass to an axial drilling (315) in the shaft; this drilling terminates at the servo valve orifice (310), which is screwed into the bottom of a counterbore at the upper end of the shaft.

Governor mechanism

7. The upper end of the pump driven shaft (314) is formed into a flange to which is spigoted and dowelled a circular plate to form the weight carrier (322), this has two diametrically-opposed pairs of lugs machined on its upper surface. A weighted lever (303) is pivoted between each pair of lugs to provide the centrifugal components, the outward movement of the levers being limited by a cylindrical cup (301) surrounding the rotor and riveted to the weight carrier.

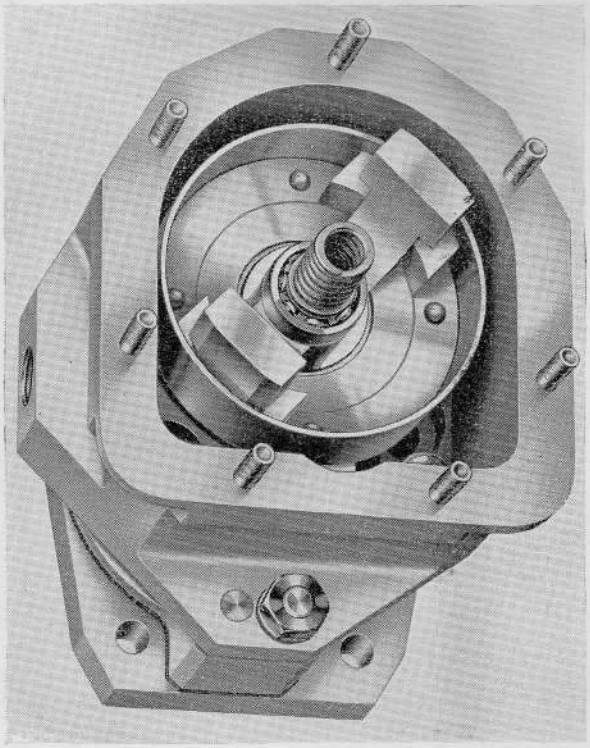

Fig. 2. View looking on governor rotor

KEY TO FIG 3

301	FLY-WEIGHT MOVEMENT LIMITER
302	GOVERNOR HOUSING TOP COVER
303	CENTRIFUGALLY-OPERATED FLY-WEIGHT
304	FLY-WEIGHT LEVER THRUST BEARING
305	GOVERNOR SETTING ADJUSTMENT
306	GOVERNOR LOADING SPRING
307	GOVERNOR HOUSING
308	GOVERNOR VALVE OPERATING PLUNGER
309	HALF-BALL VALVE
310	SERVO ORIFICE CONNECTED TO CONTROL UNIT FLOW VALVE
311	PUMP GEARS
312	DRIVEN-SHAFT BRONZE BUSH
313	DRIVEN-SHAFT CARBON SLEEVE
314	PUMP DRIVEN GEAR SHAFT
315	CONTROL UNIT SERVO PRESSURE DRILLING TO ORIFICE
316	PUMP DRIVING SHAFT
317	PUMP END COVER AND BEARING HOUSING
318	PUMP CHAMBER END PLATE (LOWER)
319	PUMP CHAMBER
320	PUMP CHAMBER END PLATE (UPPER)
321	DRIVING SHAFT LUBRICATION DRILLINGS
322	CENTRIFUGAL ROTOR WEIGHT CARRIER

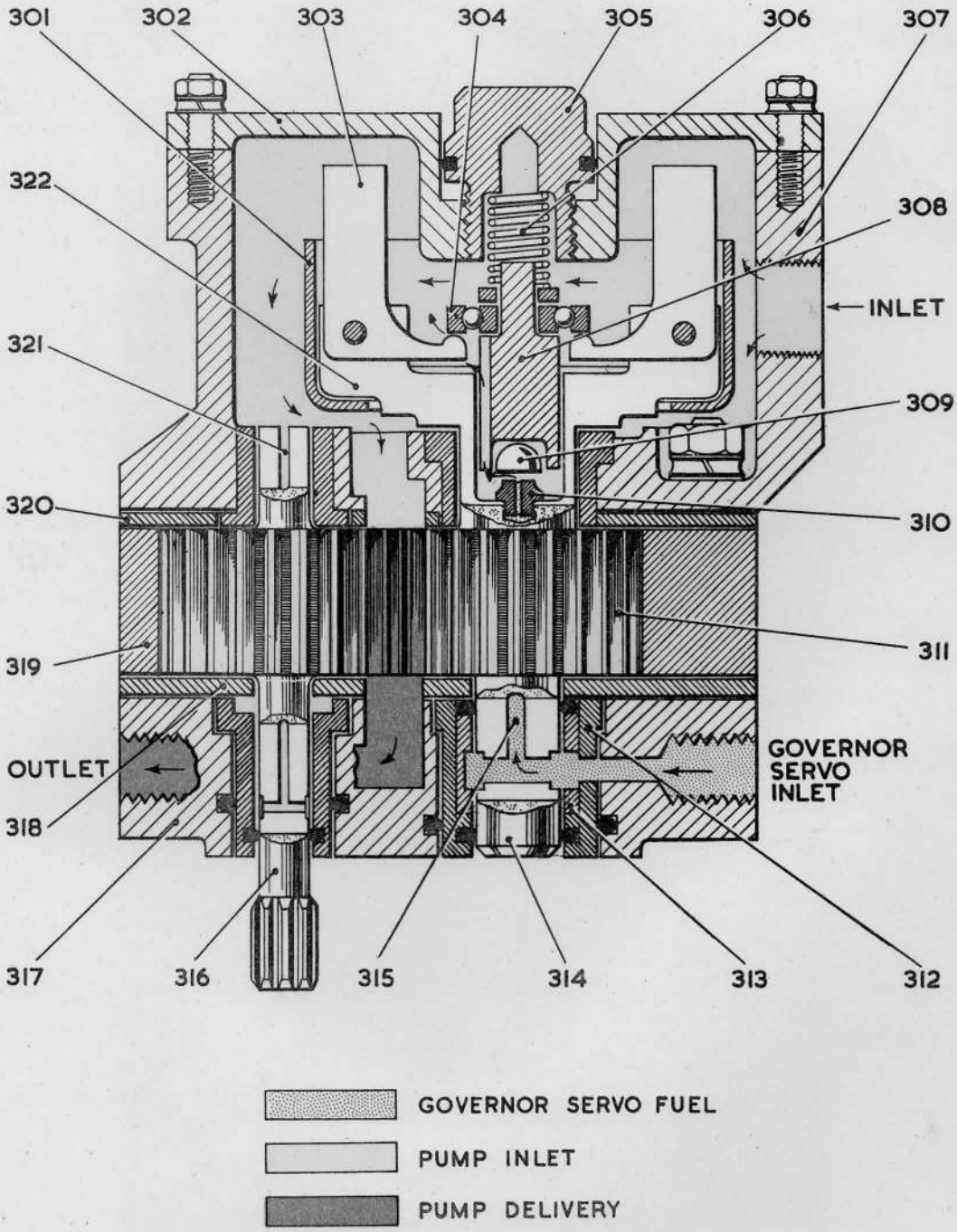

Fig. 3. Schematic diagram of pump and governor

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8. At their inner ends the weighted levers are located beneath a small ball bearing (304) which is pressed on to a spigot at the upper end of the plunger (308); the plunger is housed in a counterbore in the upper end of the driven gear shaft and is recessed at its lower end to house the-half ball (309) of the servo valve. Above the ball bearing a spring seating carries the governor setting spring (306). This is retained at its upper end by an adjusting screw (305) and imparts a downward load on the plunger to seal the servo valve and to resist the upward thrust of the weighted levers under centrifugal force.

9. The spring adjustment (305) provides a datum which can be set to determine the point at which the centrifugal force of the lever weights will overcome the spring resistance and lift the plunger to permit the half-ball valve to spill servo pressure from the control unit. As the centrifugal loading is related directly to pump, and therefore engine speed, the flow to the burners will be reduced by the control unit flow valve at the pre-determined maximum speed.

Pump and governor housings

10. The centrifugal governor is housed in a light alloy machined casing (307) which also forms the pump top cover and carries the upper bearings of the pump gear shafts. This casing carries the three fuel connections to the pump; the inlet connection leads directly into the governor chamber from where a drilling conducts the fuel to the inlet side of the pump gears. Fuel from the servo valve (309) and (310) spills into the governor chamber along flutes in the side of the governor plunger (308). The pump delivery is ducted to the outlet connection on the side of the governor casing. Servo fuel from the flow control unit enters a connection on the governor casing and is led by drillings through the base of the casing, through the pump casing and into the pump end cover, where a horizontal drilling leads this fuel to the pump driven gear shaft (314) which picks up the servo fuel (315) as described in para. 6.

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