

Chapter I

ACCUMULATOR, TYPE A.C.4/5A

LIST OF CONTENTS

	Para.		Para.
<i>Introduction</i>	1	<i>Trip valve</i>	8
<i>Identification</i>	2	<i>Principle of operation</i>	10
<i>Description</i>	3	<i>Installation</i>	16
<i>Accumulator</i>	4	<i>Inhibiting and packing</i>	18
<i>High-pressure cock</i>	6	<i>Servicing</i>	19

LIST OF ILLUSTRATIONS

	Fig.		Fig.
<i>Sectioned view of accumulator, trip valve and high-pressure cock</i>	1	<i>Schematic diagrams of accumulator, trip valve and high-pressure cock</i>	3
<i>Exploded view of type A.C.4/5A accumulator</i>	2		

Introduction

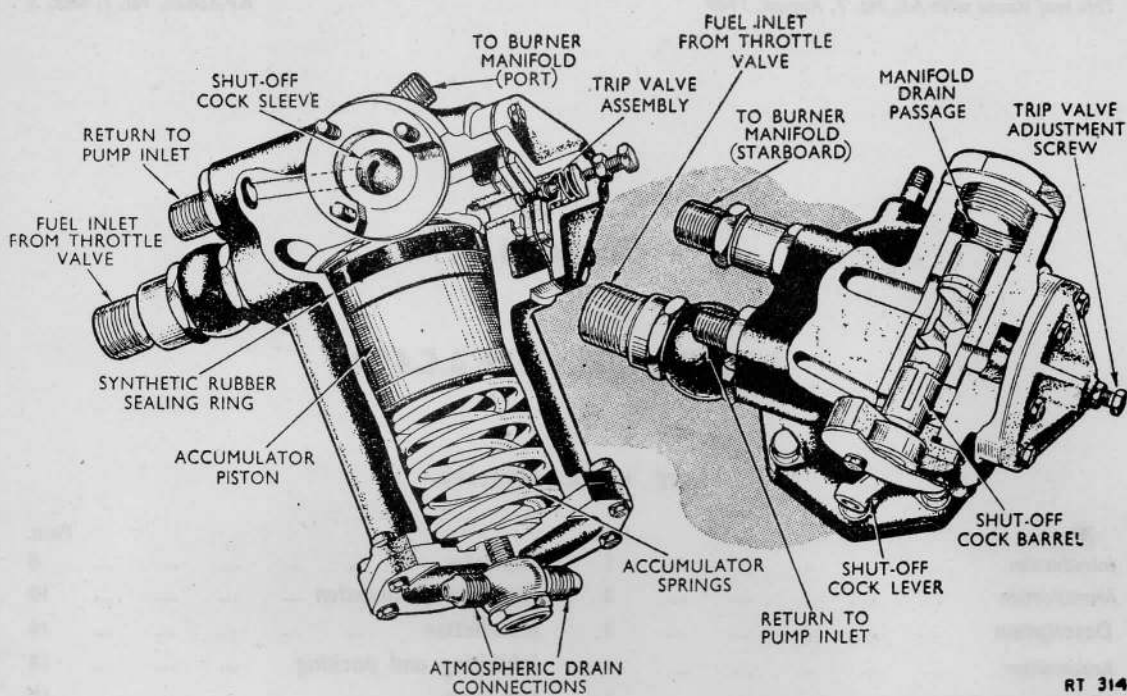
1. The type A.C.4/5A accumulator, a sectioned view of which is given in fig. 1, is a composite unit incorporating a high-pressure cock and a trip valve assembly. The function of the unit is to provide an additional supply of fuel to the burners during the initial motoring period, when the speed of the engine is insufficient to provide a readily ignitable spray of sufficient duration to start the engine. The high-pressure cock controls the fuel supply to the burners and is the only means whereby the engine can be stopped. The trip valve assembly is provided to isolate the fuel supply when starting the engine until a predetermined pressure has been built up in the cylinder, when the full charge is released to the burner manifold.

Identification

2. The combined A.C.4/5A type accumulator, trip valve and high-pressure cock unit derives its designation from the basic type A.C.4, the installation code number 5, and the calibration code letter "A". Combined accumulator units of this type are fitted to the Rolls-Royce Derwent Mk. 5 engines.

DESCRIPTION

3. For convenience of description the unit can be divided into three assemblies, the accumulator, the high-pressure cock, and the trip valve. An exploded view of the unit is shown in fig. 2, and reference should be made to this illustration during the following description of each sub-assembly.



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Fig. 1. Sectioned view of accumulator, trip valve and high-pressure cock

Accumulator

4. The accumulator body is a cylindrical light-alloy casting, of 8 cub. in. capacity, the bore being machined to accommodate the piston. The top portion is machined and drilled to provide inter-connecting passages and housings for the high-pressure cock and trip valve. A passage, drilled vertically through the cylinder wall from the high-pressure cock sleeve to the end cover, provides drainage from the sleeve and burners to atmosphere. The bottom end of the cylinder is closed by an aluminium-alloy end cap. This cap is recessed to locate the lower end of the piston springs, and is drilled and tapped in the centre to take the fuel drain banjo. The end cover is retained to the body by eight bolts and nuts. At the upper side of the cylinder is the trip valve cover, the retaining bolts of which also secure the trip valve diaphragm. Four cast bosses at the top of the body accommodate the unions for the two outlet connections to the manifold, the main supply from the throttle valve, and the return to the inlet side of the H.P. fuel pump.

5. The accumulator piston is an aluminium-bronze casting, the upper face being stepped to provide a seating for a U-shaped synthetic

rubber seal which is retained in position by a steel spring cap and a circlip located in a groove in the piston. The underside of the crown locates the upper ends of the two springs, the lower ends of the springs being located in the end cap. Steel shims are provided at both ends of the springs for adjustment of tension.

High-pressure cock

6. The high-pressure cock, located in the top of the casting and at right-angles to the piston, is a cylindrical steel rotor having transverse drillings and slots, and is carried in a fixed sleeve. These drillings are so arranged that when the cock is in the open position there is direct communication from the cylinder to the manifold outlets via slots in the sleeve of the cock. When in the closed position, annular grooves machined at each end of the rotor permit communication with the drain passage to atmosphere, and through an outlet to the input side of the H.P. fuel pump.

7. The operating lever is retained to the rotor by a pin, and is connected to a control lever in the pilot's cockpit. An end plate, retained by three studs and nuts, locates the

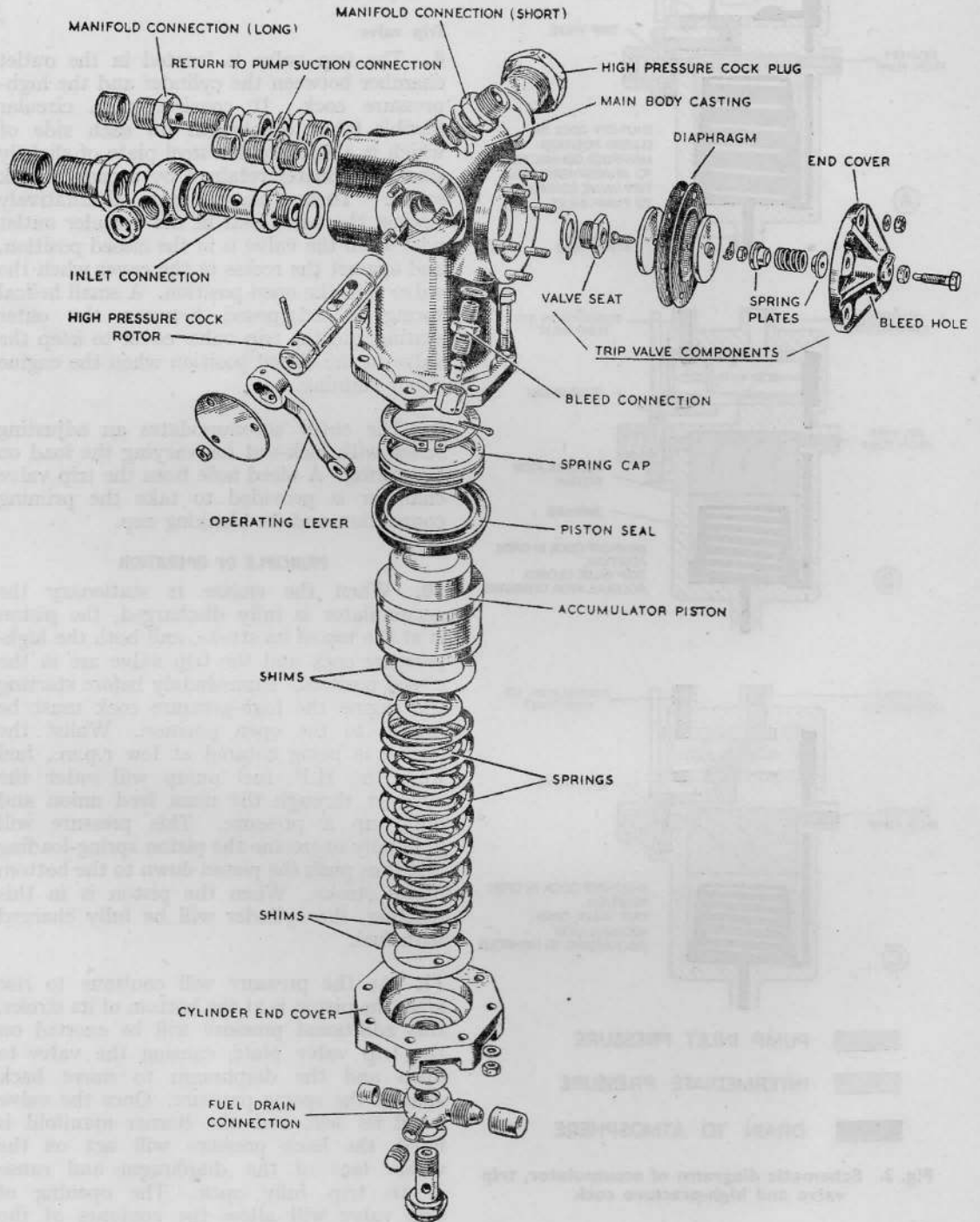


Fig. 2. Exploded view of type A.C.4/5A accumulator

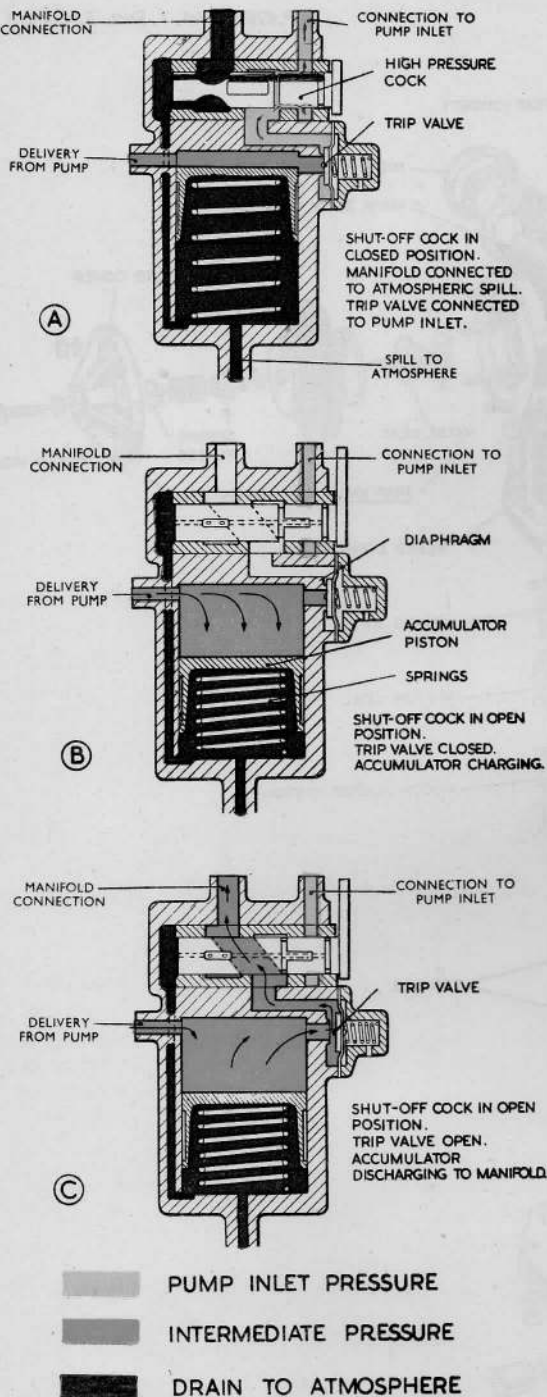


Fig. 3. Schematic diagrams of accumulator, trip valve and high-pressure cock

rotor in its sleeve. The open and closed positions are positively determined by bosses machined in the body casting. The design

of this cock ensures that the pressure on the rotor is balanced so that a minimum of torque is required for operation.

Trip valve

8. The trip valve is located in the outlet chamber between the cylinder and the high-pressure cock. It consists of a circular flexible fabric diaphragm on each side of which is a flat circular steel plate of slightly smaller diameter retained by a countersunk screw. These plates seat alternatively against the valve seat in the cylinder outlet port when the valve is in the closed position, and against the recess in the cover when the valve is in the open position. A small helical spring is interposed between the outer seating and the trip valve cover to keep the valve in the closed position when the engine is not running.

9. The cover accommodates an adjusting screw with lock-nut for varying the load on the spring. A bleed hole from the trip valve chamber is provided to take the priming connection and its blanking cap.

PRINCIPLE OF OPERATION

10. When the engine is stationary the accumulator is fully discharged, the piston is at the top of its stroke, and both the high-pressure cock and the trip valve are in the closed position. Immediately before starting the engine the high-pressure cock must be moved to the open position. Whilst the engine is being rotated at low r.p.m., fuel from the H.P. fuel pump will enter the cylinder through the main feed union and build up a pressure. This pressure will gradually overcome the piston spring-loading and thus push the piston down to the bottom of its stroke. When the piston is in this position, the cylinder will be fully charged with fuel.

11. As the pressure will continue to rise after the piston is at the bottom of its stroke, this additional pressure will be exerted on the trip valve plate, causing the valve to open and the diaphragm to move back against the spring pressure. Once the valve is off its seat and the burner manifold is filled, the back pressure will act on the whole face of the diaphragm and cause it to trip fully open. The opening of this valve will allow the contents of the cylinder under pressure to be released, the piston will therefore rise under upward pressure from the piston spring and force the fuel through the trip valve, through the slots

in the sleeve of the high-pressure cock and via the outlets to the manifolds and burners. This additional boost of fuel at the burners is sufficient to ensure a satisfactory ignitable fuel spray of sufficient duration to start the engine.

12. Throughout the period that the engine is running at normal speeds the trip valve will remain in the open position due to the fuel pump maintaining a pressure in the cylinder in excess of the trip valve pressure setting. This additional pressure will also keep the piston at the bottom of its stroke.

13. When the high-pressure cock is closed, the engine stops; the supply is cut off from the burners, and the pressure from the pump is reduced. As the pressure in the cylinder falls the piston will commence to rise and discharge fuel through the trip valve, along a slot in the high-pressure cock rotor, to the inlet side of the H.P. fuel pump.

14. When the fuel in the cylinder is fully discharged the piston will be at the top of its stroke and the pressure will be low, thus allowing the trip valve to close. Simultaneously, surplus fuel from the manifold will pass through the holes in the cock rotor, down the vertical passage in the body casting, to the underside of the piston, thence into the end cap and so drain to atmosphere.

15. Any fuel which may leak from between the cock rotor and its sleeve will also drain to atmosphere through this passage. Fuel which may pass the synthetic rubber piston sealing washer will drain into the end cap and pass to atmosphere.

INSTALLATION

16. The unit is retained to a bracket attached to No. 5 compressor delivery elbow on the engine by three $\frac{1}{4}$ in. nuts and bolts.

17. In addition the following pipes are connected to the unit:—

(1) Two flexible pipes to the port and starboard manifolds for the burners.

(2) The large flexible inlet pipe from the throttle valve.

(3) Two small flexible pipes to the fuel pump, one the return to pump input and the other connected to the seal drain from the pump.

INHIBITING AND PACKING

18. Inhibiting and packing must be carried out as described in Vol. 2, Part 3, Section 5, Chapter 1, para. 92 and 96.

SERVICING

19. It is of the utmost importance that the unit be kept clean and free from foreign matter of any kind. Frequent and careful examination must be made of pipes and connections, and any leakage immediately rectified.

20. If any pipes or connections are disturbed the fuel system must always be primed as described in the relevant Air Publication, A.P.4038B, Vol. 2, Part 3.

21. At every after flight servicing, ensure that the fuel drains from the burner manifolds through the drain connection beneath the accumulator immediately the high-pressure cock is closed. If no drainage occurs, examine the high-pressure cock and drain connection.

22. A periodic check should be made to ensure that the nuts securing the trip valve cover are tight.

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