GROUP 4 PROPELLER

List of Chapters

See Hartzell Propeller Manual

Group 5 ENGINE

Chapter List

Chapter 5.1.

General Information

CONTENT Page

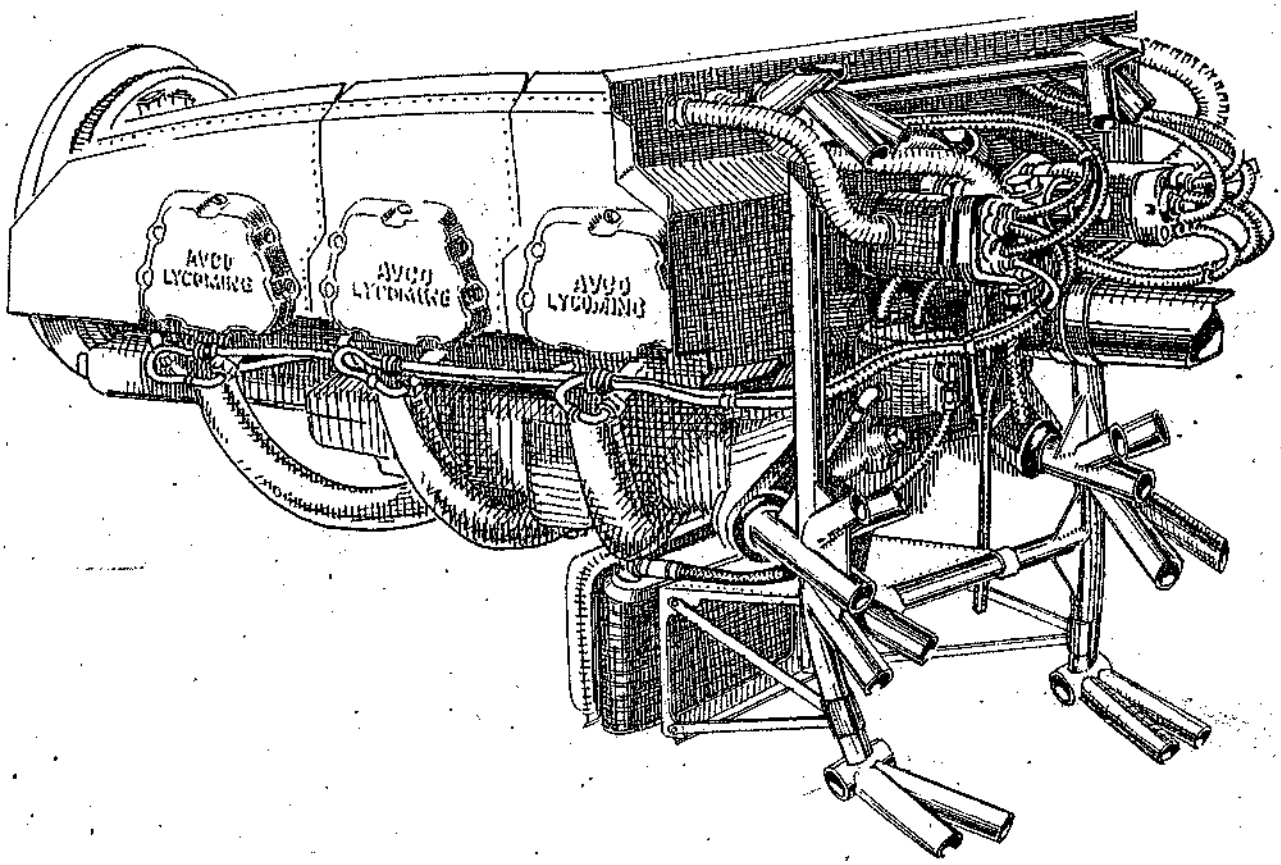


Fig.1 Engine Agregates Assy

DESCRIPTION AND OPERATION

General - Engine Agregates Assy (fig.1)

The airplane engine is of Lycoming type, with 6 opposite cylinders and normal intake. The mounting on airplane is carried out by the frame, which is mounted in its turn on the firewall fittings.

Caption. Fig.1 (Engine Agregates Assy).

1. Generator, provided with driving belt, situated in front and at the right side of the engine.
2. Diaphragms, RH-LH
3. Fuel Distributor
4. Engine Frame, with its dynafocal mounting and the engine fastening lugs.
5. Magnetos (LH-RH)
6. Metallic Links (Engine and Frame)
7. Electrical Cable for:
   - Cylinder Head temperature transmitter
   - Generator
   - Magnetos Connection
   - Oil temperature transmitter
   - Starter
   - RPM Indicator
8. RPM Indicator Holder
9. Magnetos high voltage conductors (6 for each)
10. Oil temperature transmitter
11. Cylinder Head thermocouple adaptor, cylinder no.5.
12. Fuel Injector
13. Fuel Pump
14. Engine and its spark plugs
15. Exhaust system, RH heater and cross-bars
16. Generator dyode
17. Holder and propeller pitch control cables
18. Engine Starter
19. Propeller and Slip
20. Pitch Regulator

The following tubes and pipes are fully connected to EAA.

4. Distributed fuel pipes (to cylinders).
6. Magnetos cooling tubes (two)
8. Engine crankcase vent tube
20. Injector intake tube with air inlet filter and warm air duct.
21. Injector supply pipe from the fuel pump
25. Distributor supply pipe, from the injector
26. Fuel pump drain pipe.
27. Pump cooling pipe.
28. Generator cooling pipe.

The following pipes have one end connected to EAA, and the other one free for connection to EAA when they are mounted to the engine

10. Oil cooler pipe
12. Oil pressure transmitter pipe
16. Pressure vacuum gauge pipe
18. Oil pipe leading to oil cooler
23. Fuel pump supply duct.

Engine and Auxiliary Agregates

Engine

2. Complete details about the engine, including its adjustment and check of any kind, are given in AVCO Lycoming Operator's Manual (part no.60297-10) wich is delivered with the airplane Within this publication there are also given information about defective operations cases.

Injector

3. In order to form the fuel mixture, the engine is provided with a fuel injection system, Bu endix RSA - 10 ED1 Type, automatically operated. It means that it delivers a fuel flow equal to the air flow delivered by the air inlet. References to this equipment are gi ven in the above mentionaed Lycoming publication as well as in Bendix Operating and Servicing Manual, Form no.15 - 468A. An injector derivation, situated at the opposite side of the fuel pump intake is used to adjust the fuel pressure, by means of a transmitter mounted at the right side of the frame.

Engine Fuel Pump

4. The engine drives a proper fuel pump that delivers the fluid at a high pressure, relatively much higher than for the carburator engines. The fuel is sent from the injector to a fuel distribuitor mounted above the engine.

Engine Holder (fig.2)

5. The engine frame is made of welded chrom-molybdenum steel tubes. It is fatened in 8 points on the firewall and is fitted with 4 flanges in which the engine is mounted by the intermediate of some dampers.

Engine Cowling (fig.3)

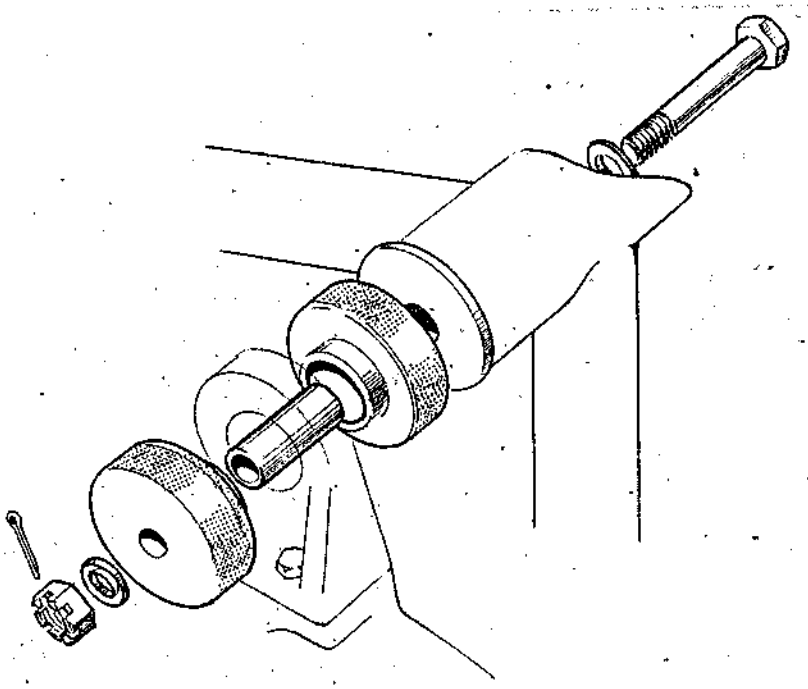
6. The engine cowling consists of the upper and lower covers. The lower cover mounting is made by 10 screws fixed in the firewall border locking nuts. The upper cover is assembled to the lower cover by 6 locks, three on each side and two screws at the front junction.

Diaphragms (fig.4)

7. Together with the upper cover, the diaphragms form a pressurized compartment above the engine, where the cold air that penetrates through the covers front openings is pushed to the cylinder.
The front diaphragms are mounted with screws to the engine and have the role of sealing the area between, the lower cover and the front cylinders pair. The rear diaphragms form the rear wall of the cowling pressure compartment.
On the rear diaphragms there are mounted the air inlets of agregates cooling systems.

Agregate Cooling

8. The right and left magnetos, the fuel pump and the alternator are the engine agregates. They are fitted with an individual cooling system. The magnetos and fuel pump cooling syste undertake the cold air through the inlets mounted in the rear diaphragms. The pump cooling system contains two rigid angle tubes and a durit sleeve. The alternator cooling system undertake the cold air from the lower cover front panel.



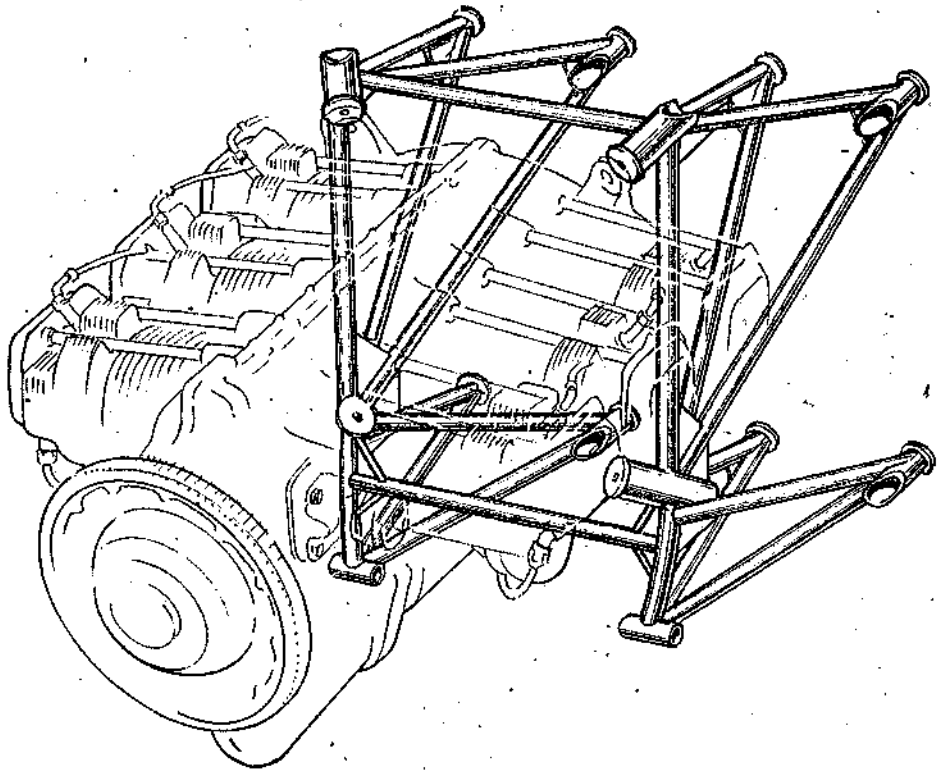


Fig. 2 Engine frame

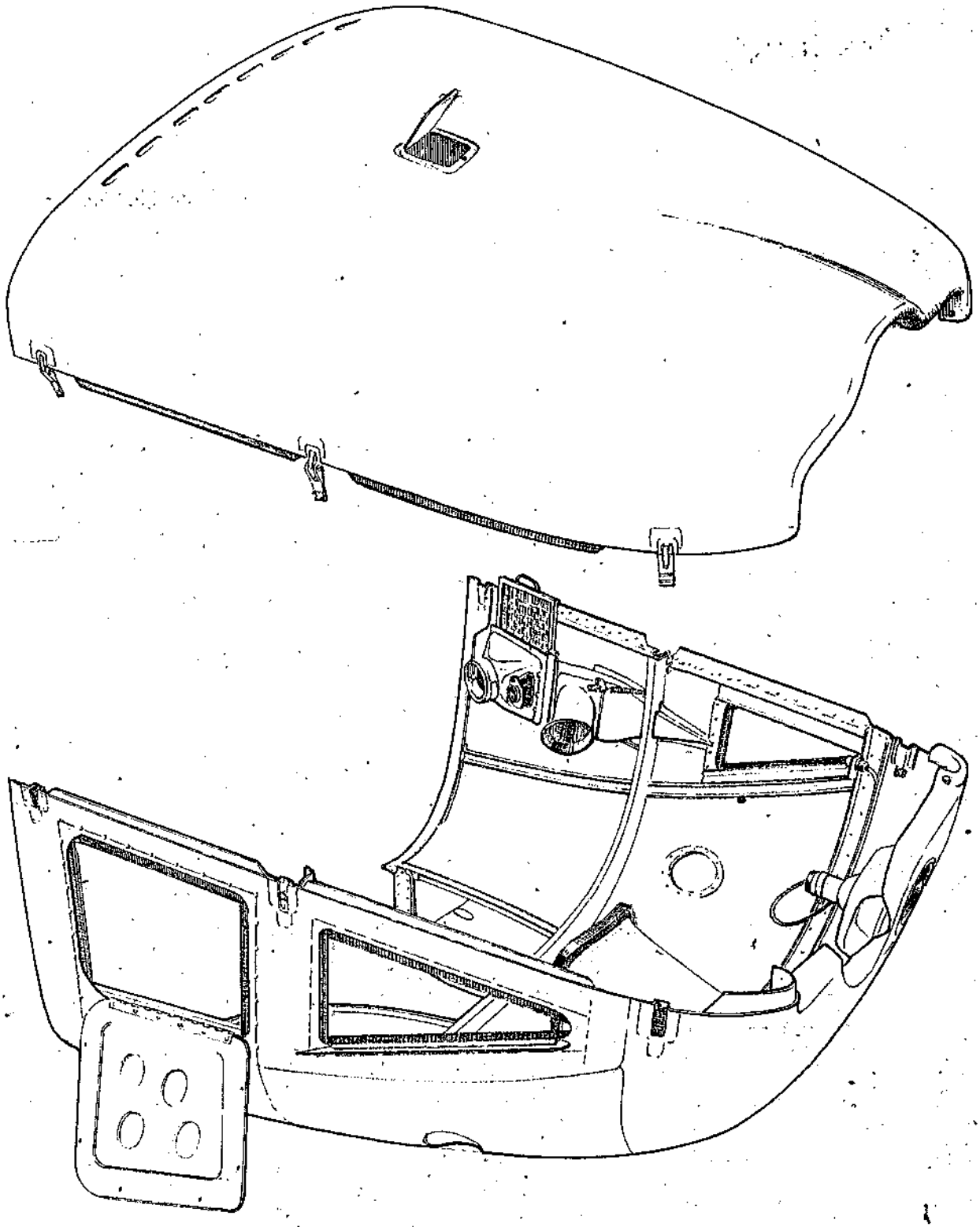


Fig. 3 Engine Cowling

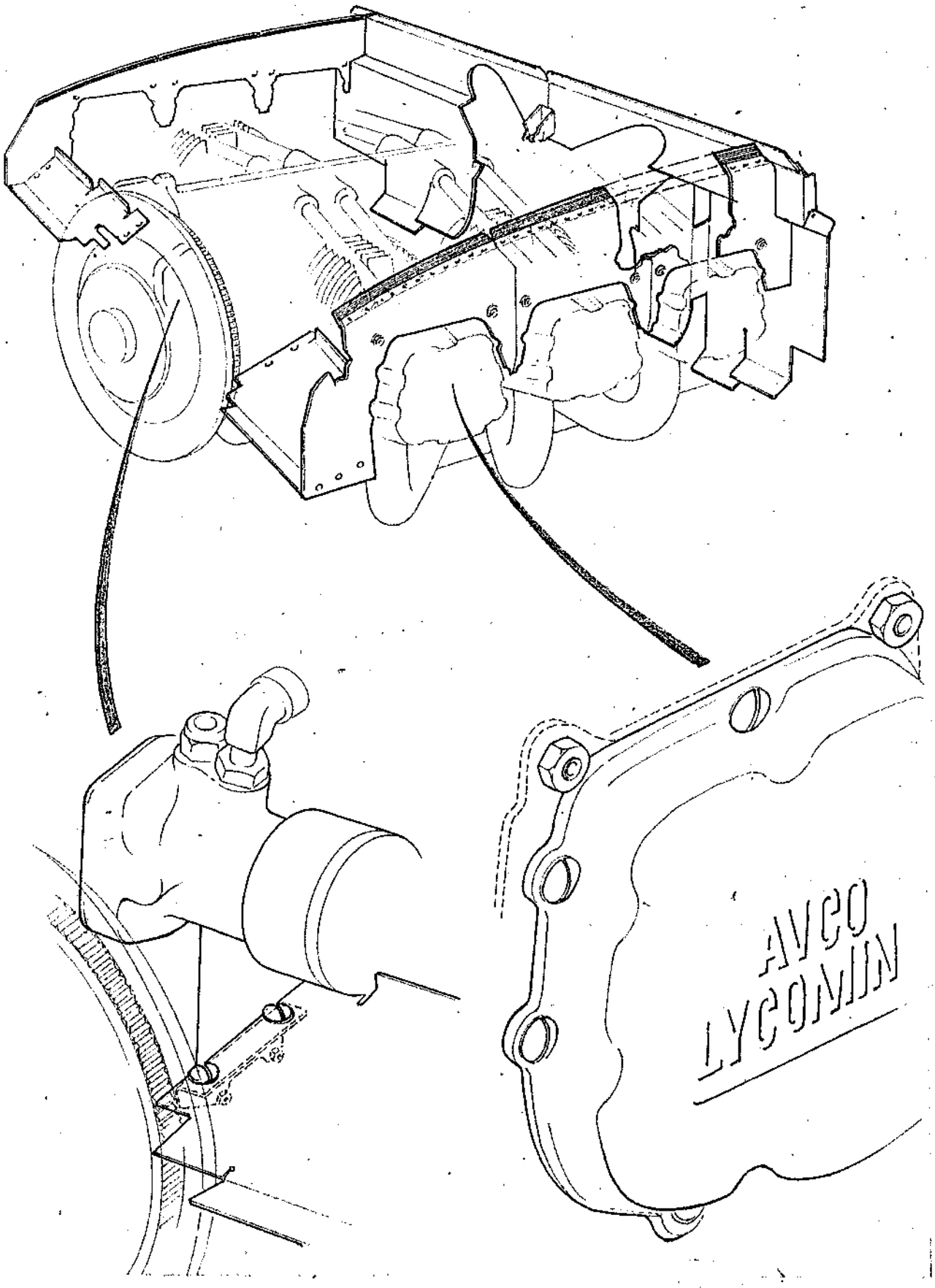


Fig. 4 Diaphragms

Maintenance

9. The normal maintenance procedures are those indicated in diagrams 1,2,3,4 of this chapter. Avco Lycoming recommendations are to be observed.

MAINTENANCE

General

1. The engine agregates assy disconnecting operations are given in diagram 2. The engine agragates assy operations are given in diagram 3.

Preparation for Dismounting

2. Before starting the engine dismounting, the following preparations are to be carried out :
   (1) Disconnect the airplane electric power supply.
   (2) Lift airplane on 3 jacks.
   (3) Prepare flasks for fuel and oil emptying.
   (4) Completely emty the fuel installation.
   (5) Emty the engine oil.
   (6) Dismount covers.

MAINTENANCE

1. Carry out preparations according to Diagram 1.
2. Dismount slip.
3. Dismount the propeller fixing pins.
4. Dismount the engine.
5. Cover the engine and oil channels.
6. Dismount the pipes of the cabin heating installation, from the exhaust heater.
7. Reserved.
8. Dismount the engine exhaust tubes.
9. Dismount engine controls according to indications given in Chapter 5.3.
10. Dismount the propeller pitch regulator pulley;
11. Dismount the pitch regulator.
12. Seal the engine orifice.
13. Disconnect the engine oil cooler pipes. Seal the pipe ends.
14. Disconnect the oil pressure transmitter pipe and cover the engine orifice.
15. Dismount the thermometer from the probe case.
16. Disconnect the engine fuel pipe and cover the orifice.

17. Disconnect the linking pipe of the fuel pressure transmitter and cover the orifice.
18. Dismount the vacuum meter switch.
19. Dismount the pipes and all the other accessories of the agregates cooling installation : magnetos, fuel pump.
20. Disconnect the spark plugs electrical connections.
21. Dismount the front and rear diaphragms.
22. Dismount the fuel pipe between injector and distributor. Cover the orifices.
23. Dismount the cylinder heads thermocouple
24. Dismount r.p.m. indicator
25. Dismount the electrical connections between fuselage and engine agregates.
26. Dismount the air installation angle tube as well as the engine flexible pipe.
27. Seal injector

Dismounting

1. Carry out the operations given in diagrams 1 and 2.
2. Check if all engine connections have been released.
3. Release two links between engine and its frame.
4. Remove the cotter pins and dismounting the dampers washers. nuts.
5. Slightly push the engine and remove it from its frame.
6. Set engine on a holder..

Mounting

NOTE :
The pins of the dynafocal mounting dampers and their nuts must befastened with 3.077 - 3.847 Kgfm and thus they must be appropriately dismounted and mounted. The dynafocal assy is shown in fig.2.
Carry out the mounting by repeating the dismounting operations in reversed order. Before lifting the engine, check the pins and dampers conditions. The dampers fluid containers shall the crackless.
After mounting the dampers on engine and frame, secure them with cotter pins. Grease pins before mounting them.

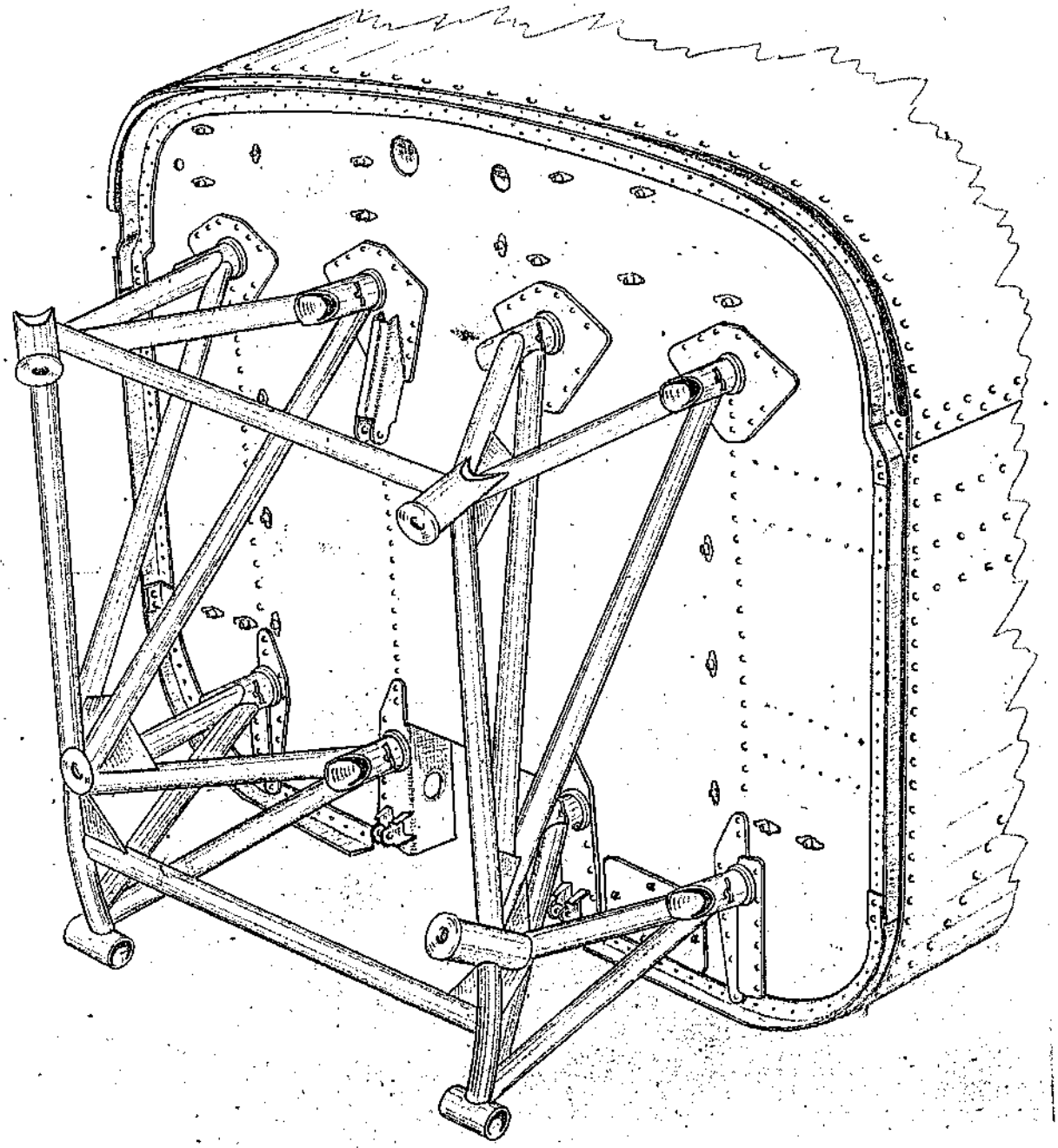


Fig. 4 Holder dismounting and mounting

Dismounting (diagram 3)

1. Carry out the operations given in diagrams 1,2 and 3
2. Dismount oil cooler and its flexible pipes.
3. Dismount the fuel and oil pressure transmitters.
4. Dismount fuel filter and the rigid tube from firewall to filter.
5. Dismount r.p.m indicator holder.
6. Dismount front leg.
7. Dismount the undercarriage position warning switches.
8. For access, dismount the thermic insulation upholstery from the firewall.
9. Dismount left and right floors, behind the firewall.
10. Check if all the agregates and connecting collars of the frame have been removed.
11. Remove the cotter pins that assemble the holder and the firewall.
12. Dismount holder from the firewall.

Mounting

Carry out the mounting by repeating the dismounting operations in reversed order.
Before mounting, check the pins condition and grease. The torque moment is 3.2 Kgfm.

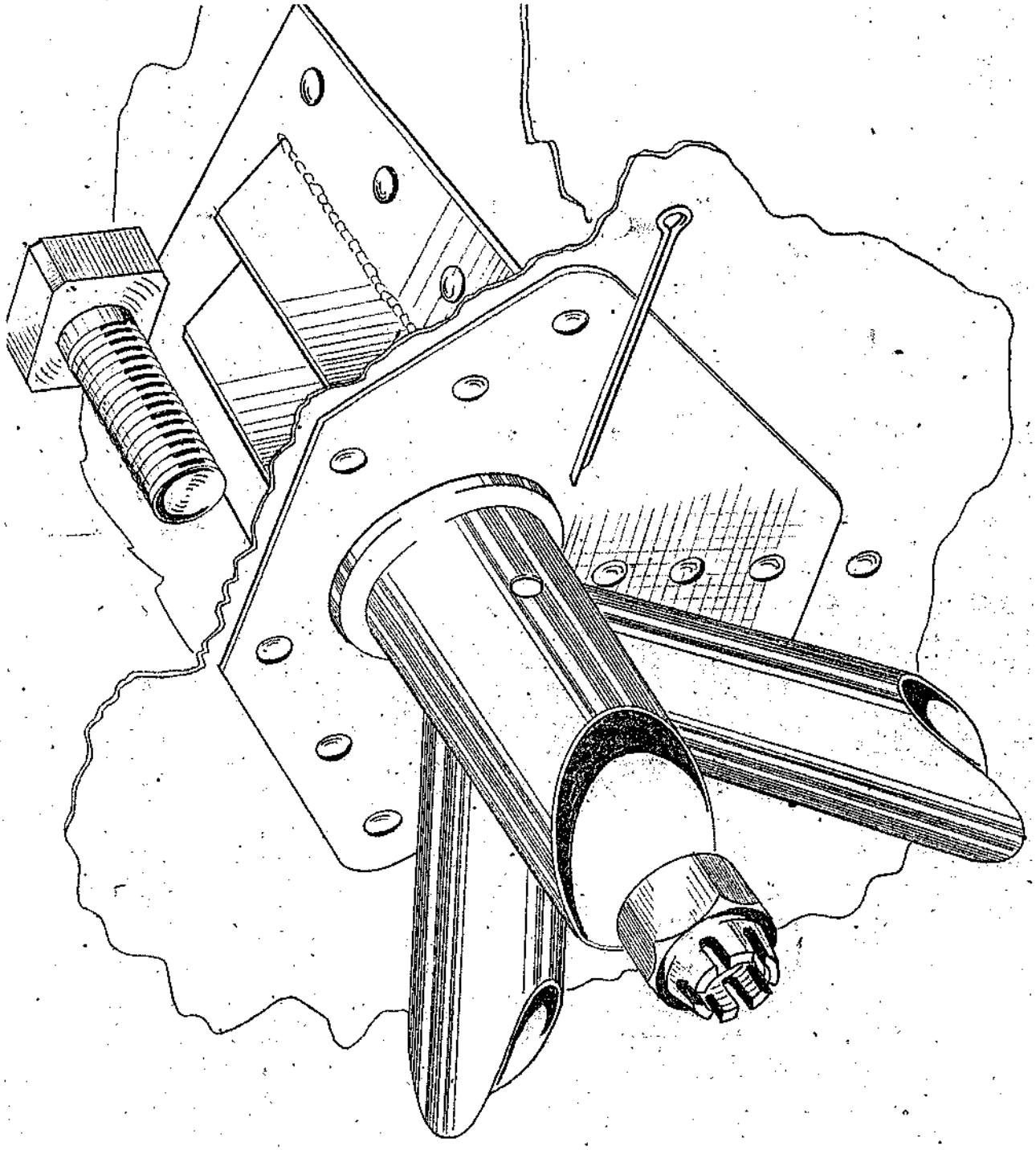


Fig. 4a Holder dismounting and mounting

Chapter 5.2.

ENGINE ACCESSORIES

CONTENT

Page

Description and Operation

Engine fuel System (fig. 1)

1. The pilot adjusts the engine injector by the mixture control, for the whole fuel mixture range, from FULL RICH to IDLE-OFF.

Engine starting system (fig. 2 and 3)

2. At its front left side the engine is provided with a 24 V dc starter.
The starter actuates the starting gear mounted on the engine shaft.

Caption for the Electrical Diagram Fig. 3

No.	Component		Type
1.	Contactor	7E	KM100DV
2.	Starter	8E	MHB4001 PRESTOLITE
3.	Thermical Automate	12E	AZS-2
4.	Button	13E	204-K
5.	Condensator	26E	948-016-01/Bendix
6.	Switch	21E	V 45
7.	Condensator	27E	948-016-01/Bendix
8.	Switch	23E	V 45
9.	Left Magneto	20E	SGLN-1227/Bendix
10.	Right Magneto	22E	SGLN-1227/Bendix

Exhaust (fig. 4)

3. The exhaust tubes are made of steel sheet. To the main body, the central cylinder exhaust tube is attached by means of two arms and a collar. The assy is fastened to the engine, on the collecting tubes flanges. On the left exhaust tubes assy it is mounted the heater. On this heater there are mounted the flexible pipes of the cabin heating system.

Air Intake System (fig. 5)

4. As mentioned in Chapter 5.1.. at the engine lower cover it is mounted the air intake system, made of fibre-glass.

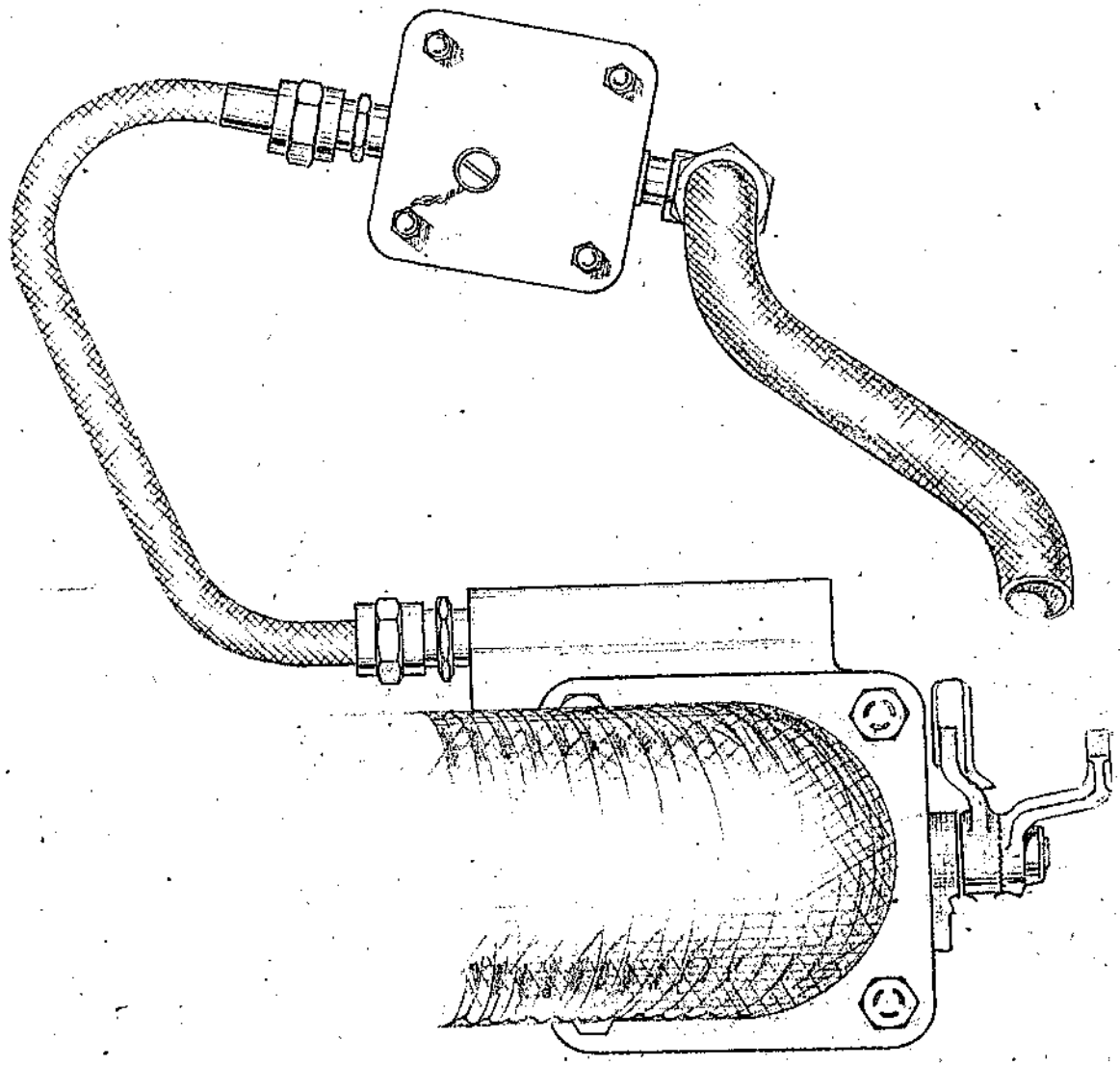
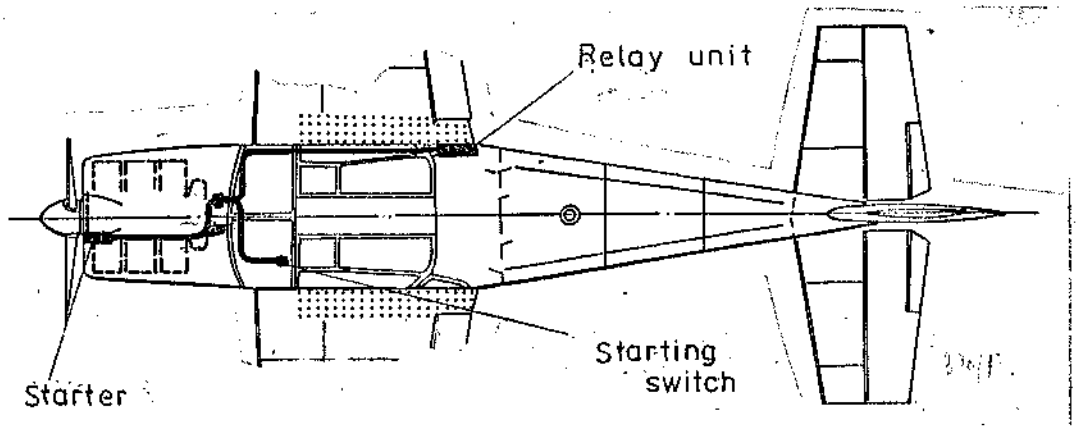


Fig. 1 Engine fuel System



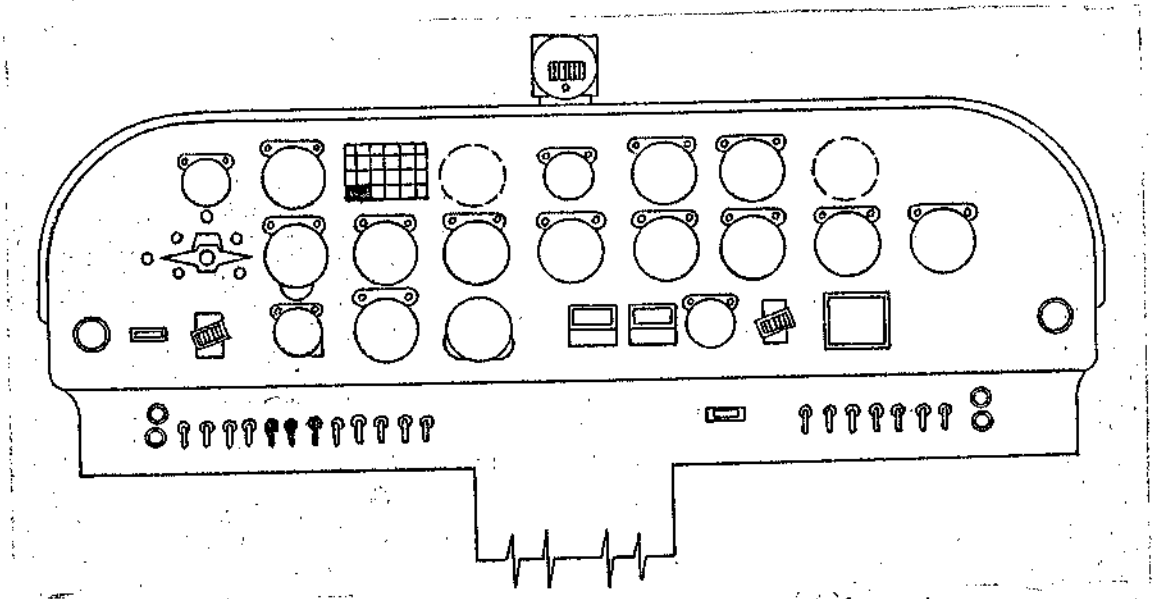
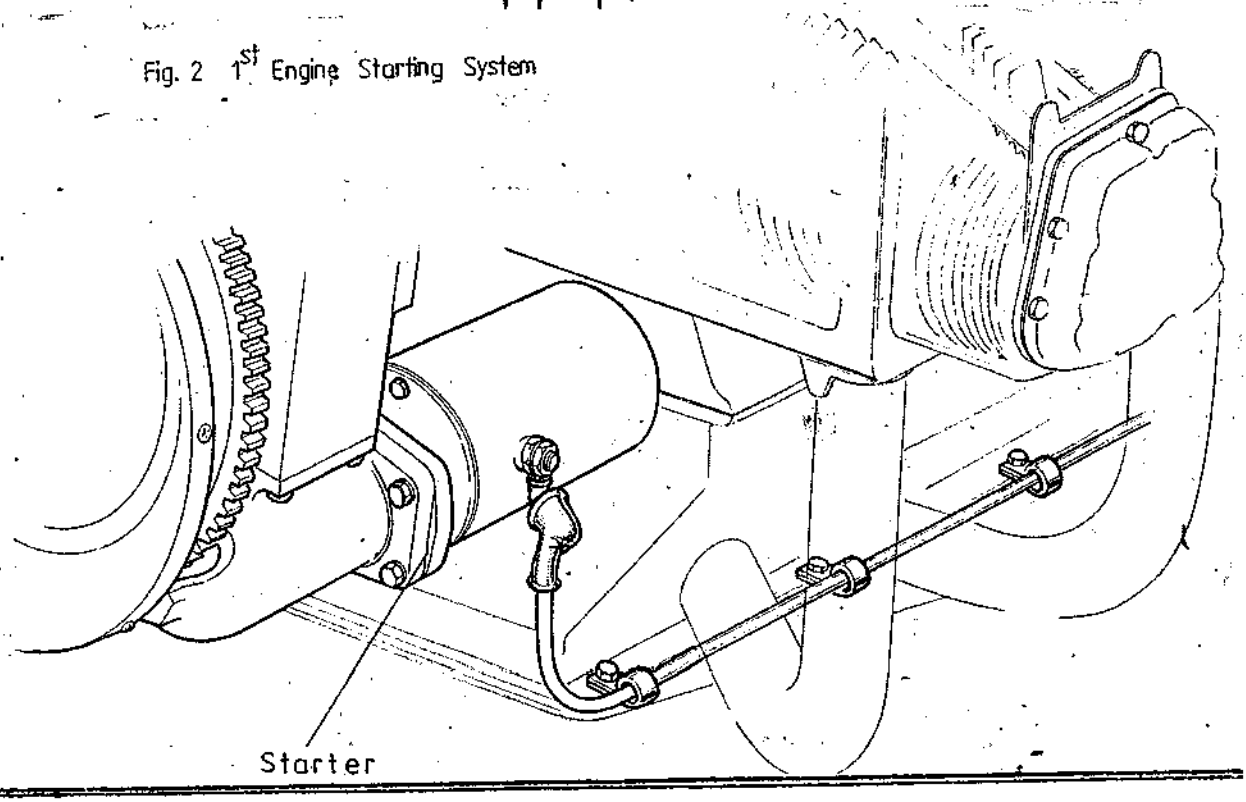


Fig. 2 1st Engine Starting System



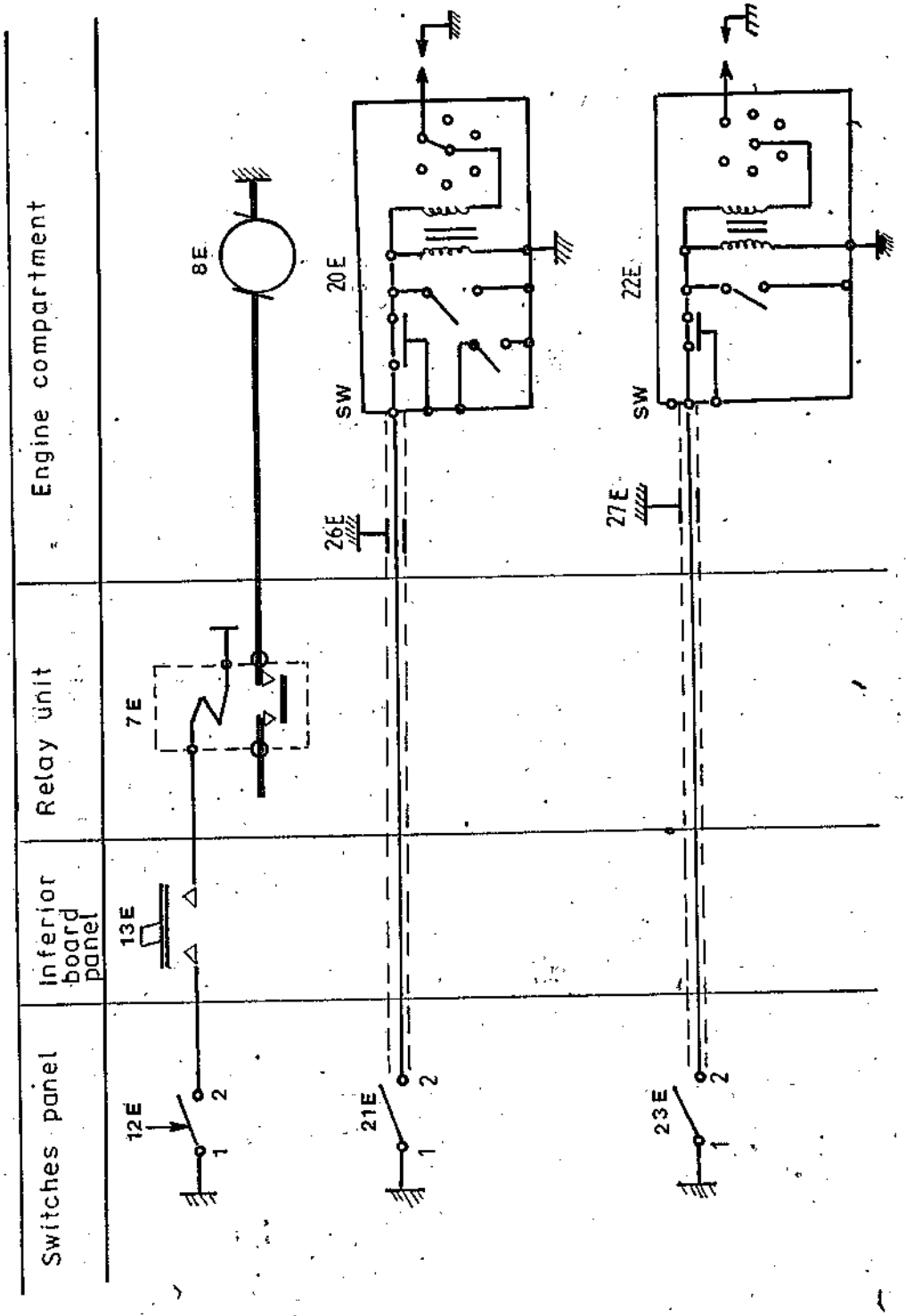


Fig.3 2nd Engine Starting System

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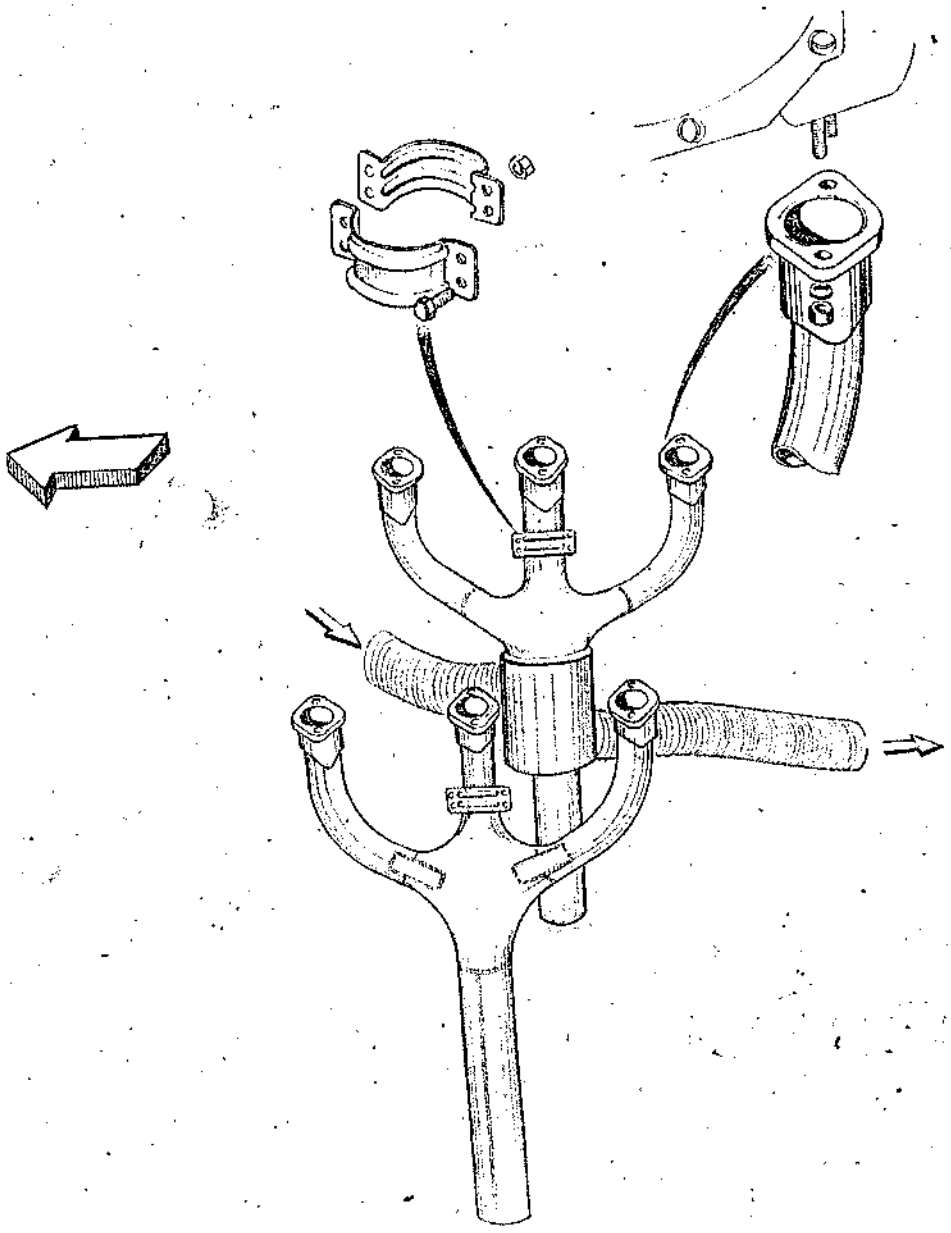


Fig. 4 Exhaust System

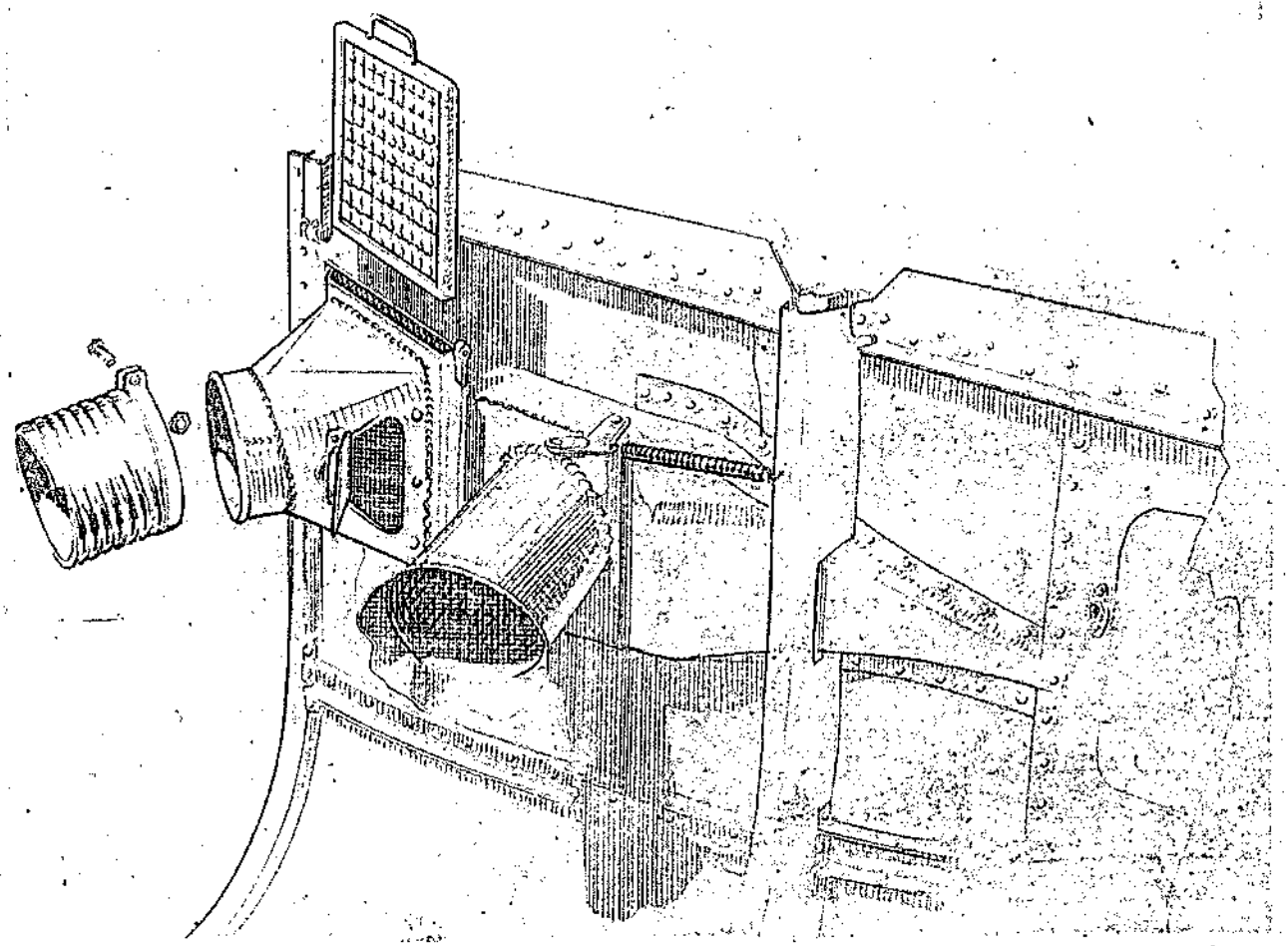


Fig. 5 Air Intake System

Oil Cooler Installation (fig.6)

5. On the engine there is an oil cooling system including a Harrison AP13AU06-01 radiator, mounted on a support fitted on the engine mount. From engine, the oil is pumped to the radiator, through a flexible duct connected to the engine by means of anbellow-connection and the thermometer probe case and to the radiator by means of two connections one of them being steerable. From radiator, the cooled oil returns to the engine through a similar circuit.

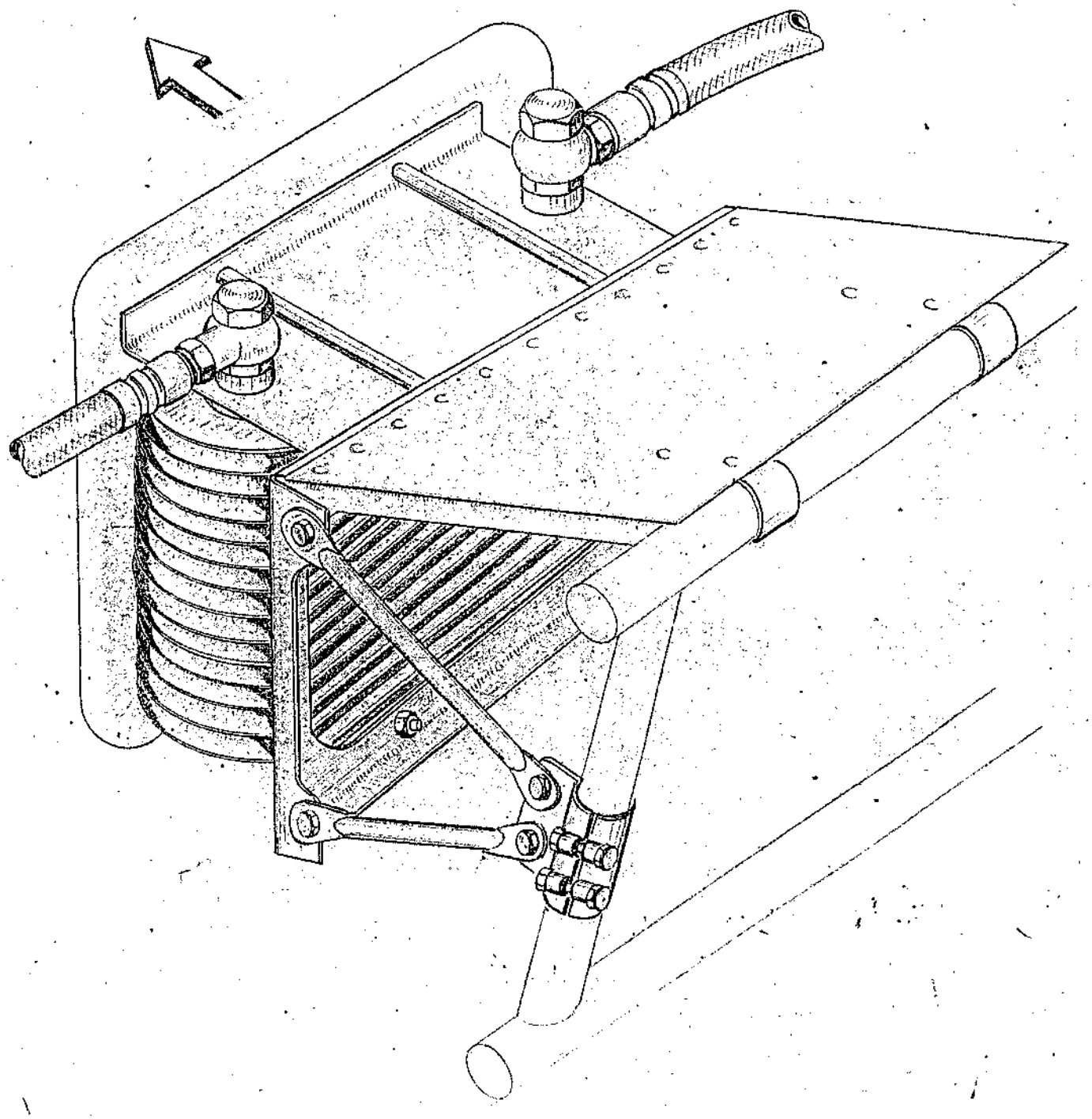


Fig. 6 Oil Cooler

MAINTENANCE

Engine Accessory	Illustration	Procedure
Fuel System	Chapter 5.2 Fig. 1	1. Check the connections of fuel pipes. 2. Check the fuel pipes general condition 3. Remove injector and fuel filter; check and clean them Note When replacing the fuel filter, use new gaskets and washers. 4. After mounting, check the securing of injector and fuel pump.
Starting System	Chapter 5.2. Fig. 2 and 3	1. Check the starter electrical connections as well as those of contactor and the rest of components 2. Check the wiring links 3. Check the wiring holders and fixing collars
Exhaust System	Chapter 5.2. Fig. 4	1. Check the engine flange connection 2. Check the washers securing 3. Check the heater fixing 4. Check pipes general condition 5. Check button condition and the nuts securing
Air Intake System	Chapter 5.2. Fig. 5	1. Check the air intake system condition 2. Check the flexible pipe general condition 3. Remove air filter and check its condition

C h a p t e r 5.3.

ENGINE CONTROLS

CONTENT

Page

Description and Operation

General (fig. 1 and 2)

1. The engine main controls are mounted inside a housing, on the board panel central pylon. The three levers are fixed on the same shaft; between them there are mounted spacers, having the role of friction bushes.
   In the cabin left wall, around a rotation axis, there are mounted the levers that double the intake and propeller controls.
   The levers have distinct actuating buttons (different shape and colour).

Intake Control (fig. 3 and 4)

2. The main and the lateral controls, are hinged to a different rod actuating the control transmission shaft. One rod end is welded to the clevis fitting and the other rod end is screwed to another clevis. The neutral transmission shaft is mounted in textolit bearings on the firewal. The transmission shaft is made of steel. To it there arewelded the hinge cranks of lever rods and the actuating crank of the controls chain final rod. This third rod is bent and actuates the intake valve lever.

Propeller Control (fig. 3 and 4)

3. The propeller control lever (Left) actuates a rod. The rods are hinged on a transmission shaft mounted on the firewall. The transmission is made through a pulley, on which is solidarily fastened a cable. The tension of propeller pitch cable is adjusted by a tender.

Mixture Control (fig. 5)

4. By means of a rod (similar to those described in § 2 and 3) the mixture control lever actuates the oscillating shaft of the firewall. By a second rod hinged to the oscillating shaft crank is actuated the lever of the mixture enrichment agregate.

Intake Heating Control (fig. 6)

5. The opening of the intake valve is carried out by a

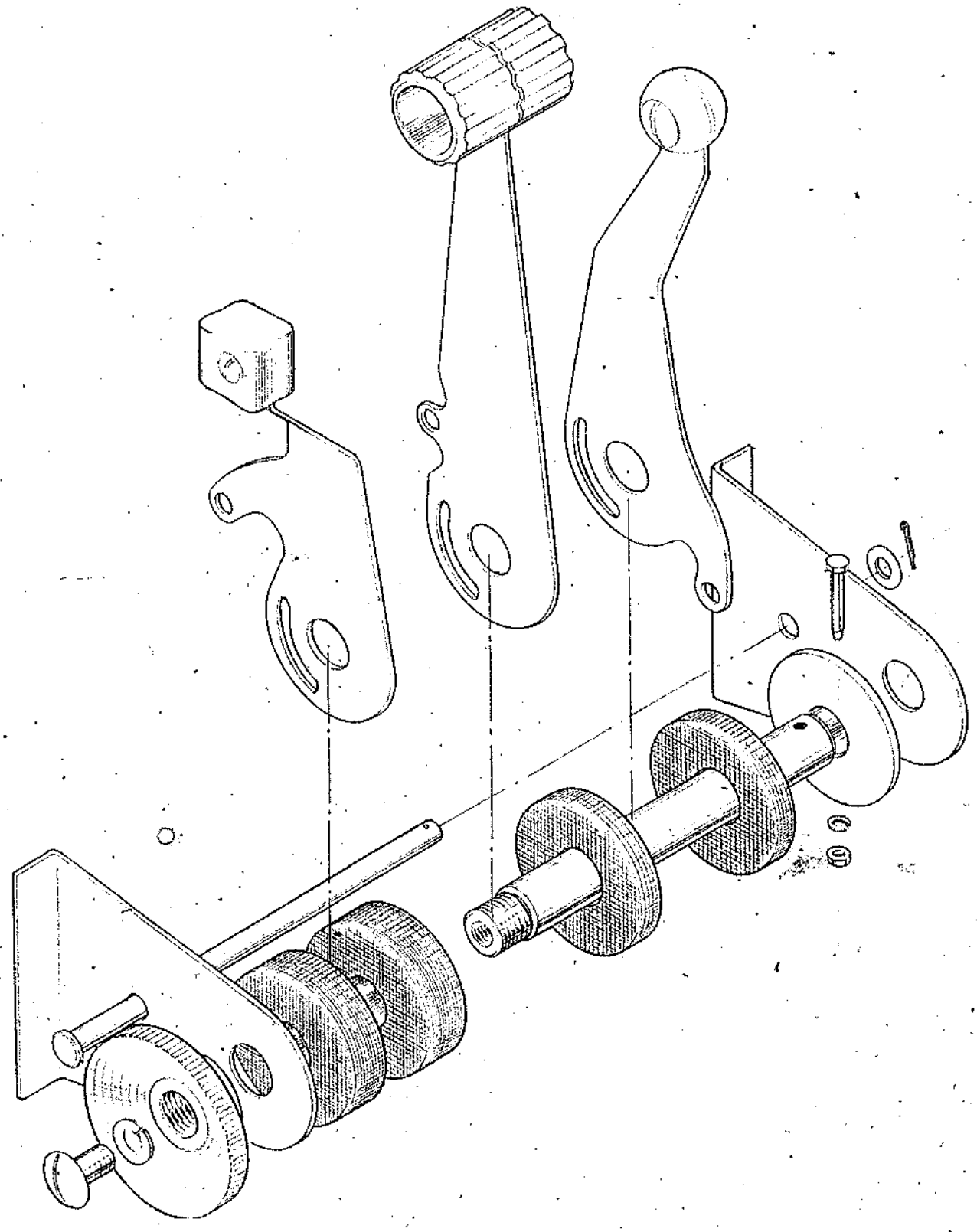


Fig.1 Mounting of Control Central Levers

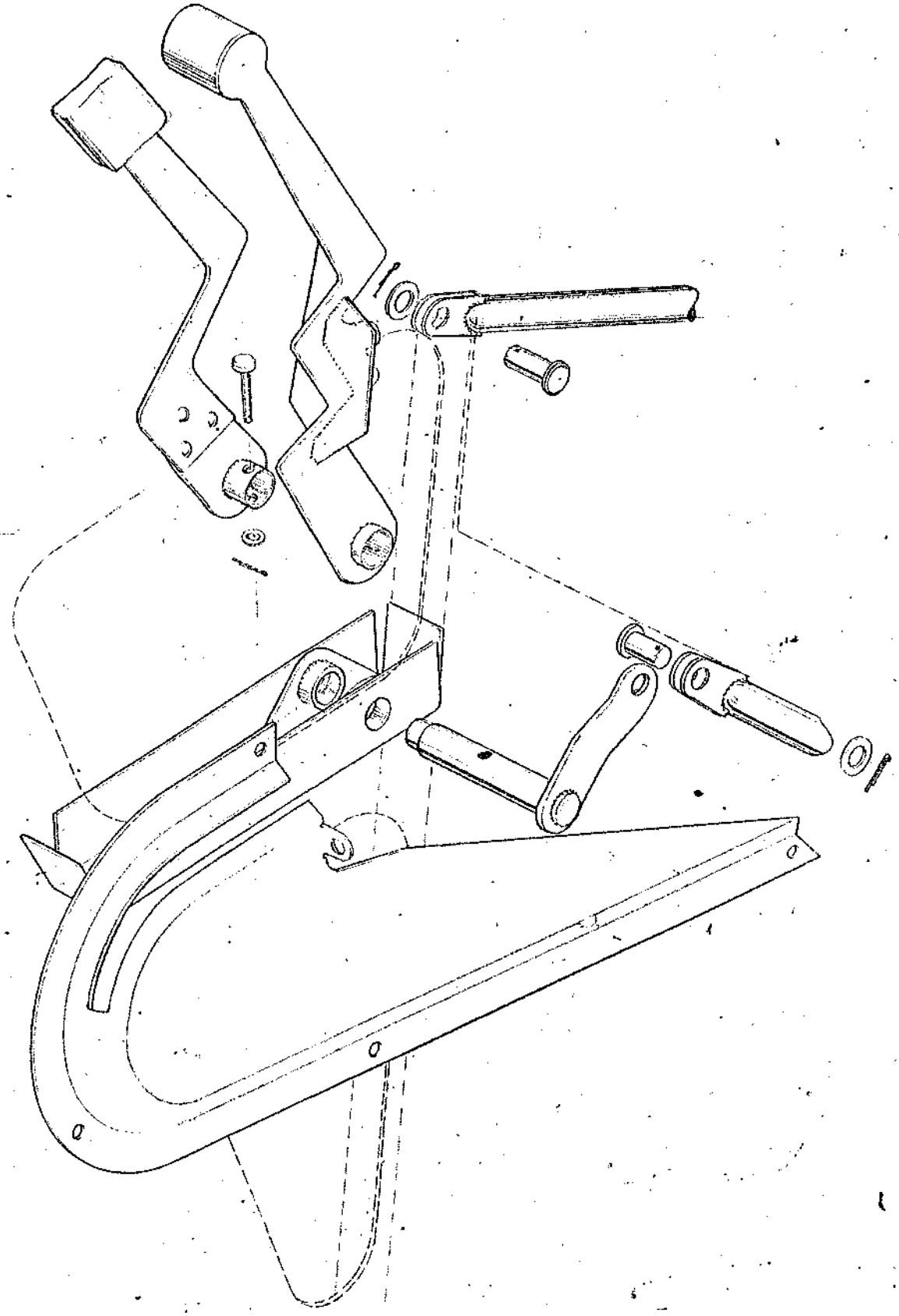


Fig. 2 Mounting of Control Lateral Levers

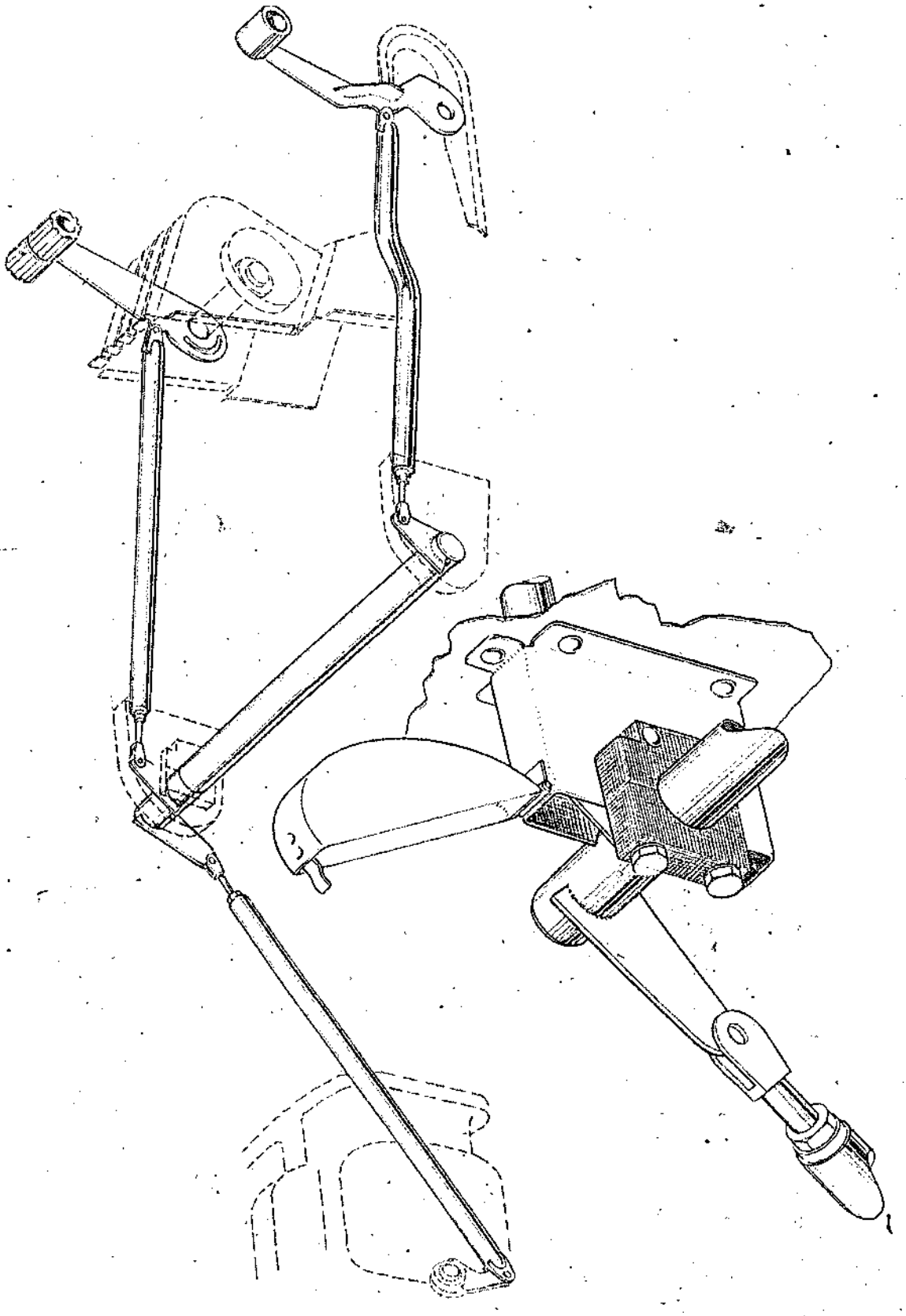


Fig. 3 Inlet Control

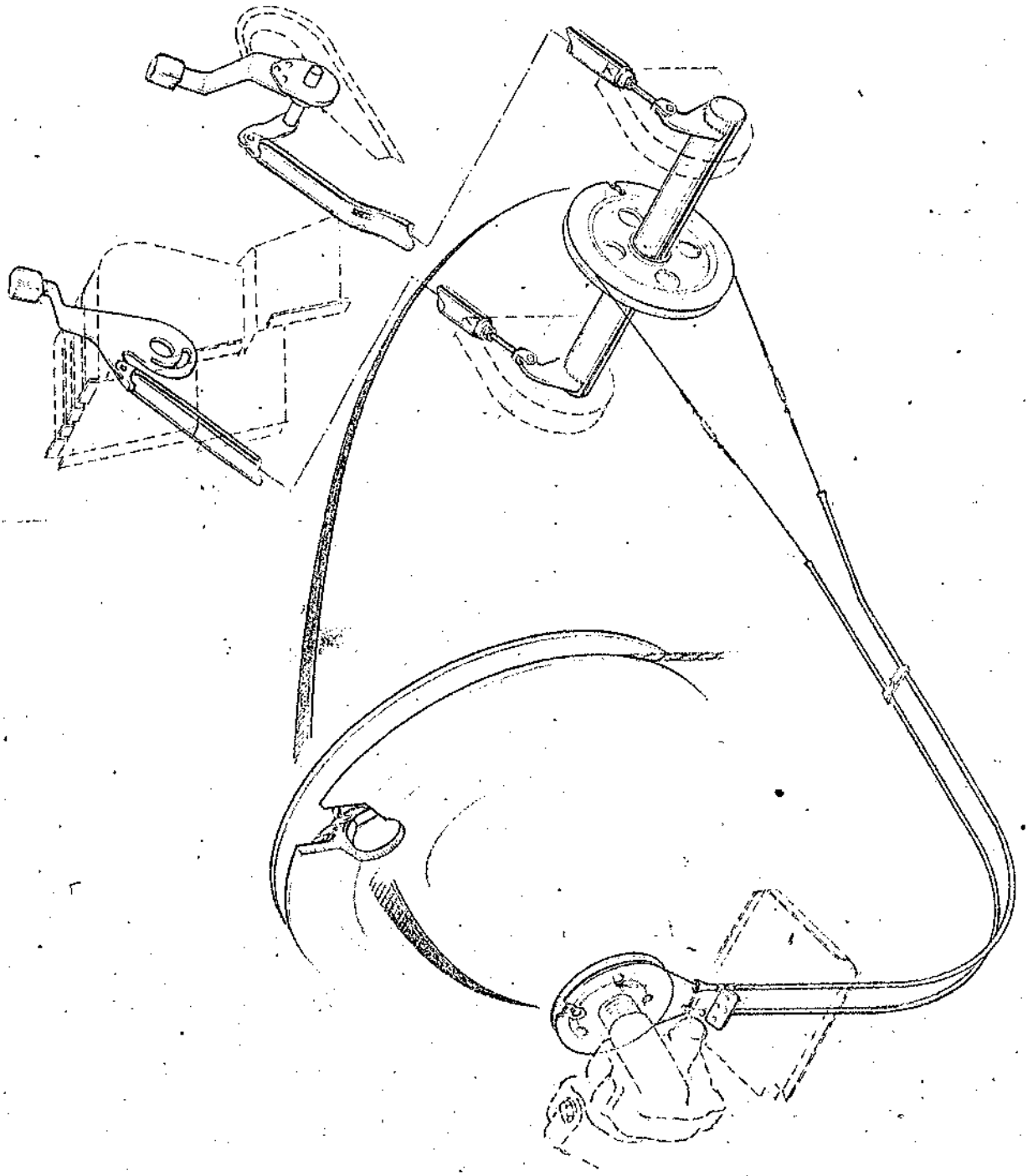


Fig.4 Propeller Control

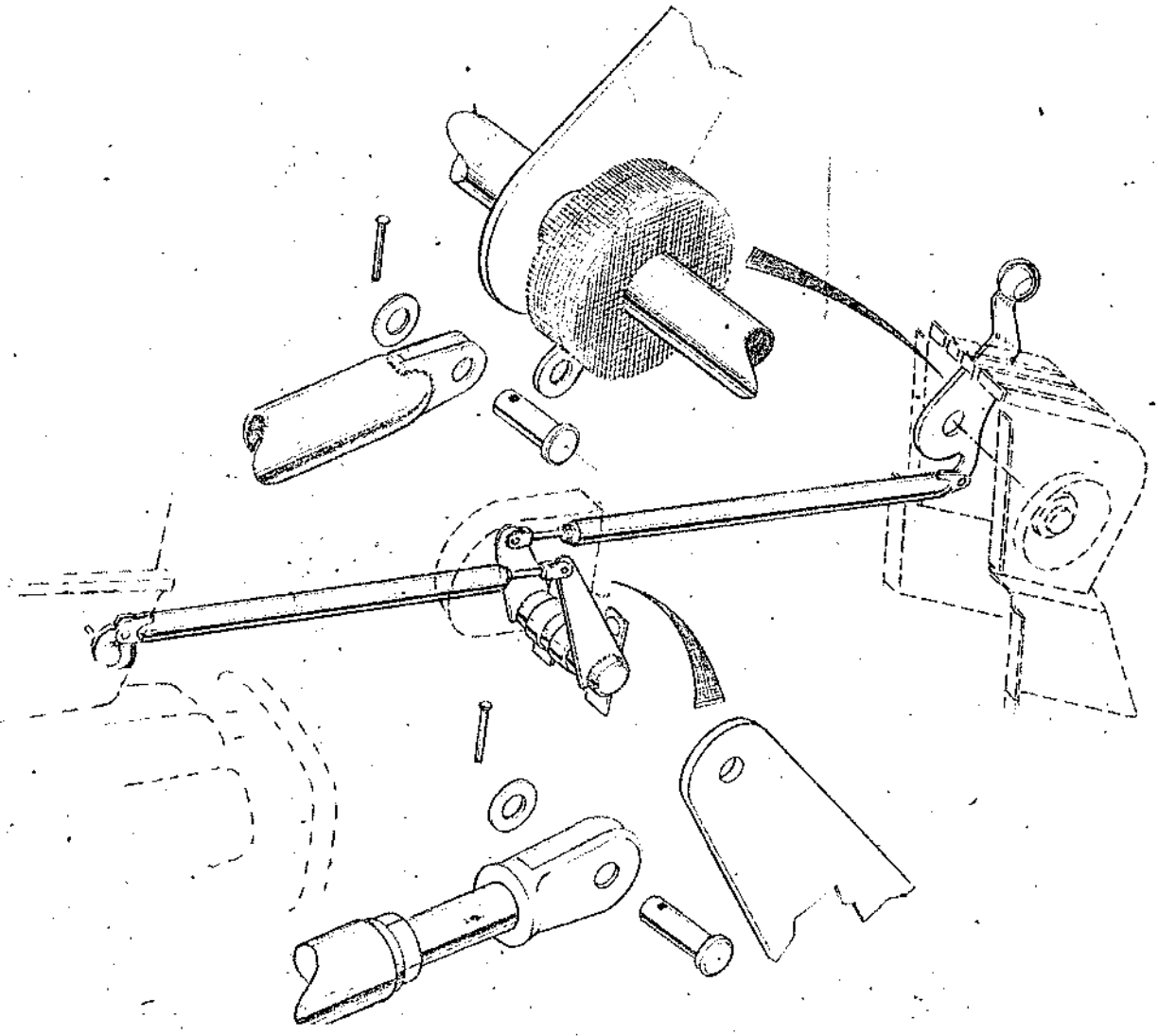


Fig. 5 Mixture Control

a flexible control. The valve opening and thus the warm air intake correspond to the button pulled position.

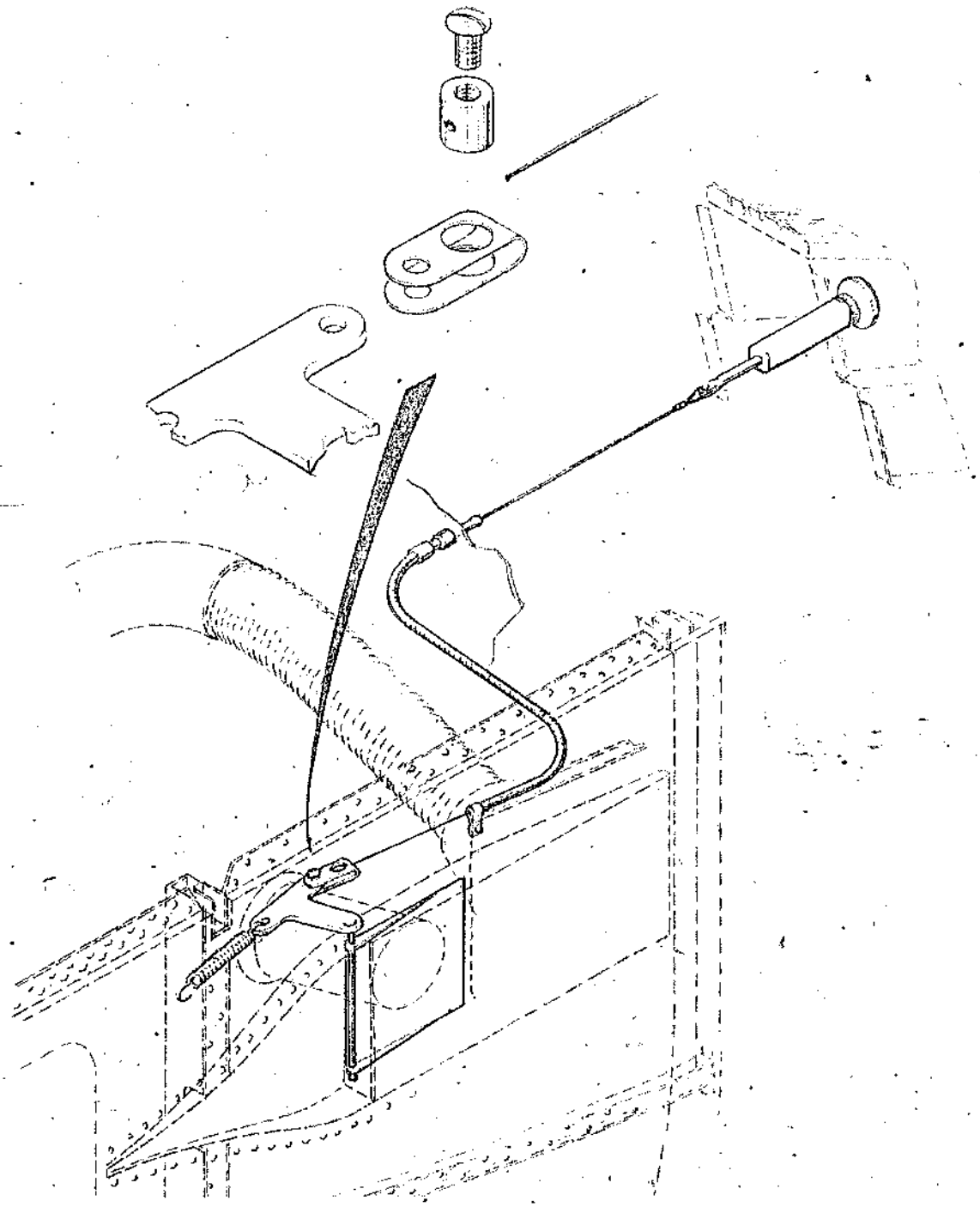


Fig. 6 Inlet Heating Control

DISMOUNTING

Generally the engine controls dismounting is made only by the 500 hours inspections and within general overhauls.

1. Disconnect the airplane electrical supply
2. Dismount the central levers fastening rosette
3. Dismount the central box of engine levers
4. Dismount the position light of elevator trimmer
5. Dismount the radio installation
6. Remove the levers box
7. Dismount the left levers box and the starter protection
8. Dismount the radio button from the lever handle of intake control
9. Remove the pins of levers and rods
10. Remove the fire protective covers at the rod front ends and release the metallic links
11. Dismount the rods metallic links
12. Dismount the rod hinges
13. Dismount the flexible part of the propeller pitch control
14. Dismount the central levers
15. Dismount the left side levers.

Inspection

Check the engine controls condition.
Check the condition of tighteners and guiding tubes.

Greasing

Grease the lever rods hinges, shaft cranks and propeller pitch control cables.
Grease the hinge of left side levers.

CAUTION
Don't grease the central levers hinge to avoid greasing the friction washers.

MOUNTING AND ADJUSTMENT

The control mounting is carried out by repeating the dismounting operations in reversed order. Adjust the rods length so that for the controls half travel, the shaft cranks should be parallele tu the firewall and rods should be perpendicular to the engine levers and the levers arms.
Check that at travels ends the intake and enrichement controls are blocked by the engine stoppers.
Correctly tighten the propeller pitch cables. Secure tighteners and hinges.

Chapter 5.4.

INDICATORS

CONTENT Page

Paragraph Description and Operation

Fig. ILLUSTRATIONS

Diagram. MAINTENANCE

Engine Indicators - General

DESCRIPTION AND OPERATION

General

1. Within this chapter there are presented a group of instruments of the instrument panel, by means of which the pilot surveys the engine good operation

RPM Indicator (fig. 1)

2. This indicator shows the engine rpm. The signal is obtained from an induction coil mounted in the left magneto.

Intake Indicator (fig.2)

3. This indicator measures the pressure of the intake mixture.

Cylinder Head Temperature Indicator (fig.3)

4. This instrument shows the engine cylinder head temperature. The transducer is mounted on the heatest cylinder.

Caption for the Electric Diagram (Fig.1)

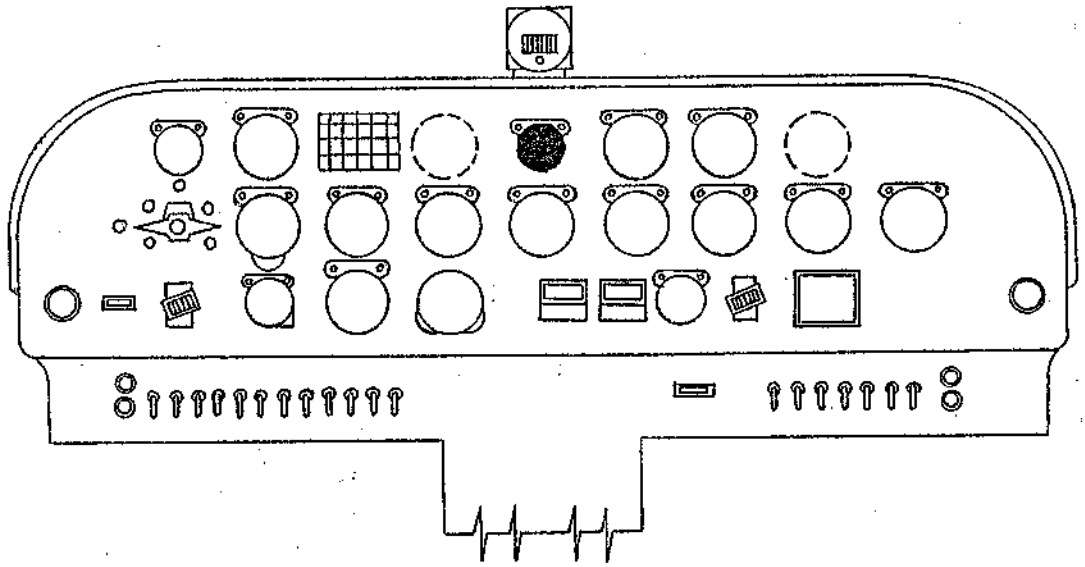
No.	Component		Type
1.	RPM Indicator	11 B	TE 45
2.	Tachogenerator	12 B	TE 45

Caption for the Electric Diagram (fig.3)

No.	Component	Type
1.	Cylinder Head Temp. Indicator	13B JAEGER AMA 8375
2.	Calibrating Box	25B JAEGER AMA 8-218AA
3.	Cylinder Head Thermocouple	14 B JAEGER AMA 8-420AB

Oil Temperature Indicator (fig.4)

5. It shows the engine oil temperature.



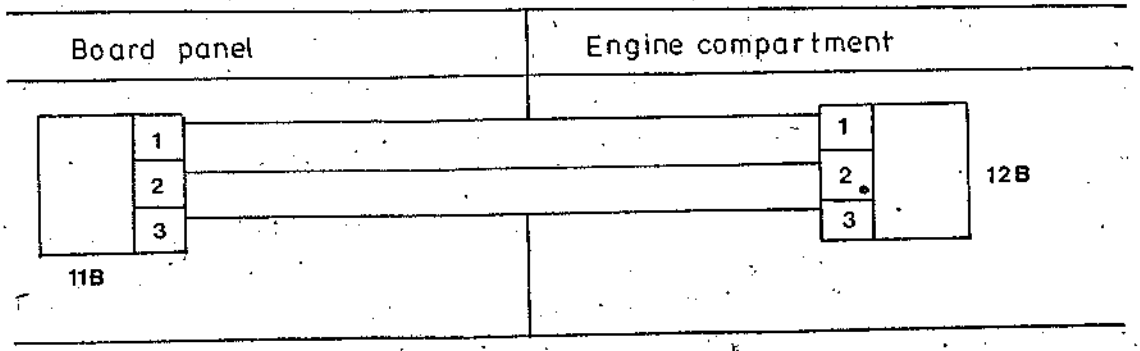


Fig. 1 R PM Indicator

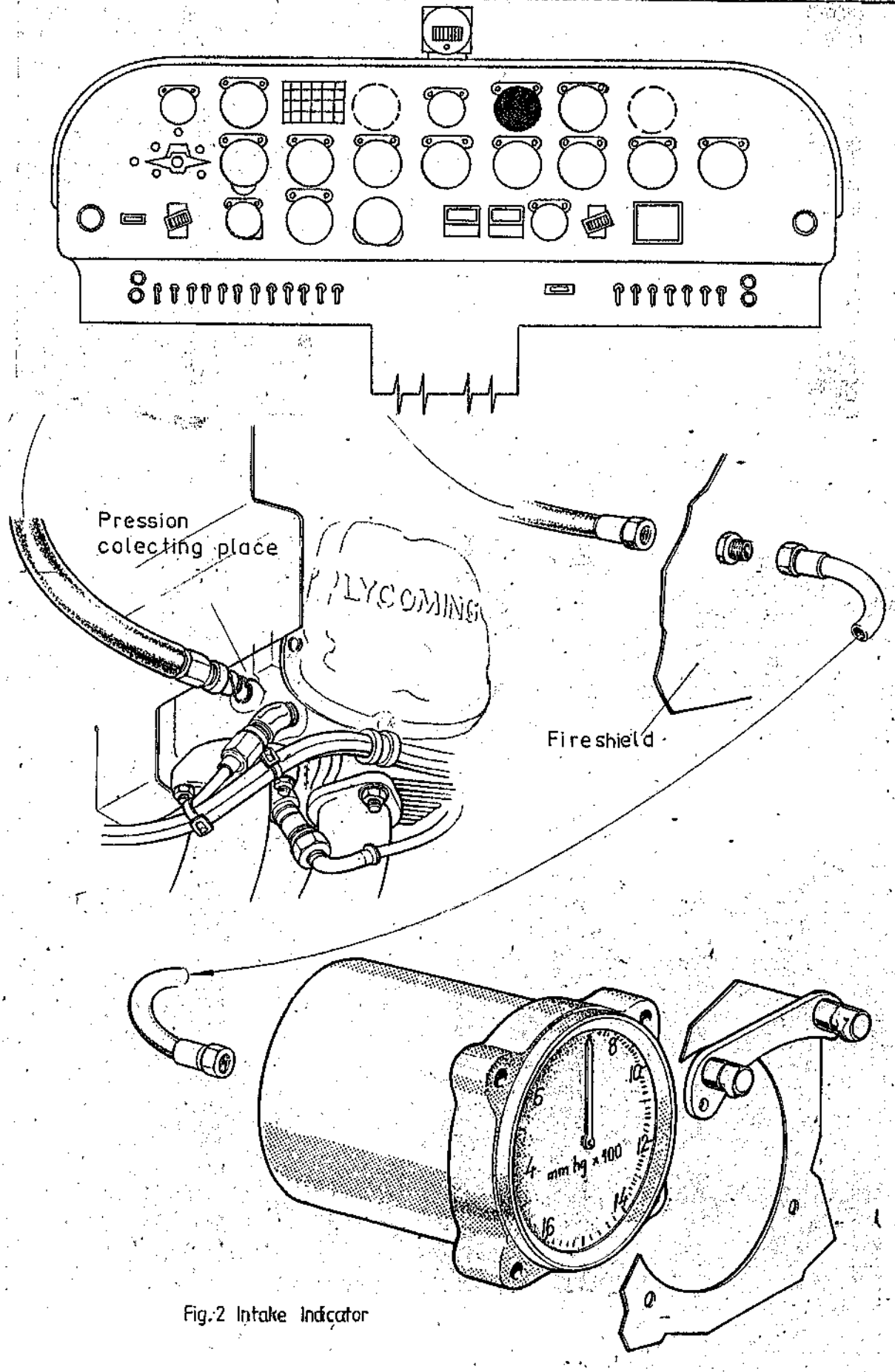


Fig.2 Intake Indicator

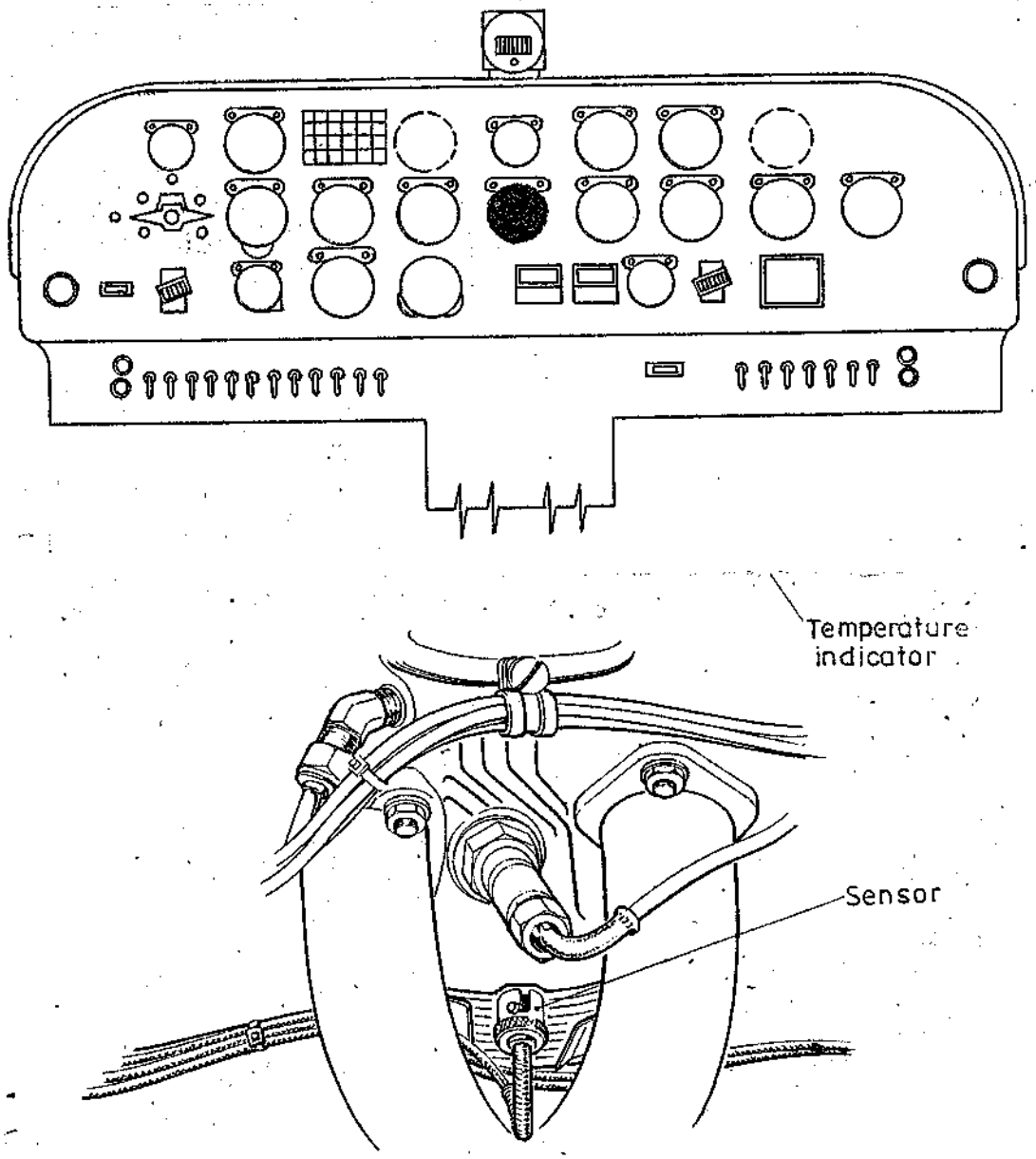
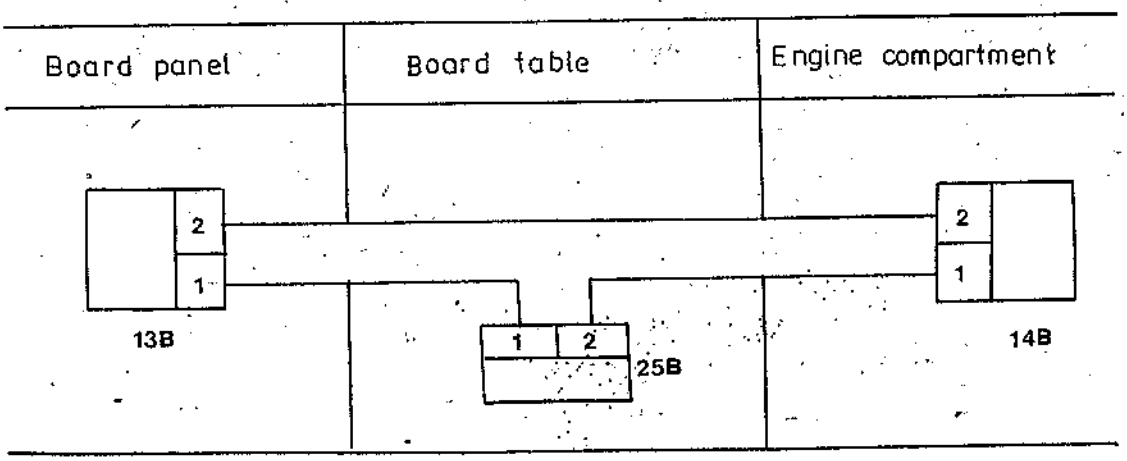


Fig.3 Cylinder Head Temperature Indicator



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Caption for fig. 4,5 and 6

No.	Component		Type
1.	Thermical Automate	2B	AZS-5
2.	Triple Indicator	19B;20B;21B	UKZ-2
3.	Oil Pressure Transducer	4B	P-15B
4.	Oil Temperature Transducer	5B	P- 1
5.	Fuel Pressure Transducer	6B	P-3B

MAINTENANCE

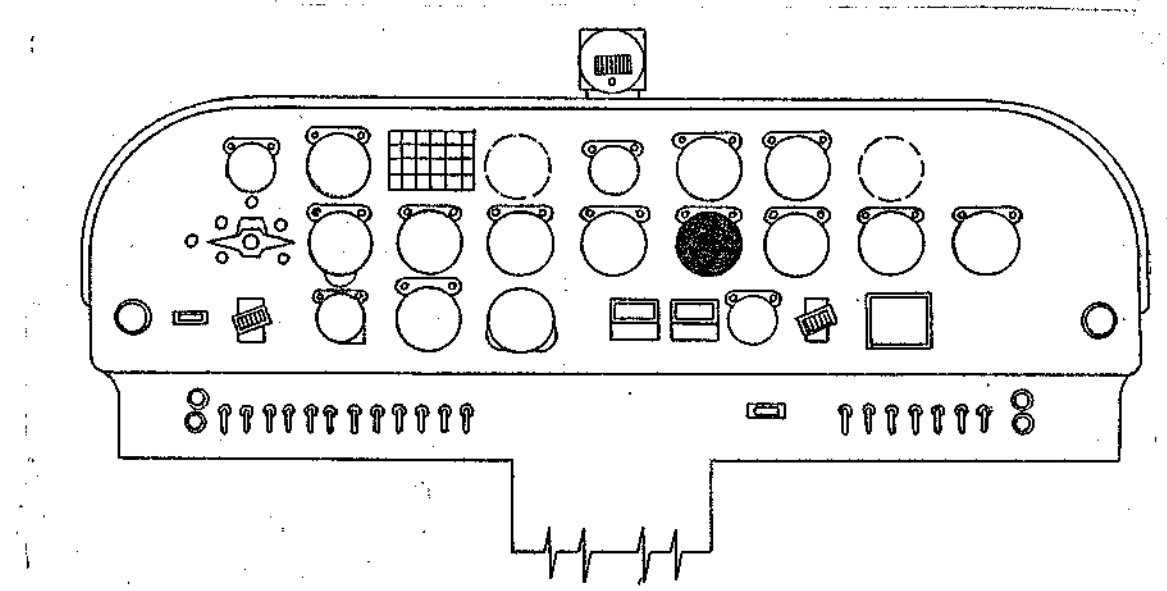
The maintenance of engine installations and indicators means to check if the electrical connections are in good condition and well insulated. If the instruments and the transducers are defect, they have to be replaced.
It is impossible to foresee all defects likely to appear, but it is possible to trouble-shoot most probable ones by the following procedure.
Defects are likely to occur at the airplane power supply, the wing, indicators or trasducers. The indicator pointers will give false readings, for instance :

- no reading
- the pointers are at scale end (max.reading)
- no precise reading and/or flickering reading

For a quick detection of the defect it is recommanded to have another instrument set available. This can be temporarily connected on board to confirm the defect.

Defect Detection

Defect	Possible Reason	Investigated Area
No reading for all indicators	- Damage of the power supply	- The airplane power supply
	- Wiring damaged	- Fuses box
	- No connection of instrument panel connector and/or	- Airplane wiring - Instrument panel connector



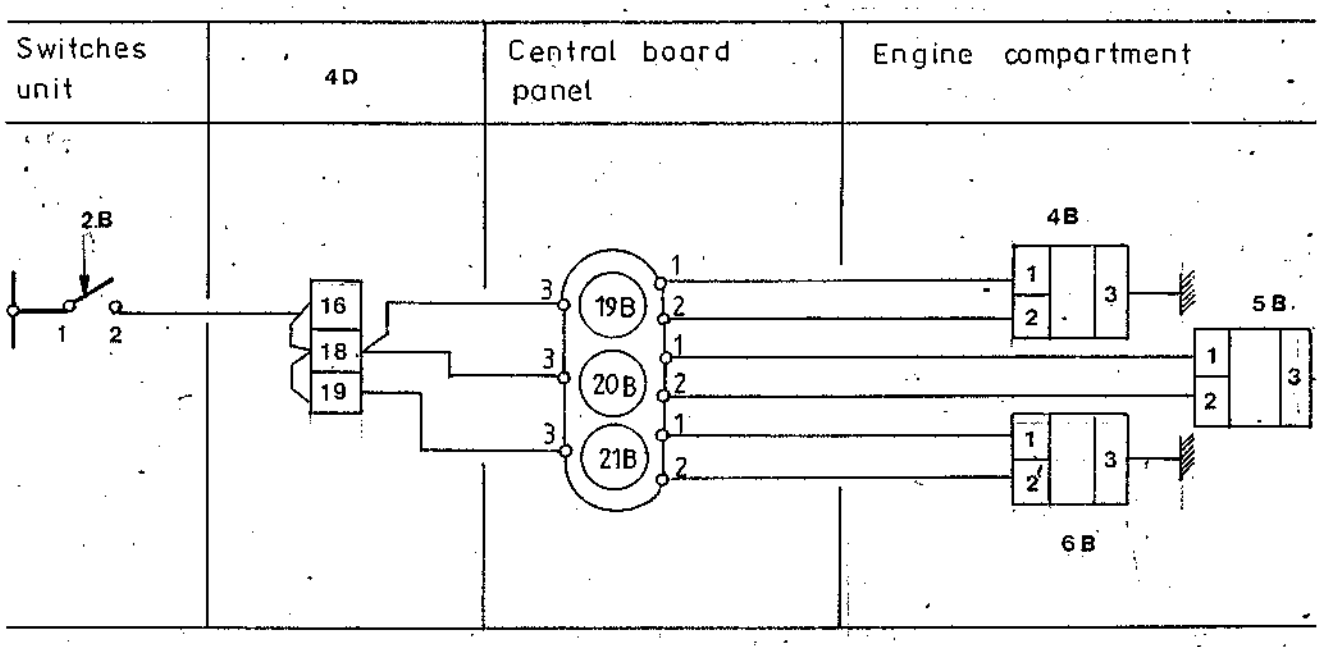


Fig.4,5,6 Oil pression, oil temperature, fuel pression indicators

	firewall connector	- Firewall connector
No reading on an individual instrument	-Defective indicator Defective transducer Defective wiring Disconnected fuse	- Indicator Fuses box Short-circuit within the transducer wiring
Max.reading on an individual indicator	Defective indicator Defective transducer Defective wiring	Indicator Broker circuit within the transducer wiring.
Flickering reading on an individual indicator	Defective indicator Defective transducer Defective wiring	Indicator Replace transducer Check wiring to detect wrong connections.

As soon as such defects have been detected, their trouble-shooting may immediately start.
Defective transducers must be replaced, as for the other indicators, they are easily repairable. After their repairing, they have to be tested by means of a potentiometer.
After having been repaired and checked, the instruments can be re-mounted on airplane.