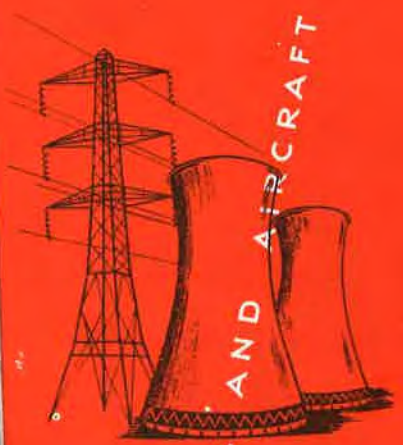
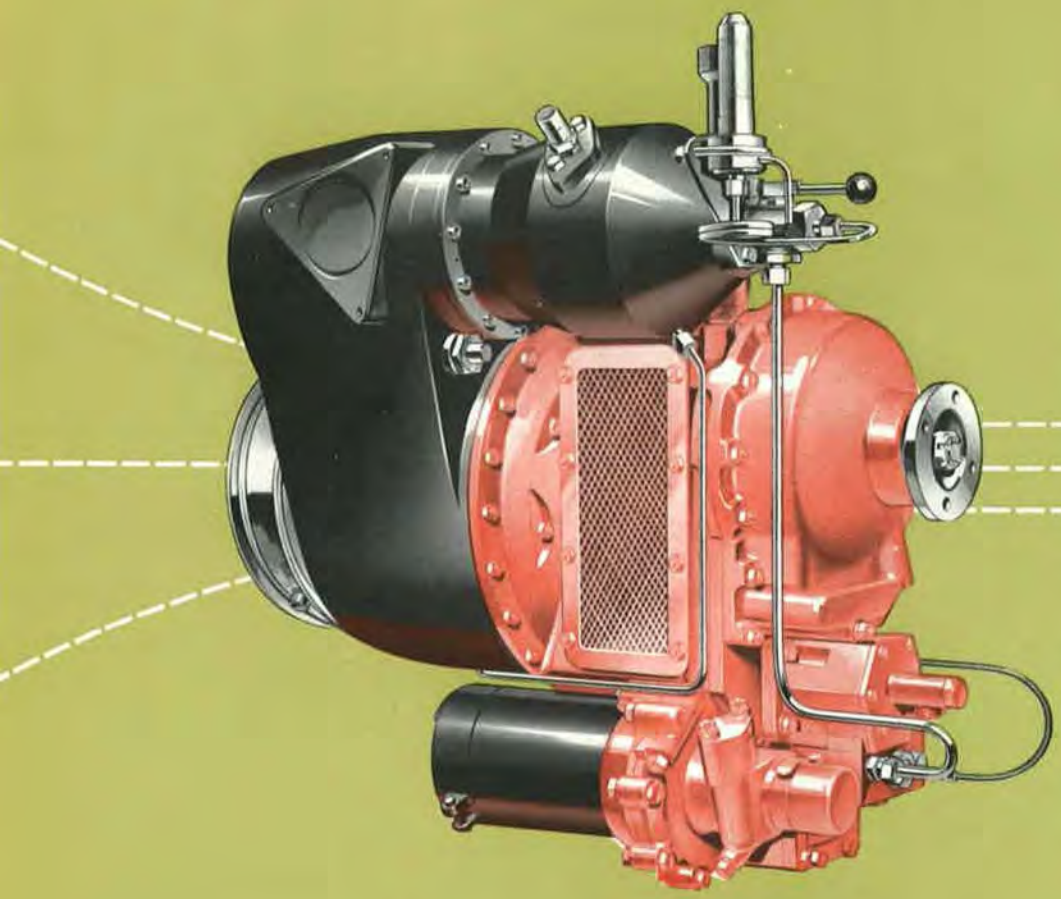
ROVER GAS TURBINES



FOR INDUSTRIAL AND AIRCRAFT APPLICATION



60 & 90 B H P

THE ROVER 60 B.H.P. AND 90 B.H.P. INDUSTRIAL GAS TURBINES

The Rover Gas Turbines are fully developed single shaft engines having a continuous output rating of either 60 or 90 b.h.p. at normal temperatures and pressures and they are the result of a twenty years' research programme to provide robust small gas turbine engines with long life for industrial, special purpose and emergency applications.

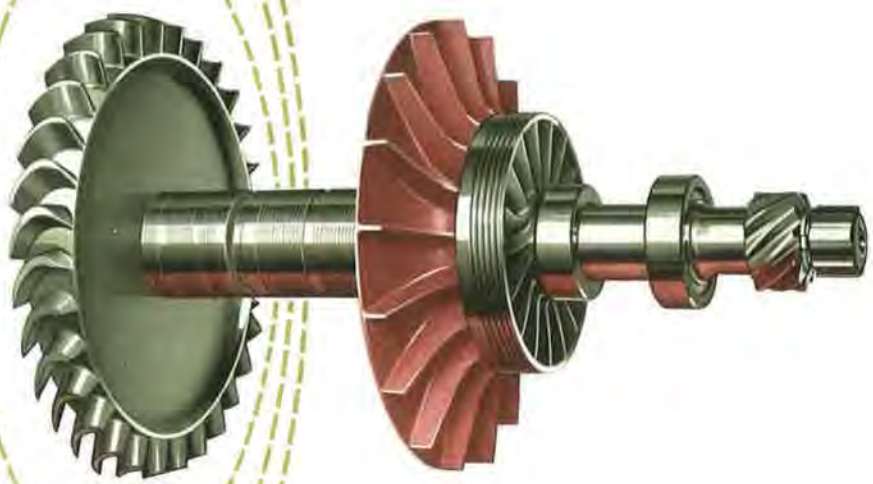
For either portable or stationary requirements both the Rover IS/60 and IS/90 engines offer reliability, lightness, easy starting and full power availability under widely varying climatic conditions.

These compact engines with vibrationless operation are easy to instal and maintain. The simple construction and automatically controlled fuel systems with their self-contained safety devices results in a single lever giving full control during running.

Simple maintenance and an accessibility far in advance of anything hitherto associated with this type of power unit are outstanding characteristics of these Rover engines. Lubricating oil consumption is extremely low and the Rover Gas Turbines can operate efficiently on a wide range of distillate fuels.

Hand or electric starting as required can be supplied with the IS/60 engine, whilst the IS/90 is supplied with electric starting only.

ROTATING PARTS



The rotating parts of the IS/60 and IS/90 engines consist of a centrifugal compressor having a single-sided impeller driven by a single stage axial turbine mounted on a common shaft running in only two bearings.

The 17-vane impeller is machined from an aluminium alloy forging and is a shrink fit on the compressor shaft. Immediately in front of the impeller, also shrunk on the shaft, is the steel rotating inlet-guide-vane, the vanes of which are shrouded and have curved leading edges to assist air entry into the eye of the impeller. A ring on the rear face of the impeller provides material for removal during balancing.

The turbine is a Nimonic forging in which the blades and disc are machined integrally. The blades are of free-vortex design and at the centre of the disc rear face is a small balancing spigot. The turbine rotor is attached to the compressor shaft by a single large diameter Nimonic bolt.

An angular contact bearing assembled at the front of the compressor shaft absorbs axial thrust, while a roller bearing ahead of the turbine supports the rear end of the shaft. The roller bearing utilizes a groove in the shaft as its inner race whilst the outer race forms a flexible mounting to locate the rear of the shaft radially. Flexibility is obtained by means of a number of longitudinal arms machined in the extension of the outer race.

The complete Rotating Parts Assembly is dynamically balanced to very close limits.

GENERAL DESCRIPTION. The main structural member of both these engines is the compressor housing (10) with its two sideways facing air intakes (11). This is an aluminium alloy casting containing the impeller (8), the front main bearing and the reduction gearing, whilst the base of this housing forms the oil sump of the engine.

Bolted to the front face of the compressor housing is the aluminium alloy auxiliaries mounting plate (14) to which are attached both the oil pump and the fuel control unit (12). These are driven from the turbine shaft by an internal train of reduction gearing. The integral shaft of the intermediate wheel of this gear train protrudes through the auxiliaries mounting plate and carries the output pinion (13).

Attached to the rear face of the housing is the sheet metal compressed air receiver (2) which provides the air duct from the compressor to the combustion chamber and houses the Nimonic alloy volute (3) carrying the combustion gases to the turbine rotor.

The radial, nine-vaned diffuser is a separate aluminium component which has fitting bolts passing through each of the vanes to locate and secure the support plate, the diffuser, and the heat shield (7) of the combustion system in the compressor housing.

Adequate protection for the support plate, turbine bearing and diffuser from excessive transfer of heat is provided by the heat shield, and by cooling air at compressor delivery pressure (15), passing through internal passages to a cooling ring.

Also attached to the support plate is the turbine nozzle assembly (6) and its separate shroud which is positioned by hollow steel pegs, one of which locates in each blade of the nozzle ring. The exhaust cone and its inner cylinder are of stainless steel; the cylinder being mounted within the cone by three location tubes through which air is induced to cool the rear face of the turbine (5). A flange welded on the outside of the cone bolts to a corresponding flange on the rear face of the compressed air receiver.

Held between these two flanges is a further flange welded to a large diameter bellows. These are bolted at their forward end to the turbine and nozzle shroud ring to allow for differential expansion between the compressed air receiver, exhaust cone and shroud ring.

Situated above the compressor housing is the single combustion chamber (1) embodying the ignition plug and burner (16).

LUBRICATION. The sump for the lubrication system is in the lower part of the compressor housing and has a capacity of five pints. A gear type oil pump secured to the auxiliaries mounting plate delivers oil under pressure to a full-flow filter (9) on the side of the engine.

From the filter the oil passes along a duct in the mounting plate to the oil jet leading into the compressor shaft; a passage drilled along the length of the shaft takes the oil to the two bearings.

Radially drilled holes feed the oil to the turbine roller bearing and the oil flows back to the sump via a short pipe. At the front of the shaft radial drillings pass the oil to the rear face of the ball bearing. After flowing through the bearing it splash-lubricates the high speed pinion and intermediate gear before returning to the sump. The oil filler tube (18) is situated at the top of the compressor housing together with the breather pipe (17).

COMBUSTION CHAMBER AND BURNER. This is a reverse flow combustion chamber of Nimonic alloy together with a burner incorporating a simplex atomiser, fuel filter and fuel shut-off valve.

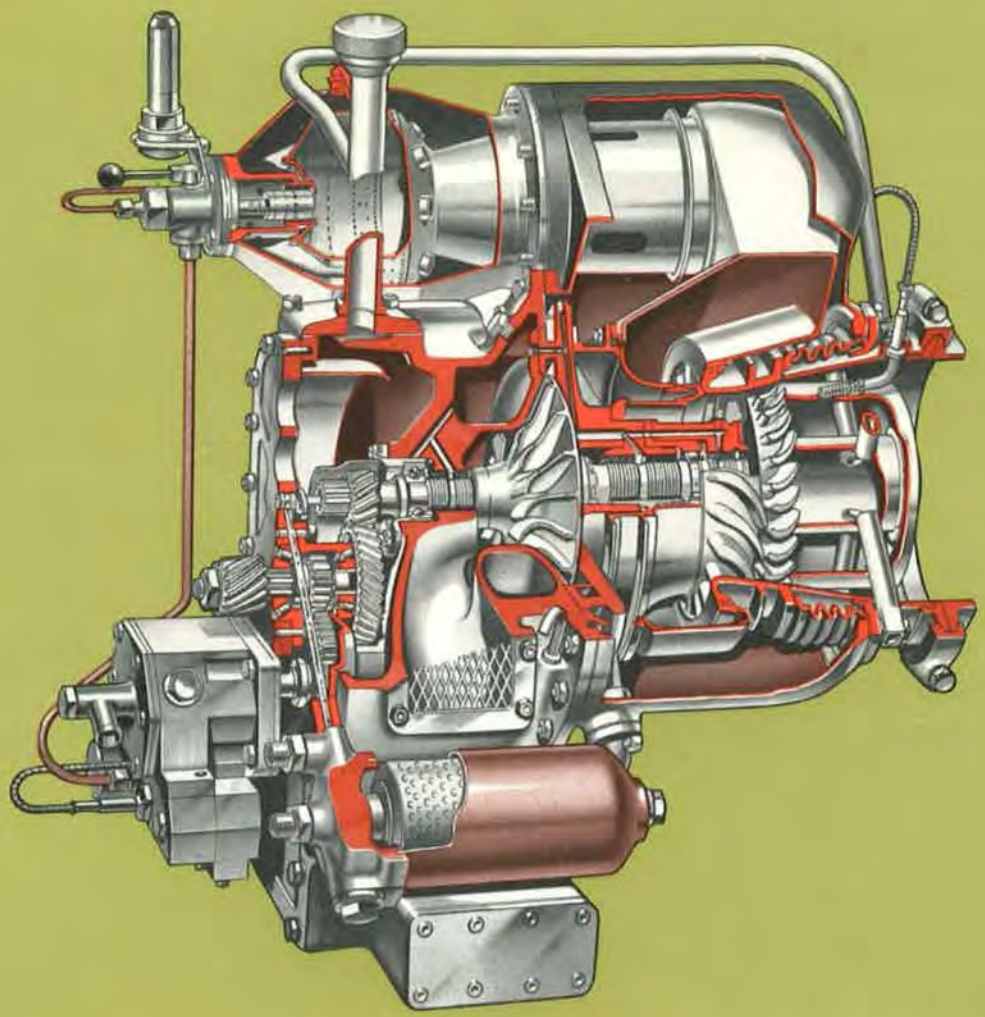
FUEL SYSTEM. This consists of a Rover multi-piston pump incorporating automatic control for both maximum speed and temperature.

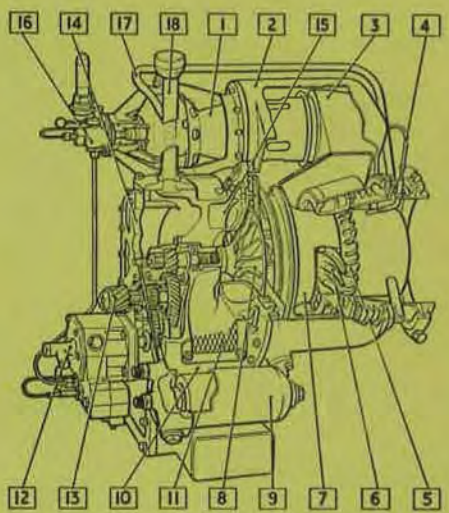
A fuel accumulator stores fuel under pressure and ensures good atomisation for starting purposes whilst acceleration is controlled by the capacity of the piston type pump.

To avoid overspeeding a centrifugal type governor is included in the unit, external adjustment being provided to enable the governor to be set at the maximum speed condition.

A temperature control located in the exhaust stream and connected to the fuel control unit prevents the engine operating at excessive temperatures by operating a valve to return fuel to the suction side of the pump at a pre-determined exhaust temperature.

OPERATION. The operation of the Rover Gas Turbine engines is extremely simple. Air is admitted through the side intakes to the compressor rotor, compressed and passed along the air duct to the combustion chamber, where fuel is injected. The resulting mixture is then ignited, and the combustion gases pass through the volute to the fixed nozzle ring assembly which directs them against the turbine rotor blades. The combustion gases then exhaust to atmosphere through the exhaust cone.





1. Reverse flow Combustion Chamber.
2. Compressed Air Receiver.
3. Volute Casing.
4. Temperature Control Capillary.
5. Turbine.
6. Turbine Nozzle.
7. Heat Shield.
8. Impeller.
9. Pressure Oil Filter.
10. Compressor Housing.
11. Air Intake.
12. Fuel Control Unit.
13. Output Pinion.
14. Auxiliaries Mounting Plate.
15. Pressure Air Reservoir.
16. Simplex Burner.
17. Breather Pipe.
18. Oil Filler.

IS/60 SPECIFICATION

Continous Power

60 b.h.p. with a jet pipe temperature of 600° C. (1,112° F.)

Fuel

Distillate fuels such as kerosene or diesel oil.

Fuel Consumption

1.45 lb./b.h.p./hr. (0.658 kg./b.h.p./hr.)

Power Take-off Pinion Speeds

3,000 r.p.m., 3,600 r.p.m. and 8,000 r.p.m. are standard.
2:1 reduction gearing can be supplied on request with the standard range.
Alternative reduction gearing to suit special requirements can be supplied.

Compressor Speed

46,000 r.p.m.

Weight, including reduction gearing

133 lb. (60.33 kg.)

OVERALL DIMENSIONS

Height: 23¾ in. (603,3 mm.)
Width: 18½ in. (469,9 mm.)
Length: 19 in. (482.6 mm.)

INSTRUMENTATION

R.P.M. indicator.
Oil temperature/pressure gauge.
On/off fuel control valve.
Additional instruments for ancillary equipment can be mounted on the engine instrument panel.

STARTING

Hand, 12 volt or 24 volt D.C. electric starting as required.

IS/90 SPECIFICATION

Continous Power

90 b.h.p. with a jet pipe temperature of 600° C. (1,112° F.)

Fuel

Distillate fuels such as kerosene or diesel oil.

Fuel Comsunption.

1.38 lb./b.h.p./hr. (0.626 kg./b.h.p./hr.)

Power Take-off Pinion Speeds

3,000 r.p.m., 3,600 r.p.m. and 8,000 r.p.m. are standard.
2:1 reduction gearing can be supplied on request with the standard range.
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ROVER GAS TURBINES LIMITED

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