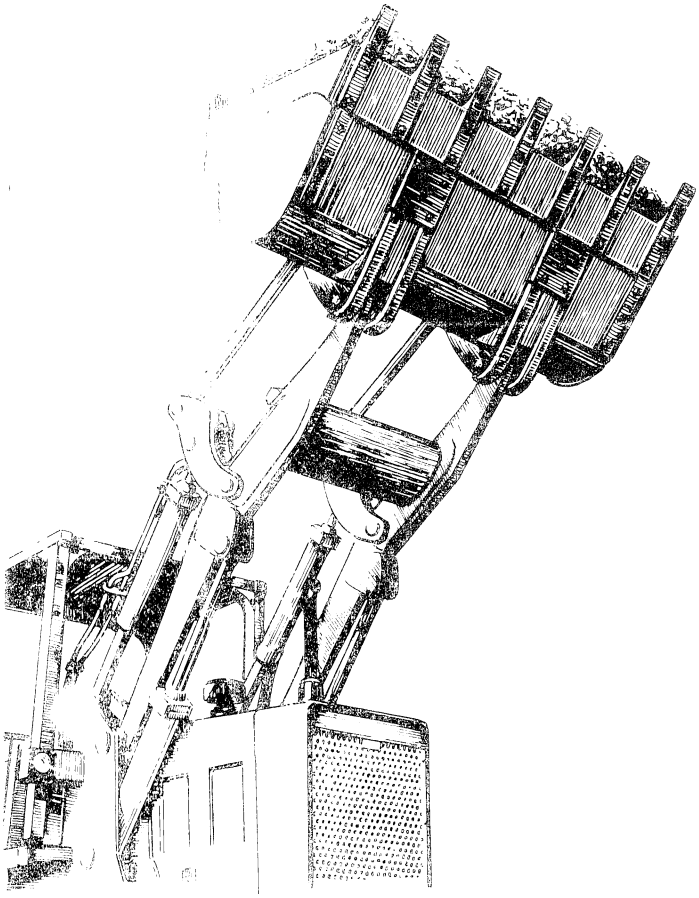
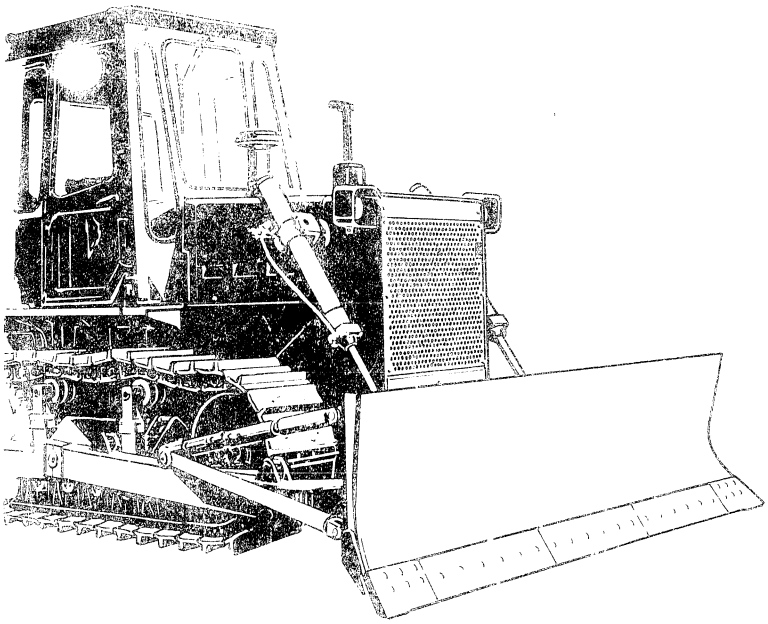
FIATALLIS





FL10 - FL10B
crawler loader

10 - 10B
dozer

Service manual

PRINT No. 604.06.077 - English

Reprinted

WARNING!

STUDY THE OPERATION AND MAINTENANCE INSTRUCTION MANUAL THROUGH BEFORE STARTING, OPERATING, MAINTAINING, FUELING OR SERVICING THIS MACHINE.

AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the highway, are caused by the failure of some individual to follow simple and fundamental safety rules or precautions. For this reason MOST ACCIDENTS CAN BE PREVENTED by recognizing the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment there are many conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident.

The complete observance of one simple rule would prevent many thousand serious injuries each year.

That rule is:

Never attempt to clean, oil or adjust a machine while it is in motion.

WARNING

On machines having hydraulically, mechanically, and/or cable controlled equipment (such as shovels, loaders, dozers, scrapers, etc.) be certain the equipment is lowered to the ground before servicing, adjusting and/or repairing. If it is necessary to have the hydraulically, mechanically, and/or cable controlled equipment partially or fully raised to gain access to certain items, be sure the equipment is suitably supported by means other than the hydraulic lift cylinders, cable and/or mechanical devices used for controlling the equipment.

FIATALLIS

FL 10 - FL 10 B
crawler loader

10 - 10 B
dozer

SERVICE MANUAL

MAIN SECTION

APPENDIX

IMPORTANT

The Imperial weights and measures are given for operators' convenience and, though the closest approximation is sought, they are normally rounded off for practical reasons. In case of discrepancies only the metric units should be considered.
The wear allowances indicated for some items are given for guidance only.
Any reference made in the manual to " front ", " rear ", " right-hand " and " left-hand " is as viewed facing the direction of forward travel from the driver' s seat.
A.M. = Ante-modification — P.M. = Post-modification.

NEW MODEL DESIGNATION SYMBOLS

The commercial designation of the FIAT-ALLIS models was changed recently for standardization reasons. For the dozers, letters AD or BD forming the first part of the designation have been suppressed, the second part remaining unchanged. The designation symbols written on the machines and in the technical literature are being progressively updated.

NEW DESIGNATION OF SERVICE TOOLS

Due to organization requirements, starting from October 1976, all part numbers of service tools have been modified by the addition of prefix 75. For instance, part number of pressure gauge kit 291314 is now 75291314. Service tools part numbers shown in this manual are not yet updated, but orders should be placed preferably making reference to the new numbers.

FIATGEOTECH S.p.A. - Tecnologie per la terra -
Divisione Macchine Movimento Terra - ASSISTENZA - PUBBLICAZIONI

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SAFETY RULES

GENERAL

Study the Operation and Maintenance Instruction Manual before starting, operating, maintaining, fueling, or servicing machine

Read and heed all machine-mounted safety signs before starting, operating, maintaining, fueling or servicing machine.

Machine-mounted safety signs have been color coded yellow with black borders and lettering for warning and red with white borders and lettering for danger points.

Do not allow unauthorized personnel to service or maintain this machine. Do not perform any work on equipment that is not authorized. Follow the Maintenance and Service procedures. Study the Operation and Maintenance Instruction Manual before starting, operating, maintaining, fueling or servicing this machine.

Always wear safety glasses with side shields.

Do not wear rings, wrist watches, jewelry, or loose or hanging apparel, such as ties, torn clothing, scarves, unbuttoned, or unzipped jackets that can catch on moving parts. Wear proper safety equipment as authorized for the job. Examples: hard hats, safety shoes, heavy gloves, ear protectors, safety glasses or goggles, reflector vests, or respirators. Consult your employer for specific safety equipment requirements.

Do not use controls or hoses as handholds when climbing on or off machine. Hoses and controls are movable and do not provide a solid support. Controls may also be inadvertently moved causing accidental machine or equipment movement.

Do not jump on or off machine. Keep two hands and one foot, or two feet and one hand, in contact with steps and grab-rails and handles at all times.

Machine should not be serviced with anyone in the operator's seat unless they are qualified to operate the machine and are assisting in the servicing.

Keep operator's compartment, stepping points, grab-rails and handles clean of foreign objects, oil, grease, mud or snow accumulation to minimize the danger of slipping or stumbling. Clean mud or grease from shoes before attempting to mount or operate the machine.

Never attempt to operate the machine or its tools from any other position than seated in the operator's seat.

Keep operator's compartment clear of loose objects.

If movement of an attachment by means of the machine's hydraulic system is required for service or maintenance, do not raise or lower attachments from any position other than when seated in the operator's seat. Before starting machine or moving attachment or tool, make sure to set brakes, sound horn and call for an all clear. Raise attachment slowly.

Always block with external support any linkage or part on machine that requires work under the raised linkage, parts, or machine per OSHA requirements. Never allow anyone to walk under or be near unblocked raised equipment. Avoid working or walking under raised blocked equipment unless you are assured of your safety.

Never place head, body, limbs, fingers, feet or hands into an exposed portion between uncontrolled or unguarded scissor points of machine without first providing secure blocking.

Never lubricate, service or adjust a machine with the engine running, except as called for in the Operation and Maintenance Instruction Manuals. Do not wear loose clothing or jewelry near moving parts.

When servicing or maintenance requires access to areas that cannot be reached from the ground, use a ladder or step platform that meets OSHA requirements to reach the service point. If such ladders or platforms are not available, use the machine handholds and steps as provided. Perform all service or maintenance carefully.

Shop or field service platforms and ladders used to maintain or service machinery should be constructed and maintained according to local or national requirements.

Disconnect batteries and TAG all controls according to OSHA requirements to warn that work is in progress. Block the machine and all attachments that must be raised per OSHA requirements.

Never check or fill fuel tanks, storage batteries or use starter fluid near lighted smoking materials or open flame due to the presence of flammable fluid.

Brakes are inoperative when manually released for servicing. Provision must be made to maintain control of the machine by blocking or other means.

Always place the fuel nozzle against the side of the filler opening before starting and during fuel flow. To reduce the chance of a static electricity spark, keep contact until after fuel flow is shut off.

Use only designated towing or pulling attachment points. Use care in making attachment. Be sure pins and locks as provided are secure before pulling. Stay clear of drawbars, cables or chains under load.

To move a disabled machine, use a trailer or low boy truck if available. If towing is necessary, provide warning signals as required by local rules and regulations and follow operation and maintenance instruction manual recommendations. Load and unload on a level area that gives full support to the trailer wheels. Use ramps of adequate strength, low angle and proper height. Keep trailer bed clean of clay, oil and all materials that become slippery. Tie machine down securely to truck or trailer bed and block tracks (or wheels) as required by the carrier.

Never align holes with fingers or hands. Use the proper aligning tool.

Remove sharp edges and burrs from reworked parts.

Use only grounded auxiliary power source for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shock.

Lift and handle all heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.

Never place gasoline or diesel fuel in an open pan.

Never use gasoline or solvent or other flammable fluid to clean parts. Use authorized commercial, non-flammable, non-toxic solvents.

When using compressed air for cleaning parts use safety

Safety Rules

GENERAL (Continued)

glasses with side shields or goggles. Limit the pressure to 30 psi according to local or national requirements.

Do not smoke or permit any open flame or spark near when refueling, or handling highly flammable materials.

Do not use an open flame as a light source to look for leaks or for inspection anywhere on the machine.

Be sure all mechanic's tools are in good condition. DO NOT use tools with mushroomed heads. Always wear safety glasses with side shields.

Move carefully when under, in or near machine or implements. Wear required protective equipment, such as hard hat, safety glasses, safety shoes, ear protectors.

When making equipment checks that require running of the engine, have an operator in the operator seat at all times with the mechanic in sight. Place the transmission in neutral and set the brakes and lock. Keep hands and clothing away from moving parts. Shut off engine and disengage the Power Take-Off lever before attempting adjustments or service.

Never use the bucket as a man lift.

The articulation point between frames will not clear a person. Stay clear when engine is running. Support, using device provided when servicing. Return support to carry position and secure before moving machine after servicing. See Operation and Maintenance Instruction Manual.

For field service, move machine to level ground if possible and block machine. If work is absolutely necessary on an incline, block machine and its attachments securely. Move the machine to level ground as soon as possible.

Guard against kinking chains or cables. Do not lift or pull through a kinked chain or cable. Always wear heavy gloves when handling chain or cable.

Be sure cables are anchored and the anchor point is strong enough to handle the expected load. Keep exposed personnel clear of anchor point and cable or chain. DO NOT PULL OR TOW UNLESS OPERATOR'S COMPARTMENTS OF MACHINES INVOLVED ARE PROPERLY GUARDED against accidental cable or chain backlash.

Keep maintenance area CLEAN and DRY. Remove water or oil slicks immediately.

DO NOT pile oily, greasy rags — they are a fire hazard. Store in a closed metal container.

Before starting machine or moving attachment check and adjust and lock operator's seat. Be sure all personnel in the area are clear before starting or moving machine and any of its attachments. Sound horn.

Rust inhibitors are volatile and flammable. Prepare parts in well-ventilated place. Keep open flame away — DO NOT SMOKE. Store container in a cool well-ventilated place secured against unauthorized personnel.

Do not carry loose objects in pockets that might fall unnoticed into open compartments.

Keep clutches and brakes on machine and attachments such as Power Control Units, winches and master clutches adjusted according to Operation and Maintenance Instruction Manuals of the manufacturer at all times. DO NOT adjust machine with engine running except as specified.

Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves when metal or other particles are apt to fly or fall.

Wear welder's protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding. Wear dark safety glasses near welding. DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.

Know your jacking equipment and its capacity. Be sure the jacking point used on the machine is appropriate for the load to be applied. Be sure the support for the jack at the machine and under the jack is appropriate and stable. Any equipment up on a jack is dangerous. Transfer load to appropriate blocking as a safety measure before proceeding with service or maintenance work according to local or national requirements.

Wire rope develops steel slivers. Use authorized protective equipment such as heavy gloves, safety glasses when handling.

Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.

Inspect your seat belt at least twice a year for signs of fraying, wear, or other weakness that could lead to failure.

Where it is necessary to use diesel fuel as a lubricant make sure all smoking material and open flames are extinguished or that no sparks are near. Place all parts in a closed container of clear diesel fuel for use as needed.

To minimize dangers of fire and explosion, it is recommended that before any welding is done on a fuel tank, the tank be completely drained of fuel, fuel lines disconnected and the ends closed to protect them, and the tank be steam cleaned. All traces of fuel must be removed before welding is started. Flood the tank with carbon dioxide (CO_2) before and during welding. Caps must be removed and vents and other openings left open during welding.

Dry ice (solid carbon dioxide) is extremely cold and will freeze flesh on contact. Use care to prevent contact with skin, eyes, or other parts of the body to avoid personal injury.

When work is required under or between components, block with an external support capable of holding the components in place according to local or national requirements.

START UP

Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.

Do not place head, body, limbs, feet, fingers, or hands near a rotating fan or belts. Be especially alert around a pusher fan.

STARTING FLUID IS FLAMMABLE. Follow the recommendations as outlined in the Operation and Maintenance Instruction Manual and as marked on the containers. Store containers in cool, well-ventilated place secure from unauthorized personnel. DO NOT PUNCTURE OR BURN CONTAINERS. Follow the recommendation of the manufacturer for storage and disposal.

Safety Rules

ENGINE

Turn radiator cap slowly to relieve pressure before removing. Add coolant only with engine stopped or idling if hot. See Operation and Maintenance Instruction Manual.

Do not run engine when refueling and use care if engine is hot due to the increased possibility of a fire if fuel is spilled.

Never attempt to check or adjust fan belts when engine is running.

Do not adjust engine fuel pump when the machine is in motion.

Never lubricate a machine with the engine running.

Avoid running engine with open unprotected air inlets. If such running is unavoidable for service reasons, place protective screen over all inlet openings before servicing engine.

ELECTRICAL

Be sure to connect the booster cables to the proper terminals (+ to +) and (- to -) at both ends. Avoid shorting clamps. Follow the Operation and Maintenance Instruction Manual procedure.

Always turn the master switch (key switch if so equipped) to the off position when maintaining or servicing machine.

BATTERY GAS IS HIGHLY FLAMMABLE. Leave battery box open to improve ventilation when charging batteries. Never check charge by placing metal objects across the posts. Keep sparks or open flame away from batteries. Do not smoke near battery to guard against the possibility of an accidental explosion.

Check for fuel or battery electrolyte leaks before starting service or maintenance work. Eliminate leaks before proceeding.

Do not charge batteries in a closed area. Provide proper ventilation to guard against an accidental explosion from an accumulation of explosive gases given off in the charging process.

Disconnect batteries before working on electrical system or repair work of any kind.

HYDRAULIC

Fluid escaping under pressure from a very small hole can almost be invisible and can have sufficient force to penetrate the skin. Use a piece of cardboard or wood to search for suspected pressure leaks. DO NOT USE HANDS. If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.

Shut off engine and be sure all pressure in system has been relieved before removing panels, housings, covers, and caps. See Operation and Maintenance Instruction Manual.

When making pressure checks use the correct gage for expected pressure. See Operation and Maintenance Instruction Manual or Service Manual for Guidance.

ATTACHMENTS

Keep head, body, limbs, feet, hands and fingers away from blade, bucket or ripper when in raised position. Use authorized blocking as a safety measure before proceeding with service or maintenance per OSHA requirements.

If movement of an attachment by means of the machine's hydraulic system is required for service or maintenance do not raise or lower attachments from any position other than when seated in the operator's seat. Before starting machine or moving attachments or tools, make sure to set brakes, sound horn and call for an all clear. Raise attachment slowly.

Do not use machine to carry loose objects by means other than attachments for carrying such objects.

Never use any gas other than dry nitrogen to charge accumulators. See Operation and Maintenance Instruction Manual.

Keep clutches and brakes on machine and attachments such as power control units, winches and master clutches adjusted according to Operation and Maintenance Instruction Manuals of the manufacturer at all times. DO NOT adjust machine with engine running except as specified.

TIRES (APPLICABLE MACHINES)

Be sure tires are properly inflated to the manufacturer's specified pressure. Inspect for damage periodically.

Stand to one side when changing inflation of tires.

Check tires only when the machine is empty and tires are cool to avoid overinflation. Do not use reworked wheel parts. Improper welding, heating or brazing weakens them and can cause failure.

Never cut or weld on the rim of an inflated tire. Inflate a spare tire only enough to keep rim parts in place — a fully inflated tire might fly apart when it is not installed on a machine.

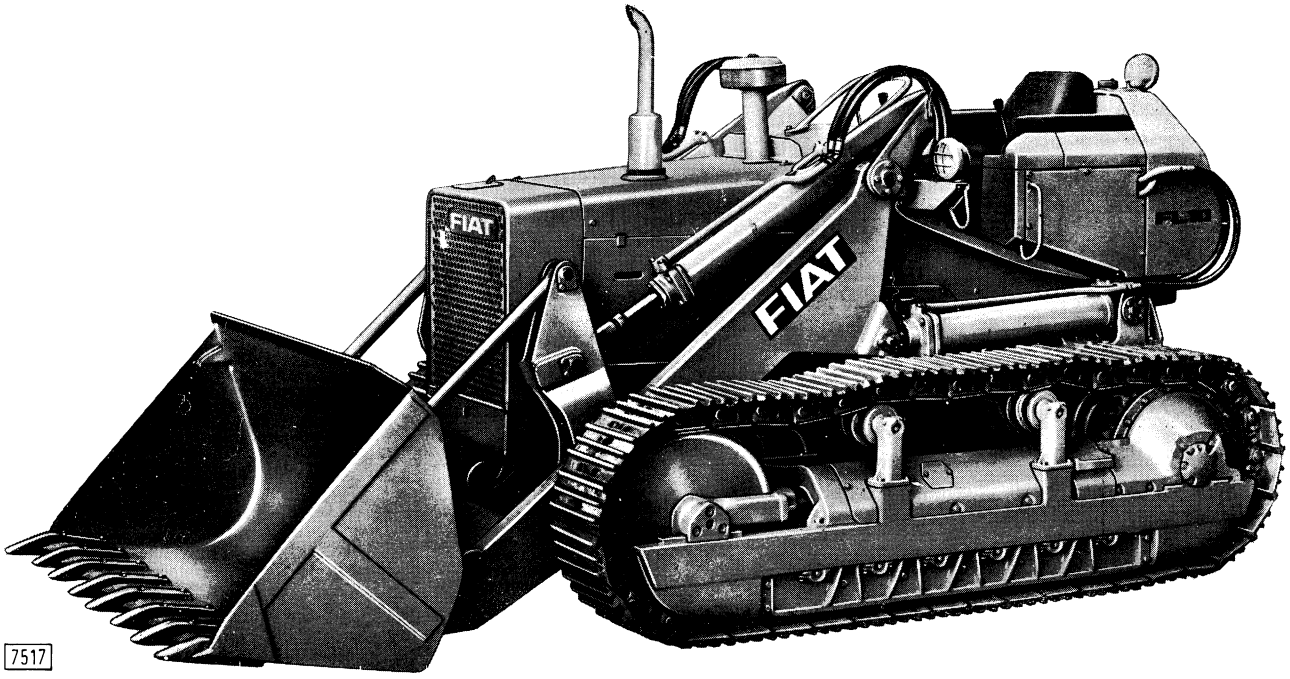
Use care if you must transport (haul) a fully inflated tire.

When servicing tires block the machine in front and back of all wheels. After jacking up, place blocking under machine to protect from falling per OSHA requirements.

Deflate tires before removing objects from the tread.

Never inflate tires with flammable gases. Explosion and personal injury could result.

LOADER
Model FL 10



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CONTENTS

GENERAL

FOREWORD

The information given in this section apply to Loader Model FL 10.
For Angledozer AD 10 and Bulldozer BD 10 see the subsequent sections.

SPECIFICATION

IDENTIFICATION DATA

Chassis type	
— Engineering code	626.100
— Marketing code	110 CA
Engine type	FIAT-OM CP 3/100
Machine type	FL 10

ENGINE

Cycle	Diesel, naturally-aspirated
Strokes	Four
Injection	Direct
No. of cylinders	Six
Bore	110 mm. (4.33 in.)
Stroke	130 mm. (5.12 in.)
Capacity	7,412 c.c. (451.8 cu.in.)
Compression ratio	17.4 to 1
Main bearings	Seven
Crankshaft rotation (as seen from fan side)	Clockwise
Output (fan, air cleaner and exhaust silencer removed) . .	110 H.P.
At	2,000 r.p.m.
Max. no-load speed	2,170 r.p.m.
Min. no-load speed (idling) .	500 r.p.m.

Valvegear

Pushrod-operated overhead valves

Hourmeter rating	1,400 r.p.m.

Fuel System

Dry air cleaner including centrifugal pre-cleaner and two pairs of in-line paper cartridge elements with associated warning indicator on the dashboard. Optional oil-bath air cleaner.

Twin, in-line cloth/paper cartridge element fuel filters inserted in the fuel pump outlet line.
OM (BOSCH licence) fuel injection pump of the in-line type featuring six pump elements, L.H. helix plungers and fuel recirculation system.

Fuel injection timing	25° B.T.D.C.
Firing order	1-5-3-6-2-4
Injector nozzles	Four spray orifices Spray angle = 145°

Lubrication System

Forced-feed system featuring gear type feed and scavenge oil pumps.

Pump drive ratio	.714 to 1

Steel gauze suction filters on each oil pump and paper cartridge fitted to feed pump outlet line.
Tube type oil cooling heat exchanger branched off the engine cooling system (A.M. engines only).

Cooling System

Vane type centrifugal water pump and wax type thermostat.

Pump drive ratio	1.475 to 1

Five-deep vertical tube radiator core and six-bladed blower type radiator fan.

TORQUE CONVERTER

Hydraulic, 13 in. dia., single-stage, single-phase.

Torque multiplication ratio . .	2.90 to 1

Double universal joint drive shaft between converter and gearbox.

GEARBOX

Power-shift gearbox and reverser with constant-mesh spur-tooth gears and five hydraulically-operated oil-bath multi-plate shift clutches.

Three forward and 3 reverse ratios.

Hydraulic powershift gear selector lever on the left of the driver's seat.

Power Take-off

Splined shaft on rear end of reverse clutch shaft.

Shaft speed range . . . . . 0 to 2,187 r.p.m.

Shaft direction of rotation (as seen from the rear) . . . . Clockwise

CONVERTER/GEARBOX HYDRAULIC SYSTEM

Double gear-type hydraulic pump (feed and scavenge) operated through a pair of gears driven off the flywheel.

Pump drive ratio . . . . . 1.326 to 1

Feed pump rated output (at max. r.p.m.) . . . . . 47 litre/min. ($10^1/_3$ gall/min.)

Feed pump rated pressure . . 13 kg/cm² (185 p.s.i.)

Scavenge pump rated pressure . 1 kg/cm² (14.2 p.s.i.)

Steel wool replaceable element oil filters on feed pump inlet and outlet, and steel mesh gauze filter on scavenge pump inlet.

Main powershift valve block assembly including a number of shuttle valves.

Gearbox clutch pressure regulating valve

— Pressure setting . . . . . 12 to 13 kg/cm² (171 to 185 p.s.i.)

Retarder valve for progressive gearbox clutch engagement.

Torque converter pressure regulating valve

— Pressure setting . . . . . .9 to 1.1 kg/cm² (13 to 16 p.s.i.)

Torque converter safety valve

— Pressure setting . . . . . 6.7 to 8.3 kg/cm² (95 to 118 p.s.i.)

Lubricating oil pressure relief valve

— Pressure setting . . . . . 2 kg/cm² (28.4 p.s.i.)

Shell-and-tube oil cooling heat exchanger branched off the engine cooling system.

BEVEL DRIVE

Centre spiral bevel reduction with bolted-on ring gear

— Reduction ratio . . . . . 3.308 to 1 (13/43)

STEERING CLUTCHES

Hydraulically-operated oil-bath multi-plate 11 inch side clutches.

— Number of plates to each clutch 12

Individual control pedals

— Initial pedal travel = Clutch withdrawal.

— Final pedal travel = Brake application.

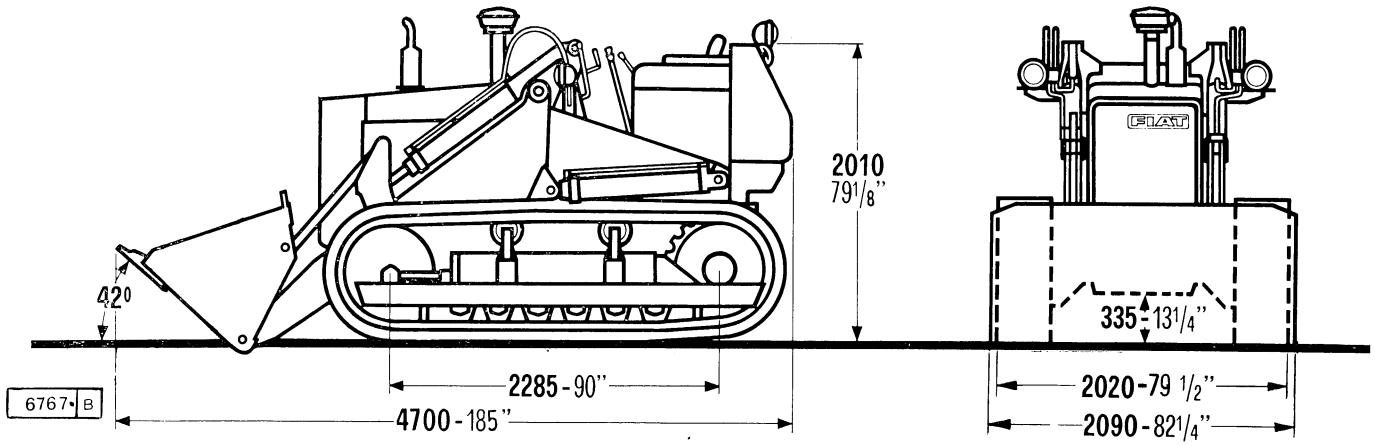


Fig. 1 - FL 10 Loader Overall Dimensions.
Note: For equipment dimensions see page 157.

BRAKES

Service

Hydraulic power-assisted oil-bath bands self-wrapping on steering clutch outer drums and actuated through two independent pedals lockable together by means of a bridge plate, or two combined steering/clutch brake pedals.

— Drum dia. . . . . 340 mm. ($13^3/_8$ in.)
— Band width . . . . . 90 mm. ($3^1/_2$ in.)

Parking

Service brakes mechanically applied through independent pedals and held in position by a locking lever.

Emergency

Quick reversing through the gear selector lever.

STEERING CLUTCH/BRAKE HYDRAULIC SYSTEM

Flywheel-driven gear type hydraulic pump

— Pump drive ratio . . . . 1.326 to 1
— Rated output (at max r.p.m.) . . . 50.5 litre/min. (11 gall./min.)
— Max. pressure setting
  — Ante-modification . . . 29 kg/cm² (412 p.s.i.)
  — Post-modification . . . 31 kg/cm² (441 p.s.i.)

Steel wool cartridge oil filter on pump inlet and paper cartridge filter on oil exhaust to transmission case.

Hydraulic control valve assembly including servovalve, shuttle and interlock valves for brake power cylinder and steering clutch control.

— Steering clutch control valve pressure setting . . . . . 19.5 to 20.5 kg/cm² (277 to 291 p.s.i.)
— Brake safety valve pressure setting
  — Ante-modification . . . 25 to 29 kg/cm² (356 to 412 p.s.i.)
  — Post-modification . . . 27 to 31 kg/cm² (384 to 441 p.s.i.)

Independent brake servo cylinders. . . . . One to each brake

HUB-REDUCTION FINAL DRIVE

Spur gear double-reduction

— Ratio . . . . . 11.209 to 1

SPROCKETS

Bolted-on split ring gear and long-life floating ring seals.

— No. of teeth 28
— Pitch circle diameter . . . 790 mm. (31.1 in.)
— Face width . . . . . 69 to 70 mm. (2.72 to 2.75 in.)

UNDERCARRIAGE

Box frame track carriage assemblies anchored to tractor frame front and rear ends.

— No. of shoes to each chain 40
— Shoe width . . . . . 380 mm. (14.9 in.)
— Link pitch . . . . . 176 mm. (6.9 in.)
— Ground contact area . . . 17,366 cm² (2,690 sq. in.)
— Ground pressure (specific) . .67 kg/cm² (9.5 p.s.i.)
— No. of track rollers per track chain 6
— No. of top idler wheels per track chain 2

Hydraulically-actuated spring-type track tension assembly

— Overload valve pressure setting . . . . . 800 to 850 kg/cm² (11,378 to 12,089 p.s.i.)

Sealed-for-life track rollers, top idlers and front idler wheels, fitted with floating ring seals.

FRONT SUSPENSION

High strength beam bracing the track carriage assemblies.

REAR SUSPENSION

Two bars attached to the rear transmission case and resting on the track carriage assemblies.

Two support arms incorporated in the track carriage frames.

EQUIPMENT

Gear-type hydraulic pump driven off the flywheel through a pair of gears.

— Pump drive ratio . . . . .956 to 1
— Rated output at max. r.p.m. . 218 litre/min. (48 gall./min.)
— Rated pressure . . . . . 132 kg/cm² (1,877 p.s.i.)

Steel wool cartridge oil filter on pump inlet and paper cartridge filter branched off the oil exhaust to tank. Hydraulic control valve assembly incorporating three shuttle valve spools, pressure relief valve, safety valves, reverse flow control valves and non-return valves in each circuit.

— Relief valve pressure setting . 128 to 132 kg/cm² (1,820 to 1,877 p.s.i.)

— Safety valve pressure setting (arm raising, bucket withdrawal and scarifier raising/lowering circuits) . . . . . 148 to 152 kg/cm² (2,105 to 2,162 p.s.i.)

—Bucket tipping overload valve setting . . . . . 113 to 117 kg/cm² (1,607 to 1,664 p.s.i.)

Bucket arm double-acting cylinders (2 off)

— Bore . . . . . 140 mm. (5.51 in.)

— Stroke . . . . . 795 mm. (31.29 in.)

Bucket raise control release device.

Bucket roll double-acting cylinders (2 off)

— Bore . . . . . 120 mm. (4.72 in.)

— Stroke . . . . . 712 mm. (28.03 in.)

Bucket positioner.

SC 10 scarifier double-acting cylinder (optional)

— Bore . . . . . 140 mm. (5.51 in.)

— Stroke . . . . . 385 mm. (15.16 in.)

ELECTRICAL SYSTEM (24 Volts)

Two series-connected batteries

— Capacity at 20-hour rate . 136 Amp-hour

Three-phase self-rectifying alternator . . . . . FIAT A 12 M 124/24/26/B

— Maximum rating . . . . 32 Amps (approx.)

Voltage regulator . . . . . FIAT RC 2/24

Alternator warning relay SIPEA T 5240 or WEP00 90003

Starter . . . . . MARELLI MT 43 P

— Output . . . . . 4 HP

— Drive . . . . . Solenoid and clutch

WEIGHTS

Dry engine (without lubricant, coolant and air cleaner) . . 670 kg. (1,477 lb.)

Standard machine (fully operational, including driver) . . . 11,700 kg. (25,798 lb.)

TRANSMISSION RATIOS AND TRAVEL SPEEDS

GEAR		Gearbox/Reverser Ratios	Engine-to-Sprocket Ratios	Max. Travel Speed (at 2,000 engine r.p.m.)	
				K.P.H.	M.P.H.
Low	Forward . .	2.543 to 1	94.277 to 1	3.5	2.1
	Reverse . . .	2.108 to 1	78.147 to 1	4.2	2.6
Intermediate	Forward . .	1.616 to 1	59.909 to 1	5.4	3.3
	Reverse . . .	1.339 to 1	49.659 to 1	6.3	3.9
High	Forward . .	0.967 to 1	35.852 to 1	8.3	5.1
	Reverse . . .	0.802 to 1	29.718 to 1	9.4	5.8

Bevel drive ratio (13/43) . . . . . 3.308 to 1

Hub-reduction final drive ratio . . . . . 11.209 to 1

Overall ratio (bevel and hub) . . . . . 37.075 to 1

CAPACITIES

DESCRIPTION	Litres	Kg.	Imp. Units	TYPE OF FLUID	
				FIAT Designation	International Designation
Engine oil					
— Sump only	14.9	14	13 1/2 qts.	AGERTER (1)	HD Series 3
— Sump, filters and lines	19.8	18	17 1/2 qts.		
Injection pump oil					
— Pump	.22	.2	1/2 pint		
— Governor	.11	.10	1/4 pint		
Oil-bath air cleaner (optional)	1.9	1.7	3 1/2 pts.		
Converter/gearbox hydraulic oil					
— Gearbox only	25.3	23	22 qts.	AGERTER 10 W(2)	HD Series 3 SAE 10W
— Total	39.5	36	35 qts.	AGERTER 30 (3)	HD Series 3 SAE 30
Steering clutch/brake hydraulic oil					
— Axle only	26.4	24	23 qts.		
— Total	27.5	25	24 qts.		
Hub-reduction oil (each)					
— Refilling	13.2	12	11 1/2 qts.	AW 90/M	SAE 90 EP
— Capacity	14.3	13	12 1/2 qts.		
Track rollers and idler wheel oil	5.9	5.4	5 qts.	AGERTER 30	HD Series 3 SAE 30
Equipment oil					
— Without scarifier	60.5	55	52 qts.	AP 31 (2)	Mineral oil containing wear/oxidation control and lubricity additives
— With scarifier	69.5	63	60 qts.	AP 51 (4)	
Grease nipples (drive shaft and articulations)	—	—	—	G 9	—
Track tension cylinder grease	—	—	—		
Fuel	210	—	46 gall.	Fuel oil (decanted and filtered)	
Coolant (including radiator and heat exchanger)	32	—	7 gall.	Water (5)	

(1) FIAT AGERTER oil grade (SAE) in relation to atmospheric temperature: Below — 15 °C **10 W**, — 15 °C to 0 °C **20 W**, up to 35 °C **30** and above 35 °C **40**.

(2) Use SAE 10 W below 0 °C.

(3) Use SAE 30 W above 0 °C.

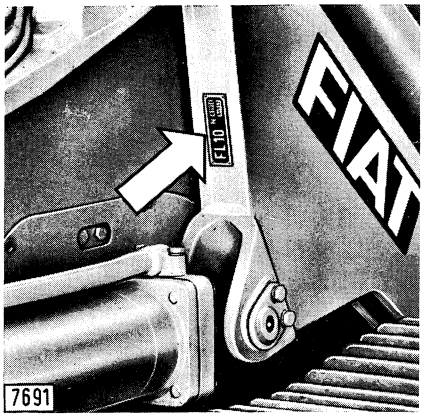
(4) Use SAE 20 W above 0 °C.

(5) At the beginning of the cold season use FIAT or other approved anti-freeze.

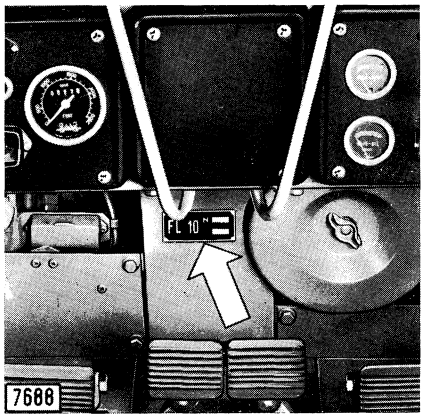
RECOMMENDED LUBRICANTS

FIAT Designation	International Designation	FIAT Designation	International Designation
AGERTER Oil	Series 3 (MIL-L-45199 A)	G 9 Grease	Lithium-calcium grease to N.L.G.1. No. 2
AW 90/M Oil	MIL-L-2105 B		

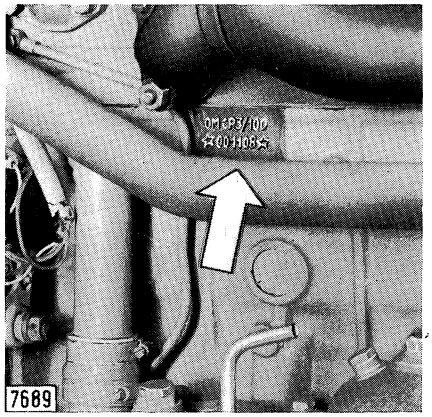
IDENTIFICATION DATA



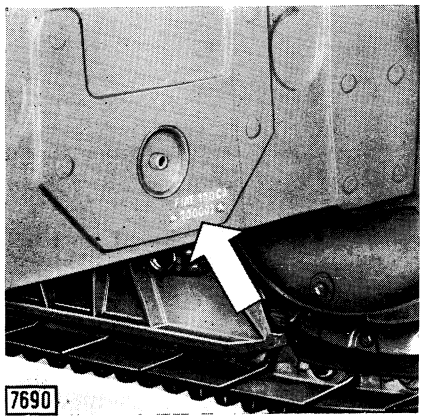
Equipment number



Data plate



Engine number



Chassis number

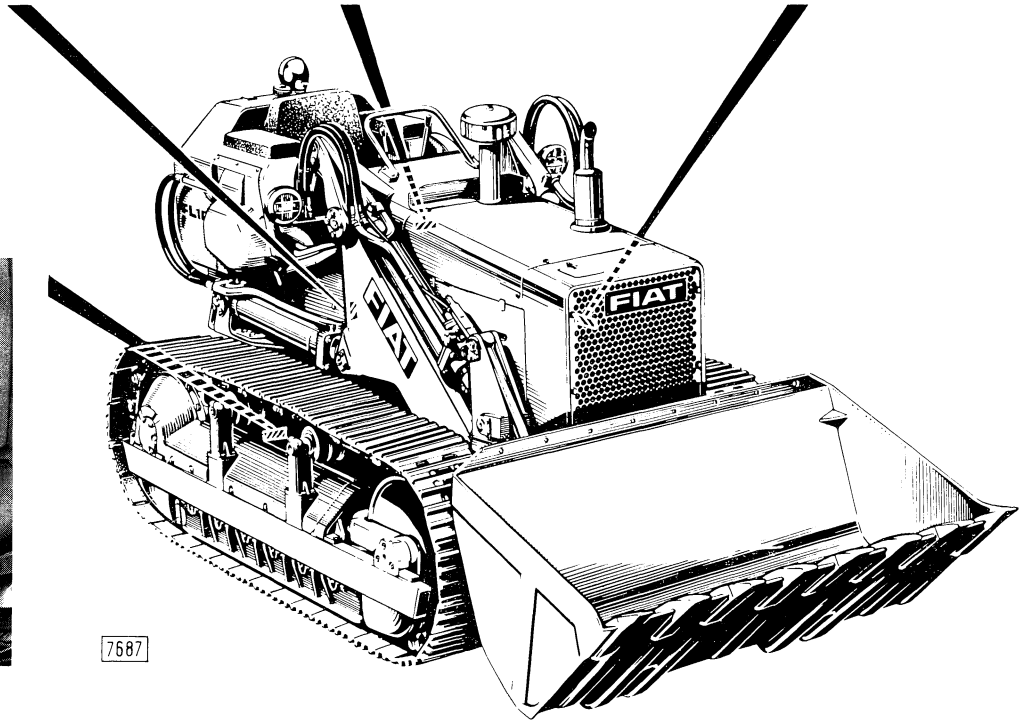


Fig. 2 - Location of Identification Data on the Machine.

SPARE PARTS

Whenever replacement parts are required it is essential that only genuine spares should be fitted to ensure efficient running.

When ordering, please state:—

— Tractor model (marketing code) and chassis number (see Fig. 2).

— Engine type and number (see Fig. 2).

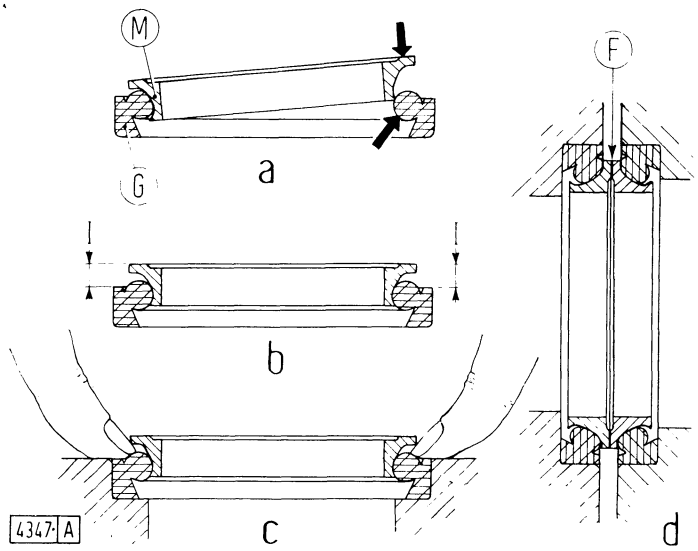
— Spare part number (see the Spare Parts Catalogue).

GENERAL FITTING NOTES

FLOATING RING SEALS

Carefully examine metal rings (M) ensuring that their sealing surfaces are free from score marks, dents or wear due to misalignment or flatness errors.

Both metal rings, together with rubber seals (G), should be renewed even if only one is found to be defective.



Do not pair new and worn metal rings together, nor used rings of different pairs.

To fit a seal proceed as follows:

— Remove all sharp corners and burrs, and carefully clean the rubber seal housings.

— Thoroughly clean the rubber seals.

— Couple each metal ring to the associated rubber seal as shown in (a), pushing and pressing as indicated by the arrows.

— Ensure that each metal ring is correctly seated - dimension I (see detail b) should be equal all round.

— Place each seal assembly in position by depressing the rubber ring as shown in detail (c).

— Before pairing the seal assemblies (see detail d) clean sealing faces (F) using a lint-free cloth and smear a light coat of highly fluid oil over the contact surfaces.

ROTARY SHAFT SEALS

To fit rotary shaft seals proceed as follows:

— Prior to fitting, soak the seals for at least half an hour in the fluid to be retained.

— Carefully clean the shaft and ensure that the contact surface is free from damage.

— Turn the end of the sealing lip towards the fluid to be retained. If of the thrower lip type, turn the grooves so that during shaft rotation the fluid tends to be thrown back.

— Smear the sealing lip with a very thin coat of lubricant (oil is better than grease) and pack the space between sealing lip and dust shield with grease (applicable to double lip seals).

— Fit the seals into their housing using a flat-ended tool or ram. Under no circumstances fit with a drift and hammer.

— Avoid entry of the seal into the recess in a tilted position. Exert a firm and uniform pressure squarely on it and ensure that the seal is pressed fully home.

— To prevent sealing lip damage during fitting use some sort of protection before sliding over the shaft.

"O" RINGS

Lubricate each ring prior to fitting and, on reassembly, slide over the part but do not twist, otherwise leakage will result.

FACE SEALING RINGS

To remove proceed as follows:—

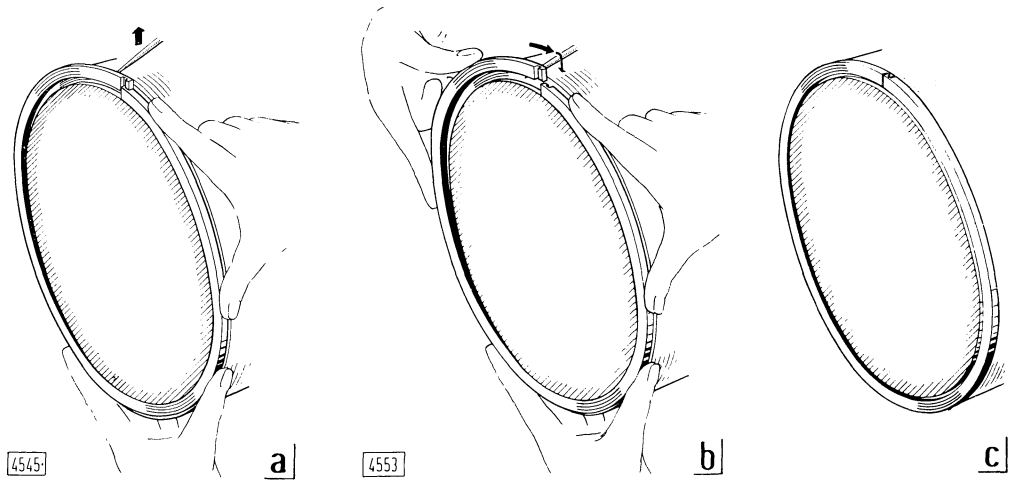
— Depress one end of the ring (see a).

— Hold in position and insert a scriber point beneath the other end to separate the interlocking ends as shown.

To refit adopt the following procedure:—

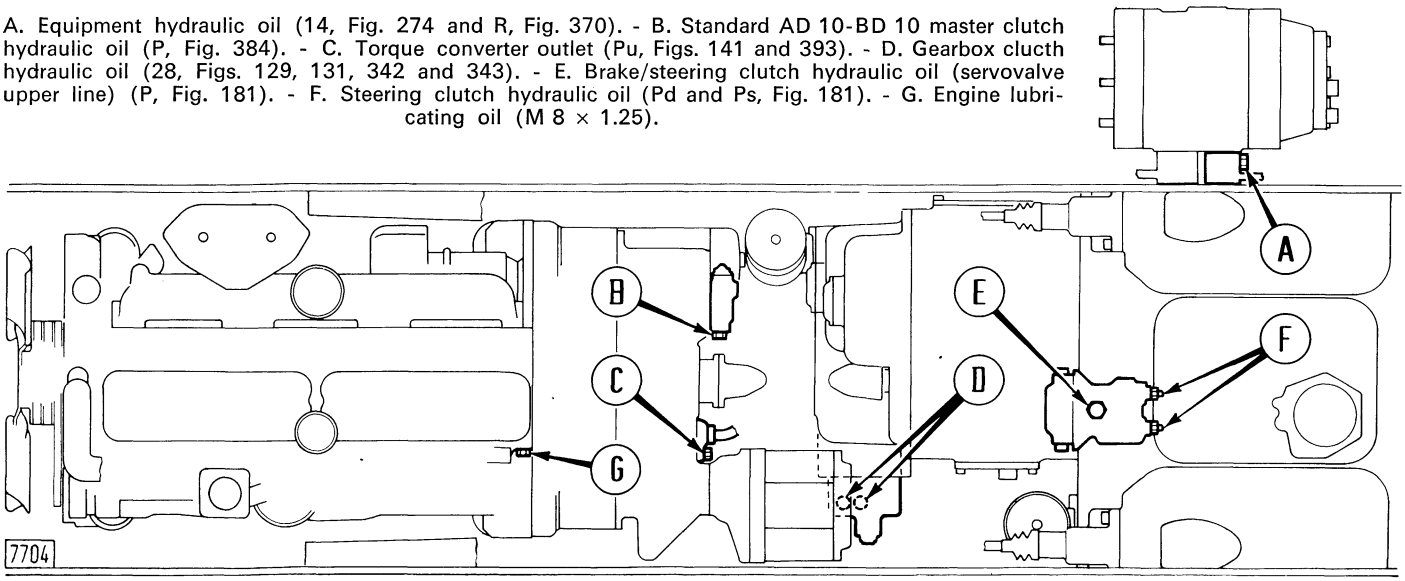
— Re-position the seal and depress one end of the ring (see b).

— Hold in position and lift the free end (see b) until the two ends lock together correctly (see c).



HYDRAULIC/LUBRICATION SYSTEM PRESSURE CHECK POINTS

A. Equipment hydraulic oil (14, Fig. 274 and R, Fig. 370). - B. Standard AD 10-BD 10 master clutch hydraulic oil (P, Fig. 384). - C. Torque converter outlet (Pu, Figs. 141 and 393). - D. Gearbox clucth hydraulic oil (28, Figs. 129, 131, 342 and 343). - E. Brake/steering clutch hydraulic oil (servovalve upper line) (P, Fig. 181). - F. Steering clutch hydraulic oil (Pd and Ps, Fig. 181). - G. Engine lubricating oil (M 8 × 1.25).



ENGINE

DESCRIPTION

The FIAT/OM engine (see Figs. 3 and 4) fitted to class 10 equipment is a high speed, 4 stroke, 6 in-line, naturally-aspirated Diesel unit.

Engine block — Single casting with machined bores, main bearing housings, camshaft bearing housings and valve tappet bores.

Cylinder liners — Wet type, cast iron.

Cylinder head — Cast iron, with valve seats and fuel injector sleeves.

Crankshaft — Seven main bearings.

Pistons — Light alloy, two compression rings and two oil control rings.

Valve gear — Helical train, pushrod operated camshaft, overhead valves and valve guides in the head.

Air breathing — Through a replaceable paper element dry cleaner.

Fuel injection — Direct into the highturbulence combustion chambers machined in the piston crowns, through in-line plunger type injection pump incorporating 4-orifice fuel injectors.

Lubrication system — Forced-feed, double gear pump (feed and scavenge), pressure relief valve, paper element full flow oil filter and heat exchanger branched off A.M. engine cooling circuit.

Cooling system — Centrifugal water pump, radiator and blower fan, wax element thermostat.

Engine starting — 24 Volt electromagnetically operated starter motor.

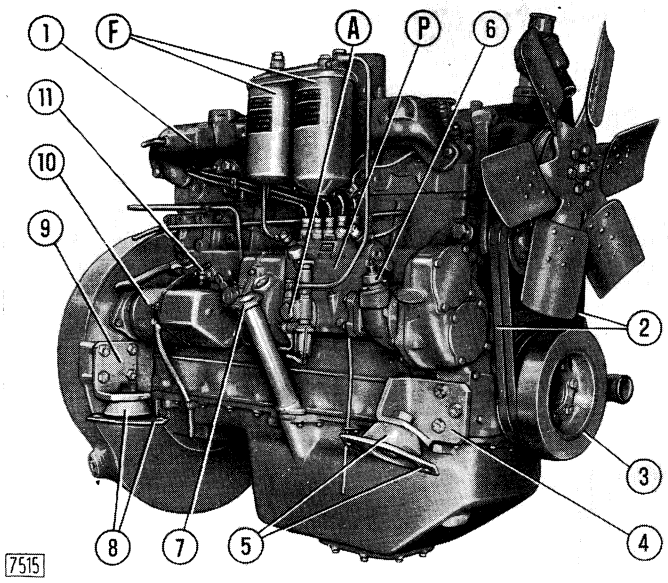


Fig. 3 - Right-hand Side View of the Engine.

A. Fuel lift pump. - F. Fuel filters. - P. Fuel injection pump. - 1. Inlet manifold. - 2. Water pump/fan belt. - 3. Crankshaft pulley/damper. - 4. Front engine mounting bracket. - 5. Cushioning pad assembly. - 6. Tacho-hourmeter drive. - 7. Oil filler with dipstick. - 8. Cushioning pad assembly. - 9. Rear engine mounting bracket. - 10. Starter. - 11. Coolant drain valve.

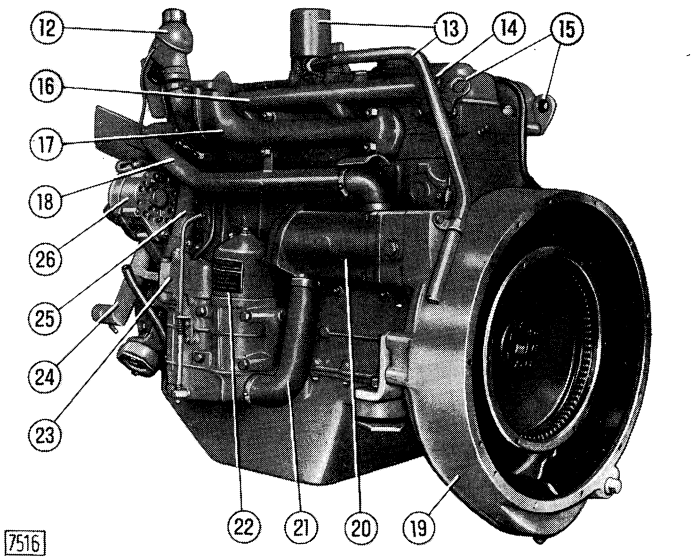


Fig. 4 - Left-hand Side View of the Engine.

12. Thermostat. - 13. Vent pipe. - 14. Temperature transmitter. - 15. Lifting eyes. - 16. Water pipe. - 17. Exhaust manifold. - 18. Water pipe. - 19. Flywheel housing. - 20. Converter/gearbox heat exchanger. - 21. Water pipe. - 22. A.M. oil filter. - 23. Engine oil heat exchanger (A.M. engine). - 24. Water pipe. - 25. Water pipe. - 26. Alternator.

BENCH TEST DATA

TEST CONDITIONS

— Engine on bench with fan, air cleaner and exhaust silencer removed.

— Atmospheric pressure 740 ± 5 mm. Hg.

— Ambient temperature 20 ± 3 °C.

— Relative humidity 70% ± 5.

— Fuel density 830 ± 10 gram/litre.

— Timing 25 ± 30' B.T.D.C., cylinder No. 1 on compression stroke.

Throttle lever position	R.P.M.	Metric H.P. after running-in		Time required to burn 250 c.c. (15.2 cu.in.) of fuel (seconds)
		2 Hours	50 Hours	
Maximum (full load)	2000	107.6 or over	108 or over	38.6 to 39.6
Maximum (maximum torque approx.) .	1000	59.8 or over	60 or over	72.7 to 75.7
Maximum (no-load)	Up to 2170	—	—	—
Minimum (no-load)	500 to 550	—	—	—

COMPRESSION TEST

If engine performance is found to be unsatisfactory, check the injection system (by replacing nozzles and injection pump) and the compression in each cylinder.

To check engine compression use tester No. **291310** proceeding as follows:—

— Remove the injector from each of the six cylinders.

— Fit dummy injector Part No. **292634 (645 N)** in place of the injector of the cylinder under test.

— Hold the injection pump in engine stop condition and take the readings driving the engine through the starter.

In normal operating conditions, compression should be 26 to 28 kg/cm² (370 to 398 p.s.i.) as recorded at 40 °C sump oil temperature, 760 mm. Hg (sea level) atmospheric pressure with the engine running at 200 to 220 r.p.m.

The minimum compression which is acceptable for a used engine is 22 kg/cm² (313 p.s.i.).

In this connection it should be noted that every 100 metres (328 ft.) altitude increase from sea level results in a 1% (approx.) decrease in compression.

The maximum compression differential between cylinders is not to exceed 3 kg/cm² (42.7 p.s.i.).

Insufficient compression may be due to faulty valves and seats, pistons and associated rings, cylinder liners or cylinder head gaskets.

Note : The purpose of the compression test is to assess the consistency of compression in the cylinders and to obtain an indication of the degree of wear affecting the parts which help to seal the combustion chambers. Therefore, the test results should not be taken as an absolute indication of engine efficiency.

TO REMOVE

1 Raise the bucket. Remove both fixed and pivoting engine side guards, the torque converter/gearbox side guards, rear and centre transmission covers and the footboards.

2 Drain the cooling system.

3 Tip the driver's seat, turn off the fuel tank tap and disconnect the battery earth lead.

4 To remove the radiator assembly with attached air ducting, proceed as follows:

— Remove the exhaust silencer, the top panelling and the front grille.

— Withdraw the cowl from the top.

— Remove the air ducting grille and disconnect both water inlet and outlet sleeves (see Fig. 5).

5 Remove the pre-cleaner and air cleaner assembly with attached elbow connectors (28, Fig. 5).

6 Disconnect the electrical cables, the piping, and the linkage to the instrumentation on the dashboard, fue tank and to the accelerator control.

7 Disconnect the torque converter assembly as described on page 61.

8 Place lifting hook Part No. **290740** on the engine, hoist to take up the weight of the engine, remove the rear left-hand mounting bracket, take off the rear right-hand mounting bracket with attached cushion pad, separate the front cushion pads from the machine frame and withdraw the power unit (see Fig. 6).

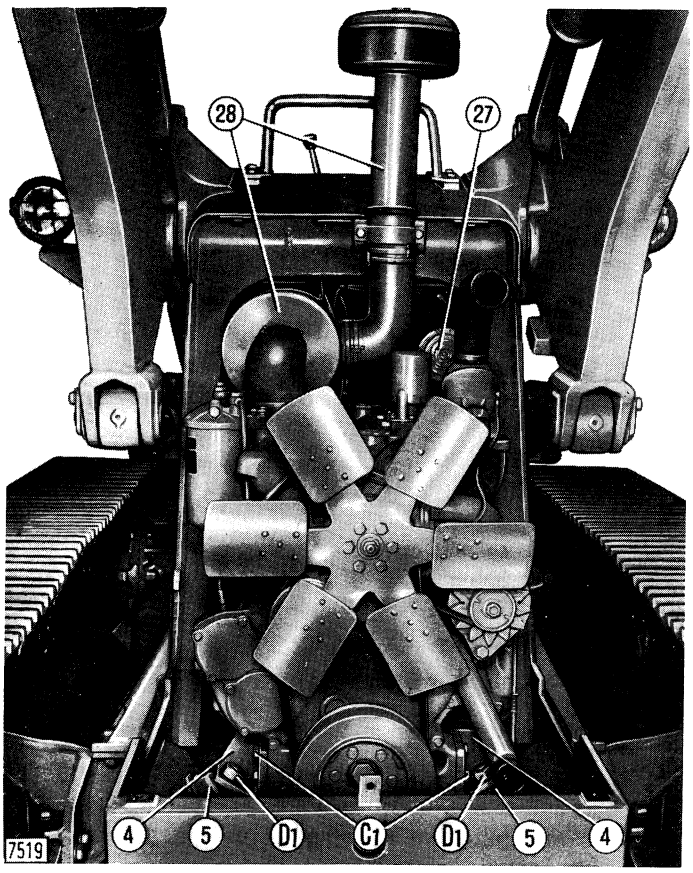


Fig. 5 - Front View of the Machine with Cowl Removed
C_1. Front mounting bracket retaining screws. - D_1. Cushion pad retaining nut. - 4. Front engine mounting brackets. - 5. Cushioning pads. - 27. Horn. - 28. Air cleaner.

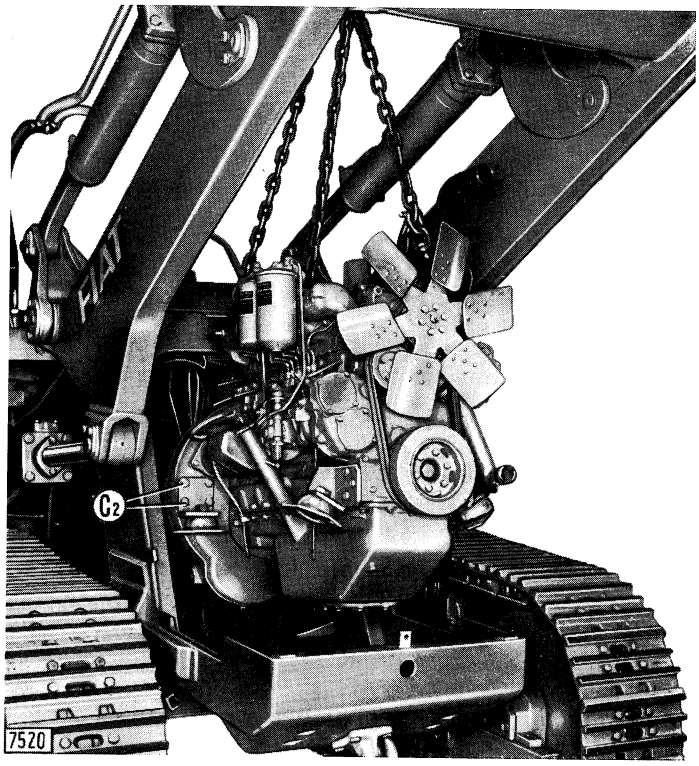


Fig. 6 - Removing (or Refitting) the Power Unit using Lifting Hook Part No. 290740
C_2. - Rear Engine Mounting Bracket Retaining Screws.

TO OVERHAUL

Place the engine on rotary stand Part No. **290090** using two front brackets Part No. **291505** and two rear brackets Part No. **291506** (see Fig. 7) and follow the instructions given under the appropriate headings.

TO REFIT

Refitting is a reversal of the removal procedure. Moreover:—

— Reinstall the front mounting brackets with attached cushion pads onto the engine and the rear left-hand mounting bracket with attached cushion pad to the machine frame.

— Hook up using lifting hook Part No. **290740** and offer up the engine onto the machine (see Fig. 6).

— Refit the rear right-hand mounting bracket with attached cushion pad and bolt the engine onto the frame.

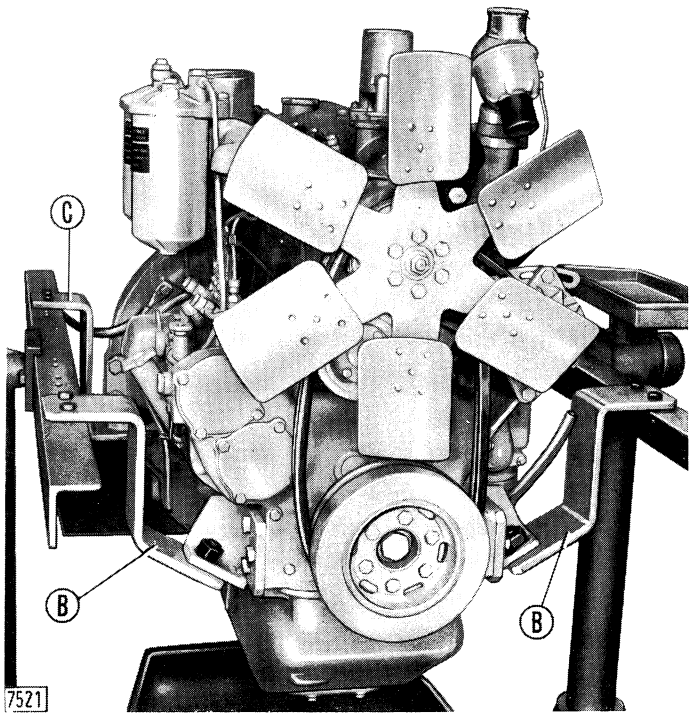


Fig. 7 - The Engine in Position on Stand Part No. 290090
B. Front brackets Part No. 291505. - C. Rear brackets Part No. 291506.

ENGINE BLOCK AND CYLINDER HEAD

CYLINDER BLOCK AND LINERS

Ensure that the block is free from damage.

Wash the casting in hot water and soda, subsequently rinsing in cold water.

Clean the internal passages using petrol and blow dry with compressed air.

Check the studs for score marks and strains resulting from excessive tightening. Renew as necessary.

Prior to fitting head and sump gaskets ensure that the associated block faces are clean.

LINER REBORING AND RENEWAL

Inspect the liners for wear as follows:

— Check the liner bore over the working length (H, Fig. 8) as swept by the piston rings.

— The diameter reading should be taken in both the upper and lower part of the working length in plane (e) parallel to the crankshaft and in plane (f) at right angles to it.

— Compare the readings to establish the amount of liner out-of-roundness and taper.

To assess the piston working clearance check the liner bore diameter in lower part (L) in plane (F) only.

If out-of-roundness or taper in excess of .15 mm. (.006 in.) is detected, rebore to .60 mm. (.024 in.) oversize (see Data Table). If the liners were already rebored, renew without hesitation.

After reboring, check the bore diameter by means of a dial gauge. To do this, zero the gauge and take c and d readings (see Fig. 8) at points 1, 2 and 3 respectively. Moreover, out-of-round should not exceed .01 mm. (.0004 in.) over X length and .03 mm. (.0012 in.) over Y length.

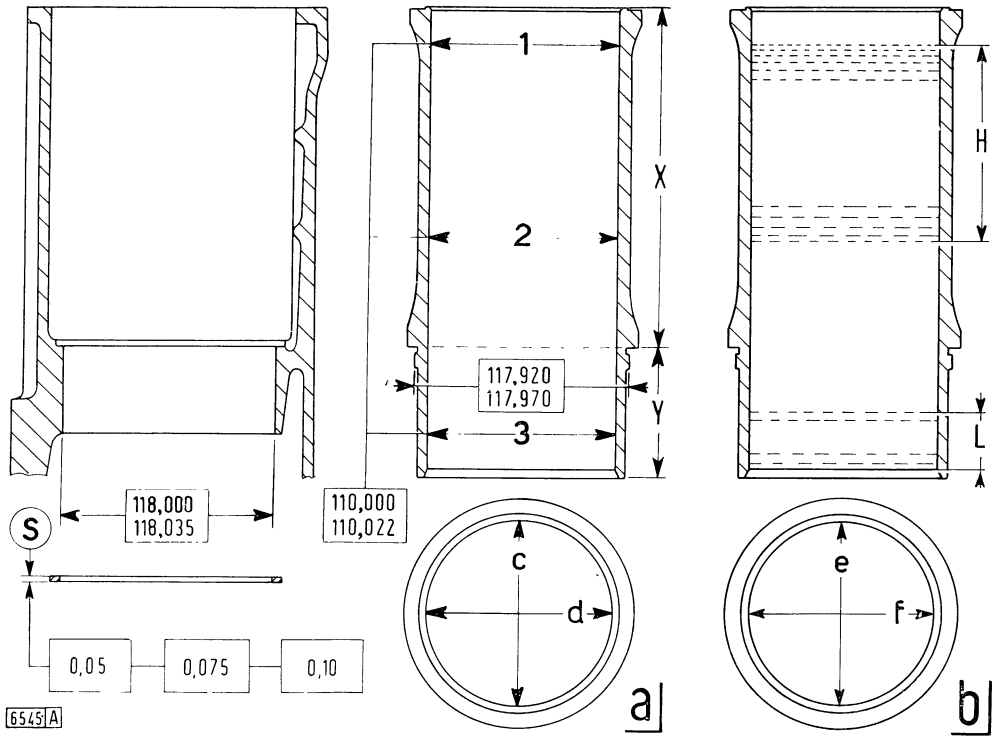


Fig. 8 - Liner and Block Dimensions and Wear Data

a. Liner and block dimensions. - b. Wear data. - H. Liner wear inspection length; readings to be taken in planes e and f. - L. Inspection length for assessment of piston fit; reading to be taken in plane f. - S. Liner protrusion control shim thickness. - X = 170 mm (6.7 in.) and Y = 65 mm (2.5 in.). New/rebored liner out-of-round inspection length (see text). - 1, 2 and 3. New/rebored liner bore dimensional check points; readings to be taken in planes c and d.

To adjust replacement liner protrusion proceed as follows:—

— Insert one liner with associated shim pack (S, Fig. 8) of unspecified thickness and press fully home.

— Place spacers Part Nos. **290955** and **290956** over two diametrically opposed studs and tighten retaining nuts (D_1, Fig. 9) to 1 kgm. (7.2 lb.ft.)

— Position straightedge Part No. **291174** over the liner at right angle to the spacer centreline and, using a feeler gauge, check the gap between block and straightedge at either end (see Fig. 9). The clearance should be .15 to .18 mm. (.006 to .007 in.). Alter shim thickness as necessary.

— Upon obtaining the correct amount of protrusion remove both the liner in question and the associated shim pack and repeat the above operations with the next liner.

The same procedure is to be adopted for the protrusion check of used liners.

Moreover, liner top misalignment should not exceed .03 mm. (.0012 in.), as shown in detail a, Fig. 9.

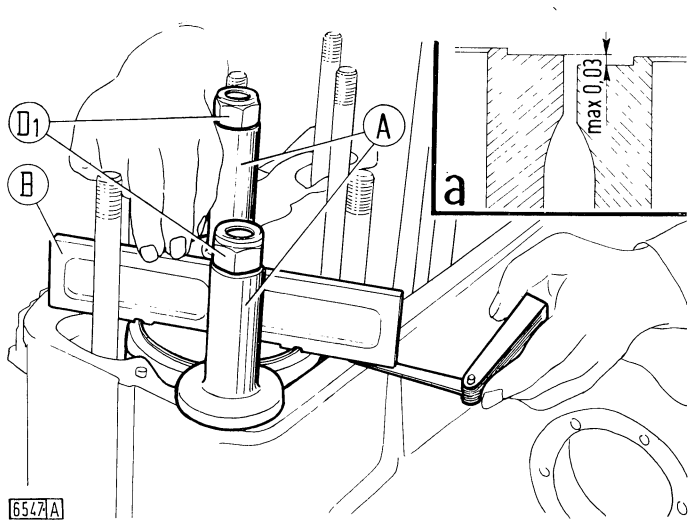


Fig. 9 - Checking Liner Protrusion Above Engine Block Top

a. Misalignment allowance.
A. Spacers Part Nos. 290955 and 290956. - B. Straightedge Part No. 291174. - D_1. Hold down nuts.

OIL SUMP

In the course of overhaul, wash the oil sump in hot water and soda and rinse in cold water.

Removal and refitting of the oil sump with the engine on the overhaul stand will be facilitated by the use of hook Part No. **291494**.

To remove the sump with the engine fitted to the machine proceed as follows:—

— Take off the front lower guard.

— Drain the engine oil.

— Remove machine frame bolts from crossmember (5, Fig. 10) and track carriage rear supports.

— Hoist the frame until the oil sump comes off the cross member and place the wood blocks as shown.

— Remove the retaining screws and lift off the sump.

To refit the oil sump proceed as follows:—

— Always renew the complete gasket.

— Using jointing compound, apply the gasket assembly onto the sump so that upon setting, the holes are correctly aligned and the ends of the gasket are flush with the machined rear end face. If necessary, cut off any excess material.

— Coat the gasket seams and ends with jointing compound. Also smear the thread of three screws retaining the sump to the rear engine mounting.

— Reposition the sump and refit the associated retaining screws adopting a staggered tightening sequence.

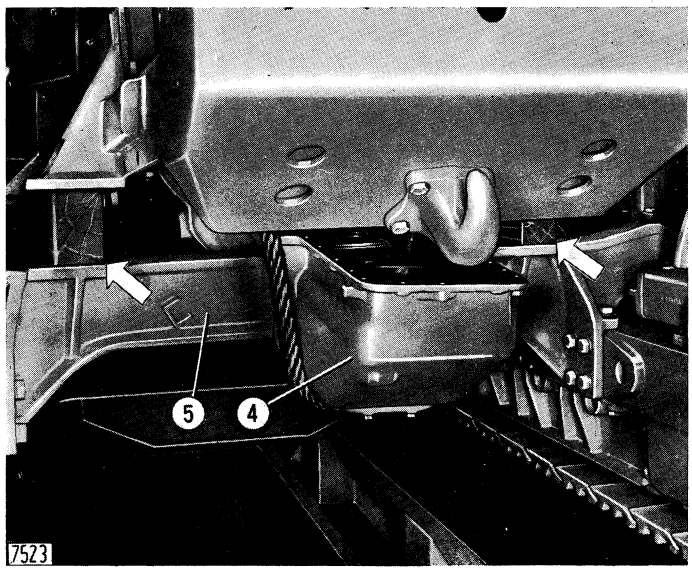


Fig. 10 - Removing (or Refitting) the Oil Sump with the Engine in Position on the Machine

Note: The arrows point to the wood blocks.
4. Oil Sump. - 5. Front crossmember.

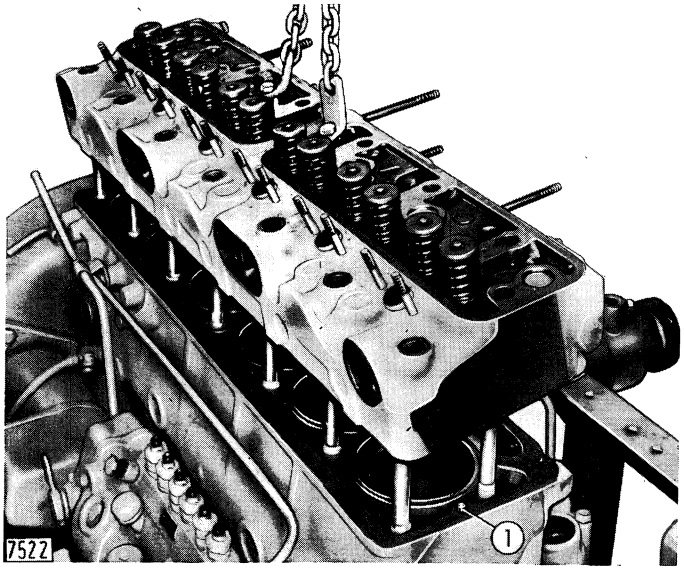


Fig. 11 - Removing (or Refitting) the Cylinder Head with the Engine on the Rotary Stand
1. Dowel.

CYLINDER HEAD

The cylinder head should not be removed when the engine is hot, otherwise distortion may result.

Check head flatness by placing the cylinder head on a surface plate smeared with carbon black and, if necessary, re-dress by scraping, or grinding if the amount of distortion is in excess of .15 mm. (.006 in.).

When grinding, the maximum amount of material which can be removed should not exceed .5 mm. (.02 in.).

Remember that new cylinder head thickness should be 99.80 to 100.20 mm. (3.930 to 3.945 in.).

After refitting the fuel injectors and the valves, ensure that:

— Fuel injector protrusion (L) is as shown in Fig. 12.

— Valve depth (H) is as shown in Fig. 13.

Check for leaking core plugs and fuel injector sleeves, In case of doubt it is advisable to renew suspect parts. Injector sleeve leakage can often be obviated by using punch Part No. **291350** (see Fig. 14).

To obtain a good seal between injector and sleeve dress the taper seat using cutter Part No. **291467** (see Fig. 15).

To renew the fuel injector sleeves, tap using set **A. 90424/1 (290687)** and remove from the cylinder head by means of extractor **A. 42110 (290633).**

Install the new injector sleeves into the cylinder head using the hand press and expand their top end using punch Part No. **291350** (see Fig. 14).

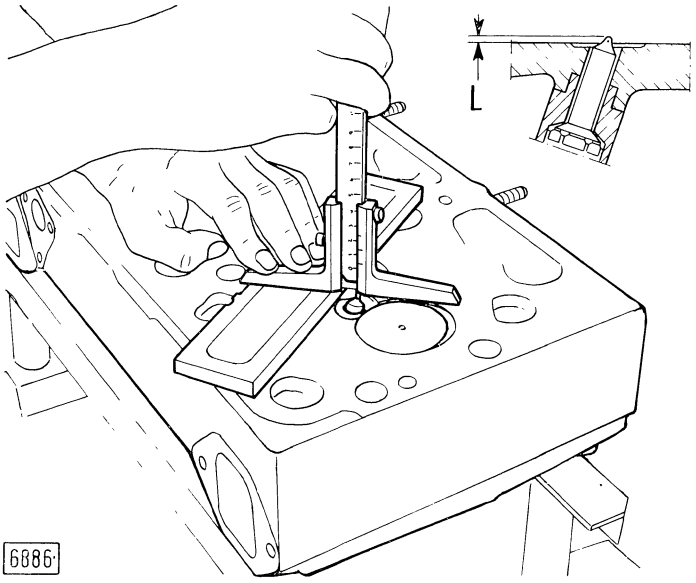


Fig. 12 - Checking Fuel Injector Protrusion
L = 3.3 to 3.9 mm. (.13 to .15 in.).

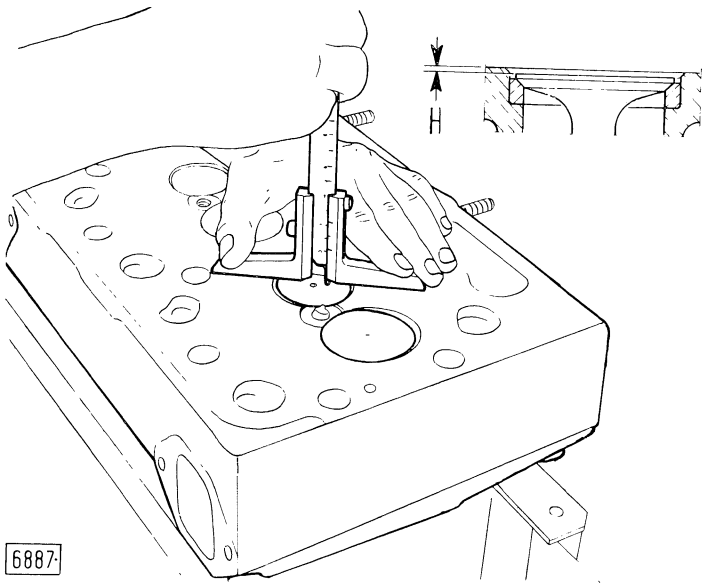


Fig. 13 - Checking Valve Depth in Cylinder Head
H = .1 to .5 mm. (.004 to .020 in.).

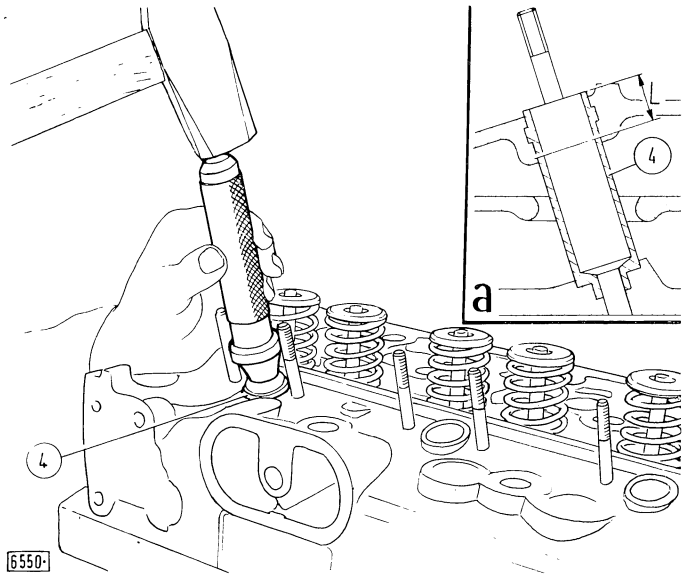


Fig. 14 - Expanding the Fuel Injector Sleeves in Position Using Punch Part No. 291350

a. Detail of fuel injector sleeve section. - 4. Fuel injector sleeve. - L = 20 mm. ($^3/_4$ in.) max. depth of punch for sleeve expansion.

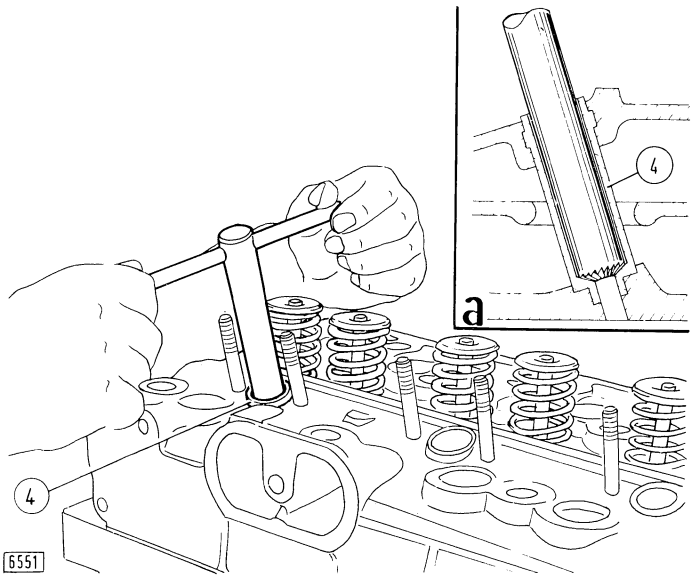


Fig. 15 - Fuel Injector Sleeve Recutting Using End Cutter Part No. 291467

a. Detail of cutter position in sleeve. - 4. Fuel injector sleeve.

Ensure that rocker lubricant way (14, Fig. 23) is clear.

Subsequently, the cylinder head should be thoroughly washed to eliminate all abrasive particles.

When refitting the cylinder head:—

— Wipe the engine block top using white spirit and carefully clean the cylinder head.

— Smear the block top with Wellseal or other approved jointing campound.

— Wipe the head gasket steel face and smear the area shaded in Fig. 16 with jointing compound bearing in mind that an excessive amount of compound could result in water way obstruction and cylinder edge scaling.

— Fit the gasket with the mark "BASSO" on the steel liner facing towards the block top.

— Position the cylinder head over dowels (1, Fig. 11) and tighten the hold down nuts in three stages according to the sequence given in Fig. 17.

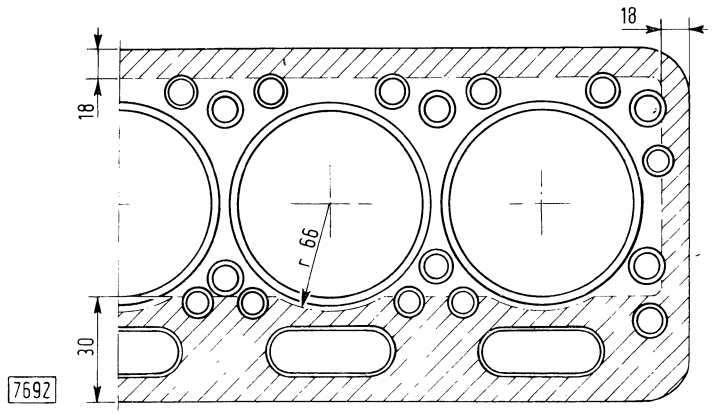


Fig. 16 - Cylinder Head Gasket Steel Face Area to be Coated with Jointing Compound Prior to Fitting (see text)

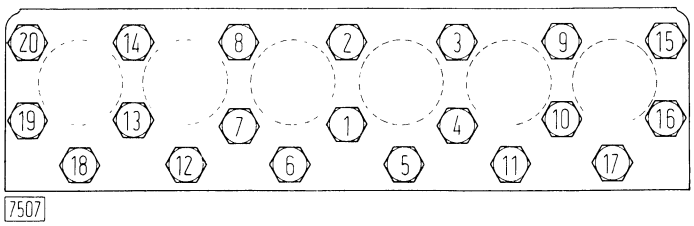


Fig. 17 - Cylinder Head Tightening Sequence

Note : The prescribed tightening torque should be reached in at least 3 successive stages.

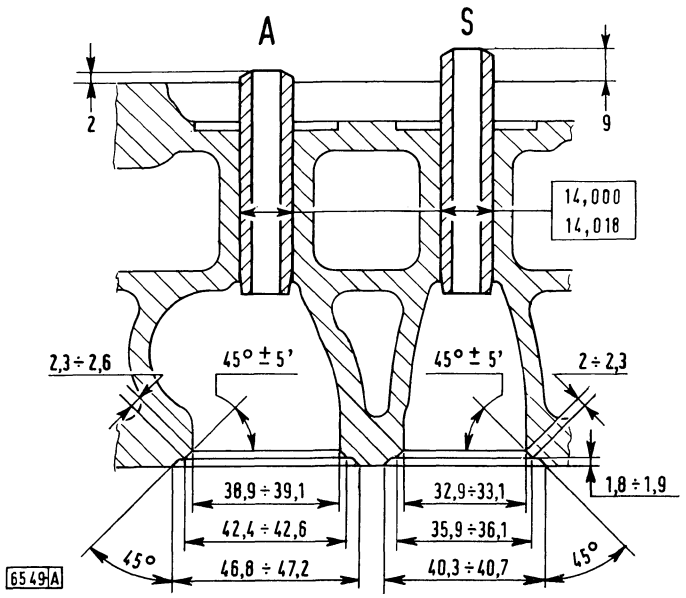


Fig. 18 - Valve Seat, Valve Guide Housing Bore and Valve Guide Protrusion Data

A. Inlet valve guide. - B. Exhaust valve guide.

VALVE SEAT RECUTTING

Use tool Part No. **291113** to rest the cylinder head on, and support Part No. **291112** to position the valves.

For valve seat recutting using universal hand cutter **A. 60419 (292913)**, proceed as follows:—

— Remove all deposits and carefully clean the valve guide bore prior to insering the cutter pilot.

— Attach the tool to the associated support and place in position.

— Zero the cutter on the valve seat centreline.

— Take .1 mm. (.004 in.) cuts until a complete new seat is obtained.

— Take a .05 mm. (.002 in.) finish cut.

Proper use of universal hand cutter enables the seat width to be reduced so as to obtain the value prescribed in Fig. 18.

Should the universal hand cutter not be available for any reason, satisfactory results can be obtained by means of milling cutter/handle kit Part No. **292264**, bearing in mind the following points:—

— Universal hand cutter machined seats do not necessitate honing if new valves are fitted.

— Milled seats must be honed together with the valves.

After the seats have been recut several times, when valve depth below the cylinder head face exceeds the prescribed allowance (see page 34), the cylinder head can be reconditioned by skimming the head lower surface or by adopting valve seat inserts.

A constructional diagram indicating dimensions of valve seat inserts and operation to be executed on cylinder head is given in Fig. 19.

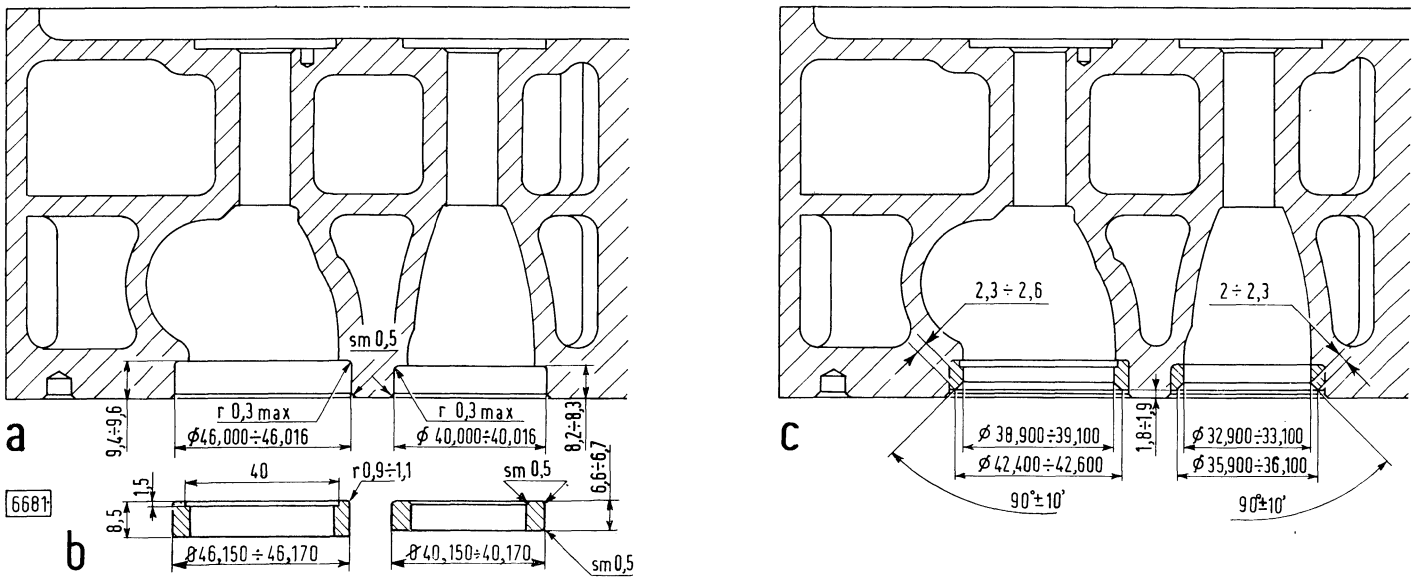


Fig. 19 - Valve Seat Insert Details

a. Valve seat insert housing. - b. Inlet and exhaust valve seat inserts. - c. New valve seats in inserts fitted to cylinder head

VALVE GEAR

CAMSHAFT

The crankcase mounted camshaft runs on seven white-metal-lined steel bearings and is retained in position by thrust plate (6, Fig. 21).

To take out the camshaft:—

— Remove the engine from the machine (see page 16) and place over the overhaul stand (see Fig. 7).

— Take off the oil sump.

— Dismantle the cylinder head (see Fig. 11).

— Replace the front brackets used to retain the engine to the stand with bracket Part No. **291509**.

— Remove the timing cover.

— Withdraw the tappets using tool Part No. **290947** (see Fig. 25).

— Take off thrust plate (6, Fig. 21) and slide out the camshaft.

Camshaft bearing removal involves flywheel housing and crankshaft dismantling (see Figs. 32 and 33 respectively); to this purpose bracket Part No. **291508** will have to be fitted in replacement of the rear brackets used to retain the engine to the stand.

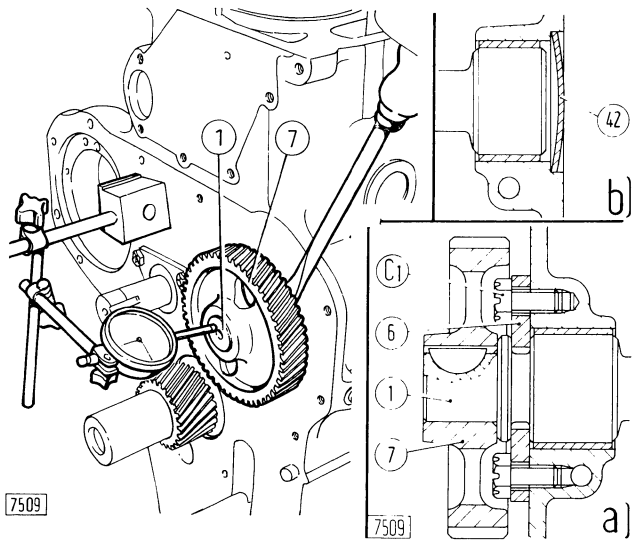


Fig. 21 - Checking Camshaft End Float Using a Dial Gauge
a. Part section of camshaft front end. - b. Part section of camshaft rear end. - C_1. Thrust plate retaining screw. - 1. Camshaft. - 6. Thrust plate. - 7. Camshaft drive gear. - 42. Core plug.

TO INSPECT CAMSHAFT AND BEARINGS

Check both camshaft journals and associated bearings (see Fig. 20) for wear and excessive running clearance (see Data Table).

The bearings are not supplied with undersize inside diameter. If the running clearance is found to exceed .25 mm. (.010 in.) the bearings should be renewed, if necessary together with the camshaft itself.

Scored cam surfaces can be redressed using a very fine abrasive stone; however, if the results obtained are not satisfactory, it is advisable to renew the camshaft.

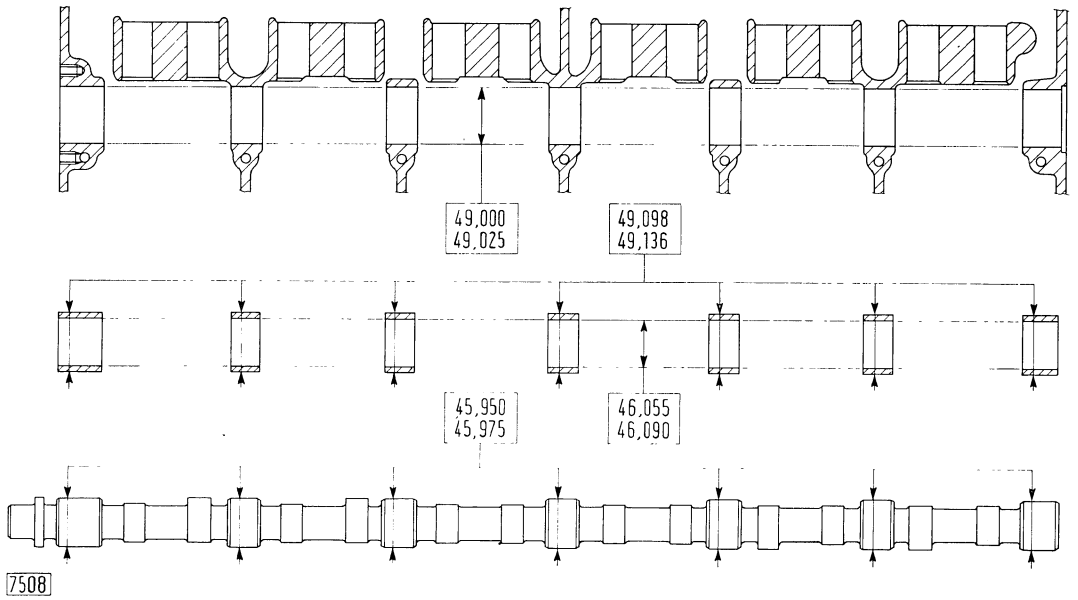


Fig. 20 - Camshaft, Bearing and Housing Dimensions
Note: Fitted bearing bore dia. to be obtained after reaming.

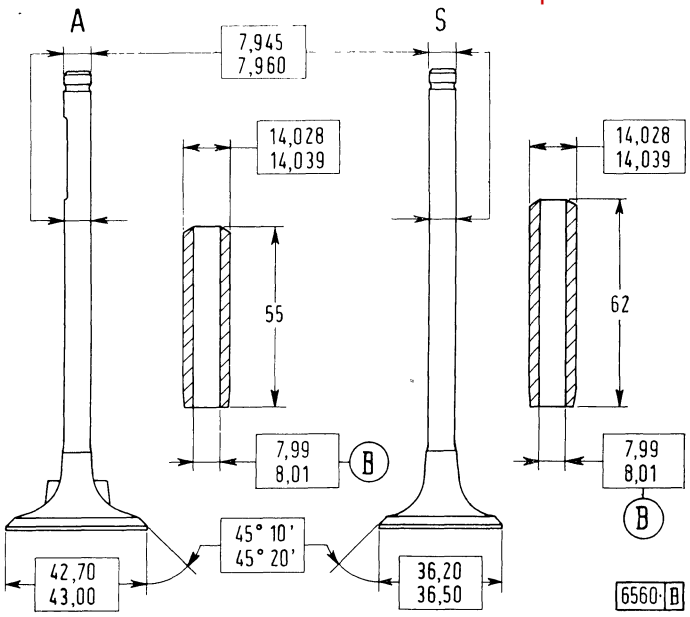


Fig. 22 - Valve and Guide Dimensions
A. Inlet valve. - S. Exhaust valve. - B. Fitted diameter.

Check for shaft distortion by placing the camshaft over V-blocks and resting the stylus of the dial gauge over the centre journal. Maximum eccentricity should not exceed .20 mm (.008 in.) over one full revolution. If distortion is less than the stated allowance straighten the shaft using a suitable press. Badly distorted camshafts should be renewed.

When camshaft drive gear replacement is needed heat the new gear to 220°-250° C and press fully home on the shaft.

VALVES AND VALVE GUIDES

To remove the valves take off the cylinder head, compress the valve springs using tool Part No. **291050** (see, Fig. 23) and withdraw spring cones (8).

If after thorough cleaning the valves show signs of damage or defective sealing, regrind and rehone together with the associated seats. Subsequently, the parts involved will have to be carefully washed to eliminate all abrasive matter.

The valve stem face can be reground removing as little material as possible. In this connection it should be noted that the depth of the hard case in this area is 2 to 3 mm. (.08 to .12 in.).

Maximum valve stem working clearance is .13 mm. (.005 in.).

Check valve stems and valve guides for size using a micrometer and kit **A. 95723 (292867)** respectively. If the clearance recorded is excessive, renew the valves in question. If following valve replacement the clearance still exceeds the specified value, also renew the valve guides.

Following valve regrinding check valve face eccentricity with respect to the stem. Maximum allowance is .04 mm. (.0016 in.) over one full revolution.

To renew the valve guides use driver Part No. **291046** together with a suitable press, acting from the underside of the cylinder head to remove, and from the top to refit.

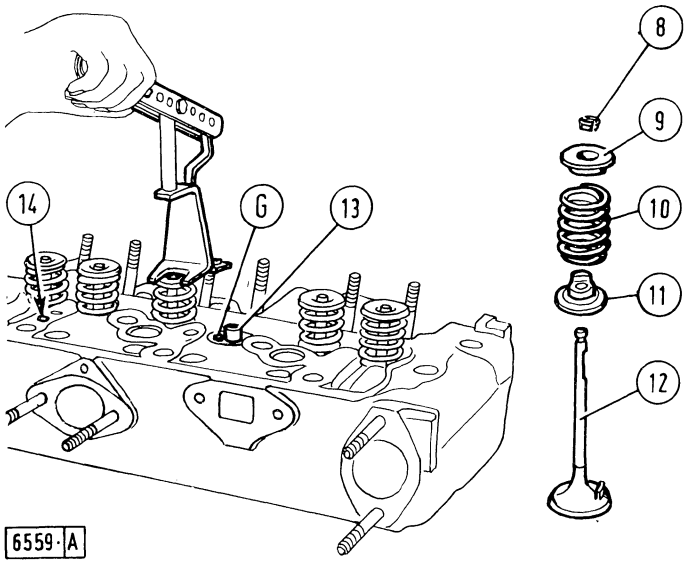


Fig. 23 - Removing (or Refitting) the Valves and Springs Using Tool Part No. 291050
G. Dowel. - 8. Cover. - 9. Thrust washer. - 10. Spring. - 11. Spring cup. - 12. Inlet valve. - 13. Valve guide. - 14. Rocker lubricant port.

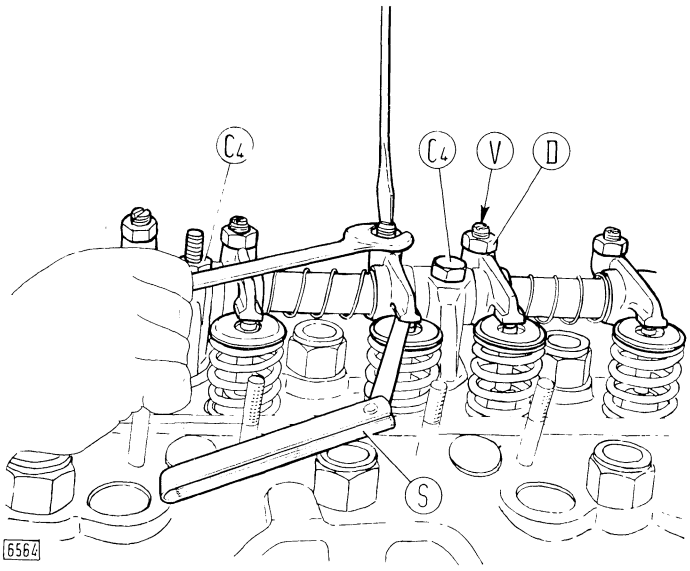


Fig. 24 - Checking the Valve Clearance
C_4. Rocker shaft bracket retaining screw. - D. Locknut. - S. Feeler gauge. - V. Adjusting screw.