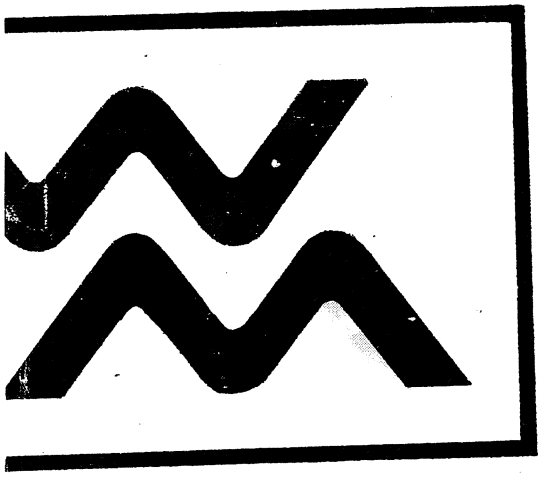
MK II
SEA WOLF



SERVICE MANUAL

SEA TIGER

ERMOTA LTD., NEWTON ABBOT, DEVON

TELEPHONE: STD — 0626·3674.

75-

FEBRUARY 1972

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we have printed it on
'POLYART'*

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WATERKAMPIOEN 13
96

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INTRODUCTION

Your engine has been fully tested and run under load, and finally inspected prior to its despatch from Watermota, but on receiving a new engine a careful check should be made to see that no damage has occurred in transit.

This book has been produced to assist the owner in the proper care and maintenance which should be given to the engine to ensure that it will give long and trouble free service.

The equipment dealt with in the following pages is precision built, every part conforming rigidly to standards of the highest quality. Every effort is made to maintain your confidence and satisfaction in the product.

Your engine and gearbox are known at the factory by their numbers. We suggest you record these numbers in the panel provided below for quick and easy reference. The engine and gearbox numbers will be found on the plate mounted on the gearbox inspection cover. We would ask that you refer to these numbers when writing to us.

The data given in this book applies to both the Sea Wolf and Sea Tiger.

WATERMOTA LTD.

Engine Type .....

Engine No. .....

Gearbox No. .....

ENGINE DATA

SEA WOLF — Based on the Ford 2251E engine unit

Type	4 cyl. in line vertical O.H.V. Cross Flow
Bore	3·188 in. (80·98 mm.)
Stroke	2·098 in. (53·29 mm.)
Swept Volume	67·0 cu. in. (1098 cc.)
Comp. Ratio	8·1 (Low)
Firing Order	1, 2, 4, 3.
Valve Clearance. Hot	Inlet: ·010 in. 0·25 mm. Exhaust: ·017 in. 0·43 mm.
Carburettor	G.P.D. Downdraught
Main Jet	No. 117
Oil Pressure	35 to 40 lb./sq. in. 2·46 to 2·81 kg./cm.
Oil Filter Capacity	·68 pints 0·341 litres
Sump Capacity	5·72 imp. pints 3·25 litres
Fresh Water Cooling System Capacity	8¾ pints
Earth	Negative
Spark Plug	Autolite. AG22A. 14 mm. Champion N9Y
Spark Plug Gap	·023 in. 0·58 mm.
Contact Breaker Gap	0·025 mm. 0·64 mm.
Max. Torque	54 ft./lb. at 2700 R.P.M.
Power Output	10/30 B.H.P.
Dry Weight engine only	270 lb. 127 kilos.
Watermota J Type Gearbox	
Direct Drive	28 lb. 12 kilos.
2/1 Reduction	41 lb. 18 kilos.
T.M.P. Hydraulic Gearbox	
Direct Drive	82 lb. 37 kilos.
2/1 Reduction	114 lb. 51 kilos.
Borg-Warner Gearbox	
Direct Drive	96 lb. 43 kilos.
2/1 Reduction	140 lb. 63 kilos.
Perkins Mk. II Z-Drive	90 lb. 40 kilos.

ENGINE DATA

SEA TIGER Based on the Ford 2254E engine unit

Type	4 cyl. as Sea Wolf
Bore	3·188 in. (80·98 mm.)
Stroke	3·056 in. (77·62 mm.)
Swept Volume	97·6 cu. ins. (1599 cc.)
Comp. Ratio	9·1 (High)
Main Jet	145
Fresh Water Cooling System Capacity	11 pints
Max. Torque	85 ft./lb. at 2200 R.P.M.
Power Output	15/60 B.H.P.
Dry Weight engine only	290 lb. 135 kilos.

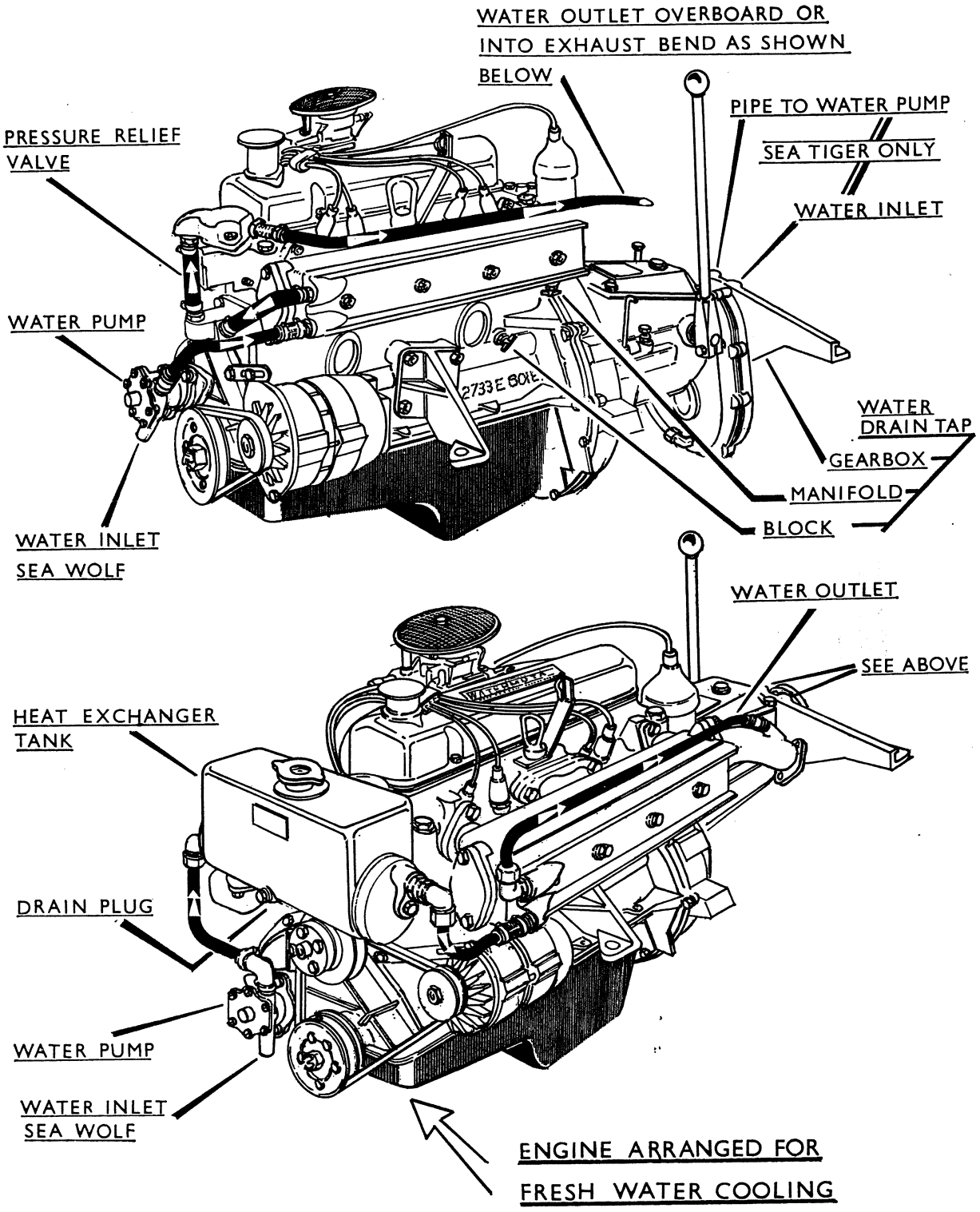
Refer to Sea Wolf engine data for:
Valve clearance, Firing order, Oil pressure and capacity, Earth, Spark plug, Gap, and Contact breaker setting, etc., etc.

NOTE: We advise that on the Sea Wolf and the Sea Tiger engines the fuel used should have an octane rating of not less than:

97—Sea Tiger

92—Sea Wolf

DIAGRAM OF WATER CIRCUITS



SERVICE SCHEDULE

Each time of using check

PETROL LEVEL.
OIL LEVELS.
WATER TANK. (If fresh water cooled.)
ADEQUATE COOLING WATER FLOW.

After first 15/20 hours running

1. TIGHTEN CYLINDER HEAD BOLTS.
2. CHECK AND ADJUST VALVE CLEARANCES.
3. CHECK ALL NUTS/BOLTS MANIFOLD SUMP ETC.
4. ADJUST SLOW RUNNING.
5. CHECK AND ADJUST ALTERNATOR BELT.
6. CHECK THE ALIGNMENT (COUPLINGS).
7. ADJUST DISTRIBUTOR POINTS AND CLEAN CAP.
8. TOP UP BATTERY ELECTROLYTE AS REQUIRED.
9. CLEAR SEA COCK FILTER.
10. ADJUST GEARBOX IF REQUIRED.

After 100 hour running and every subsequent 100 hours, or once per season, whichever is the more frequent

11. RECHECK ITEMS 2, 5, 7.
12. CHANGE ENGINE OIL AND RENEW FILTER ELEMENT.
13. CLEAN OIL FILLER CAP.
14. LUBRICATE DISTRIBUTOR.
15. CLEAN SPARK PLUGS AND ADJUST GAP.
16. CLEAN CRANKCASE EMISSION VALVE.
17. CLEAN PETROL PUMP FILTER SCREEN.
18. CLEAN CARBURETTOR JETS AND REMOVE ANY SEDIMENT FROM THE FLOAT CHAMBER BOWL.

REGULAR ATTENTION TO THE ABOVE ROUTINES WILL ENSURE THE RELIABLE STARTING AND QUIET RUNNING FOR WHICH YOUR UNIT IS RENOWNED.

INSTALLATION ANGLE

The maximum angle of installation of both the Sea Wolf and Sea Tiger must not exceed 12° from the horizontal, and must not exceed this angle at any time when running, otherwise there is a danger of an oil leakage from the aft main bearing. If the design is such that this angle is likely to be exceeded we recommend fitting a universal join aft of the reverse gear and a thrust bearing aft of this. Angles of installation steeper than 12° must be Works approved.

LINING UP

It is absolutely essential that the engine and propellor shaft be correctly aligned.

Faulty alignment will cause vibration, loss of power and rapid wear or damage to the gearbox and stern gear.

To obtain an accurate alignment, the following procedure should be adopted. Assuming the engine to be in a position and the holding down bolts tightened make sure that the register on the gearbox coupling will enter the female register in the shaft coupling. This may involve packing under the mounting points of the engine or gearbox, or if too high, shaving a little from the top face of the bearers.

N.B. Should there not be a bearing close to the tailshaft coupling support must be given to the propellor shaft to keep it true and prevent deflection under its own weight thereby giving false alignment.

Having completed the preliminary line up the coupling faces should now be brought close together and held with the finger and thumb whilst inserting a ·002 in. feeler gauge at intervals between the coupling faces. From this it will be apparent in which direction the engine is to be moved, shim packing under the appropriate engine/gearbox mounting points should be employed.

Once satisfied the coupling faces are aligned the bolts can now be fitted and securely tightened.

A final alignment must always be done when the boat is afloat, and again after a few days' running, since a further settlement of the engine may have occurred.

If a flexible gearbox coupling is fitted, attention must still be paid to accurate alignment to avoid short coupling life and vibration.

CONTROLS

Provision is made on the engine for the attachment of a Morse throttle cable; this and a cable/fittings, etc., for the remote gearbox operation, are obtainable from Watermota or Morse agents.

If it is proposed to fit a rod type remote control to the gearbox do not use flimsy rods that will buckle or bend. Use $\frac{3}{4}$ in. gas barrel for the long rods or not less than $\frac{1}{2}$ in. for the short connections. Do NOT use long levers which may drag on the gear shift by reason of their weight and thus cause the reverse brake band to bind in the neutral position and impose a constant load on the operating collar inside the gearbox.

The ahead clutch is self-locking when pushed home and on NO account must a constant thrust be imposed on the operating collar otherwise it will heat and wear from undue friction when running in ahead.

INSTRUMENT PANEL

A compact panel with combined ignition and start key, oil pressure warning light and ammeter is supplied as standard with each engine.

SPECIAL INSTRUMENT PANEL

This alternative panel can be supplied in lieu of the standard at extra cost. This includes an oil gauge, temperature gauge, rev. counter, ignition switch with two keys, ammeter and ignition warning light. This panel is recommended for power boat installations.

COOLING SYSTEM

Reference to the diagram on page 5 shows the water circuits employed on both the Sea Wolf and Sea Tiger.

It should be noted that if a two-way cock is fitted to divert the water used to cool the exhaust, make certain the cock cannot restrict the flow of water in any position, or a cracked cylinder block may result. If a water injected silencer is used in the exhaust system, ensure that the silencer is given sufficient fall so that the outlet is below the level of the water injection point. This prevents the possibility of the silencer filling with water and draining back to the engine, or causing severe back pressure in the exhaust system.

Draining the cooling system is most important when laying up for the winter if frost damage is to be avoided.

The engine block drain tap will be found situated on the port side just aft of the engine mounting bracket. Immediately above this is the manifold drain tap. (On the underside of the manifold.)

On the Sea Tiger engine fitted with the J type gearbox a further hexagon head drain plug will be found midway between the lower central fixing studs of the aft mounting bracket.

Should the engine be fitted with fresh water cooling a drain plug is fitted on the forward lower edge of the heat exchanger tank, this is in addition to the above drain points.

In the case of engines fitted with the Borg-Warner Velvet drive gearbox, a hexagon head drain plug will be observed on the after end of the oil cooler.

Meadows gearboxes have a drain plug with screwdriver slot on the aft cover face. (Refer to the gearbox instruction book.)

FUEL SYSTEM

The engine is equipped with a fuel lift pump as standard and it is essential that the fuel tank be installed at a lower level than the float chamber of the carburettor. If this is not possible the firm or person carrying out the installation should contact Watermota for advice.

PRIOR TO RUNNING THE ENGINE FOR THE FIRST TIME

(1) Fill the engine sump by pouring approx. 5¾ pints of oil through the filler which is mounted on the top forward end of the valve cover, using any of the following grades:

Nuton

B.P. ENERGOL SAE 30. CASTROL XL. VACUUM MOBILOIL A. SHELL X100 30. ESSOLUBE 30.
Top up to "FULL" mark on the dipstick.

(2) Fill gearbox as outlined in the supplement.

(3) Pour fuel into tank and operate hand priming lever on the petrol pump, if fitted, in order to fill the float chamber of the carburettor.

(4) See that the throttle is closed.

(5) Check that seacock is open.

(6) Fill heat exchanger tank to the correct level if the engine is fresh-water cooled.

(7) Pull out choke. In warm weather this need only be at the midway position.

(8) Make sure gear lever is in the neutral position.

(9) Switch on the ignition and engage the starter motor by turning the key fully to the right. As soon as the engine fires release the key which will return to the running position.

(10) Push the choke control in as soon as the engine shows signs of erratic running caused by too rich a mixture. This should, however, be done gradually so that the transfer from the starting device is made smoothly and without stalling the engine.

(11) When the engine has reached running temperature engage Ahead or Astern as required. This should be carried out gently and the throttle opened to compensate for the extra load on the engine.

(12) To stop the engine switch off by means of the key. Should the halt be of some duration turn off the fuel cock.

N.B. Do not operate the engine at full throttle from cold, but rather progressively build up.
N.B. Always switch off fuel tap when not running the engine, and when refuelling.

LUBRICATION

The engine oil dipstick will be found on the starboard side. To check the level contained in the sump, withdraw the dipstick, wipe clean, replace, and again withdraw it. The mark made by the oil will then be clearly seen. If necessary add oil of the correct grade to bring to the level line on the dipstick. Do not overfill, and on no account should the level be allowed to fall below the "FILL" mark.

Avoid checking the oil after the engine has been running as this will not give a true indication and could result in overfilling.

DRAINING THE ENGINE SUMP OIL

This is usually most conveniently drained by means of a sump pump.

To use the pump first withdraw the dipstick and slip the plastic tube of the pump over the dipstick tube, then operate the pump, collecting the oil in a suitable container.
See Service Schedule.

CHANGING THE OIL FILTER ELEMENT

With the engine sump drained, unscrew the oil filter centre bolt and carefully remove the body, filter element, and the sealing ring. This can be extracted using a suitable pointed instrument. Its location is shown in Fig. 11.

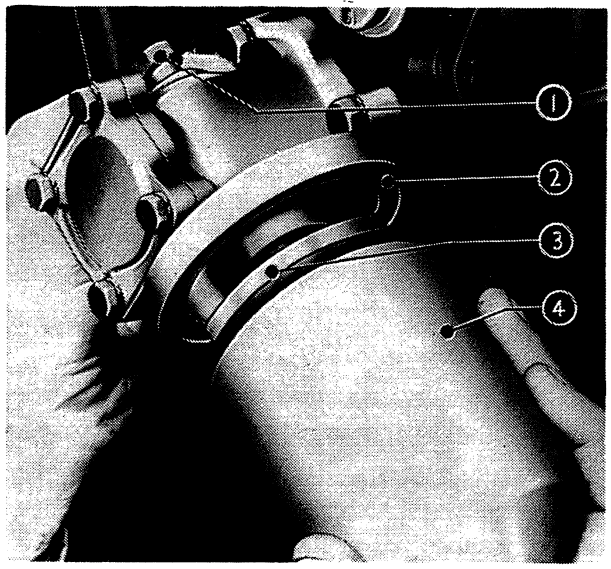


Fig. 11.

Fit the new sealing ring which is supplied with the oil filter element, now thoroughly clean the filter body and place the element in position. It is advisable to partially fill the filter body with oil prior to reassembling the unit, this ensures oil reaches the engine immediately on starting. Otherwise there will be an undesirable period

whilst it is filling with oil and during this the engine will not have oil reaching the bearings, etc.

Note. When tightening the centre bolt check that the filter body is seating correctly against the sealing ring.

See Service Schedule, p. 6.

OIL FILLER CAP

Remove the filler cap, wash in petrol, dry and immerse in clean engine oil, shake out surplus oil and replace.

ENGINE VENTILATION SYSTEM

A semi closed positive ventilation system is fitted and comprises a breather incorporated into the oil filler cap, and an oil separator located close to the fuel pump. Into this is fitted the crankcase emission valve. To service this item first remove the rubber pipe connecting this to the induction manifold and pull out the valve unit from its rubber grommet. The valve can now be dismantled by removing the circlip, extracting the seal, valve and spring. Clean each part in petrol to remove any sludge, and reassemble the components in the reverse order. Push the valve into its grommet and reconnect the rubber pipe. Fig. 15.

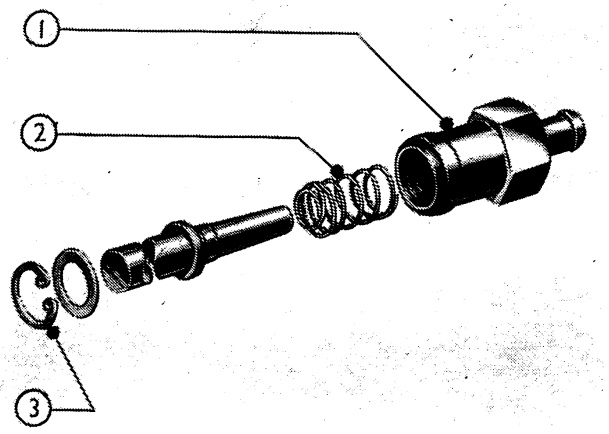


Fig. 15.

THERMOSTAT

This is situated under the top water outlet flange and is set to open at 60° Centigrade/140° Fahrenheit.

Engines fitted with heat exchanger tank, i.e. fresh-water cooling do not have a thermostat.

PRESSURE RELIEF VALVE

This is fitted to all engines with the exception of those that have fresh-water cooling.

Should it become necessary to renew the water pipe Plate No. E60/61, first release both the upper and lower hose clips and remove the top water flange Plate No. E68. Care should be taken that the ball and spring are not lost. Now place the new pipe on to the lower pipe connector, fit the clip and tighten.

Drop the ball down inside the pipe followed by the spring, place top hose clip in position, replace the top water flange and finally tighten all securing nuts and clips.

It is advisable when the above replacement is carried out to renew the water flange joint to avoid any possibility of a leak.

WATER PUMP

No lubrication is required on the pump unit, but should a water leak develop the seals may need replacing. To renew these seals first remove the pump unit from the engine by releasing the water pipe connections and undoing the two securing nuts on the pump flange. The unit can now be withdrawn.

To dismantle, undo the six cover plate screws, remove the cover plate and withdraw the spindle complete with the impellor.

The seals will be found at the aft end of the pump body and can be pushed out using a small screwdriver or suitable pointed instrument.

The new seals may now be fitted making sure the first or forward seal has the open end/lip facing toward the impellor. Examine the drive end of the spindle for any burrs or sharp edges; these if present should be removed using a smooth file or emery paper. Refit the spindle using a little grease. With the impellor/spindle assembly in position in the pump body the "O" ring can now be carefully pushed along the shaft until it rests against the forward seal. The second seal should now be slid along the shaft and pressed into its housing with the open end/lip outermost. This seal must be positioned just flush with the recess face. If this is in too far it will close off the small drain hole.

It is recommended that the impellor be renewed every year. With the pump stripped as outlined above it is easily achieved by undoing the grub screw which will be found between the impellor blades. When replacing the impellor make sure the grub screw locates correctly into the hole in the spindle.

Grease should be smeared on to the spindle end and a new joint fitted before the cover plate is finally fitted.

When refitting the pump unit to the engine, first make sure that the slot in the spindle is lined up with the tongue of the drive* flange. When this is correct the pump will slide easily into position, and the two securing nuts and spring washers can be fitted, but at this stage these should only be left finger

* In models later than December 1969 a sliding block plate No. E42 will be found between the pump spindle and pump drive flange.

tight. Next reconnect both the inlet and outlet water pipes, start the engine and run at a little over idling speed, this will allow the pump to centralise itself. The two securing nuts can now be tightened whilst the engine is running. Take care that the fingers are kept well clear of the crankshaft pulley and the alternator belt.

Failure to follow the lining up procedure outlined in the preceding paragraph would most certainly cause rapid wear and failure of the pump bearing.

Finally check for any water leaks making sure all unions and pipe fittings are tight. Trouble may otherwise be experienced with intermittent water flow.

CYLINDER HEAD BOLTS

Tighten the bolts as shown in Fig. 1. This should preferably be done with the engine hot, using a Torque wrench and repeating the sequence in stages until the correct torque figure of 65/70 lb./ft. (8·9–9·7 Kg./m.) is achieved. After this operation it will be necessary to reset the valve clearances.

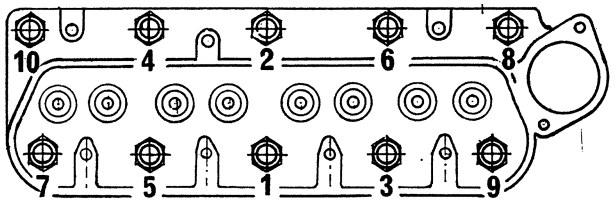


Fig 1 CYLINDER HEAD BOLTS

Fig. 1.

VALVE CLEARANCE

Clearances should only be checked when the engine is hot and set as follows:

INLET VALVE ..... ·010" (0·25 mm.)

EXHAUST VALVE ... ·017" (0·43 mm.)

Valves Open	*Adjust*
1 Exhaust and 6 Inlet	3 Inlet and 8 Exhaust
3 Inlet and 8 Exhaust	1 Exhaust and 6 Inlet
2 Inlet and 4 Exhaust	5 Exhaust and 7 Inlet
5 Exhaust and 7 Inlet	2 Inlet and 4 Exhaust

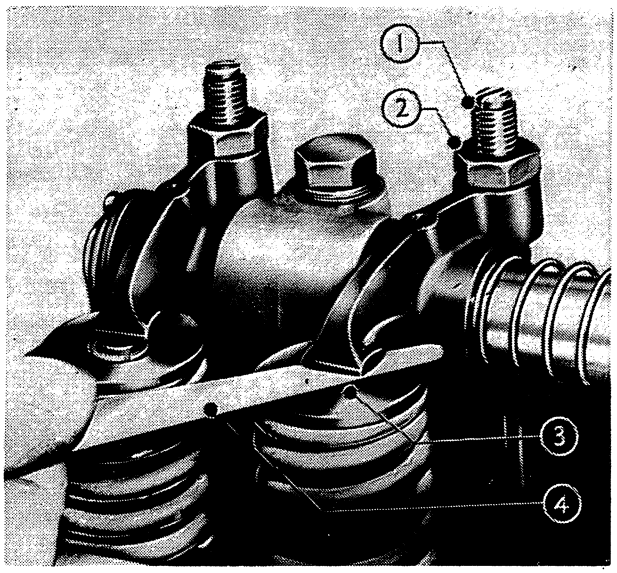


Fig. 6.

To check the clearance insert the appropriate feeler blade as shown in Fig. 6. If the clearance is not correct loosen the locknut and, with a screwdriver, move the adjusting screw until it is just possible to insert the feeler blade. While still holding the adjusting screw in position re-tighten the locknut at this point and recheck the clearance. *N.B.* Use only ring spanner, not open jawed.

Finally having made sure all clearances are set correctly refit the valve cover, and with the engine running examine for any oil leaks.

Note. Care should be taken when removing the valve cover as the gasket can easily become damaged.

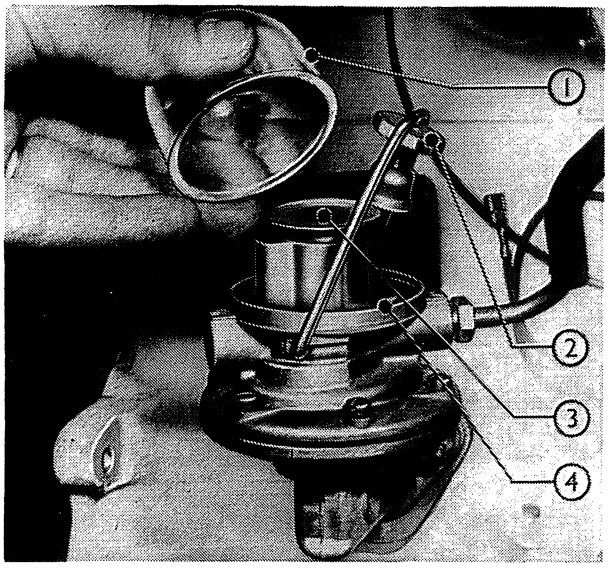


Fig. 5.

PETROL PUMP

Occasionally remove and clean the filter screen using petrol, at the same time clean out any sediment which may have collected in the pump body. This is accessible by first unscrewing the clamp nut and detaching the metal bowl. Fig. 5.

On reassembly care should be taken to ensure that the bowl is seating correctly on the sealing ring prior to finally tightening the clamp nut.

A hand priming lever is sometimes provided at the base of the pump body to enable the carburettor to be primed when required.

CARBURETTOR

The exploded view of the carburettor is shown on page 20 to assist when cleaning and when the removal of sediment

from the instrument is required after prolonged service. Also shown is the location of the slow-running throttle stop and volume control screws.

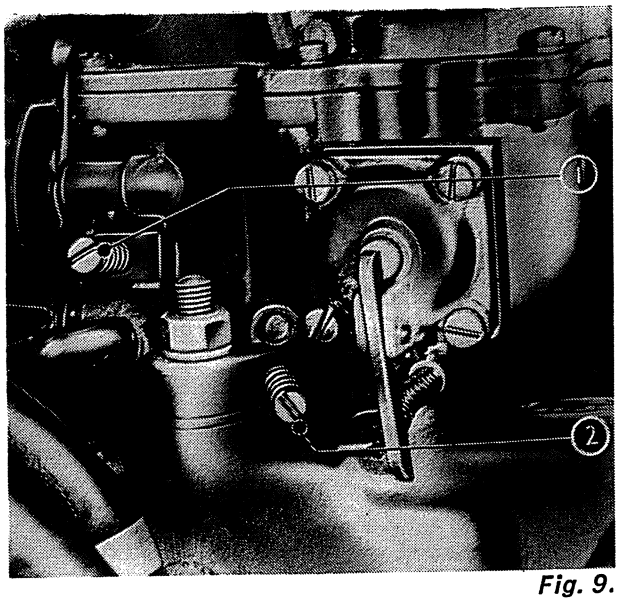


Fig. 9.

Any adjustments to both the slow-running or the volume control screws should only be carried out when the engine has reached its normal running temperature.

The correct procedure is as follows: Adjust the slow-running screw to give a tick-over speed of approximately 800 R.P.M. Next turn the volume control screw anti-clockwise until the engine "hunts", i.e. lumpy or irregular running. Now turn the control screw clockwise until the engine runs evenly, this should be carried out very slowly. Re-adjust the slow-running which may now have increased to again give 800 R.P.M. Fig. 9.

Repeat the above operations if necessary until satisfied that the engine is running smoothly and at the correct idling speed.

Do not expect a new engine to idle perfectly at low speeds until run in.

N.B. On no account should wire be used to clean the jets or orifices. Obstructions should be cleared by using compressed air. Remember that the jets are machined to fine limits of accuracy, and not only economy but the general engine performance can be upset by possible damage or the enlargement of the jets if this practice is adopted. If the various channels in the carburettor are badly corroded, first leave to soak in methylated spirit for at least four hours, then blow through with high pressure air line.

INDUCTION MANIFOLD

In the event of this having to be removed do not on any account replace the joint with any other than one that has been supplied by WATERMOTA.

EXHAUST MANIFOLD

If desired the exhaust outlet may be arranged at the forward end of the engine by removing the blanking flange (Plate No. E11) and replacing at the after end of the manifold.

DISTRIBUTOR

At intervals as stated in the service schedule, release the two spring clips, remove the distributor cap and rotor arm, apply two or three drops of engine oil to the lubricating pad inside the cam body and at the same time smear a very thin film of lithium grease to the cam faces.

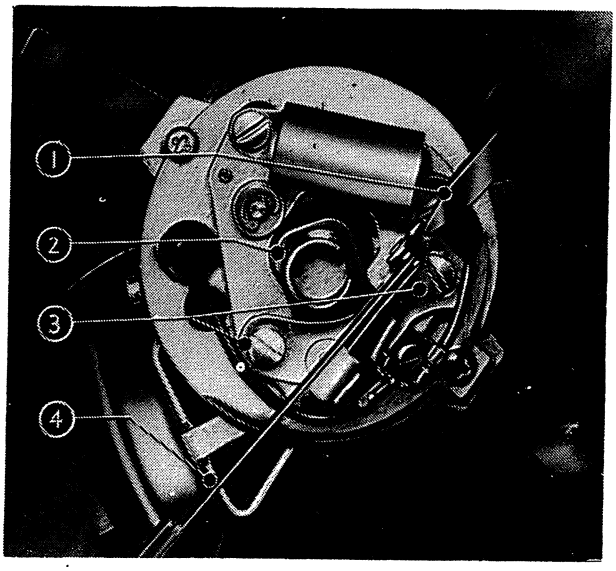


Fig. 4.

The adjustment of the points gap is accomplished by slackening the screws shown in Fig. 4, turn engine over until moving contact breaker arm heel is on the highest point of the cam, move fixed contact point, and with an 0·025 in. feeler blade set the gap accurately. Tighten the adjusting screws and finally re-check the gap.

Remember it is a waste of time setting the points if these are worn, badly pitted or burned. Should this be the case they should be dressed flat using a carborundum stone or a contact point file. Alternatively if badly pitted a new set should be fitted.

N.B. Badly burnt points are often an indication of a faulty condenser.

Should the distributor have to be removed from the engine for any reason it must be refitted to its original position, any deviation from the correct timing will seriously impair engine performance and possibly cause expensive damage.

To refit the distributor the following procedure should be adopted. Remove No. 1 spark plug, cover the hole with thumb and rotate engine slowly until the piston is coming up on the compression stroke; this will be felt by the increased air pressure as the piston rises. Stop rotating the engine when the notch on the rim of the crankshaft and the pointer on the timing cover are dead in line.

Refit the distributor to the engine observing that the rotor arm rotates towards the condenser as the helical gears slide into mesh. Finally secure the body clamp to the engine block with the bolt and lockwasher. The lobe on the rotor arm must be in line with No. 1 cylinder contact when the distributor is fully inserted.

Rotate the distributor in a clockwise direction to take up any backlash in the drive until the contact points just break, taking care distributor is not moved, tighten the clamp bolt.

SPARK PLUGS

Periodically the plugs should be removed and cleaned (sand-blasted) and the gaps accurately set with a 0·023 in. feeler blade. On refitting wipe the plug insulator, leads and waterproof caps to reduce the possibility of high tension tracking taking place.

It would be beneficial to renew the spark plugs approximately every 400 hours running to maintain maximum engine efficiency.

STARTER MOTOR

No servicing is required on this component.

If the starter motors refuse to turn the engine when the starter key is turned, or the starter motor spins but does not turn the engine, removal of the domed cap situated on the adaptor housing will allow access to the gear which can then be given a sharp tap using a brass drift, or if not available a screwdriver. This should then free the pinion. Alternatively it may also be freed by turning the squared end at the forward end of the starter motor using a wrench or suitable spanner. Some starter motors have a metal cover protecting the squared end of the armature shaft, this should be removed by gently tapping sideways.

It may be that dirt or corrosion is preventing the pinion gear sliding along the bendix drive. In this case clean and lightly oil, making sure the pinion gear slides freely. If trouble persists have the motor checked as it may be that the shaft has become bent.

It should be noted that the symptoms given can each be caused by a battery which is in a low state of charge.

WARNING – WHEN ANY MAINTENANCE OR REPAIR IS CARRIED OUT INVOLVING ELECTRICAL EQUIPMENT IT IS ADVISABLE TO DISCONNECT THE BATTERY.

ALTERNATOR

No maintenance is required, bearings being of the "sealed for life" type.

Should no charge be indicated when the battery is in a run-down condition, first make sure that there are no broken wires or loose connections. If all is found satisfactory then it must be assumed that a fault has developed in the alternator, in which case this should be examined by the local Lucas agent.

ALTERNATOR DRIVE BELT

Correct tension of the belt must be maintained; this is important as persistent running with a slack belt will result in rapid wear and a flat battery. The method of adjustment is to slacken the three bolts securing the alternator, two being under the unit and one on the adjusting strap. Then hold the body of the alternator away from the engine block and re-tighten the three bolts to allow $\frac{1}{2}$" deflection of the belt at the mid point.

Do not on any account over-adjust as a tight running belt will cause rapid wear and premature failure of the alternator bearings.

BATTERY

Examine at close intervals the level of the electrolyte and top up as required with distilled water. Occasionally see that the connections are secure and kept covered with petroleum jelly at the terminal post to prevent corrosion.

Should the battery at any time be disconnected, when reconnecting care must be taken that the correct polarity is maintained, that is that the NEGATIVE terminal is EARTH.

LAYING UP

The engine should be drained of all cooling water (See description of cooling), and if possible flushed with fresh water.

On the final run of the season add Redex or similar additive in the petrol. Remove the spark plugs and pour a small quantity of Redex into each plug hole and slowly crank the engine over, this will ensure a protective coating to the bore and piston rings. Failure to do this may result in the engine being impossible to turn at the commencement of the next season, due to the fact that the piston rings have become rusted to the bores.

We would mention that whilst the engine is still hot after its final run, it would be a good opportunity to drain the engine oil and refill with new oil.

Wash the exterior of the engine with fresh water to remove any salt deposits which may set up corrosion.

When practical, remove the electrical equipment, clean and store in a dry place.

All parts which appear liable to rust should be oiled or greased to give added protection.

The battery should be removed and stored in a fully charged condition. If the storage period is prolonged then ideally the battery should be slowly discharged and a trickle charge applied; this should be carried out at intervals.

Turn the engine over slowly at least once per month. This will help to ensure your engine starts easily at the start of the season.

OVERHAULS AND SERVICE

The power unit of the Watermota marine engine is a Ford industrial unit and is best serviced by an authorised Ford agent from whom all engine spares are readily available.

The Marine reverse gear and marine equipment as listed in the spare parts section of this book, are only serviced by us or our own agents.

Reconditioned reverse gears, etc., are obtainable from Watermota, and if the old assemblies are returned at the time of order these will be supplied on an exchange plan.

Spare parts are stocked for immediate despatch, and under normal conditions will be sent by return of post.

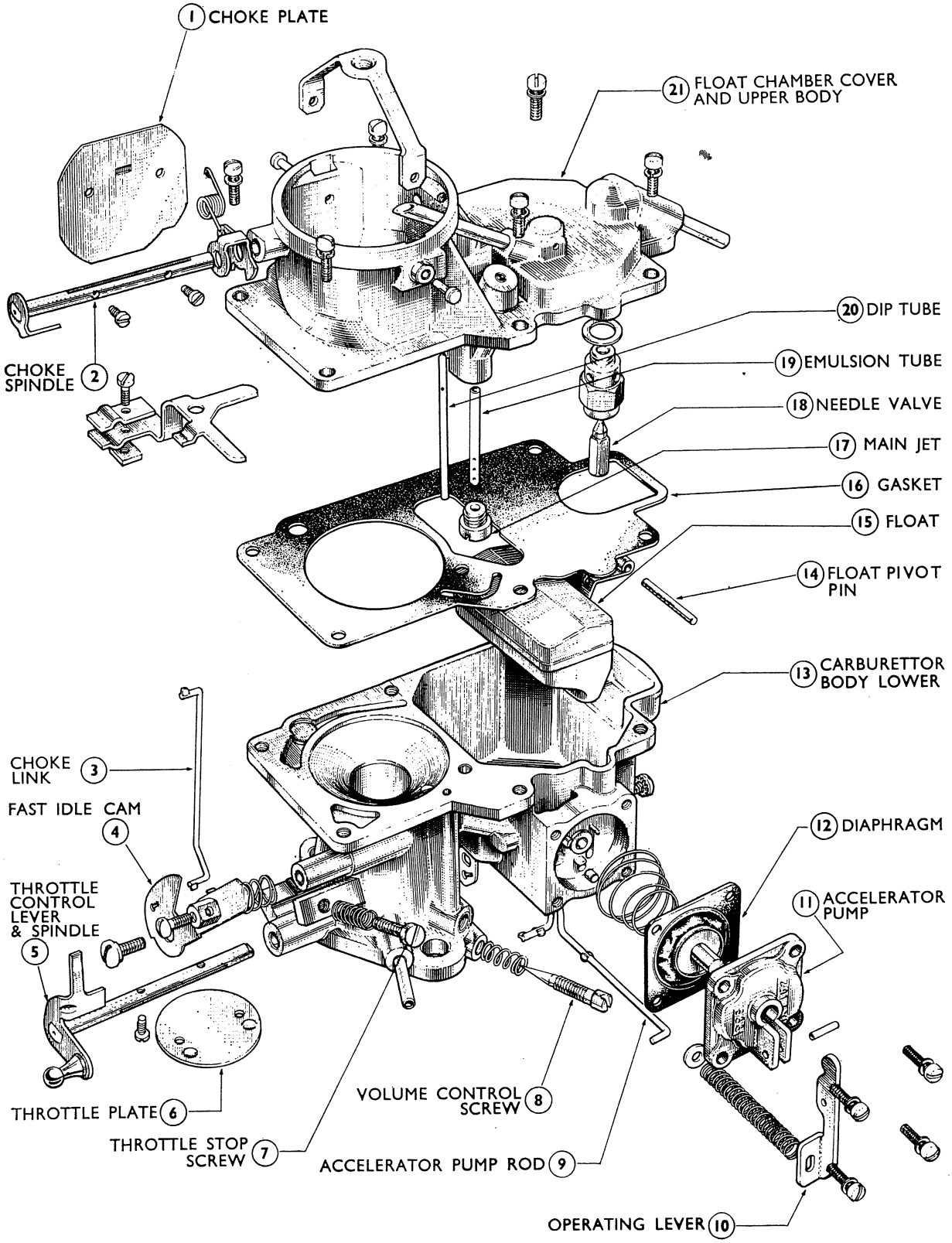
When ordering parts it would greatly assist us to give prompt service if the Engine, Gearbox, and Plate Nos. followed by the description of the part/s are quoted at the time of ordering. Always be sure to include the prefix letter of the Plate No.

Allow sufficient cash with order to cover postage and packing.

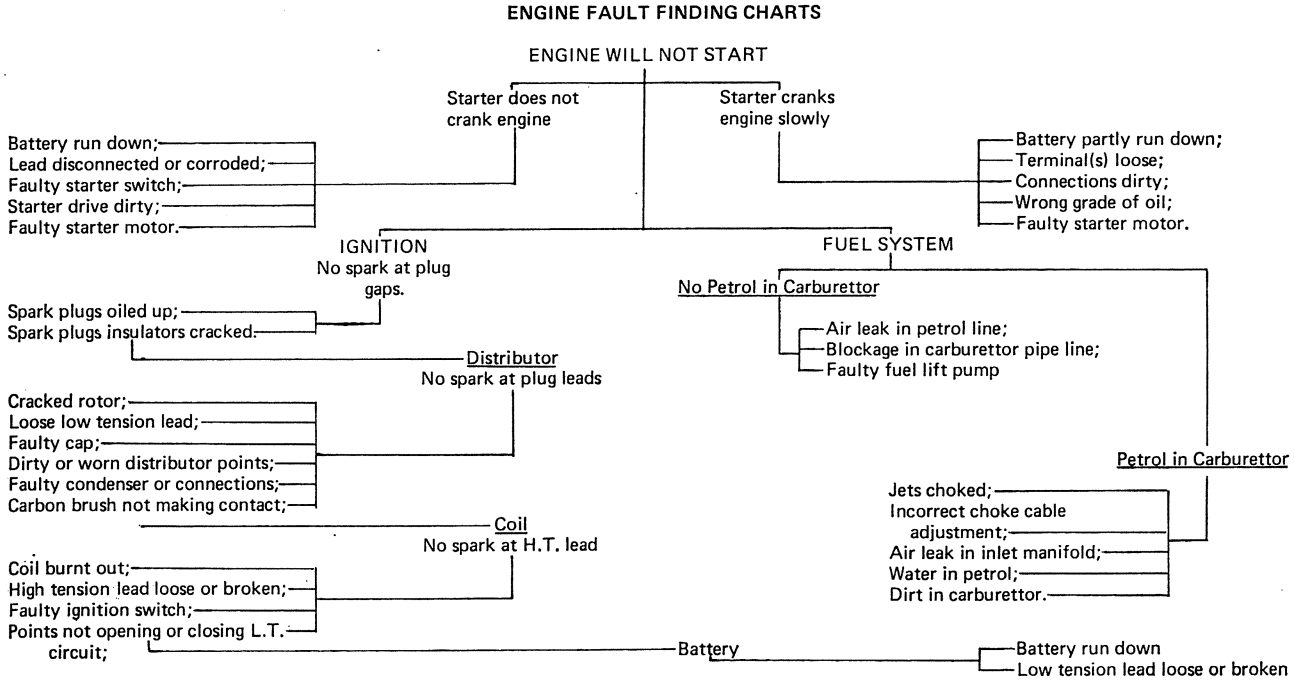
The procedure when no ledger account exists it to forward a Pro-Forma invoice and on receipt of the amount due the goods are despatched. Alternatively goods can be despatched C.O.D. if the items required are within postal limits.

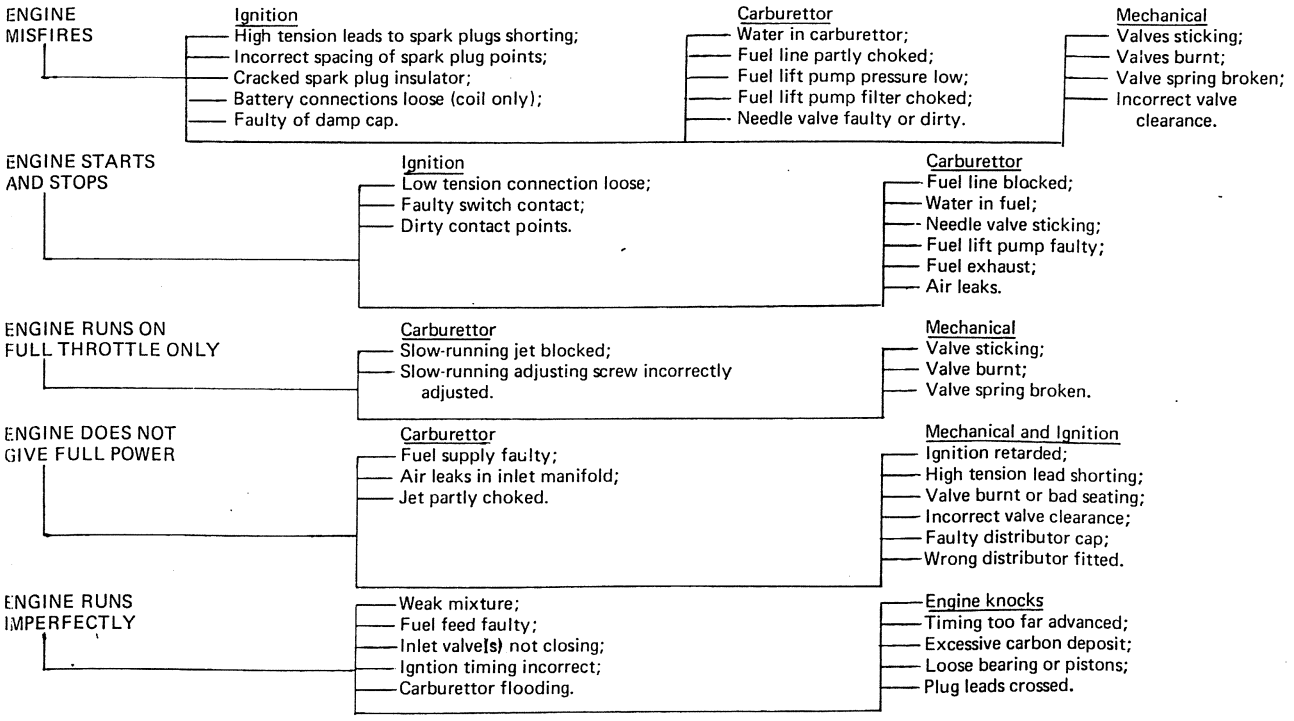
Goods cannot be sent C.O.D. by any means other than parcel post. (2nd class mail.)

CARBURETTOR

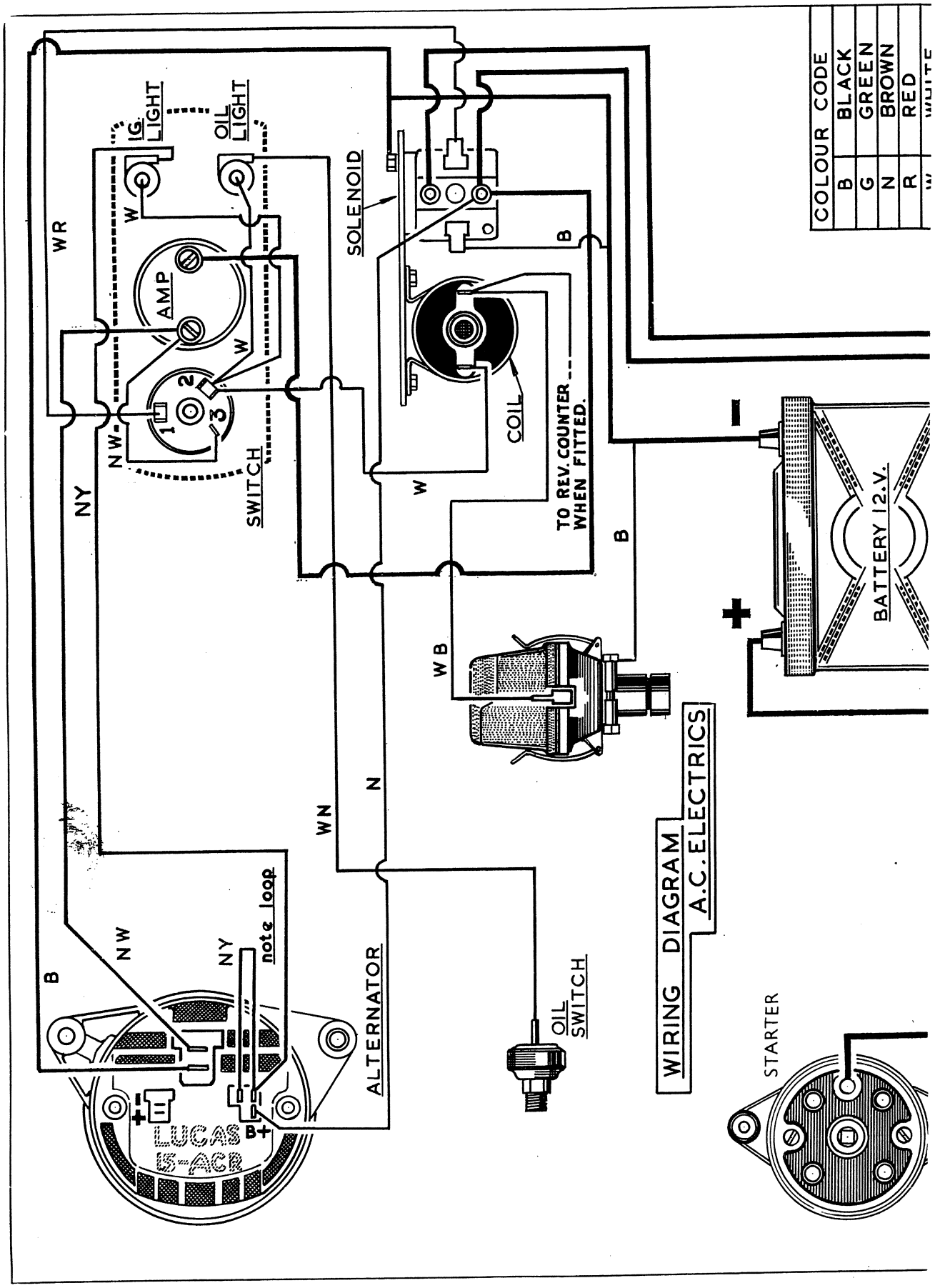


ENGINE FAULT FINDING CHARTS

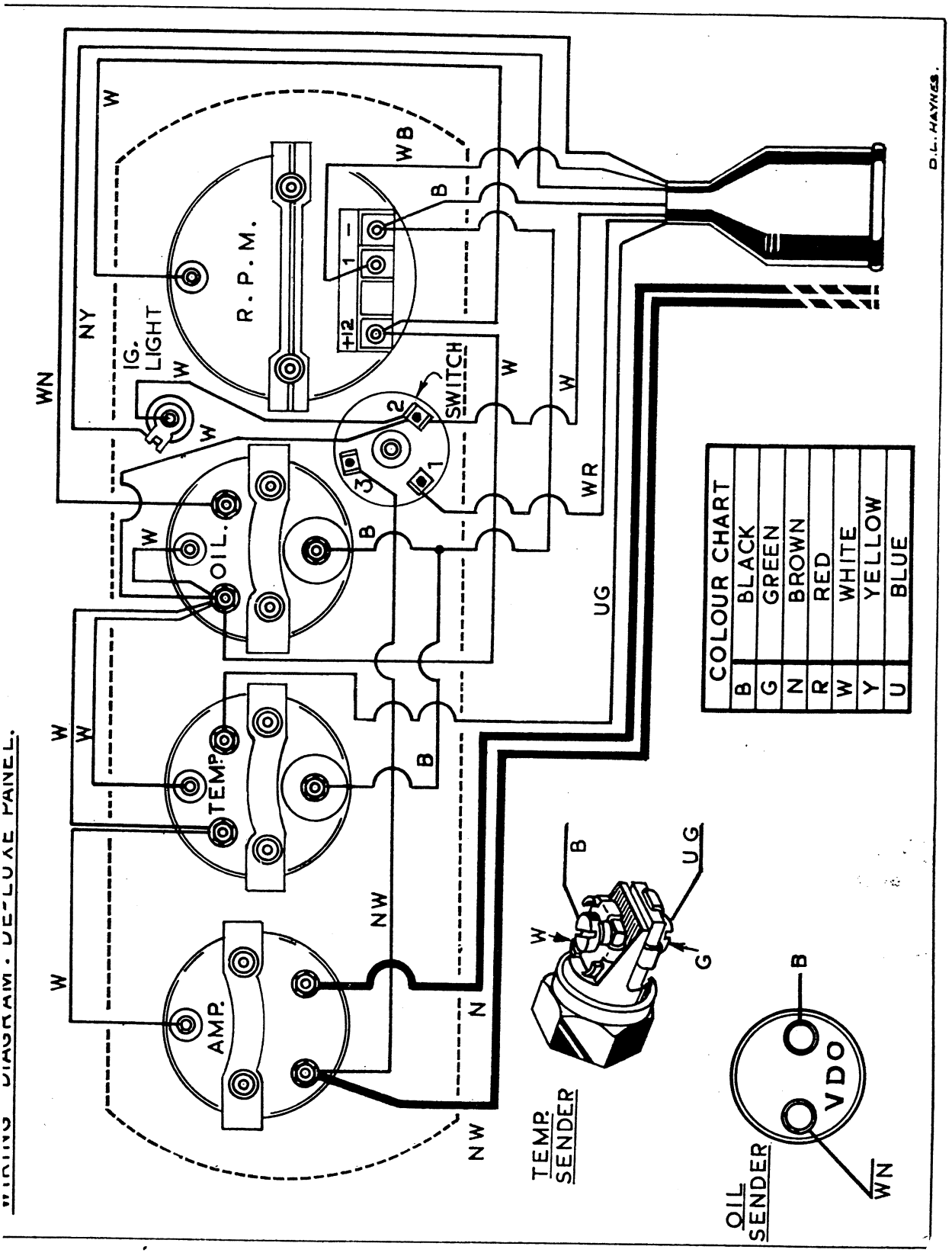




WIRING DIAGRAM STANDARD



WIRING DIAGRAM DE LUXE PANEL



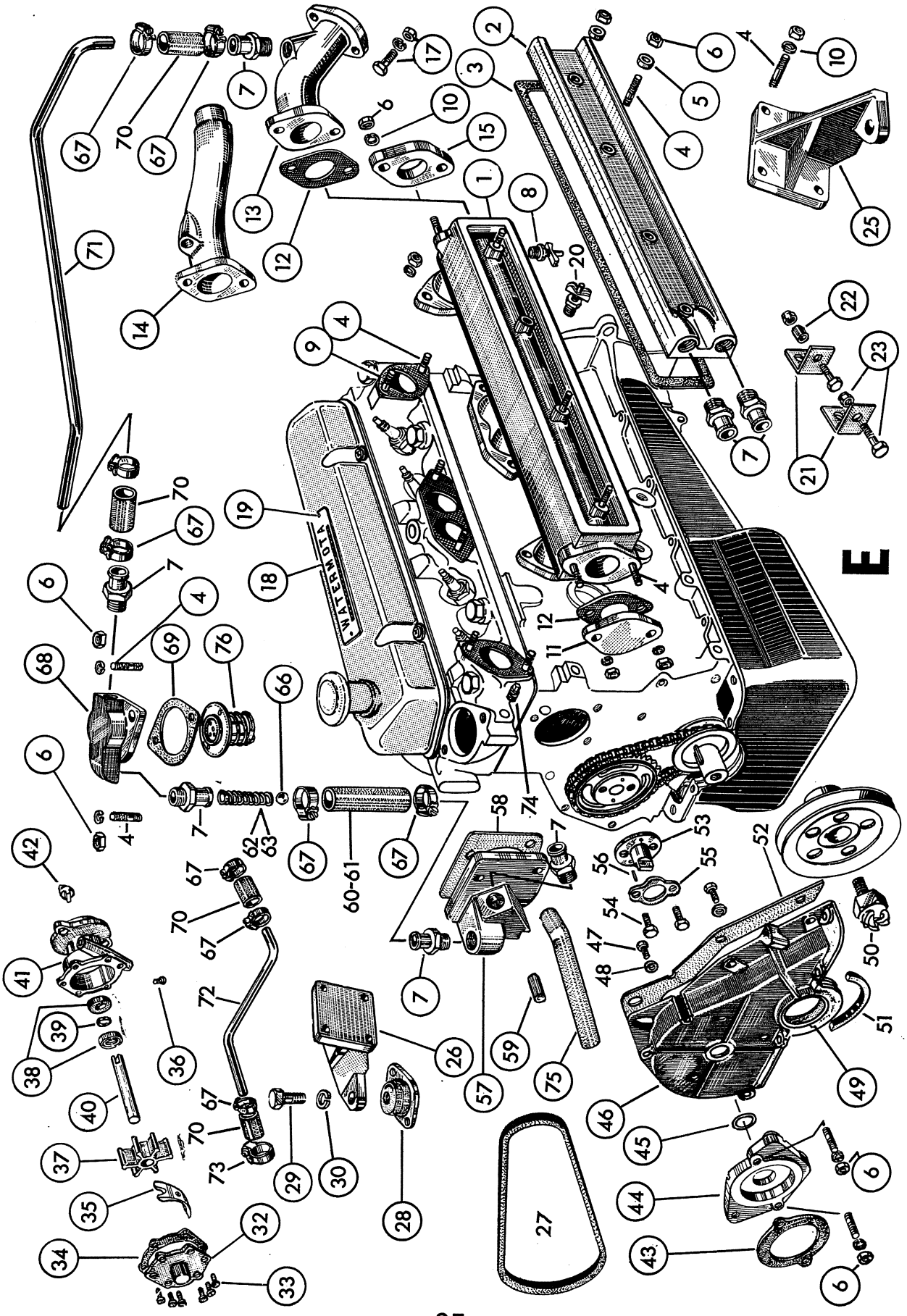
ENGINE PARTS LIST

PLATE E

Plate No.	Part No.	Description	Qty.
E1	W104	Exhaust manifold	
E2	W105	Manifold cover	
E3	W105J	Manifold cover joint	26
E4	W15	Studs	4
E5	W105D	Dubo sealing washer	26
E6	$\frac{5}{16}$W	Nut	7
E7	W172	Pipe connectors	
E8	W13T	Manifold drain tap	
E9	E9448	Set of joints manifold, to block	24
E10	5W	Spring washer	2
E11	W106	Manifold blanking flange	
E12	FD41J	Joint, blanking flange	
E13	W17	Exhaust bend 45°	
E14	S78	Exhaust bend inboard/outboard	
E15	FD41B	Brazing flange	
*E16	FD41	Screwed flange 1¼" BSP	2
E17	P102AL	Bolt, and nut	
E18	W177	Watermota Valve cover label	2
E19	652B	Rivets for label	
E20	W113	Cylinder block drain tap	2
E21	W136	Alternator brackets	
E22	W137	Spacer	2
E23	A600	Securing bolt/nut alternator	
*E24	W136S	Bolt/plain washer/SpW. (alternator)	
E25	W26	Bearer port forward	
E26	W27	Bearer starboard forward	
E27	W138	Alternator drive belt	4
E28	W149	Anti-vibration mount	4
E29	W149B	Bolt	4
E30	W149S	Spring washer	
*E31	W103	Water pump assy.	
E32	W103C	Cover plate	6
E33	W103S	Cover plate screws	
E34	W103J	Joint, cover plate	
E35	W103M	Cam	
E36	W103X	Screw securing cam	
E37	W184	Impellor c/w screw	2
E38	W185S	Seal	
E39	W1850	'O' Ring	
E40	W186	Spindle	
E41	W254	Pump body	
E42	W253	Sliding block	
E43	W102J	Joint, pump/adaptor	
E44	W102	Water pump adaptor. Note: only sold as assy. with Pl. Nos. E44, E45, E46 – See E77	
E45	A641	'O' Ring	
E46	W100	Timing cover (See E42)	3
E47	W102S	Set screw T/Cover to adaptor	3
E48	W102W	Dubo washer	
E49	F6362	Oil seal c/shaft	
E50	W165	Starter dog	
E51	FE29CE1	Packing strip	
E52	F6020	Timing cover joint	
E53	W101	Water pump drive flange	2
E54	W101S	Setscrew, drive flange	
E55	F6258	Lock tab	2
E56	HC41R	Transax pin	
E57	W107	Water inlet cover	
E58	F8507	Joint inlet cover	
E59	W135S	Spacer Alt. Adj. strap	
E60	W175W	Hose, pressure relief (Sea Wolf)	
E61	W175T	Hose, pressure relief (Sea Tiger)	
E62	W176W	Spring, pressure relief (Sea Wolf)	
E63	W176T	Spring, pressure relief (Sea Tiger)	
*E64	S90S	Spacer (only if temp. sender block fitted)	
*E65	S90H	Hose P.R. (only if temp. sender block fitted)	
E66	W110	Ball	12
E67	W171C	Hose clip	
E68	W108	Water outlet cover	
E69	F8255	Joint outlet cover	4
E70	W171	Hose	
E71	W187	Water pipe, outlet to bend	
E72	W173	Water pipe, pump to manifold	
E73	W171CX	Clip, water pump	
E74	58B	⅛" BSP Plug cylinder head	
E75	W174	Water hose, manifold to water inlet	
E76	587	Thermostat	
*E77	W243	Complete set of engine joints (Decoke)	
*E78	W242	Exhaust manifold assy. comprising: manifold, cover, cover joint, pipe connectors, cover studs, dubo washers, drain tap, cover nuts	
*E79	NR241	Timing cover assembly comprising: Timing cover, oil seal, packing strip, adaptor (pump) securing setscrews, dubo washers	

* Not illustrated

PLATE 'E'



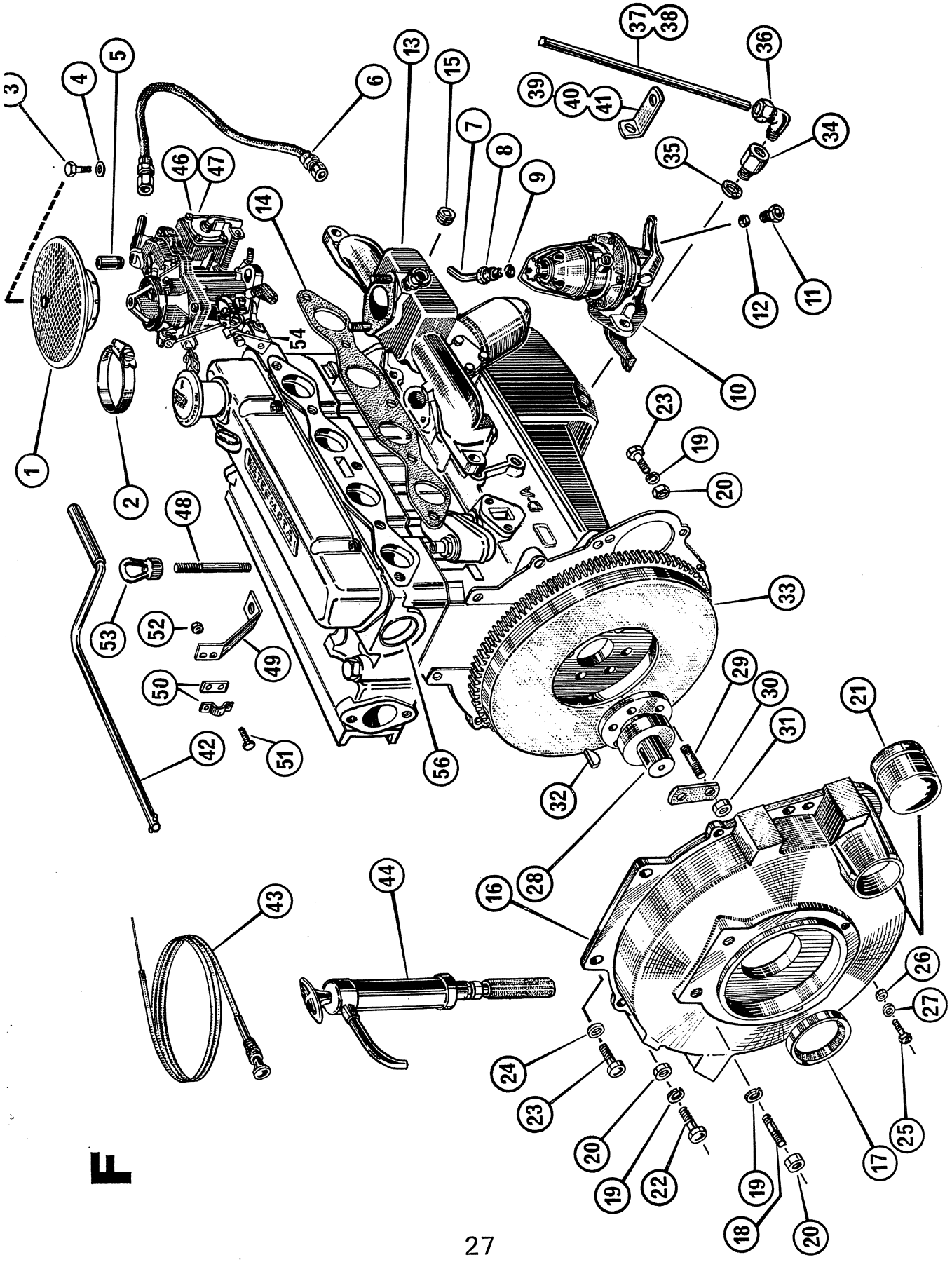
ENGINE PARTS LIST

PLATE F

Plate No.	Part No.	Description	Qty.
F1	W85	Air cleaner	
F2	W86	Retaining clip	
F3	W28	Centre retaining bolt ($\frac{1}{4}$" × $\frac{3}{4}$")	
F4	A640	Plain washer	
F5	W200	Pipe carb. vent ($\frac{5}{16}$" O/D × $1\frac{3}{4}$" O/A)	
F6	W117	Fuel pipe (flexible) c/w nuts/olives	
F7	W182	Connector pipe (fuel pump)	
F8	W157N	Nut	
F9	W157	Olive	
F10	W87	Fuel pump	
F11	W157N	Nut input side of fuel pump	
F12	W157	Olive $\frac{5}{16}$"	
F13	W203	Induction manifold	
F14	S86	Joint	
F15	W178	$\frac{3}{8}$" BSP Plug (blanking water chamber)	
F16	W40	Adaptor (gearbox)	
F17	FD23	Oil seal for adaptor	
F18	601A	Stud G.B. retaining ($\frac{3}{8}$" BSF)	4
F19	6W	Spring washer $\frac{3}{8}$"	4
F20	$\frac{3}{8}$F	Nut $\frac{3}{8}$"	4
F21	W40C	Starter cap	
F22	W41	Bolts ($\frac{3}{8}$" BSF × $1\frac{1}{2}$")	4
F23	W42	Retaining bolt coil bracket ($\frac{3}{8}$" W × $1\frac{1}{8}$")	2
F24	W133	Shake proof washer	2
F25	W28	Bolt matchplate ($\frac{1}{4}$" W × $\frac{3}{4}$")	3
F26	W43	Nuts $\frac{1}{4}$" W	3
F27	4W	Spring washers	3
F28	W130	Stub shaft	
F29	W131	Studs	6
F30	W204	Lock tab	3
F31	W132	Nuts $\frac{3}{8}$" UNF	6
F32	413E	Stub shaft key	
F33	W205	Flywheel	
F34	W111	Sump adaptor nut	
F35	W111J	Fibre washer	
F36	W16	Elbow union	
F37	W24W	Dipstick tube $\frac{3}{8}$" O/D = $10\frac{1}{2}$" (Sea Wolf)	
F38	W24T	Dipstick tube $\frac{3}{8}$" O/D = $12\frac{1}{16}$" (Sea Tiger)	
F39	W112W	Clip/Tube (Sea Wolf)	
F40	W112T	Clip/Tube (Sea Tiger)	
F41	W112Z	Clip/Tube (Z-Drive 20 ctrs./spacer block)	
F42	W66	Cranking handle	
F43	W63	Choke control. Designate 4' 6" or 8' 6"	
F44	W147	Sump pump	
*F45	W148	Tool Kit	
F46	W206W	Carburettor (Sea Wolf)	
F47	W206T	Carburettor (Sea Tiger)	
F48	W115	Stud cylinder head Morse attachment	
W49	W179	Throttle Bkt. (Engine)	
F50	W181	Clip throttle cable	
F51	W181S	Bolt throttle cable	2
F52	W181M	Nut. Throttle cable	2
F53	W116	Lifting eye	
F54	W180	Throttle lever	
*F55	W207	Cable terminal kit (Morse)	
F56	W114	Core plugs (stainless)	4

* Not illustrated.

PLATE 'F'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F

FRESH-WATER COOLING PARTS LIST

PLATE G

Plate No.	Part No.	Description	Qty.
G1	EH160	Heat exchanger tank (Sea Wolf)	
G2	EH260	Heat exchanger tank (Sea Tiger)	
G3	S50	Water outlet flange	
G4	F8255	Joint cyl. head to outlet flange	
G5	W229	Joint flange to H.E. tank and circ. pump	2
G6	W15	Stud $\frac{5}{16}$" W × $1\frac{1}{4}$". Flange to tank and bend	4
G7	5W	Spring washer $\frac{5}{16}$"	4
G8	$\frac{5}{16}$W	Nut $\frac{5}{16}$" W	4
G9	S65W	Water bend. Tank to circ. pump (Sea Wolf)	
G10	W230	Connecting hose $1\frac{3}{8}$" dia. × $2\frac{1}{2}$" (Sea Wolf)	2
G11	W231	Clip No. 2A N.B. (2 only Sea Tiger)	4
G12	S65T	Water bend Tank to circ. pump (Sea Tiger)	
G13	W232	Connecting hose $1\frac{3}{8}$" dia. × 4" (Sea Tiger)	
G14	W233	Water circ. pump c/w pulley	
G15	W234	Spacer for pulley	4
G16	W235	Bolt pulley to circ. pump $\frac{1}{4}$" W × 1"	4
G17	$\frac{1}{4}$W	Spring washer $\frac{1}{4}$". See also c/shaft pulley	5(4)
G18	W236	Crankshaft pulley	
G19	W237	4" 'Vee' Pulley	
G20	W238	Spacer for pulley	5
G21	W239	Bolt, pulley retaining $\frac{1}{4}$" UNC × $\frac{7}{8}$"	5
G22	$\frac{1}{4}$FB	Nut $\frac{1}{4}$" W	5
G23	W240	Drive belt	
G24	W241F	Timing cover c/w pump adaptor	
G25	W103F	Water pump	
G26	W174F	Connecting hose 90° (Sea Wolf)	
G27	W244W	Water pipe. Pump to H.E. Tank (Sea Wolf)	
G28	W245	$\frac{1}{2}$" BSP Elbow	2
G29	W171C	Clip No. 0	
G30	W171CX	Clip No. 00. This includes water outlet	5
G31	W171	Connecting hose. This includes water pump	3
G32	W244T	Water pipe. Pump to H.E. Tank (Sea Tiger)	
G33	W246W	Water pipe. H.E. Tank to manifold (Sea Wolf)	
G34	W246T	Water pipe. H.E. Tank to manifold (Sea Tiger)	
G35	W227	$\frac{3}{8}$" BSP Elbow. Water outlet	
G36	W247	Water pipe. Manifold to exhaust bend	

PLATE 'G'

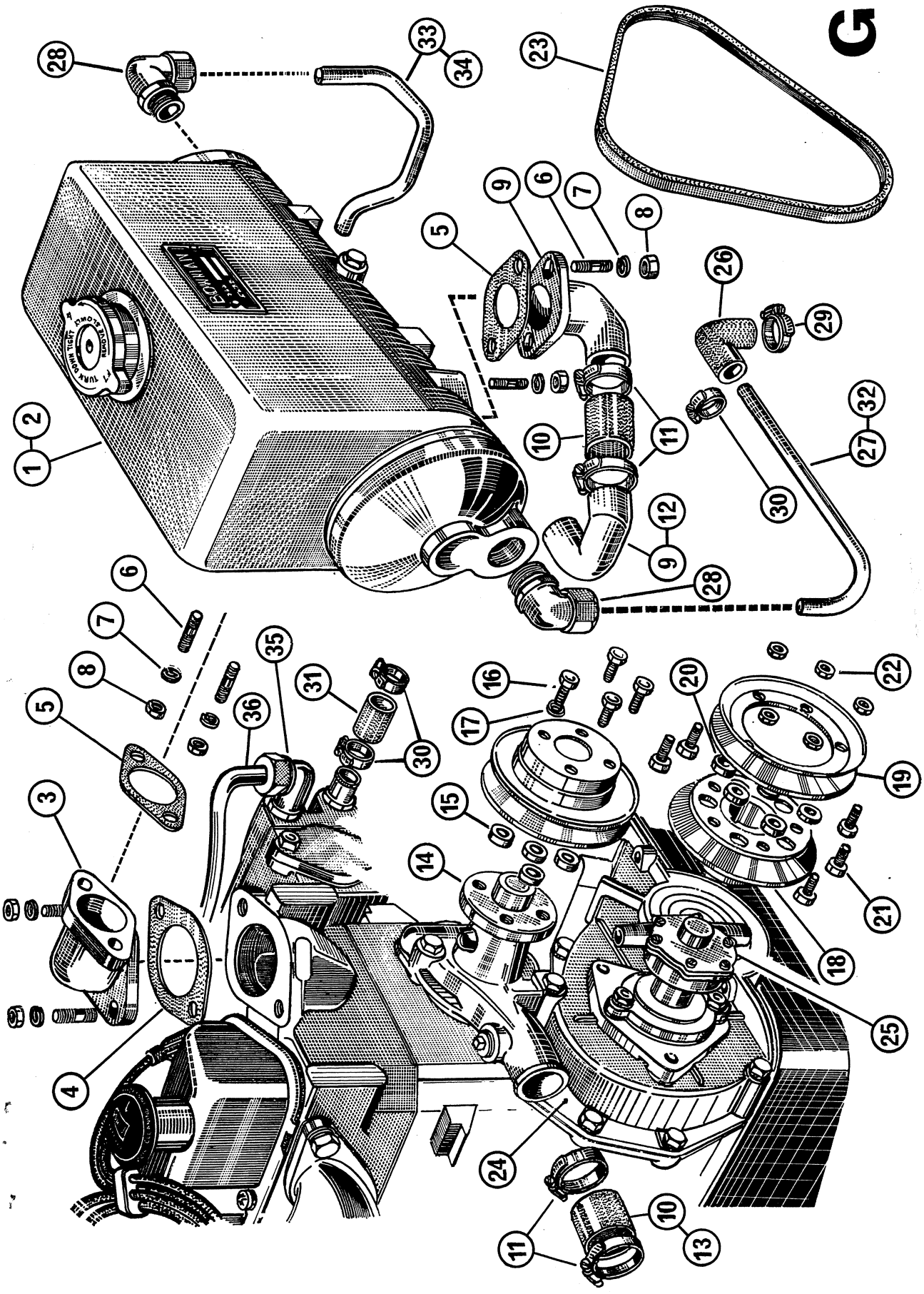


PLATE H

Plate No.	Part No.	Description	Qty.
1	W52A	Standard instrument panel	
2	W53	Ammeter c/w boot	
3	W144	Oil warning light lens	
4	W143	Ignition warning light lens	
5	W145	Ignition start switch c/w key	
* 6	W209	Standard instrument panel assembly	
7	W139PS	Panel wiring harness (standard)	
8	W152	De-luxe instrument panel	
9	W156	Ammeter	
10	W153	Tachometer 0 – 4000	
11	W153A	Tachometer 0 – 6000	
12	W155	Water temperature gauge	
13	W154	Oil pressure gauge	
14	W139PL	Panel harness (de-luxe)	
15	W151	Oil warning light switch (standard only)	
16	W154S	Oil pressure sender unit	
17	W155S	Water temperature sender unit	
18	W155J	Fibre washer temperature sender	
19	S90	Adaptor block temperature sender	
20	W210	Stud $\frac{5}{16}$" W	
21	F8255	Joint	
22	5W	Spring washer $\frac{5}{16}$"	
23	$\frac{5}{16}$W	Nut	
24	W139J	Jumper harness	
25	W139ES	Engine harness (standard)	
26	W139EL	Engine harness (de-luxe)	
27	W140	Coil mounting bracket	
28	W49	Coil complete with boot	
29	W28	Bolt $\frac{1}{4}$" W × $\frac{3}{4}$"	
30	4W	Spring washer	
31	W43	Nut $\frac{1}{4}$" W	
32	W161	Solenoid	
33	5W	Spring washer	
34	W8A	Nut $\frac{5}{16}$" BSF	
35	W139S	Cable solenoid to starter	
36	W183	Coil H.T. lead	
37	W135	Alternator	
*38	W211	De-luxe Panel assembly, less senders and harness	

* Not illustrated.

PLATE 'H'

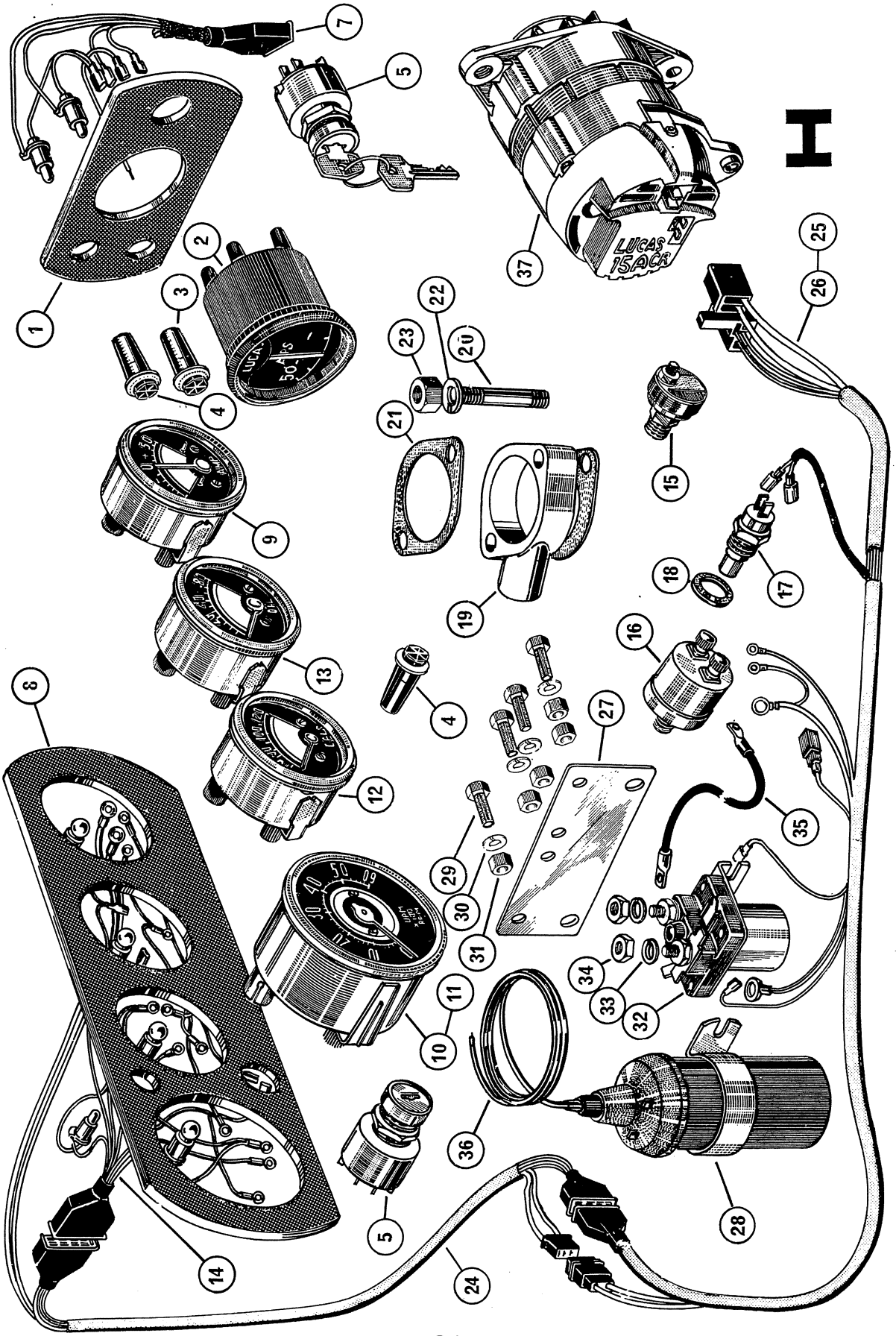
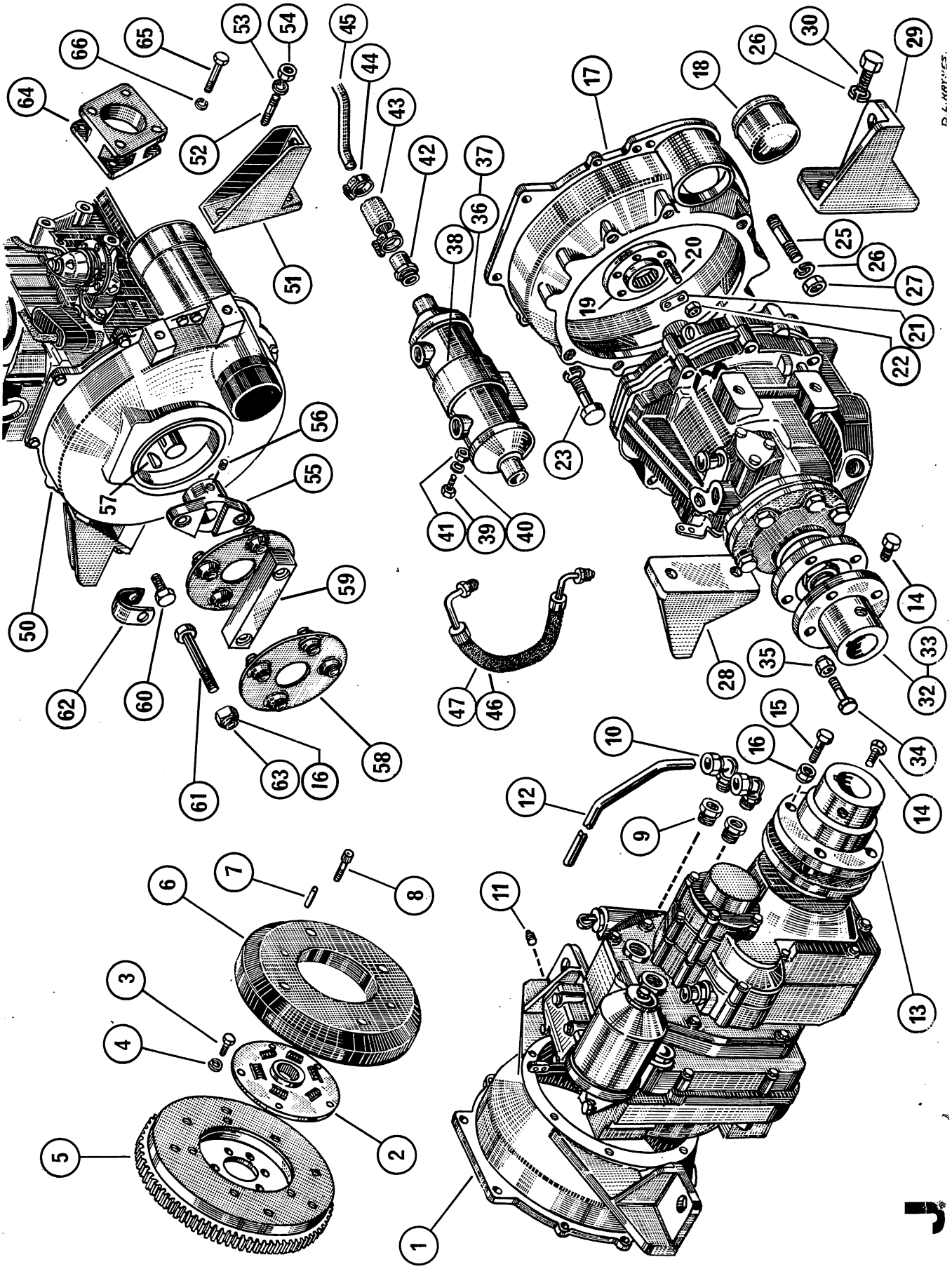


PLATE 'J'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T.M.P. GEARBOX

PLATE J

Plate No.	Part No.	Description	Qty.
1	S83	Adaptor	
2		Spring drive plate	
3		Bolt $\frac{1}{4}$" BSF × $\frac{3}{4}$"	
4	4W	Spring washer	
5		Flywheel	5
6	S70	Flywheel weight	5
7		Dowel $\frac{5}{16}$" dia. × 1"	
8		S.H. Cap screws $\frac{1}{2}$" BSF × 1$\frac{1}{2}$"	
9		Reducer $\frac{3}{4}$" to $\frac{1}{2}$" BSP	2
10	W245	$\frac{1}{2}$" BSP Elbow	4
11	58B	Plug $\frac{1}{8}$" BSP (Oil pressure take off)	2
12		Water pipe (gearbox to water pump)	2
13		Shaft coupling (bore as required)	
14		Screw shaft retaining $\frac{3}{8}$" W × $\frac{3}{4}$"	
15		Coupling bolt $\frac{7}{16}$" W × 1$\frac{1}{2}$"	2
16	W216	Nut nyloc	4
			4

BORG-WARNER GEARBOX

17	W90	Adaptor	
18	W217	Starter cap	
19	W218	Drive flange	
20	W131	Stud	
21	W204	Lock tab	
22	W132	Nut	6
23	W219	Bolt, gearbox to adaptor $\frac{7}{16}$" BSF 3$\frac{1}{4}$"	3
25	W219S	Stud, gearbox to adaptor $\frac{7}{16}$" BSF 3$\frac{1}{2}$"	6
26	7W	Spring washer $\frac{7}{16}$"	4
27	W219N	Nut	2
28	W92P	Aft bearer (port)	10
29	W92S	Aft bearer (stbd)	2
30	W220	Bolt $\frac{7}{16}$" W × 1$\frac{1}{4}$"	
*31	See plate 26		
32	W221	Shaft coupling, direct drive	4
33	W222	Shaft coupling, reduction	
34	671A	Bolt $\frac{3}{8}$" BSF × 1$\frac{1}{4}$"	
35	W223	Nut, nyloc $\frac{3}{8}$" BSF	
36	4872	Oil cooler, direct drive	4
37	4872B	Oil cooler, reduction	4
38	4875A/6A	Mounting strap for cooler	
39	W28	Bolt $\frac{1}{4}$" W × $\frac{3}{4}$"	
40	4W	Spring washer	2
41	W43	Nut	2
42	W172	Pipe connector	2
43	W171	Connecting hose	2
44	W171C	Clip	
45	W224	Water pipe, cooler to pump	
46	W225	Oil pipe, cooler to gearbox	
47	W226	Oil pipe, gearbox to cooler	

'Z' DRIVE

50	W40Z	Adaptor	
51	W162	Aft bearer	
52	W212	Stud $\frac{3}{8}$" BSF × 1$\frac{1}{2}$" now changed to studding	2
53	6W	Spring washer	4
54	$\frac{3}{8}$F	Nut	4
55	S42	Coupling, stub shaft	4
56	P126	Grub screw $\frac{3}{8}$" W × $\frac{1}{2}$"	
57	413E	Key $\frac{1}{4}$" W	2
58	W208	Metallastic coupling	
59	W213	Coupling bar	2
60	W214	Bolt $\frac{7}{16}$" UNF × 2$\frac{1}{4}$"	
61	W215	Bolt $\frac{7}{16}$" W × 4$\frac{1}{2}$"	2
62	36478311	Lock tab	
63	W216	Nyloc nut $\frac{7}{16}$" W	2
64	W161	Spacer block, forward bearer	2
65	W1615	Bolt $\frac{5}{16}$" W × 2$\frac{3}{8}$"	4
66	$\frac{5}{16}$W	Spring washer	2
			2
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