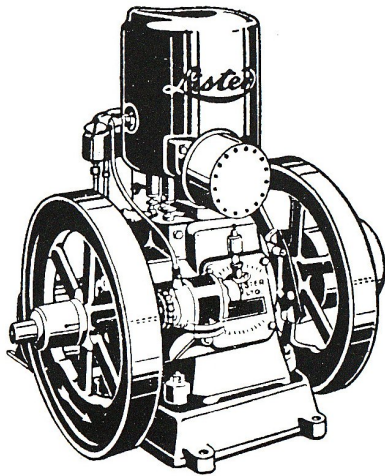


Lister

**PETROL AND PETROL-PARAFFIN ENGINES
TWO FLYWHEEL MODELS—Types A, AK, B and BK
INSTRUCTION AND SPARE PARTS BOOK**



CONTENTS

Fixing, Cooling, Lubrication	How the Engine Works
Starting	Overhauls
Stopping	How to Deal with Possible
Special Instructions for	Trouble
Petrol/Paraffin Engines	List of Spare Parts
Running & Maintenance Notes	Sectional Arrangement

**R. A. LISTER & CO. LTD.,
DURSLEY, Glos., ENGLAND.**

INSTRUCTIONS

INSTALLATION. Fix the Engine level and accessible. Arrange cooling tank with bottom pipe level and the top pipe a continuous upward slope. If a longer exhaust pipe is necessary use $1\frac{1}{2}$ bore pipe or larger and turn downward from the Engine.

COOLING. Fill water tank or hopper. If engine is tank cooled see that three-way cock is turned so that water can flow from tank into engine cylinder jacket. Add water as necessary to maintain water level. Boiling in the Hopper does not matter. *Drain water in frosty weather.*

EXHAUST. Should be colourless. Black smoke indicates too much fuel, blue smoke too much lubricating oil. Clean out the exhaust pipes when decarbonising.

LUBRICATION. For petrol engines use Listroil L.2 in Winter and L.3 in Summer. For Petrol Vapourising Oil Engines always use L.3.

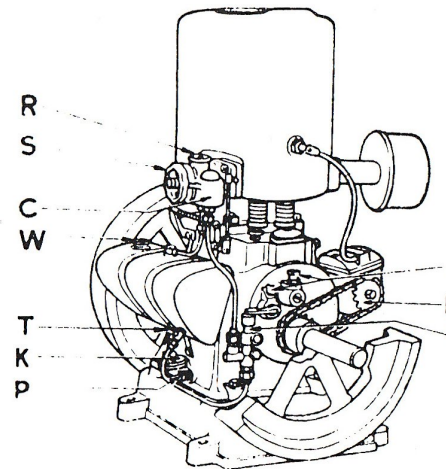
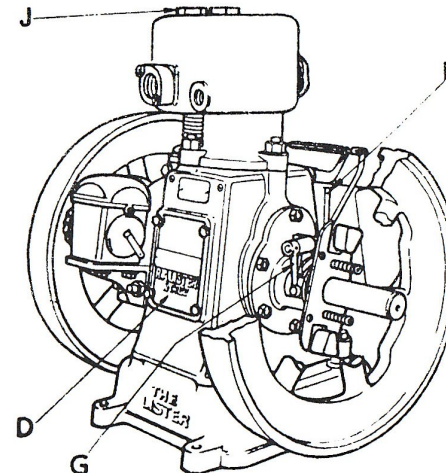
Where Listroil is not available, use SAE 30 oil in Temperate Climate and SAE 40 oil in Tropical Climate.

Every three months drain off lubricating oil through drain plug P, remove door D and clean out crankcase. Do this every month if engine is running on vapourising oil.

Always keep the Engine Sump filled and pour oil into Lubricators L DAILY.

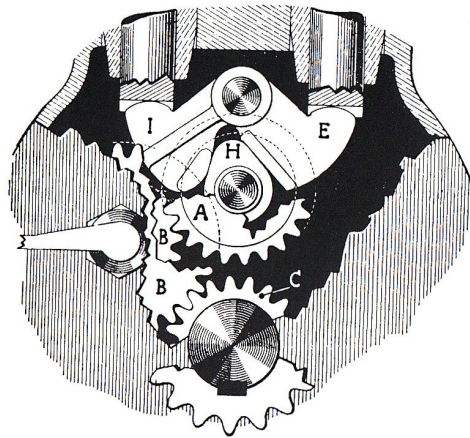
Sump Capacity—1 Pint.

STARTING. New or Overhauled Engine. Remove Door D and Filler Cap K, pour lubricating oil into trough and over Big End Bearing, particularly the two holes in Connecting Rod. Fill sump until Filler is full. Replace Crankcase door and Filler cover. Further oil as necessary should be added through Filler where oil should always be visible. Pour oil into the three lubricators L, and lubricate the Governor Quadrant G and Fuel Pump Plunger F. Fill Fuel Tank W through a fine gauze strainer and see that ignition cable is connected to Sparking Plug.



TO START PETROL PARAFFIN ENGINE. Shut Fuel Tap T to pump, unscrew thumb-screw on carburettor to allow any paraffin to drain back to Tank, retighten thumb screw. Half fill carburettor C. with Petrol, and start as above. Allow to run for a few minutes on petrol to warm up before opening Fuel Tap to Pump. If the engine misfires place the hand over the Air Intake S to allow engine to pick up speed.

TO STOP. Turn fuel regulator down as far as it will go. Always drain water from Cylinder Jacket if there is a possibility of frost.



IGNITION AT FAULT. Clean sparking plug points and re-set gap to .020" and test. Use sparking plugs such as Lodge BBL or equivalent. If a good spark is not seen fault may be in Magneto—see Magneto Instruction Book.


COMPRESSION. Loss of compression may be due to a valve sticking open or carbon on the valve seat. Place a screwdriver or suitable tool between the Valve Tappet and Valve Stem, lever up as far as possible, slip out the screwdriver and allow the valve to close with a snap. Alternatively the loss of compression may be due to Valve Cap leaking, no tappet clearance, piston rings carboned in grooves or a worn cylinder bore.

KNOCKING may be caused by worn bearings, carbon deposit on piston and cylinder head, overheating, overload, pre-ignition or a loose flywheel.


DECARBONISING. This is recommended every six months. Drain water system, disconnect piping, throttle rod and Fuel pipe, remove valve caps J and sparking plug. Remove nuts round cylinder base and lift off cylinder. Disconnect Connecting Rod big end bearing and lift out Piston and Connecting Rod.

Remove all carbon, grind in Valves if pitted and re-assemble all parts, see that Big End bearing marks are at their correct side. Adjust Valve tappet clearance to—Inlet .010"—Exhaust .012", when cold.

TIMING VALVES. Turn crankshaft to T.D.C., replace large end of camshaft in crankcase with cam hump H at the top and Valve rocker levers I and E on either side as illustrated. Slide crankcase end cover, with idler pinion B and fuel pump operating spindle attached, into position; rotating idler pinion as necessary to engage with camshaft pinion A. Slide in combined crankshaft pinion and sprocket wheel C and secure end cover with setscrews.

TIMING IGNITION. Turn flywheel until ignition mark  on rim is at the top. Loosen magneto sprocket M and turn magneto spindle in normal direction until contacts just commence to separate; push sprocket back on the spindle and tighten nut.

TIMING OF RS1 MAGNETOS.

The magneto has been correctly timed by the engine makers before dispatch, and should not be interfered with unnecessarily. Should it, however, be necessary to retime the magneto, the driving sprocket should be loosened on the tapered spindle of the magneto, and the nut tightened up with the fingers sufficiently to give a slight frictional grip between spindle and sprocket. Next turn engine round until the point on the flywheel, indicated pictorially  is on top (Fig. 6). Place magneto on the platform, with the chain on sprockets, and insert fixing screws. Turn magneto armature round by means of contact breaker, in the direction in which it rotates normally, until contacts just commence to separate, taking care, of course that the engine is not rotated during this operation. Then push or lightly tap the sprocket on to the tapered spindle, and tighten up sprocket fixing screw, taking care that armature is not rotated in the process. This operation should leave magneto correctly timed but it is advisable to check timing after the operation by turning engine in the normal direction of rotation and noting that contacts separate at the same moment as the mark on the flywheel comes to the top.

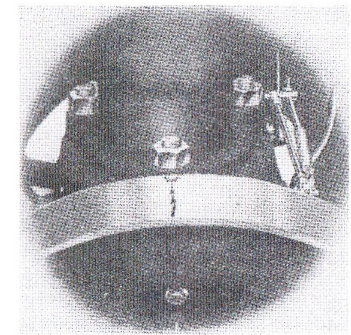
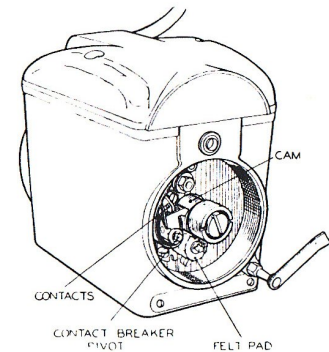


Fig. 6



WATER IN PETROL TANK.

Care should always be taken to prevent water getting into the Petrol Tank.

Occasionally it is advisable to remove the Petrol tank and drain out through the filler any water which may have accumulated at the bottom, and which might in time cause the tank to become badly rusted.

How to Deal with Possible Trouble

FAILURE TO START will probably be due to :

1. Not having carried out starting instructions
2. Ignition at fault
3. Petrol jet choked.

ENGINE STOPPING OF ITS OWN ACCORD will probably be due to :

4. Ignition at fault.
5. Lack of fuel in the tank.
6. Hot bearings. (Due to insufficient lubricating oil in reservoir).
7. Overload.
8. Dirt under fuel regulating needle.

IGNITION AT FAULT.—MISFIRING.

The sparking plug should be removed, and the points cleaned with petrol, after which the gap at the points should be adjusted to the gauge provided on magneto spanner ($\frac{1}{2}$ m/m). Then test the plug by placing it on some unpainted part of the engine, taking care that the terminal to which the cable is attached is dry and does not touch anywhere. Turn starting handle smartly, and sparks should be seen to pass across the points of the plug. If sparks are not seen, connect a new sparking plug and re-test. If this fails, probably magneto is at fault. See separate magneto instruction book for remedy.

MAGNETO GUARANTEE. This is only effective if magneto is returned to makers intact and not tampered with in any way.

The contact breaker should be examined periodically and any dirty deposit on the cam track removed. Should the cam **appear dry a single spot of thin oil** should be applied to the surface on which the tappet runs, as this will prevent rusting and wear. Do not, however, give more oil than this, as an excessive amount may get on the contact points and cause trouble and misfiring.

Examine cable for "short circuit" which is caused by the insulation on the cable having become cracked or chafed, thus allowing a leakage of current.

POOR COMPRESSION when starting or LOSS OF POWER when working.

Ascertain that there is a good compression when turning flywheel. If not, this will be due to :—

- (A) Loose carbon or dirt under valve head—valve should be cleaned.
- (B) Faulty valve face or seat—valve should be ground in.
- (C) Leak at valve cap—clean joint surfaces and fit new joint ring.
- (D) Leak past piston—renew rings and/or piston and cylinder.

GRINDING IN VALVES.

If valves leak, grind them in with fine emery powder and oil, until both valves AND seats show complete bright rings. After replacing valves carefully adjust the clearance at tappets to $1/32$ ". Run the engine until it has warmed up and then finally adjust the tappet clearance to about $.012$ ".

PISTON RINGS.

Piston rings will last for a long time before requiring replacement unless by some mischance a ring is broken. If on examination of the piston rings part of them is worn bright, while another part is black, this indicates that they have worn irregularly, and those so marked should be renewed. This is not likely to happen for several years.

HOT BEARINGS.

Practically the only cause of hot bearings is lack of lubricant, and if the reservoir is examined occasionally and filled up as per instructions, hot bearings will be unknown.

OVERLOAD

This will cause the engine to slow up and probably stop. All LISTER engines have an ample reserve of power to meet emergencies, and should not be overloaded.

LIGHT LOAD.

It is also not advisable to run an engine constantly on a very light load, or the combustion chamber will be quickly carboned up due to excessive fuel consumption and over-lubrication ; whilst mis-firing and irregular running will probably result from a sooted-up sparking plug.

FUEL REGULATING NEEDLE.

Grit under the needle valve will cause the engine to stop of its own accord. Remedy : Remove stop pin on regulating needle head, unscrew needle valve, clean and replace.

FILLING FUEL TANK.

ALWAYS care should be taken to strain the fuel through the funnel and fine gauze strainer when filling tank. To neglect this will eventually cause much trouble and loss of time in stopping.

KNOCKING.

A knocking sound in the engine may be caused by :—

- Overloading.
- The explosive mixture being too hot.
- Slack connecting rod bearing.
- Carbon deposit.
- Ignition too far advanced.

OVERHEATING.

The act of compressing the mixture in the cylinder (the second stroke) raises its temperature considerably, though not enough to ignite it. The occurrence of the spark at the CORRECT moment, supplies the necessary heat. If for any reason the mixture or the piston head is too hot, ignition will take place by its own heat, before the spark occurs, and will produce KNOCKING in the cylinder.

Do not allow the engine to continue knocking. The following are all contributory causes to overheating and should be examined in the order given.

1. See that the engine is not doing more work than it is intended for.
2. See that there is sufficient cooling water in hopper or water tank. If these points are in order, the knock, will be due to one of the following :—
3. If the engine has been working steadily, every day for six months, overheating and knocking will probably be due to a deposit of carbon on the top of the piston and cylinder head. See "Cleanliness of Engine."
4. If the magneto has been removed or the engine dismantled for any reason, knocking may be due to the spark actually occurring too early. This is known as "Pre-ignition." The ignition is correctly set before leaving the works for a FULL POWER LOAD and should be re-set according to instructions for timing ignition.

SLACK CONNECTING ROD BEARING.

There is another knocking sound due to mechanical defects, such as slack connecting rod bearings ; this should be rectified at once.

This is not likely to occur until an engine has been running for a very considerable time, unless the white metal bearing has run out, owing to lack of lubricating oil. (Carefully follow instructions).

EXCESSIVE FUEL CONSUMPTION.

One notch on the regulating needle makes a considerable difference to the fuel consumption, therefore, keep the fuel regulating needle screwed down as far as possible consistent with good running.

WATER IN CYLINDER.

Water in the cylinder is often due to condensation in a long exhaust pipe draining back into the cylinder.

On tank cooled cylinders remove cover on top of cylinder and ascertain if plug between water jacket and cylinder is tight. It is very improbable that this will work loose.

SPECIAL INSTRUCTIONS for PETROL-PARAFFIN ENGINES AK and BK Types

To Start Engine.

Fill Paraffin Tank with paraffin or vaporising oil, always using fine gauze Strainer, and prevent water and dirt getting into Tank.

Turn off Tap in bottom Paraffin Pipe between Tank and Pump.

Lift off Lid of Carburettor.

Unscrew flat Thumb Screw on Carburettor about half a turn to let any paraffin in Carburettor drain back to Tank. Then screw down again lightly.

Pour PETROL into Carburettor up to mark inside chamber (just over half full)

Turn Fuel Regulator to START position.

Turn Flywheel in opposite direction to arrow on Flywheel until compression is felt, then while holding hand over Carburettor Air Inlet, turn Starting Handle smartly in direction of arrow on Flywheel, when Engine should start. Remove hand from Carburettor, take off Starting Handle, and turn Fuel Regulator to NORMAL mark.

Turn Small Lever on top of drip feed Lubricator to vertical position. This should feed about 2 drops of oil per minute to Crankcase.

Allow Engine to run for a few minutes or until petrol in Carburettor is **nearly used up**, then Paraffin Tap in bottom Pipe can be turned on. During cold weather it is advisable to recharge Carburettor with Petrol before turning on Paraffin. If engine misfires slightly after turning on Paraffin hold the hand over Air Intake for a moment or two to permit it to pick up speed.

IMPORTANT: Fuel Regulator should be turned down a notch or two further until Engine shows signs of slowing down, then turn back a notch to maintain speed. Every notch makes a difference to fuel consumption.

To Stop Engine.

Turn down fuel Regulator as far as it will go towards mark STOP.

Turn Small Lever on top of drip feed Lubricator to horizontal position to stop oil drip.

Drain Lubricating Oil Sump and refill with fresh oil about every month, if Engine has been in constant use.

LUBRICATION

IMPORTANT. The following parts of the Engine **must** be lubricated before starting up for the first time, or after Engine has been idle for a lengthy period.

1. Remove Inspection Door: Oil Connecting Rod Big End Bearing both sides. Fig. 1 "P."
2. Fill Trough until it overflows (replace door). Fig. 1 "A."
3. Through Lubricator Hole: Oil Intermediate and Pump Spindles. Fig. 3 "Z"
4. Oil Governor Quadrant Fig. 2 "A"
5. Oil Pump Plunger. Fig. 3 a.
6. Remove Oil Filler "K" Fill up Reservoir until oil (about 1½ pints) reaches edge of filler. Fig. 1 & 3 "K."
7. Give Greaser on end of Camshaft one turn and refill frequently. Fig. 3a.

NOTE: All parts must be replaced before starting Engine.

A projection on the bottom of the connecting rod dips at every rotation of the crank into the oil reservoir, and splashes oil which lubricates the piston, both ends of the connecting rod, and the valve rocker gear, while the oil which is splashed against the walls of the crankcase runs down into a trough into which oiling rings dip, which rotate with the crankshaft, and supply oil to the main bearings.

*Use **Listroil** Lubricating Oil as sent out with engine. If this oil is unobtainable use any good brand of medium-body motor car engine oil suitable for water cooled engine. In cold seasons a thinner oil should be used than in hot seasons.

It is most important that oil used should be neither too thin nor too thick

When oil begins to get thick and dirty from use it must be changed and the crankcase washed out.

Occasionally remove cover of oil filler (K) and add sufficient lubricating oil to fill up filler "K" to the top (see Fig. 1). On no account must the oil level be allowed to fall so low that you can see the bottom of the filler. **Using oil can, put a little oil on the tappets at (W) (Fig. 3), also on the governor sleeve through the hole in the top of the bearing housing, and well lubricate governor quadrant at position (A) (Fig. 2), all the Governor outside connections and put a few drops of oil on fuel pump plunger (Fig. 3a).** Re-fill small greaser on end of camshaft.

* Temperate climates or conditions where ambient air temperature does not exceed 90° F use Listroil L2. Tropical climates or conditions where ambient air temperature exceeds 90° F use Listroil L3.

Petrol-Paraffin Engines. Use Listroil L3 or a good quality heavy bodied motor car engine oil.

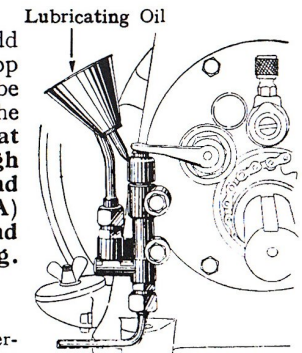


Fig. 3a.

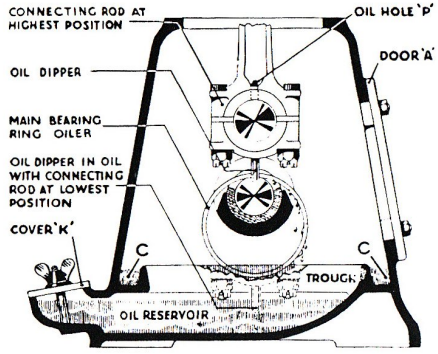


Fig. 1.—Cross Section through Crankcase

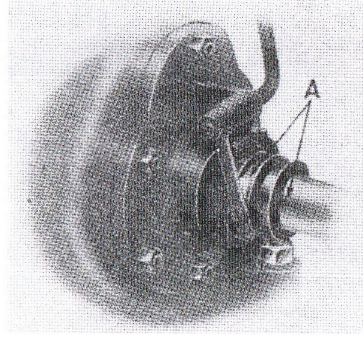


Fig. 2.—Governor Quadrant

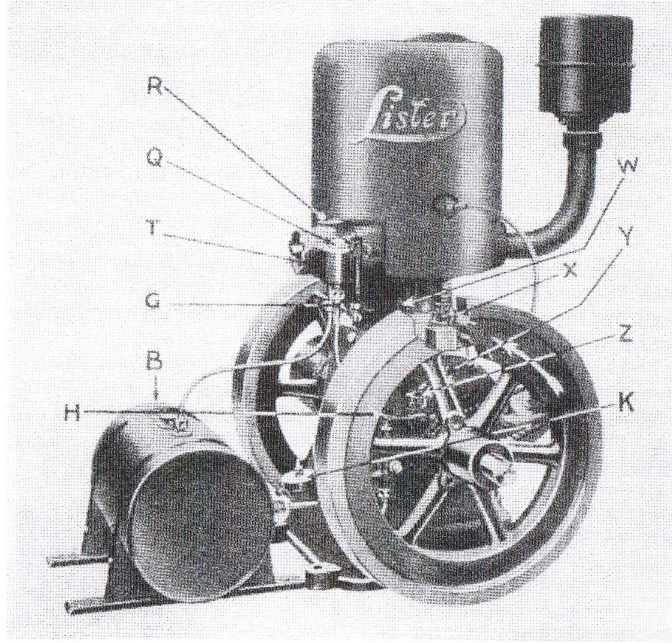


Fig. 3.

SPARE PARTS LIST

Figures given in this List are subject to revision without notice.

When ordering always give Engine and Specification Number, Description of Part and Part Number. Engine Number may be found on: 1—Crankcase Door; 2—Rim of Flywheel.

Do NOT quote illustration numbers.

A TYPE ENGINE. List of Joints

(Ordering Reference—List SP268)

Description	Part No.	Material
2 Joints for Main Bearing Housing	A.295	Paper
1 Joint for Crankcase Door	H.87	Fibre
1 Joint for Cylinder Flange	*A.298	Paper
1 Joint for Carburettor Flange	*27/669	Paper
1 Joint for Top Core Plug	3304	C & A
2 Joints for Cylinder Valve Caps	*B.91	C & A
1 Joint for Sparking Plug	*291/2265	Copper
1 Joint for Fuel Tap	12406	Fibre
1 Joint for Drain Tap Adaptor Plug	12406	Fibre
2 Joints for Drain Tap	5197	Fibre
4 Joints for Fuel Pipe Fixing Plugs	5197	Fibre
1 Joint for Cylinder Top Cover	*A.150	Fibre
1 Joint for Water Jacket Core Plug	12419	Fibre

* For Decarbonising Only

B TYPE ENGINE. List of Joints

(Ordering Reference—List SP269)

Description	Part No.	Material
2 Joints for Main Bearing Housing	A.295	Paper
1 Joint for Crankcase Door	H.87	Fibre
1 Joint for Cylinder Flange	*A.298	Paper
1 Joint for Carburettor Flange	*106/572	Paper
1 Joint for Top Core Plug	3304	C & A
2 Joints for Cylinder Valve Caps	*B.91	C & A
1 Joint for Sparking Plug	12406	Fibre
1 Joint for Fuel Tap	291/2265	Copper
1 Joint for Drain Tap Adaptor Plug	12406	Fibre
2 Joints for Drain Tap	5197	Fibre
4 Joints for Fuel Pipe Fixing Plugs	5197	Fibre
1 Joint for Cylinder Top Cover	*A.150	Fibre
1 Joint for Water Jacket Core Plug	3306	Fibre

* For Decarbonising Only

STANDARD ROTATION is anticlockwise when looking at the Valve Springs.

OVERSIZE PARTS. Pistons, Piston Rings and Cylinders can be supplied .010", .020" and .040" oversize.

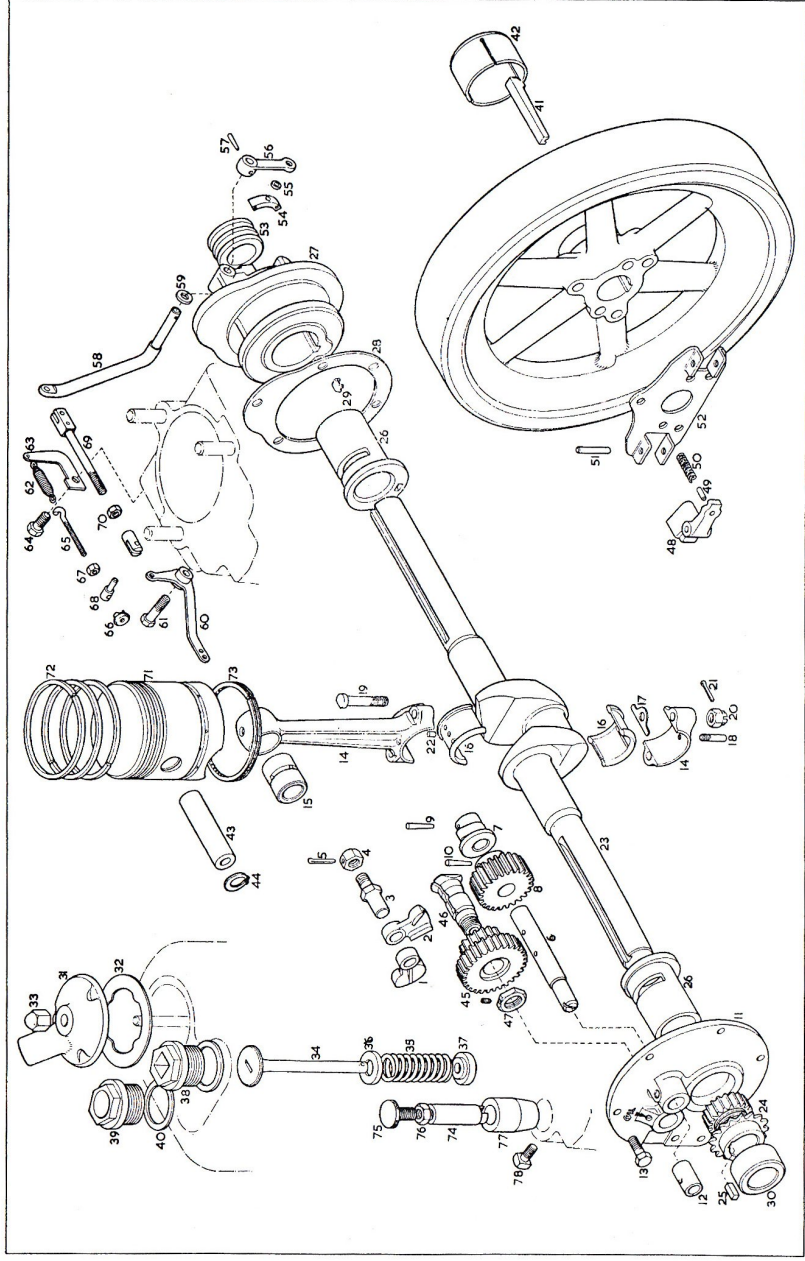


PLATE I.

FOR ILLUSTRATIONS OF THESE PARTS REFER TO PAGE 4

PLATE I.

Illus. No.	Part No.	No. per Set.	Illus. No.	Part No.	No. per Set.
CAM ROCKER LEVER					
1	Inlet Rocker Lever	1	A232	A Type	2/579
2	Exhaust "	1	A234	A Type	2/483
3	Spindle for "	1	A235	B Type	106/423
4	Slotted Nut for "	1	S629	B Type	106/483
5	Split Pin	1	S120		A323
CAMSHAFT					
Camshaft complete (Comprising the following parts)					
Note: Complete Camshaft is recommended for replacement instead of separate parts.					
6	Camshaft only	1	A231	A Type	A324
7	Cam	1	A233	A Type	A25
8	Camshaft Gear Wheel	1	A224	B Type	106-106
9	Cam Taper Pin, No. 4 x 1 1/4	1	S614	B Type	106-404
10	Gearwheel Taper Pin, No. 4 x 1 1/4	1	S237	B Type	106-403
CAMSHAFT END COVER					
11	Camshaft End Cover	1	A327		A290
12	" " Bush	1	A247		A322
13	" " Oiler	2	2/525		
	" " Set Pin	6	S150		
CONNECTING ROD					
Complete (Comprising the following parts)					
14	Connecting Rod Stamping (with Cap)	1	A218		S3
15	" " Bush (Small End)	1	A216		B10T
16	" " Bearing (Big End)	1	A219/220		A150
17	" " Bearing Shim .005 thick	1	A228		S657
18	" " Dipper	6	A338	A Type	H551N
19	" " Bolt with Castle Nut and Split Pin	1	A290C	A Type	H55EX
20	" " Castle Nut	2	S656	B Type	2-419
21	" " Split Pin	2	S120	B Type	3382
22	" " Bearing (Big End) Dowel	1	S655	A Type only	A256
CRANKSHAFT					
23	Standard Crankshaft for Direct Coupling	1	A232	A Type	A257
24	" " Standard for Direct Coupling	1	A235	B Type	A257
25	" " Pinion and Sprocket Key	1	S629	B Type	3383
26	" " Oiling Ring	2	S120	B Type	H139
27	" " Main Bearing Bush	2	A233	B Type	B280
28	" " " " Bush	2	A224	B Type	B281
29	" " " " Housing	1	S614	B Type	B91
30	" " Bearing Housing Joint	1	S237	B Type	A298
	" " Crankshaft Oil Retaining Block for Housing Collar	1			
CYLINDER FITTINGS					
31	Cylinder Flange H.D. Nut	3	S3		
32	" " Top Cover Joint	1	B10T		
33	" " Nut	1	A150		
	" " Valve, Inlet	1	S657		
34	" " Exhaust	1	H551N	A Type	
	" " Spring	1	H55EX	B Type	
35	" " " " " "	2	2-419	B Type	
36	" " " " " "	2	3382	B Type	
37	" " " " " "	2	A256	A Type only	
	" " Top Carrier	2	A257	B Type	
	" " Bottom Carrier	2	3383	B Type	
	" " Carrier Pin	2	H139	B Type	
	" " Cap for Hopper Cylinder	2	3384	B Type	
38	" " Tank Cylinder (Exhaust)	1	B280	B Type	
39	" " " " (Inlet)	1	B281	B Type	
40	" " " " " "	1	B91	B Type	
	" " " " " "	1	A298	B Type	

PLATE II (Continued)

FOR ILLUSTRATIONS OF THESE PARTS REFER TO PAGE 7

Illus. No.	Part No.	No. per Set.	Illus. No.	Part No.	No. per Set.
155	104/68	1	3"	Pipe 2ins. long	2
156	106/407	1	1/4"	Hex. Nipple	1
157	X16148	1	Rubber Hose, 1" bore x 4" long	S373	1
158	106/408	1	Clips for 1" bore Hose (bottom only)	27/2339	1
	12515	1	1" to 3/4" Reducing Bush	H95	2
	S273	1	1" Socket	S376	1
159	S373C	2	1" Pipe x 12" Scr. 1 end	S172	1
	3375	1		S361	1
	27/1529	1	WATER TANK & CONNECTIONS "B" Type		
160	3374	1	Water Tank, 23" x 33" (50 Galls.) Temp.	3405	1
161	S8	1	" " 23" x 47" (70 Galls.) Trop.	5405	1
162	3376	1	1" Spring Bend x 120°	27/2340	1
163	S122	2	1" 3-Way Cock	S174	1
		4	1" Pipe x 2 1/2" long, Scr. 1 end	S170	1
			1" Socket	S255	1
			1" Hex. Nipple	S173	2
			Rubber Hose 1 1/2" bore x 4" long	S171	1
			Clips for 1 1/2" bore x 4" long	27/2341	2
			3/4" Pipe x 6ins. long, Scr. 1 end	3404	4
				S381	1

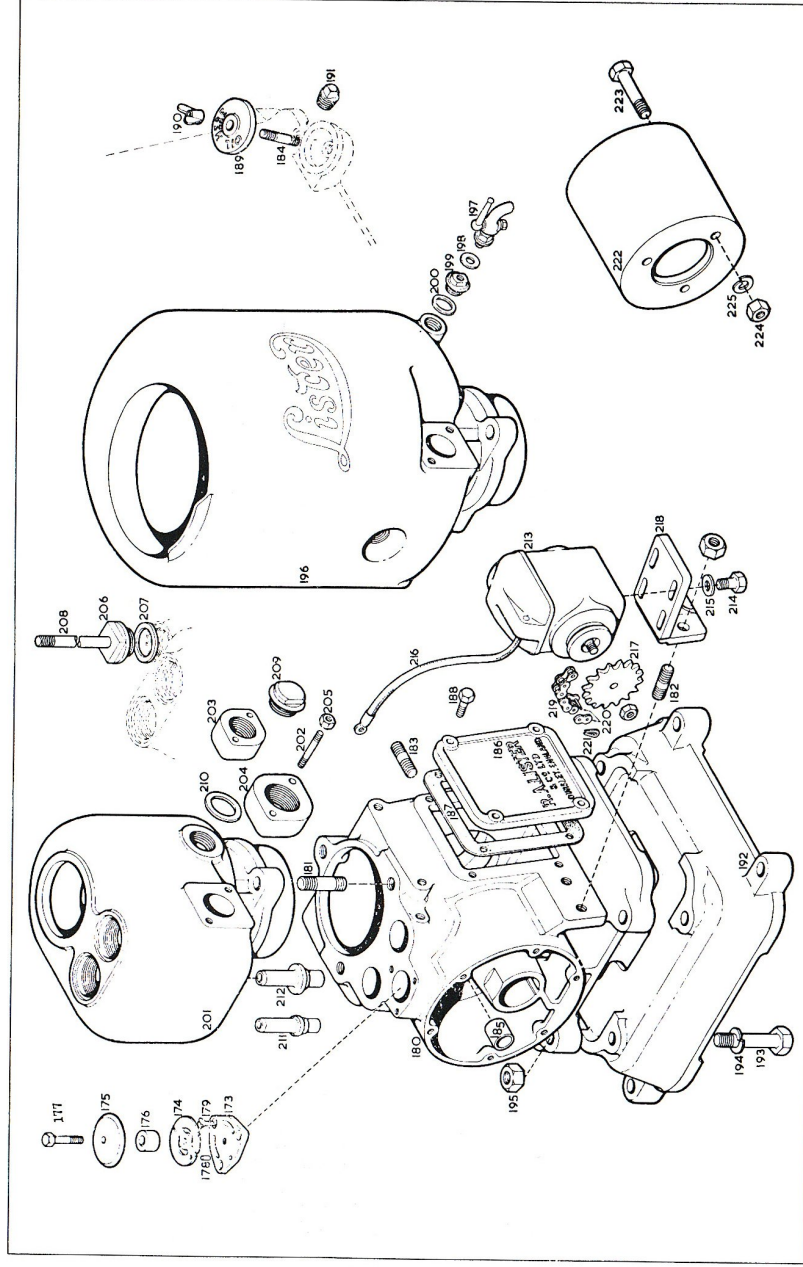
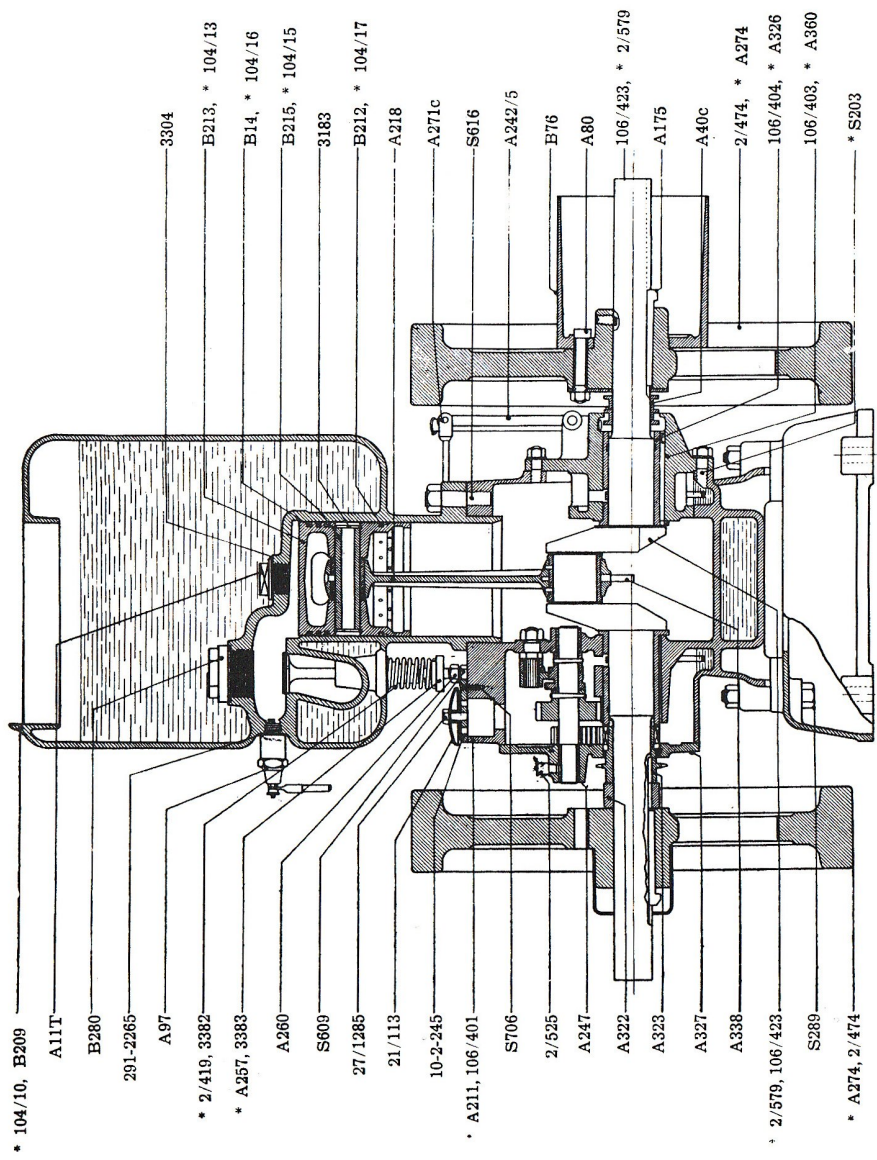


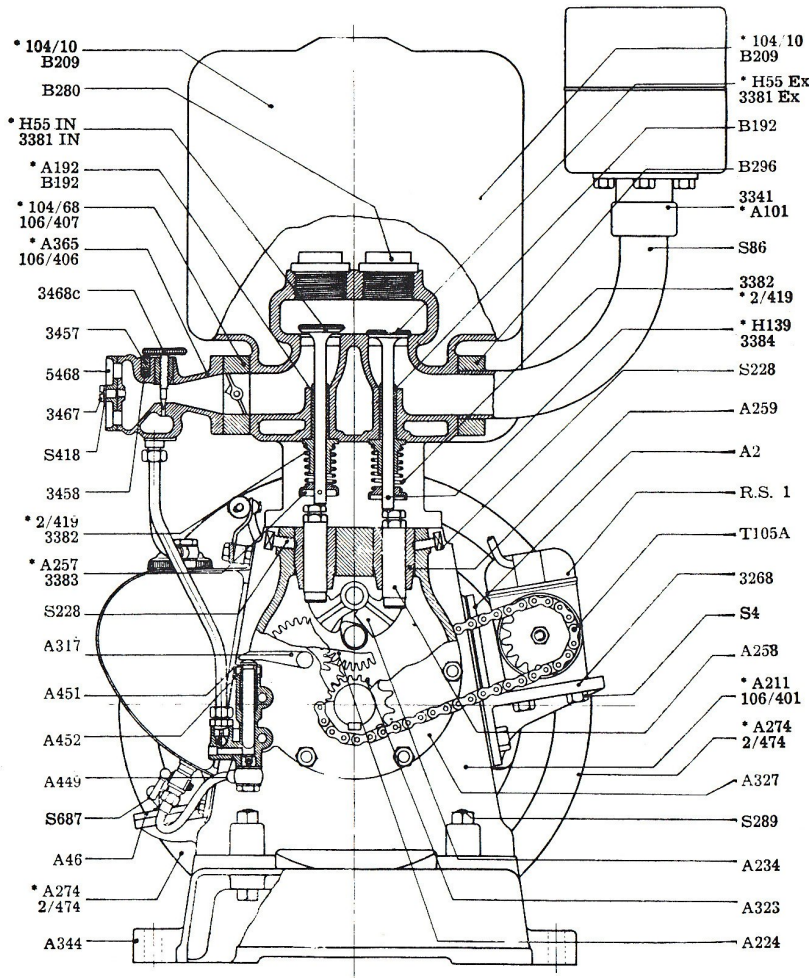
PLATE III.



* Denotes Part for "A" Type.

A rough guide to engine dating by serial number.

The following list is useful for roughly dating your A and B type, also types H,J,K,L,M,N,P,Q and R. Unfortunately the list cannot be treated as 100% accurate because a duplicate set of 'engine build day-books' provides conflicting information, as shown by the numbers in brackets. However, as a general guide the list should be helpful, and reasonably accurate from 1928 onwards, but please note that these are build dates and not dates of sale.



* Denotes Part for "A" Type.

1923	34557 (34561)	38037 (38052)
1924	38053 (38075)	44843 (44847)
1925	44844 (44848)	53072 (53299)
1926	53073 (53300)	61233 (61578)
1927	61234 (61579)	69596 (69627)
1928	69628	78095
1929	78096	208767
1930	208768	216463
1931	216464	220613
1932	220614	222840
1933	222841	225967
1934	225968	229735
1935	229736	233647
1936	233648	237993
1937	237994	242482
1938	242483	245464
1939	245465	248820
1940	248821	252369
1941	252370	254677
1942	254678	256489
1943	256490	257975
1944	257976	258735
1945	258736	260795
1946	260796	262274
1947	262275	263720
1948	263721	268062
1949	268063	272799
1950	272800	274579 (May 1950).
1951	275829	278880
1952	278881	279284