

NORTON VILLIERS
C.15A
FOUR-STROKE ENGINE

*The Experience behind
keeps Villiers in front*



NORTON VILLIERS

AUSTRALIA PTY. LTD.

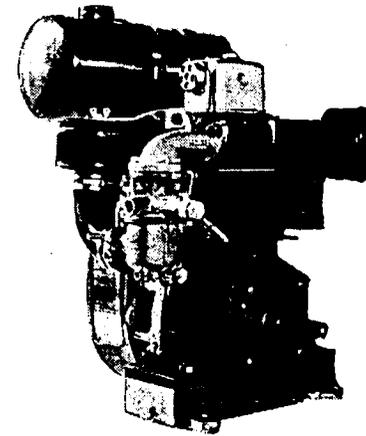
BALLARAT, VICTORIA, AUSTRALIA 3350



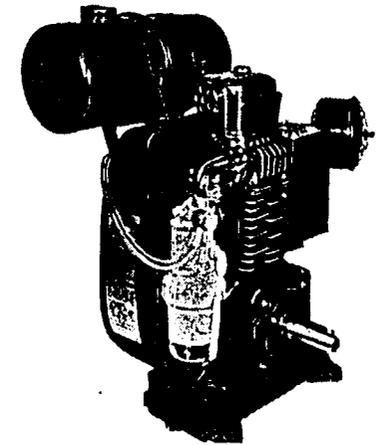
Waller & Chester, Printers, Ballarat.



TYPE C-15A ENGINE



ZENITH CARBURETTER MODEL



B10/I CARBURETTER MODEL

★ BEFORE STARTING THIS ENGINE FOR THE
FIRST TIME CAREFULLY READ PAGES 4 AND 5

INTRODUCTION

★

YOUR VILLIERS ENGINE is the heart of the machine in which it is installed. It has been manufactured and assembled with great care and precision, and it will give you long and efficient service if it receives the attention it deserves.

This book contains the necessary information to enable you to give your engine this simple, but important routine attention, and you will be well advised to keep the book on hand for consultation when necessary.

After a long period of service, your engine may require overhauling, and it is important always to make sure that only genuine Villiers replacement parts are used. Remember that genuine Villiers spares are made with the same fine workmanship as the original engine components. If you do not know the name of your nearest Service Depot for Villiers engines, write for information to the manufacturers:—

NORTON VILLIERS AUSTRALIA PTY. LTD.

Box 237 P.O., Ballarat, Vic. 3350

ENGINE DATA

—★—

Engine	Villiers Type C-15A Overhead Valve.
Bore	63 m.m.
Stroke	47 m.m.
Capacity	147 c.c.
Power Output	3.6 B.H.P. with B10/1 Carburetter. 4.3 B.H.P. with BV1320 and Zenith Carburetters.
Cooling System	Air Cooled, by fan.
Magneto	High Tension Flywheel Magneto.
Point Gap020"
Carburetter	Villiers B10/1 or BV1320 or Zenith 24T.
Sparking Plug	Bosch W45T-1 or Champion L14, .025" Gap.
Air Filter	Oil bath type for Villiers B10/1. Dry type for Villiers BV1320 and Zenith 24T.
Fuel tank capacity	$\frac{1}{2}$ gall.
Lubricating oil sump capacity	1 pint
Recommended rocker clearance (cold)	Inlet .003", Exhaust .006"
Ignition timing100" B.T.D.C.
Crankpin Diameter9995"/1.000"
Undersize Big End Liners	Available in .020" undersize.
Oversizes (Pistons & Rings)	Plus .020", .030", .040"
Torque, Cylinder Head Nuts	230-240 in./lbs.
Torque, Con Rod Nuts	8 ft./lbs.
Torque, Flywheel Nut	41.5 ft./lbs.

TYPE C-15A ENGINE

INSTALLATION

Engine must be securely fixed in place and be **reasonably level**, otherwise lubrication and operation of the carburetter are liable to be adversely affected.

BEFORE STARTING (See also Routine Attention page 5)

LUBRICATION — Fill sump with recommended grade of oil up to the notch on the dipstick.

RECOMMENDED GRADES OF OIL

Engine

All temperatures :—Castrol GTX 20W-50SE.

Reduction Gears

All temperatures :—Castrol GTX 20W-50SE.

FUEL

Fuel tank must be filled with good quality standard grade petrol.

Note :—Do not mix oil and petrol. The lubrication system of this engine is separate from the fuel supply system.

STARTING

When engine is cold :—B10/1, B1320 and Zenith Carburetters. Open petrol tap, close strangler fitted on carburetter intake.

Where fitted, the ignition switch should be in the "ON" position. If a push button switch is fitted this is automatically in the "ON" position.

Wind rope around starting pulley in a clockwise direction. One end of the rope is placed in notch provided in pulley, the knob at the other end of rope being held in the hand. Where recoil starter is fitted a firm straight pull on the cord is required to rotate the engine. Allow cord to return slowly.

Note :—At extremely low temperatures it may be helpful to inject petrol through sparking plug hole before starting.

When the engine is hot :—All Carburetters. The same method is used for starting when the engine is still hot from a recent run, but it is not usually necessary to close the strangler.

If the engine will not start after a reasonable number of attempts, the cause may be found by a systematic check-over as given under heading "Tracing Troubles," on page 31. Read this section carefully before doing anything to the engine.

STOPPING

The engine can be stopped in two ways.

1. Closing fuel tap will shut off fuel supply, and engine will stop as soon as carburetter float chamber is empty.
2. The ignition system can be switched off by operating the ignition switch, fitted to the engine cowling, or by depressing the cut out strip against spark plug where fitted.

Routine Attention

OIL LEVEL

Do not remove filler plug whilst engine is running.

After every eight running hours, the level of oil in engine sump must be checked, and if necessary topped up with recommended grade of oil.

The engine **must be level** when checking and topping up, otherwise an incorrect amount of oil may be put in.

Check reduction gear oil level every 50 running hours. See Fig. 9 and Fig. 10 for position of oil filler and level plugs.

CHANGING THE OIL

After every 100 hours operation, drain all old oil from sump by removing small hexagon plug fitted at end of sump.

This is best done when engine is warm, as oil will then run out freely.

Refill sump with clean new oil of the correct grade.

Note :—If the above operation is not carried out at proper intervals, the operation of the engine may be affected, due to excessive wear and formation of large deposits of carbon.

Reduction gear oil should be changed when engine is overhauled.

AIR FILTER

Regular attention to the air filter is required, especially when engine is operating under dusty conditions. It is important to see that the filter does not become choked, or engine will lose power and fuel consumption become excessive.

If engine runs better without the filter, then the filter needs cleaning. Directions for this operation are given on pages 12 & 13.

CLEANING BREATHER VALVE

We show in Fig 11 an illustration of the breather valve assembly which is screwed into the rocker box. After approximately 200 hours running, or more often in severe dusty conditions, the breather valve end cap should be unscrewed in an anti-clockwise direction, and the gauze taken out for cleaning in petrol or paraffin.

Take care to replace the split pin. The breather valve body is pinned to the rocker cover, and need not be removed. The breather valve ball can be removed after taking out retaining circlip.

Maintenance and Repairs

PETROL FILTER

Occasional examination and cleaning of the filter gauze is desirable. This filter is accessible by unscrewing the banjo bolt (not illus., fig. 6, illus 12, fig. 4 and illus. 13, fig. 5). There is also a filter incorporated in the petrol tap (illus. 9, fig. 3).

SPARKING PLUG

Clean and re-set the points .025" gap after each 100 hours operation. Adjustment of the gap should be done by moving the points attached to the outer body of the plug. NEVER BEND THE CENTRE PIN. Keep the outside of the plug insulation free from water and dirt. When screwing the plug into the cylinder head, should any undue stiffness be experienced, do not use force but examine the threads for any particles of grit or carbon which may be present. These must be removed, otherwise the threads in the cylinder head may be damaged. It is a good plan to smear a little graphite grease on the plug threads before replacing.

CONTACT BREAKER ASSEMBLY

Check the points for cleanliness and for correct clearance when in fully open position. To gain access to the contact breaker points it is first necessary to remove the engine cowling, pulley, flywheel and dust cover.

Turn crankshaft clockwise until the heel of the rocker arm is on top of the profile of the cam attached to the crankshaft. Should point gap be more or less than .020" release screw "A" (fig. 1) when the bracket "B" (fig. 1) can be positioned so that a .020" feeler gauge can just be inserted between the contact points. Tighten screw "A" and withdraw feeler gauge.

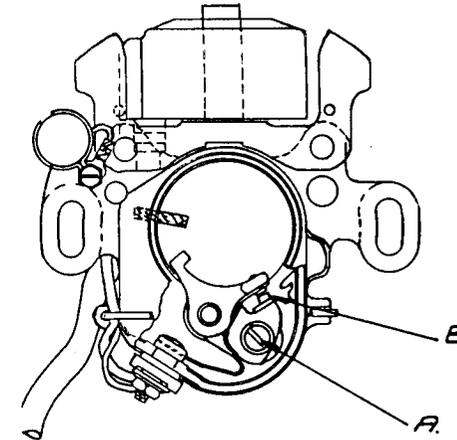


Fig. 1

DECARBONISING

This will be necessary at intervals, varying according to the type of service the engine has to perform, but generally after every 200/300 hours operation. If the engine "knocks" at normal loads but not when the load is reduced, it is usually an indication that there is an excessive amount of carbon on the piston and the inside of the cylinder head. It is advisable to have new cylinder head and rocker cover gaskets available for replacement in the event of the originals being damaged.

VALVE GRINDING

While the engine is being decarbonised raise the valves and inspect the condition of the seats to see whether they require re-grinding. When the valve springs are compressed, the horse shoe collars which hold the spring seat in place can be removed, thus allowing the valves to be taken out of the cylinder head. All traces of grinding compound must be removed before re-assembly of the valves. A suitable grade of valve grinding compound is Carborundum No. 360 Fine. Inlet and exhaust valves are marked on the stems and are not interchangeable.

VALVE CLEARANCE

When the valves are in the closed position there must be clearance between the valve stem and the valve rocker. In the case of the exhaust valve the clearance should be .006" and for the inlet valve .003". These clearances refer to a cold engine.

To reset the valve clearance the valve rocker adjusting screw (illus. 81, fig. 3) should be turned in the required direction after the lock nut has been released. Make sure that the lock nut is re-tightened after adjustment.

COOLING SYSTEM

The fan is now an integral part of flywheel and it is vital that the complete casing should be in position when the engine is running.

CRANKSHAFT AND CAMSHAFT

Unless it is absolutely essential we do not recommend that the crankshaft or camshaft be removed.

In some cases when removing the crankshaft the ball race may come away with the shaft instead of being left in its housing. This will prevent the shaft being withdrawn completely with the camshaft still in position as the ball race overlaps the gear teeth on the camshaft.

The method of removal therefore is to withdraw the camshaft spindle which will allow the camshaft to be lifted out of the crankcase after the crankshaft has been withdrawn sufficiently to permit the gear to lie between the two crank webs.

With the crankpin lying at its furthestmost point from the camshaft, the whole camshaft can then be rolled around the crankshaft itself and lifted clear. In doing this it is desirable that the crankpin should be protected by insulating tape or similar protection in order to prevent it being bruised by the camshaft gear during this operation.

OIL LEAKS

The outside of the engine should be kept clean. If oil leaks develop check the tightness of the rocker cover and the cylinder nuts. Examine oil level—this should not be higher than the notch on the dipstick.

If after these precautions, oil still leaks from the crankshaft bearing or governor shaft, it would be advisable to examine the condition of the oil seals and piston rings; the latter must be free in their grooves and rubbing surfaces clean and bright. Remove carbon from grooves and replace any damaged rings. Check breather valve for cleanliness and operation.

CARBURETTER (BV1320) (See fig. 5, page 22)

Carburetter Adjustments

The carburetter is set before the engine leaves the works and under normal conditions no adjustments should be necessary. The main and pilot jets are not adjustable, but the throttle stop screw can be turned in to increase or out to decrease the idling speed. A spring loaded screw enables adjustments to be made to the slow running mixture strength, turning clockwise to richen and anti-clockwise to weaken the mixture.

Resetting Pilot Air Bleed and Throttle Stop Adjusting Screws

If the original settings have been lost, turn the pilot adjusting screw clockwise until it is fully home and then give two complete turns anti-clockwise. Start the engine and allow it to warm up and see that it runs evenly, both on and off load. If the engine "hunts" when off load, turn the pilot adjuster anti clockwise until smooth running results. Any tendency for the engine to fade when load is suddenly applied may be corrected by slightly turning the adjuster screw clockwise to richen the mixture. The screw should be moved only one-eighth of a turn for each adjustment and engine put on load momentarily for each check.

Carburetter Maintenance

The gauze around the banjo bolt should be removed periodically and washed in petrol. If it is necessary to dismantle the carburetter it is advisable to blow out the main casting with an air line. Do not use a rag and under no circumstances try to clear the jets with a pin or wire. This will only enlarge the jets and impair the running of the engine. All parts of carburetter should be carefully cleaned before reassembly and it is important to replace the gasket between the two halves of the body. The fuel needle is screwed into the top half of the body and access is only possible by dismantling.

Air Filter

The paper element type filter should be dismantled every 20 operating hours and the element tapped against a solid surface to remove dust and grit. Replace paper element every 100 operating hours or sooner if engine is operating under extreme dusty conditions.

CARBURETTER (ZENITH) See fig. 6, Page 25

Carburetter Adjustments

The carburetter is set before the engine leaves the works and under normal conditions no adjustments should be necessary. The main and pilot jets are not adjustable.

With the load off the engine the slow-running mixture strength can be set. The strength of the mixture can be varied by means of the air regulating screw (illus. 45, Fig. 6) and screwing in a clockwise direction will enrichen the mixture.

Adjustments for idling speed can be made by means of the throttle stop screw (illus. 5, Fig. 6) which controls the throttle opening. Screwing in a clockwise direction will increase the idling speed of the engine.

All adjustments should be made when the engine is hot.

The magneto is timed so that the contact breaker points commence to open when the piston is .100" before top dead centre. Accurate timing can only be done with the piston visible, therefore the cylinder head must first be removed.

The cam operating the contact breaker lever is keyed onto the crankshaft and if alterations to magneto timing are necessary, this is achieved by altering the position of the stator plate.

With piston in the correct position release stator plate holding screws and move stator plate until the contact points are just commencing to break. Then tighten down holding screws. Always set contact breaker points to .020" before timing ignition.

Smear a little heavy oil on the cam profile and on cam breaker felt when assembling. If too much oil is put on the felt pad it will creep along the rocker arm and foul the contact points.

GOVERNOR

This is carefully set before delivery to give the specified engine speed. An adjusting nut is fitted above the spring so that a different speed may be obtained when this is really necessary. NO ADJUSTMENT can be made by altering the position of the lever on the shaft. Hunting at light load may occur due to stiffness in the joints of the carburetter link. These should always be quite free, and adjustment of the pivot pins to ensure this can be made provided that the locknut is tightened up again. If hunting occurs when the joints are free, the throttle adjusting screw should be screwed in, so that the throttle just does not close, without appreciably increasing the engine speed. Hunting may also be due to a weak carburetter setting.

To reset governor after removal

Fit governor lever loose on its shaft, connect up carburetter link at each end, turn shaft as far as possible in a clockwise direction then move the lever to the right until the throttle is fully open. Tighten clamp bolt securely.

CONNECTING ROD

This rod is fitted with detachable white metal linings which can, and should, be replaced when necessary without filing or scraping. It is essential that the assembly lugs are correctly mated up as shown in fig. 2.

Always replace connecting rod with assembly lugs towards the camshaft.

The connecting rod bolts are now fitted with a locking type nut and not the castellated type illustrated in fig. 2. It is recommended that these locking nuts be replaced after dismantling.

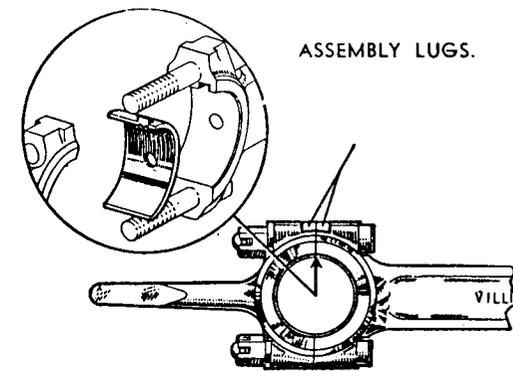
Note:—When ordering spares it is important that the engine number is quoted. This will be found on the name plate fixed to the fan casing. Always quote the part number and description, not the illustration number.

ENGINE, COWL and TANK ASSEMBLY Fig. 5

ILLUS. No.	PART No.	DESCRIPTION.	QTY.
1	C880AU/2	Tank, fuel with cap & insert (not as illus.)	1
—	E1158AU/2	Band, rubber tank strap	2
2	EM542	Strap, Fuel tank	2
3	E1009AU	Cap, fuel tank (not as illustrated)	1
or	E1009AU/1	Cap, fuel tank (from engine serial No. 26237)	1
—	E1120AU	Insert, fuel cap	1
or	E1120AU/1	Insert, fuel cap (from engine serial no. 26237)	1
4	DM1292	Bracket, tank support	2
4A	EM1575	Bolt, tank support	4
5	E163AU	Screw, tank strap (long)	2
and	E265AU	Screw, tank strap (short)	2
6	E134AU	Trunnion, plain, strap screw	4
7	E1482AU	Trunnion, tapped	4
8	D1781AU/18	Pipe, petrol	1
9	E1514AU	Tap, petrol	1
—	E10824	Plunger with cork, petrol tap	1
—	M596	Strip, cut out	1
11	80302	Cowl	1
12	EM1264	Bolt, top cowl	2
13	16653	Washer, bolt	2
14	20984	Bolt, side, cowl	1
—	E1210AU	Washer, bolt side cowl	1
15	E785AU	Ring Set, Std size	1
or	E785AU/20	Ring Set, .020" O/S	1
or	E785AU/30	Ring Set, .030" O/S	1
or	E785AU/40	Ring Set, .040" O/S	1
19	D1923AU	Piston, complete, standard	1
or	D1923AU/20	Piston complete, .020" O/S	1
or	D1923AU/30	Piston complete, .030" O/S	1
or	D1923AU/40	Piston complete, .040" O/S	1
20	EM135	Pin, gudgeon	1
21	E903AU	Circlip, gudgeon pin	2
22	30531	Rod, connecting, complete	1
23	29261	Bolt, connecting rod	2
24	E2924	Washer	2
25	E1462AU	Nut, connecting rod bolt	2
27	DM1591	Liner, connecting rod, standard	1 pr.
or	EM2566	Liner, connecting rod, .020" U/S	1 pr.
28	See Page 19	Crankshaft (quote engine No.)	1
29	EM523/2	Gear, timing, crankshaft	1
30	18429	Key, timing gear	1
31	28244	Bearing, ball, magneto side (L.S.8)	1
—	EM545	Shim packing armature bearing	4
32	20940	Seal, oil Mag. Side (MIS012)	1
33	DM530	Washer, joint, armature plate	1
33A	28245	Bearing, ball, drive side (MS9)	1
34	28893	Seal, oil, drive side	1
35	EM1553	Nut, cap, rocker cover	1
36	H104X8	Washer, cap rocker cover nut	1
37	28217	Cover, rocker	1
38	EM1185/3	Washer, joint, rocker cover	1

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ILLUS. No.	PART No.	DESCRIPTION	QTY.
39	—	Valve, breather, complete (see page 30)	1
—	E1813AU	Dowel rocker cover	1
—	EM1194	Stud long rocker cover	1
43	EM1197	Nut, rocker bracket	1
44	E2667	Washer, spring	1
45	EM1559	Stud, short, cylinder head	2
46	27815	Nut, cylinder head stud	2
47	EM1568	Stud, medium, cylinder head	2
48	EM1572	Nut, long	2
49	E2667	Washer	4
—	EM1471	Stud, long cylinder head (not illustrated)	1
50	E9290	Stud, Silencer Fixing	2
50	E998AU	Stud, inlet pipe	2
51	18320	Washer, spring (Inlet and silencer studs)	4
52	EM1565	Nut, stud inlet and silencer	4
53	30525	Head, cylinder	1
54	DM1199	Gasket, cylinder head	1
55	80277	Cylinder and crankcase std. (Not as illus.)	1
56	DM2409	Washer, joint, cylinder base (Not as illus.)	1
57	BM2324	Base, crankcase (Not as illus.)	1
58	E998AU	Stud, armature/crankcase	3
58A	E907AU	Screw, cowl to back plate	2
58B	22212	Washer, cowl to back plate	2
59	E8907	Stud, crankcase base	4
60	E9723	Washer, shakeproof	4
61	27815	Nut	4
62	D1945AU	Plug, oil filler and dipstick (Not as illus.)	1
64	E1608AU	Plug, oil drain	2
66	EM1071	Valve, exhaust	1
67	EM1937	Guide, valve	2
68	EM515	Collar, valve spring	2
69	EM2143	Seat, valve spring, top	2
70	EM1932	Spring, valve	2
71	EM1938	Seat, spring, bottom	2
72	EM546	Circlip, rocker	2
73	EM1083	Washer, rocker spindle	4
74	EM1074	Spindle, rocker	1
76	EM1073/1	Rocker	2
—	29569	Spring, rocker return R.H.	1
—	29570	Spring, rocker return L.H.	1
77	EM1183/2	Bracket, rocker	1
78	EM1169	Valve, inlet	1
79	EM1194	Stud, rocker bracket	1
80	EM1197	Nut	1
81	EM1195	Screw, valve rocker adjusting	2
82	EM1197	Nut, valve rocker adjusting screw	2
83	EM1072	Tappet	2
84	DM1079	Rod, push	2
85	EM202	Washer, joint, inlet pipe	1
95	EM546	Circlip, Camshaft	1
96	EM521	Spindle, camshaft	1
97	DM507	Camshaft with gear	1
98	27815	Nut, governor gear spindle	1
99	EM341	Washer, lock, governor spindle	1
—	D1752AU	Governor gear assembly	1
100	D1350AU	Wheel, governor gear	1
101	V111 x 2E	Pin, split	2
102	D1535AU/1	Pin, governor gear	2
103	EM701/1	Weight, governor gear	2



ASSEMBLY LUGS.

Fig. 2

VALVE TIMING

Correct timing will only be obtained by assembling the camshaft and crankshaft gears so that the timing marks on each gear are together and in line (see Fig. 2A).

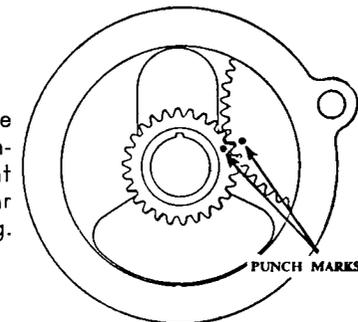


Fig. 2A

PISTON RINGS

Three compression and one scraper ring are fitted to the piston in the following order:—

Top Compression Ring: Chromium plated stepped ring. Fit with letters "BTM" towards bottom of piston.

Second Compression Ring: A taper faced ring. Fit with letter "T" towards top of piston.

Third Compression Ring: A symmetrical ring, can be fitted either way.

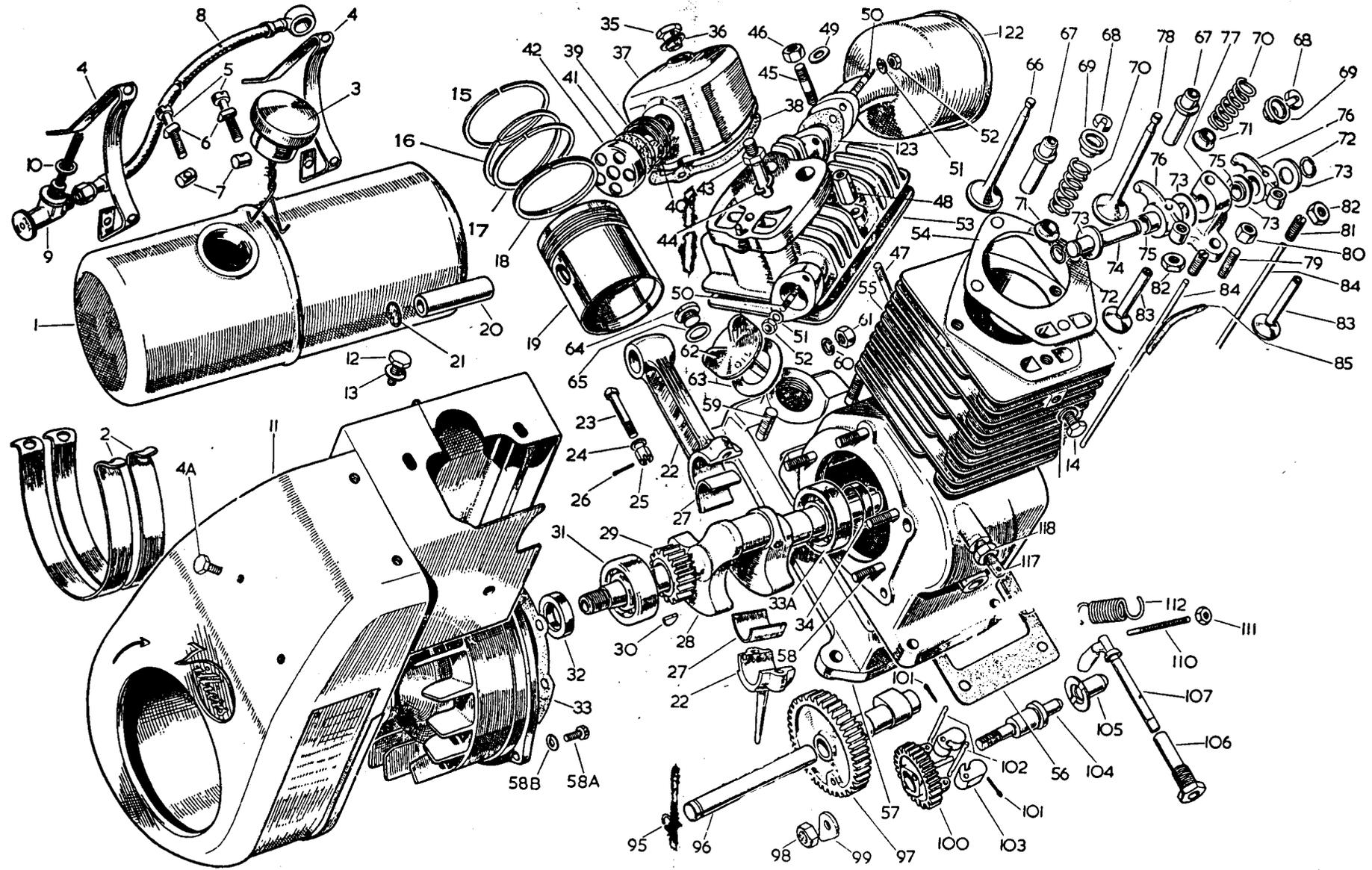
Scraper Ring: Can be fitted either way.

Piston Ring gap is as follows:—

Square cut gap: .011 to .015"

The above figures are for new components fitted in a new cylinder bore.

When the piston ring gap exceeds .030" the ring should be changed or cylinder examined for excessive bore wear.



(Fig. 3)

ENGINE COWL and TANK.