

NORTON VILLIERS
F.12
FOUR-STROKE
INDUSTRIAL ENGINE

OPERATING INSTRUCTIONS
AND
REPLACEMENT PARTS

NORTON VILLIERS LTD.

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TECHNICAL DATA

Model	F.12
Bore	59 mm (2.324 in)
Stroke	44 mm (1.732 in)
Capacity	119 c.c. (7.32 cu. in.)
Oil-sump capacity	$\frac{7}{8}$ pint (.48 litres)
Fuel-tank capacity	4 pints (2.27 litres)
Contact-breaker points gap	.018 in (.46 mm)
Ignition timing B.t.d.c.	.125 in (3.17 mm)
Sparking plug	Champion N8
Sparking-plug gap	.030 in (.76 mm)
Tappet clearance (Inlet and exhaust)	.006 in (.15 mm)
Carburettor	Amal 379
Rotation (Facing drive shaft)	Anti-clockwise
Dry weight	30 lb (13.6 kg)

FOREWORD

This engine is an air-cooled four-stroke power unit manufactured to high standards of quality and precision and provided the maintenance instructions given in this handbook are closely followed it will give long and trouble free service. When a major overhaul or repairs involving dismantling are necessary the operator is advised to entrust the work to an official Norton Villiers Service Depot.

LUBRICATION SYSTEM

The engine is lubricated by a simple system. The camshaft gear, operating in an oil trough, picks up oil as it revolves and as the teeth mesh with those of the crankshaft pinion, oil is squirted from the teeth with considerable pressure. An oil mist is built up in the engine providing adequate lubrication for the moving parts.

The system requires no maintenance but users must ensure that the sump is filled to the top of the filler-hole threads and that oil changes are carried out as instructed.

Oil recommendations

Below -9°C (16°F):	Castrolite (SAE 10W-30)
Above -9°C (16°F):	Castrol GTX or XL (SAE 20W-50)

OPERATING INSTRUCTIONS

Before starting a new engine

Read all labels attached to the engine, clear away packing material and wipe the engine clean. Fill the sump with oil of the recommended grade.

Fill the fuel tank with regular or commercial-grade of petrol. During the early life of the engine add one tablespoonful of oil or upper-cylinder lubricant to each gallon of petrol.

Remove the sparking plug and check the points, which, if the engine has been standing for any length of time, may be affected by condensation. If so dry and refit.

Starting a cold engine

Turn on the petrol and close the choke. Set the throttle $\frac{1}{4}$ to $\frac{1}{2}$ open. Using the rewind starter, rotate the engine until compression is felt and continue to turn the engine until it is just past compression. Allow the starter rope to rewind, pull the rope slowly until the starter mechanism engages with the engine and give a brisk pull to start the engine. Allow the starter rope to rewind slowly. Open the choke as soon as possible after the engine has started.

Restarting a hot engine

Proceed as previously described but do not close the choke.

Stopping the engine

Close the throttle and depress the spring-loaded ignition cut-out allowing it to rest on the plug terminal until the engine has stopped.

ROUTINE MAINTENANCE

Daily

Check the oil level in the sump and top up as required with oil of the recommended grade.

After the first 5 hours operating time

Carry out the first oil change. This is important as during the running-in period the engine oil may have become impregnated with minute particles of metal which will impair its lubricating qualities.

Remove the drain plug, preferably whilst the engine is hot and allow the oil to drain away. When the sump is empty, replace the drain plug and fill the sump with oil of the recommended grade.

After every 50 hours operating time

Change the engine oil as previously described. If the engine operates under very dusty conditions it is advisable to reduce the time between oil changes. Each time the oil is changed the air filter should be serviced.

Sparking plug

Remove and clean the sparking plug, preferably using sand-blasting equipment. Blow away loose particles of sand with compressed air. The gap should be checked and set to the recommended figure by bending the outer earth electrode only. Never bend the centre electrode. The efficiency of the spark can be tested on garage servicing equipment.

Contact breaker

Check the contact-breaker points as instructed in the section dealing with the ignition system.

Fuel filters

Where fuel filters are fitted to the fuel tap or the carburettor they should be removed and thoroughly cleaned.

Paper-element air filter (Fig. 2)

The air filter should be inspected regularly and if the element has become seriously impregnated with dirt it should be replaced. It must not be wetted or oiled. A choked air filter will cause rich mixture, which will be indicated by black smoke from the exhaust, bad starting and loss of power.

Oil-wetted air cleaner (Fig. 3)

Remove the top cover, take out the gauze and felt pad and wash all parts with clean petrol. Allow them to dry and dip the element and felt pad in clean engine oil. Drain off the surplus oil and reassemble.

Rewind starter

Remove the rewind starter and oil the centre pivot at the back of the starter, which if allowed to become dry will impair and eventually cause damage to the rewind mechanism.

Engine

At all times the engine exterior should be kept clean, particular care being taken to keep the cylinder and cylinder-head fins clear of fouling which could cause overheating.

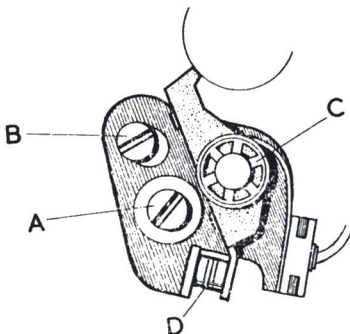


Fig. 1
Contact-breaker assembly

IGNITION SYSTEM

Ignition is provided by a flywheel magneto consisting of two main assemblies, the flywheel and the stator. The stator around which the flywheel revolves, comprises a metal plate bolted to the crankcase and carries the H.T. coil, condenser, and contact-breaker mechanism.

Contact-breaker points (Fig. 1)

To gain access to the contact-breaker points, remove the rewind starter which is secured to the cowl by three screws. With a $\frac{1}{8}$ in. A.F. box spanner or socket and tommy bar, undo the pulley fixing nut by striking the tommy bar with a hammer. It has a normal right-hand thread. With the pulley removed the flywheel inspection plate is accessible. Take off the inspection plate and rotate the flywheel until the contact-breaker mechanism is revealed, and the points are in the fully open position.

Using a .018 in (.46 mm) feeler gauge check the gap. It should be just possible to slide the gauge in without force. If adjustment is necessary, release the fixed-contact screw 'A' and turn the eccentric screw 'B' to obtain the correct gap. Tighten the fixed-contact screw and recheck the gap.

To remove the contact set for replacement, partial dismantling of the magneto is necessary. This involves the use of an extractor to withdraw the flywheel and the work should be entrusted to a skilled mechanic.

CARBURETTOR

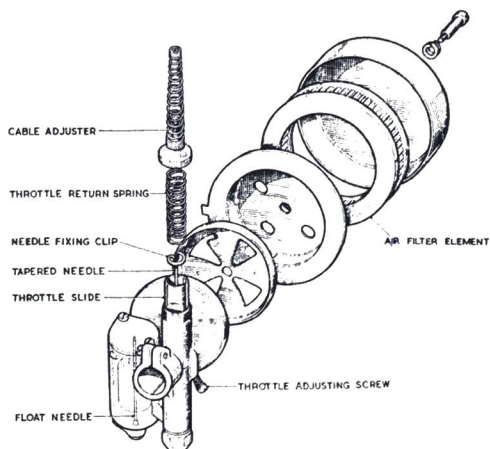
The carburettor is correctly set before leaving the works and alterations to the adjustment should be made only when absolutely necessary.

The carburettor is of simple construction and the only servicing necessary is the periodical cleaning of the float chamber, jets and filters.

To reach the main jet, unscrew the large hexagon cover nut at the base of the carburettor body. After removing the tubular filter, the main jet can be unscrewed from the bottom of the needle jet. A blocked jet should be cleared with compressed air. Never use a pin or wire as the jet is finely calibrated and the bore is easily damaged.

To remove the float and float needle, unscrew the two float-chamber cover screws and take off the top cover. Unscrew the banjo bolt at the base of the float chamber and push the needle downwards until it is released from the clip and passes through the needle seating.

Fig. 2
Amal 379 carburettor
with renewable paper-
element air filter



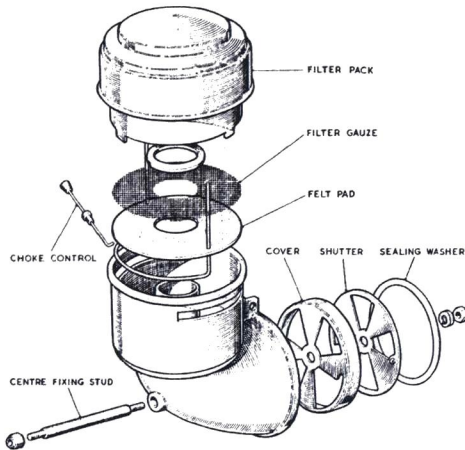


Fig. 3
Oil-wetted gauge air filter, fitted for certain engine applications

Any sediment should be cleaned from the float chamber and needle seating and the needle checked to see that it is not bent. Serious flooding can be caused by a faulty or dirty fuel needle seating.

The throttle needle, which passes through throttle slide, is secured by a clip located in one of the grooves at the top of the needle. The needle provides a mixture adjustment covering throttle openings of between $\frac{1}{4}$ and $\frac{3}{4}$. Lowering it will also compensate for wear of the needle or needle jet. Raising the needle, by moving the clip to another groove richens the mixture, lowering the needle weakens it. The needle position which is decided after careful tests should not be altered unless it is proved necessary.

Idling adjustment is provided by a slow-running screw located in the carburettor body and adjustments should be made with the engine at its operating temperature. To set the idling speed, close the throttle fully, slacken the adjuster screw locknut and turn the adjuster screw in or out until the idling speed is satisfactory. Retighten the locknut.

Excessive backlash on the throttle cable is adjusted by means of the screw in the carburettor top disc.

The carburettor is fixed to the inlet pipe by a clamping screw and should be fitted perfectly upright.

FAULT-FINDING GUIDE

The diagnosis and rectification of faults in an internal combustion engine is simplified if investigation is carried out in a logical and systematic manner.

The engine should operate satisfactorily if:

1. There is fuel in the tank and it is being supplied to the engine in the correct fuel/air ratio.
2. There is a good spark at the sparking plug.
3. The spark occurs at the correct distance before top dead centre.
4. The engine is in good mechanical condition, with the valves, valve seats, cylinder bore and piston rings sound.

Engine stops suddenly or fails to start

Check that there is fuel in the tank and that the spring-loaded ignition cut-out is not shorting out the sparking plug.

Remove the sparking plug and examine the working face. If there are signs of unburnt fuel there is probably an ignition fault. Dry the plug and with the H.T. lead attached, earth the body of the plug to some bare metal part of the engine. Using the rewind starter rotate the engine briskly. If no spark occurs detach the H.T. lead, hold the end of the lead about $\frac{1}{8}$ in from bare metal and once more rotate the engine. If the magneto is producing a spark the plug is most probably at fault and should be cleaned and reset or changed. If there is no spark from the magneto examine the H.T. lead and magneto wiring for shorts or dampness. Clean the contact-breaker points with a brush moistened in white spirit and check the gap. If the points are slightly pitted or burnt they should be dressed with a carborundum stone, if they are badly affected they should be renewed.

If the plug is dry and sparking satisfactorily it may indicate fuel shortage. Ensure that the air vent in the filler cap is not blocked and trace the flow of petrol from the tank to the carburettor by undoing the banjo union leading into the carburettor. When it has been ascertained that fuel is reaching the carburettor but is not reaching the combustion chamber, refer to the chapter dealing with the carburettor and trace the flow of petrol through the fuel needle into the float chamber and through the jets.

If a valve sticks in its guide and fails to close, the engine will not start. There will be a total loss of compression and the tappet clearance of the affected valve will be excessive. The only satisfactory remedy is to remove the cylinder head, take out the valve and polish the stem with fine emery cloth until the carbon deposits are removed and the valve is free in its guide.

Lack of power

This may be due to a faulty or incorrect grade of sparking plug, dirty or incorrectly adjusted contact-breaker points, incorrect ignition timing or partial obstruction of the fuel supply.

It may also be due to loss of compression. When rotating the engine, compression should be indicated by resistance as the piston reaches the top of the compression stroke. Should there be no evidence of compression, the gas which is normally compressed in the combustion chamber is leaking past either the valves, piston rings or the cylinder-head gasket.

Valve leakage occurs when the valves or valve seats are pitted or burnt, when the valves sticking in their guides or held open by incorrect tappet clearance. Should the piston rings or cylinder bore be at fault, a sure indication will be heavy oil consumption and a smoky exhaust. If the cylinder-head gasket is blowing it should be possible to see or hear the gas escaping. The remedy for these faults is to have the engine decarbonised or completely dismantled for examination.

Engine misfires or runs erratically

Erratic running will be caused if there is a fault in the ignition system or the carburettor. It may be caused by dirty or incorrectly adjusted contact-breaker points, an intermittent short in the H.T. cable or magneto wiring or a faulty condenser.

A partial stoppage in the fuel supply or partially choked jets will cause weak mixture resulting in bad starting, overheating and spitting back through the carburettor. Air leaks at the junction of the carburettor and the inlet pipe will also cause weakness with similar symptoms.

'Lumpy' running and eight-stroking with black smoke from the exhaust is caused by an excess of fuel in the float chamber usually resulting from a badly seating fuel needle.

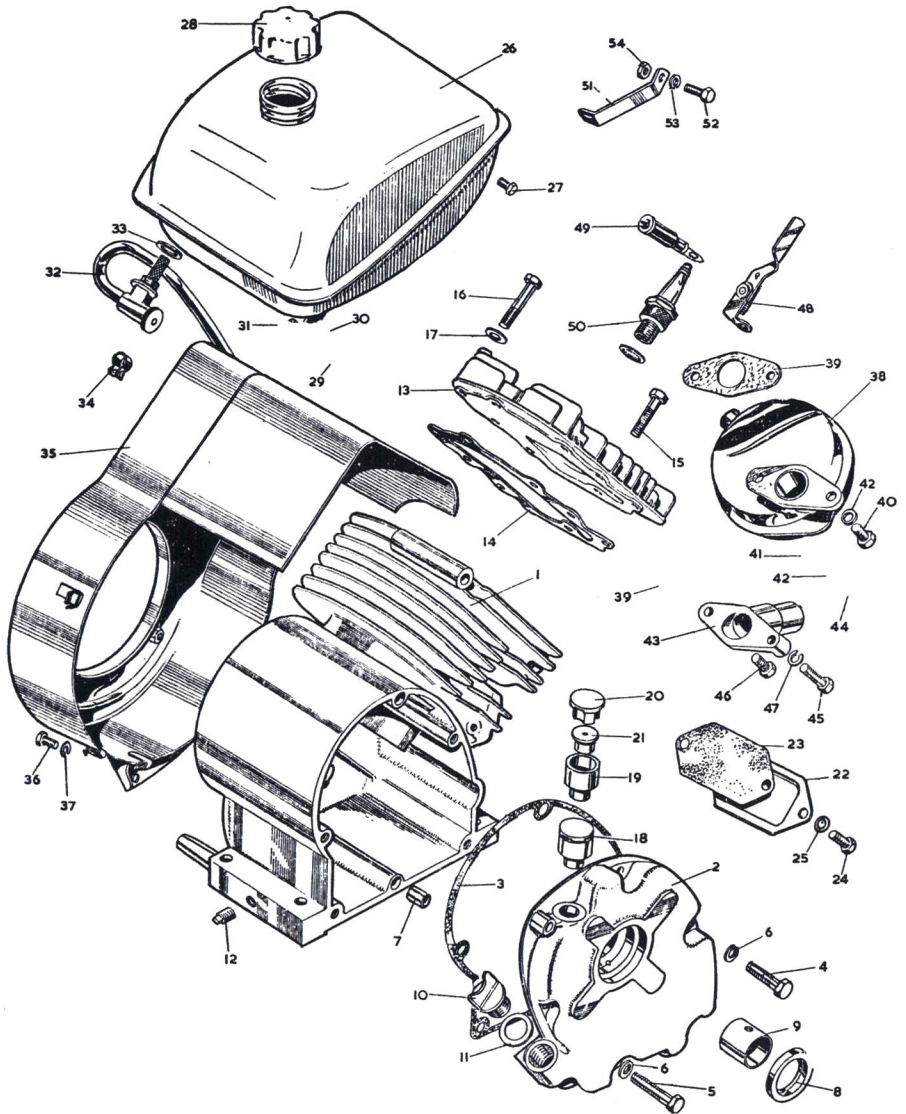


Fig. 4
Engine components

REPLACEMENT PARTS

ENGINE

Illus. No.	Part No.	Description
1	87-1511	Cylinder block
2	87-1598	Crankcase cover
3	87-1616	Gasket
4	87-2004	Bolts (4)
5	30024	Bolts (2)
6	25592	Washers (6)
7	66-3074	Dowels (2)
8	86-8769	Oil seals (2)
9	30164	Bearings (2)
—	87-1528	Bearings—.010 in. undersize (2)
—	87-1529	Bearings—.020 in. undersize (2)
10	86-6515	Filler plug
11	86-6035	Washer
12	86-8771	Drain plug
13	87-1575	Cylinder head
14	87-1576	Gasket
15	87-2006	Bolts (short) (6)
16	87-2007	Bolts (long) (2)
17	18316	Washers (8)
18	87-1669	Breather complete
19	87-1670	Breather body
20	87-1671	Breather top
21	87-1673	Breather valve
22	87-1858	Valve-chest cover
23	87-1630	Gasket
24	20943	Bolts (2)
25	2-0525	Washers (2)
26	87-1693	Fuel tank
27	25613	Bolt
28	30505	Filler cap
29	20943	Bolts (2)
30	25592	Washers (2)
31	21865	Nut
32	87-1661	Fuel pipe with tap
—	87-1660	Fuel pipe
—	18435/4	Fuel tap
33	18617	Washer
34	64-8023	Clip
35	87-2805	Fan cowl
36	20943	Bolts (2)
37	25592	Washers (2)
38	87-1722	Silencer
or	87-1724	Silencer
39	87-1656	Gaskets (2)
40	87-2002	Flange bolt
41	87-1725	Stud
42	25592	Washers (2)
43	87-1653	Inlet pipe
44	21865	Nut
45	21864	Bolt
46	25613	Bolt

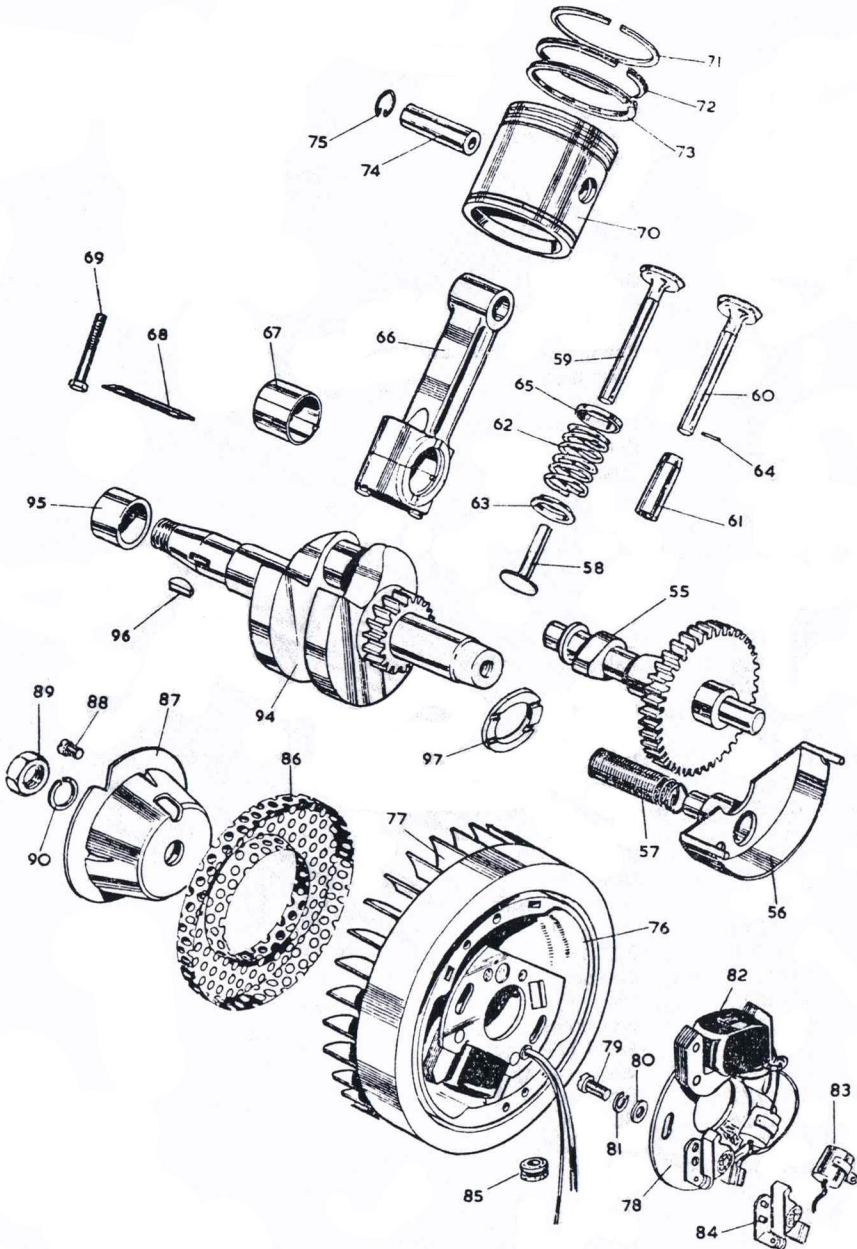


Fig. 5
Engine components

Illus. No.	Part No.	Description
47	25592	Washers (2)
48	87-1666	Ignition cut-out
49	30542	Suppressor
50	87-1574	Spark plug (Champion N.8)
51	87-1662	Air-filter bracket
52	87-2002	Bolt
53	25592	Washer
54	21865	Nut
55	87-1551	Camshaft
56	87-1618	Gear trough
57	87-1619	Spring
58	87-1581	Tappets (2)
59	87-1627	Inlet valve
—	87-2799	Inlet valve—.010 in. oversize
60	87-1628	Exhaust valve
—	87-2798	Exhaust valve—.010 in. oversize
61	87-1514	Valve guides (2)
62	87-1580	Valve springs (2)
63	87-1583	Retainers (2)
64	87-1634	Pegs (2)
65	3996	Cups (2)
66	87-1561	Connecting rod
67	86-2552	Bearing
—	86-2945	Bearings—.010 in. undersize
—	86-2946	Bearings—.020 in. undersize
—	86-2947	Bearings—.030 in. undersize
68	87-1565	Lockwasher
69	87-1564	Bolts (2)
70	87-1638	Piston complete (standard)
71	87-1639	Compression rings (2)
72	87-1641	Scraper ring (stepped)
73	87-1640	Scraper ring
74	86-2511	Gudgeon pin
75	74-1066	Circlips (2)
—	87-1730	Piston complete—.020 in. oversize
—	87-1731	Compression ring—.020 in. oversize
—	87-1732	Scraper ring (stepped)—.020 in. oversize
—	87-1733	Scraper ring—.020 in. oversize
—	87-1734	Piston complete—.040 in. oversize
—	87-1735	Compression ring—.040 in. oversize
—	87-1736	Scraper ring (stepped)—.040 in. oversize
—	87-1737	Scraper ring—.040 in. oversize
76	87-1820	Flywheel magneto complete
77	S3397	Flywheel and fan
78	S3399	Stator plate
79	87-2050	Screws (2)
80	18315	Washers (2)
81	25592	Washers (2)
82	S0551	H.T. coil
83	S2935	Condenser
84	S0577	Contact set
85	42-7539	Grommet
86	87-1655	Grass screen
87	87-1659	Pulley

} For Siba starter
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Illus. No.	Part No.	Description
88	86-6566	Locating screw
89	87-2100	Nut
90	35-0037	Washer
94	Quote engine No.	Crankshaft
95	S3396	Ignition cam
96	86-4555	Key
97	86-8807	Thrust washers (2)
—	S0935	H.T. lead—quote length
—	00-3302	Gasket set

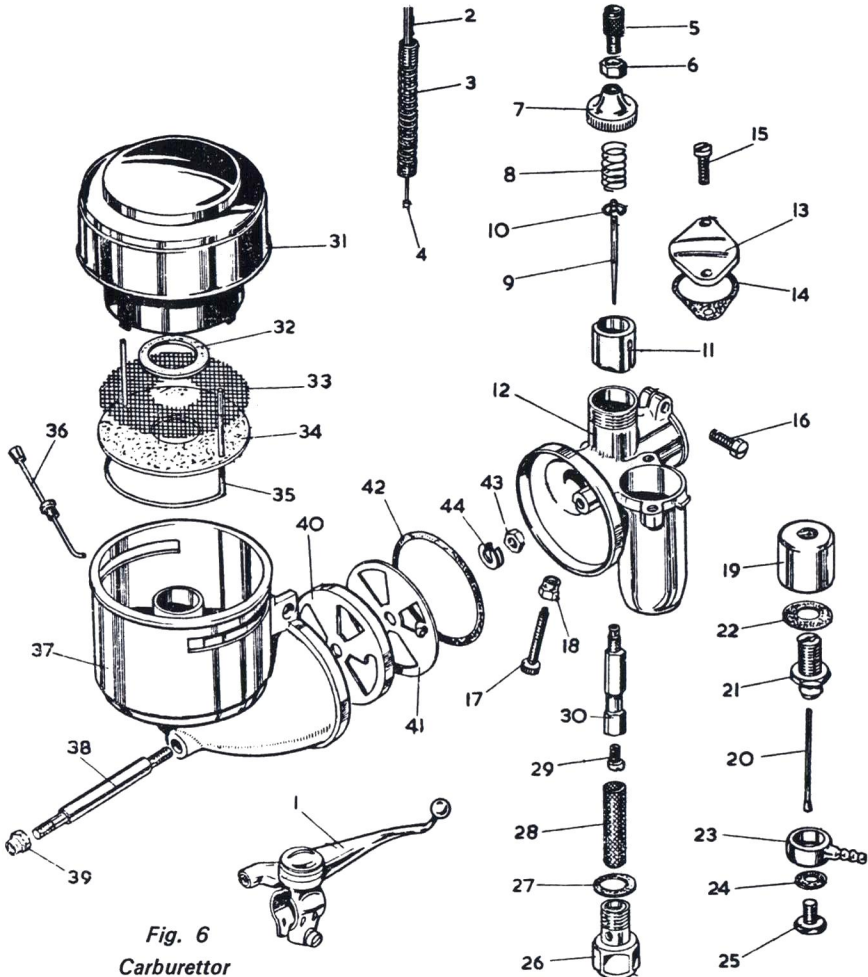


Fig. 6
Carburettor

CARBURETTOR

(Equipped with oil-wetted gauze air filter)

Illus. No.	Part No.	Description
—	87-1658	Carburettor complete with oil-wetted gauze air filter
1	87-1665	Handlebar lever
2	19-7075	Cable (33 $\frac{1}{2}$ ")
3	360/077	Spring sheath
4	308/051	Nipple
5	308/041	Adjuster
6	308/042	Locknut
7	308/040	Mixing-chamber top
8	308/038	Throttle spring
9	308/043	Jet needle
10	308/044	Clip
11	308/054	Throttle valve
12	379/022	Body
13	379/003	Cover
14	379/004	Gasket
15	352/209	Screws (2)
16	11/014	Clamp screw
17	379/015	Slow-running adjuster screw
18	379/016	Locknut
19	308/022	Float
20	308/025	Float needle
21	360/037	Seating
22	360/038	Washer
23	360/036	Banjo
24	360/040	Washer
25	360/039	Bolt
26	360/020	Jet plug
27	38/022	Washer
28	360/051	Filter
29	124/026	Main jet (35 c.c.)
30	335/019	Needle jet
—	384/1	Air cleaner
31	384/009	Filter pack
32	384/015	Washer
33	384/006	Gauze
34	384/005	Felt pad
35	384/012	Gauze extractor
36	348/018	Rod, knob and guide
37	384/001	Filter body
38	384/004	Centre stud
39	244/408	Locknut
40	362/022	Cover
41	383/008	Shutter
42	384/013	Washer
43	295/014	Nut
44	224/044	Washer

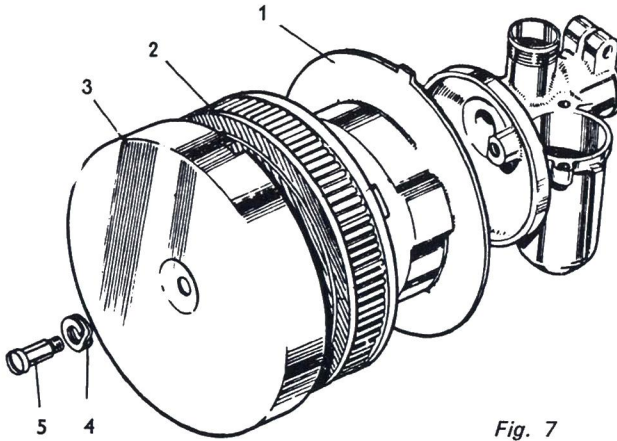


Fig. 7
Paper-element air filter

PAPER-ELEMENT AIR FILTER

Illus. No.	Part No.	Description
—	30829	Carburettor complete with paper-element air filter
—	30828	Carburettor only
1	87-346	Inner cover
2	87-347	Outer cover
3	87-348	Filter element
4	87-349	Bolt
5	16620	Washer

When ordering replacement parts or sub-assemblies always quote the full engine number and insist on components manufactured or recommended by Norton Villiers Ltd.

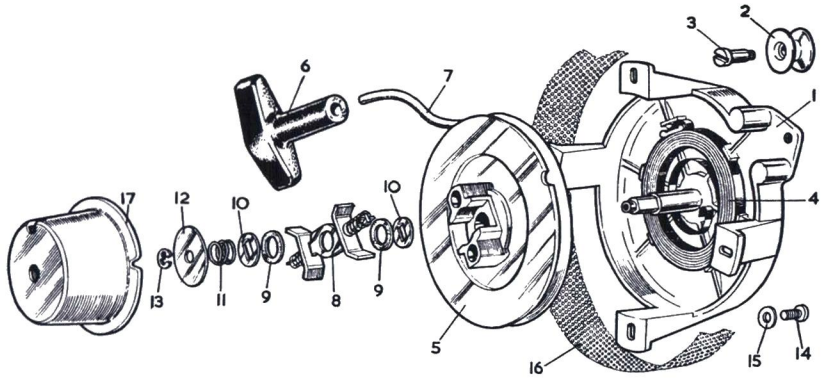


Fig. 8
Rewind starter

SIBA REWIND STARTER

Illus. No.	Part No.	Description
—	40831	Rewind starter complete
1	86-9427	Cover
2	86-9428	Rope guide
3	86-9429	Rope-guide fixing screw
4	86-9430	Torsion spring
5	86-9431	Pulley
6	30417	Handle
7	86-9432	Rope
8	86-9433	Clutch engaging assembly
9	86-9434	Friction discs (2)
10	86-9435	Engaging disc
11	86-9436	Clutch spring
12	86-9437	Clutch retaining washer
13	86-9438	Circlip
14	30802	Rewind-starter fixing screws (4)
15	E5257	Fixing-screw washers (4)
16	40934	Gauze
17	30176	Pulley

GUARANTEE

We give the following guarantee with our engines and accessories in place of any implied guarantee by statute or otherwise, all such guarantees being in all cases excluded. No statement or representation contained in this book shall be construed as enlarging or varying this guarantee. In cases of engines and accessories which have been used for "hiring out" purposes or from which our trade mark, name or manufacturing number has been removed, no guarantee of any kind is given or is to be implied.

Subject to the conditions mentioned below, we guarantee that all usual and reasonable precautions have been taken by us to secure excellence of materials and workmanship, but this guarantee is to extend and be in force for six months only from the date the engines or accessories are purchased by the first owner-user and the damages for which we make ourselves responsible under this guarantee are limited to the replacement of a part manufactured by us and which may have proved defective.

We cannot accept responsibility for the replacement of any proprietary articles or parts not manufactured by us unless the makers of such parts agree to their replacement. We do not undertake to refit or bear the cost of replacement or refitting such new part.

Subject to the conditions mentioned below, we guarantee to make good at any time within six months any defects for which we are responsible, but this guarantee does not apply to defects caused by misuse or neglect.

CONDITIONS OF GUARANTEE

If a part in our engines or accessories is found to be defective it should be sent to us carriage paid, together with the name and address of the sender, the full engine number and the details and date of purchase. We cannot accept responsibility for any parts sent without this information, but such parts will be retained for a period of three months at the risk of the sender, after which time they will be disposed of.

The term "Agent" is used in a complimentary sense only and firms whom we style as our agents are not authorised to advertise, incur any debts or transact any business whatsoever on our account other than the sale of goods which they may purchase from us. They are not authorised to give any warranty or make any representation on our behalf to sell subject to or with any conditions other than those contained in the above guarantee.

The guarantee becomes void if any parts not made or supplied by NORTON VILLIERS LTD. are fitted to the engine.

TEMPORARY STORAGE

Before storing the engine away for a considerable period, the following precautions should be taken to lessen the risk of corrosion and ensure that the engine will start readily and operate efficiently when next required.

1. Turn off the fuel tap whilst the engine is running in order to empty the carburettor.
2. Drain all fuel from the fuel tank and replace the filler cap.
3. Remove the sparking plug and squirt a small amount of engine oil into the cylinder. Rotate the engine a few times so that the cylinder wall is covered with a thin film of oil. Replace the sparking plug.
4. Rotate the engine until the piston is at top dead centre with both valves closed. This action seals the combustion chamber and releases some of the tension from the springs.
5. Cover the engine, preferably with a waterproof sheet, and store in a dry place.

Before bringing the engine into service again

Before bringing the engine into service again, carry out the following procedure.

1. Remove the sparking plug and examine for the effects of condensation, dry and clean it and adjust the points gap if necessary.
2. Check the condition of the H.T. lead.
3. Test all controls for freedom of movement and lubricate if necessary.
4. Examine the carburettor, dry out any condensation and clean if necessary.
5. Drain the sump and refill with clean oil of the correct grade.
6. Before starting the engine, leave the fuel turned off and rotate the engine briskly a few times to raise oil to the moving parts.