THE

HOWARD

ROTAVATOR

'Bantam'

Instruction Book and Spare Parts List

Publication No. RB/B/152

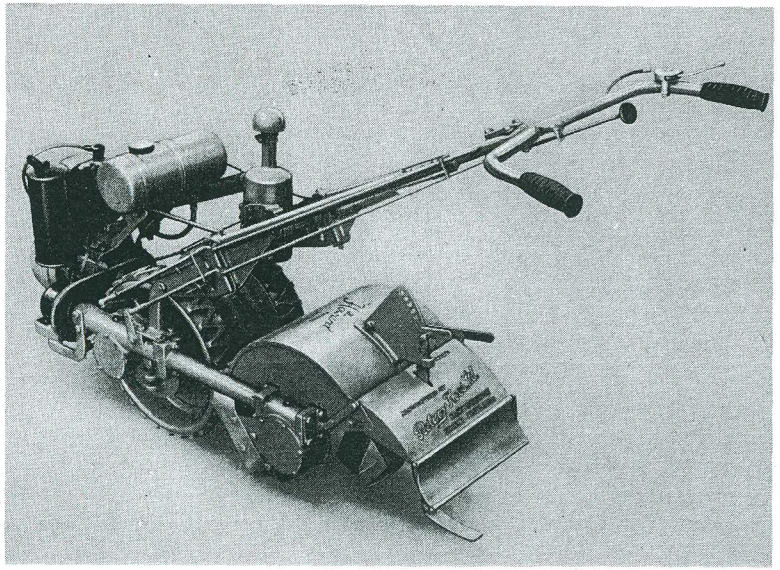
THE HOWARD ROTAVATOR 'Bantam'

INSTRUCTION BOOK AND SPARE PARTS LIST

This Owner's Handbook has been written with the object of providing in the simplest possible manner a complete guide for the owner in the operation of the Rotavator "Bantam". Detailed instructions for the larger maintenance operations, especially those which may become necessary after long service, are not included in this publication, as such work should be entrusted to the Rotavator Dealer.

ROTARY HOES LIMITED
HORNDON · ESSEX · ENGLAND
Tel. No. Herongate 361 (6 lines) Cables: Rotovate, Brentwood

THE HOWARD ROTAVATOR 'Bantam'



GENERAL DESCRIPTION

ENGINE: A separate Engine Instruction Book is provided with each machine.

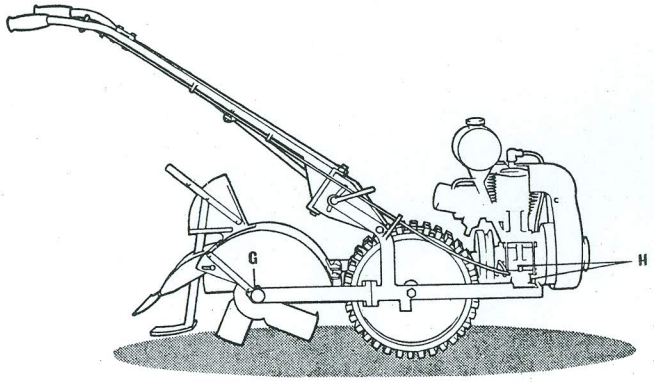
GEAR-BOX (*see Diagram* 2) : The primary drive from the engine is by V belt to high and low-ratio pulleys. The forward belt pulley gives high ratio, i.e. the fast speed, and the rear pulley gives the low ratio, i.e. the slower speed. The drive is then by worm shaft to the two-speed gear-box. Four travel speeds are thus provided.

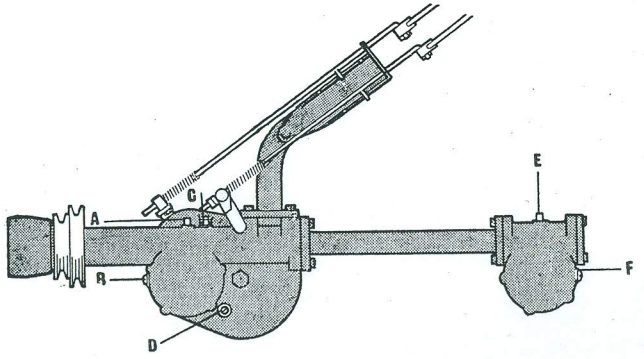
ROTOR (*see Diagram* 3) : The drive to the rotor is by worm gear with its separate control. The rotor has a cultivating width of 10″, 12″ or 14″ with flanges carrying eight specially shaped hoe blades, four of which are right-hand and four left-hand.

DIMENSIONS: Overall length 5′ 2″ ; overall width 1′ 3″ ; Weight including Rotor 196 lbs. Working depth 5″ on lay ground ; 7″ to 8″ on worked garden soil. This is easily adjustable in ½″ stages.

LUBRICATION

FILLING AND OILING POINTS





A Filler for Worm Drive Gear-box.

B Oil level screw for Worm Drive Gear-box.

C Filler for Change Speed Gear-box.

D Oil level screw for Change Speed Gear-box.

E Filler for Rotor Drive Worm Gear-box.

F Oil level screw for Rotor Drive Worm Gear-box.

G Rotor Axle Cap.

H Engine Mounting Oil Cups (two on offside and two on near side).

All other moving parts as required. FOR ENGINE SEE ENGINE INSTRUCTION BOOK

Use gear oil SAE 140. There are eight filling and oiling points :—

1. MAIN GEAR-BOX Plug A will be found on top of the worm gear-box and another C on top of the change-speed gear-box. Fill and maintain both boxes up to the level plugs provided B and D. Replace plug.

2. ROTOR Remove filler plug E on top of the rotor worm drive box and fill and maintain up to level plug provided F. Replace plug.

3. ROTOR AXLE CAP Remove screw plug G and fill with oil. Replace plug.

4. ENGINE MOUNTING OIL CUPS Maintain with oil the four engine mounting oil cups : two of each are on the main frame at either side of the engine. These are marked H on the Lubrication Chart.

NOTE—Check all filling and oiling points after every eight hours work. IT IS ESSENTIAL THAT THE OIL IN THE GEAR-BOX AND IN THE ROTOR (plugs A C and E) SHOULD BE TOPPED UP AFTER EACH EIGHT HOURS WORK.

ADJUSTMENTS

ENGINE DRIVE BELT—(Illus. No. B.47). A simple wing nut has been fitted to enable the tension of the engine drive belt to be adjusted. This is located on the right-hand side of the engine. Tension is applied by turning it in a clockwise direction.

PULLEY BRAKE—(Illus. No. B.48). To counteract the tendency of the pulley to creep when the engine is idling, a fibre block (Illus. No. B.44) maintains a slight pressure against the side of the driving pulley wheel. After gradual wear has taken place the block should be moved nearer to the pulley and elongated bolt holes have been provided to permit this. Clamp up securely after adjustment.

CLUTCH—The clutch control rod (Illus. No. B.11) is mounted between the handle bars. To engage pull upwards and to disengage push sharply downwards.

GEAR CONTROL—(*See Diagram* 2). The upper gear control rod (Illus. No. B.98) operates the travel-speed gear-box while the lower (Illus. No. B.99) operates the rotor gear. The neutral position of the travel-speed box is in the centre of the gear control gate. To select top gear push the gear control rod downwards and engage the pin in the appropriate slot in the gate. To select low gear pull the gear control rod upwards and engage the pin in the upper gate slot.

To engage the rotor drive gear push the lower control rod downwards until the selector pin engages in its appropriate slot in the gate. To adjust either of these gear control rods, the lower half is provided with a threaded end which enables the rods to be lengthened or shortened.

OPERATING INSTRUCTIONS

Ensure that the two gear-levers are both in the neutral position. Start the engine as explained in the separate Engine Instruction Handbook.

To commence work—having started the engine select the travel speed required for the particular job to be undertaken and then engage the rotor gear (see directions above) and engage the clutch by pulling the control rod upwards.

During the first twenty-four hours of work, the Bantam engine should be used for only light cultivation so that the engine may be properly run in on a light load.

Generally speaking, when operating on cultivated land the high-ratio pulley can be used, but the low-ratio pulley i.e. the rear one, should be always used for working virgin ground or when operating on particularly heavy soil. Never overload the engine by using high-ratio when the load is too heavy for the engine to carry with ease.

The high-ratio pulley should be used when the Bantam is being used as a grass mower, hedge clipper and for its other ancillary jobs.

If the operator wishes to work the machine from the side in order to avoid walking on the cultivated land, all that is necessary is to pull the handle to the side where he wishes to work, at the same time holding the machine steady with the other hand. This swings the handle bars to the side.

ADVICE ON HANDLING

It will be found, when working hard ground, that the best results will be obtained by the user putting the machine into work in easy stages. At the first cutting of virgin ground 2″ depth only should be attempted and then the required depth obtained by putting the rotavator blades in progressively deeper on each occasion.

To avoid an accumulation of soil choking the rotor and causing the use of unnecessary power, always keep the rear shield raised so that the blades will throw the soil clear.

On lumpy ground the operator should not try to conteract the jumping of the machine, but should merely hold the handle bars lightly. Until the operator is fully accustomed to using the machine the rotor should be put out of gear at the end of each row before the machine is turned round, but with experience users will be able to lift the machine and turn it round while the rotor is still revolving.

Examine the hoe blades daily. If any are bent out of line so that the back of the blade is rubbing hard on the soil, straighten them with the hooked bar provided with tool kit.

It is essential that the cutting edge only should touch the soil and the back have clearance. If the edge of the blade should wear thin, and tend to turn inwards, leaving a heavy shoulder rubbing on the ground, this can be rectified by placing the end of the setting bar behind the blade and tapping the edge into position with a hammer. The efficiency of the machine depends largely on the condition of the hoes. If the blades become bent through striking solid obstacles in the ground and are not straightened, they will take more power to drive, the quality of the work will be poor and the blades will wear quickly.

A keen look-out, therefore, should be kept for bent blades, which should be straightened as soon as they are noticed.

It sometimes happens that a stone is trapped between the blades and the shield. When this occurs, the rotor will automatically stop. The operator should then put the rotor out of gear, lift the machine by its handle bars and turn the rotor in reverse by pushing sharply on one of the blades with the foot.

PREPARING THE MACHINE FOR USES OTHER THAN CULTIVATING

TO REMOVE ROTOR—The rotor unit may be quickly detached by undoing the two swivel bolts (Illus. No. B.50) on the drive shaft housing at the rear of the gear-box on the left-hand side of the machine and also the two swivel bolts (Illus. No. B27) on the main frame on the right-hand side of the machine (in both cases looking from the rear).

Care should be taken when removing the rotor unit that oil from the dog clutch chamber is not allowed to escape. This may be almost completely avoided if the machine is tilted upwards and the engine mounting allowed to rest on the ground.

LIST OF PARTS

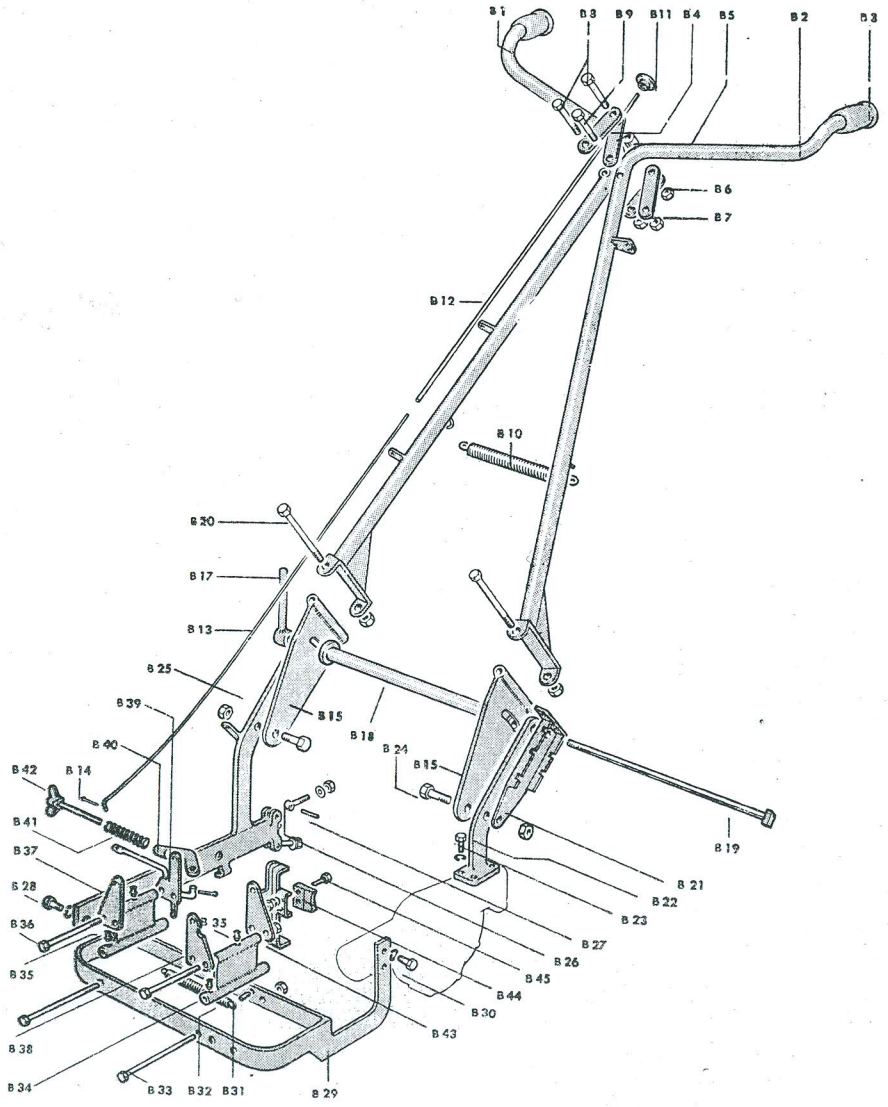
for the Rotavator "Bantam"

When ordering parts it is necessary to quote the number of the machine. This number is to be found at the base of the left-hand handlebar support. We cannot guarantee that correct replacements will be supplied unless this number is quoted.

All directions are given from left or right looking to the back of the cultivator.

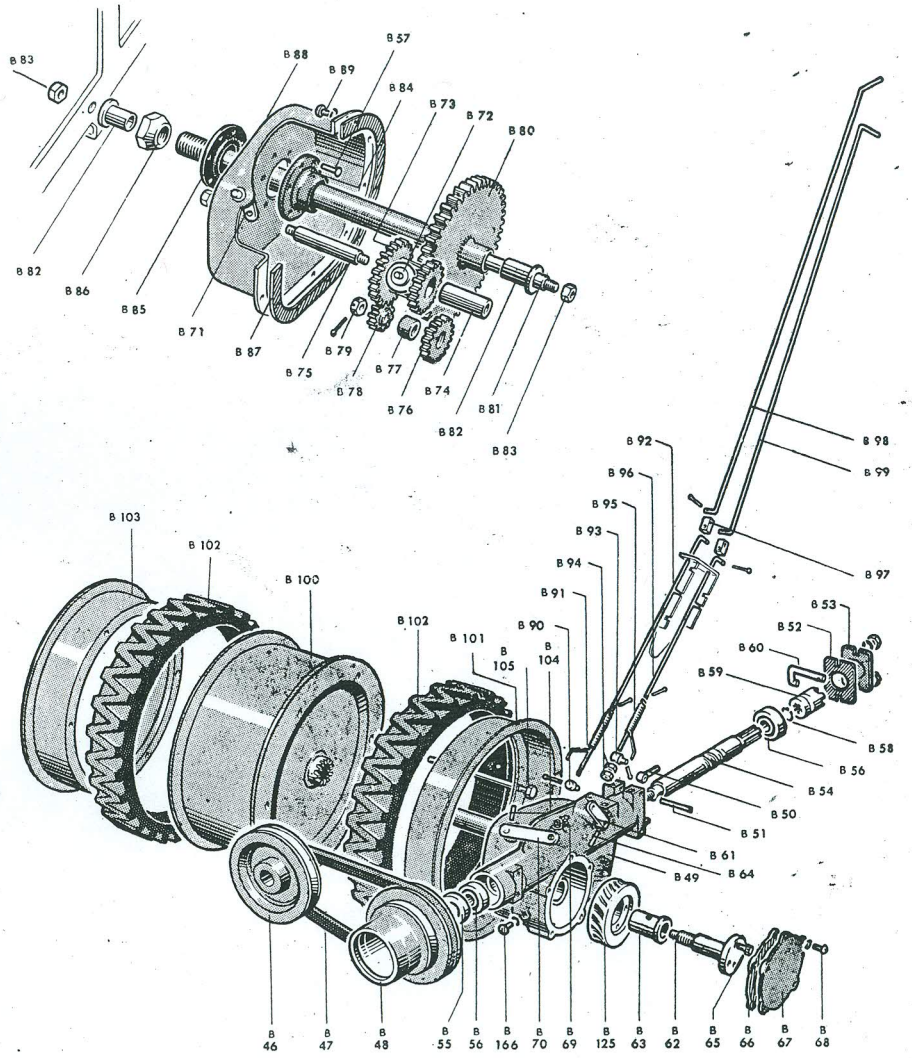
Illus. No.	*Part No.*	*Description*
B1	B578	Handlebar, Right Hand
B2	B539	,, Left ,,
B3	20557	,, Grip
B4	B525	,, Upper Toggle Link
B5	B528	,, Toggle Spacer
B6	B527	,, Lower Toggle Link
B7	B526	,, Centre Toggle Link
B8		5/16″ BSF x 2″ long Hex Head Bolt
B9		5/16″ BSF x 1½″ ,, ,, ,, ,, Nuts 5/16″ BSF
B10	B422	Handlebar Spring
B11	B572	Clutch Push Rod Knob
B12	B573	,, ,, ,, Upper
B13	B564	,, ,, ,, Lower
B14		Split Pin 1/16″ dia. x ½″ long
B15	B492	Handlebar Height Adjusting Plate
B16	B561	Oilseal Housing Securing Pin
B17	B517	Handlebar Clamping Lever.
B18	B490	,, Spacing Tube
B19	B491	,, Adj. Clamp Bolt, Nut ½″ whit square
B20		Bolt 5/16″ BSF x 4¾″ long Locknut 5/16″ BSF
B21	B548	Rotor & Travel Selector Quadrant
B22	B502	Handlebar Support
B23		5/16″ BSF x ¾″ long Setscrew Spring Washer 5/16″ dia.
B24		Bolt 7/16″ BSF x 1″ Locknut 7/16″ BSF
B25	B489	Front Side Frame
B26	B513	Captive Bolt Nut 5/16″ BSF Flat Washer 5/16″ dia.
B27	B513/3	Captive Bolt Pin short
B28		Setscrew 5/16″ BSF x ¾″ Spring Washer 5/16″ dia.
B29	B488	Engine Cradle ¼″ drilling
	B480	,, ,, 5/16″ drilling
B30		Setscrew 5/16″ BSF x ¾″ Spring Washer 5/16″ dia.
B31	B529	Engine Cradle Tension Spring Pin
B32	B421	,, ,, ,, Spring
B33	B623	Pivot Hinge Bolt 5/16″ long (A.C. Engine) Locknut 5/16″ BSF

DIAGRAM 1



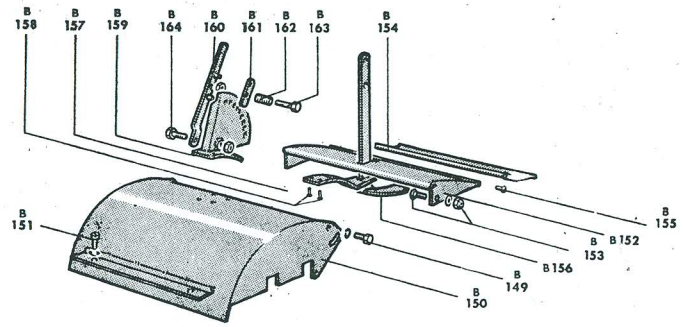
Illus. No.	*Part No.*	*Description*
	B624	Pivot Hinge Bolt 5/16″ short (A.C. Engine)
	S/104/3	Locknut 5/16″ BSF
B34	B484	Engine Pivot Hinge ¼″ (Villiers Engine)
	B636	,, ,, ,, 5/16″ (Villiers)
	B896	,, ,, ,, R.H. (A.C. Engine)
	B612	,, ,, ,, L.H. (A.C. Engine)
B35		Flip-flap Oiler
B36	B82/16	Bolt ¼″ BSF x 2¾″ long hex hd.
		Locknut ¼″ BSF
	B624	Pivot Hinge Bolt 5/16″ (A.C. Engine)
	S/104/3	Locknut 5/16″ BSF
	B626	Pivot Hinge Bolt 5/16″ (Villiers Engine)
	S/104/3	Locknut 5/16″ BSF
B37	B500	Engine Clamping Plate ¼″ (Villiers)
	B652	,, ,, ,, 5/16″ (Villiers)
		Shakeproof Washer 5/16″ dia.
B38	B500	Engine Clamping Plate ¼″ (Villiers)
	B652	,, ,, , 5/16″ (Villiers)
B39	B580	Clutch Fulcrum Bracket Assy. ¼″ (Villiers)
	B654	,, ,, ,, ,, 5/16″ (Villiers)
	B659	,, ,, ,, ,, ¼″ (A.C. Engine)
		Split Pin 5/16″ dia. x ¾″ long
B40	B576	Engine Clutch Positioning Lever
	B577	,, ,, ,, ,,
B41	B469	,, ,, ,, ,, Spring
B42	B574	,, Lever Tension Bolt Assy. (Villiers)
B43	B478	Brake Bracket ¼″ (Villiers)
	B653	,, ,, 5/16th″ (Villiers)
	B436	,, ,, (A.C. Engine)
B44	B476	Brake Block
B45		Bolt 3/16″ BSF x 1″
		Nut 3/16″ BSF
		Spring Washer 3/16″
		Flat Washer 3/16″ dia.
B46	B472	Engine Pulley (Villiers)
	20099	,, ,, (A.C. Engine)
B47		,, Vee Belt (Villiers)
		,, ,, ,, (A.C. Engine)
B48	B420	Worm Shaft Pulley
B49	B439	,, Drive Gear Box
B50	B513	Captive Bolt
		Nut 5/16″ BSF
		Flat Washer 5/16″ dia.
B51	B513/2	Captive Bolt Hinge Pin Long
B52	B462	Worm Drive Housing Gasket
B53	B494	,, ,, Box Spare End Cover
B54	B444	,, ,, Shaft Front
B55		,, ,, ,, Gitseal 15608731
B56		Bearing BRL ⅝″
B57		Rivet ⅛″ dia. x ½″ long flat head copper
B58		Circlips ⅝″ dia. ext. type
B59	B458	Sliding Dog
B60	B465	Rotor Dog Selector
B61	B457	,, Selector Lever
		Flat Washer ⅜″ dia.
B62	B440	Gear Box Drive Shaft
B63	B442	Gear Box Drive Shaft Bush
B64	B499	Rotor Selector Arm Taper Pin

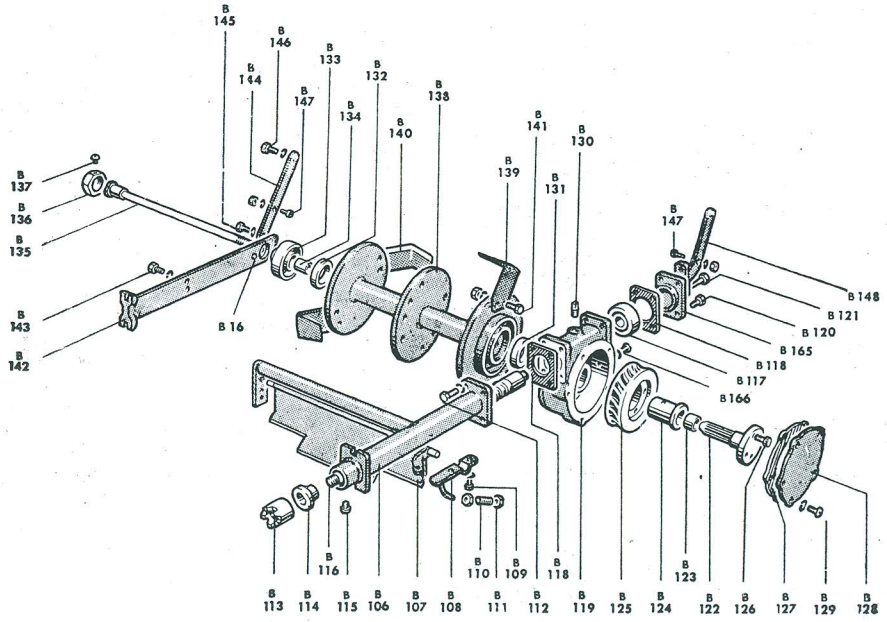
DIAGRAM 2



Illus. No.	*Part No.*	*Description*
B65	S/73/5	Setscrew 5/16″ BSF x ⅝″ long drilled head
B66	B461	Worm Drive Gear Box Gasket
B67	B512	,, ,, ,, ,, Cover
B68		Setscrew 2BA x ⅜″ long round head Spring Washer 3/16″ dia.
B69		Oil Plug ⅛″ BSP
B70	B555	Travel Gear Leyer
B71	B485	,, ,, Selector
B72	B487	,, ,, ,, Roller
B73	B425	Cluster Gear
B74	B433	,, ,, Bush
B75	B441	,, ,, Shaft
		Nut ⅜″ BSF
B76	B434	Drive Shaft High Gear
B77	B437	,, ,, Gear Spacer
B78	B435	,, ,, Low Gear
B79		Nut ½″ BSF Slotted Split Pin 3/32″ dia. x 1″ long
B80	B560	Bull Wheel Assy.
B81	B445	Road Wheel Axle
B82	B446	,, ,, ,, Bush
B83		Nut ½″ BSF
B84	B423	Bull Wheel Bushing
B85		Gear Box Gitseal 26213125 sp.
B86	B473	Road Wheel Clamping Nut
B87	B464	Gear Box Gasket
B88	B424	Gear Box
B89		Setscrew ¼″ BSF x ⅜″ cheese head ,, ¼″ ,, x ⅜″ hex head Spring Washer ¼″ dia.
B90	B587	Travel Selector Eye Bolt Split Pin 3/32″ dia. x ½″ long
B91	B552	Travel Selector Spring
B92	B546	,, ,, Rod
B93	B549	Rotor Selector Eye Bolt Split Pin 3/32″ dia. x ½″ long
B94		Locknut ¼″ BSF
B95	B552	Rotor Selector Spring
B96	B547	,, ,, Rod
B97	B545	,, & Travel Trunnion Block
B98	B543	Travel Hand Connecting Road
B99	B544	Rotor ,, ,, ,, Split Pin 3/32″ x ½″ long
B100		Road Wheel Drum
B101	B635/4	,, ,, Loose Rim
B102	B635/6	Tyre
B103	B615	Road Wheel Iron Rim
	B635	,, ,, Assy.
B104		Travel Selector Arm Pin
B105		Setscrew 5/16″ whit x ⅝″ long hex head Nut 5/16″ BSW Spring Washer 5/16″ dia.
B106	B455	Rotor Drive Shaft Housing (Villiers)
	B885	,, ,, ,, ,, (A.C. Engine)
B107	B690	Wheel Scraper Assy. (Bobbin Wheel Drum)
B108		Pivot Bracket
B109		Setscrew and Washer
B110		Pivot Bracket Spring
B111		Locknut

DIAGRAM 3





Illus. No.	*Part No.*	*Description*
B112		Setscrew 5/16″ BSF x ¾″ long hex head
		Spring Washer 5/16″ dia.
B113	B459	Fixed Dog
B114	B452	Rear Drive Shaft Bush
B115		Setscrew 2 BA x ¼″ long round head
B116	B449	Worm Drive Shaft Rear (Villiers)
	B882	,, ,, ,, ,, (A.C. Engine)
B117	BRL ⅝ ACD	Bearing LS7 ACD
B118	B463	Drive Shaft Housing Gasket
B119	B427	Rotor Worm Drive Housing (Villiers)
	B881	,, ,, ,, ,, (A.C. Engine)
B120		Setscrews 5/16″ BSF x ¾″ long hex head
B121		,, ,, ,, x 1″ ,, ,, ,,
		Spring Washer 5/16″ dia.
B122/3	B700	Rotor Drive Shaft
B124	B414	Rotor Worm Housing Bush
B125	B453	Worm Wheel (Villiers Engine)
	B883	,, ,, (A.C. Engine
B126		Setscrew 5/16″ BSF x ⅜″ long drilled head
B127	B461	Rotor Worm Drive Housing Gasket (Villiers)
	B895	,, ,, ,, ,, (A.C. Engine)
B128	B512	Worm Drive Gear Box Cover (Villiers)
	B884	,, ,, ,, ,, ,, (A.C. Engine)
B129		Setscrew 2 BA x ¼″ long + 3/16″ sp. washer
B130		Oiling Plug ⅛″ BSP
B131		Drive Shaft Gitseal 22515037/R4
B132		Rotor Stub Axle Gitseal 13708725/R4
B133	B415	Rotor Stub Axle Housing
B134	B416	,, ,, ,, Bush
B135	B418	,, ,, ,, and draw Bar
B136	B417	,, ,, ,, Nut
B137		Setscrew ¼″ BSF x 3/16″ long round head
B138	B407	Rotor Only
B139	B565	Blade Right Hand
B140	B565	Blade Left Hand
B141		Bolt 5/16″ BSF x ¾″ hex head (thin head)
		Nut 5/16″ BSF
		Spring Washer 5/16″ dia.
B142	B466	Rear Side Frame (Villiers Engine)
	B891	,, ,, ,, (A.C. Engine)
B143		Setscrew 5/16″ BSF x ⅝″ long hex head and Spring Washer
B144	B496	Shield Side Support Right Hand
B145		Setscrew ¼″ BSF x ½″ long round head
		Spring Washer ¼″ dia.
B146		Setscrew 5/16″ x ¾″ long hex head
		Spring Washer 5/16″ dia.
B147		Setscrew ¼″ BSF x ½″ long round head
		Spring Washer ¼″ dia.
		Locknut ¼″ BSF
B148	B495	Shield Side Support Left Hand (Villiers)
	B887	,, ,, ,, ,, ,, (A.C. Engine)
B149		Setscrew 5/16″ BSF x ¾″ long hex head
		Spring Washer 5/16″
B150	B518	Front Shield (Villiers Engine)
	B889	,, ,, (A.C. Engine)
B151		Setscrew ¼″ BSF x ½″ long round head
		Nut ¼″ BSF
		Spring Washer ¼″ dia.

Illus. No.	*Part No.*	*Description*
B152	B521	Rear Shield
B153		Coach Bolt ¼″ BSW x ¾″ long
		Simmons Nut ¼″ BSW
		Thackeray Washer ¼″ dia.
B154	B522	Trailing Shield
B155		Rivet 3/16″ dia. x ⅜″ long round head
B156	B503	Depth Control Skid
B157		,, ,, ,, Support
B158		Rivets
B159		Depth Control Quadrant
B160	B504	Depth Control Lever
B161	B505	,, ,, Spring Clip
B162	B470	,, ,, Spring
B163		Bolt ¼″ BSF x 1½″ long hex head
		Nut ¼″ BSF
B164		Setscrew 5/16″ BSF x ¾″ long hex head
		Nut 5/16″ BSF
B165	B501	Rotor Worm Housing End Cover
B166		Setscrew 2 BA x ⅜″ long
		Fibre Washer 3/16″ dia.

PARTS NOT ILLUSTRATED

	Road Wheel Axle Shims .005″
	,, ,, ,, ,, .010″
	,, ,, ,, ,, .015″
B710	Blade Setting Bar
B810	Engine Support Stay Assy. (Villiers)
B818	,, ,, ,, ,, (A.C. Engine)
AC.209	Air Cleaner Tank
AC.213	,, ,, Cap
AC.212	,, ,, Bracket
AC.211	,, ,, Adaptor (A.C. Engine)
	Setscrew ¼″ whit x 1⅛″ long
	Spring Washer ¼″ dia.
AC.225	Air Cleaner Rubber Hose (A.C. Engine)
B903	,, ,, Elbow (Villiers Engine)
B907	,, ,, Rubber Hose (Villiers Engine)
G276	,, ,, Hose Clip (Villiers Engine)
B913	,, ,, ,, ,,
B897	Worm Housing Coulter (A.C. Engine)
B899	Induction Manifold (Villiers Engine)
	Gear Box Drain Plug ⅛″ BSP

PARTS REQUIRED FOR ALTERNATIVE FITMENT OF 14″ ROTOR

B901	Front Shield
B902	Rotor
B904	Drive Shaft Housing
B905	Rear Side Frame
B908	Rear Shield
B909	Trailing Board
B910	Rotor Stub Axle & Draw Bar

PARTS REQUIRED FOR ALTERNATIVE FITMENT OF 12″ ROTOR

B711	Rotor Stub Axle & Draw Bar
B712	Trailing Board
B713	Rear Shield
B714	Front Shield
B715	Drive Shaft Housing
B905	Rear Side Frame
B716	Rotor

THE 'Bantam'

OWNER'S TOOL KIT*

D.E. Spanner ¼″ x 5/16″ B.S.F.	1
D.E. Spanner 5/16″ x ⅜″ B.S.F.	1
Adjustable Spanner	1
Screwdriver	1
Oilcan	1
Tool Roll Pack	1

Supplied with the Villiers Engine :

Box Spanner, ⅛″ x 3/16″	1
Tommy Bar	1
Spanner and Gap Gauge	1
Plug Spanner	1

Supplied with the A.C. Engine :

Tappet Feeler Gauge	1
14mm. Plug Spanner	1
Spanner and Gap Gauge	1

* *Subject to alteration without notification*

HANDBOOK

for the

Villiers

Mark 25C Engine
Specification No. 138A

This handbook has been specially prepared for the Villiers engine of the Rotary Hoe 'Bantam' manufactured by Rotary Hoes Ltd., Horndon Essex.

THE VILLIERS ENGINEERING CO., LTD.
WOLVERHAMPTON . . . ENGLAND
Telegrams: Villiers, Wolverhampton.
Telephone: Wolverhampton 21666-7-8.
" **20851 (Service Dept).**

CHESTER HUDSON
STREAM FARM
HORHAM, EAST SUSSEX
ENGLAND

Ph. 44-0-7863-210-363

BANTAM ROTAVATOR
VILLIERS ENGINE

PART # [illegible]

HAS SOME PARTS

HANDBOOK

for the

Villiers

Mark 25C Engine
Specification No. 138A

This handbook has been specially prepared for the Villiers engine of the Rotary Hoe 'Bantam' manufactured by Rotary Hoes Ltd., Horndon Essex.

THE VILLIERS ENGINEERING CO., LTD.
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Telephone: Wolverhampton 21666-7-8.
" **20851 (Service Dept).**

CONTENTS

THE Villiers MARK 25C ENGINE

THE HEART of your Rotary Hoe is the Villiers Mark 25C Two-stroke Engine, and you will find it a very sound one. It is an example of British precision engineering at its best.

Villiers have specialised in the development and manufacture of two-stroke engines for more than 35 years. The reliability of these engines has been proved the world over.

The factory in Wolverhampton, England, where Villiers engines are made, is the largest self-contained plant in the world devoted to the making of small engines. In it are produced all the component parts, including magnetos and carburettors, from the castings and drop forgings through all stages of manufacture to the finished product. Rigid inspection and constant testing ensure that a very high standard of quality is maintained, which makes certain that your engine will withstand all the hard work you give it, providing the simple instructions for maintenance are observed. These instructions are contained in this Handbook, which you should read carefully.

The Villiers Service Department is at your disposal with advice and help in maintaining the maximum efficiency of the Engine of your Rotary Hoe.

THE TWO STROKE PRINCIPLE

THE TWO STROKES from which the engine gets its name are the two strokes of the Piston in one complete revolution of the crankshaft, i.e. Piston ascending and Piston descending.

In these two cycles the induction, compression, ignition burning of the charge and exhaustion of the charge are affected.

In the wall of the cylinder are exhaust port, transfer port and inlet opening. As the Piston ascends and descends these ports are uncovered and covered in the following order:

Piston Ascending

The bottom of the Piston uncovers the inlet port and because the crankcase is an air-tight compartment the ascending Piston creates a depression in the crankcase. The atmospheric pressure (14.17 lbs. per sq. inch) is effective upon the inlet port and fills the compartment in the crankcase with gas from the carburettor.

Piston Descending

After the Piston has reached the top of its stroke it descends and compresses the gas in the crankcase. In descending, the Piston uncovers the exhaust port and, when nearing the bottom of the stroke the transfer port provides a passage for the compressed gas. The gas flows into the cylinder and is deflected by the specially shaped Piston, thus displacing any exhaust gas. The latter flows from the cylinder through the open exhaust port.

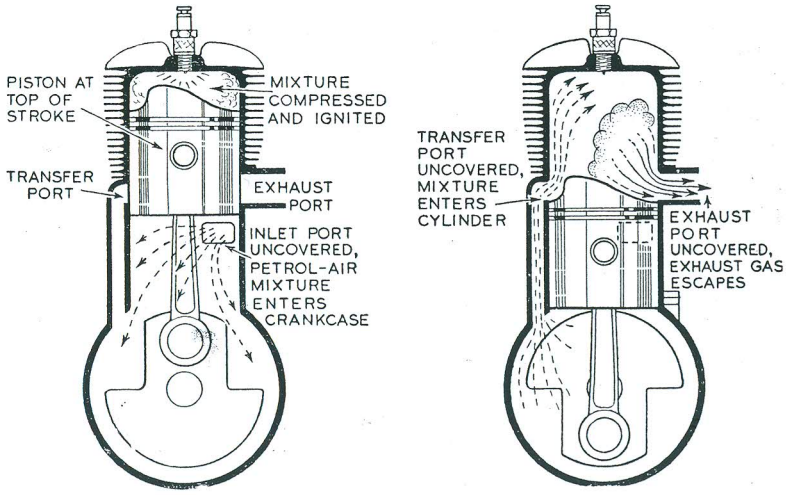


DIAGRAM SHOWING THE PRINCIPLE OF THE TWO STROKE ENGINE

The necessary cycles for operation are achieved with only Piston, Connecting Rod and Crankshaft as the moving parts of the engine.

OPERATING INSTRUCTIONS

FIXING. The engine should be securely fixed and stand reasonably upright, otherwise lubrication and carburation will be adversely affected.

BEFORE STARTING. This engine is lubricated by petroil, which is a mixture of oil and petrol in the proportion of half a pint of lubricating oil to one gallon of petrol. The life and good service the engine will give depend almost entirely on the way it is lubricated, especially during the early stages of its life.

Patent Castrol XL Oil (S.A.E. 30) has been found to give good results and is recommended by us. It is advisable always to use one particular brand of oil and not to change from one to another.

The Villiers engine is as reliable as engineering skill can make it. The only constant attention which the owner is asked to give it is to ensure that the proper oil is thoroughly mixed with the petrol before putting into fuel tank. An oil measure is fitted to the tank filler cap, the required number of measures being stated on the cap.

TO START — WHEN COLD. When you have put petroil mixture in the fuel tank, turn on the tap. Then press tickler at side of carburettor until petroil is seen to drip. There is no need to allow fuel to run to waste.

Open the throttle control lever about one third of its full opening. The engine is now ready for starting.

Placing the plain end of the starting rope in the notch provided, wind the rope round the starter pulley in a clockwise direction. Give a brisk pull to rotate the engine, pulling the rope clear of the starting pulley.

TO START — WHEN HOT. The procedure is the same except that it should not be necessary to close the strangler or to flood the carburettor by pressing the tickler.

FAILURE TO START. Failure to start, after a reasonable number of trials, may be due to:

Lack of Compression. Compression should be felt when the engine is rotated at normal starting speeds with the throttle partly open.

Faulty Fuel Supply. Depress the tickler at the side of the carburettor body. If fuel is reaching the float chamber it will spurt out of the vent at the top of the tickler.

Faulty Ignition. Unscrew the sparking plug from the cylinder head and place it, with ignition cable attached, on a metal part of the engine. If the plug and ignition system are in order a spark will be visible at the plug points when the engine is rotated.

If there is no spark, try a new plug. Alternatively, check whether a spark occurs at the end of the ignition cable when this is held about one-eighth of an inch away from a clean metal part of the engine.

These preliminary tests will show whether or not more detailed examination is necessary.

RUNNING IN. With new engines, add a litle extra oil to the fuel and set the carburettor needle adjustment a little on the rich side.

MAINTENANCE AND REPAIRS

DECARBONISING. Because the Villiers Two-stroke Engine is so simple a unit, decarbonising is quite straightforward. Note the following points:

When removing and replacing the cylinder, take care not to twist it round the piston. It should be pulled off or pushed on straight, so that the rings cannot catch in any of the ports and break.

Remove all carbon from inside the piston head as well as from the top of the piston and from the cylinder head. The ports in the cylinder—particularly the exhaust

port—should receive careful attention and should be kept clean. On no account must the size or shape of these ports be altered by filing.

Keep the piston ring grooves clear of carbon to leave the rings quite free. Piston rings should be bright round their surface which makes contact with the cylinder bore. If wear causes the joint gap to exceed 1/32″ when in the cylinder, the piston ring should be replaced.

Carbon will form on the gudgeon pin at either side of the small end bush. This should be removed carefully, otherwise difficulty will be experienced in removing the pin from the piston. The small end bush and the piston bosses should be kept quite free from carbon.
It is most important that silencer and exhaust pipe are kept quite clean internally. A heavy deposit of carbon will cause back pressure and loss of power and must therefore not be allowed to accumulate.

Take care to avoid air leaks.

Keep the connection between carburettor and induction pipe absolutely airtight. If, in dismantling a new engine, you have disturbed the orginal washers at the induction pipe joint and the cylinder base joint, you must fit new washers at these points.

SPARKING PLUG. For the Mark 25C Engine, we recommend the Lodge C3, 18mm. diameter thread.

Clean and reset 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. If you experience stiffness when screwing the plug in the cylinder head do not use force, but examine the thread for any particles of grit or carbon. 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.

FUEL FILTER. A filter gauze is fitted to the banjo bolt connecting the fuel pipe to the carburettor and a gauze is part of the fuel tap. These filters should be examined occasionally and cleaned by dipping in petrol.

AIR FILTER. Remove the Air Filter every 100 hours (more frequently under very dusty conditions), dismantle the

oil bath filters and drain away the old oil. Wash the filter and refill with oil to the level indicated on the container.

CONTACT BREAKER. Occasionally check the contact breaker points. They should be clean, and should open and close properly. When fully open, the gap should be between .012″ and .016″.

To reach the points, you must first take off the cowling (attached by three screws to the armature plate and by two screws to the cylinder head) and the starting pulley.

MAGNETO TIMING. The magneto is timed to give a spark when the piston is 5/32″ **before** top dead centre, with the points commencing to open. This timing is set when the engine is built, the flywheel is tightened on the shaft and the shaft is then rotated until the piston is at the **top** of the stroke. Two timing marks are then punched directly opposite each other—one on the boss at the back of the armature plate, the other on the flywheel rim (as close as possible to the armature plate). Timing must be checked whilst the cowling is removed.

FLYWHEEL REMOVAL. The cam operating the contact breaker is rivetted to the flywheel, which is driven by a taper on the crankshaft. If the magneto timing has to be altered, the flywheel must be released by unscrewing the centre nut with the box spanner provided in the tool kit. This nut has a right-hand thread and is imprisoned in the flywheel. It should be unscrewed until the flywheel is just free to revolve on the crankshaft.

With the piston in its correct position, move the flywheel round until the points begin to open, then tighten up the nut firmly and re-check the timing. (The nuts must be tightened up hard by hitting with a hammer on the end of the tommy bar).

The taper of the shaft and cam must be clean and dry; if any oil is on the surfaces it will be impossible to secure an effective drive.

It is important that the cowling and fan should be in position when the engine is running.

CARBURETTOR — DISMANTLING. The carburettor is a Type 3/4 " Lightweight " Pattern. The throttle position is controlled by a cable to which is attached a hand lever.

Release clip screw and detach the carburettor from engine. Unscrew the top ring, then pull out the throttle, taking care not to damage the taper needle. Turn the carburettor upside down, unscrew the bottom nut, remove the fibre washer, float cup and fibre washer. To reach the fuel needle you must remove the centrepiece. Before this can be done you must unscrew the compensating tubes. When the centrepiece has been removed, the fuel needle lever will swing to one side to allow the fuel needle to be lifted out.

CARBURETTOR — ASSEMBLING. Make sure that every part is clean.

Place the centrepiece in position with fibre washer under head. Make sure that the fuel needle and lever are in position, then screw in the compensating tubes.

Place the float on the centrepiece. Check the fuel level by measuring the gap between the float and the underside of the body. When the fuel needle is fully raised, this gap should be 7/32″.

Place large fibre washer on flat cup seating, then position cup and small fibre washer, and finally bottom nut, taking care not to use too much force when tightening.

ADJUSTMENT AND REMOVAL OF TAPER NEEDLE. When the slotted screw in the centre at top of throttle is turned clockwise, the needle is lowered and the mixture weakened by a reduction in the size of the jet orifice. Turning the screw anti-clockwise will give a richer mixture.

Before removing the slotted screw to replace the needle, note how far the needle projects from the end of the throttle. To adjust, give half a turn at a time until the correct setting is found.

HINTS AND TIPS

Always mix the oil and petrol thoroughly before putting the mixture into the tank.

It is wise to filter your mixture through a fine wire gauze when putting the mixture into the tank.

Do not flood the carburettor when starting a warm engine.

Stopping the Engine. If the engine is not to be used for several days, stop it by turning off the fuel tap.

Do not experiment with cheap sparking plugs.

Only skilled mechanics should take driving shafts apart. Special tools are required for ensuring alignment when re-assembling. The makers have these facilities and are therefore able to undertake repairs at the lowest cost.

It is important that air leaks should be avoided at the following points:

(i) Between inlet pipe and cylinder.
(ii) Between inlet pipe and carburettor.
(iii) Between cylinder base and crankcase.
(iv) Between the two halves of the crankcase.

Avoid all sharp bends in the carburettor control cables.

Always quote the engine number when ordering spares or asking for advice. This number is stamped on the crankcase below the cylinder base, at rear of engine.

IMPORTANT

1. When sending parts for replacement, repair, or as pattern, the name and address of the sender should always be securely attached, and full instructions explaining what is required should be sent separately by post. In no circumstances should instructions be enclosed with the parts, as they are liable to be lost or damaged in unpacking.

2. If an engine is sent for repair, it should be well packed in a strong box. Cardboard or sack is insufficient, and engines so packed are liable to get seriously damaged in transit. Packing cases are not returnable unless specially asked for by the owner at the time of sending to us.

3. All goods must be consigned to us carriage paid, addressed to "Service Dept." Goods returned by rail are consigned carriage paid.

4. In correspondence, always quote the engine number, stamped on the crankcase below the cylinder base.

5. As we are not the manufacturers of complete motor hoes or other machines, only the engine should be sent to us. If machines are forwarded, extra expense will be involved for dismantling the engine from the frame and refitting same.

6. We prefer to bench-test every repaired engine before returning it to its owner. It is, therefore, always advisable to send the engine complete with its magneto, sparking plug and carburettor.

7. When forwarding a flywheel magneto for overhaul, send the armature plate and the flywheel complete. These parts should in no circumstances be separated, as certain magnetic flux is lost thereby.

8. Always quote the magneto number and letter(s), if any, which are stamped on the face of the flywheel, when corresponding about your flywheel magneto.

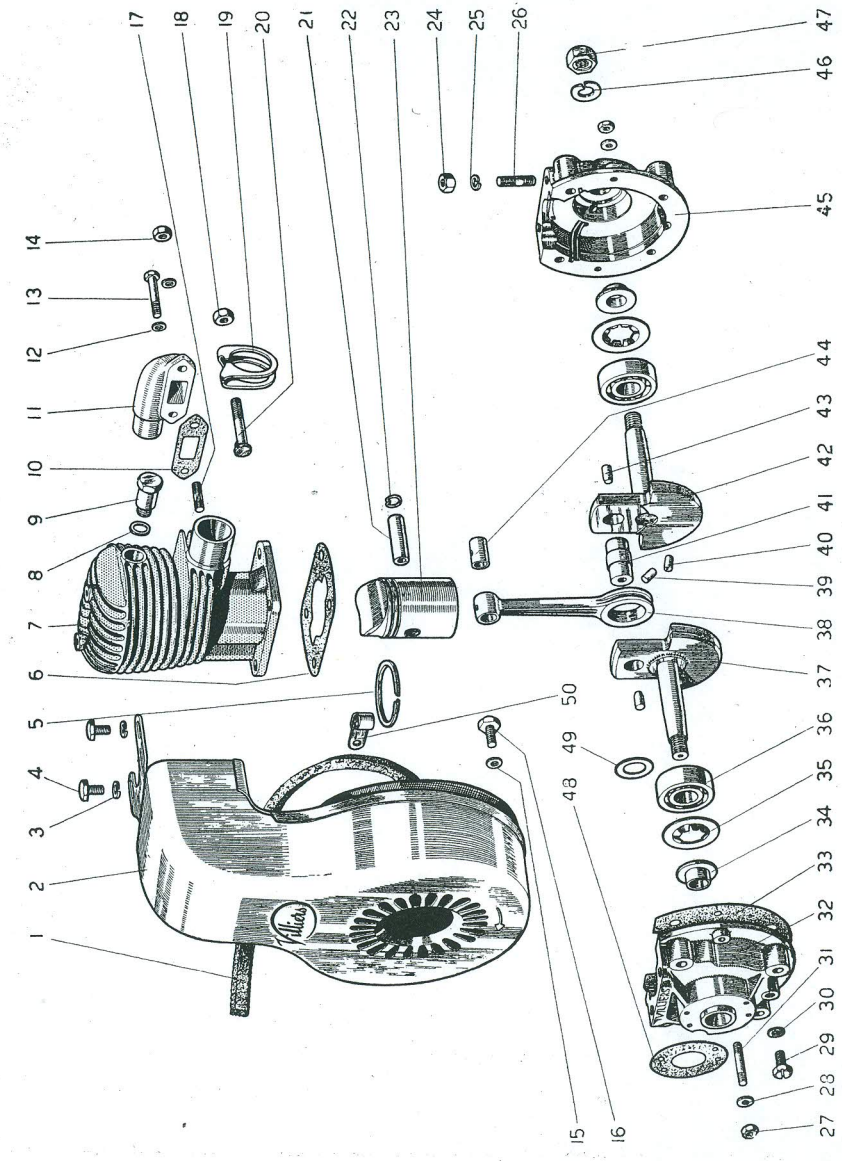
9. Old or worn-out parts sent as patterns, which we consider obsolete, are not returned unless specially asked for by the owner at the time of sending them to us.

10. Any engines or parts sent to our Works for repair, not paid for within six months from the date of our estimate, will be offered for sale by us elsewhere to defray expenses.

ENGINE — Diagram No. 1

Illus. No.	Part No.	Description
1	M.2051	Cowl Felt Strip
2	B.7047	Cowl
3	E.1430	Spring Washer ¼"
4	EM.539	Cowl Fixing Screw
5	E.6928	Piston Ring
6	D.6963	Cylinder Base Washer
7	B.6850	Cylinder
8	E.1238	Joint Ring, Cylinder Plug
9	E.7008	Plug, R.V. Hole
10	E.6965	Washer, Inlet Manifold
11	D.7981	Inlet Manifold
12	E.1430	Spring Washer ¼"
13	E.7100	Bolt for Manifold
14	E.401	Nut ¼"
15		As Illus. 3
16		As Illus. 4
17	E.6902	Stud, Inlet Manifold
18	E.364	Nut 5/16"
19	E.1130	Silencer Clip
20	E.435	Bolt for Clip
21	E.5042	Gudgeon Pin
22	E.4047	Circlip for Pin
23	C.6954	Piston (Alum)
24	E.364	Nut, Cylinder Stud
25	E.1050	Spring Washer 5/16"
26	E.363	Cylinder Base Stud
27	E.401	Nut ¼"
28	E.2924	Plain Washer ¼"
29	E.1962	Crankcase Drain Screw
30	E.1905	Fibre Washer
31	E.3392	Crankcase Joint Stud
32	B.6961	Crankcase, Magneto Side
33	D.6964	Crankcase Joint Washer
34	E.5109	Gland Bush
35	E.7013	" " Spring
36	MS.8	Crankshaft Ball Bearing
37	D.6958	Driving Shaft
38	D.2692	Connecting Rod
39	E.375	Steel Roller
40	E.1899	Bronze Roller
41	E.7579	Crankpin o/s
42	D.6958	Driving Shaft
43	E.5593	Crankpin Plug
44	E.1729	Con Rod Bush
45	B.6962	Crankcase, Drive Side
46	E.424	Driving Shaft Washer
47	E.422	" " Nut
48	E.7698	Magneto Joint Washer
49	E.5039	Bearing Sealing Washer
50	M.1662	H.T. Cable Clip

DIAGRAM No. 1



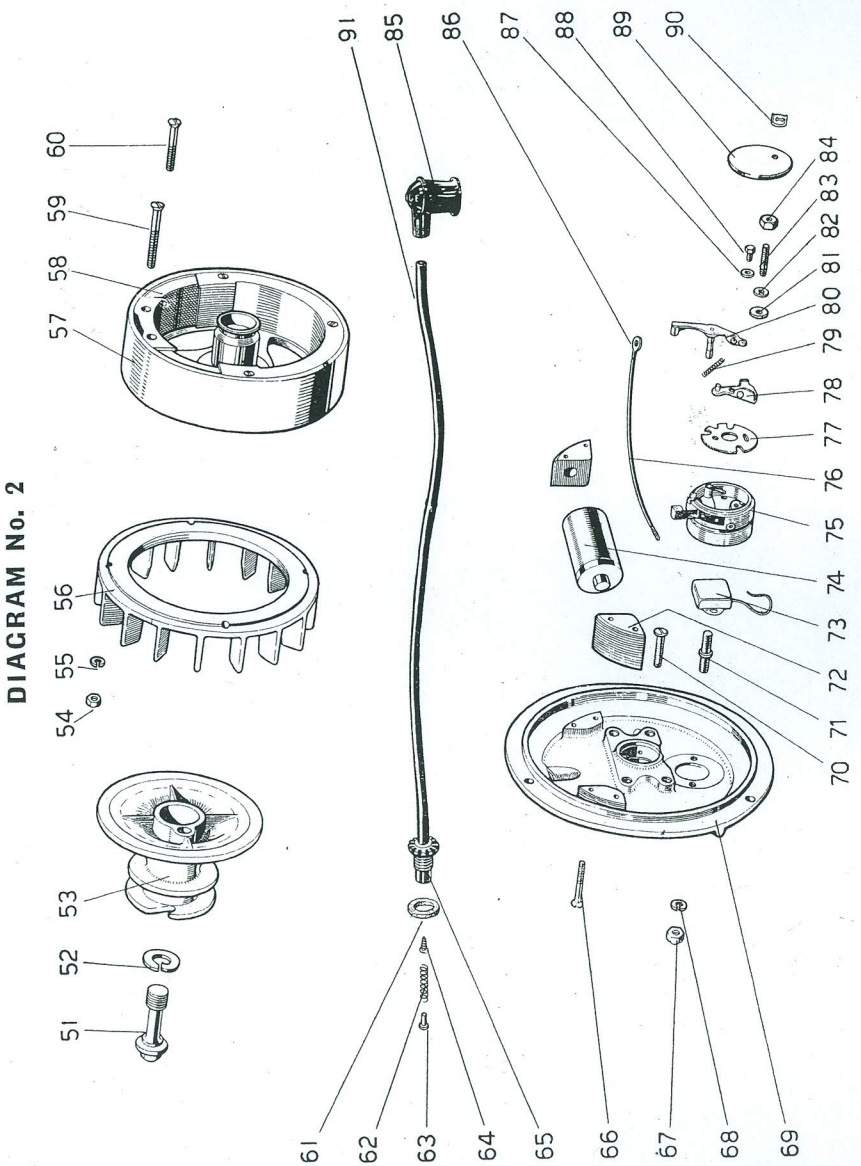
MAGNETO

Diagram No. 2

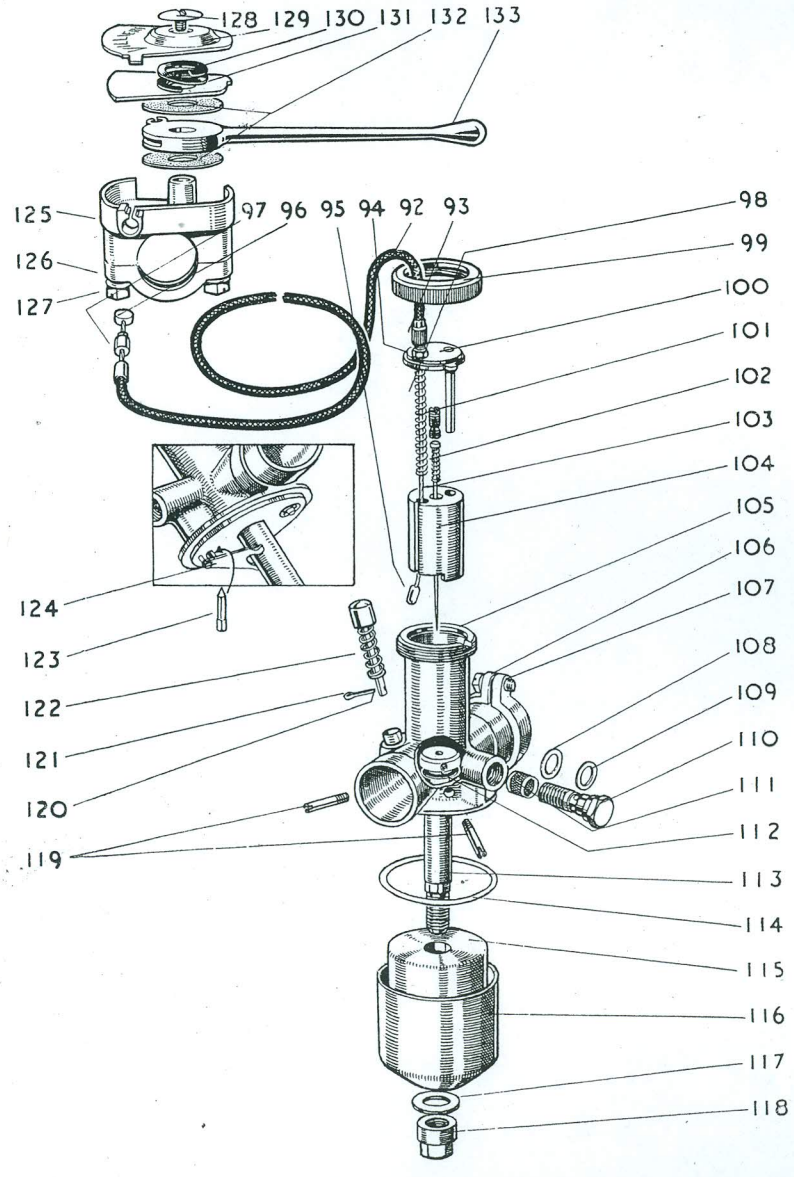
Illus. No.	Part No.	Description
51	E.6753	Bolt, Starting Pulley
52	E.424	Washer for Bolt
53	CM.509	Starting Pulley
54	1002 x 15	Nut, Fan Screw
55	1002 x 13	Spring Washer
56	D.7048	Fan
57	R.57	Flywheel Assembly
58	M.1507	Magnet
59	M.1797	Fan Screw
60	1002 x 9	Pole Shoe Screw
61	E.869	Felt Washer
62	1010 x 11	Terminal Spring
63	1046 x 13	,, Pad
64	491	,, Wood Screw
65	1124 x 8	H.T. Terminal
66	M.1799	Screw for Cheek
67	1002 x 15	Nut 3/16"
68	1002 x 13	Spring Washer 3/16"
69	A.68	Armature Plate Assembly
70	1124 x 9	Fixing Screw
71	1053 x 1	Condenser Box Stud
*72		Armature Cheek
73	M.1750	Condenser
74	M.1634	Ignition Coil
75	M.1872	Condenser Box
76	482	L.T. Lead
77	M.1803	Insulating Pad
78	M.1873	Point Bracket
79	1047 x 3	Rocker Spring
80	M.1714	Rocker Arm
81	M.1805	Insulating Washer
82	M.1802	Brass Washer
83	M.2042	Cover Stud
84	M.2043	Nut for Stud
85	M.4	Plug Cover
86	M.1291	L.T. Shoe
87	1113 x 5	Washer L.T. Screw
88	1006 x 3	L.T. Screw
89	M.1891/1	Con Box Cover
90	SNE/372/17	Nut for Cover
91	494	H.T. Lead with Terminal

* NOT SERVICED SEPARATELY

DIAGRAM No. 2

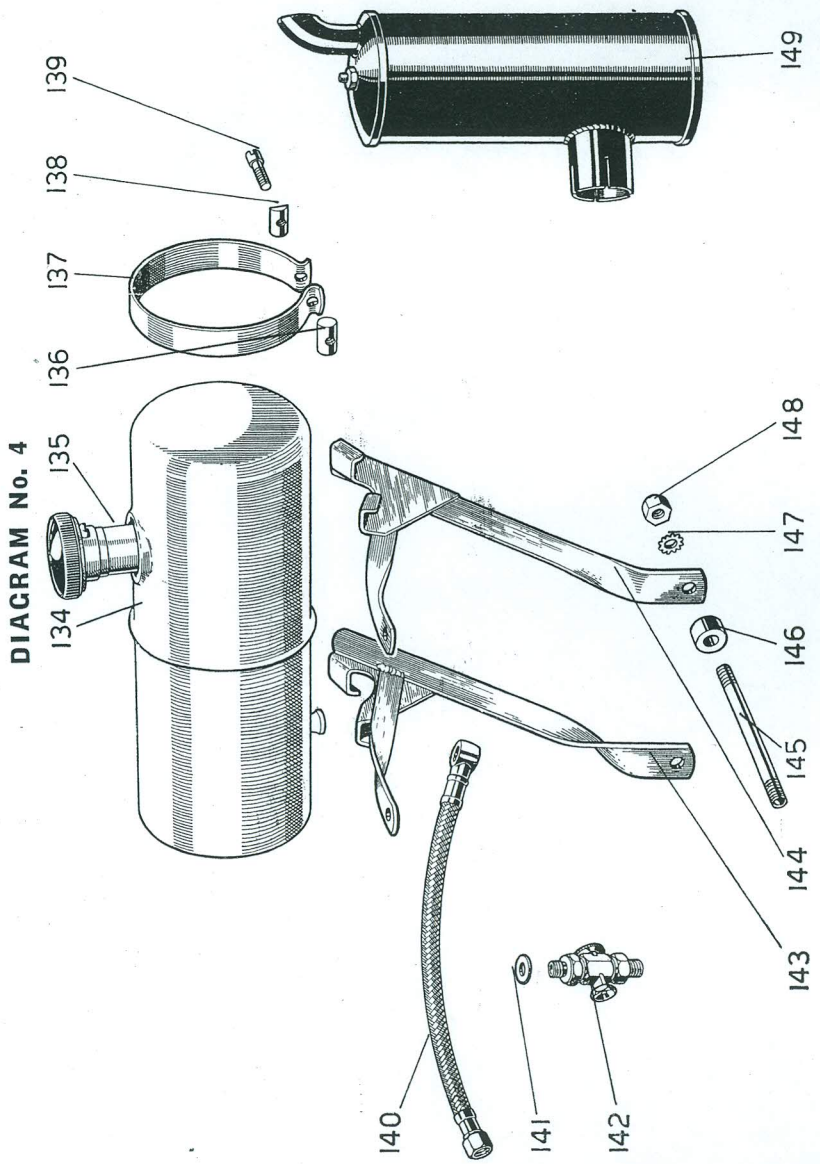


Illus. No.	Part No.	Description
92	V.234B, EL	Control Cables, Inner and Outer with Adjuster and Locknut
93	V.105 x 1	Cable Adjuster
94	V.105 x 2	Adjuster Locknut
95	V.108 x 15	Cable Nipple, Throttle End
96	V.123 x 4	Cable Nipple, Control End
97	V.108 x 4	Cable Control Sleeve
98	V.586	Throttle Spring
99	V.107 x 5	Top Ring
100	V.646	Top Disc and Peg
101	V.413	Needle Adjuster
102	V.107 x 1	Taper Needle Spring
103	V.625	Taper Needle No. 3
104	V.580	Throttle
105	V.648C	Body
106	V.107 x 15	Body Clip
107	V.107 x 16	Body Clip Screw
108	H.104 x 8	Banjo Union Washer, Large Hole
109	V.383	,, ,, ,, Small Hole
110	V.382	,, ,, Bolt
111	V.404	,, ,, Gauze
112	V.107 x 3	Centrepiece Washer
113	V.595	,, and Jet
114	V.107 x 2	Cup Washer
115	V.107 x 1	Float
116	V.146 x 6	,, Cup
117	V.107 x 4	Bottom Nut Washer
118	V.581	,, ,,
119	V.105 x 10	Compensating Tube
120	V.207	Tickler
121	V.111 x 2	,, Split Pin
122	V.369	,, Spring
123	V.355	Fuel Needle
124	V.257	,, ,, Lever
125	V.117 x 1	Control Body
126	V.117 x 3	,, ,, Clip
127	V.107 x 16	,, ,, Screw
128	V.117 x 5	,, ,, Screw
129	V.117 x 4	,, Top Plate
130	V.117 x 8	,, Spring Washer
131	V.117 x 6	,, Friction Plate
132	V.117 x 7	,, Fibre Washer
133	V.117 x 2	,, Lever



MISCELLANEOUS — Diagram No. 4

Illus. No.	Part No.	Description
134	C.7460	Fuel Tank
135	E.7602	Cap with Measure
136	EG.532	Trunnion, Tapped Hole
137	DG.513	Tank Strap
138	EM.276	Trunnion, Plain Hole
139	E.781	Screw for Strap
140	EM.551	Fuel Pipe
141	V.107 x 4	Tap Washer
142	5157	Fuel Tap, Single Level
143	C.7982	Tank Bracket, Right Hand
144	C.7612	,, ,, Left ,,
145	E.1483	Crankcase Stud, Long
145	E.835	,, ,, Short
146	E.7615	Distance Piece
147	Shakeproof	Lockwasher $\frac{3}{8}$"
148	E.834	Nut for Crankcase Stud
149	D.7616	Silencer



GUARANTEE

We give the following guarantee with VILLIERS 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 catalogue shall be construed as enlarging or varying this guarantee. In the case 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.

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

We do not undertake to refit or bear the cost of replacement or refitting such new part. We guarantee, subject to the conditions mentioned below, to make good at any time within six months any defects in these respects. As VILLIERS Engines and Accessories are liable to derangement by neglect or misuse, this guarantee does not apply to defects caused by wear and tear, misuse and neglect.

CONDITIONS OF GUARANTEE

If a defective part should be found in our engines or accessories, it must be sent to us carriage paid and accompanied by an intimation from the sender that he desires to have it repaired free of charge, under our guarantee, and he must also furnish us at the same time with the number of the engine, and full particulars of purchase. Failing compliance with the above, no notice will be taken of anything that may arrive, but such articles will lie here at the risk of the sender, and this guarantee or any implied guarantee shall not be enforceable.

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