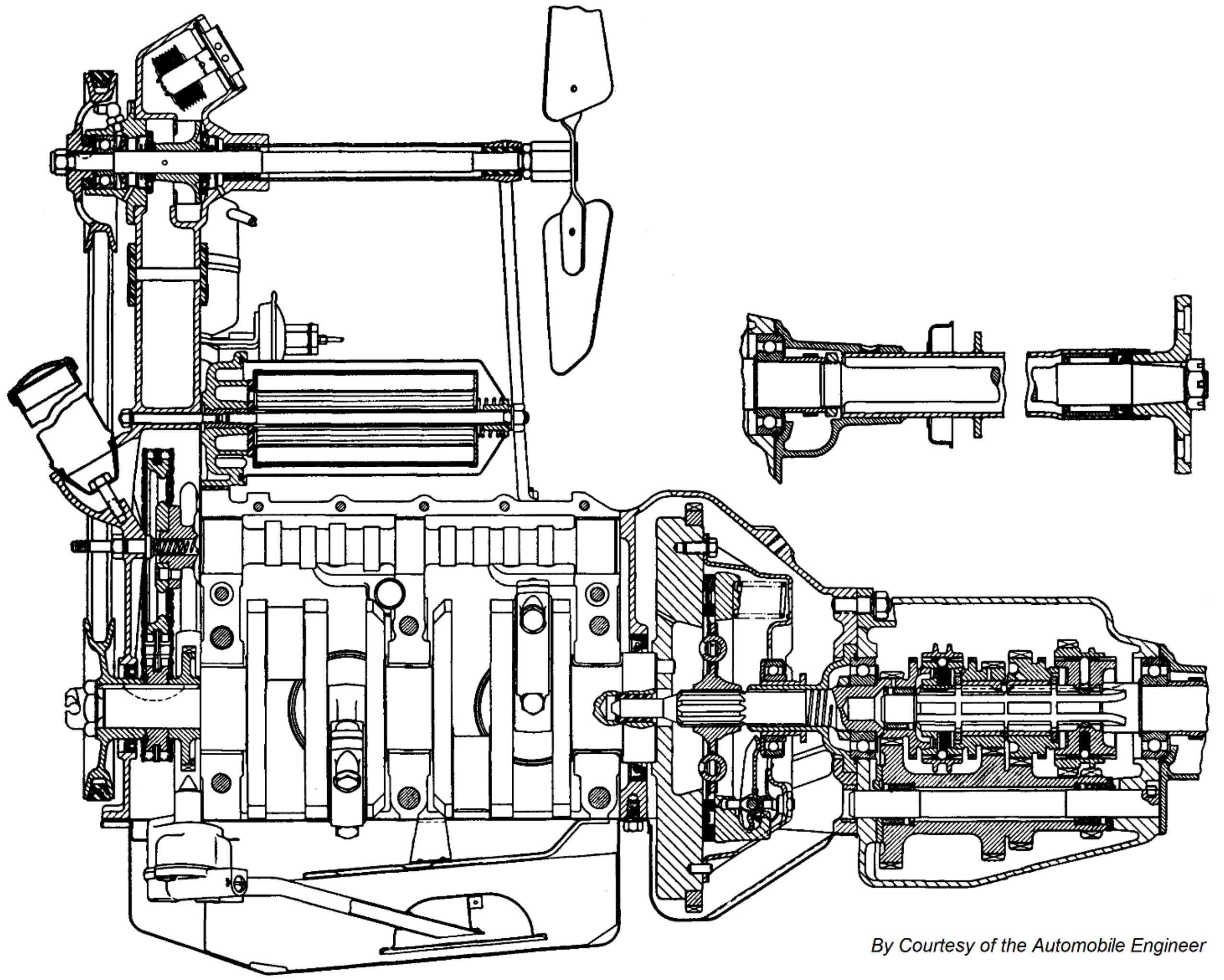
TECHNICAL NOTES SERIES

JOWETT JAVELIN – PA, PB, PC, PD & PE
JOWETT JUPITER – SA & SC



Above: Cross section of Javelin engine, clutch, and gearbox (early version).

PART XLIII –JOWETT JAVELIN AND JUPITER ENGINE REFURBISHMENT PRACTICES

The Jowett Car Club of Australia Incorporated is not responsible for any inaccuracies or changes that may occur within this document. Every effort has been made to ensure total accuracy. It is not a Jowett Car Club publication and, therefore, the Club has no control over its contents. These Technical Notes have been compiled by using the latest information available.

IMPORTANT! These notes are not a hard and fast Jowett engine rebuild procedure, the notes are based on personal experience. It is entirely the responsibility of the engine rebuilder to select procedures and spare parts for a Jowett engine rebuild.

Compiled by Mike Allfrey – April, 2022.

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IMPORTANT ADVICE!

Currently, specialist engine reconditioners may not have any idea of what a Jowett is, nor know how to proceed with vital tasks, such as crankshaft grinding, crankcase set repairs, camshaft re-profiling and cylinder head reworking for operation with modern petrols that are available. There is a common attitude from shop counter staff that the customer has no idea about what he/she may be requesting.

It is recommended that, should procedures be adopted from these notes, then the relative pages should be printed and presented to a specialist repairer with requested job items to be carried out, highlighted or underlined – at the time that the repair request is launched.

To take the crankshaft as an example, there are vital rules:

1. **The crankshaft must be crack tested.**
2. **All bearing journals must be ground to have a 0·1000-in. radius at both ends of each journal where they meet the crankshaft webs.**
3. **The rear spigot for the flywheel must not be 'clean-up' ground for the rear main oil seal. The spigot dimension has an extremely close tolerance for the fit of the flywheel onto the crankshaft. The specified dimension of the spigot is 3·000-in. diameter.**
4. **Ideally, the crankshaft, flywheel and clutch pressure plate assembly (less the friction disc) should be balanced as an identified set. Such identification must be observed during the engine assembly process.**
5. **Crankshaft end float should be between 0·0015 to 0·0030-in.**
6. **The crankshaft bearings must not 'pinch' at the journal radii, the bearing shells can be machined with a chamfer to provide running clearance.**

Good luck with your Jowett engine rebuild!

INTRODUCTION

These notes have been assembled in an effort to assist those taking on, for the first time, the task of dismantling, inspecting and assembling an engine for Jowett Javelin and Jupiter models. Hereafter called ‘the Jowett engine’, to keep matters simple. There are some differences between a Javelin and a Jupiter engine, mostly in the Jupiter’s case, to enhance performance.

However, between 1948 and 1963 numerous modifications to the engines were introduced by Jowett Cars Limited, and later by Jowett Engineering Limited. Very likely, more improvements in the period 1948 to 1953, and probably more such changes than a significant number of the British motor car manufacturers combined. Many of these improvements were introduced to distributors and dealers (agents) *via* a comprehensively produced Service Bulletin notification system. It appears that here in Australia, a large number of engine improvements did not find their way into the cars.

The number of improvements that may be available is so great, that gathering the parts to assemble an ‘up-to-date’ engine, close to seventy-five years after the engines’ introduction, can be rather difficult. In some cases, we have probably come to the end of copious supplies of spare parts.

This document should be used in conjunction with Part VI – Introduction to Engine Overhaul of the Jowett Technical Notes Series.

IMPORTANT NOTE

The notes in Section 3 are arranged in illustration (*Figures 1 and 2*) Item Number order, not at all in a sequence of importance. There have been far too many variations on a theme to be able to list them in some sort of order other than the method used in this document.

ENGINE IDENTIFICATION

During the Jowett engine’s production life the models of motor car they were used in went through a series of updates:

PA Javelin Saloon from its introduction in late 1948 – such an engine will have an identification number showing e.g. D8 PA 919 on the plinth on the front face of the left-hand side crankcase half. Where ‘D’ represents ‘4’ as the decade when the engine was built, ‘P’ denotes that it is for a passenger vehicle and the ‘A’ refers to the first version in the series. ‘919’ is the actual Engine Number – which is the same as the Chassis Number.

SA Jupiter Sportscar from its introduction in late 1950 – such an engine will have an identification number showing e.g. E0 SA 42R on the plinth on the front face of the left-hand side crankcase half. Where ‘E’ represents ‘5’ as the decade when the engine was built, ‘S’ denotes that it is for a sports model and the ‘A’ refers to the first version in the series. ‘42R’ is the actual Engine Number – which is the same as the Chassis Number.

PB Javelin Saloon from its update in 1950 – such an engine will have an identification number showing e.g. E0 PB 2955 on the plinth on the front face of the left-hand side crankcase half. Where ‘E’ represents ‘5’ as the decade when the engine was built, ‘P’ denotes that it is for a passenger model and the ‘B’ refers to the second version in the series. ‘2955’ is the actual Engine Number – which is the same as the Chassis Number.

PC Javelin Saloon from its update in 1951 – such an engine will have an identification number showing e.g. E1 PC 16644 on the plinth on the front face of the left-hand side crankcase half. Where ‘E’ represents ‘5’ as the decade when the engine was built, ‘P’ denotes that it is for a passenger model and the ‘C’ refers to the third version in the series. ‘16644’ is the actual Engine Number – which is the same as the Chassis Number.

PD Javelin Saloon from its update in 1952 – such an engine will have an identification number showing e.g. E2 PD 20974 on the plinth on the front face of the left-hand side crankcase half. Where ‘E’ represents ‘5’ as the decade when the engine was built, ‘P’ denotes that it is for a passenger model and the ‘D’ refers to the fourth version in the series. ‘20974’ is the actual Engine Number – which is the same as the Chassis Number.

PE Javelin Saloon from its update in late 1952 – such an engine will have an identification number showing e.g. E2 PE 22900 on the plinth on the front face of the left-hand side crankcase half. Where ‘E’ represents ‘5’ as the decade when the engine was built, ‘P’ denotes that it is for a passenger model and the ‘E’ refers to the fifth version in the series. ‘22900’ is the actual Engine Number – which is the same as the Chassis Number.

SC Jupiter Sportscar from its update in late 1952 – such an engine will have an identification number showing e.g. E3 SC 935 on the plinth on the front face of the left-hand side crankcase half. Where ‘E’ represents ‘5’ as the decade when the engine was built, ‘S’ denotes that it is for a passenger model and the ‘C’ refers to the second version in the series. ‘935’ is the actual Engine Number – which is the same as the Chassis Number. There was no ‘SB’ model.

In addition to the foregoing Engine Number sequences, there could be engines with a Reconditioned Engine Number plate riveted to the rear shoulder adjacent to the clutch housing on the left-hand half of the crankcase. These numbers usually commence ‘RO’ with a following number, also on the plate there can be crankshaft journal grind data.

PARTS LIST IDENTIFICATION CODES

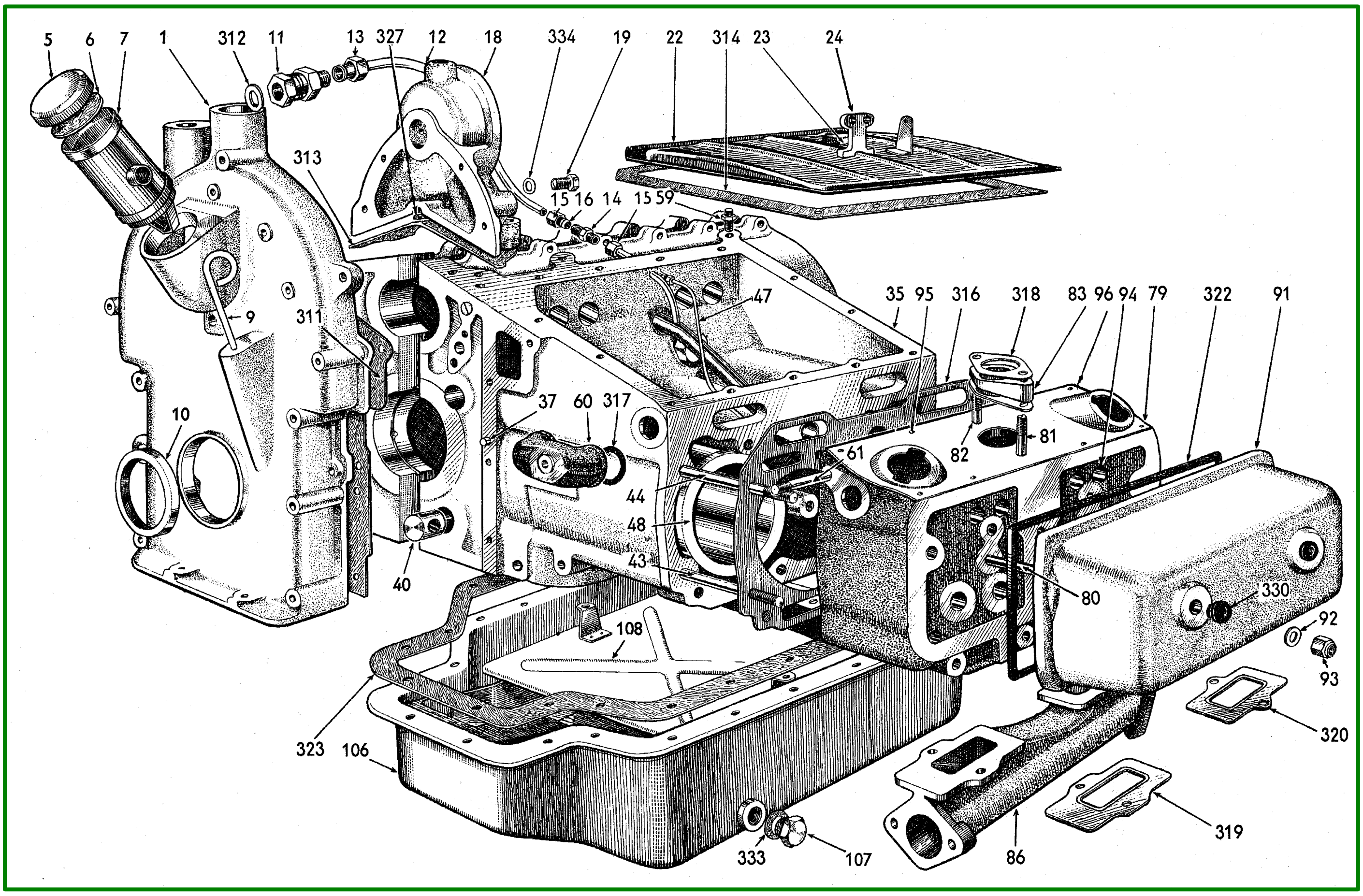
In the lists below *Figures 1 and 2* there are the following identification codes:

^ Means the Item is not illustrated. A number of significant parts are not illustrated.

* Means that the Item is also used for Jupiter models

» Indicates noted information encompassed in Section 3.

SECTION 1. – DESCRIPTION OF THE PARTS



Above: Figure 1. Illustration taken from the Spare Parts Catalogue, dated May, 1952.

Legend for the *Figure 1*:

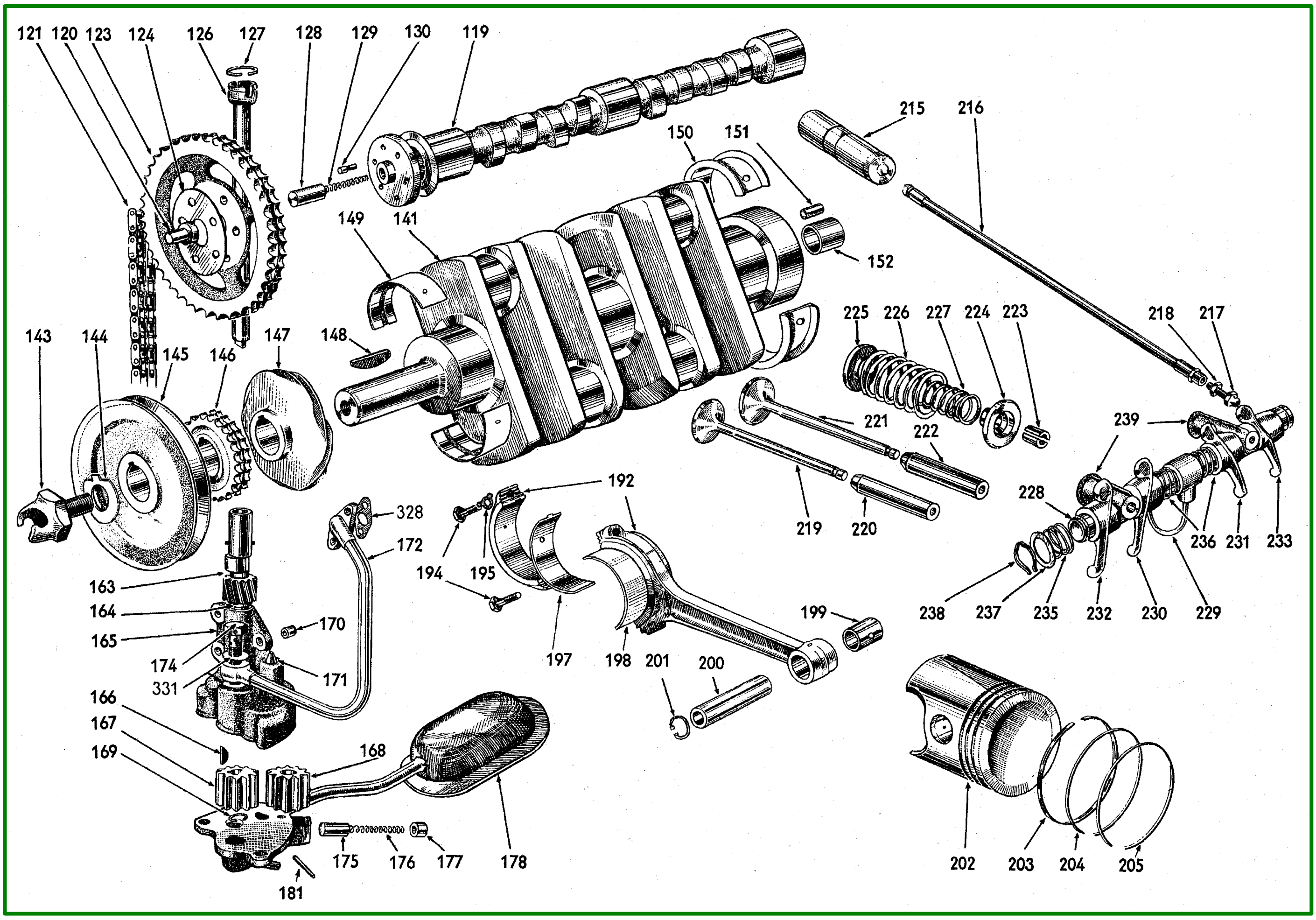
Item	Qty.	Part No.	Description
1	1	54662	Front Timing Cover (J54647 Late PD and all PE Models)
^*1	1	J54531	Front Timing Cover (Later Jupiter Type)
^*2	12	FB104/18	Timing Case Bolt – ¼-in. BSF x 2¼-in.
^*3	2	FB104/19	Timing Case Bolt – ¼-in. BSF x 2⅜-in.
^*4	1	52197	Timing Case Stud – ¼-in. BSF
5	1	6411	Oil Filler Cap
^5	1	3163x7	Oil Filler Cap – Jupiter
*6	1	52161	Oil Filler Cap Washer (Cork Composite with Vent))
7	1	52155	Oil Filler Tube Assembly (Javelin)
^7	1	1·53705	Oil Filler Tube Assembly (Jupiter)
^*8	1	FS105/8	Oil Filler Tube Setscrew – 5/16-in. BSF
*9	1	554542	Oil Level Dipstick (Later Dipstick has Plastic Grasp Knob)
*10	1	50694	Crankshaft Front Oil Seal (Use Double Lip Seal)
*11	1	50871	Crankcase Vent Valve (A Standard AC Valve)
*312	1	52207	Sealing Washer – Vent Valve
*12	1	52208	Breather Pipe – Long
*13	1	52209	Union Nut
*14	1	52203	Pipe Union – Double Ended

Item	Qty.	Part No.	Description (Continued)
*15	2	ND392	Union Nut
*16	2	ND392A	Pipe Olive (Must Make an Effective Seal at Joints)
^*17	1	53436	Balance Valve Assembly (Part of Item 11 – Breather Assembly)
*18	1	50690	Timing Case Rear Cover (Early Version – Vokes Filter Element) »[1]
*18	1	53030	Timing Case Rear Cover (Mid Version – Tecalemit Filter Element) »[1]
*18	1	J54547	Timing Case Rear Cover (Later Version – With Large Union Bolts) »[1]
*19	1	FS105/8	Setscrew – Oil Filter Drain (Loosen Back ¼-in. to Drain Filter)
^*20	2	FB105/9	Bolt – Timing Case Rear Cover
^*21	1	52096	Tappet Cover Assembly – R.H.
22	1	1·53700	Tappet Cover Assembly – R.H. (Jupiter – L.H.D.)
22	1	1·53678	Tappet Cover Assembly – L.H. (Jupiter – L.H.D.)
22	1	50297	Tappet Cover Assembly – L.H.
22	1	53107	Tappet Cover Assembly – L.H. (Jupiter – R.H.D.)
*23	2	52244	Air Vent Filter Felt
*24	2	52071	Sparking Plug Lead Support
^*25	24	FS504/4	Round Head Machine Screw for Tappet Cover
*35	1	50522/3	Crankcase Complete with Studs, Bolts, Oil Pipes and Balance Pipes »[2]
^*36	2	52137	Crankcase Dowel
*37	2	50634	Front Timing Cover Dowel
^*38	4	50630	Crankcase Joint Bolts
^*39	2	50631	Crankcase Tie Studs
*40	4	50632	Round Nut – Crankcase Tie Bolts (Has Lead-in Thread)
^*41	4	FN109/K	Crankcase Tie Stud Nut (Use Plain Washer)
^*42	5	FB104/14	Bolt – Crankcase Upper Joint – ¼-in. BSF x 1¾-in.
43	8	50636	Cylinder Head Stud – Short (⅜-in. BSF) – Javelin
^43	8	1·53693	Cylinder Head Stud – Short (⅜-in. BSF) – Jupiter
44	8	50637	Cylinder Head Stud – Long (⅜-in. BSF) – Javelin
^44	8	1·53692	Cylinder Head Stud – Long (⅜-in. BSF) – Jupiter
^45	2	52110	Cylinder Head Stud – Centre (⅜-in. BSF) – Javelin
^45	2	1·53694	Cylinder Head Stud – Centre (⅜-in. BSF) – Jupiter
^*46	2	50638	Cylinder Head Stud – Drilled (Rocker Gear Oil Feed)
*47	2	50639	Oil Pipe – Rocker Gear Oil Feed
*48	4	50642	Cylinder Liner – Early Version (Thinner Wall) »[3]
*48	4	54019	Cylinder Liner – Later Version (Thicker Wall) »[3]
^*49	2	52142	Liner Locating Plate – Should Not Be Used »[4]
^*50	14	BR140	Stud – Oil Sump Mounting
^*51	4	FD105/9	Stud – Coolant Inlet
^*52	1	FD104/7	Stud – Oil Pump (Short)
^*53	2	FD104/11	Stud – Oil Pump (Long)
^*54	2	50974	Stud – Clutch Housing (7/16-in. BSF x 1⅜-in.)

Item	Qty.	Part No.	Description (Continued)
^*55	4	50975	Stud – Clutch Housing (⅜-in. BSF x 1⅜-in.)
^*56	4	50976	Stud – Clutch Housing (⅜-in. BSF x 1⅝-in.)
^*57	2	52178	Stud – Clutch Housing (⅜-in. BSF x 2⅜-in.)
^*58	4	52179	Stud – Engine Mounting Bracket
*59	2	52003	Anchor Pin – Fan Support Strut (Not Used On Jupiter)
60	2	52072	Coolant Transfer – Javelin (Cast Iron)
^60	2	53668	Coolant Transfer – Jupiter (Aluminium and Different Dimensions)
*61	2	FD106/19	Stud – Coolant Transfer (Use With Nyloc Nut)
^*62	AR	52381	Shim – Cylinder Liner (JCCA Supplies a Selection of Thickness)
^*63	1	50628	Internal Balance Pipe
^*64	5	50635	Dowel – Main Bearing Location
^*65	4	52393	Washer – Crankcase Tie Bolt
^*66	4	50265	Plug – Oil Galleries (Three Known Types) [»5]
^*67	2	J54395	Support – Cylinder Head Gasket (Centre) [»4]
^*68	2	J54396	Distance Washer – Cylinder Head Gasket Support
^69	2	J54429	Distance Piece
^78	1	52167	Cylinder Head – R.H. (Javelin)
^78	1	53500	Cylinder Head – R.H. (Jupiter)
79	1	52166	Cylinder Head – L.H. (Javelin)
^79	1	53499	Cylinder Head – L.H. (Jupiter)
*80	4	50703	Stud – Rocker Cover
*81	2	50585	Stud – Carburettor (Long)
*82	2	50586	Stud – Carburettor (Short)
*83	2	50880	Packing – Carburettor Flange
^*84	2	52231	Tap – Cooling System Drain
^*85	1	50884	Exhaust Manifold – R.H.
86	1	50883	Exhaust Manifold – L.H. (Javelin)
^86	1	1·53687	Exhaust Manifold – L.H. (Jupiter)
^*87	8	FD105/8	Stud – Exhaust Manifold to Cylinder Head
^*88	8	FN105/B	Nut – Brass (Use With Spring Washer)
^*89	2	52031	Stud – Exhaust Manifold to Exhaust Pipe Flange
^*90	2	52193	Seal Washer – Centre Cylinder Head Stud
*91	2	50854	Rocker Cover
*92	4	52235	Washer – Rocker Cover
*93	6	52164	Nut – ⅜-in. BSF (Self-locking – Simmons, Nyloc)
*94	4	50588	Tube – Push Rod
*95	16	52140	U-drive Screw – Splash Cover
*96	2	50704	Splash Cover – Cylinder Head
*106	1	52078	Engine Oil Sump
*107	1	52012	Drain Plug – Oil Sump Drain

Item	Qty.	Part No.	Description (Continued)
*108	1	52067	Baffle Assembly – All Steel Version Preferred
^*109	4	FS104/6	Setscrew - Baffle

Quantities – per vehicle. ^ = Not Illustrated; * = Common to Jupiter; »2 = Section Notes



Above: Figure 2. Illustration taken from the Spare Parts Catalogue, dated May, 1952.

Legend for *Figure 2*:

Item	Qty.	Part No.	Description
*119	1	50662	Camshaft (Early – Non Vernier Timing)
*119	1	J54538	Camshaft (Later – Vernier Type Timing)
*119	1	J54651	Camshaft (Latest – Vernier Type Timing)
*120	1	50695	Thrust Peg – Camshaft
*120	1	54002	Thrust Peg – Camshaft
*120	1	J54644	Thrust Peg – Camshaft (Series III Engine)
*121	1	50664	Duplex Chain – Camshaft Drive (Preferably Endless)
*123	1	50575	Camshaft Chainwheel (Early) »6
*123	1	J54481	Camshaft Chainwheel (Vernier Timing) »6
*124	1	50663	Lock Plate – Camshaft Chainwheel
*124	1	J54482	Lock Plate – Camshaft Chainwheel (Vernier Timing)
^*125	2	FB105/6	Bolt – Camshaft Chainwheel
*126	1	50882	Shaft – Ignition Distributor Drive

Item	Qty.	Part No.	Description (Continued)
*127	1	50964	Circlip – Distributor Drive
*128	1	52474	Camshaft Thrust Plunger (Deleted From Vernier Timing Type)
*129	1	50681	Camshaft Thrust Spring (Deleted From Vernier Timing Type)
*130	1	50634	Dowel – Camshaft Drive (Non Vernier Timing Type)
*130	1	J54483	Dowel – Camshaft Drive (Vernier Timing Type)
*141	1	52010	Crankshaft Assembly – With Dowel And Spigot Bearing »7
*141	1	J54593	Crankshaft Assembly – With Dowel And Spigot Bearing »7
*143	1	50699	Dog – Starting Handle
*144	1	50700	Tab Washer – Starting Handle Dog
*145	1	50576	Crankshaft Pulley
*146	1	50649	Timing Chain Pinion
*147	1	50648	Gear – Oil Pump Drive
*148	1	50583	Crankshaft Key
*149	4	52573	Bearing – Front And Centre Main »8
*150	2	50646	Bearing – Rear Main With Thrust Flanges »8
*151	1	50633	Dowel – Flywheel
*152	1	50601	Spigot Bearing (Shorlube, Oilite)
^*162	1	AS52403	Oil Pump Complete (Early Type) »9
^*162	1	J54555AS	Oil Pump Complete (Intermediate) »9
^*162	1	J54711	Oil Pump Complete (Series III) »9
*163	1	52402	Spindle – Oil Pump Drive
*163	1	J54717	Spindle – Oil Pump Drive (Series III)
*164	1	50667	Washer – Oil Pump Drive Spindle
*165	1	52403	Body – Oil Pump
*165	1	J54555	Body – Oil Pump (Intermediate)
*165	1	J54757	Body – Oil Pump (Series III)
*166	1	50673	Woodruff Key
*167	1	52348	Oil Pump Driving Gear
*168	1	52347	Oil Pump Driven Gear
*169	1	50670	Circlip – Oil Pump Drive Spindle
*170	2	50689	Dowel – Oil Pump Locating
*171	1	52468	Spindle – Oil Pump Idler Gear
*172	1	50682	Delivery Pipe (Early) »10
*172	1	J54554	Delivery Pipe (Series III) »10
^*173	2	FS104/5	Setscrew – Delivery Pipe Elbow
*174	1	50686	Banjo Union Bolt – Delivery Pipe »11
*174	1	J54548	Banjo Union Bolt – Delivery Pipe (Series III) »11
*175	1	50680	Piston – Oil Release Valve (Early) »12
*175	1	J54720	Piston – Oil Release Valve (Series III) »12
*176	1	50681	Spring – Oil Release Valve (Early) »12

Item	Qty.	Part No.	Description (Continued)
*176	1	54388	Spring – Oil Release Valve (Intermediate) [»12]
*176	1	J54721	Spring – Oil Release Valve (Series III) [»12]
*177	1	50864	Retainer – Oil Release Valve Assembly
*178	1	50674	Cover Assembly – Oil Pump (Do Not Use Brass Version)
*178	1	J54714	Cover Assembly – Oil Pump (Series III)
^*179	3	FS104/5	Setscrew – Oil Pump Cover
^*180	1	FB104/8	Bolt – Oil Pump Cover
*181	1	52180	Mills Pin – Oil Release Valve (Early)
^*182	1	54722	Screw – Release Valve Adjusting (Series III)
^*183	1	54724	Thin Nut – Release Valve Locking
*192	4	50650	Connecting Rod Assembly (Early – Do Not Use) [»13]
*192	4	54024	Connecting Rod Assembly [»13]
*192	4	J54493	Connecting Rod Assembly [»13]
*192	4	J54727	Connecting Rod Assembly (Series III) [»13]
*194	8	50653	Bolt – Connecting Rod (Early)
*194	8	54022	Bolt – Connecting Rod (Later) [»14]
^*194	8	54022U	Cap-screw – Connecting Rod (Unbrako In-hex Screw – Current) [»14]
*195	8	50654	Tab Washer (No Longer Used)
*196	4	J54444	Bearing – Connecting Rod (Use Hillman Avenger) [»15]
*199	4	54020	Bush – Connecting Rod Small End
*200	4	50660	Piston Pin
*201	8	50661	Circlip – Piston Pin
202	4	50656	Piston – Javelin With Rings And Pin (Use JP Pistons) [»16]
202	4	53227	Piston – Jupiter With Rings And Pin (Use JP Pistons) [»17]
*203	4	50659	Piston Ring – Oil Scraper
*204	4	54021	Piston Ring – Second Compression (Stepped)
*205	4	54018	Piston Ring – Top Compression (Vacrom)
*215	8	52670	Tappet – Hydraulic (No Longer Used)
*215	8	54161	Tappet – Solid
216	8	50731	Push Rod – Hydraulic Tappet
216	8	1·53696	Push Rod – Complete (Solid Tappet – Jupiter)
*216	8	54162	Push Rod – Complete (Solid Tappet – Javelin)
*217	8	50735	Adjustment Screw – Hydraulic Tappet
*218	8	FN204/K	Lock Nut – Push Rod Adjustment
*219	4	50516	Valve – Exhaust [»18]
*220	4	50518	Guide – Exhaust Valve
*221	4	50515	Valve – Inlet [»18]
*222	4	50517	Guide – Inlet Valve
*223	8	50705	Valve Collets – Supplied In Pairs
*224	8	53307	Valve Spring Collar

Item	Qty.	Part No.	Description (Continued)
*225	8	53303	Seat – Valve Spring
*226	8	52964	Valve Spring – Outer
*227	8	50709	Valve Spring – Inner
*228	2	50711	Shaft – Rocker
*229	2	50713	Rocker Shaft Oil Pipe With Banjo Union
*230	2	50717	Inlet Rocker With Bush – Cylinders 1 and 4
*231	2	50718	Inlet Rocker With Bush – Cylinders 2 and 3
*232	2	50722	Exhaust Rocker With Bush – Cylinders 1 and 4
*233	2	50723	Exhaust Rocker With Bush – Cylinders 2 and 3
^*234	8	50721	Rocker Bush
*235	4	50726	Spring – Short (Rocker Shaft)
*236	4	50727	Spring – Long (Rocker Shaft)
*237	4	50728	Washer – Rocker Shaft
*238	4	50729	Circlip – Rocker Shaft
*239	4	50710	Pedestal – Rocker S haft
^*240	4	52163	Washer – Pedestal »[19]
^*250	1	?????	Engine Oil Filter Assembly – Vokes Type »[20]
^*250	1	53422	Engine Oil Filter Assembly – Tecalemit Type (Later Version) »[20]
^*251	1	50872	Cannister – Engine Oil Filter (Vokes Type) »[20]
^*251	1	53423	Cannister – Engine Oil Filter (Tecalemit Type) »[20]
^*252	1	50873	Element – Vokes Type
^*252	1	53424	Element – Tecalemit Type
^*263	2	50686	Union Bolt – Oil Delivery Pipe (Tecalemit Type)
^*264	4	54157	Fibre Washer – Union Bolt
^*265	1	50875	Seal Ring – Cannister To Rear Timing Cover (Vokes Type)
^*265	1	53428	Seal Ring – Cannister To Rear Timing Cover (Tecalemit Type)
Engine Gaskets And Sealing Washers			
*311	1	50698	Gasket – Front Timing Cover
*312	1	52207	Seal Washer – Vent Valve
*313	1	50692	Gasket – Rear Timing Cover »[1]
*313	1	J54688	Gasket – Rear Timing Cover »[1]
*314	2	50746	Gasket – Tappet Cover
^*315	4	50643	Seal Washer – Cylinder Liner (Not Used) »[3]
316	2	50738	Gasket – Cylinder Head (Javelin) »[21]
316	2	1·53691	Gasket – Cylinder Head (Jupiter) »[21]
*317	4	52708	‘O’ Ring – Coolant Transfer
*318	4	50881	Gasket – Carburettor Flange
*319	2	50867	Gasket – Exhaust Manifold (Long)
*320	2	50868	Gasket – Exhaust Manifold (Short)
^*321	2	52192	Rubber Ring – Centre Head Stud Seal »[22]

Item	Qty.	Part No.	Description (Continued)
*322	2	50869	Gasket – Rocker Cover (Use ‘O’ Ring Cord)
*323	1	50767	Gasket – Engine Oil Sump
^*324	1	52386	Paper Packing – Oil Pump Cover
^*325	1	50875	Seal Ring – Cannister To Rear Timing Cover (Vokes Type)
^*325	1	53423	Cannister – Engine Oil Filter (Tecalemit Type)
^*326	3	52027	Gasket – Exhaust Flange
*327	1	52171	Felt – Seal For Rear Timing Cover (Use ‘O’ Ring Cord) »1
*328	1	56087	Gasket – Oil Pipe Elbow (Small Bore)
*328	1	J54552	Gasket – Oil Pipe Elbow (Large Bore)
^*329	4	52162	Fibre Washer – Banjo Union At Rocker Shaft Feed
*330	4	52055	Grommet – Rocker Cover Seal
*331	2	50688	Fibre Washer – Oil Pump Union Bolt
*331	2	J54549	Fibre Washer – Oil Pump Union Bolt (For Larger Pipe Union)
^*332	1	50853	Gasket – Coolant Pump Front Cover Housing
*333	1	52013	Fibre Washer – Engine Oil Sump Drain Plug
*334	1	52173	Fibre Washer – Engine Oil Filter Drain Setscrew
^*335	2	50629	‘O’ Ring – Internal Balance Pipe Seal
^*336	2	52013	Fibre Washer – Coolant Drain Tap
^*337	1	50833	Gasket – Petrol Pump (Blank Off Plate, Jupiter)
*338	2	50832	Gasket – Coolant Inlet Elbows »2
*339	1	54038	Gasket – Crankcase To Clutch Housing (Instead Use Loctite 518)
The Gaskets And Seals Make Up The Engine Overhaul Gasket Set			

Quantities – per vehicle. ^ = Not Illustrated; * = Common to Jupiter; »2 = Section Notes

SECTION 2 – HOW TO MAKE A START?

This can be a difficult question, and it would be best to get back to basics. These notes will commence with information relating to the numbered green quotation marks in the parts descriptions.

One point that must be carefully understood is that, over the years, someone has attempted to try and repair an engine at some time previously. These ‘attempts’ can cause serious disruptions to an engine’s rebuild schedule. The points to look out for are listed in the next section.

The terms left and right, above and below, are used here as viewed from the driver’s seat, looking forward. The terms inboard and outboard are in relation to the crankcase joint faces.

SECTION 3 – NOTES ABOUT IDENTIFIED ITEMS

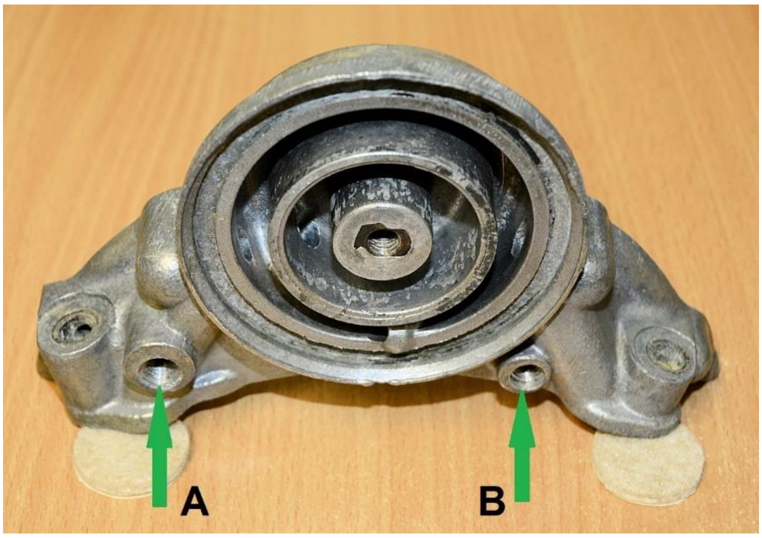
»1 Notes – Rear Timing Cover

During the Javelin/Jupiter production run three distinctly different rear timing cover designs were introduced by Jowett Cars Limited:

1. The original rear timing cover was that for the Vokes oil filter with a green painted filter cannister. This cover did not feature ports for oil cooler plumbing into the lubrication system. It does have a port for an oil pressure gauge and the long setscrew that can be loosened off for draining the filter cannister prior to its removal. As a rear timing cover, properly installed, it works well. Refer to *Figure 3* for identification purposes. The oil gallery drillings are the same size as those they match with in the PA, PC, early PD and SA crankcase upper surface.

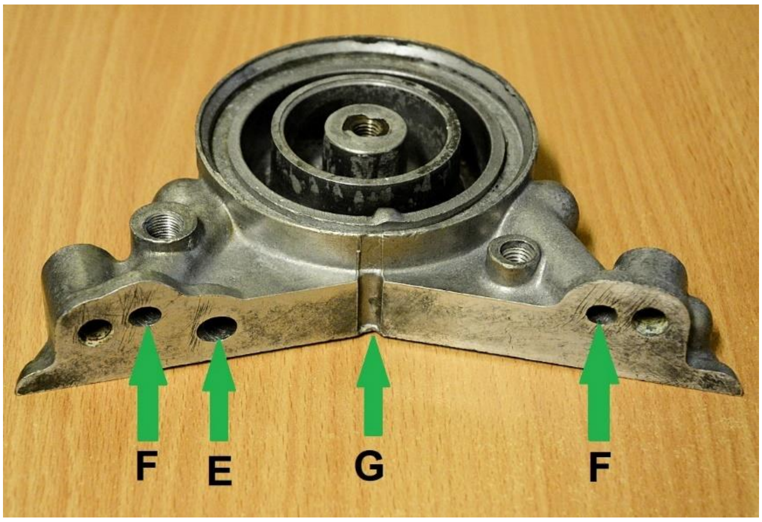
2. The second style rear timing cover is that for the Tecalemit engine oil filter. The cannister is painted a bronze colour. The rear cover is a more bulky item that described above, mostly to accommodate a larger diameter cannister, which has a Tecalemit identification plate riveted on its diameter, but having the addition of two ports for oil cooler hose fittings. The oil pressure gauge port and the filter drain setscrew are still present in the same positions. The oil gallery drillings in the cover match those drilled in the crankcase.
3. The third style rear timing cover continues with the Tecalemit engine oil filter, however, it has larger ports for oil cooler connections to enhance oil flow. In addition, the oil gallery drillings have been increased in diameter for better oil flow characteristics. Again, the oil pressure gauge port and filter drain setscrews remain in the same location.

   This rear timing cover, Part Number J54547, was fitted to some PD Javelins and SA Jupiters, and was fitted to all PE and SC models.
4. All types of rear timing covers feature a tapered gas thread for the oil pressure gauge union. It is known that over-tightening the fitting into the cover can cause the port boss to split. A fitting should be installed using Loctite 569 as a sealant in accordance with its use instructions.



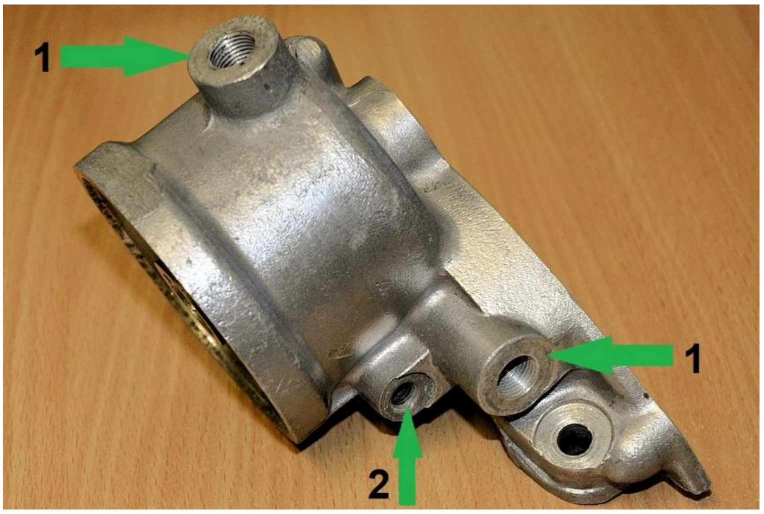
Right: Figure 3. The rear timing cover for Vokes filter. 'A' Oil pressure gauge port, 'B' Oil filter drain setscrew port.

Right: Figure 4. Front face of the same rear timing cover. 'C' five threaded holes that need checking before installation, Items 'D' show securing bolt holes.

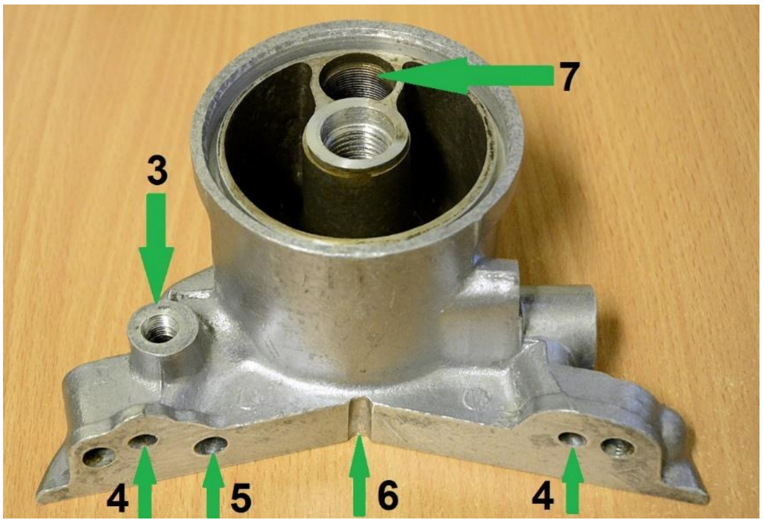


Right: Figure 5. Gasket surface at crankcase joint at underside of rear timing cover. 'E' Inlet port from oil pump, 'F' are oil ports to longitudinal oil galleries in crankcase, 'G' is the relief for the bend in the gasket. This area, on assembly, is filled with sealant soaked felt strip. 'O' ring cord can be used here by gluing in place with Loctite 406 adhesive and allowed to cure, before using a sharp blade to shave the cord to be just proud of the gasket face, for squeezing at assembly.

Right: Figure 6. The first version of the rear timing cover for the Tecalemit oil filter, Item 1 are the ports for an oil cooler connection, Item 2 shows the revised position of the oil filter drain setscrew.

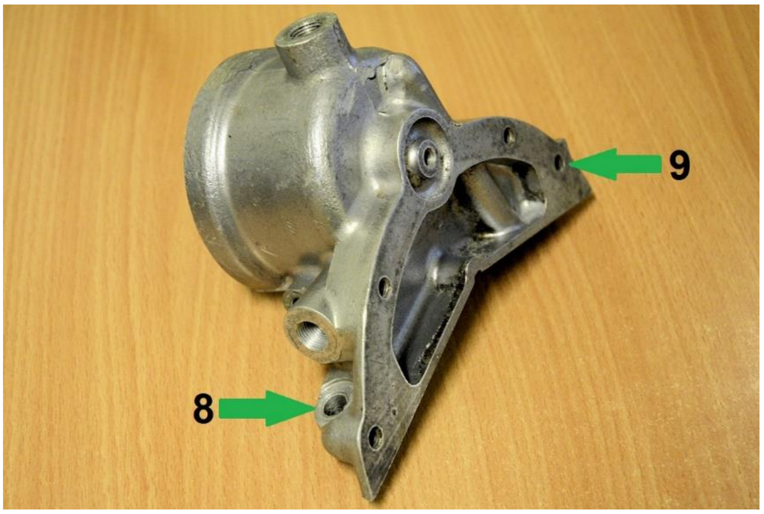


Right: Figure 7. View of the rear face of the rear timing cover. Item 3 is the port for the oil pressure gauge, Items 4 are the oil feed ports to the crankcase galleries, Item 5 is the port that receives oil from the oil pump. Note that these drillings are of the same diameter as those shown in Figure 5. Item 6 is the same as that described in Figure 5. Item 7 is the threaded bore for the blocked filter element bypass valve cassette.



Right: Figure 8. Showing the front face, with Item 8 being one of the two mounting bolt holes, Item 9 relates to the threaded holes that need to be checked before assembly on to the crankcase.

It should be noted that the third version of the rear timing cover is virtually the same as that shown in Figure 8. The major differences are in the larger ports at Items 1, 4 and 5. If desired, the oil galleries in the rear cover of the earlier versions can be carefully drilled to decrease oil flow restrictions. The drillings into the crankcase can be drilled to match.



The rear timing cover – this is well up in the running for number one in the oil leakage stakes, due to those who do not understand, over-tightening the two bolts that secure the cover to the crankcase set. All too often stripped out threads are discovered in this area. In numerous cases, these threads may have been opened out to ⅜-in. BSF, or more likely, BSW thread forms. The common repair method is to employ $^{5}/_{16}$-in. BSF Recoil (Helicoil) repair kits, these will work well when installed into the parent metal accurately.

The original left-hand side thread can be tapped deeper into the crankcase, and a longer bolt of Unbrako type employed. At the right-hand side, the writer has not tried to deepen that thread hole.

There is another method that can be employed to ensure that there is no oil leakage. Cut a strip of 1·6 mm thick aluminium sheet to the same dimensions and shape of a new Gasket (*Item 313*) mark out the positions of the oil gallery and bolt holes accurately. Drill the oil gallery holes to allow an 'O' ring at each hole to seat against the crankcase surface. The 'O' ring's section should be such that when the rear timing cover is fastened to the crankcase, there is a degree of crush on the 'O' ring as it is located on the surface of the crankcase peak. The inside diameter of the rings should be such that oil flow is not impeded. At the left hand side, the proximity of the oil feed from the pump, and the feed port to the crankcase galleries can be at close quarters – but a successful result can be achieved.

The assembly procedure for the modified seal requires that the aluminium plate be carefully bent over the crankcase peak to ensure that bolt holes and oil drillings align. There should be no burrs or contamination at any of the mating surfaces. Apply a light smear of Loctite 518 Master Gasket sealant and bolt the assembly down tightly against the front timing cover, minus its gasket (*Item 311*). After the sealant has fully cured, the front timing cover can be removed and re-installed with its gasket, using Loctite 515 Master Gasket sealant. The reason for the two sealants is due to the Loctite 518 being the best sealant for metal to metal joints.

The writer of these notes has a homemade jig for drilling the aluminium plate, it is available for club members' use, provided they are financial members and collect/return the jig promptly.

Note: Refer to Note **»20** on Page 26, for information relating to installation of engine oil filters.

Service Bulletin Advice – Rear Timing Cover

Redesigned rear timing cover.	E0 PB 7676
Oil filter outer casing strengthened.	E0 PB 9423
Tecalemit oil filter introduced.	E1 PC 16603

»2 Notes – Crankcase Set

Throughout production of the Jowett engine, there were a number of changes to the crankcase set (*Item 35*), surprisingly, the part numbers did not change. The Engine Number stamped into the plinth on the front face of the left-hand side half, provides a good indication of what the engine should be.

One of the first upgrades was the slightly raised longitudinal oil galleries, this was done to prevent loss of oil pressure after hydraulic tappets were abandoned. The galleries were originally designed to break through into the tappet bores to fill the hydraulic system of the tappets. In approximately late 1952 a Series III crankcase was introduced, one feature was that the oil galleries were raised even higher in the crankcase – to the extent that there is a pronounced 'hump' between the joint line and the tappet cover (*Item 22*). Another means of identification is the use of shouldered brass oil gallery plugs (*Item 66*). Internally, the Series III crankcase featured St. Andrew's cross bracing ribs at front and rear of the centre web for the main bearing.

There is a view that the Series III crankcase set, because of the alloy used, is susceptible to early corrosion at the coolant jackets. However, should a well preserved crankcase of either type be found then, continued use employing a suitable corrosion inhibitor will assure long life.

It has been established that a Series III crankcase can, should the six tie bolts have been abused in the past, the main bearings can be pinched, thus locking the crankshaft. The recommended torque for tightening the tie bolts is 75 lb. ft. and, should the crankshaft be nipped at this torque, the tie bolts should be backed off and tightened to 60 lb.ft. which, from experience, will allow the crankshaft to spin freely.

In essence, only minor improvements were made to the crankcase set. There were changes to the oil passage grooves behind the main bearing shells. Those crankcases that do not feature these grooves, should be machined so that circular grooves surround the bearing shell locating dowels to allow free flow of oil.

The crankcase set has counter bores for the shanks of the cylinder head studs (*Items 43, 44, 45*) that provide supports for the studs. The counter bores should hold the studs snugly. Furthermore, those crankcase sets used for reconditioned engines, may have the number 7 or 10 (in tightening sequence) extended *through* the coolant inlet port. The reasoning behind this action is to provide additional strength at the rear faces of the crankcase when the cylinder heads are being torqued in place. The extended stud is 'waisted' at the area where it passes through the coolant inlet port. The fact that the studs pass through the ports has very little effect on coolant flow. New studs can be machined from stainless steel 9·5 mm rod. Refer to Technical Notes – Part XII for detailed information.

The coolant inlet elbows and their gaskets should be installed securely, prior to other engine assembly procedures on the crankcase set. The elbow flanges at strength to the rear crankcase faces.

As shown below, from crankcase set number 26496, there were changes to the cylinder head studs which entailed extra length to suit thicker cylinder head nuts and corrosion proof zinc plating.

Service Bulletin Advice – Crankcase Set

Crankcase oil flow increased.	E2 PD 21937
Redesigned crankcase fitted.	E2 PD 22190
Main bearing dowel drilled.	E0 PB 9540
Oil groove added to crankcase main bearing bore.	E1 PC 16744
Series III crankcase introduced.	E2 PD 22221
Cylinder head studs modified from crankcase Set Number 26496.	
Improved oil gallery plugs from crankcase Set Number 26496.	

Note: Other changes took place that were instigated after 1953 by Jowett Engineering Limited.

»3 Notes – Cylinder Liners

There are five types of liner (*Item 48*). These are of the wet liner type and are a push fit in the crankcase. They are held in place by the pressure of the tightened cylinder head nuts and a locating plate, or a support casting (*Item 49*) centred on the head stud situated between each pair of liners.

1. The earliest liners in use up to about Engine Number 8825 (1950), are rather thin in the water jacket wall. For this reason they are believed to be liable to be porous if rebored. They should not be rebored, therefore, unless absolutely necessary.

   ***NOTE:** If thin-walled cylinder liners are bored out, they will crush (give) under the pressure applied by the cylinder head securing nuts. In addition, the thinner wall will vibrate with combustion forces and piston direction change, and will then cause what is known as 'cavitation erosion'. This is a condition where tiny air bubbles in the coolant implode against the cylinder liner.*

2. After the above liner, a similar one was introduced with a thickened water jacket. This will be dependent on corrosion take rebores up to 0·040-in. oversize, and perhaps beyond.
3. It is difficult to distinguish between these two liners but comparing them side by side they are in fact clearly different. Whilst the diameter of the water jacket area is different the lip flange diameter remains the same and, hence, the flanges look more stubby. The outside diameter of the later liner barrel is 3·375-in. (85·73 mm) but this is often difficult to measure because of ,the surface rusting of used liners.
4. The cylinder liners described at Steps 1 and 2 have a shallow groove round the liner skirt, apparently intended to take the edge of the original Hallite liner seal (gasket).
5. Very late in production the adoption on of an 'O' ring seal between the cylinder liner and the crankcase, meant a change in the liner design. The 'O' ring liner is longer from top to bottom flanges. It has a radius (curve) under the lower flange which goes into the chamfer in the crankcase seating.

   ***NOTE:** 'O' ring liners cannot be used in a standard crankcase, without modification, nor can standard liners be used in an 'O' ring type crankcase.*

6. The original Hallite cylinder liner to crankcase seals (*Item315*) are no longer used, the proven alternative being a copper spacer approximately 0·035-in. thick. The original Hallite seal tended to yield and cause failure at the cylinder head gasket. The copper ring holds position successfully under normal circumstances, however, if cylinder liners have been over bored, the liner itself can yield and produce cylinder head gasket failure symptoms.

Service Bulletin Advice – Cylinder liners

Introduction of strengthened cylinder liners. E0 PB 8825

»4 Notes – Cylinder Head Gasket Support

The initial design of the cylinder head gasket support (*Item 49*) was a steel plate that located over the centre cylinder head stud (*Item 45*), seating on machined ledges outboard of the cylinder liner (*Item 48*) skirts. Placed over the stud there was an aluminium tube (later with a plain washer) to support the cylinder head gasket (*Item 316*) at the span between the upper and lower cylinder head studs. At times, the support system required brass shims to level it with the cylinder liner lips.

A modified one-piece gasket support (a single aluminium casting), that was accurately machined was introduced. These supports have been re-manufactured and are now in common use. Still, at times, brass shims are required to ensure correct gasket support.

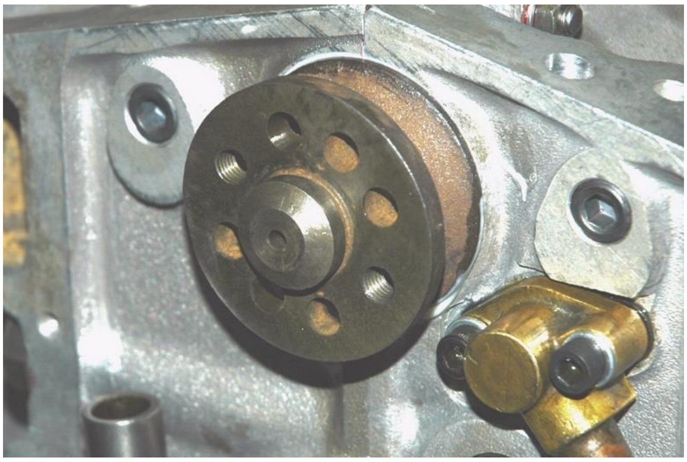
Experience has shown that, should the gasket not be supported adequately, the copper sheet part of the gasket may fracture due to local vibration.

Service Bulletin Advice – Centre Cylinder Head Gasket Support

New cylinder head gasket support tube and distance washer introduced. E1 PC 17900
One-piece cylinder head gasket support and liner retaining flange fitted. E2 PE 23184

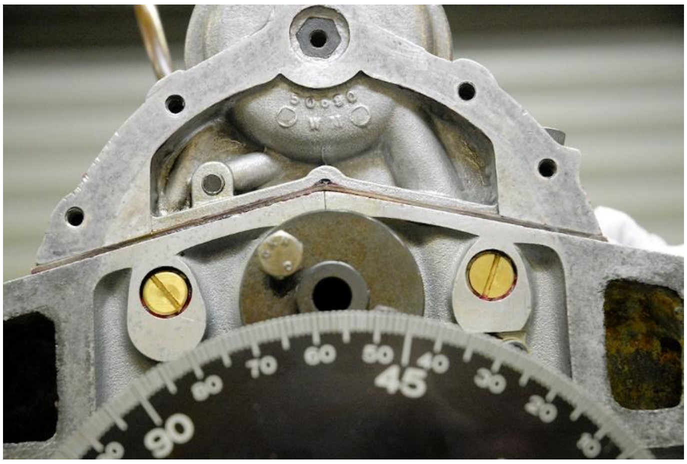
»5 Notes – Oil Gallery Plugs

There was a change, at the introduction of the Series III engine, at the crankcase longitudinal oil galleries of the type of end plugs used. Early crankcases were fitted with taper thread aluminium plugs with a screwdriver slot for tightening. The plugs were installed with a bitumastic sealant and, after tightening, were secured with centre punch indentations at each end of the screwdriver slots.



Right: Figure 9. Oil galleries with Unbrako plugs installed with Loctite 680 High Strength Retaining Compound to hold in place.

Later crankcases were fitted with brass plugs with a larger diameter head that fitted into spot faced recesses so that the head is flush with the faces of the crankcase. Again, a centre punch was used for securing purposes.



Right: Figure 10. An example of the brass gallery plugs, located in enlarged seat area.

Both types of oil gallery plug can be difficult to remove, the best technique being to cut away the centre punch 'tangs' and use a good quality impact screwdriver. It also helps to gently heat the area around a plug with a propane gas flame. When the plugs are reinstalled after cleaning out the oil galleries, they can be shuffled so that the screwdriver slots are tightened to a different position, and a centre punch can be used again. The plugs should be sealed with Loctite 569 sealant.

Service Bulletin Advice – Oil Gallery Plugs

Improved oil gallery plugs from crankcase Set Number 26496.

»6 Notes – Camshaft Chainwheel

The camshaft chainwheel (*Item 123*) can be classed as two distinct types – earlier and late. The sprocket portion is the same on both types, but the method of setting the valve timing differs for the later type, which features a Vernier type of timing set up. The chain wheels can only be fitted to the camshafts that suit them. That means that an early chainwheel can only be fitted to an early camshaft, and *vice versa*. However, the later chainwheel and matching camshaft can be installed in an early engine. Most reconditioned engines were set up with the later assemblies.

Some early chainwheels do not have timing marks stamped into them, the Vernier adjustment type chainwheels do not have timing marks.

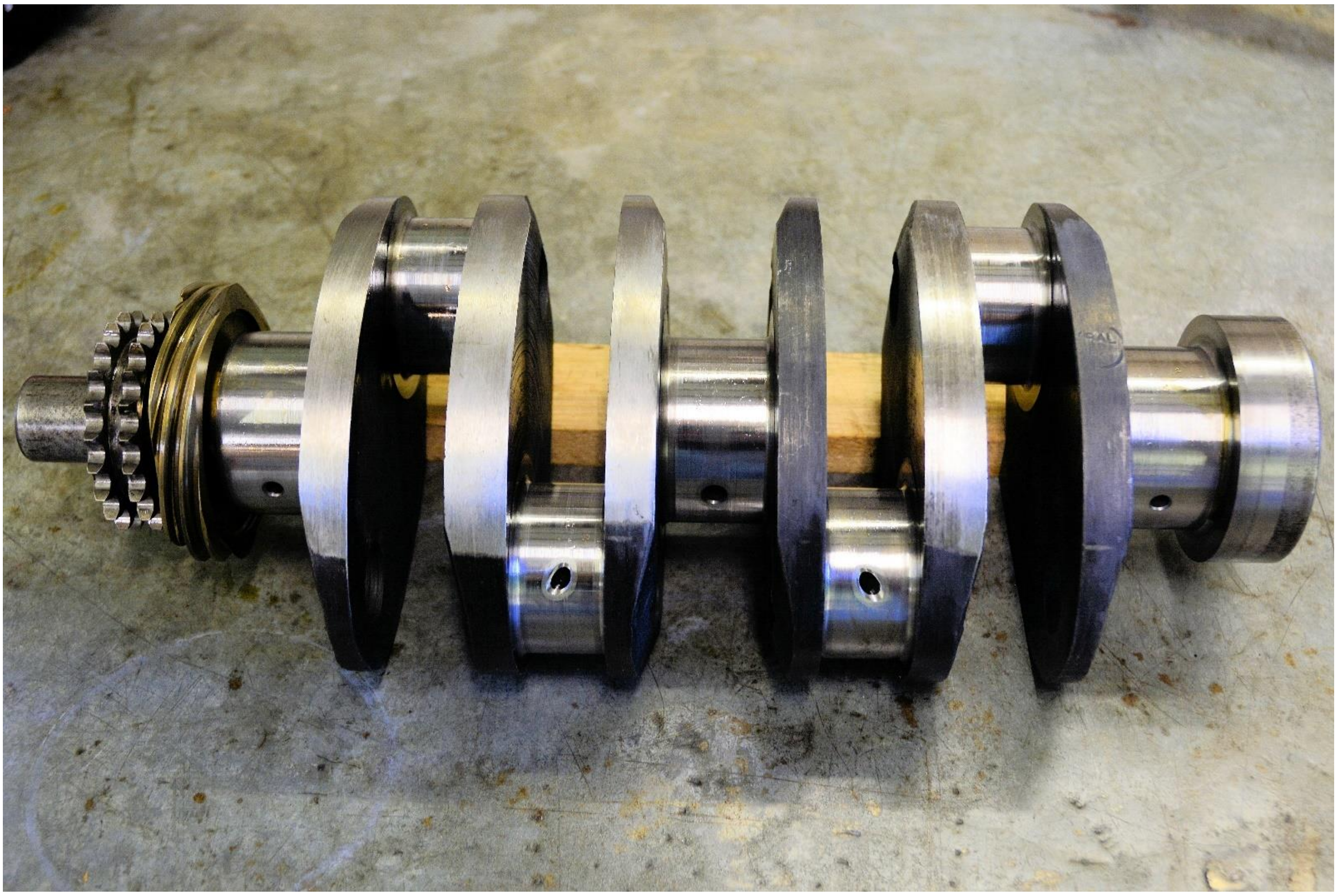
The later chainwheel setscrews have a circle-shaped lock tab, this diameter ensures that the setting dowel (*Item 130*) does not fall out at the front, the rear end of the dowel has a peg that prevents the dowel moving rearward.

Refer to Section 8, Step 11 for valve timing information.

Service Bulletin Advice – Camshaft Chainwheel

Camshaft chainwheel modified (Vernier timing adjustment).	E1 PD 19295
Adjustable camshaft peg fitted.	E2 PE 23643

»7 Notes – Crankshaft Assembly



Above: Figure 11. A Laystall crankshaft showing a stamping at the rear web. The shaft has been balanced and the Laystall logo has been ground away. This shaft now runs with aluminium/tin bearings and the oil drillings have smoothed countersinks.

Over its production life, the Jowett engine was plagued by crankshaft breakage. There were several improvements made to the crankshaft in attempts to cure the concern, which, over the years was compounded by engine reconditioners grinding away the 0·100-in. radii at the ends of all bearing journals resulting in a sharp corner instead of the correct radius. Set out below is a summary of the development of the Jowett engine crankshaft, as written by the late Dr. Harry Brierley, a highly respected member of the Jowett Car Club (UK), in the 1960s.

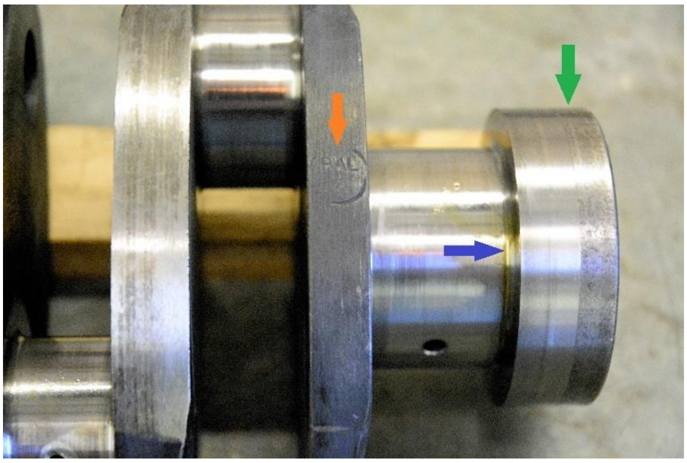
1. There are four different crankshaft designs used, although modifications were introduced piecemeal and the transition from one design to another was somewhat confused. The four types are as follows.
2. Phase 1. This shaft has almost rectangular webs (as viewed from the front of the engine). A shaft with oil holes in the crankpins pointing straight up the bores when the pistons are at the top of the stroke, is definitely Phase 1, but some Phase 1 shafts have the oil hole at an angle. The only crucial distinction is in the angle where the crankpin meets the web. If the radius of this angle is less than 0·100-in., this is likely to be a Phase 1.
3. Phase 1 crankshafts should **never** be used, no matter how good they look. If in doubt find another shaft. These shafts are liable to fracture.

   NOTE: *Early Phase 1 crankshafts were not hardened. From Engine Number E0/PB/8902 the crankshaft was hardened at the bearing journals.*
4. Figures stamped into the webs of all shafts may indicate the undersize of the crankpins. Numbers like R50647/10/20/0 would show the factory reconditioned crankshaft part number (R50647); the connecting rod journals are reground 0·010-in. undersize; the main bearing journals 0·020-in. undersize; and the final ‘0’ indicates that the connecting rod crankpin width has been increased by 0·025-in. But beware, it is probable that these figures will be misleading because regrinds will have been carried out by a variety of firms who may not have altered the stamped numbers. Do not take any numbering as the truth

   The crankshaft that has been hardened at the journals is known as the Phase 2 crankshaft.
5. Crankshaft introduced at Engine Number E2/PD/22190 (and a few earlier ones) is sometimes called the Phase 3, or ‘high limit’ shaft.

   This shaft is broadly similar in outline appearance to the Phase 1, but incorporates some or all of a crucial series of modifications.

   NOTE: *The only sure indication of a high limit shaft is the crankpin radii referred to at Step 2 above. This must never be less than 0·100-in. If a shaft is taken for regrinding it must be pointed out that this radius must not be reduced, otherwise the crankshaft is virtually ruined.*



Right: Figure 12. Green arrow indicates spigot for flywheel, blue arrow indicates 0·100-in. radius and orange arrow shows balance stamp mark.

6. The oil drillings in the crankpins were introduced at Engine Number E0/PB/8902 in the ‘trailing’ position, as mentioned in Step 2.
7. $^{15}/_{16}$-in. diameter holes are drilled length-ways through the crankpins to reduce the off-centre weight of the shaft.
8. Although it will not be possible to detect easily, the hardening process was modified from that used on the Phases 1 and 2 crankshafts, and the machining quality was improved.

   NOTE: *It is understood that all Phase 1 and 2 crankshafts were machined from solid steel billet. They were machined all over.*
9. This shaft was a result of consultation with de Havilland’s and was extensively tested. There is no positive reason to think that this shaft is defective for any normal purpose but opinions and personal experiences differ.
10. The black-sided shaft – Phase 3. This was probably introduced after 1953 and close to the end of car production. It is essentially a high-limit shaft as described above, the webs have been strengthened somewhat by leaving the edges rough forged – hence the term ‘black’.

__NOTE:__ It is understood that the 'black' sided crankshafts were machined from a forging.

11. This shaft was fitted to some engines until Jowett Engineering Limited ceased trading in 1963. It was, therefore, regarded as sound for all normal use.
12. The oval-web shaft. This is quite different in appearance from the other shafts. Viewed end-on the webs are elliptical in shape. This is the Phase 4 crankshaft.
13. This crankshaft exists in two forms. Early shafts are made from a forged steel which cannot be nitrided. Later ones would be nitrided at time of manufacture.
14. A date stamp can be found on the webs of almost all oval-web crankshafts. All shafts dated after Sept. 1958 (9/58) are understood to be nitride-able. Some of these shafts have had the date stamping removed during balancing activities.

    __NOTE:__ This dateline is considered uncertain and some earlier shafts may also take nitriding. Laystalls are able to advise on this matter when reconditioning an oval-web crankshaft.
15. Oval web shafts, if not nitrided, can wear rather rapidly especially if fitted with copper-lead bearings. Some see this as a disadvantage of the shaft.

    __NOTE:__ A Laystall shaft that has not been nitrided should run with good wear characteristics in aluminium-tin bearings, assuming good quality engine oil is used.
16. Making a choice of crankshaft, if there is one, probably indicates an oval-web as first choice. For competitive driving the oval web should always be the choice. Phase 3 crankshafts have accumulated very high mileages without breaking.
17. For normal driving the black sided shaft should be perfectly satisfactory and the high limit (Series Ill) adequate. The Phase 1 shaft is not useable.
18. It should be noted that crankshaft breakage was far more frequent on all makes of cars built before 1950, than on current motor vehicles. The oval-web is not immune from breakage. It is also worthy of comment that the Jowett engineers always felt that the fault lay in the flexibility of the crankcase rather than the shaft itself.

    __IMPORTANT NOTE:__ And it can not be stressed strongly enough – any Jowett crankshaft that has had the journal corner radii reduced from the specified 0.100" radius, will break, whether it is a Phase 4 crankshaft or not.

Further Comment

The earliest version crankshaft can be identified by the ⅜-in. BSF bolts for securing the flywheel, later shafts had 7/16-in. BSF bolts. This is the shaft shown in *Figure 2*.

In Australia there are also locally manufactured crankshafts, the most common of which was the Meade shaft, which was a machined casting that looked the same as the Laystall. These shafts were known to break into three separate pieces and should be avoided.

A major problem when selecting a used crankshaft, is incorrect machining of the rear main oil seal running surface. Crankshaft repairers tend to 'clean up' the entire length of the rear spigot for the flywheel. This action can completely ruin the location and balance of the flywheel when mounted on to an undersize spigot. As a further comment, the flywheel is provided with two ⅜-in. BSW threads for the purpose of drawing the flywheel off the shaft's rear spigot. The threads are BSW so that mild steel setscrews can be used to push against the shaft without damaging the shaft face.

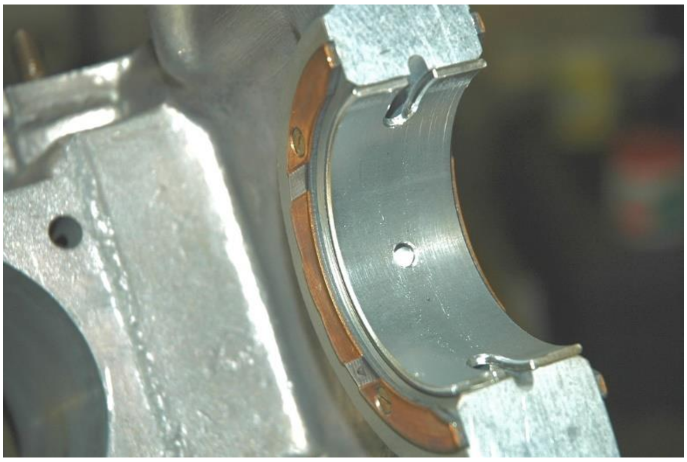
The crankshaft, flywheel and clutch assembly should be balanced as an assembled unit and suitably marked with a permanent white marker at a clutch mounting setscrew for position identification.

Service Bulletin Advice – Crankshaft

Flywheel bolts, diameter increased from ⅜" to 7/16".	D9 PA 2200
Copper lead front and centre main bearings fitted.	D9 PA 4322
Hardened crankshaft fitted (RHD).	E0 PB 8902
Hardened crankshaft fitted (LHD).	E0 PB 8937
Crankshaft tolerances revised.	E2 PE 22873

»8 Notes – Main Bearings

Early in the production of the Jowett engine, all three main bearings (*Items 149 and 150*) were of the white-metal type, then at D9 PA 4322 the front and centre bearing lining material was changed to copper/lead and continuing with the white-metal lining on the bearing and thrust flanges at the rear main. This format continued through to the end of production.



Right: Figure 13. Modified Perkins aluminium-tin bearing shell in rear main bearing position.

In recent years, the same format bearings have been remanufactured and are available from a British supplier. It is understood that the Jowett Car Club of Australia (JCCA) now carries stocks of these bearings. In another development, the Jowett Car Club of New Zealand has opted for converting sets of Perkins 3A152 diesel engine big end bearings for use in Jowett engines. The Perkins aluminium-tin bearings are a straight fit in a Jowett crankcase, and are modified by drilling, slotting, and grooving for improved oil flow. They also require the use of separate thrust bearings, which require the rear web to be machined on both faces to provide 0·0015-in. end float and can be held in place by small brass countersunk machine screws, with two per thrust bearing plate.

Right: Figure 14. Shows thrust bearing retained by two brass countersunk machine screws.

Another proven method for holding the thrust plates is to drill ⅛-in. clearance holes through clamped thrust plates and the crankcase web for floating brass anchor pins.

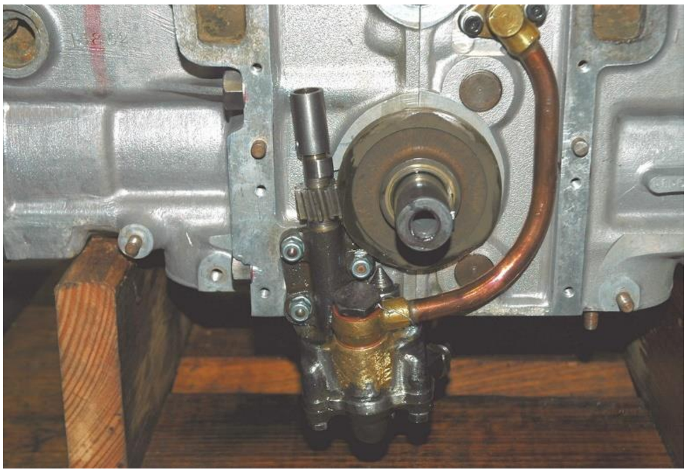
The installation of the front and centre main bearings is the same as that shown in *Figure 10*, less the thrust bearings. The bearings come from the three cylinder Massey-Ferguson 35 tractor and are in plentiful supply. This set of modifications has been entirely successful.

Service Bulletin Advice – Main Bearings

Copper lead front and centre main bearings fitted.   D9 PA 4322

»9 Notes – Oil Pump

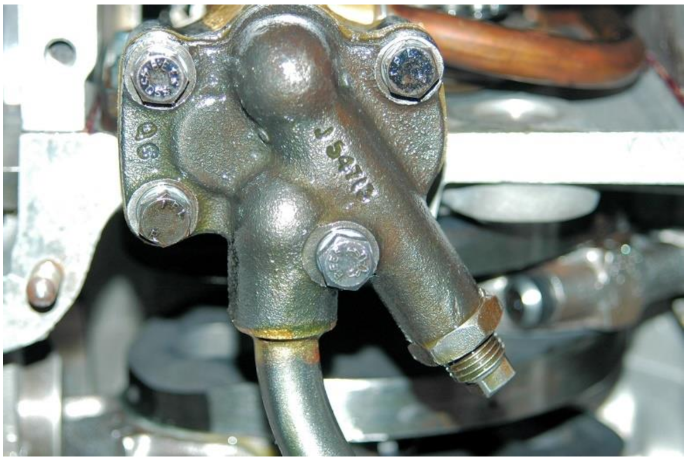
The oil pump (*Item 162*) went through detail changes during its production life. The first upgrade was adding a modified banjo union bolt at the delivery port that could be lock-wired in place.



Right: Figure 15. This example shows an early oil pump that has been modified to accept a larger diameter oil delivery pipe assembly.

All oil pumps and delivery pipe elbows (*Item 172*) feature spray delivery to the oil pump drive gear (*Item 147*) to the rear of the delivery pipe banjo union, and from the upper elbow housing to the timing chain (*Item 121*). These small orifices must be kept clean for effective lubrication. This oil flow helps to keep the drive train quiet.

A change to the oil pressure relief valve spring (*Item 176*) was introduced to increase engine oil pressure. The next change was to add a pipe to vent excessive oil from the valve to a point below the normal oil level, to prevent aerating the oil as it is drawn into the pump.



Right: Figure 16. A later oil pump cover (Item 178) with an adjustable relief valve and venting to suction inlet, inside cover.

Major changes were introduced to improve oil flow, these included an extended pump body (*Item 165*) to lower it into the oil. At this time, the suction and delivery pipes were enlarged and, in addition an adjustable relief valve with a vent into the suction gallery were added.

At the time the oil pump body and cover assembly were extended lower in relation to the engine sump oil level, the drive spindle was also lengthened. Therefore the spindles are not interchangeable between the two different length pump bodies.

All versions of the oil pump are interchangeable as complete units. The later style delivery pipe has a different elbow – this needs to be taken into account when fitting the pump to an early crankcase.

Service Bulletin Advice – Oil Pump

Oil delivery pipe union bolt wired for locking purposes.	E0 PB 9860
Maximum oil pressure increased.	E1 PC 15098
Return pipe from oil pressure relief valve added.	E1 PC 18985
Submerged oil pump fitted.	E2 PE 23122

»10 Notes – Oil Delivery Pipe Assembly

The copper oil delivery pipes should be handled with care and ensuring there is sufficient clearance between the pipe (*Item172*) and the timing chain (*Item 121*). The copper pipe is soft and a distorted pipe can be carefully bent to the correct profile. The banjo union and the elbow should not be under any strain when tightening in place. Small diameter pipes can be cut out of the fittings and a larger diameter pipe silver-soldered in place. The banjo union can be increased in size, as shown in *Figure 12*, and the upper elbow and oil gallery in the crankcase carefully enlarged.

It is convenient to use a 1·6 mm thick aluminium plate cut to the same outline as the gasket, with the oil passage hole enlarged to accept an ‘O’ ring as described on Pages 14 and 15. It is also an excellent fitting procedure to use Unbrako cap screws to secure the elbow to the crankcase.

In addition, should the correct size fibre washers (*Item 331*) be difficult to obtain, then appropriate Dowty hydraulic system washers, with bonded internal seal lips, can be used with confidence.

Service Bulletin Advice – Oil Pump

Oil delivery pipe union bolt wired for locking purposes. E0 PB 9860

»11 Notes – Oil Delivery Pipe Banjo Union Bolt

The oil delivery pipe banjo union bolt (*Item 174)*, and those located at the rear timing cover (*Item 18*) with Tecalemit oil filter assembly were, during the engine's production, enlarged from ½-in. to ⅝-in. for increased oil flow to the various pressure lubricated components of the engine.

»12 Notes – Oil Pump Relief Valve

The relief valve in the oil pump (*Item 162*) is controlled by a spring (*Item 176*) and during the engine's production run, springs that matched two specifications were employed:

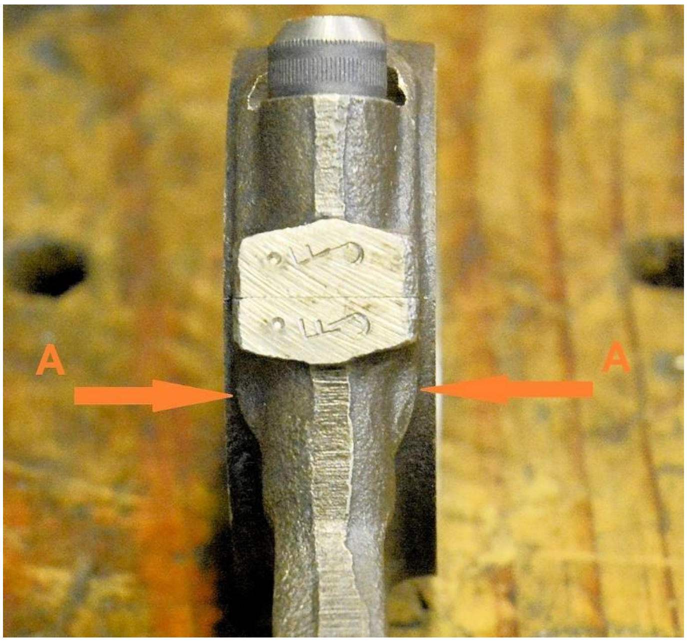
Condition	Before E1 PC 15098	After E1 PC 15096
Free Length	2·000-in. (50·8 mm)	1·750-in. (44·4 mm)
Load at Compressed Length, 1·1875-in. (30·175 mm)	9 lbs. (4·086 kg)	10 lbs. (4·54 kg)
Rate	11·08 lbs./in. (1·978 kg/cm)	19·78 lbs./in. (3·2 kg/cm)

The engine oil pressure should be checked, in accordance with the Maintenance Manual and for the earlier spring the pressure should be 50 to 60 lbs./sq. in. (3·5 to 4·2 kg/sq. cm.); the later spring should provide 60 to 70 lbs./sq. in. (4·2 to 4·9 kg/sq. cm.), with both settings assuming the engine is in sound condition.

With the oil pump cover dismantled, the relief valve can be checked for wear.

»13 Notes – Connecting Rod Assembly

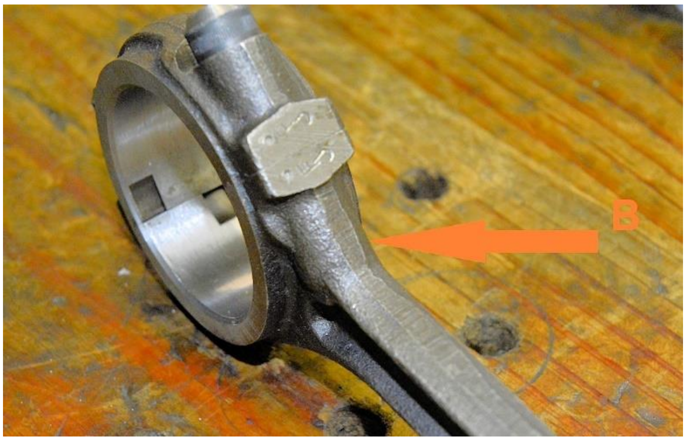
All connecting rods (*Item 192*) were stamped with two-letter codes, example 'FJ', on both the rod and the cap. No engine, originally, had two connecting rods with the same code letters. It is important to look for additional cylinder number identifying markings, such as hacksaw cuts in the '**I**' section of the rod, or heavy centre punch marks – such can cause connecting rod breakage. The best policy to adopt, every time a Jowett engine is dismantled, is to write the letter codes against their cylinder's number, example FJ = Cylinder 1, and so on for the remaining rods/cylinders on a piece of card-board located on the workshop wall.



*Right: Figure 17. 'A' indicates the strengthened connecting rod big end. Also shown is a modified Unbrako cap screw. The rod has gained centre punch markings for further identification – thankfully, they were not stamped into the '**I**' section.*

An engine, which is assembled from an assortment of used parts, must have the selected connecting rods weight-equalised to keep the rotating mass in balance. The connecting rods must be crack tested prior to equalising weights.

Very early connecting rod caps were fastened with 5/16-in. bolts, which were superseded by ⅜-in. BSF bolts. Next important change was from the plain ledge big end joints, which were replaced with serrated joint pads, each cap unique to its connecting rod assembly. After the serrated joints were introduced, there was another version with a 'beefed-up' forging at the short end of the rod, where the cap bolt is threaded in. Connecting rods of this type should be selected, and early non-serrated connecting rods should, really, be cast aside.



Above Left: Figure 18. Part number identification. Above: Figure 19. 'B' indicates strengthened area.

Service Bulletin Advice – Connecting Rods

Connecting rod bolts, diameter increased from 5/16" to ⅜".	D9 PA 2373
Copper lead connecting rod bearings fitted.	D9 PA 3794
Introduction of serrated type connecting rods.	E0 PB 10506
Sludge release hole drilled in connecting rod cap.	E1 PC 17402
Hole deleted from rod half of connecting rod bearing.	E1 PC 18646
Connecting rod cap sludge release hole deleted.	E2 PD 20977
Narrow lock-notch connecting rods fitted.	E2 PE 22451

»14 Notes – Cap Screw, Connecting Rod

It is now common practice to fasten the big end bearing caps with modified Unbrako cap-screws, which should be installed using Loctite 263 Thread-Locker, ensuring that none of the liquid finds its way onto the serrations. The Unbrako cap-screws are of SAE Grade 8 strength and have proved to hold their torque effectively.

»15 Notes – Connecting Rod Bearings

Bearing shells with a copper/lead bearing surface have been the most common type used. However, the Jowett engine rebuilder now has the option of aluminium-tin bearing surface shells, in the form of those used in Hillman Avenger engines. There is an added bonus – these bearing shells are very slightly thicker in their steel backup metal, and with the big end bores in Jowett connecting rods probably being stretched after long use, just a small amount of honing will ensure a good fit for these shell bearings. The crankshaft big end journals should be ground to provide a correct running clearance. A knowledgeable crankshaft repairer has the standard running clearance information for aluminium-tin surface bearings. There could be instances that require the bearing shells' anti-spin tang to be filed narrower, to match those in rod and cap.

It is understood that original style copper/lead big end bearings are available from the JCCA.

The small end bearings are, when the engine is running, well lubricated by splashed oil. However, it is necessary to check the bushes for wear and if worn, replace with new bushes. Check that the oil hole in the bush aligns with that at the small end of the rod.

Service Bulletin Advice – Connecting Rod Bearings

Copper lead connecting rod bearings fitted.	D9 PA 3794
Small end bearing changed from 'Glacier' to 'Clevite' metal.	E0 PB 8737

»16 Notes – Pistons And Rings – Javelin

Originally, Jowett engines were fitted with piston sets manufactured by Hepworth & Grandage Ltd., such pistons are no longer available. In Australia, JP Pistons, manufactured in Adelaide, have been used, although they do have a reputation of having their crowns detach. The reason for this wide-spread reputation is not known, however, it is possible that used JP pistons have been re-grooved for oil consumption control. In the writer's experience, such forms of oil control piston rings, if not properly installed, can behave like a broach as the piston moves along the cylinder bore, thus being detrimental to the piston's construction. The writer has driven many miles on Jowett engines installed with JP pistons and has experienced total reliability.

JP pistons manufactured for the JCCA are all of Jupiter specification, providing a higher compression ratio. They are equipped with the original style piston rings.

Members of the JCCA tend to opt for piston sets from a Mazda engine, the type/model is not known. What modifications may be necessary to fit such pistons are not known by the writer.

Service Bulletin Advice – Pistons And Rings

Vacrom piston rings fitted (T/C 27).	D9 PA 5756
Introduction of barrel ground pistons.	E0 PB 8825

»17 Notes – Pistons And Rings – Jupiter

JP pistons manufactured for the JCCA are all of Jupiter specification, providing a higher compression ratio. They are equipped with the original style piston rings.

»18 Notes – Cylinder Head Valves

Inlet and exhaust valves (*Items 219 and 221*) did not change during the production life of the Jowett engine. It is known that local cylinder head reconditioners have been using valves from Mazda engines. It appears that the dimension from the valve cap (*Item 224*) collet groove to the outer tip of the valve stem at the Mazda valve is shorter than the same dimension of the original valves. This means that the rocker arm (*Items 230, 231, 232 and 234*) should be checked to ensure that there is no contact between the underside of the rocker arm and the valve cap. Should there be a conflict there, the under side of the rocker should be carefully ground away to resolve the conflict.

The Jowett engine was designed to have paired valve springs for closing the valves. This was due to the push rods being longer due to the engine's configuration and the extra weight affecting their inertia. The tappets, being close to horizontal, also would have contributed to valve bounce at high crankshaft speeds. The double valve springs helped keep this condition in check.

Some cylinder heads, with non-standard valves, may have just one return spring per valve.

Locally made solid tappets were equipped with shallow push rod seats that allowed the rods to drop out of the seats at high engine speeds – the original Jowett tappets had deep bronze shrouds.

»19 Notes – Rocker Gear Pedestal Washer

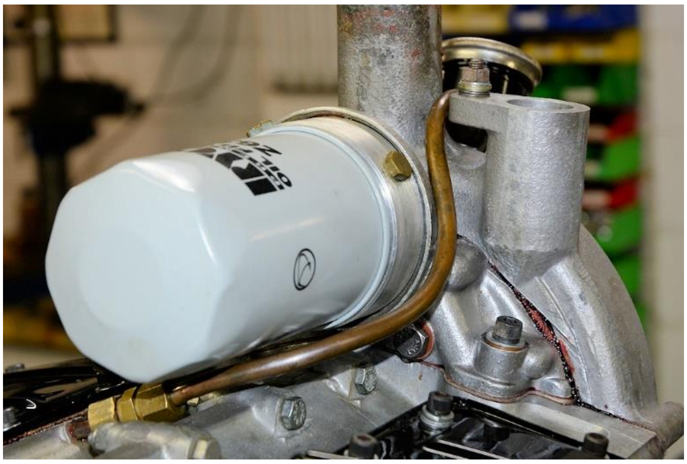
Each set of valve rocker assemblies are mounted on pedestals (*Item 239*) and secured with ⅜-in. BSF nuts. In order to prevent the hexagon points on the nuts from clashing with the pivoting rocker arms (*Item 230*), thicker ring washers are used to lift the nuts clear of the moving rocker arms.

»20 Notes – Engine Oil Filter

There were two major differences between the Vokes and Tecalemit engine oil filtration types. The first being that the Vokes, green cannister, (*Item 250*) filtered the oil by directing it through the inside of the filtration element (*Item 252*) with the cleaned oil passing from the outside of the element. The filtered debris was trapped inside the filter element.

The Tecalemit (bronze cannister) filter operated in the opposite manner to the Vokes system, in that trapped debris remained in the cannister, with the oil passing from the outside diameter of the filter element, to be cleaned as it passes into the centre gallery of the filter element. The change in oil flow direction was achieved by creating different oil galleries within the rear timing cover. The two types of rear timing cover are interchangeable, provided the filter components are changed as well.

Originally, the Vokes filtration element was a washable corrugated felt unit that could be reused several times. All Tecalemit filter elements were of the single-use folded paper type which, due to their larger filtration surface area, were superior in performance.



Right: Figure 20. A Ryco Z63 spin-on cannister fitted to a Vokes oil filter adaptor. The two plugs in the drillings that facilitate the reverse flow through the aluminium adaptor can be seen.

Currently, the JCCA can provide conversion kits to enable the use of modern-style 'spin-on' type cannister oil filters. The Tecalemit adaptor is common to other makes of engines that used the same style Tecalemit oil filter, however, it should be noted that the adaptor for converting the Vokes filter features drillings and plugs in its body to ensure that the oil follows the same path for cleaning as that for the Tecalemit unit. Modern filter cannisters also have an anti-drain valve built in, which can make filter changing less messy. Even with the anti-drain valve, it is still necessary to release the filter drain setscrew (*Item 19*) to let the warmed oil drain to sump for about half an hour, prior to unscrewing the cannister.

NOTE: When installing the Vokes type adaptor kit, the anchor bolt that secures the adaptor to the rear timing cover, should be installed with Loctite 263 Thread Locker and the adaptor face that contacts the 'O' ring should have a smear of Loctite 518 Master Gasket applied, as well as the same sealant being applied at the 'O' ring groove in the rear timing cover. This will assist preventing the adaptor from loosening off as the cannister is unscrewed during replacement. **DO NOT OVER-TIGHTEN THE SPIN-ON CANNISTER!**

The Vokes filtration system does not feature a clogged filter blow-off valve, other than the element itself moving rearwards against a spring in the cannister. Should a modern spin-on filter cannister be used, it may pay to change the cannister assembly at time determined intervals, to avoid filter blockage and oil leakage due to a possibly burst cannister.

Refer also to Note »1.

»21 Notes – Cylinder Head Gasket

The Jowett engine has, over the years, suffered a reputation for cylinder head gasket (*Item316*) failures. To be fair, this concern is not solely due to actual gasket failure. Such 'failures' can be due cylinder liner seals (*Item 315*) relaxing during sustained use, which reduces the nip at the head gasket, thus allowing coolant into the affected cylinders. This was the most common cause of such failures and, the JCCA quickly decided to delete the Hallite liner seal and replace it with a solid copper washer that is approximately 0·035-in. thick. Refer to Pages 41 and 47 for cylinder head gasket and cylinder liner installation procedure.

Currently the JCCA stocks cylinder head gaskets that were manufactured in New Zealand and, there are now two versions, the original gasket being of thinner compressible material, and later versions being 0·002 to 0·005-in. thicker. In addition, these gaskets feature an 'O' ring over the rocker gear oil feed stud, to improve sealing in that area.

Recently, cylinder head gaskets manufactured in the Czeck Republic conforming to the original Jupiter type gasket configuration (copper/non-asbestos material/steel) have become available. It is not known how these gaskets perform, but it is understood that cylinder liner protrusion can be less than that for the New Zealand gaskets. Refer to Page 41.

»22 Notes – Centre Cylinder Head Stud Seal

At the centre cylinder head stud (*Item 45*) there is a large span that has minimal support for the cylinder head gasket (*Item 316*). Due to the position of the cylinder head gasket support (*Item 67*), the coolant can migrate along the centre stud to the point where the stud passes through the cylinder head (*Item 79*) and, if left unsealed, can permit coolant to leak into the rocker cover (*Item 91*) and mix with the engine oil. A rubber sealing ring of square section (*Item 321*) was provided to effect a seal as the number 4 cylinder head nut (cylinder head nuts' tightening sequence) is tightened against a plain washer. Currently, an 'O' ring is provided and for a coolant tight seal, a close fitting ⅜-in. plain washer that is a snug fit in the recess in the cylinder head outer face, should be inserted so that, as the nut is tightened, the 'O' ring is squeezed into the thread on the stud. Further sealing can be added by applying a smear of Loctite 518 Master Gasket compound between the nut and the outer washer.

SECTION 4. HAND TOOLS FOR USE ON JOWETT ENGINE

The importance of using good quality hand tools for dismantling, assembling and general work on a Jowett engine cannot be stressed enough. Jowett Cars Limited always used bolts, studs, anchor-pins, and nuts that utilised, in the vast majority, British Standard Fine thread forms. All BSF threaded hardware is of high-tensile steel. A very minor proportion is British Standard Whitworth, and BSW hardware is only used where mild steel is required to be utilised – the threads in the flywheel that are used for withdrawing the flywheel from the crankshaft, the mild steel setscrews will not damage the precision face at the rear end of the crankshaft.

To properly fit bolt heads and nuts, hand tools need to be in BSW spanner sizes. This also applies to socket spanners which, when applying the specified torque wrench settings, must be a good fit on the hardware. Therefore, it is necessary to be equipped with good quality hand tools. Such tools are becoming difficult to obtain in modern times, but careful selection at swap meets and garage sales can be rewarding.

The Internet is crowded with suggestions that SAE and Metric spanner sizes can be used on BSF hardware. Such suggestions should be avoided. The following brands of spanners/sockets can be recommended with complete confidence:

Britool, King Dick, Superslim, Snail, Gedore, Stahwille and Blue Point (if they can be found).

Australian-made Sidchrome open-end spanners can be loose fitting and stretch as they are used on tight bolts and nuts – they do tend to spring back to original size.

Kinchrome is an Asian brand that works reasonably well.

A useful tool kit should consist of the following items:

Open-end spanners from ⅛-in. BSW through to ⅝-in. BSW

Bi-hexagon ring spanners from ⅛-in. BSW through to ⅝-in. BSW

A ½-in. drive socket set from ⅛-in. BSW through to ⅝-in. BSW of bi-hexagon form

Suitable socket accessories – a selection of extensions, a universal drive joint, a ratchet handle, a speed-brace handle, a breaker bar, and a good quality torque wrench.

A 33 mm A/F single hexagon impact wrench type deep socket for use at the crankshaft dog.

An assortment of good quality flat blade screwdrivers, pliers, circlip pliers and self-locking grips.

A set of Allen keys – if required.

An assortment of brass drifts, cold chisels, and parallel pin punches.

A good quality piston ring clamp.

Accurate measuring tools – feeler gauge set, 12-in. straight edge, 0–1-in. micrometer, 0·001-in. increment dial indicator and a good quality Vernier gauge (Starrett or Moore & Wright).

Assorted BSF Recoil thread repair kits.

Various hand levers and tapered pry-bars. Assorted pieces of timber.

Stiff bristle oil gallery and parts cleaning brushes. A copious supply of compressed air for drying.

The list above should be a useful start for an engine project.

SECTION 5. DISMANTLING THE JOWETT ENGINE

The removal of the Jowett engine from the vehicle is adequately covered in the Maintenance Manuals and does not require further mention here.

However, there is a procedure for dismantling the engine. First, a sturdy steel framed free standing work bench with a thick dressed softwood work surface and adjustable feet, the bench should be completely stable, is a valuable starting point. To support the engine, it is best to make a solid wooden cradle to support the engine and gearbox. The cradle should support the crankcase at each side of the oil sump, with good clearance beneath the sump. It is probably best to leave the wood unpainted, any oil spilt or dripped will soak into the timber and preserve it.

The work surface should have ten 11 mm holes drilled inboard of the steel bench frame in the form of a cylinder head gasket where the head studs pass through. This allows the cylinder head studs in one crankcase half to pass through the bench top so that the engine can be worked on safely. There should also be an 11 mm hole near the middle of the surface, so that while the engine is in a vertical position and resting on the rear face of the flywheel/clutch housing, a securing bolt, clamp bar, washers and nut can be tightened to hold the assembly firmly while being worked on, Page 53.

To completely dismantle a Jowett engine, and assuming the ancillaries (carburettors, dynamo, starter motor, coolant pump and exhaust manifolds) have been removed first, proceed as follows:

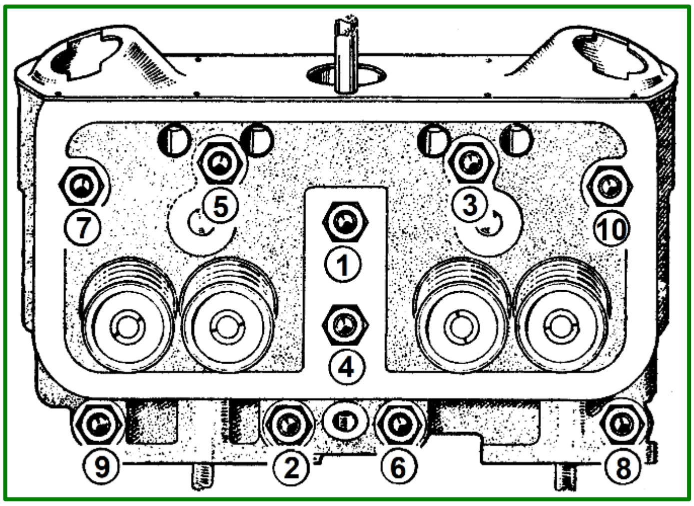
1. Unscrew the oil filter drain setscrew from its tightened position by ½-in.
2. Drain the engine oil into a waste oil pan. While the oil is draining, select four plastic containers that can be marked as 1 & 3, 2 & 4 (to store the parts removed from each side of the engine), mark another bin ‘Front Parts’ and the other ‘Rear Parts’. It is a good idea to have a spare bin for ‘Oddments’, but large enough to hold bigger items. Have a cleared strong shelf/bench for storing large (heavy) parts.
3. Remove the lower pan from under the flywheel/clutch housing
4. With a permanent white marker, place identifying marks at flywheel rim and clutch pressure plate for balancing purposes.
5. The gearbox can be removed from the clutch housing by unscrewing the four nuts – two inside the lower edge of the housing and two external at the top. Depending on the type of sealant used previously, up to four layers of different sealants have been found, so the gearbox may require some gentle leverage to release it. Do not break off the upper RH stud lug.
6. Withdraw the bronze clutch shaft cover, remove the clutch throw out bearing and operating fork by pushing rearwards the lever ball pivot. Place these parts in the bin marked ‘Rear’.

6. Remove the sparking plugs to make it easier to rotate the crankshaft.
7. The clutch cover and pressure plate assembly can then be unbolted as the crankshaft is rotated. The clutch cover may require levering off the two dowels in the flywheel. The clutch friction disc assembly should be treated with due care, because the lining material may contain asbestos which is a health hazard – seal it in a stout plastic bag.
8. Use a piece of old starter ring gear, cut to a taper at one end, so that it can wedge between the flywheel housing, at the right-hand side of the housing, to hold the ring gear on the flywheel firmly while the four flywheel securing bolts are loosened off.

Right: Figure 21. Section cut from an old starter ring gear, with convenient handle that can be screwed in from either side for convenience.

9. Move the jamming section of ring gear to the left-hand side, so that the front crankshaft dog can be loosened-off. Withdraw the front pulley and place in the bin marked ‘Front’.

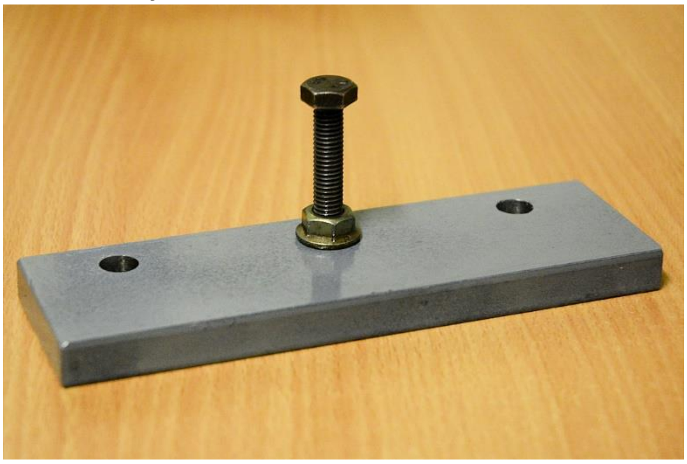
10. The flywheel bolts should then be removed and the flywheel can be withdrawn using two ⅜-in. BSW setscrews. Care needs to be taken due to the flywheel being a snug fit in the housing. Place the flywheel bolts in the bin marked ‘Rear’.
11. For balancing purposes, the clutch cover and pressure plate assembly can be bolted back on the flywheel – less the friction disc.
12. The starter motor ring gear should be checked at this time for a tight grip on the flywheel. It should be borne in mind that some ring gears were a loose fit. Ring gear retention instructions are in the assembly procedure notes on Page 45.
13. Remove the valve rocker covers and place them in the appropriate bins.
14. Remove the nuts securing the rocker shaft oil feed banjo unions.
15. Remove the valve rocker gear by gradually loosening both pedestal nuts. Note the special washers that keep the nut points clear of the pivoting rocker arms.
16. Remove the engine oil filter cannister.
17. Remove the tappet chest covers – there are twelve machine screws that hold each cover.
18. Wiggle the push rods to set them free from the tappets and pull them through the cylinder heads. A push rod (exhaust valve) could be difficult to remove due to an incorrect sparking plug socket having dented the tube in the cylinder head. place the push rods in the appropriate bin. Do not identify push rods with hacksaw cuts!
19. Remove both coolant transfer housings from front of engine.
20. In reverse tightening sequence, gradually loosen off the cylinder head nuts. Start at nut ten, then progress to nut two as shown at right.



Right: Figure 22. Cylinder head nut sequence.

21. The cylinder heads can be successfully pushed off the crankcase by using a device that can be easily constructed from a piece of flat steel bar, drilled to slide over the two rocker gear studs. Aligned with the number one cylinder head stud, the bar should be drilled and tapped with an 8 mm thread for a 50 mm long setscrew that can be adjusted to push on the oil feed stud. ½-in. nuts can be used as spacers on the rocker gear studs, to ensure purchase for the pusher to function. The two studs have sufficient thread to facilitate the removal of each cylinder head. A cylinder head may require several ‘bites’ with the pusher and its setscrew pushing against the head stud.

    Using a hammer to force a tapered lever between the cylinder head and the crankcase is not at all a recommended practice – too much damage can result at the gasket surfaces.



Right: Figure 23. Cylinder head removal tool.

22. With the cylinder heads removed, it is advisable to clamp the cylinder liners using the cylinder head gasket support and spacers to prevent liner movement during crank-shaft rotation.
23. Remove the petrol pump. Jupiter engine – remove the cover plate.
24. The front timing cover, located on two dowels, can be removed. The parts catalogue states that two of the front timing cover bolts are longer than the rest – note the position of these bolts

and place all bolts in bin marked ‘Front’. Thus 14 bolts are listed, 12 are used! The setscrews at the sump should be removed – the threads in the cover may have been damaged.

25. Remove the rear timing cover.
26. To remove the sump, roll the engine to the upside down position, resting on the tappet chest surfaces, on the work cradle, is the best option for removing the oil sump. Use a sharp knife to slice the cork composite gasket if necessary. Do not hammer the sump flange where the front timing cover fastens, the flange bends easily and could become a source of oil leakage.
27. The flywheel/clutch housing can be removed from the crankcase, it is located by two hollow dowels close to the oil sump flange. Note that the housing should match the crankcase.
28. Remove the oil delivery pipe, keep the fibre washers.
29. Remove the oil pump assembly, the pump is located on two hollow dowels.
30. Bend back the camshaft chainwheel lock tabs, remove the bolts, and pull the camshaft chain-wheel forwards bringing the timing chain with it.
31. Withdraw the camshaft and tappets. The tappets can be identified, placed in plastic bags, for same location during engine assembly.
32. Using a suitable three-legged puller, withdraw the camshaft chain pinion from the crankshaft. With the pinion removed, the oil pump drive gear should be a sliding fit. Should it be tight, avoid using leverage force that could break the gear teeth.
33. Remove the oil baffle (*Item 108*) assembly.
34. Identify the connecting rod letter codes and write them on a piece of cardboard, showing the cylinder number they are appropriate to. Pin the card to a wall. All four codes must be different.

    IMPORTANT! Do not attempt to make cylinder number identification with hacksaw or centre punched markings – broken connecting rods could/definitely result.
35. Release lock tabs that may be securing connecting rod bolts. Remove the connecting rod caps and, with a timber pusher, shove the connecting rod and piston assembly through the cylinder liner and out of the engine.
36. Withdraw the cylinder liners that should be a sliding fit in the crankcase. With a permanent white marker, make cylinder number identification marks on the coolant surface areas.
37. The engine should be somewhat lighter, and can be lifted off the cradle. It can now be placed in a vertical position with the right-hand side cylinder head studs through the work bench top, having one nut and spacers securing the assembly to the bench.
38. Remove the five ¼-in. bolts along the top crankcase joint.
39. Progressively unscrew the crankcase tie bolts and studs (*Items 38 and 39*). Remember that there is a tie bolt inside the left-hand side tappet chest. Use a ring spanner on this bolt.
40. The crankcase tie nuts (*Item 40*) can be removed after separating the crankcase halves.
41. The upper half of the crankcase should lift away easily, should it be stubborn use two lengths of stout broom handle as levers inside the front and rear camshaft bearing bores. It should be noted that there are two floating dowel pins that locate the crankcase halves.
42. The crankshaft can now be lifted clear of the crankcase. The internal balance pipe can be withdrawn at this stage.
43. Where possible, all threaded studs should be removed from the crankcase.
44. The front and rear crankshaft seals can be driven out.
45. The Jowett engine is now dismantled.

SECTION 6. CLEANING THE ENGINE COMPONENTS

This topic can be somewhat debatable, therefore no absolute recommendation can be provided in these notes. Some readers may have a desire to have all of the aluminium parts grit or soda blasted in an attempt to make them look like new. This process used on soft aluminium parts can cause real problems, due to grit or sand particles being embedded in the metal, causing problems with welding.

After aluminium has been cast in a foundry, on cooling and weathering, it forms its own protective skin. This also occurs after machining. What to do is entirely up to the engine's owner, but it should be borne in mind that grit blasting, if over-enthusiastic, can upset bearing clearances. Grit can also lodge in oilways and subsequently cause havoc with crankshaft bearings. Such lodged grit can be difficult to remove during the cleaning process.

Where possible, all studs and oil gallery plugs should be removed from the crankcase so that threads can be checked. Stud removal socket type tools are available, but the gripping mechanism should only act on the shank of a stud. Those studs with very short shanks (sump studs) can be unscrewed successfully by locking two full nuts on the exposed thread. Really stubborn studs can be assisted by the gentle application of heat from a propane fuelled torch. Any loose or stripped threads should be repaired using Recoil (Helicoil) thread inserts. The crankcase and all other parts should be cleaned using a good quality de-greasing fluid. A useful de-greasing fluid is Valvoline Super Degreaser which is effective and rinses freely, a pressure washer is also useful.

After washing, all parts should be air dried quickly and, those parts being put aside for an extended time, should be oiled with light oil to prevent rust from forming. Studs, bolts, and nuts can be gently cleaned with a spinning wire brush. Eye and hand protection should be worn. It is advisable to thread two full nuts onto a BSF bolt, locking the nuts together so that a stud or bolt can be screwed into them for holding safely against the wire brush wheel.

SECTION 7. INSPECTION OF MAJOR COMPONENTS

Introduction

Inspection – this relates to ensuring that a component meets all standard dimensions and is a check to make sure that a component can be reused. All castings should be examined for cracks and other abuse. Gasket surfaces need to be checked to ensure that they are not damaged.

1. Crankcase Set

This is, the heart of a Jowett engine and, therefore, requires detailed and careful inspection, with particular attention being allocated to all aspects of its need to perform as it should. The first areas to look at are the main and camshaft bearing tunnels. Should there be damage at the main bearing bores then a repair technique should be evaluated prior to proceeding with the original crankcase. New main bearing shells (*Items 149 and 150*) should be trial fitted to ensure that they are not loose in their bore, nor are they protruding at the joint faces. The camshaft bearing bores are easier to recondition, they can be skim bored to a slightly larger diameter (with crankcase halves bolted together) and the bearing journals on the camshaft built up by metal spraying and grinding to suit the new bore size. This action can be expensive, but can also be worthwhile, however, due to the camshaft receiving a huge amount of oil, the wear can be minimal, even after high mileages.

Weld Repairs

The most common weld repair on a crankcase can be found at the rear cylinder faces, just inboard of the cylinder head gasket surface. Correctly carried out repairs to such cracks (splits) can be good repairs, however, such repairs can cause some distortion along the gasket face.

Right: Figure 24. A typical weld repair at rear face.

Distortion in this area can be between 0·010 to 0·014-in., a dimension which a cylinder head gasket cannot cope with. Also, it needs to be taken into consideration, what did cause the crankcase to crack? Possibly, it was excessive cylinder liner protrusion outboard of the head gasket surface, or, due to the coolant inlet elbows not being fitted prior to beginning the engine assembly procedure.

Attempts at adding weld to the distorted area and machining back to the original surface dimension may not be feasible due to further distortion 'walking' around the head gasket surface. The weld repair process does cause contraction towards the weld repair location, the head gasket surface is the weakest link to the repair area. There is an option whereby the entire head gasket surface be machined absolutely flat. This task requires the skill of a qualified machinist, who can determine the lowest point in the surface and machine to that point, but no further. This can be classed as a last resort type of repair, and it would be preferrable to find a crankcase that may be in better condition. In addition, there are other concerns that need addressing:

a) Machining the surface will include removal of the nip lip at the carburettor balance pipe. The lip protrusion should be a semi-circular 0·012-in. flare.
b) Excessive machining can result in too much piston protrusion at the T.D.C. point, which could result in the piston crown clashing with the cylinder head surface – with consequential results.

Should the balance pipe lips have been machined, then thin-walled sleeves with lips that replicate the originals can be pushed into the balance pipes. Such sleeves should be sealed with Loctite 569 pipe sealant and clamped in place while curing is completed.

A crankcase set that has undergone welding repairs that were required due to, for example, a broken connecting rod should be set aside so that a set in better condition can be used.

Threads For Bolts And Studs

All threads in the crankcase set must be carefully examined for robustness, or even for having been tapped to a larger thread size. The critical threads are those where the rear timing cover has been bolted to the upper plinth. Should these threads be felt to be loose when a new bolt is screwed in, then repair with correctly fitted Recoil (Helicoil) inserts should be considered.

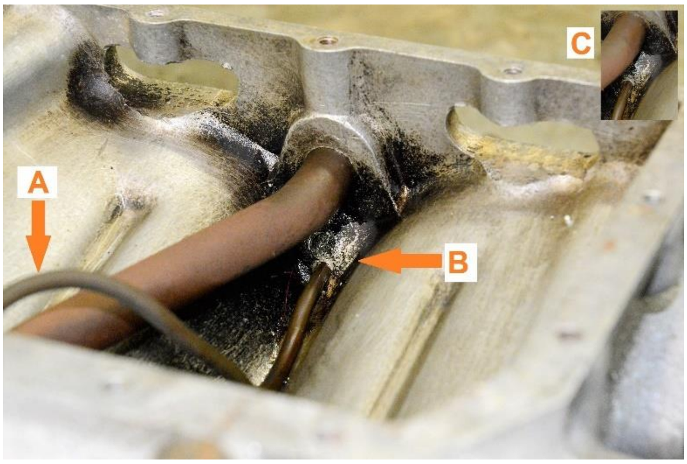
Pay particular attention to the cylinder head stud threads in the crankcase, again, looseness should initiate repairs, and the studs must be at 90° to the cylinder head gasket surface. The same applies to all other studs, care needs to be taken with threads that are exposed to oil-wet areas (sump studs) where oil can migrate through loose threads and through nuts, to continually drip.

Be prepared to modify the crankcase to accept extended studs through the coolant inlet ports, refer to Jowett Technical Notes Series, Part XII for details.

NOTE: The cylinder head stud threads are counter bored to support the stud shanks in the crankcase. These counter bores are, typically ⅛-in. deep and can be very close to the inside edge of the coolant jacket. Small, vertical cracks can be found in the thin section, provided the studs are tightened home with Loctite 263 Thread Lock, the studs should hold satisfactorily.

Valve Gear Oil Feed Pipes

The valve rocker oil pipes (*Item 47*) should be checked for damage during crankcase storage and for loose union fittings at oil gallery ends.



*Right: Figure 25. View inside tappet chest, with '**A**' oil feed pipe for valve rocker gear, '**B**' boss for flared oil feed pipe, and '**C**' detail of boss.*

Particular attention should be directed at the oil pipe entry ports at the cylinder head ends of the pipes. There is a boss inside the tappet chest that can be broken should the drilled stud (*Item 46*) have been overtightened into the crankcase. The copper pipe has been flared against a special seat and is clamped by the drilled oil feed stud, Number 1 in the cylinder head nuts' tightening sequence. In cases where the boss has broken away, the crankcase can be considered as being not repairable. *Since writing this, a repair that could be both effective and involve simple machining processes has been instigated. It needs a trial setup and could use small bore nylon with brass fittings to replace the copper pipes.*

Gasket And Joint Faces

The joint faces at the crankcase set joint must be free of burrs, completely flat and free of any corrosion. The joint along the top edge is critical for achieving an oil-tight join on assembly. While inspecting the oil sump flanges, also check the fit of the front timing cover and flywheel/clutch cover being absolutely flush at the oil sump flanges at the crankcase set. All items form a matched set.

All gasket surfaces should be scrutinised for remnants of clear silicone sealants that can be difficult to see, but can upset the functioning of new gaskets and sealants.

Coolant Jacket Corrosion

A major concern with the Jowett engine has been the quality of water that has been used in the cooling system. Here in Australia, because of a generally warm climate, car owners tended to keep well away from the added cost of using an anti-freeze solution in the cooling system. The Jowett engine has numerous metals of different types and, when such dissimilar metals are immersed in water, galvanic corrosion (caused by any presence of zinc/brass) will take place. Too thin a wall at the coolant jacket can cause a reduction in crankcase stiffness. Should the wall be thin, it would be best to obtain a crankcase that is in less corroded condition – even if it requires extensive repairs to threads etc.

2. Crankshaft

For most who are contemplating a Jowett engine overhaul, a Laystall crankshaft is a must. However, it is probable that a 'black-side' shaft, running in aluminium/tin bearings, would be just as durable.

The crankshaft spigot for the flywheel should be scrutinised first, should the flywheel be loose on the spigot, first try another flywheel for a tight fit.

Below are the original regrind specifications:

Crankshaft And Bearings

Crankshaft End Float:	0·003 – 0·004-in. (0·076–0·102 mm)
Flywheel Spigot Diameter:	3·000 – 2·999-in. (76·200–76·175 mm)

Main Bearing Journal Diameters

Standard	2·250 – 2·249-in. (57·150–57·125 mm)
First Regrind	2·245 – 2·244-in. (57·020–56·990 mm)
Second Regrind	2·240 – 2·239-in. (56·895–56·870 mm)
Third Regrind	2·230 – 2·229-in. (56·640–56·620 mm)

Crankpin Journal Diameters

Standard	2·000 – 1·999-in. (50·800–50·775 mm)
First Regrind	1·990 – 1·989-in. (50·550–50·520 mm)
Second Regrind	1·980 – 1·979-in. (50·290–50·270 mm)

Crankshaft Reconditioning

Should the crankshaft require regrinding, it should be crack tested, and it is advisable to provide the specialist repairer with the crankcase set with the new main bearings installed. The crankshaft journals can then be ground to suit the bearing material to be used. The same applies to the connecting rods, which may require that the big end bore be honed.

For those crankcases requiring separate thrust bearings, these should also be provided for machining the crankcase to suit. A Laystall crankshaft for use with new copper/lead bearings will require local nitriding and linishing for correct bearing clearance.

Refer to Technical Notes Series – Part OO – Jowett Javelin And Jupiter Maintenance Manual.
Refer to Technical Notes Series – Parts IX and Part X – Crankshaft Bearings.

3. Cylinder Liners

The cylinder liners (*Item 48*) require careful inspection and selection of the type that have the thicker wall section. The seat ledge that locates in the crankcase must be smooth without any pitting due to corrosion. The outer lip should also present a uniformly smooth outer surface. The lip can be lightly skimmed for a good cylinder head gasket seal.

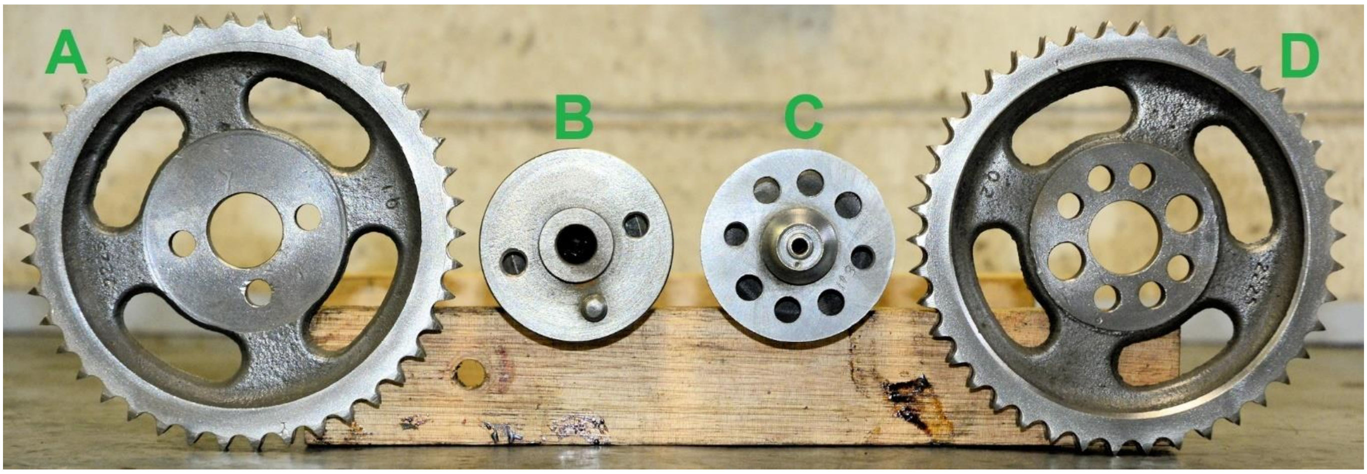
The cylinder liners should not be bored more than 0·040-in. oversize, otherwise cylinder liner collapse and wall vibration can occur. Consideration should also be given to liners being of slightly different length between the outer lip and the crankcase ledge, dimensions can be within manufacturing tolerance, but may require differing shim pack values during assembly.

4. Pistons

The choice of which pistons (*Item202*) to install in a Jowett engine usually rests with personal choice and, most likely, the cheapest option. However, should the cylinder liners (*Item 48*) have been bored oversize, then some form of new piston sets will certainly be required.

The consequences of the use of non-genuine type pistons cannot be covered here.

5. Camshaft And Tappets



*Above: Figure 26. Where – '**A**' is early chainwheel, '**B**' is early camshaft, '**C**' is later camshaft, and 'D' is later chainwheel. Item '**C**' has been running with incorrect end float adjustment.*

Referring to *Figure 26*, the chainwheel, labelled 'A', is located on a single dowel and there is only the option to switch the crankshaft sprocket on the shaft to gain a half tooth change to the valve timing. The camshaft and chainwheel pair labelled 'C' and 'D' feature a Vernier type of valve timing adjustment. The two threaded holes in the camshaft align with the two larger holes in the chainwheel to allow a small amount of radial movement on the camshaft. Refer to Page 48 for timing data.

An early version of the camshaft (*Item 119*) is entirely suitable for reconditioning by a camshaft specialist workshop, provided it is accompanied by the set of tappets (*Item 215*) that match it. Excessively worn camshaft bearing journals and cam lobes may demand the choice of a replacement camshaft – preferably of the later Vernier style valve timing adjustment, which can produce more accurate timing adjustment.

For those camshafts with a spring-loaded plunger in the front, the spring and the plunger should be checked for wear. The plunger must be free to float under the influence of spring pressure.

Refer to Technical Notes Series – Part III – Service Bulletins for changes to camshaft adjustment.

The tappets, due to copious lubrication, do not tend to wear at their diameter, however, the faces that are in contact with the cam lobes can, if poor quality oil has been used, suffer from wear. This wear is also prominent at the cam lobe toes. If the pitting at the face is not deep, the tappet face can be re-finish ground and Tuftrided for initial bedding in purposes. A careful check should be made to ensure that the bronze push rod seats are a firm fit in the tappet – should they be loose, then the two components should be thoroughly cleaned, treated with Loctite 7471 Activator, and set in place using Loctite 263 locking compound. The tappet and shroud assembly should be lightly clamped in a soft jawed (thin softwood strips) vice while the Loctite cures.

6. Valve Timing, Chainwheel And Timing Chain

The Jowett engine's camshaft drive train is copiously lubricated from jets in the oil delivery system from the oil pump (*Item 162*), with oil directed at the pump drive gear from the oil pump idler spindle (*Item 171*), which means that wear can be minimal. It is good policy to select an oil pump drive gear (*Item 147*) with the least amount of wear.

The timing chain (*Item 121*) should be renewed, it is a standard Renold duplex chain and should, if at all possible, be of the 'endless type', a reputable supplier can rivet the chain together. The timing chain receives a jet of engine oil from the upper elbow of the oil delivery pipe (*Item 172*), the jet should be checked for blockage. Both earlier engines and the Series III engines feature jets for lubrication. An oil pump can be checked on a test rig to ensure the jets are operating as they should.

7. Oil Pump

The oil pump (*Item 162*) is, due to its proximity to the oil level, is a pump that in good condition, will prime itself quickly – it does not require any special procedure. Provided good quality oil has been used at all times, excessive wear does not tend to occur.

The oil pump drive and idler gears (*Item 167, 168*) should be inspected for wear. At the same time, the drive key needs to be checked for its fit in the drive spindle (*Item 163*) and the idler spindle (*Item 171*) should be inspected for wear. The drive spindle should be free running in the oil pump body (*Item 165*) and the gear retaining circlip (*Item 169*) should have a firm grip on the spindle. The relief valve piston (*Items 175, 176, 177*) should be checked for wear.

The oil pump cover and filter (strainer) assembly (*Item 178*) should be inspected for wear where the pumping element gears run – excessive wear here can cause loss of oil pressure performance. It is also worth checking that the strainer housing has not been damaged due to the oil sump having struck a solid object. In addition, in some cases, the rear lip at the gauze may have been bent at a right-angle to keep the gauze away from the sump. This condition can, over time, wear a hole in the sump, with disastrous results. Early brass pump covers did tend to droop and let the gauze strainer contact the inside of the sump.

A rig can easily be made up for testing the oil pump, by mounting it on a frame that allows the pick-up to be submerged in a container of oil. The delivery pipe elbow requires an oil pressure pipe adaptor and gasket so that a pressure gauge can be attached. The pump can be driven by a ½-in. electric drill, switched to reverse direction, and used with a piece of scrap distributor drive shaft (*Item 126*). Be sure to fit a deflector to prevent oil reaching the ceiling from the idler spindle jet. Those later oil pumps with an adjustable relief valve can be set on such a test rig. Do not be tempted to increase the valve's setting beyond that specified – failure of the Woodruff key (*Item 166*) could result.

8. Crankshaft Pulley

The front timing cover oil seal (*Item 10*) has a lip that can, despite a flood of oil inside the cover, wear a groove in the surface of the crankshaft pulley (*Item 145*) that the lip is in contact with. Such a groove can be repaired by employing a Speedi-sleeve that can be pressed into place to provide an extra life for the pulley. The pulley should also be examined for wear at the vee where the drive belt (standard B-section) runs. If the bottom of the vee is polished, that signals that the pulley is worn, or that the drive belt is worn, the pulley should be checked against a new belt.

9. Cylinder Heads And Valves

The cylinder head assemblies (*Items 78, 79*) can be taken to a cylinder head specialist for conversion to operate with unleaded petrol. At this time, conversion of the valve guides (*Items 220, 222*) can be carried out as well.

The Welch plugs (not listed) should be removed by drilling a hole in the centre and levering out of position. Then the plug seat ledges can be examined for effects of corrosion, as can limited passageways inside the cylinder heads. The Welch plugs are of standard size and should be replaced with brass plugs, to prevent rust damage.

It is good practice to remove the cylinder head top covers (*Item 96*) by driving a slim cold chisel at the sides of the drive screws (*Item 95*) to force them out of the cylinder head. Modern sparking plug leads can be made (not blue leads!) up by an ignition specialist that are completely waterproof. The Series III engines did not have the covers fitted.

The cylinder heads should be carefully inspected for damage at the push rod tubes (*Item 94*) for damage due to incorrect sparking plug spanner use. Should the tubes be dented, provided they are a tight fit in the cylinder head, can be successfully straightened out by driving a smooth piece of bar of 0.4875-in. diameter, with a smooth radius at one end, through each tube. Be sure to coat the sized bar with Loctite 771 Anti-galling compound to prevent lodging.

Loose push rod tubes can cause oil leakage into the plug wells, such looseness can be fixed by treating the outer ends of a tube with Loctite 7471 Activator, applying a small bead of Loctite 569 sealant around the edge of the tube, allowing time for the sealant to soak in and then expanding the tube end with a gradually tapered punch with a sharp hammer blow. The taper on the punch will force the tube end tightly into the cylinder head.

Always use correct size box spanners for loosening the sparking plugs and adopt the habit of not leaning against the push rod tubes for added purchase, ½-in. drive sparking plug sockets are mostly too thick at the wall to fit correctly.

10. Front And Rear Timing Covers

The front timing cover (*Item 1*) should be examined for corrosion at the coolant galleries. The two dowel holes in the rear face should be examined for damage resulting from the fitting of a non-matched cover onto a crankcase set. The gasket faces for joints at the crankcase, petrol pump and oil sump should be flush and perfect matches with both the sump and pump faces when seated on the dowels. The camshaft thrust peg (*Item 120*) should present a smooth face to the camshaft plunger or nose plug (Series III).

The rear timing cover (*Item 18*) should have all front timing cover threads examined and repaired if necessary. The two gasket faces must be clean and free of any damage that could cause oil leakage. If an oil filter conversion is to be installed, the groove for the adaptor's 'O' ring should not be damaged. The filter drain setscrew (*Item 19*) thread must be in good condition, as must the fibre washer seat. If in doubt, the setscrew can be sealed with Loctite 569 sealant at both washer faces.

The rear timing cover to crankcase joint faces should be checked for truth. Over-tightened bolts on a soft composition gasket can cause the outer ends to bend downwards, check with a straight edge.

11. Flywheel/Clutch Housing

The flywheel/clutch housing, although not shown in the engine section of the Spare Parts Catalogue, does form a part of the assembled crankcase set. It forms the gasket flange for the oil sump (*Item 106*) at the rear and, therefore, should be absolutely flush with the flanges of the crankcase and front timing cover (*Items 35, 1*). A Series III housing has clutch operating fork openings with rounded ends to protect against cracks that can migrate from the sharp corners of the earlier rectangle clutch fork operating windows.

The bore for the rear main oil seal should be checked for being concentric with the rear crankshaft (*Item 141*) flywheel spigot – there can be variations from housing to housing.

All threads in the housing should be checked.

12. Engine Oil Sump

The engine oil sump (*Item 106*) should be inspected for damage at the front face and the underside which can affect, in severe cases, the oil pump pick-up gauze strainer. The boss for the drain plug fibre washer (*Items 333, 107*) should present a reliable sealing surface.

In the past, the sump gasket (*Item 323*) flange will have been distorted, mostly due to techniques employed for separating the sump from the crankcase. The flange will have been damaged by those who tend to fix an oil leak by even further tightening the sump securing nuts. Such minor distortions can be plenished out by placing the sump on a flat surface and using a hammer with a flat end bronze drift that fits inside the channel. The most common distortions at the flange are at the front and rear corners; the most effective method that can be used for bending the flange back into line is to use a suitable bending bar, or, in most instances, a 12-in. adjustable spanner. The jaws need to be set to just clear the outer rib of the flange and the spanner handle used to effect the bend. The sump should be held down on a wooden bench top by an assistant, while the corners are bent upwards to form a completely flat gasket surface.

It should be noted that at the front corners, there is a lengthy span between sump studs. This means that, for effective gasket clamping, the flange (all the way around) must be absolutely flat.

13. The Oil Filler Tube And Engine Breather Valve

The oil filler tube (*Item 7*) should be inspected for an oil-tight seat at the front timing cover. The tube assembly is secured by a setscrew, which, if it has been overtightened, can distort the retaining bracket. The bottom face of the bracket can be straightened by clamping a steel bar in a bench vice and hammering the bracket flat against the bar.

The crankcase breather (*Item 11*) rarely gives trouble, however, poor storage conditions can cause rust to affect the valve. It is important to carefully examine the union fittings at the breather pipe (*Item 12*) because, at the crankcase end, the union nuts may have been overtightened and as a result, air can be drawn into the balance pipe at low idle due to loose olives (*Item 16*) on the copper pipes. The long pipe can also be distorted and kinked due to it being a tight fit *en route* to the breather assembly. This pipe assembly is an important component and must be airtight from the balance pipe in the right-hand side tappet chest to the connection on the breather valve.

14. Conclusion

For more than seventy years the Jowett engine has been beset by interference with its assembly methods being altered/abused by those who do not understand how an engine should be repaired locally or completely assembled from scratch. With regard to many components, there is evidence that proper working practices have not been employed. This is a very sad situation, it also explains why many Javelins went for scrap, for no other reason than fitting skills' incompetence.

Hopefully, such abuse of vital parts may now be well in the past.

It should be understood that the inspection information was written both from practical experience and from skills learnt in the farm machinery and tractor industry.

SECTION 8. ASSEMBLING THE JOWETT ENGINE

Introduction

Having examined what components, as shown in the *Jowett Javelin & Jupiter Spare Parts Catalogue*, noted the engine dismantling procedure, thoroughly cleaned all of the required parts, inspected them carefully and purchased new parts, seals and gaskets, it is time to give due consideration to the Jowett engine's assembly. This can, depending on the condition of the parts to be assembled, be a lengthy activity. The first consideration is the assembler's age, most of those with long-time Jowett experience are into what is termed 'old age'. A Jowett engine rebuilder should be younger than eighty years of age – mostly because of the strain of lifting heavy components and the comparatively exhausting stress of keeping ahead of the game. There is one very important rule – nothing should be taken for granted, setbacks should be anticipated, even if all preventive steps have been taken.

The majority of Jowett engine parts are now over seventy years old and the modern thought process should relate to the fact that the skilled Jowett factory workers, very likely, had no concept that their products would have an enthusiast following all these years later. Due to the age of some components, we need to treat them, as the trade used to remark, ‘with the touch of a midwife’.

That should be borne in mind!

1. Preparation

A Jowett engine rebuild has to start somewhere. The obvious requirements are for a sufficient amount of working space and, of course, work bench space in addition to the free-standing work bench described previously. All tools should be readily to hand and the spanners must be of correct fit for the hardware used by Jowett Cars Limited.

The floor area should be kept clean, preferably with a vacuum cleaner, and a rubbish bin for waste should be to hand. In Australia home garages and sheds can be favoured breeding grounds for spiders and their webs which can cause dust contamination. The household bed linen store can be raided for an older double bed sheet to use as a dust cover for the engine being assembled.

Other needs are a healthy supply of compressed air, good lighting with a portable lead light and such as a bench drill, along with an electric bench grinder.

The reader will have noticed frequent mention of Loctite products, there are reasons for exclusive use of the brand – in the 1970s the Bearing Service Company provided the motor industry with excellent service training and product backup for the use of Loctite products. That still happens in modern times, although the brand is now handled by Henkel who have a local head office in Kilsyth, Victoria. Recently, the writer experienced a concern with some studs installed with Loctite 263, E-mailed the company’s office and a representative was sent to observe the situation. Other Loctite products were recommended for the various tasks and successfully adopted. Such breeds customer loyalty to a particular brand.

A Jowett engine rebuilder is free to use whatever retaining and sealing compounds he/she wishes to use, however, should a problem arise, the Jowett brand should not be blamed. The writer has no association with Henkel or Loctite – just is still a satisfied customer.

Another useful preparation is to ensure that all bolt, stud, and nut threads are free-running. Suitable thread cleaning die nuts and taps of the BSF thread form are useful to have ready to hand.

2. Initial Engine Assembly

Most likely, it is advisable to commence with the installation of all studs in the crankcase halves. The cylinder head studs (*Items 43, 44, 45, 46*) should be carefully installed using a ½-in. drive ⅜-in. stud installer/remover. These operate with loose rollers on ramps to firmly grip the studs as they are screwed into the crankcase. Other types have a rotating knurled wheel that can easily damage a stud and promote breakage. The studs should be gripped at the shank, not at the threads. Before final installation, the studs should be checked for length, approximate lengths are, as shown in the cylinder head nut tightening sequence:

1	Drilled Oil Feed Stud – 5⅛-in. Long
3, 5, 7, 10	Upper Row Of Studs – 4⅞-in. Long (Different For Jupiter)
4	Centre Stud – 7-in. Long
2, 6, 8, 9	Lower Row Of Studs – 4 3/16-in. Long (Different For Jupiter)

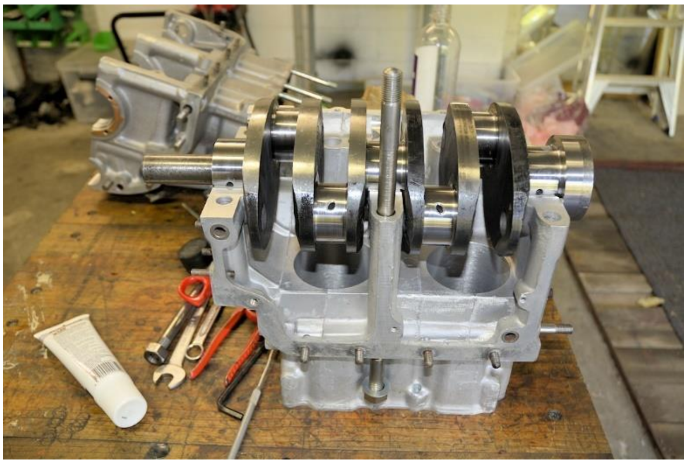
The lengths of the studs are approximate, due to different thickness nuts having been used.

All cylinder head studs and crankcase threads to be retained with Loctite 263 Thread Locker should be treated with Loctite 7471 Cleaner Activator prior to applying the Loctite 263 and tightened to 20 lbs. ft., excess Loctite should be wiped away immediately the stud is tightened into the crankcase.

Should a stud shank be a loose fit in its crankcase counterbore then, at cylinder head installation, the gap can have Loctite 518 trowelled into the clearance gap. Loctite 518 is an anaerobic sealant and will solidify after air has been excluded.

After the Loctite 263 has fully cured, test with a reverse-acting torque wrench at the 21 lbs. ft. setting to verify that the studs are secure.

Note: The extended cylinder head studs that pass through the coolant inlet ports require a different Loctite retaining procedure. Where the stud is fixed at the cylinder head surface, Loctite 263 Thread Locker should be used and, where the stud is threaded beyond the port, Loctite 569 brown sealant should be used.



Right: Figure 27. Crankcase half mounted on free standing bench for assembly work.

All other studs can be threaded into the crank-case by threading on two new dry BSF nuts and jamming then tightly together. The studs can then be installed with Loctite 263 to prevent them coming loose. Once installed, the nuts can be released and used on the next stud. The studs for the coolant inlet elbows have a shorter thread that screws into the crankcase, as do the four front engine mounting bracket studs. Such studs should be tightened in with a consistent flick of the wrist, not the pull of an arm.

WARNING! The drilled oil feed cylinder head stud (*Item 46*) must not be over-tightened into the crankcase halves, excessive force can break out the boss for the flared copper oil feed pipe.

With *all* studs threaded and tightened into the crankcase halves, the right-hand half should be up ended to sit on its cylinder head gasket face, with the studs passing through the holes that have been drilled into the bench top. The crankcase half can be secured by using ½-in. nuts as spacers and a plain washer and a ⅜-in. BSF nut, at the centre head stud, from underneath.

It is wise to have some extra internal balance pipe 'O' rings (*Item 335*) at hand in case the balance pipe fails its test. Such 'O' rings are easily obtainable from Consolidated Bearing Service stores.

There is a reason for placing the right hand half on the bench, it provides convenient access to the tie bolt located in the tappet chest. With the crankcase half thus positioned, the main bearing dowels can first be pushed into place, then the main bearing shells installed and, if necessary, the separate thrust bearings located on the rear crankcase web. The left-hand crankcase half can be fitted with main bearing dowels, bearings, and thrusts. The two long tie studs (*Item 39*) should be inserted into their bores and the lower plain washers and nuts threaded on until the thread of the stud just shows through the nut. The eye nuts (*Item 40*) can be placed into their positions, ensuring that the lead threads face the tie bolts (*Item 38*). Lubricate the main bearing surfaces with Nulon L90 Extreme Assembly Paste, ensuring that it covers the thrust bearings. The crankshaft (*Item 141*) can now be lowered into the main bearings and the thrust clearance verified – the clearance should be 0·003 to 0·004-in. From this point onwards until the crankcase is bolted together, an assistant can help to guide the two halves together. Also, this task must be completed in one continuous operation. Have all tie bolts at the ready as well as the five ¼-in. BSF bolts for above the camshaft tunnel. Ensure that the crankcase joint dowels are lubricated and in place.

On the internal balance pipe (*Item 63*), apply a smear of Loctite 518 sealant at each end, slide on the 'O' rings and insert the pipe into a sealant coated crankcase seat. Make sure that the balance pipe is vertical and that the flat faces the number 2 crankshaft web. Apply a light smear of Loctite 518 along the upper joint of the crankcase, making sure that the sealant smear surrounds each bolt hole. Do not apply any sealant at the three web joints. Apply Loctite 518 sealant to the upper end of the internal balance pipe. With careful assistance, lower the left hand crankcase half over the two tie studs as guides. This is a true precision task, and as the upper half is lowered the entry of the upper end of the balance pipe should be felt as a slight resistance.

Once the two halves meet, the tie bolts can be threaded into the eye nuts and the washers and nuts threaded onto the tie studs. The assistant can, meanwhile, install the five bolts along the top edge. The tie bolts and studs should be tightened in three stages to 30 lb. ft., 60 lb. ft. and 75 lb.ft. The five ¼-in. bolts should be tightened into ¼-in BSF Nyloc nuts. The assembly should be left for the Loctite 518, which is anaerobic, to fully cure before carrying out the balance pipe vacuum test.

There is no requirement for tie bolt/stud sealant, oil should not be able to reach these areas.

The crankshaft should be checked to ensure it spins freely. Should it be pinched, then the tie bolts and studs can be slackened off until the shaft does spin. Retighten after the engine has been run-in.

3. The Balance Pipe Seal Test

Prior to any further engine assembly a proper balance pipe seal test must be carried out. The Jowett Javelin & Jupiter Maintenance Manual provides a complete description of how to make a test. If the test is not performed, serious oil burning will probably result at engine start up.

Right: Figure 28. Balance pipe test rig.

Therefore a proper test is a wise move. Proceed as follows:

a) Allow time for the Loctite 518 sealant to cure.

b) Fit the sealing rubber pads over the cylinder head studs so that they blank off the balance pipes at the cylinder head surfaces.

Right: Figure 29. Connection at crankcase pipe.

c) Install the blanking plates and tighten firmly with ⅜-in. washers and BSF nuts.

d) Attach a vacuum gauge to the breather pipe union fitting (*Item 14*) at the crankcase.

e) With a tyre pump that has a reversed piston washer, pull a vacuum of 20-in. mercury. The gauge should hold position for 10 minutes.

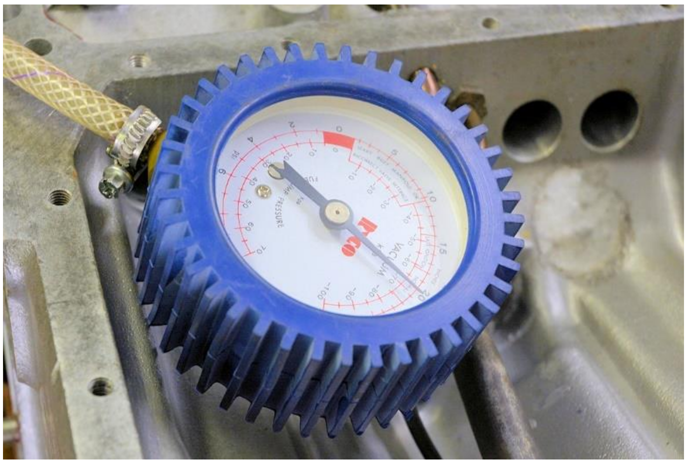
f) This test relies on a few conditions:

  (i) The check valve in the test kit seats with tight effect.

  (ii) The union fitting at the pipe exiting the crankcase balance pipe makes a tight connection. Should the olive be loose on the copper pipe, the test will fail.

  (iii) That the rubber pads make an effective end seal.

Right: Figure 30. Reading the vacuum value.



  (iv) Should the drawn vacuum disappear immediately, one of the ‘O’ rings has been inadvertently cut during assembly. The only effective repair is to split the crankcase and start all over again.

Right: Figure 31. The coolant inlet elbow has been fitted at both sides.

A successful balance pipe test provides the confidence to continue with the Jowett engine rebuild. After completing the balance pipe test, install both coolant inlet elbows. With these flanges properly mounted, the rear faces of the crankcase are reinforced. The elbows should be installed before the cylinder heads are tightened in place.

It is probably difficult to believe, but they do add a degree of strength to the crankcase set. The long elbow mounts on the left-hand side.

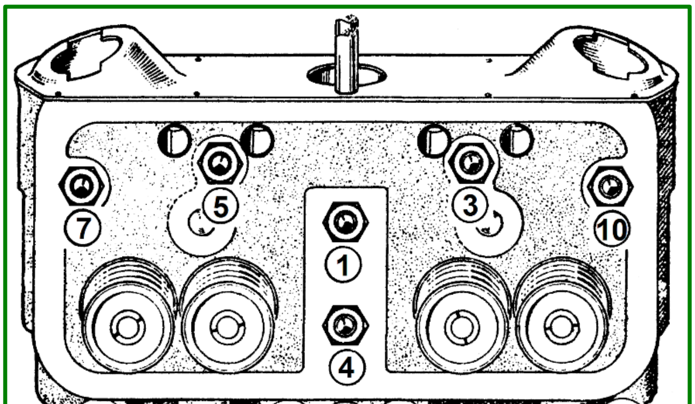
The writer has a balance pipe test rig which can be lent to financial members of the JCCA. There are two conditions – that the rig be collected and that it be returned quickly, no excuses.

4. Adjusting The Cylinder Liner Protrusion

All four cylinder liners (*Item 48*) should have, as previously mentioned, been marked with a white indelible marker showing the cylinder number in the crankcase the liner was extracted from. There is a tried and tested procedure for setting the cylinder liner protrusion outboard of the crankcase cylinder head surface. The JCCA can supply sets of copper spacer washers and shims. The Hallite liner gasket (*Item 315*) should not be used. In addition to that comment, the specification for the liner protrusion needs to be adjusted in view of the copper washer not compressing as much as the original gasket material. The original specification was 0·008 to 0·012-in., however, using the copper washers the JCCA recommended 0·006 to 0·008-in. with copper/asbestos/copper cylinder head gasket (*Item 316*) in use (Jupiter – copper/asbestos/steel). As is now well known, asbestos is banned in Australia and substitutes have been found. Currently, the JCCA stocks cylinder head gaskets from New Zealand, these are the grey on one face gaskets and they have worked well. However, the 'padding' material has more yield than the original asbestos (indeed, some of these gaskets have been reported to be thicker than the originals). All of this means that, once again, cylinder liner protrusion has become a critical item. Added to that, new gaskets to Jupiter configuration are now available from Britain, with the claim that they only require 0·002 to 0·004-in. liner protrusion. Just where that dimension and tolerance came from is not known in Australia, refer to Part XXXIX.

Very likely, this is all extremely confusing and there are quite a number of opinions as to what should be done to set a reliable cylinder liner protrusion. The following procedure can be followed:

a) Make sure that the crankcase seats and the cylinder liner ledges are absolutely clean.
b) Lightly oil the cylinder liner skirts so that they slide easily into the crankcase bores.
c) Install a copper washer over each of a matched pair of liners (1 & 3, 2 & 4), slide the pair of liners into the cylinder bores.
d) Use a good quality straight edge and, with accurate feeler gauges, measure the gap between the liner lip and the straight edge, while the liners are handheld firmly in place,
e) Use a micrometer to measure shim packs to provide approximately 0·011-in. cylinder liner protrusion. Both liners should be as close as possible to the same amount of protrusion.



Right: Figure 32. Cylinder head nut tightening sequence that should be adopted.

f) Find a spare cylinder head that is clean and has a smooth cylinder head gasket surface. Slide it over the head studs to make contact with the cylinder liner lips direct. The next step ensures that the cylinder liner washers and shims are flattened and there is no distortion affecting the final measurements.
g) In the correct sequence, refer to *Figure 32*, tighten all nuts to 15 lb. ft. Confirm this again.
h) With the feeler gauge blades, measure the gap all the way around the crankcase edge. The result could be slightly different from point to point, therefore, an average dimension will need to be calculated.
i) Now, making numerous attempts, try to achieve 0·010-in protrusion with the pair of liner lips as close to being equal as possible. It is convenient to remember the 15 lb. ft. and the 0·010-in. combination. With attention to detail, an accurate protrusion can be achieved.

j) The pair of cylinder liners should have a very light smear of Loctite 518 applied at the liner ledge only and the pair of liners installed with a new head gasket support (*Item 49*) of one-piece cast aluminium type. Each liner should be firmly clamped to 23 lb. ft., with suitable spacers and nuts arranged so that the pistons can be installed without interference.

The cylinder head gaskets from England, of Jupiter configuration are, to the writer, an unknown quantity and the cylinder liner protrusion specification will require working out for them. It should be remembered that the aluminium crankcase, as it warms up, expands at a greater rate than the cylinder liners do. Also, depending on the thickness of the New Zealand sourced gaskets, the thicker gasket should have the liners set to 0·010-in., and the thinner gasket, probably 0·008-in. protrusion – this last dimension has worked well in the past before the thicker gaskets came on the scene.

The writer has spacers, plates, nuts, and washers that can be lent under the previously mentioned conditions only.

5. Installing The Pistons And Connecting Rods

Assuming that JP pistons are being fitted, it is important that the piston ring gaps, when placed in the cylinder bore are measured. The specified piston ring gap is 0·007 to 0·015-in. and they can be measured with feeler gauge blades. The top (with piston sitting on its skirt) ring (*Item 205*) is Vacrom plated and the middle ring (*Item 204*) is a plain ring, the bottom ring (*Item 203*) is an oil scraper ring.

The piston should be fitted to the connecting rod before the piston rings are installed. The piston pin (*Item 200*) and the small end bush (*Item 199*) in the connecting rod should be lubricated with Nulon L90 prior to assembly. If the pistons have split skirts (the split allows expansion as the piston heats up), then the split must face opposite the thrust side when on the power stroke.

The piston pin is retained in the piston and connecting rod by a pair of circlips.

A circlip (*Item 201*) is a simple clip that is made from tempered spring steel. A pair are used in the piston to prevent the pin from floating sideways and contacting the cylinder bore. The circlips seat in a pair of machined grooves positioned in the piston pin bore in the piston (*Item 202*). The circlips are installed by inserting the points of a pair of circlip pliers that compress the open ends of the clip together, to facilitate insertion in the piston bore.

Right: Figure 33. A typical internal circlip. At ‘A’ are the opening and two circlip plier holes.

There is a technique that should be employed for circlip installation. Prior to inserting the pliers, careful examination of the clip will reveal that the holes provided in the clip are tapered, i.e. on one face the holes are of smaller diameter than they are on the other face. This is a useful result of the way the circlip is punched, in one operation from a steel strip. By installing the plier points into the small (sharp edged) face of the clip, a secure grip can be maintained while the pliers are being squeezed to compress the ends of the circlip prior to insertion in the gudgeon pin bore. As well as the plier holes having a sharp edge, the outer diameter of the circlip is also sharp edged – this feature will help lock the clip in position.

Inserting the pliers from the sharp edged face of the circlip will make its removal at a later time much easier, thus saving workshop time. Good quality circlip pliers feature a number of circular grooves along the points that enter the circlip holes. The grooves work in conjunction with the sharp edged face.

The circlips should be installed with the opening, ‘A’, facing the big end of the connecting rod.

The piston rings are best fitted if the piston and connecting rod assembly is held in a soft jaw vice, so that the skirt of the piston is resting on the vice jaws. In cold weather, the piston rings can be warmed in hot water to avoid breakage during installation. The rings need only be expanded to the extent that they can pass over the piston without inflicting scratches.

The connecting rod bearings (*Items 197, 198*) should be a snug fit in the connecting rod and big end bearing cap, if they fall out under their own weight, better condition connecting rods should be sought.

Make sure that the connecting rod letter codes match the cylinder numbers as previously recorded.

The connecting rod big end cap bolts (Item 194) and the threads in the rod should be treated with Loctite 7471 Activator and allowed to dry. Lubricate the big end shells with Nulon L90, use clean engine oil to thoroughly lubricate the pistons and rings. Set the piston rings so that the gaps are evenly spaced around the piston. Use a good quality piston ring clamp that has been oiled and, operating the clamp, tighten the piston rings in their grooves. Set the clamp so that a portion of the piston skirt is free to enter the cylinder.

The crankcase should be located in the cradle with the sump face uppermost. Insert the piston and connecting rod assembly into the cylinder bore (open end of connecting rod upwards) and, holding the clamp firmly and squarely against the lip, use a rubber hammer handle to nudge the piston into its bore, in one swift movement. The crank pin should be in a position so that the connecting rod and bearing can be brought up to the crank pin and held in place. Insert a wad of clean rag under the connecting rod. Apply a drop of Loctite 263 only at the threads in the connecting rod. Make sure that no Loctite is present at the connecting rod cap serrations, Loctite 263 here can have an influence on the clearance between the bearing and the crank pin surface. Tighten the bearing cap bolts to 35 lb. ft., wipe excess Loctite from under the open thread hole in the connecting rod. Repeat the procedure operation for the remaining cylinders.

If Unbrako bearing cap bolts (*Item 194*) are used, they should be tightened with an Allen key fitted ½-in. drive socket. The size of the Allen type key is $^{5}/_{16}$-in. across the flats (A/F).

6. Installing The Flywheel/Clutch Housing

A new rear main oil seal should be carefully pressed into the bore in the flywheel/clutch housing. Most new seals have a rubber coating and care needs to be taken to ensure the rubber portion is not cut as the seal is pressed home, use rubber grease sparingly to assist, make sure that the ‘open’ face on the seal faces the crankcase when the housing is fitted in place.

The contact faces at the crankcase and the housing must have all traces of used sealant removed before a coating of Loctite 7471 Activator is applied and allowed to dry. A light smear of Loctite 518 sealant should be applied. Apply a smear of Nulon L90 at the rear of the crankshaft and at the lip of the rear main oil seal. The flywheel/clutch housing will require some jiggling to ease the seal’s lip over the crankshaft and onto the hollow dowels located in the crankcase. Once home, the securing nuts should be tightened against internal tooth lock washers. Wipe away squeezed out sealant.

Step 7 is on next page.

7. Loose Starter Ring Gear Situation

Right: Figure 34. Arrows indicate the distance a ring gear has moved on a flywheel.

In some instances it may be found that the starter ring gear is loose on the flywheel rim. The loose ring gear situation can be caused by excessive heat being applied to a new ring gear being fitted, or due to previous wear caused by a slipping gear when the starter motor is operated.

In the past, attempts have been made to effect a repair by stitch-welding a loose ring gear to a flywheel. This action has not been successful, the two types of metal are not compatible for a good weld joint, unless a highly skilled, and expensive technique is used by a repairer.

Right: Figure 35. An attempted weld repair.

There is a method whereby a ring gear can be set securely onto a flywheel. The flywheel and the ring gear should be set up on a flat surface with four strong 'G' clamps holding the gear tightly on its mounting ledge. The assembly must be accurately marked out for four securing countersunk setscrews, to be drilled on a jigging table with the tapping holes accurately positioned equally apart as shown in *Figure 36*. The holes should be countersunk to match the heads of the setscrews.

The drilling and countersinking should be done in a machine shop milling machine. The flywheel is first spot faced flush with the ring gear to ensure that the tap size drill will hold central between the ring gear and the flywheel. After drilling, while at the same setting, the countersink operation is carried out.

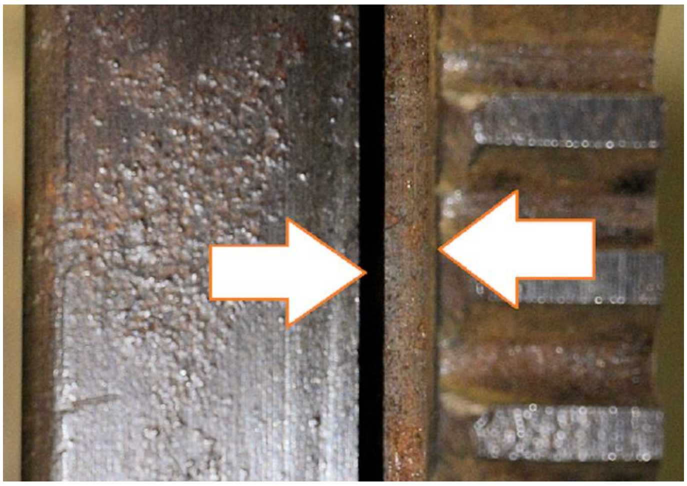
Right: Figure 36. The four countersunk setscrews are at 90° to each other.

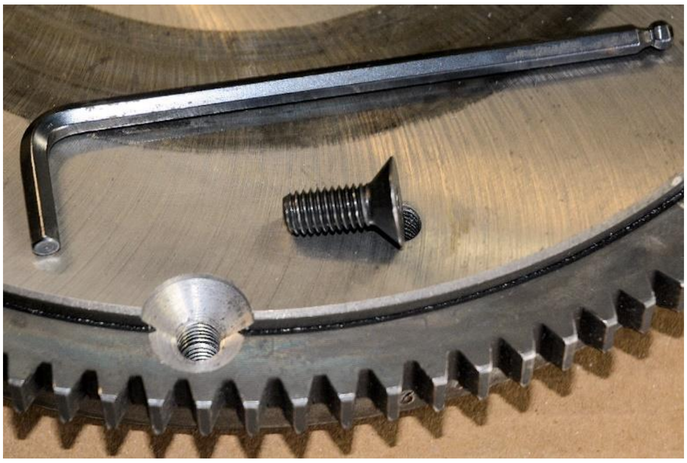
If the four machining operations are the same, the assembly should remain in balance. If in doubt, the assembly with the clutch pressure plate bolted in place should be balanced.

To assemble the countersunk setscrews, clean with Loctite 7471 Activator the screws and the four threads and allow to dry. Apply Loctite 680 at the countersink faces only and fully tighten the four setscrews. Wipe away any surplus Loctite.

Right: Figure 37. Setscrew and Allen key prior to final installation.

The countersunk setscrews are 8 mm diameter and 20 mm long, metric screws have been used due to ease of sourcing. Refer to Part XIX of the Jowett Technical Notes Series.





8. Fitting The Flywheel And Clutch Assembly

With a white permanent marker pen, fill the stampings for T.D.C. 1 and 2 in the flywheel rim, then wipe away excess paint. Do the same for the 3 and 4 T.D.C. stamping. This makes identifying the points easier when setting the valve and ignition timing. Refer to *Figure 37*.

Having ensured that the starter ring gear is secure on the flywheel, rotate the crankshaft so that the dowel (*Item151*) is uppermost (engine still upside down in cradle) and carefully lower the flywheel into position on the crankshaft. The flywheel is heavy and is a tight fit in the housing. Once fully home on its crankshaft spigot, clean the bolt and crankshaft threads with Loctite 7471 Activator and, with good quality internal tooth lock washers, apply Loctite 263 and tighten the four bolts to 60 lb. ft. torque. Use the tool shown in *Figure 21*, to lock the flywheel while tightening the bolts.

To install the clutch, it is advisable to set the crankcase assembly in a vertical position in the cradle, with the flywheel housing uppermost.

Right: Figure 38. Installing the clutch assembly.

Place a smear of Nulon L90 assembly paste in the spigot bush at the rear of the crankshaft. Install the clutch disc and then locate the clutch pressure plate onto the two dowels in the flywheel making sure that the white identifying marks are aligned. Insert a spare gearbox first motion shaft so that the loose friction disc is aligned with the spigot bush (*Item152*) in the crankshaft. The six clutch pressure plate setscrews (with new spring washers) should be installed progressively as the flywheel is rotated. With all setscrews fitted, make a final check for equal tightness – 20 lb. ft. torque.

Right: Figure 39. Clutch and flywheel alignment marks confirm correct position.

The gearbox first motion shaft should be easy to slide in and out of position – if tight, investigate and resolve the concern. A spigot that is a good fit in the bush can, due to the lubricant, cause a slight vacuum as the shaft is withdrawn.

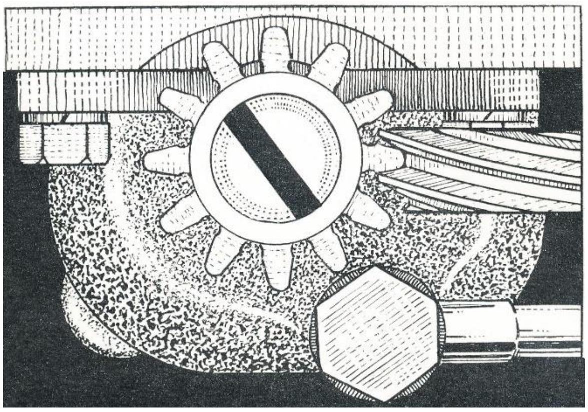
9. Fitting The Oil Pump And Camshaft

With the engine assembly still in the vertical position on the cradle, install the oil baffle (*Item 108*) and then roll the engine so that it sits the correct way up. Installing the oil pump requires that the ignition timing be basically set.

Right: Figure 40. T.D.C. 1 and 2 aligned.

Rotate the crankshaft so that the T.D.C. 1 and 2 arrow on the flywheel rim aligns with the crank-case upper joint line. A window in the top of the flywheel/clutch housing is provided for sighting the mark on the flywheel – there is also a similar mark for T.D.C. at 3 and 4 cylinders. Fit the crankshaft key (*Item 148*) into the nose of the crankshaft and slide the oil pump drive gear, with extended centre boss facing forward, onto the crank-shaft.

Fit the oil pump assembly, with the oil strainer below the baffle plate, locating it onto the hollow dowels, and ensuring the drive spindle is positioned so that the offset slot into which the distributor drive is fitted, as shown in *Figure 38*. This action is very important, if the tongue slot is out of position, the ignition timing at the distributor cannot be set, due to the proximity of the coolant pump. Tighten the three oil pump securing nuts.



Right: Figure 41. The oil pump drive spindle viewed from above, when in position with T.D.C. 1 and 2 is set. This view is from directly above the drive spindle.

Fit the oil pump delivery pipe, using a new elbow gasket at the joint with the crankcase, and fitting new fibre washers above and below the banjo union at the pump. Use a piece of tie wire to lock the banjo union bolt in place. The wire can be wrapped around the union/pipe and then twisted snugly and trimmed. Should the banjo bolt not have holes for locking wire, find a bolt with the holes, or drill through one hexagon point.

Lubricate with Nulon L90 the camshaft bearing journals and all cam lobes, then install the camshaft in the crankcase.

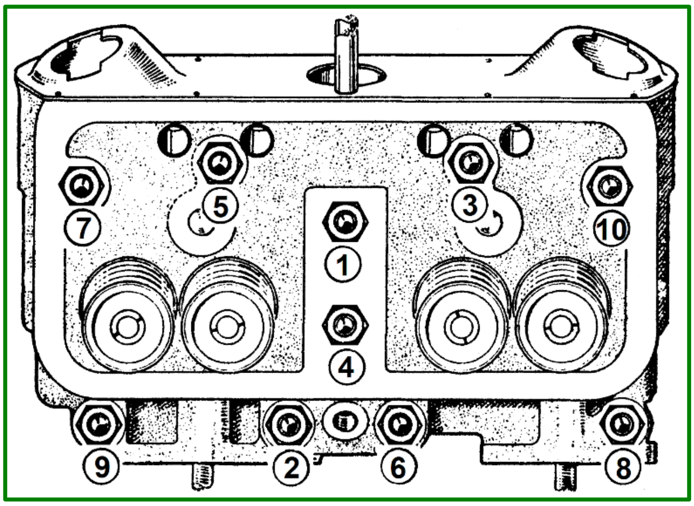
The valve timing must only be carried out, as detailed in Step 11 (Page 48) of the assembly process, to ensure that the engine's valve timing is accurately set.

10. Installing The Cylinder Heads

The installation of the cylinder heads is, most likely, the most critical stage of a Jowett engine rebuild. The first point to note is that all of the cylinder head stud nuts are readily to hand, along with their respective plain washers. It is worthwhile to have some ½-in. nuts to use as spacers on the drilled oil feed studs for the rocker gear (*Item 46*) so that initial cylinder head nut tightening can proceed. The second point is that the 'O' ring coolant seal (*Item 321*) that fits over number four stud (in tightening sequence) and a close-tolerance plain washer that fits into the recess in the outer face of the cylinder head (*Items 78, 79*) and, with a larger outside diameter ⅜-in. plain washer, squeezes the 'O' ring into the stud (*Item 45*) thread to form an effective seal against coolant migration.

It is important to have all necessary tools to hand. For these instructions, one cylinder head is being described. The procedure is the same for the second cylinder head. It can be easier to fit the Zenith carburettors prior to installing the cylinder heads.

The cylinder head gasket (*Item 316*) surfaces at the cylinder head and the crankcase (*Item 35*) do require cleaning with Loctite 7471 Activator prior to assembly. There should be no traces of oil on the cylinder liner lips (*Item 48*). Do not rotate the crankshaft. The liner clamp tubes can now be released and the areas around the cylinder head studs prepared for the application of Loctite 515 Master Gasket. Apply a light smear over the crankcase surface, but keep the sealant away from the liner lip surfaces. Do the same on the grey surface of the cylinder head gasket (*Item 316*), keeping the liner lip areas free of sealant.



Right: Figure 42. Cylinder head nut tightening sequence diagram.

A benefit of Loctite 515 is that it is anaerobic, meaning that it will not start to cure in the presence of air, which allows plenty of time for making sure that it is applied correctly. The gasket should be slid part way over the cylinder head studs, then pushed fully home, with 'O' ring for number 1 stud, the cylinder head and then the cylinder head nuts, with their washers, threaded onto the studs. Be sure to insert the centre stud 'O' ring coolant seal (*Item 321*) into the recess with a smear of Loctite 518, followed by the neat fitting washer, the larger plain washer, and the nut. Apply a small bead of Loctite 518 between the plain washers and the cylinder head face at studs 2, 3, 4, 5, 6, 7, 8, 9, 10 to prevent coolant migration. Place some of the ½-in. nuts over the drilled oil feed stud, a ⅜-in. plain washer and then its nut. Referring to *Figure 42*, tighten all nuts, in sequence order to 18 lbs. ft. torque wrench setting, carry out the sequence at the same setting a second time for the head to bed home. Next, set the wrench to 25 lbs. ft. and, again tighten in sequence twice. Finally, adjust the torque wrench to 37 lb. ft. and proceed in sequence two more times. At the final sequence, the nuts should not move, confirming that the gasket is clamped effectively. The Jowett Maintenance Manual calls for a torque setting of 42 lbs. ft. (or 40 lbs. ft. depending on manual) which, with the age and condition of the crankcase set, could be too much strain. Using the copper cylinder liner washers virtually stops liner 'sinkage'.

Right: Figure 43. The red arrow indicates a crack that appeared two days after installing a cylinder head. The crankcase had been seriously abused.

After installing the cylinder heads, it is advisable to let the assembly settle for a few days. The writer has recently experienced the devastating discovery of a crack appearing two days after the cylinder head was installed and left for the sealant to cure. This was a first time experience, it was found to be the result of previous abuse and improper repair methods – being cheaper in the short run. Possibly, no one knows if, in the past, a crank-case set has been abused due to incorrect cylinder liner protrusion or unskilfully repaired threads exist. It has to be understood that Jowett Engineering Limited introduced the extended cylinder head stud through the coolant inlet port for good reason. Indeed, an excellent modification and extremely cheap peace of mind for the Jowett engine builder.

11. Setting The Valve Timing – Solid Tappets

Jowett Cars Limited relied on skilled mechanics for setting the valve timing to ensure optimal running performance of the engine. There is just one method that should be employed when setting and checking the valve timing. The original method relates to both the early camshaft chainwheel and, even more accurately for the Vernier adjustment type camshaft and chainwheel. Setting the valve timing, as described here, ensures accurate timing of the valves and removes all doubts there may be.

Do not accept any marks that have been applied to the camshaft chainwheel.

The Four-stroke Cycle

There needs to be an understanding, particularly with regard to valve timing, as related to the Jowett engine, which operates on the four-stroke cycle (Otto cycle) principle. The Jowett engine has four cylinders and, during the cycle described for one cylinder, the engine is kept running by the power strokes of the other cylinders that operate in turn, the flywheel also assists. The four strokes of the piston (throws of the crankshaft every two (2) complete revolutions), at No. 1 cylinder, are as follows.

Induction

With the piston at top dead centre (*outer dead centre for the Jowett*) moving towards the crankshaft during the first half revolution of the crankshaft and, since the inlet valve is open, sucks the petrol/air mixture into the cylinder.

Compression

As the piston reaches bottom dead centre (*inner dead centre*) and commences its stroke at the second half revolution of the crankshaft, the inlet and exhaust valves are closed, the petrol/air mixture is then compressed.

Expansion

As the piston nears the top dead centre (*outer dead centre*) of its stroke, an electric current passes across the points of the sparking plug and ignites the compressed mixture and then begins the power stroke, commencing the second revolution of the crankshaft. The piston is forced towards bottom dead centre (*inner dead centre*) performing the third stroke.

Exhaust

As the piston, after reaching bottom dead centre (*inner dead centre*), commences the final stroke and the exhaust valve opens and the burnt gases are expelled through the exhaust system. This completes the four strokes of the cycle.

Exhaust And Inlet Valve Overlap

As the piston approaches top dead centre (*outer dead centre*) the pair of exhaust and inlet valves are both partially open. This is known as valve overlap, or more commonly, the valves are *on-the-rock* with both valves closing and opening at the same time.

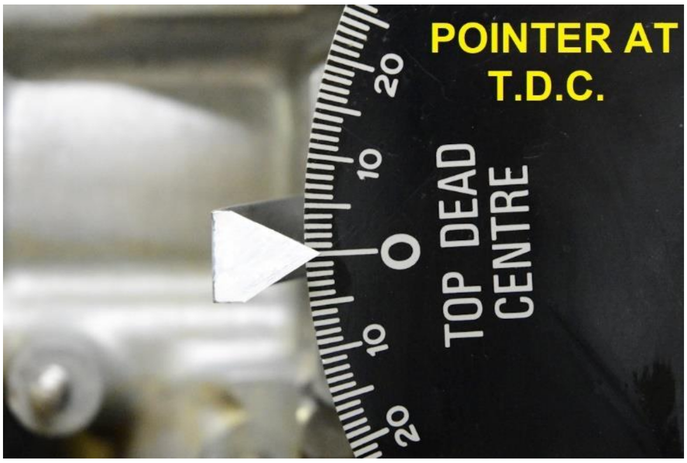
For all of this to happen, there is specific timing of the valves – hence the requirement for accurate valve timing, as outlined below.

To set the camshaft timing proceed as follows:

1. Lubricate the camshaft (*Item 119*) journals and cam lobes with Nulon L90 and insert the camshaft into the crankcase.
2. Lubricate the tappets (*Item 215*) with Nulon L90 and insert them in their bores.

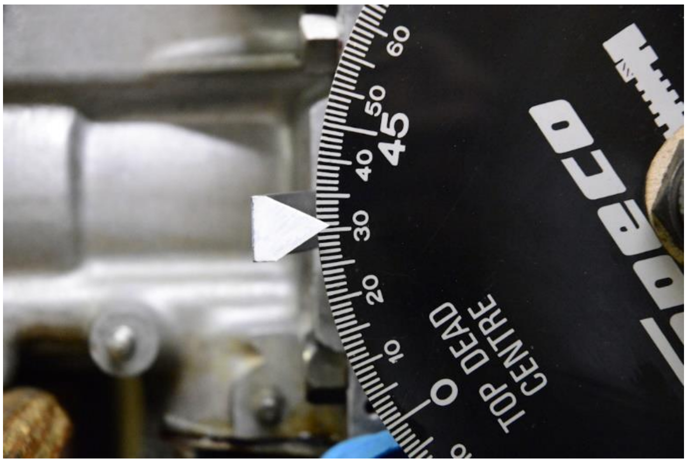
Right: Figure 44. Top Dead Centre for cylinders 1 and 2 in preparation for valve timing.

3. Ensure that the oil pump drive spindle is located as shown in *Figure 41*, when the crankshaft is set to T.D.C. at 1 and 2, right. The oil pump spindle is driven at half crankshaft speed.
4. Fit a suitable pointer at one of the front timing cover bolt threads, mount the 360° timing wheel on the nose of the crankshaft and, with the crankshaft at T.D.C. on 1 and 2 cylinders, align the T.D.C. timing wheel 0° mark accurately with the pointer.



Right: Figure 45. Showing the pointer set at T.D.C.

5. Insert the push rod for Number 1 inlet valve and slide on the rocker shaft assembly.
6. Turn the crankshaft anti-clockwise until it is roughly 30° before T.D.C. mark, as shown in *Figure 43*, when viewed from the front of the engine. Tighten the rocker assembly nuts.
7. Turning the camshaft clockwise, as viewed from the front, find the full lift position at number 1 inlet valve, then turn the camshaft exactly half a turn. With the push rod set the inlet valve rocker at the valve stem to zero gap while on the heel of the cam lobe.



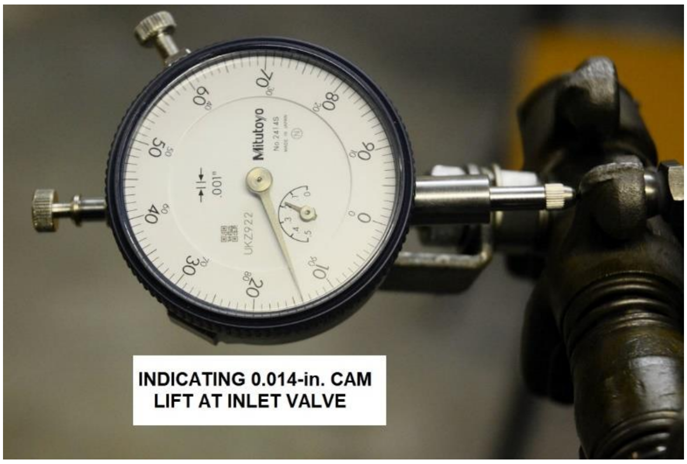
Right: Figure 46. Crankshaft set approximately 30° before T.D.C. at cylinders 1 & 2. Step 3.

8. Mount a dial indicator, which displays 0·001-in. increments, with its plunger directly in line with the push rod centre, to bear on the push rod end of number 1 inlet valve rocker arm. The plunger should be set to have some travel in both directions, to prevent it from bottoming in the indicator body. Rotate the indicator rim so that the indicator needle aligns with zero (0) on the dial. This is the ‘home’ position.

Right: Figure 47. Dial indicator mounted on the bracket at rocker gear pedestal stud.

9. With the aid of a suitable lever between the two chainwheel setscrews, rotate the camshaft clockwise until the dial indicator needle has moved from its pre-set zero position to 0·014-in. reading. In the Jowett Maintenance Manual there is also mention of 0·013-in. tappet movement.***** Hold the camshaft firmly in this position.

   ***** 0·014-in. dimension is shown in *Cylinder Heads and Valves* section, the 0·013-in. is shown in *Camshaft and Timing Gear* section.



Right: Figure 48. During rotation of the camshaft, the cam lobe valve opening ramp has moved the tappet, push rod and rocker arm, from the heel of the cam, 0·014-in. as indicated here.

10. Rotate the crankshaft clockwise until it is at 12° before T.D.C. position. At this point, hold the timing chain onto the crankshaft sprocket, and work the camshaft chainwheel to a position in the upper arc of the chain so that the chainwheel can be pushed over the spigot and dowel on the camshaft.

Right: Figure 49. The crankshaft has been set at 12° before T.D.C.

   For camshaft and chainwheel with Vernier timing adjustment, proceed as at this stage, however, the chainwheel should be rotated inside the chain until a position is found where the floating dowel can be freely pushed into the chainwheel and the camshaft mounting boss, and the bolts can be threaded into the camshaft boss. The small diameter arbour on the dowel prevents it from moving rearwards after installation – the locking plate prevents the dowel from moving forward. The Vernier camshaft timing is thus correctly set – it is accurate.

11. Install the two chainwheel bolts, turn the crankshaft back past 30° before T.D.C., and verify the timing. Once verified, the locking tabs can be bent against the bolt heads.

12. It can be possible to install the crankshaft sprocket the incorrect way round, the reason for this is that by switching over the sprocket, a half tooth change can be achieved. There are usually no timing marks on the chainwheel or sprocket – unless someone has laboured with a centre punch, or other method, to make their own marks – it is best to ignore such markings.

13. A timing wheel can be made from stiff cardboard by marking off the degree points with a school type protractor, with the 90° line being marked as top dead centre, along with the 12° mark inscribed clockwise and the 30° mark inscribed anti-clockwise from the 90° line. The cardboard

should extend well below the 0° line on the protractor for a hole to be cut to the diameter of the ledge on the crankshaft dog (*Item 143*). Use two suitable fibre washers, a steel plain washer and a thin ½-in. BSF nut to secure the cardboard firmly enough so that it can be rotated to align the T.D.C. mark with a pointer attached to the crankcase. The dog should be screwed into the crankshaft nose until the nut/dog/cardboard assembly can be tightened against the crankshaft and the timing cardboard can be rotated with moderate force, but not be able to slip.

NOTE: During the setting of the valve timing, the dial indicator must show the initial movement at the push rod end of the rocker arm, *not* the movement of the valve.

IMPORTANT! It should be noted that there are numerous used early camshaft chainwheels that have no timing marks impressed into them. All introduced timing marks should be treated with immense suspicion and the valve timing should always be carried out as detailed above.

12. Installing The Valve Rocker Assemblies

Once the valve timing has been set, the push rods (*Item 216*) and valve rocker assemblies (*Items 228, 229, 230/1, 232/3, 239*) can be final fitted to the cylinder heads. Loosen the push rod lock nuts (*Item 218*) and screw in the push rod adjusting screws (*Item 217*) to provide suitable clearance as the rocker pedestals (*Item 239*) are tightened in place. This action prevents valves (*Items 219, 221*) reaching the limit of their travel and preventing damage (bending) to the push rods. This is dependent on the position of the camshaft while the rocker pedestals are tightened in place.

Smear a small amount of Nulon L90 assembly paste in the tappet cups. The push rods (*Item 216*) need to be checked for straightness and then be inserted through the cylinder head. The paste in the tappet cup should hold the push rods in position while the rocker shaft assembly is fitted.

The thin fibre washer (*Item 329*) should be fitted on the drilled oil feed stud (*Item 46*), and the rocker shaft assembly offered up on the two studs (*Item 80*), before the rockers lodge with the push rods, a small spot of Nulon L90 should be placed in each rocker arm push rod cup. With the oil feed banjo union (*Item 229*) positioned over the drilled stud, add the second fibre washer and a plain washer prior to threading on the nut. Place the two rocker pedestal washers (*Item 240*) on the studs and tighten the two nuts to hold the rocker gear in place. The nut securing the banjo union has to be tightened with a stout open-end spanner, a socket cannot be used, due to the rocker shaft restricting access. This nut should be tightened to almost the torque applied to the cylinder head nuts. Care needs to be taken with this nut, the thread into the crankcase is shorter than those for the other cylinder head studs.

To adjust the tappets, use a socket and bar at the crankshaft dog (*Item 143*) and turn the crankshaft clockwise until the tappet (*Item 215*) at number 1 exhaust valve has been fully extended then, noting the position of the breaker bar, rotate the crankshaft one complete revolution – this positions the tappet at the heel of the cam lobe (opposite the pointed end of the lobe). The exhaust valve tappet clearance is 0·006-in. between the tip of the valve stem and the face of the rocker arm. Clearance is adjusted by means of the push rod adjusting screw (*Item 217*) and using the following technique:

a) Holding the 0·006-in. feeler gauge between the valve tip and the rocker, unscrew the adjusting screw until the feeler blade is just nipped.
b) With open-end spanners, hold the push rod and screw the lock nut lightly against the rod.
c) Should the blade be too firmly gripped, hold the push rod and screw the adjusting screw into the rod until the feeler gauge blade is a sliding fit with a small amount of drag.
d) Firmly tighten the lock nut against the push rod. Check the clearance again and adjust the setting if necessary.

Continue with the same procedure with number 1 inlet valve, use the 0·002-in. feeler gauge blade. Then continue in the same way with the remaining unadjusted tappets. This procedure may seem to be laborious, however, it is accurate. There is a procedure that describes setting the camshaft in certain positions and setting specific tappet clearances at those positions. It is extremely important that the correct $^{3}/_{16}$-in. Whitworth open end spanners are used. The push rod hexagon, the lock nut and the adjusting screw must be clean and dry. Wash the spanner jaws with Loctite 7471 Activator and wipe them dry with a clean cloth, this will ensure better grip with the spanners during adjustment. Lock nuts with ‘rounded’ hexagon points should not be used.

13. Installing The Rear Timing Cover

The installation of the rear timing cover (*Item 18*) is predisposed to be the most misunderstood component on the Jowett engine. To ensure correct assembly, adopt the following procedure:

a) Bolt in place the front timing cover (*Item 1*), less its gasket (*Item 311*) firmly with two bolts above and below the two dowels. The cover should be hard against the crankcase set (*Item 35*).

b) In the groove provided in the rear cover, where the original felt strip (*Item 327*) locates, clean the area with Loctite 7471 and allow to dry. Use Loctite 406 adhesive to attach a short piece of suitable ‘O’ ring cord. Allow to cure and, with a sharp blade, shave the rubber so that it will be compressed as the cover is bolted onto the the gasket (*Item 313*) located on the crankcase set.

c) Wipe the gasket surfaces and the new gasket (*Item 313*) with Loctite 7471 Activator.

d) Apply a smear of Loctite 515 Master Gasket sealant to the aluminium gasket surfaces.

e) Carefully bend the gasket over the peak of the plinth on the crankcase set.

f) Push the gasket forwards until it contacts the rear face of the front timing cover. Keep it pushed against the front timing cover during the following two steps.

g) Holding the rear timing cover, minus the stud (*Item 4*), tightly against the rear face of the front timing cover, lower it onto the gasket and nip up the two hold down bolts, while holding the rear cover against the front cover.

h) Thread in four of the front timing cover bolts to hold the rear timing cover vertical while the two hold down bolts are tightened home. The upper bolt holes in the front timing cover are of generous clearance to allow the rear cover to be uniformly tightened in position.

i) Allow the sealant to fully cure.

If an aluminium piece of plate and ‘O’ rings are used in place of the gasket (*Item 313*), as described earlier, then Loctite 518 sealant should be used instead of the 515. The oil filter drain setscrew (*Item 19*) should be fitted with a new fibre washer (*Item 334*) to prevent oil leakage. The oil pressure pipe union should be carefully installed, it has a tapered thread, and sealed with Loctite 569 sealant.

14. Front Timing Cover Installation

The front timing cover (*Item 1*) should be removed from the crankcase set and the rear timing cover (*Item 18*) after the gasket’s (*Item 313*) sealant has cured. Check that the gasket is absolutely flush with the front face of the crankcase set.

Install the stud (*Item 4*) in its position at the top of the rear timing cover.

Press a new front crankshaft oil seal (*Item 10*) using care to prevent damage to the oil seal’s rubber coating. The oil seal’s ‘open’ face must be towards the crankcase and the front face of the seal be pressed into the front timing cover so that it is flush with the boss on the cover. The oil filler tube (*Item 7*) and the breather valve (*Item 11*) and the felt washer (*Item 312*) should be installed in the timing cover prior to its fitting. Apply a small bead of Loctite 518 at the tube to timing cover joint.

Clean the front timing cover gasket (*Item 311*) faces at the cover and crankcase with Loctite 7471 Activator and allow to dry. Place a light smear of Loctite 771 anti-galling compound into both dowel (*Item 37*) holes and then apply light smears of Loctite 515 to both sides of the front timing cover gasket. If the rear timing cover gasket is not flush with the front face of the crankcase, apply small beads of Loctite 518 into the cavities. Set the gasket over the dowels and push the the cover into place. Install the bolts, washers and nut and tighten home. The Spare Parts Catalogue lists two of the bolts (*Items 2, 3*) as being longer than the others, by ⅛-in. These bolts are ‘not illustrated’ and the writer has not been aware of the difference in bolt length, nor has any mention been found in the Jowett Maintenance Manual about where the two bolts should be fitted.

After the gasket sealant has fully cured, remove each bolt in turn and apply a smear of Loctite 771 to thread and shank to protect against corrosion.

Apply a smear of Nulon L90 at the crankshaft oil seal lip and push the crankshaft pulley (*Item 145*) onto the crankshaft, making sure the keyway is lined up. The starting dog (*Item 143*) should be tightened against the tab washer (*Item 144*) and tightened to 60 lbs.ft. torque. The tab washer should be folded against one flat of the starter dog.

If a tab washer is not available, use a heavy-duty plain washer and install the starter dog with drops of Loctite 263 on the thread.

15. Installing The Oil Sump

The engine assembly should be rolled carefully with an engine crane onto the back face of the flywheel/clutch housing and anchored to the bench top. This action sets the oil sump (*Item 106*) in a suitable position for ease of fitting.

Right: Figure 50. Engine assembly clamped to bench top for oil sump installation.

The oil sump gasket flange must be flat and any remaining sealant residue cleaned away. Both of the sump gasket (Item 323) faces at crankcase and sump should be treated with Loctite 7471 and allowed to dry. The gasket should be cleaned with the Activator as well. Apply a smear of Loctite 515 Master Gasket to the sump flange and the crank-case flange, ensuring that the sealant surrounds the studs and holes completely.

Right: Figure 51. Support the engine on timber to provide space for the gearbox studs.

Place the sump gasket, the correct way round, over the studs and push the sump home. It can be advantageous to use plain washers and Nyloc nuts on the studs. Apply a spot of Loctite 518 at the studs and at the setscrews that thread into the flange at the front timing cover (*Item 1*). The sealant will prevent engine oil migrating along the threads. Tighten all nuts and setscrews.

IMPORTANT! The four setscrews that thread into the front timing cover flange are relatively short and, at the sides, care needs to be taken to ensure that the screws do not clash with the lowest pair of timing cover bolt (*Item 2*) shanks. These threads, along with the rear timing cover (*Item 18*) hold down bolts, are the most abused threads in the Jowett engine.

The sump drain plug (*Item 107*) and the fibre washer (*Item 333*) should be installed with a $^{9}/_{16}$-in. Whitworth ring spanner – definitely not with an adjustable spanner.

The Jowett engine can be restored to its normal attitude on the cradle. The sump should be filled with good quality oil (Penrite 10 Tenths Running In Oil – 15W-40) to the level indicated on the dipstick (*Item 9*). The engine oil filter should be assembled and, with an oil pressure gauge connected to the union and the sparking plugs not fitted, the engine can be cranked with the starter motor, connected to a fully charged battery, until oil pressure builds up. A check should be made for oil reaching the valve rocker gear. Top up the oil level after filling the oil filter and oil galleries.

16. Supplementary Items

A. Tappet Covers

The sparking plug lead supports (*Item 24*) are available from club spares stock, the original split rivet can be drilled out with a 5 mm drill and and stainless steel button head machine screws, with flat washers above and below the support feet. A plain nut can be used to grip the rubber and a 5 mm Nyloc nut tightened, while holding the screw head, inside the tappet cover (*Items 21, 22*) to hold the assembly in place.

The tappet cover assemblies should have their gasket faces cleaned with Loctite 7471 activator, and at the same time, clean the crankcase and gasket (*Item 314*) prior to applying a smear of Loctite 515 Master Gasket at the cover flange and the crankcase gasket surface. Install the tappet covers and tighten down equally from the centre line outwards. Note that the screw holes in the crankcase, adjacent to the cylinder heads break through into the oil-wet tappet chest, therefore, those machine screws (*Item 25*) should be smeared with Loctite 518 before tightening. A new vent felt (*Item 23*), soaked in engine oil and the excess oil squeezed out, should be fitted into the vent opening.

Most of the original machine screws have suffered abuse at the screwdriver slots. Unbrako socket head cap screws can be obtained, should they be ⅝-in. long, then thick ¼-in. small diameter heavy duty plain washers, that fit easily in the tappet cover valley should be used under the spring washers. Overtightening these cap-screws with an Allen key should be avoided.

Note that the tappet covers are unique to each side of the Javelin engine, the same but differently applies to the Jupiter as well.

B. Petrol Pump/Cover Plate

The petrol pump (or cover plate, Jupiter) gasket (*Item 337*) mounting surfaces should be cleaned with Loctite 7471 Activator and, when dry, smear with Loctite 515 Master Gasket sealant. Lubricate the petrol pump push rod (*not illustrated*) with Nulon L90 assembly paste and insert the rod in the crankcase bore before installing the petrol pump. In some cases, Javelins have been converted to operate with electric petrol pump mounted on the chassis, these engines have a cover plate similar to that fitted to Jupiter engines. Such covers can be made from 6 mm aluminium sheet.

C. Valve Rocker Covers

The valve rocker gear covers (*Item 91*) are sealed with an ‘O’ ring (*Item 322*). The ring can be difficult to keep in its groove during installation. The solution for this concern is to clean the groove and ‘O’ ring with Loctite 7471 Activator, allow to dry and then, at each corner, use Loctite 406 adhesive to fix the ‘O’ ring in place. Do not allow the ring to be stretched or twisted. The adhesive should be given time to cure before fitting the covers.

Ensure that the covers sit well over the upper cylinder head nuts and washers. The grommets fit into the stud holes in the covers and they should be secured with new Nyloc nuts. Should new self locking nuts not be available, smear the stud threads with Loctite 518 sealant, which permits easier removal of the nuts for servicing access.

D. Coolant Transfer Housings

The coolant transfer housings (*Item 60*) must be clean and free of paint at the seats where the ‘O’ rings are located. This also applies to the area on the cylinder heads (*Items 78, 79*) – the ‘O’ rings must be in contact with bare metal as the Nyloc nuts are tightened. When assembled on painted surfaces, coolant is guaranteed to leak, sometimes profusely. The same applies to gaskets that are supplied in lieu of the ‘O’ rings.

E. Carburettors

For carburettor information, refer to Technical Notes – Part XXIV – Zenith Carburettors.

All petrol pipe fittings must have new fibre washers installed. This is a fire safety requirement.

F. Exhaust Manifolds

The exhaust manifolds (*Items 85, 86*) should have the gasket faces cleaned in preparation for fitting the gaskets (*Items 319, 320*), due to age and corrosion, Loctite Muffler Putty (Part No. 476015) can be smeared on both faces of the gaskets. The manifolds are secured with special brass nuts with spring washers, the stud threads should be smeared with Loctite 771 anti-seize compound before the nuts are threaded on and tightened. The Muffler Putty takes 24-hours to cure. The front cross-over exhaust pipe flanges can be attached to the manifolds with 8 mm stainless steel bolts, spring washers and nuts to promote ease of removal at servicing activities. The exhaust flange gaskets (*Item 326*) should also be coated with Loctite Muffler Putty prior to fitting in place. Stripped exhaust pipe threads can be repaired by tapping them to 10 mm and using in-hex stainless steel capscrews.

G. Engine Breather Pipe

The engine breather pipe assembly (*Items 12, 13, 14, 15, 16*) must be fitted with care, the copper pipe should have no kinks and, ideally, be annealed by heating until the copper is red hot and then immediately plunged into cold water. Keep the breather valve (*Item 11*) end of the pipe away from direct heat to prevent the soldered nipple from separating. The pipe can be a bit problematic to fit between the coolant outlet and the distributor mount post on the front timing cover (*Item 1*). Gentle tweaking will achieve a good result. *Figure 1* shows the breather valve approximately 180° away from its normal position. At the crankcase end, the pipe olive can be sealed with Loctite 518, however, the sealant must not affect the thread at the union (*Items 14, 15*) for ease of removal.

The breather pipe, after fitting, should be stress-free and not be in contact with any part of the front timing cover (*Item 1*) or the rear timing cover (*Item 18*) so that chafing cannot occur.

17. Setting The Ignition Timing

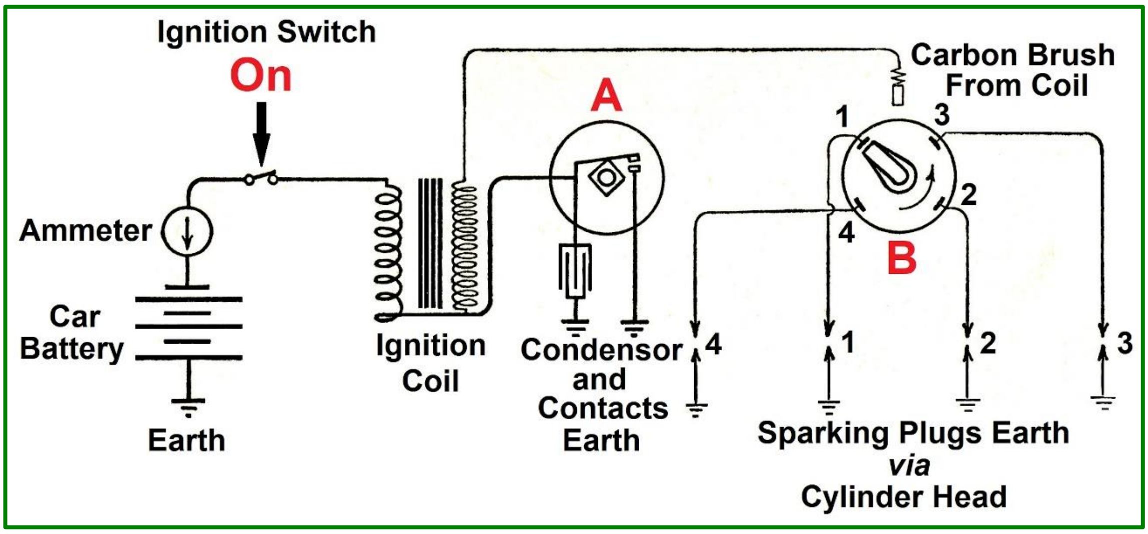
During its production life, the Jowett engine used two types of Lucas distributor – the DKY H4A on the early models and the DM2 after the following engine numbers:

Javelin – Lucas DM2 distributor fitted. E2 PD 21016

Jupiter – Lucas DM2 distributor fitted. E2 SA 717

The DM2 version is easily recognised by its built in micrometer advance/retard adjuster, the earlier DKY H4A having a completely external vacuum advance/retard mechanism. Both types of distributor can be fitted in the same manner, the only difference being the orientation of the securing clamp.

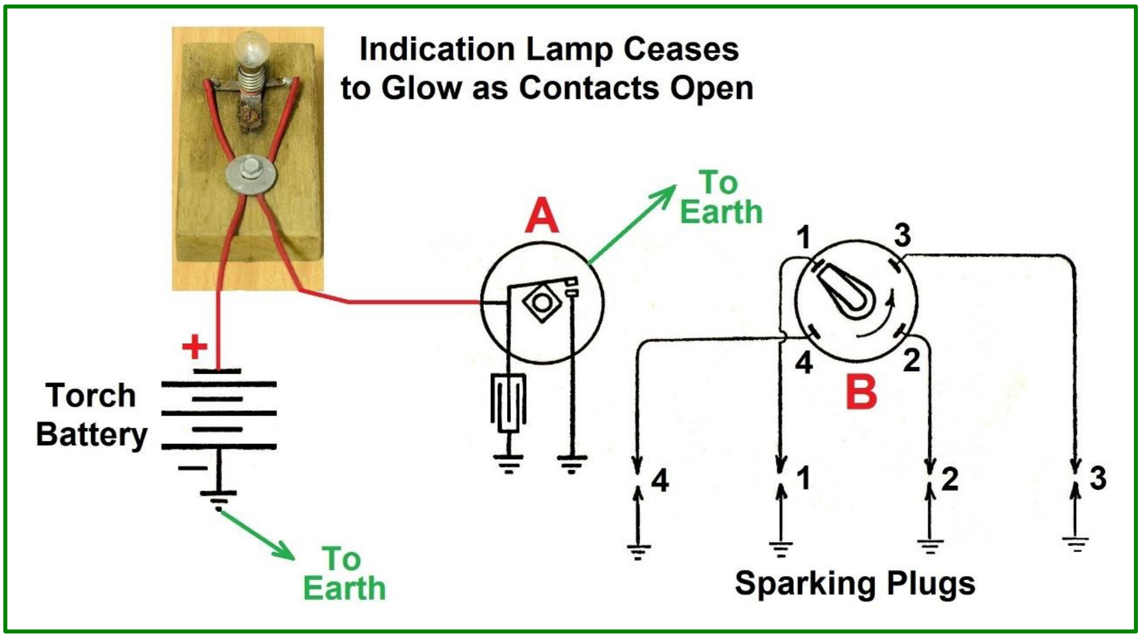
Set the crankshaft at **1 ↓ 2** T.D.C. mark on the flywheel, on the compression stroke, i.e. when both number 1 cylinder push rods (*Item 216*) can be spun freely. Insert the distributor and its drive shaft (*Item 126*) into the front timing cover (*Item 1*) opening. With the distributor cap removed, rotate the rotor arm so that the tongue on the shaft enters the offset slot in the oil pump drive spindle (*Item 163*). The distributor body should be positioned, with the mounting clamp loosened, so that the rotor arm is pointing towards Number 1 plug lead lug in the cap. This is ignition firing at T.D.C. at Number 1 cylinder and the distributor body can be initially clamped at this position. The high tension plug leads should be arranged in the engine's firing order – 1,4,2,3.



Above: Figure 52. Basic diagram of ignition circuit as used with the Jowett engine.

An accurate method of setting the ignition timing is detailed below *Figure 53* on the next page.

NOTE: The Lucas DM2 micrometer advance/retard mechanism should be set at its mid-point in the adjustment range so that convenient fine tuning adjustments can be made during on-road tuning. This initial setting does not apply to the earlier Lucas DKY H4A distributors which need to be clamped in place after on-road tuning has finished.



Above: Figure 53. Simple, but effective distributor set up for initial timing with test lamp.

Referring only to *Figure 53*, a 6-volt torch battery has been attached to a test lamp and continuing (red cables) to the installed distributor that is not connected to the vehicle's wiring harness. Here, '**A**' is the distributor body that is not clamped in its final position, hence the requirement for a cable to a sound earthing point on the engine. The torch battery's **–** terminal (minus terminal) should also be connected to a sound earthing point on the engine or, preferably, to the diecast distributor body. The distributor body must be free to pivot within its clamp mounted on the front timing cover.

With the crankshaft set at **1 🡇 2** T.D.C. mark at the flywheel, on the compression stroke, rotate the distributor body so that the rotor arm points approximately halfway between sparking plug lead lugs 1 and 4, use the '**B**' portion in diagram as a guide. All being well with the insulation at the low tension cable terminal, the indication lamp will glow. Next, gently rotate the distributor body in the clockwise direction, when viewed from above, until the lamp extinguishes completely. This test, of course, relies totally on the contact breaker points being in good condition and correctly adjusted.

At the precise point where the test lamp extinguishes, firmly clamp the distributor in position. The distributor is now correctly timed for initial engine start up. Fine tuning can be carried out on road test, or with the car stationary and having a strobe timing light connected to Number 1 plug lead.

It can be advantageous to add a flexible earth cable from the diecast distributor body (DKY H4A) to a sound connection on the engine. The distributor body can be drilled and a short self-tapping screw used to hold a soldered ring terminal. The body of this model distributor rotates with the action of the vacuum advance/retard system and a good earth continuity may not be present.

Vacuum pipe should be free of sharp kinks and have vacuum-tight union fittings at both ends. If it is required, the copper pipe should be annealed at its middle section. Heat the copper to red hot and, immediately, plunge in cold water.

Distributor Data:

Rotation	Clockwise (When Viewed From The Drive Dog End)		
Contact Breaker Gap	0·010 to 0·012-in.	Sparking Plug Gap	0·020 to 0·025-in.

High Tension Lead Lengths:

Number 1	24-in. (610 mm)	
Number 2	27-in. (690 mm)	
Number 3	29-in. (740 mm)	Modern High Tension Leads Have A Carbon Core.
Number 4	24-in. (610 mm)	
To Ignition Coil	14-in. (355 mm)	
Wire Specification	20 Strands	

CRANKCASE SET NUMBERS

Above: Figures 54 and 55. From a Series III crankcase set, matching production reference numbers, in this case the matching numbers are 26716.

Engine crankcases are in matched sets, this means that both halves of a crankcase set must have the same production reference number. This is not the number stamped into the plinth at the front of the left hand crankcase half. Above the plinth, stamped into the coolant jacket, is another number, example: 26716, as shown in *Figures 54* and *55*.

Matching production reference numbers is a 'must achieve' when selecting a replacement set for a Jowett engine rebuild. In a scenario where the numbers do not match, a mismatch at the main bearing and camshaft bearing tunnels will almost certainly be the result. The two joint dowels may align, but there can be numerous other discrepancies:

(i) The sump mounting flanges may not align.

(ii) The five bolt holes along the top may not align.

(iii) The dowels for the front timing cover and the flywheel/clutch cover may be out of position.

(iv) The crankcase joint may be out of position at the area where the rear timing cover (oil filter housing) is attached.

(v) The crankcase joint faces may be out of position at front and rear faces.

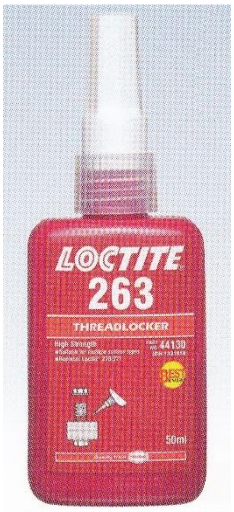
A NOTE ABOUT JOWETT MAINTENANCE MANUALS

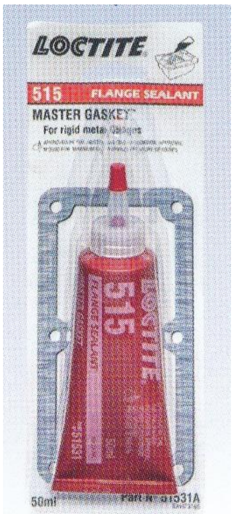
The Maintenance Manuals published by Jowett Cars Limited were, for their time, very comprehensive with clear text, excellent cross-sections, and good quality illustrations. There were two editions, one for PA, PB, PC, and SA models (Javelin/Jupiter) Later came the even more comprehensive version for PD, PE, and SC (Javelin/Jupiter). There was not a separate Maintenance Manual for the Jowett Jupiter – the essential information is the same for both versions of the engine. The later version of the manual, in PDF form, is in Part OO of Jowett Technical Notes Series.

LOCTITE PRODUCTS

Throughout these notes there has been frequent mention of Loctite products. The following is a review of each Loctite type used when assembling a Jowett engine. These products can be seen to be expensive, however, the products' performance and service are of the highest standard.

This is not at all an advertisement for the following products:

Item	Description	Applications	Jowett Usage
	**Loctite 7471** Cleaner/Activator	Cleaning surfaces prior to using Loctite products for all tasks	At all gasketed joint faces and threads that require locking and sealing
	**Loctite 263** Thread Locking – Works by filling the spaces between threads. Provides an assembly that will not loosen under stress and vibration.	Red liquid, high strength, can be used on threads up to 1-in. diameter. Copes with temperatures from minus 55 °C to 180 °C	Connecting rod bolts, flywheel bolts, studs in crankcase, starter dog, stud in rear timing cover, setscrews in flywheel ring gear, early oil filter adaptor anchor bolt.

Item	Description	Applications	Jowett Usage
	**Loctite 680** Component Locking. Extreme strength for loose parts on shafts.	Green liquid fills gaps up to 0·020-in. Will require heat for dismantling. Very high strength. Copes with temperatures from minus 55 °C -150 °C.	Fixing loose starter ring gear. Useful for permanent locking tasks.
	**Loctite 569** Seals threaded fluid fittings – stays flexible. Works by filling the spaces between threads. Provides an assembly that seals but will not loosen under stress and vibration.	Brown liquid, of medium strength, can be used on threads up to ¾-in. diameter. Copes with temperatures from minus 55 °C to 150 °C	Oil pressure union, breather pipe fittings, extended cylinder head stud, oil filter drain fibre washer, advance/retard union on carburettor.
	**Loctite 515** Master Gasket Sealant. Flexes with gaskets as temperature changes	Purple liquid in a tube. Can seal gaps up to 0·008-in. Has excellent oil sealing properties. Excellent sealing against engine coolants, glycol etc. Copes with temperatures from minus 55 °C to 150 °C	All gasketed joints, head gaskets, timing cover, tappet covers, sump and petrol pump.

Item	Description	Applications	Jowett Usage
	**Loctite 518** Master Gasket Sealant for metal to metal joints. Flexes in joint as temperature changes.	Red gel in a tube. Can seal gaps up to 0·020-in. Has excellent oil sealing properties. Good sealing against engine coolants, glycol etc. Copes with temperatures from minus 55 °C to 150 °C Non-dripping gel.	Centre head stud seal. Internal balance pipe. Joint between flywheel housing and crankcase. Joint between gearbox and clutch housing. Joint between rear timing cover and crankcase if aluminium plate is used in place of gasket.
	**Loctite Muffler Putty** Strong adhesion to all metals. Impervious to heat.	High temperature sealant, alkaline paste. Complete cure in 24 hours.	Sealing exhaust manifold and exhaust flange gaskets. Cures quicker with heat.
	**Loctite LB 771** Anti-seize, anti-galling compound with Nickel. Also available in tube form for convenience.	Dark grey paste that comes in a bottle that has a brush inside lid. Prevents corrosion.	Several general uses. Smear on dowels.

Mike Allfrey – 15th April, 2022.