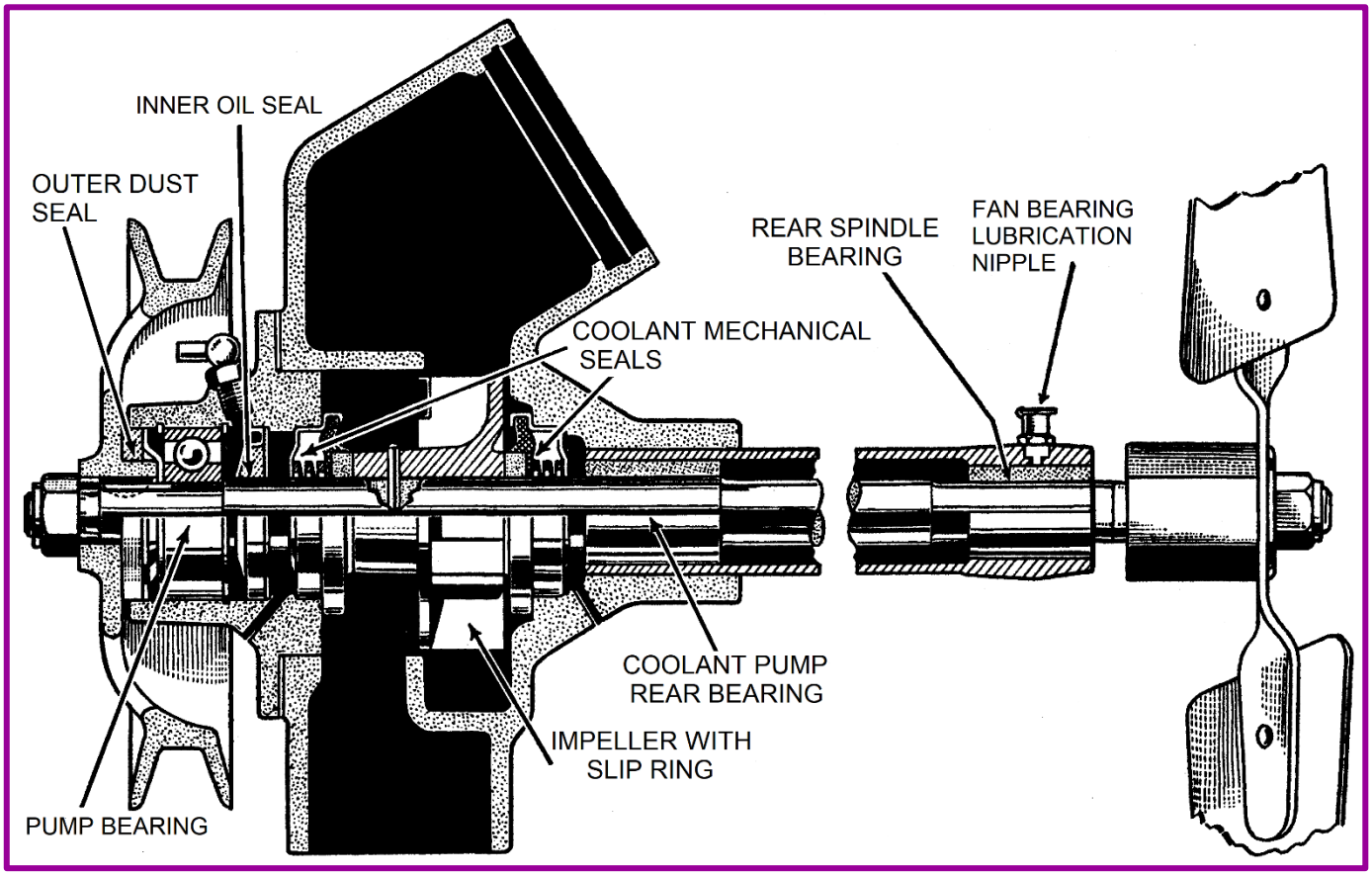
TECHNICAL NOTES SERIES

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



Above: Cross section of the early type of coolant pump (front cover has no upper shroud).

IMPORTANT NOTES: The Jowett coolant pump is of the stand-alone type of pump assembly. It sits above the engine and has no direct connection to the engine. The pump is supported by two hoses and two fan support stays. It features two mechanical seals to keep the engine coolant in its correct place within the cooling system.

These notes have been assembled in a format that, as much as possible, they assist those who have never attempted a Jowett coolant pump overhaul, and for those who cannot realise what the sketches and sectioned drawings relate to. They have been written to cater for younger Jowett club members who may have limited mechanical knowledge.

It should be noted that, throughout these notes, the pump is referred to as a coolant pump.

PART XL – COOLANT PUMP OVERHAUL

Compiled by Mike Allfrey – August, 2021.

CONTENTS

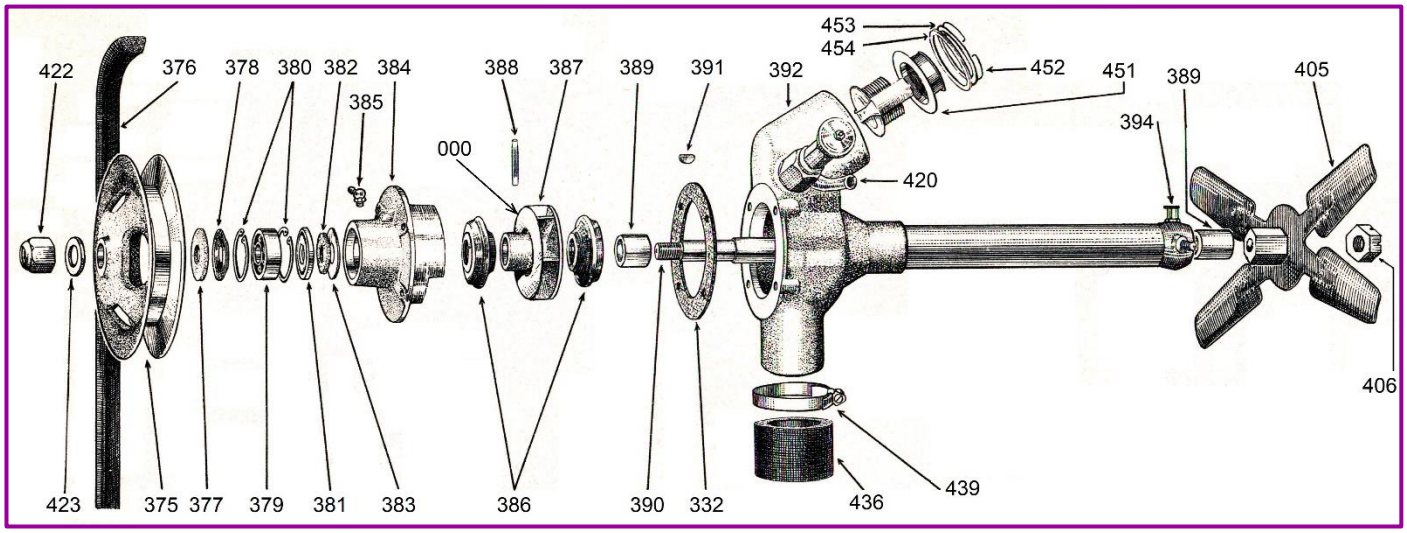
NOTE: Appendices have been provided for ‘out of the ordinary’ coolant pump repair techniques. There was no need for such topics to be included in the main text of these notes.

INTRODUCTION

These notes have been assembled to assist those who are contemplating the overhaul of a Jowett coolant pump, but have limited experience of undertaking such a task. The Jowett coolant pump is somewhat different from a 'normal' automotive coolant pump. It is what is known as a stand-alone type of pump, the reason for this is because it is located where the coolant is on its way to the radiator and the pump itself provides the drive to the cooling fan which is located at the rear of the engine. For this reason, with the drive spindle extending rearwards, there are two mechanical seals within the pump housing assembly. These seals keep the coolant inside the pumping element. The mechanical seals that are currently available require modifications to the front and rear housings.

There is minimal difference between pumps for Javelin and Jupiter models. The Javelin pump has a longer neck for the hose that attaches the pump to the front timing cover. This neck is quite short for the Jupiter version. The extension tube assembly that continues rearward, for the Jupiter is longer than that for the Javelin. It also features a different rear support to hold the fan in place. The Javelin/Jupiter coolant pump went through a number of changes during its production life (refer to Chapter XV, Page 15). The Service Bulletins should be used to establish which improvements may be required if an early version of a pump is the subject of the overhaul that will take place.

CHAPTER I – DESCRIPTION OF THE PARTS



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

Legend for *Figure 1*:

Item	Qty.	Part No.	Description
*332	1	50853	Gasket, Front Cover Housing (Listed in Gasket Set)
*375	1	50594	Coolant Pump Pulley
376	1	50821	Accessory Drive Belt (Fan Belt)
*377	1	50613	Outer Oil Seal (This is the felt seal that keeps dust out of the bearing)
*378	1	50614	Outer Oil Seal Pressing (It holds the felt seal in place)
*379	1	50611	NTN 6301LLU/2AS Pump Bearing (Bearing that fits inside the front cover)
*380	2	50612	Bearing Circlip (These locate the bearing in the front cover)
*381	1	50609	Inner Oil Seal Housing (Can be deleted if a sealed-for-life bearing is used)
*382	1	50608	Inner Oil Seal Felt (Can be deleted if a sealed-for-life bearing is used)
*383	1	50610	Inner Oil seal Washer (Can be deleted if a sealed-for-life bearing is used)
*384	1	52710	Housing Cover (The front cover – with rear shroud)
*384	1	50613	Housing Cover (The front cover – less rear shroud, not to be used)
385	1	54360	Coolant Pump Grease Fitting
*386	2	50602	Mechanical Seal (Avon NB020A)
*387	1	J54414	Impellor Assembly (Must have the slip ring fitted), Item 000 is Slip Ring.

Item	Qty.	Part No.	Description (Continued)
*388	1	50615	Mills Pin (Can be replaced with 5 mm grubscrew)
*389	2	50600	Coolant Pump Rear Bearing (Reservoil, Oilite, Shorlube)
390	1	J54518	Coolant Pump Spindle (Commonly called a shaft)
*391	1	50616	Woodruff Key
392	1	J54505	Coolant Pump Housing Assembly
393	1	52012	Plug, Heater tap (Not illustrated)
*394	2	54011	Oil Cup (1 added to front Reservoil bush)
*405	1	53798	Fan Assembly
406	1	FN406/K	Fan Lock Nut
*422	1	52164	Self Locking Nut (Simmonds or Nyloc)
*423	1	52193	Flat Washer
*436	1	50617	Coolant Pump Hose
*439	2	50618	Hose Clip
*451	1	50768	Thermostat 75 °C
*452	1	4022x3	Circlip (Brass)
*453	1	6228x1	Packing Washer (Brass)
*454	1	6228x2	Rubber Washer

** Denotes Items Common to Jupiter.*

CHAPTER II – NOTES FOR SELECTED COMPONENTS

Item	Component Notes (Refer to Figure 1.)
*375	There were two versions of the drive pulley. The improved version featured an extended nose to provide more support on the spindle, which was lengthened in the area where the pulley and ball bearing are located. The Woodruff key remained the same.
*379	The preferred option is to use a sealed-for-life ball bearing (NTN 6301LLU/2AS). This type of bearing renders the inner oil seal (Items *381, *382, *383) as not being required.
*384	Housing Cover, commonly called the front cover, it houses the ball bearing and the front oil seal. It also provides the seat for the front mechanical seal. Very early front covers did not have the rear upper shroud, rendering the pump as not very efficient. New front covers have been manufactured by the JCCA, easily identified by having just one circlip groove for retaining the ball bearing.
*386	Coolant pump mechanical seal, this component has caused numerous irregularities when pumps have been assembled. The current version, Avon NB020A, stocked by the JCCA parts store does require machining operations at the front cover and the rear housing.
*387	Most impellors have suffered from wear at front and rear faces that contact the carbon ring at the mechanical seal – mostly due to excessive force, due to incorrect mechanical seals being used. Impellors can be modified to accept ceramic boots to greatly improve wear characteristics. The use of a good quality corrosion inhibitor will extend greatly the life of a new impellor. The preferred method for retaining the impellor in position on the spindle, is to use a 5 x 5 mm grubscrew. The brass slip ring can be secured in place with 3 small countersunk screws, or be silver soldered in place.
*388	Mills pin – this item can be deleted when a grubscrew is used to secure the impellor.
*389	Rear bearing, of the Reservoil (Oilite, Shorlube) type, the front bearing features a 0·620-in. bore, there are two sizes for the rear bearing, 0·500-in. and 0·620-in. bore.
390	Coolant pump spindle – for Javelin there were numerous versions. Refer to extra notes.
392	Coolant pump housing – for Javelin there were three versions. The first version employed a 0·500-in. rear fan bearing, the second a 0·620-in. rear bearing and the third featured threaded studs for the support stays. The Jupiter rear housing is longer overall and uses a different method for

	supporting the rear of the extension tube assembly. All extension tubes should be drilled for lubrication purposes, as described in Service Bulletin Item 93.
*405	Fan assembly – it is preferrable to use a St. George's cross version of cooling fan. Such a fan must be mounted on a matching taper at the spindle. A suitable plastic fan with an adaptor can be fitted.
406	Fan securing lock nut. For those fans threaded onto the fan spindle, the nut should be threaded onto the spindle first, set at 0·032-in. (0·82 mm) to the rear of the extension housing and the fan hub tightened securely against the lock nut.
*452	Circlip (brass) – a new circlip can be formed from brass spring wire.
*453	Packing washer – can be cut from brass sheet 0·8 mm thick.
*454	Rubber sealing washer – can be cut from suitable rubber sheet from Clark Rubber in Melbourne. The rubber should be 2-3 mm thick.

CHAPTER III – ADDITIONAL PARTS NOTES

Item *384 The front housing – in order that the current Avon mechanical seals (*Item *386*) can be installed into the Jowett coolant pump, it will be necessary to have the seal seat ledge machined deeper into the housing and to deepen the bore diameter for the mechanical seal spring cup to locate a comparable distance into the housing. The diameters of the seat and the bore for the spring cup remain the same as the originals. At the front housing it is recommended that a sealed-for-life ball bearing be installed. On Pages 10 and 11 are dimensional calculations that can be handed to a machine shop so that the modifications can be made accurately. The benefit of having this job done is that, in future, repairs can be made without any concerns about excessive loadings at the seal carbon rings.

Item *386 The mechanical seals, for too many years the JCCA has been forced to use an incorrect seal specification. The type of mechanical seal used, was a common at the time version, but was too long in its overall length. The original, Jowett specified seal (which is no longer available) was shorter overall and had the same diameter dimensions as the type of seal that has later been in use. The two mechanical seals do look the same at first glance.

Right: Figure 2. Illustration of an Avon Part No. NB020A mechanical seal.

The main problems related to using the incorrect seals are:

a) The spring that exerts pressure at the carbon ring against the impellor face becomes coil-bound when installed in the Jowett coolant pump. The seal was locally known as the 'Holden' seal. Initially, this seal was of the type illustrated in *Figure 2*.

b) With the internal spring coil-bound, excessive pressure was exerted at the carbon ring and accelerated wear at the surfaces of the impellor. The rubber bonded to the carbon ring was forced inside the coil spring. Frequently, the rubber ruptured due to the compression force during assembly. Also, some cushioning was provided by the rubber surrounding the cup for the spring – this was very limited.

c) During the 1970s, the motor industry adopted a new, and cheaper, design for the mechanical seal. The spring contained a thin-walled rubber bladder and metal to metal contact with the aluminium pump housings, particularly not good in corroded areas.

d) Then came the passion for having such seals manufactured in China. Numerous seals of the same specification, did not in any way conform to the dimensions of the original 'Holden' type seal. Common variances were extended free length and seal springs formed using different wire gauges (diameters).

e) The situation came about when mechanical seals were purchased at Repco, it was soon discovered that the metal cups varied slightly in diameter where they fit into the Jowett

housings. In some cases, the springs were fully coil-bound well before the spindle reached the ball bearing in the front cover housing. This was to such an extent that the spring coils cut the rubber bladder, with instant massive leakage.

At the time, these poor quality seals were costing $21·00 each, a cost that had to be borne – there was no guarantee from Repco's supplier.

f) Eventually, an original style of mechanical seal came along from Avon, in the form of their 16B36 version that the JCCA recently stocked. Useful communication with the Avon company has revealed that the correct crush at the carbon ring should be 3·5 to 4 mm maximum. We have also been offered their slightly shorter length NB020A seal. The benefit of this seal is that less machining, to ensure it fits correctly in the Jowett housings, is required. More about this in Chapters IX and X.

Item *387 Those impellors manufactured for and supplied by the JCCA feature a deliberate undersize bore. Refer to Item 390 below.

Item *389 Jowett terminology for these is 'bearing', the common terminology is 'bush'. New Oilite (Reservoil, Shorlube) bushes must be pressed into the extension tube with a mandrel (arbour) that matches the outside diameter of the bush, has a machined spigot (end projection) machined to 0·6200-in. or 0·5000-in. diameter with a finely ground finish, a ¼-in. longer than the bush being pressed in. One mandrel can have the two sizes at one end. The smooth finished mandrel expands the inside diameter of the oil-porous bush material, to the correct inside diameter for a free running spindle.

Item 390 Coolant pump spindle (shaft), there were a number of locally manufactured spindles, with the nominal (steel rod supplier's diameter) tolerance that were of smaller diameter than the originals. The decision was made to purposely bore the JCCA supplied impellor to a diameter that would require finish reaming (to increase the bore diameter) to match the spindle being used for installation in the pump. A note requiring attention to the resizing process was prepared for packing with local manufacture impellors.

Jupiter spindles are visibly longer than those for the Javelin pump. The journal diameters are the same, so the same mandrel can be used to press the fan bearings home. There may be some Jupiter spindles that were manufactured for the Jupiter Owners' Auto Club (UK). These spindles were machined in stainless steel.

Both Javelin and Jupiter spindles can differ in length at the diameter for the ball bearing and the drive pulley. The longer arbour diameter should match the later version of the drive pulley. The drive key slot must hold the key snugly and it is vital that the nut securing the drive pulley be kept tight at all times the pump is in use. Should a new self locking nut not be available, then clean with Loctite 7471 Activator and apply a smear of Loctite 518 Master Gasket at the thread and tighten securely. The flat washer is thicker than a standard washer and has a close tolerance inside diameter and a larger outside diameter.

Spindles that are worn at the journals (the portions of the spindle where the bearings [bushes] run) can be built up, using the metal spraying process and then precision ground to 0·620-in. or 0·500-in. as required. They should be ground to original size, not to worn bearing inside diameter, otherwise there could be assembly problems due to differing sizes.

Important: The last edition of the Jowett Javelin and Jupiter Maintenance Manual states that the spindle diameters for impellor mount and the the two rear bearings (*Item 389*) are located, should be suitable to rotate in the bearings. However, measurement of two spindles at original (unworn) locations revealed that the journal and impellor mounting areas had the dimension 0·622-in. (15·80 mm). The Manual states that the Reservoil (Oilite, Shorlube) bearings require a mandrel with 0·620-in. (15·748 mm) or 0·500-in. (12·70 mm) dependant on which size bearing is installed at the rear of the extension housing. This indicates an interference fit for the spindle. The Manual also states clearly that the bearings (bushes) must not be opened out by machining or reaming. It is possible that when the spindle is pushed, with lubricant, into the bearings for the first time, the bearings yield enough to resize themselves. This determines the requirement for a smoothly ground finish on the spindle bearing running surfaces.

Item 392 Pump housing (Javelin only), during production a modified method for attaching the fan support stays (not illustrated in *Figure 1*) was introduced. The later type featured $^{5}/_{16}$-in. BSF threaded supports that use self-locking nuts. Should the earlier style supports be excessively worn, then the shanks should be cut off, filed smooth and drilled at the original centre line with a 0·267-in. drill size for tapping to $^{5}/_{16}$-in. BSF thread to a depth that does not break through into the fan

bearing. Short-thread length studs (engine mounting bracket type), Part Number 52179, should be threaded into the support housing, secured with Loctite 263. The $^{5}/_{16}$-in. BSF self-locking (Nyloc) nuts to hold the stay rods should be tightened to just hold the stays against the bearing housing, allowing for limited movement.

NOTE: In order that the current Avon mechanical seals can be installed into the Jowett coolant pump, it will be necessary to have the seal seat ledge machined deeper into the housing and to deepen the bore diameter for the mechanical seal spring cup to locate a comparable distance into the housing. The diameters of the seat and the bore for the spring cup remain the same as the originals. On Pages 10 and 11 are dimensional details that can be handed to a machine shop so that the operation can be carried out accurately. The benefit of having this job done, is that in future, repairs can be made without any concerns about the loadings at the carbon rings.

This is probably the way the original mechanical seals should have been.

CHAPTER IV – GOOD HOUSEKEEPING

Safety glasses, steel toe-capped shoes and suitable nitrile gloves should be worn.

Before any assembling of the coolant pump can commence, all parts require cleaning with good quality degreasing fluid and rinsing with clean water. After rinsing, the parts should be dried with high pressure compressed air. Spray steel and cast iron parts with WD40 to prevent rust formation.

All traces of scale residue should be removed from inside the pump housing (*Item 392*), both in the mechanical seal area and the thermostat (*Item 451*) parts of the housing. Scale residue should also be removed from the front cover housing (*Item 384*) and from between the vanes of a used impellor (*Item 387*). This action will ensure that the pump operates efficiently.

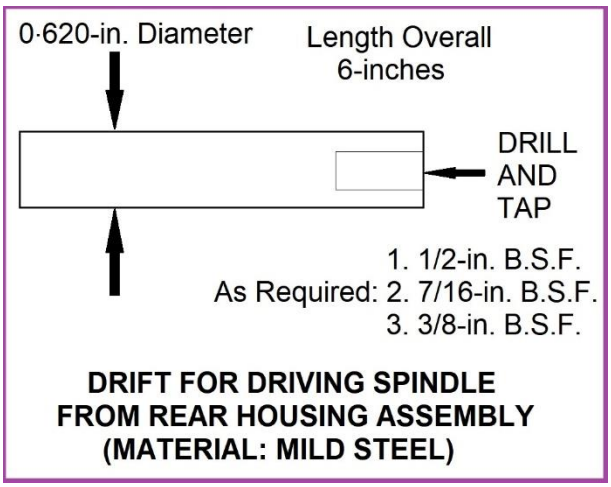
New rear bearings (*Item 389*) should be soaked in clean SAE30 engine oil for two days.

CHAPTER V – DISMANTLING THE COOLANT PUMP

Virtually all Jowett coolant pumps are more than sixty-nine years old and some, undoubtedly, have suffered from neglect over those years. Therefore, when it comes to dismantling a pump for overhaul it is prudent to exercise a degree of care during the dismantling process. A used pump should be dismantled by adopting the following procedure:

1. Make sure there is sufficient work bench space for laying out the parts in the order they are removed, refer to *Figure 1*, which also shows the item numbers so that parts can be identified.
2. The pump assembly should be thoroughly cleaned prior to any parts being removed.
3. With the cooling fan (*Item 405*) still secured, hold it firmly while the drive pulley securing nut (*Item 422*) is unscrewed.
4. Use a suitable three-legged puller to remove the drive pulley (*Item 375*), remove the Woodruff key (*Item391*) and remove the felt seal (*Item 377*) along with its locating plate (*Item 378*).
5. Locate the pulley drive end of the spindle in a soft jawed vice and carefully release the fan (*Item 405*) from the spindle. A cooling fan that is located on a tapered spindle may require the use of a puller.

   Right: Figure 3. Drift for the removal of the spindle and front cover housing, drill to depth and countersink so that the drift butts against spindle shoulder (Step 7).
6. Keep the pulley drive Woodruff key (*Item 391*) in a safe place.



DRIFT FOR DRIVING SPINDLE FROM REAR HOUSING ASSEMBLY (MATERIAL: MILD STEEL)

7. Using a drift punch as shown in *Figure 3*, screw it firmly onto the fan end of the spindle.
8. With great care, unscrew the four front cover housing securing bolts (not illustrated), using a $^{3}/_{16}$-in. Whitworth spanner. The bolts may have been installed without any lubricant and corrosion may have taken place. Note that the bolt holding the pump support bracket is longer than the other three. For information about repairing damaged threads, see Page 13.

9. Locate the extension housing (*Item 392*) in a soft jawed bench vice and gently tap the spindle drift forwards to release the front cover housing (*Item 384*). Should the housing and shaft not move forward easily, the front end of the pump should be immersed in a releasing agent such as Penetrene or diesel fuel for forty-eight hours. The pump body can be heated gently with a propane flame to assist with separation. Do not drive a wedge between the front cover housing (*Item 384*) and the rear housing (*Item 392*) to force apart, cover flange could easily break. Remove the drift from the fan end and withdraw spindle.
10. With the front cover housing (*Item 384*) and spindle assembly removed, the the spindle can be pressed rearwards from the ball bearing (*Item 379*). Depending on how tight the bearing is on the spindle (*Item 390*), it can be pushed through the bearing with a three-legged puller.
11. After the spindle (*Item 390*) has been removed, the front circlip (*Item 380*) can then be eased out of the front cover housing (*Item 384*) and the ball bearing can be drifted from the housing.
12. The Mills pin (*Item 388*) securing the impellor (*Item 387*) can be driven out with a suitable pin punch. The impellor can then be either pressed from the spindle (*Item 390*) or drawn off with a three legged puller, with each leg positioned to grip directly behind three of the vanes. See Appendix II, Page 19.
13. The mechanical seals (*Item 386*) can then be prised from their housings (*Items 384 and 392*).
14. The fan bearings (*Item 389*) can be driven out with a long rod used as a punch. Alternatively, the inside diameter of the bearing can be threaded with a suitable tap and an adaptor made for a slide hammer to withdraw.
15. The circlip (*Item 380*) from behind the bearing (*Item 379*), should be removed along with the inner seal.
16. Finally, the circlip (*Item 452*), the brass packing washer (*Item 453*) and the rubber washer (*Item 454*) should be removed. The thermostat (*Item 451*) can then be carefully prised from its housing.
17. The in-car heater tap (*Item 420*) should be carefully unscrewed from the housing (*Item 392*) taking careful note of the shim washer(s) between the tap and the housing. The quantity of copper washers controls the tap's outlet nozzle position relative to the heater hose.
18. The coolant pump is now completely dismantled.

CHAPTER VI – COMPONENT INSPECTION

Prior to inspection, all parts must be thoroughly cleaned, with all traces of gasket (*Item 332*) having been removed. Clean faces at the front housing (*Item 384*) and the pump housing (*Item 392*) are required for checking dimensions during the installation of new mechanical seals (*Item 386*).

CHAPTER VII – NEW PARTS REQUIRED

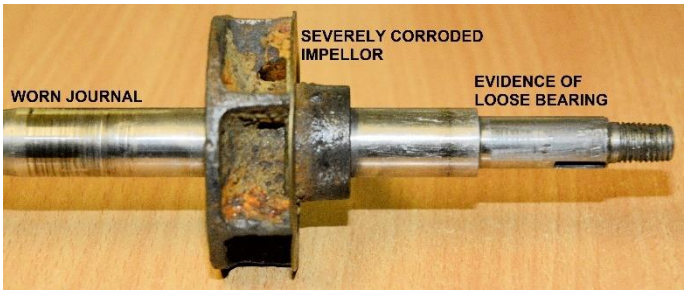
The required new parts for overhauling the pump assembly cannot be placed in a set list. The JCCA can only make a recommendation. See the list below:

1. Pump body and extension tube (*Item 392*) – only second-hand parts may be available.
2. The front housing (*Item 384*) requires careful inspection, particularly at the mechanical seal seat and the ball bearing (*Item 379*) bore. Should the seal seat be severely corroded and the ball bearing be loose in the housing bore, then the housing should be replaced. A slightly loose ball bearing can be secured in the housing with a smear of Loctite 518 Master Gasket gel and be left to cure after new bearing installation. The mechanical seal seat area in the housing will require machining to accommodate the Avon NB020A seal, which should be sufficient to remove traces of corrosion at the seat area.
3. The ball bearing (*Item 379*) should be replaced with a new sealed-for-life bearing (NTN 6301LLU/2AS).
4. A new front felt seal (*Item 375*) should be fitted, it becomes a dust seal.
5. New mechanical seals (*Item 386*), Avon Part Number NB020A, must be installed.
6. The pump spindle (*Item 390*) must be carefully examined. Should the bearing journals show excessive wear and ridges, the spindle can be replaced or metal sprayed and ground to original size. The spindle must not be bent.

Right: Figure 4. An example of a worn journal.

Note that *Figure 4* shows the rear end of a late production run spindle with less steep taper and $^{7}/_{16}$-in. BSF thread for securing the cooling fan.

7. The spindle should also be examined for wear at the front journal and the shank for ball bearing (*Item 379*) and drive pulley (*Item 375*), for abuse and wear. The key slot should also be checked for a loose fitting key (*Item 391*).



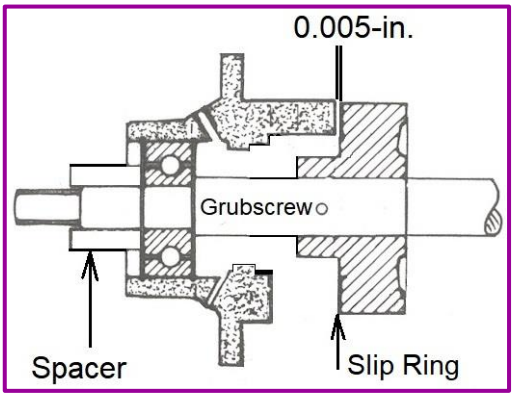
Right: Figure 5. Abnormal wear at bearing journal, wear at ball bearing and drive pulley shank. The impellor is severely corroded.

8. The impellor (*Item 387*) should be checked for looseness on the shaft. If corroded as shown in *Figure 5*, build up of rust and scale can be carefully cleaned up for re-use. The overall length of the impellor should be measured accurately to establish if wear has taken place at the contact surfaces for the mechanical seals (Item 386). The dimension should be 1·216 to 1·233-in. (30·89 to 31·32 mm). See Appendix III on Page 19.
9. The drive pulley (*Item 375*) should be inspected for signs of wear at the accessory drive belt (*Item 376*) 'V' groove, both at the sides of the 'V' and at the inner diameter of the 'V', and also at the keyway in the bore. Be sure to check that the Woodruff key (*Item 391*) has not worn the keyway in its immediate location. Excessive wear here is an indication that the pump has been driven with a loose securing nut (*Item 422*), allowing the key to flog in the aluminium keyway.

CHAPTER VIII – POSITIONING THE IMPELLOR ON SPINDLE

The location of a used or new impellor (*Item 387*) on the spindle (*Item 390*) should be checked and, if out of position, adopt the following procedure:

1. Install the rear circlip (*Item 380*) into the front housing (*Item 384*). Insert the circlip plier into the small diameter grip hole face of the circlip to ensure future ease of circlip removal. See Appendix I, Page 18.
2. Install the sealed-for-life ball bearing (*Item 379*) and insert the second circlip, using the same technique as for the first circlip.
3. Assemble the impellor (*Item 387*) onto the spindle (*Item 390*) to the rear of its normal position. Tap the spindle forwards into the ball bearing (*Item 379*) until the shoulder is is against the inner race. Use a suitable spacer and washer so that a ⅜-in. BSF nut can be used to hold the assembly together tightly. Then, with a 0·005-in. feeler gauge blade held between the front cover housing (*Item 384*), gently tap the impellor forwards until the brass spin ring contacts the feeler gauge, hold the position and install the 5 x 5 mm grubscrew to secure the impellor. Remove the feeler gauge and the spindle should spin freely without rubbing on the upper rear shroud.



Right: Figure 6. Setting the clearance between impellor and rear upper shroud on front cover.

NOTE: The front mechanical seal (*Item 386*) should not be installed during this procedure.

CHAPTER IX – SETTING FRONT MECHANICAL SEAL CRUSH

Correct Mechanical Seal Crush – 0·138 to 0·157-in. (3·5 to 4 mm)

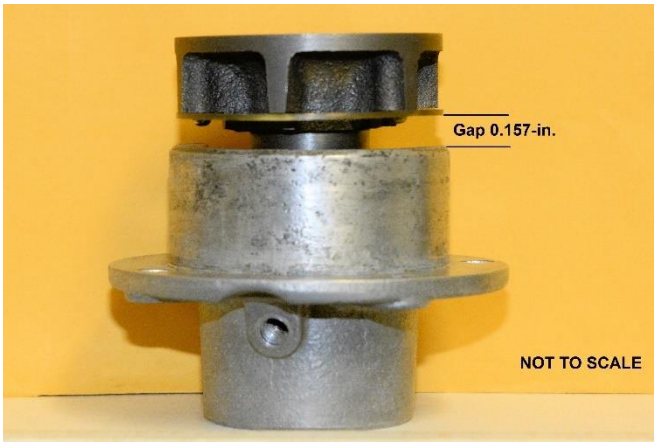
The following determining procedure is, very likely, the best to employ during coolant pump assembly:

a) Prior to any assembly procedure taking place, the correct crush at the mechanical seals (*Item 386*) must be determined.

Right: Figure 7. Illustrating an excessive crush value on the mechanical seal during assembly.

As a basic check, adopt the following procedure:

First, place one new seal into its position in the front cover housing (*Item 384*) and place an impellor (*Item 387*) to rest on the seal's carbon ring, as shown in *Figure 7*.



Right: Figure 8. The dimension that is required to create optimal crush at the mechanical seal.

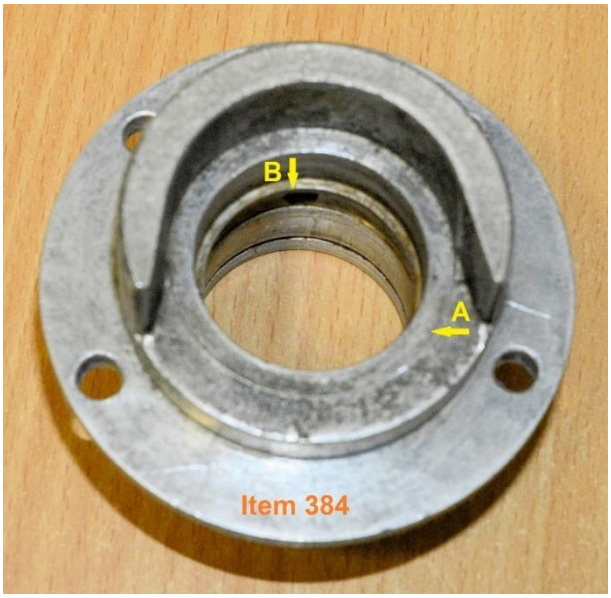
b) Accurately measure the dimension as shown in *Figure 7*. The dimension shown, example 0·326-in. (8·28 mm), represents a vast amount of crush on the mechanical seal during final assembly. The mechanical seal is capable of supporting the weight of the impellor without disturbing the spring noticeably.

Referring to *Figure 8*, the gap can be reduced by machining the seal's ledge in the housing to create a gap of approximately 0·138 to 0·157-in. (3·50 to 4·00 mm).

c) To calculate how much material is required to be removed at the seal seat ledge, subtract dimension 0·157-in. (crush gap) from the first dimension you have taken (*Figure 7*) to determine the amount of metal to be removed.

Therefore in this example: 0·326 minus 0·157 gives a value of 0·169-in. that is required to be machined deeper at '**A**' and '**B**' *Figure 9*, this is a reference calculation, purely shown as an example.

Figure 9 shows at '**A**' the seal ledge that requires machining deeper into the housing by the amount required to achieve the correct amount of crush on the mechanical seal when assembled.



Right: Figure 9. Front cover housing, viewed from rear.

Item '**B**' shows the bore in the housing that should also be continued in depth, by the same amount, to accommodate the mechanical seal's spring cup. On original front cover housings, this bore can break through into the ball bearing cavity. With a sealed-for-life bearing, the breakthrough does not cause any inconvenience. Record the calculation result so that it can be given to a machinist.

IMPORTANT: Do not assume that the rear housing will require the same amount of machining.

Refer to Chapter X for details.

CHAPTER X – SETTING REAR MECHANICAL SEAL CRUSH

Correct Mechanical Seal Crush – 0·138 to 0·157-in. (3·5 to 4·00 mm)

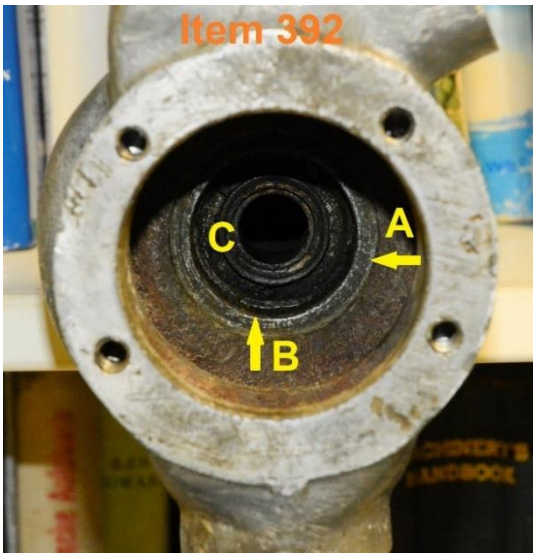
Right: Figure 10. Showing how to check the gap be-tween the rear housing and front cover at the gasket surfaces. The impellor is resting on the Avon NB020A mechanical seal. The illustration is not to scale.

a) The same technique as for the front cover housing (*Item 384*), can be applied to the rear housing (*Item 392*), so that the amount of material to be removed can be established. Assemble the front cover housing, ball bearing, circlips and spindle assembly as shown at *Figure 6*, on Page 9.

A new gasket (*Item 332*) should be placed on the rear pump housing while the dimension for the calculation is measured. The gap between front cover housing (*Item 384*) should be 0·138 to 0·157-in. (3·5 to 4·0 mm) after the rear housing has been machined, with the gasket located on the rear housing surface (e.g. 0·026-in. thick).

Note: All dimensions shown in *Figures 7-8-10* are for reference purposes only – they are not to scale. To repeat, ideal crush should be 0·138 to 0·157-in. (3·5 to 4 mm) maximum, which will provide a reserve of spring movement in the compressed mechanical seal (*Item 386*), which will reduce wear at the impellor (*Item 387*).

Examples of the coolant pump gasket have been found to be 0·026 to 0·029-in. (0·66 to 0·74 mm) thick, for confirmation a new gasket should be measured during the crush setting process.



Right: Figure 11. The rear housing showing portions to be machined.

b) Bear firmly in mind that the bore diameter 1·465-in. (37·2 mm) is deepened by the same amount as established for the seat ledge, to accommodate the mechanical seal's spring cup in its revised position.

c) *Figure 11* illustrates the areas that require machining on the rear housing (*Item 392*). Indicator '**A**' shows the seat ledge, indicator '**B**' shows the bore that needs to be deepened to accommodate the seal's spring cup. Indicator '**C**', *Figure 11*, illustrates the extension tube and bearing (*Item 389*) protruding into the spring cup chamber. The protrusion can be machined flush with the aluminium housing surface, or even slightly deeper.

Record the calculation result so that it can be given to a machinist.

d) Having established the amount required to be machined, both housings should be taken to a machinist with a lathe capable of handling the rear housing (*Item 392*). Adhere strips of masking tape to the two housings identifying front and rear housings, with the amounts to be machined, in writing. It is also pertinent to note that the front cover housing (*Item 384*) and the rear housing (*Item 392*) may require different machining dimensions. In addition, machine shop staff members have, most likely, never seen or been involved with a Jowett coolant pump.

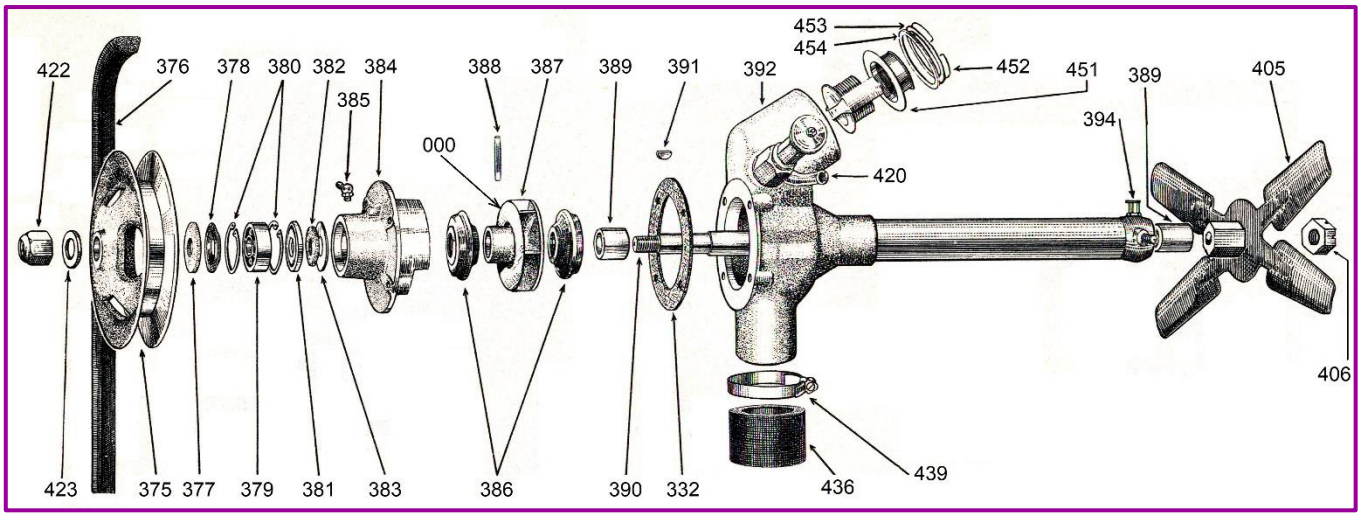
IMPORTANT: The two procedures described guarantee that the current mechanical seal can be installed and thus ensure that the correct amount of seal spring compression is applied.

CHAPTER XI – ASSEMBLING THE COOLANT PUMP

This is the easy part of the overhaul activity – the Jowett Maintenance Manual states:

'Reverse the operations detailed, fitting a new gasket, and new oil and water seals if necessary. Special care should be taken to avoid damage to water seals.' Rather delightful methodology.

However, some of us may require a step by step set of instructions to guide them to correctly put together a completely dismantled coolant pump. With new mechanical seals being installed, there are some added techniques that require detailed explanation, see Pages 10 and 11.



Above: Figure 12. A repeat of Figure 1, showing Item Numbers that are referred to in the text.

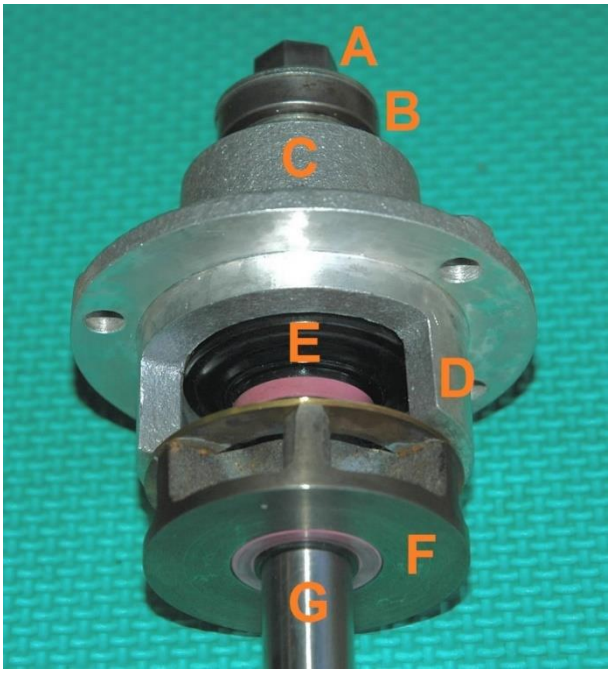
1. The spindle assembly should be drifted from the ball bearing and the Avon NB020A mechanical seal (*Item 386*) can be installed in the front cover housing (*Item 384*), using a small bead of Loctite Blue RTV sealant between the seal and its ledge in the housing. Apply a smear of Vaseline at both contact faces of the impellor for initial lubrication at the carbon rings on the mechanical seals. The spindle assembly can then be reassembled into the ball bearing and secured with a spacer, washers and nut.

   Right: Figure 13. Front cover housing as a sub-assembly, ready for insertion into the rear pump housing.

   The sub-assembly is now ready for inserting into the rear housing (*Item 392*). See *Figure 12*.

   Identification of items listed in *Figure 13*:

   '**A**' Securing Nut. '**B**' Suitable Spacer and a ⅜-in. Flat Washer. '**C**' Front Cover Housing (*Item 384*).
   '**D**' Upper Rear Shroud, viewed from underside.
   '**E**' Avon NB020A Mechanical Seal (*Item 386*). '**F**' Impellor Assembly (*Item 387*). '**G**' Coolant Pump Spindle (*Item 390*).



2. The fan bearings (*Item 389*) require pressing into the extension tube with a suitable mandrel. The spindle (*Item 390*) journals should be smeared with Nulon L90 assembly paste.
3. The rear Avon NB020A mechanical seal (*Item 386*) should be installed into the rear housing (*Item 392*), using the same technique and sealant as for the front seal.
4. The gasket (*Item 332*), and the gasket faces on the two housings require cleaning with Loctite 7471 Activator, and a thin smear of Loctite 515 Master Gasket sealant applied to each face.
5. Apply a smear of Loctite 771 Anti-seize to the threads of the front cover housing securing bolts.
6. Grip the rear housing (*Item 392*) in a soft jaw vice, fit the gasket (*Item 332*) and insert the spindle and front cover assembly into the rear housing with the rear upper shroud uppermost (**D** – *Figure 13*). Install the four front cover bolts and evenly tighten home. Allow time for the sealants to fully cure.

7. Carefully clean and rinse the thermostat (*Item 451*). Place the thermostat in an old saucepan and heat on a stove, keeping watch of a thermometer to check that the thermostat valve is fully open at 75 °C. A non-opening thermostat should be replaced with a new unit. Modern thermo-stats are shorter in overall length and use wax in place of alcohol for expansion to open the valve. A new thermostat should be of the same diameter as the original where it locates in the rear housing (*Item 392*).
8. Install the rubber washer (*Item 454*), the brass packing washer (*Item 453*) and the brass wire circlip (*Item 452*). The thermostat should be held firmly in its housing (*Item 392*).
9. Install the outer oil seal pressing (*Item 378*) to seat against the ball bearing's (*Item 379*) inner race so that clearance is provided at the outer diameter of the bearing.
10. Install the well-greased outer felt seal (*Item 377*). This may need some fiddling to set it inside the front cover housing (*Item 384*). Once in place, the inner diameter can be eased larger with a pin punch to facilitate insertion of the drive pulley (*Item 375*) arbour into the seal. The prime purpose of this seal is to keep dust away from the sealed-for-life bearing (*Item 379*).
11. Insert the Woodruff key (*Item 391*) into its slot in the spindle (*Item 390*).
12. Attach the pump support bracket, Part Number 52220 (Electrical Equipment), at the lower left-hand bolt (as viewed from the driver's seat), which should be a longer bolt.
13. Apply a smear of Loctite 771 Anti-seize to the front arbour of the spindle (*Item 390*) and push the drive pulley fully home over the Woodruff key (*Item 391*) and into the outer oil seal (*Item 377*). Using a piece of stiff wire, insert into the keyway to check that the Woodruff key is still in place. Install the flat washer (*Item 423*) at the front of the pulley. Use a new Nyloc nut (*Item 422*) and tighten in place. The nut should be checked after 500 miles (805 kilometres) have been covered. Should a new Nyloc nut not be available, clean the threads in nut and on spindle with Loctite 7471 Cleaner-activator, allow to dry and apply a smear of Loctite 518 Master Gasket before screwing the nut home. The Loctite 518 will allow easier nut tightening and removal for servicing.
14. Should the cooling fan (*Item 405*) have a threaded hub, first install the fan lock-nut (*Item 406*) so that there is a minimum clearance of 0·031-in. (0·79 mm) between the nut and the rear face of the extension tube (*Item 392*). Holding the lock-nut in this position with a spanner, tighten the cooling fan hub tightly against the nut – the gap must be maintained. In cases where the fan is matched to the spindle with a taper, the male and female surfaces must be clean, bright metal. There must not be any lubricant at the taper joint. Fully tighten the Nyloc nut, and the nut should be checked after 500 miles (805 kilometres) have been covered.
15. When the pump has been installed in the vehicle, apply engine oil at the top of the extension tube assembly. Fill until oil starts to drip from the oil level hole. Wipe away excess oil.

That completes the overhaul of a Jowett Coolant pump.

CHAPTER XII – A NOTE ABOUT THREAD REPAIRS

The threads for the front cover housing (*Item 384*) bolts, in the rear housing (*Item 392*) may have suffered abuse over the years and could be very loose, or even stripped out. Damaged, or stripped threads can be repaired by using a ¼-in. BSF Recoil kit. This kit contains a hand thread tap that matches the Recoil thread inserts in the kit. It is of paramount importance that the stripped out threads are tapped at exact right angles to the gasket surface of the rear housing (*Item 392*). The stripped thread hole is the correct tapping size for the Recoil hand tap. Should only a part of the thread be stripped, then the remaining thread will need to be drilled out for the Recoil tap to properly bottom in the thread hole.

CHAPTER XIII – IMPROVING IMPELLOR LIFE

Introduction

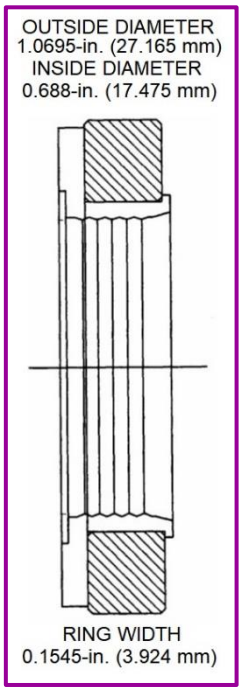
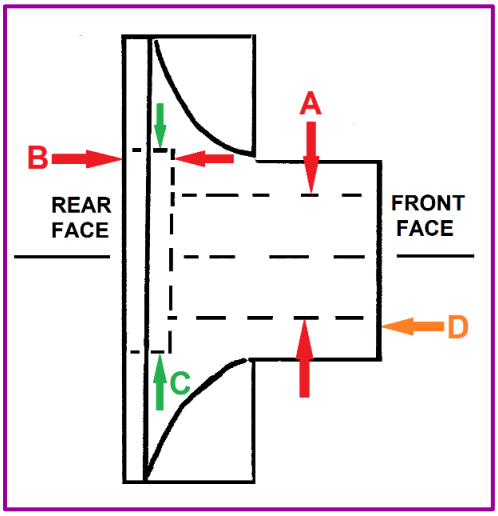


Figure 13 shows two items that are coloured dark pink, they are the ceramic boot assemblies that Avon Mechanical Seals are able to supply. The ceramic rings are mounted on rubber boots that are not bonded to the ceramic rings, but when pushed onto the pump spindle (*Item 390*) form a coolant tight seal against a modified impellor. The ceramic ring has a very smooth running surface that contacts the carbon ring on the NB020A mechanical seal (Item 386), making a very reliable combination.

A useful point about the introduction of ceramic boot assemblies is that a very worn impellor (*Item 387*), at the faces that contact the mechanical seals, can be restored by machining to accept the ceramic boot assemblies. Thus increasing the life of an impellor into the distant future.

Right: Figure 14. A cross section sketch of a ceramic boot assembly. The dimensions shown relate to the ceramic ring alone, it is shown here as the cross-hatched component.

Installing Avon Ceramic Boot Assemblies



The coolant pump impellor (*Item 387*) requires machining at both ends prior to the installation of two ceramic boot assemblies. A recess needs to be machined in the rear face of the impellor and a similar amount needs to be machined from the front end.

Left: Figure 15. Impellor machining.

Referring to *Figure 15* at left, the red arrows identified '**A**' show the spindle bore in the impellor. The red arrows '**B**' show the depth of the recess in the impellor's rear face. The green arrows '**C**' show the diameter of the recess. The orange arrow '**D**' shows where material has to be removed to accommodate a ceramic boot assembly.

The dimensions are as follows:

B 0·1925-in. (4·89 mm), **C** 1·072-in. (27·20 mm).

C tolerance –0·000 to +0·0025-in. (–0·000 mm to +0·064 mm).

D 0·1925-in. (4·89 mm) – material removed from front face.

Overall length of impellor after machining – 0·990-in. (25·15 mm) – Reference.

Note: All dimensions have been rounded up.

It should be noted that the ceramic boot assemblies are of the colours shown below. In all cases, the rubber boot will be black. The Avon Part Number is V16278. The illustrations are not to any scale, they are shown here purely for descriptive purposes.

Above: Figure 16. Dark pink ceramic boot assembly.

Above: Figure 17. White ceramic boot assembly.

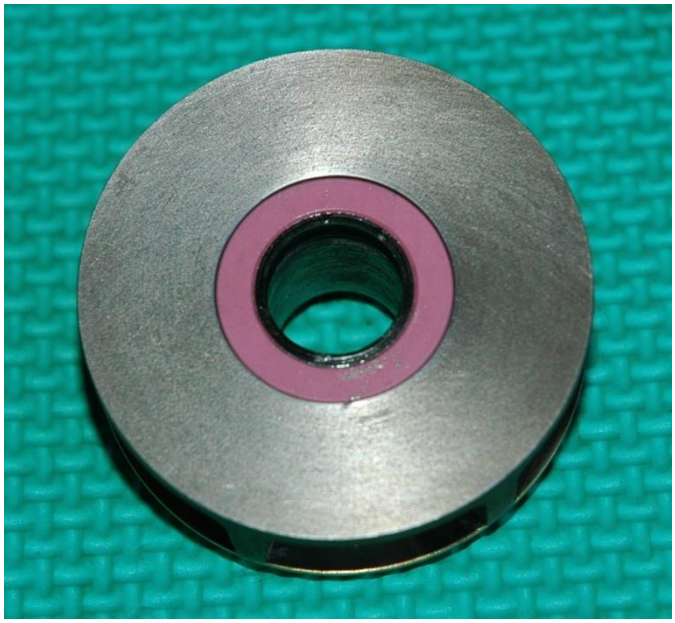
When the spindle (*Item 390*) impellor and ceramic boot assembly are installed the mechanical seals (*Item 386*) will exert sufficient pressure to hold the ceramic boot assemblies against the impellor, thus providing a completely leak proof coolant pump.

NOTE: The ceramic portion is fragile and, therefore should not be forced into an undersize impellor recess.

To install the ceramic boot assemblies onto a spindle (*Item 390*) and impellor (*Item 387*) that have been assembled as at Step '1', Page 12, apply a liquid soap solution at the inside diameter of the rubber boot, and on the spindle at both sides of the impellor. Then apply a light smear of Vaseline to the ceramic faces that contact the carbon ring on the mechanical seals.

Next, slide the first ceramic boot assembly, with the rubber towards the front face of the impellor and push it firmly home. From the rear end of the spindle, slide the ceramic boot assembly onto the spindle and push it home into the recess so that it is flush with the rear face. The ceramic boot assemblies can be a tight fit on the spindle journals, but once in position, they will be held in place by the mechanical seals.

Above: Figure 18. Recess in rear of impellor.



Above: Figure 19. Ceramic boot installed.

CHAPTER XIV – COOLANT MAINTENANCE

The Jowett engine is constructed using dissimilar metals that are in contact with the coolant. Should plain water be used in the system, then, depending on the water's hardness or softness (or chlorine content), corrosion will take place due to electrolysis caused by the different metals it comes into contact with. Such metals are cast iron, aluminium, copper, brass and solder (lead/tin). In addition to electrolysis caused corrosion, plain water can cause items such as the cast iron cylinder liners to suffer cavitation erosion locally where they are seated in the crankcase. Cavitation erosion is caused by minute air/steam bubbles acting on the cylinder liner as it vibrates during the firing cycle. Over long periods of time, such erosion can eat its way into the unprotected cylinder bore. In such cases, replacement cylinder liners will need to be installed. Another situation is where a solder bloom residue can result due to the use of hard water, in the radiator and in time, clogging the radiator core tubes and bottom tank. The use of a good quality corrosion inhibitor will greatly assist in maintaining a clean and efficient cooling system.

Cavitation erosion and solder bloom can be easily prevented by mixing a solution of Tectalloy Gold (actually green) with soft water. Using soft water, Tectalloy Gold has a life of 37,283 miles (60,000 kilometres) and, using distilled water in the mix, the mileage increases to 62,138 miles (100,000 kilometres). These figures are based on daily use. The inhibitor also prevents corrosion due to electrolysis, and cavitation erosion, by forming a protective skin on the surfaces within the cooling system.

Use strictly as directed on the one-litre container.

IMPORTANT! This maintenance procedure is much more relevant than most Australian vehicle owners care to give acceptance for.

CHAPTER XV – COOLANT PUMP SERVICE BULLETINS

NOTE: These Service Bulletin texts are reproduced here, as they were originally written, from April, 1950 to May, 1952. There are references to Spares Notes, such notes are not currently to hand. The bulletins do provide valuable reference to Serial Number break points.

Bulletin Issue Date: April 1950

Item No. 14. Water Pump Housing

From Engine Number E0 PB 8472 an oil cup has been fitted to the rear of the water pump housing extension tube to assist the lubrication of the fan bearing.

Refer to Spares Note Number 28 for parts change information.

Bulletin Issue Date: October 1951

Item No. 65. Water Pump Modification – PC Models

From Engine Number E1 PC 18140, an improved type of water pump and fan assembly, which embodies the following modifications has been introduced:

a) Single pressing fan with a taper fitting to the water pump spindle.

b) A slip ring fitted to the water pump impellor to increase circulated volume.

c) The internal diameter of the rear fan spindle bearing, Part Number 50600, has been increased to give additional bearing surface.

d) Threaded studs on the fan spindle bearing housing for the fitting of the fan support struts with the use of 'Oddie' nuts.

Note: To allow a certain amount of flexibility on the water pump supporting stays, the 'Oddie' nuts must not be tightened fully down.

The following parts on the new assembly are not individually interchangeable with corresponding parts on water pumps prior to Engine Number E1 PC 18140, and stocks of these parts will be maintained by our Spares Department for servicing requirements:

1. Water Pump Housing (Part Number J54505)
2. Water Pump Spindle (Part Number 54331)
3. Rear Fan Spindle Bearing (Part Number 50600)
4. Fan Assembly (Part Number 53058)

The new type of pump, Part Number J54513, complete with fan assembly is fully interchangeable with the previous type as a complete unit.

For parts change information please refer to Spares Note Number 80.

Bulletin Issue Date: March 1952

Item No. 85. Water Pump and Fan – Javelin and Jupiter

Further to Bulletin Item Number 65, from Javelin Engine Number E2 PD 20379 and Jupiter Engine Number E2 SA 575, a non-stick taper has been introduced to the water pump spindle to facilitate the removal of the fan. This modification incorporates a sharper taper at the fan location end of the spindle. The new type of fan and spindle are fully interchangeable as a pair with the types previously fitted, but not as individual items.

For parts information please refer to Spares Note Number 100.

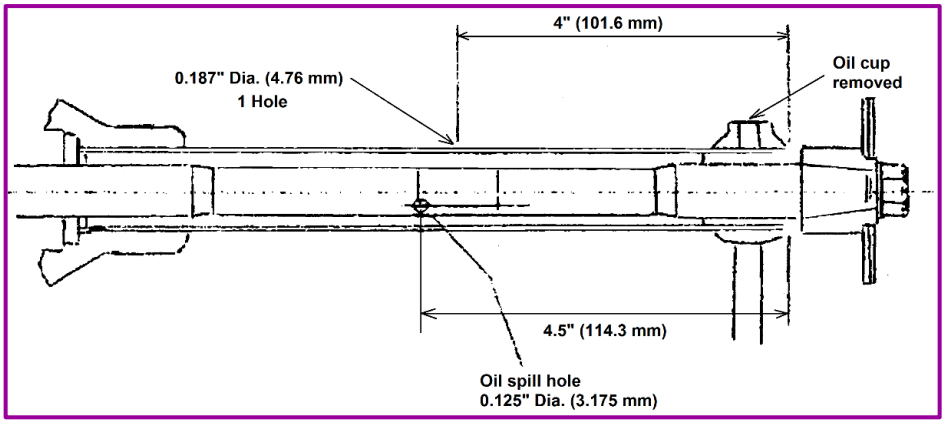
Bulletin Issue Date: May 1952

Item No. 93. Lubrication of Fan Spindle Bearing – Javelin

With the introduction of the radiator mounted oil cooler the fan support tube oil cup, Part Number J54011, was inaccessible and therefore removed.

A $^{3}/_{16}$" (4·7625 mm) diameter hole is now incorporated in the fan support tube for lubrication purposes together with a ⅛-in. (3·175 mm) spill hole to prevent over lubrication.

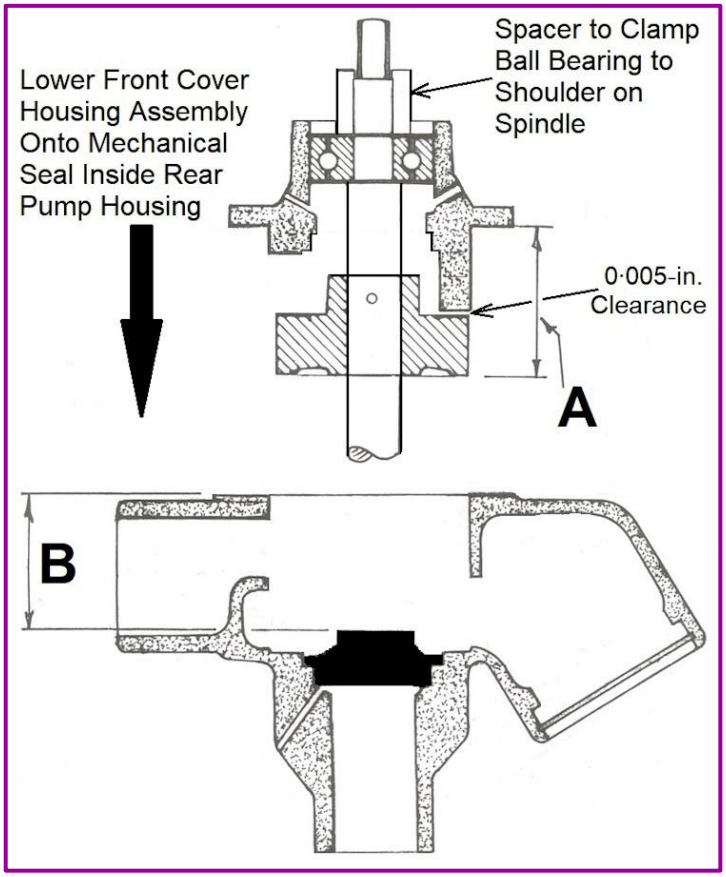
Right: Figure 1. Dimensions for drilling fan support tube.



CHAPTER XVI – REAR MECHANICAL SEAL 'CRUSH' – CALCULATION

Prior to establishing the amount of 'crush' at the rear mechanical seal when the coolant pump is assembled, the overall length of the impellor should be measured. Wear at the front and rear faces can take place due to high mileages or corrosion after lengthy storage.

Right: Figure 20. The front cover assembled, with the pulley securing nut tightened to hold the spacer and flat washer hard against the inner ball bearing race.

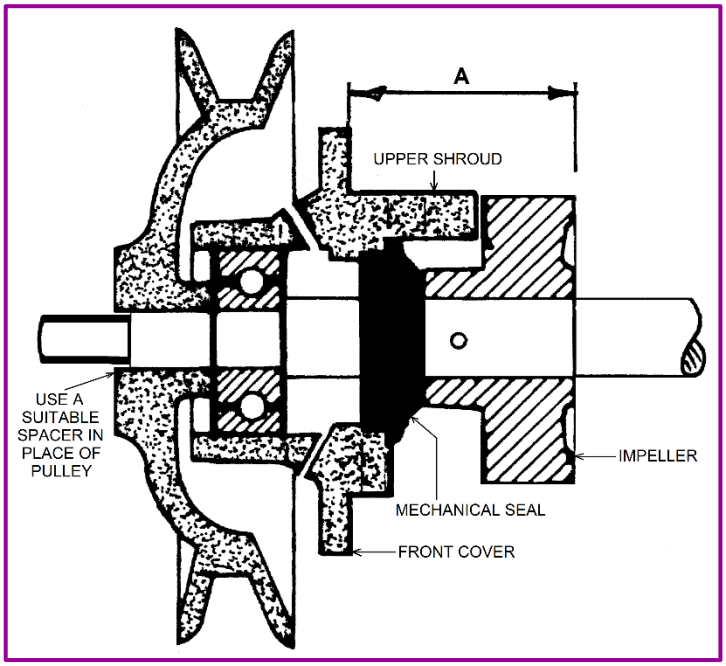


Impellors may have been machined to present 'new' seal surfaces for contact on the carbon seal rings. Wear at the impellor reduces the spring pressure of the mechanical seals, such wear can cause coolant leakage at the drain holes in the front cover and the pump body.

A JCCA supplied impellor measures 1·217-in. to 1·234-in. (30·912 mm to 31·344 mm) in length, measurements were taken from two samples. The slip ring on the front of the impellor should have 0·003 to 0·005-in. (0·072 to 0·127 mm) running clearance between the slip ring and the front cover upper rear shroud.

With the rear mechanical seal installed in the pump body, slide in the assembled front cover (*at top in Figure 20*), spindle, impellor unit and with the gasket (*Item 332*) in place, until the the impellor just contacts the carbon face of the rear mechanical seal. There should be a gap of 0·137 to 0·157-in. (3·5 to 4·00 mm) between the pump rear housing front face and the gasket held against the front cover housing. The gasket has a direct relationship with the 'crush' at the rear seal. Gaskets supplied by JCCA are of the correct thickness.

Right: Figure 21. Identification of front cover components. The ball bearing must be held tight against the shoulder on the spindle.



Note 1: *Figures 20* and *21* were drawn by club member Tony George. The JCCA is grateful for the work in creating the drawings for our use.

Note 2: With the ball bearing (*Item 379*) in position between the two circlips (or against the rear shoulder) in the front cover, the dimension '**A**' (*Figure 20*) should be roughly 1·785-in. (45·34 mm), dependant on front cover housing (*Item 384*), running clearance at the slip ring (*Item 000*) and the impellor (*Item 387*) measurements, as a specimen overall dimension. This is the fundamental dimension for correct placement of the impellor assembly within the coolant pump rear housing (*Item 392*) assembly.

Referring to '**B**' *Figure 20* the following approximate checks of measurements can be carried out.

1. Gasket face of front cover to rear face of impellor = 1·785-in. (45·34 mm) Reference. [1]
2. Thickness of gasket = 0·026-in. (0·66 mm), if in doubt, measure gasket to be used. [2]
3. Thus, projection of impellor into pump body = 1·755-in. (44·58 mm). The calculation result of [1] minus [2] above.
4. With rear mechanical seal fitted into pump housing, the distance from front face of rear pump housing to carbon face of uncompressed seal = 1·616-in. (41·05 mm), shown at '**B**' *Figure 20* (Page 17).

Therefore, seal crush will be 1·755-in. (44·58 mm) minus 1·616-in. (41·06 mm) which represents 0·138-in. (3·5 mm) crush against the rear mechanical seal's carbon face after installation. A tolerance of 0·020-in. (0·5 mm) is permissible.

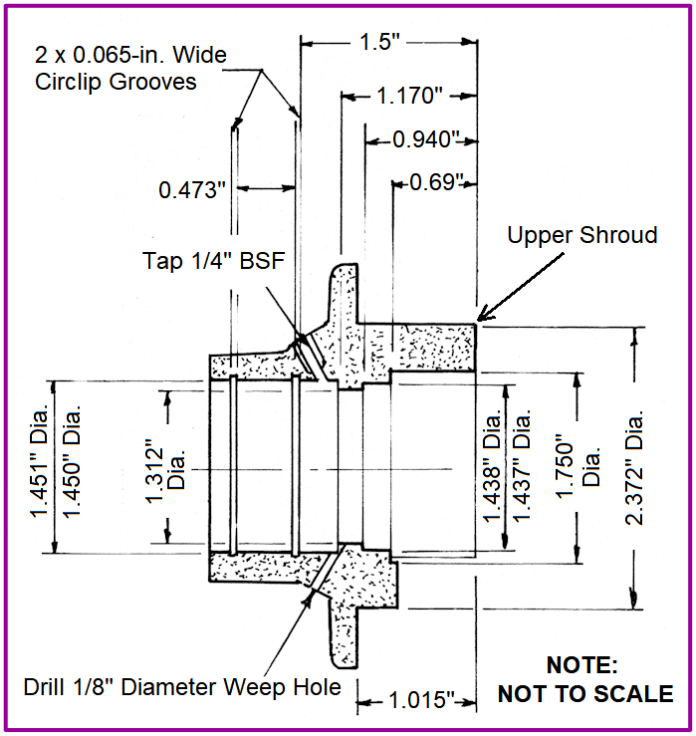
IMPORTANT NOTE: Due to variances in components, all dimensions are approximate – with the exception of the recommended crush at both of the mechanical seals

Note: The front mechanical seal has been crushed during the assembly of the front cover. Care should be taken to ensure that the impellor is positioned on the spindle to provide recommended running clearance to the front cover housing's (*Item 384*) upper rear shroud. This will require precise locating of the impellor (refer to Page 9).

Coolant Pump Front Cover Dimensions

For reference purposes a cross-section sketch of the later coolant pump front cover is shown in *Figure 22*. This shows the two circlip grooves, Australian manufactured front covers have a shoulder for the bearing, Part No. 52710-SB, which is a sealed-for-life bearing.

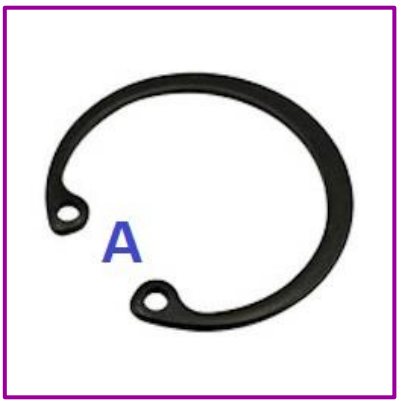
Right: Figure 22. Cross section sketch of front cover housing for Jowett coolant pump.



APPENDIX I – INTERNAL CIRCLIPS

1. A circlip (*Item 380*) is a simple clip that is made from spring tensioned steel (or grade 304 stainless steel). A pair are used in the Jowett coolant pump to locate the front bearing in its correct position. The circlips seat in a pair of machined grooves positioned in the bearing bore at the front of the front cover housing (*Item 384*). The circlip is 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 bearing bore.

   Right: Figure 23. 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 bearing 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.

APPENDIX II – IMPELLOR REMOVAL

To remove a stubborn severely corroded impellor (*Item 387*) from the spindle (*Item 390*), and should a new or second-hand impellor be readily available, the following method for removal can be adopted.

After the locating Mills pin has been punched out, secure the spindle assembly in a soft jawed bench vice, firmly clamped at the waisted area between the two bearing bush journals. The impellor should be positioned so that one vane points downwards. With a hacksaw, saw through the impellor diagonally between the upper vanes and continue the cut to within ⅛-in. (3 mm) of the spindle. Then, with a sharp cold chisel and a hammer, apply a sharp blow into the hacksaw cut to spread the impellor by breaking the remaining uncut material.

Care needs to be taken to ensure that the spindle is not damaged by the chisel. Once the cast iron is broken, the impellor should come off the spindle without resistance.

NOTE: This is a last resort method of removal.

APPENDIX III – DRESSING IMPELLOR SEAL CONTACT FACES

Should the impellor (*Item 387*) be in a sound condition and the brass slip ring clearance at the front cover housing (*Item 384*) rear shroud be correct, the front and rear faces of the impellor can be lathe-dressed to a smooth surface by careful machining in situ on the spindle (*Item 390*). The overall length can be reduced by up to 0·010-in. (0·254 mm) maximum at each end of the impellor. There should be enough crush at the mechanical seals (*Item 386*) to continue to make an effective coolant seal. It is important that equal amounts are dressed from each end of the impellor.

APPENDIX IV – FOR REFERENCE

Right: Figure 24. Print this page and use as an identification guide while overhaul work at the bench is in progress.