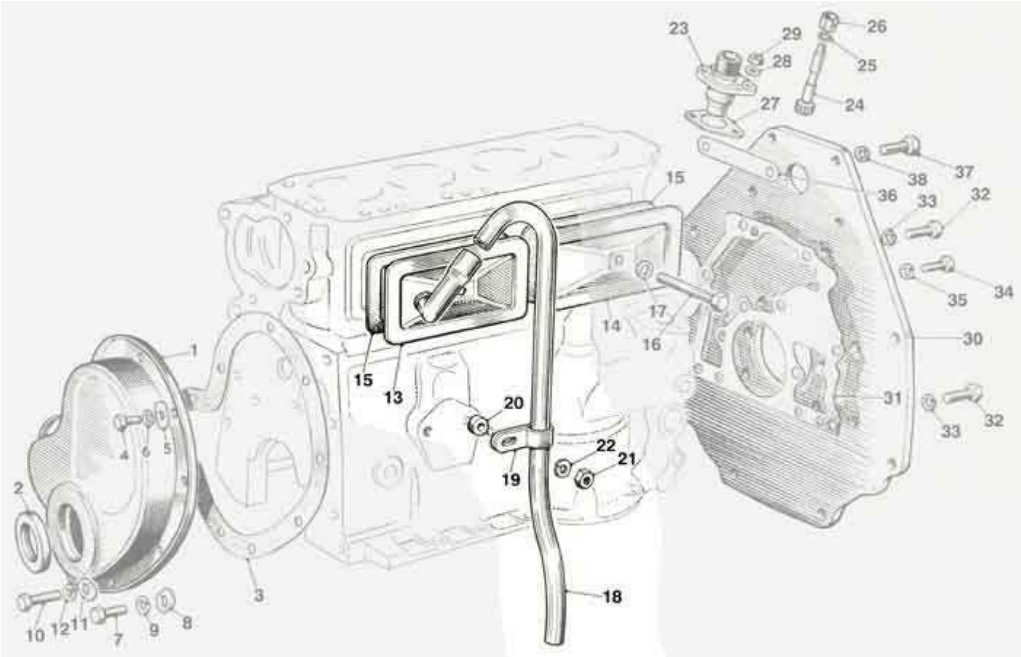
Crankcase Breathing

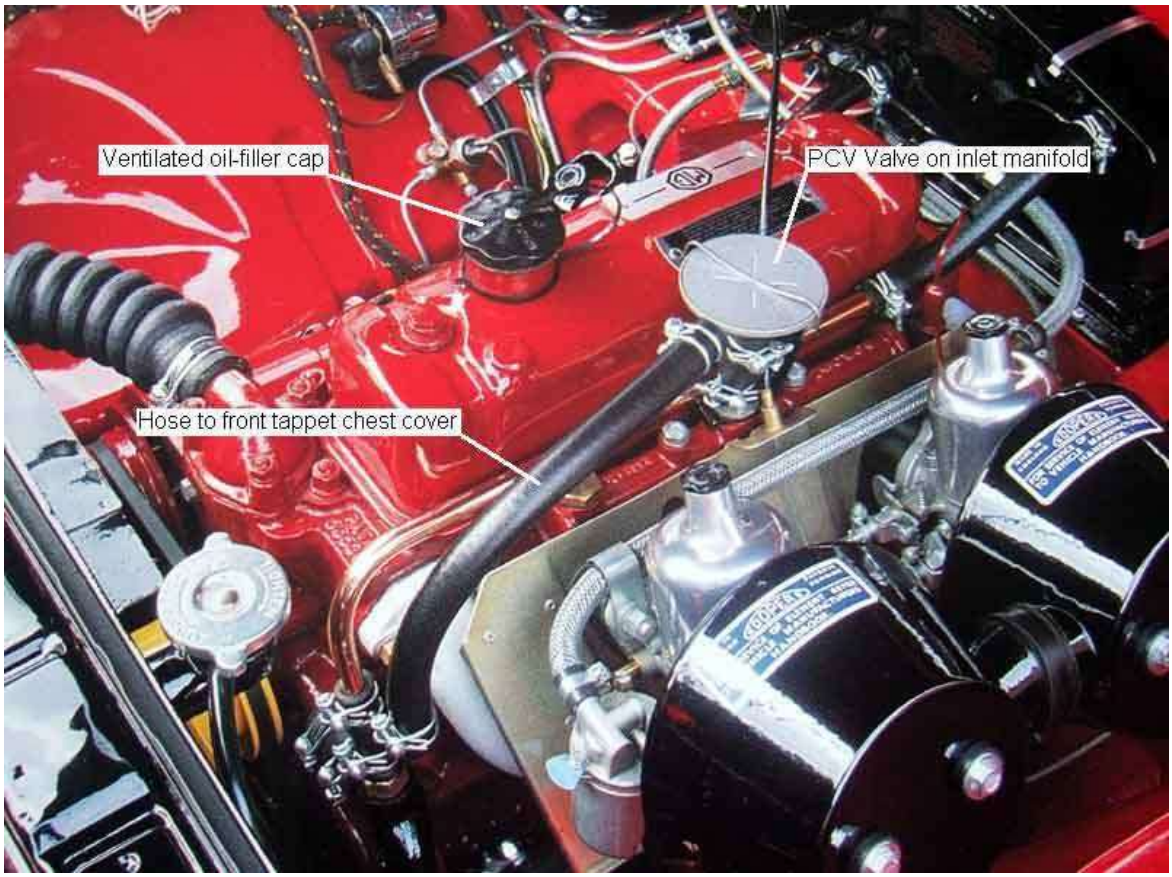
See also Engine Side Covers.

Non-positive system used until February 1964. This uses a hose from the rocker cover to the front air-cleaner (outside the filter) and a non-ventilated oil filler cap: (*Clausager Original MGB*)

There is also a hose on the front tappet chest cover clipped to a stud or blanking-plate screw where the mechanical fuel pump is on other models, just hanging down with an open end: (*Auto-Part.com*)

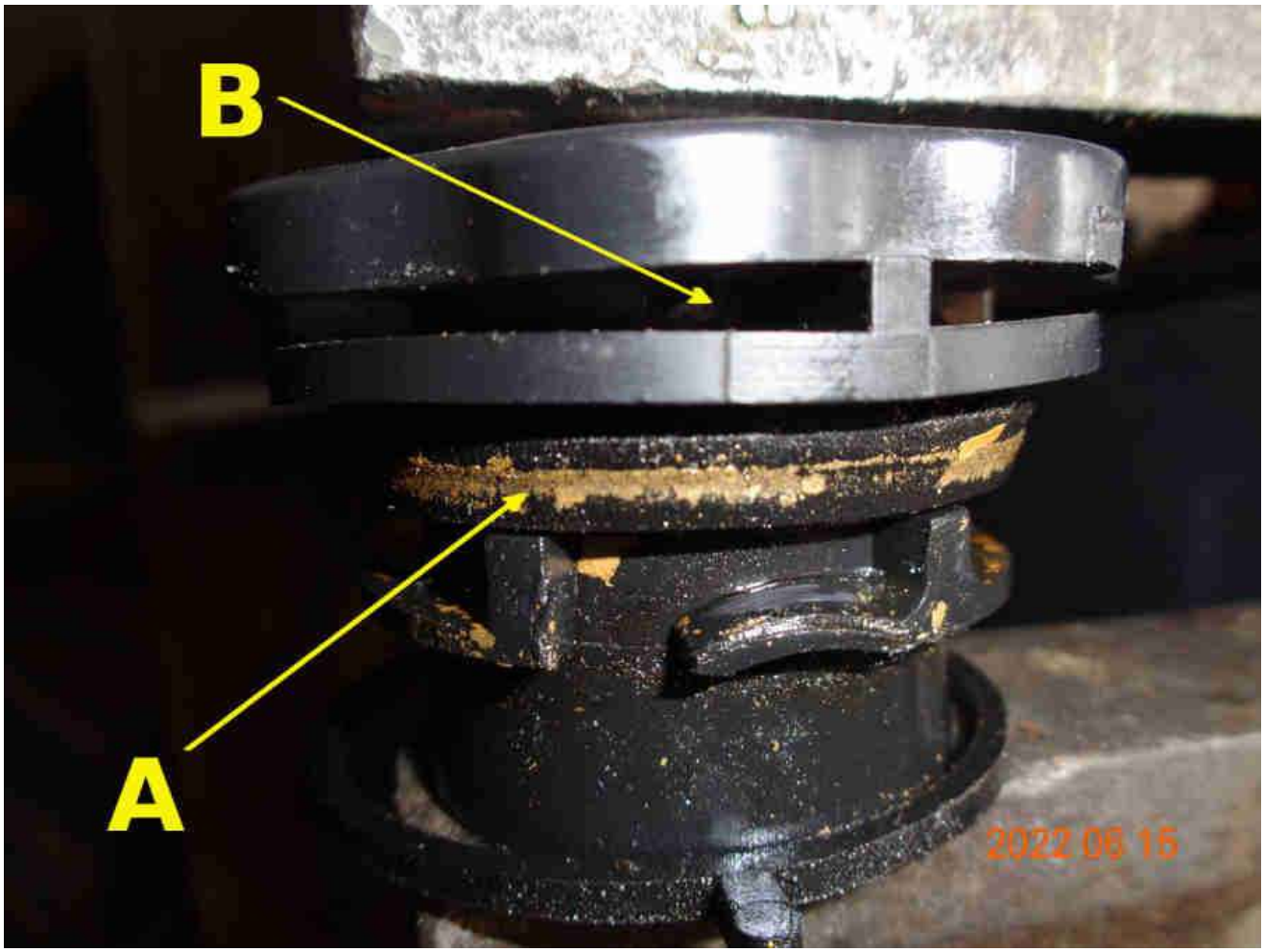


In February 1964 a positive ventilation system was implemented. Until October 1968 it consisted of a PCV valve (13H5191) mounted on the inlet manifold, plumbed to a port on the front tappet chest cover. The oil filler cap is now ventilated with a restriction and a filter: (*Clausager Original MGB*)

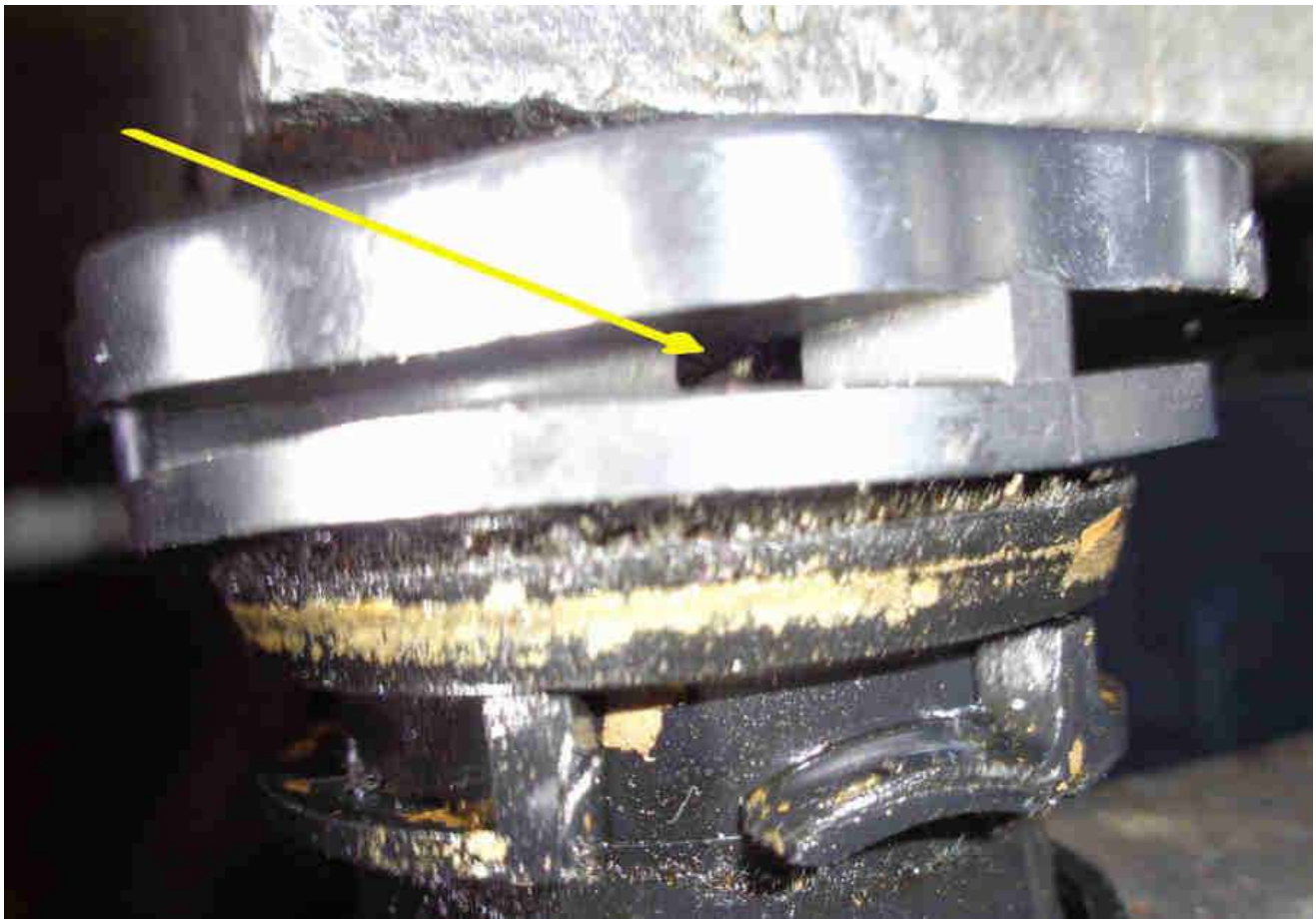


Ventilated oil filler cap, with filter gauze visible through the hole at the bottom. Non-ventilated caps are hollow inside and should not be used on engines with positive crankcase ventilation:

'A' is the rubber seal to the filler neck, 'B' is one of two air inlet holes:

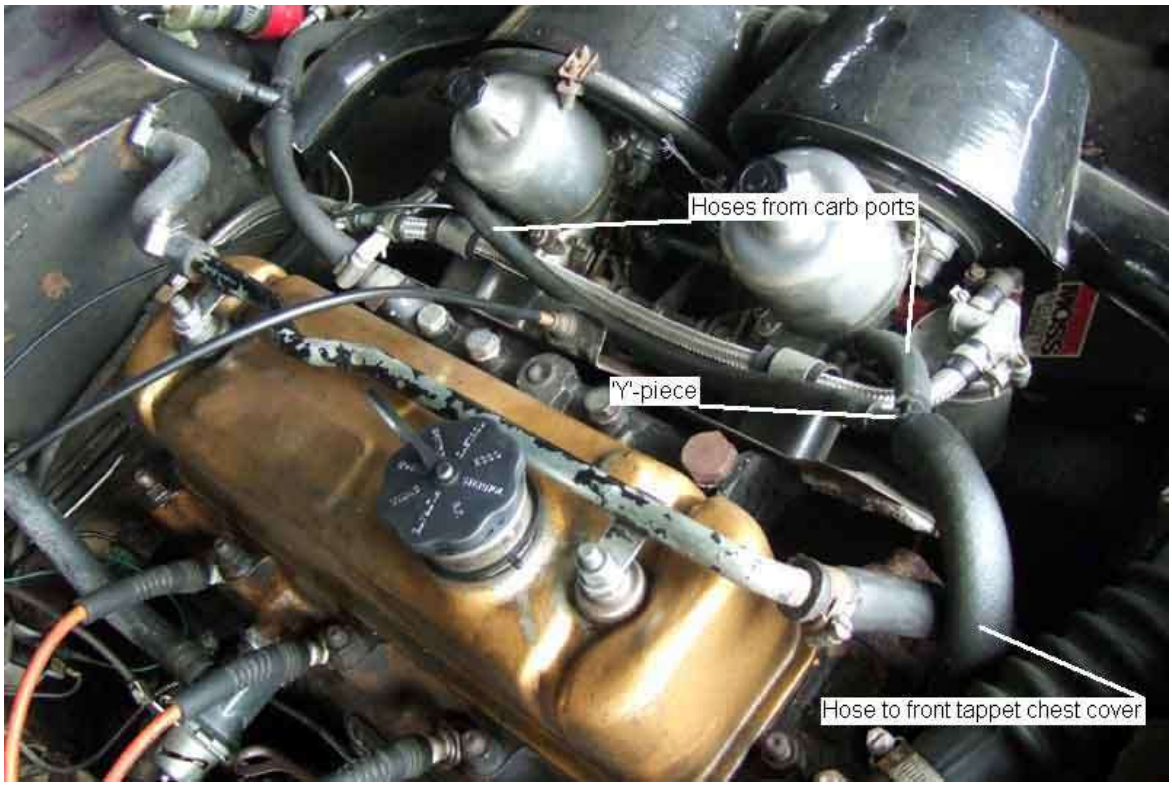


One of the two air inlet holes, just above where the cap locks onto the pins in the filler neck. With a light shining straight down onto the hole you can see the filter mesh:



Cover 12H1399 (above) with internal filtering and oil separation, used with the PCV valve: (*Chris Howells*)

In October 1968 the PCV valve was replaced by carb ventilation, with ports on both carbs connected together and taken down to the front tappet chest cover. The oil filler cap is ventilated as before. This system was used on UK cars until the end of production:

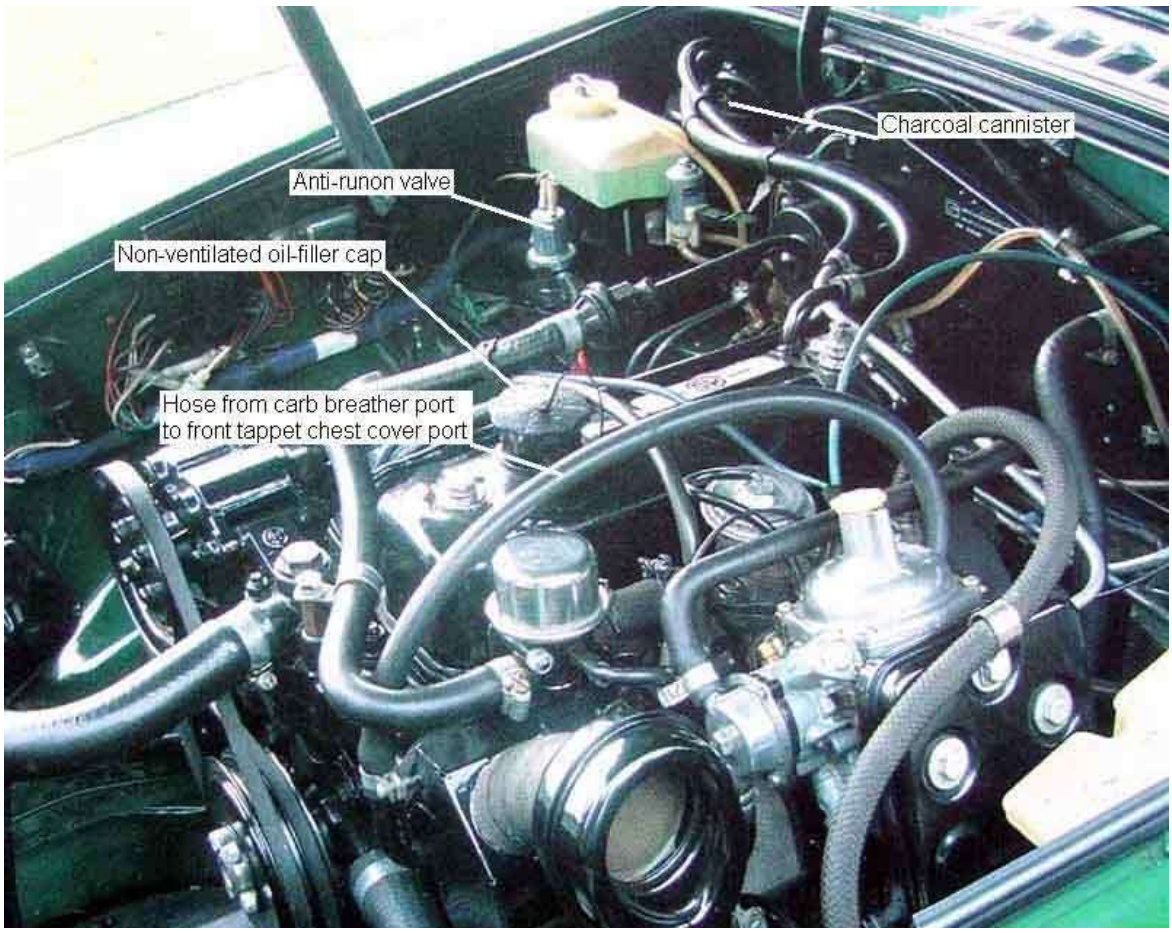


Cover with external filter and separator 12H3684 used with carburettor ventilation until the 18V779/780 engines during the 74 model year. However the Parts Catalogue states that rebuilt engines used the cover below, as is the case on Bee's Gold Seal engine: (*William Revit in Tasmania via the MG Enthusiasts forum.*)

Cover 12H4395 (below) again with internal filtering and oil separation, used with original 18V797 and later engines, and for all

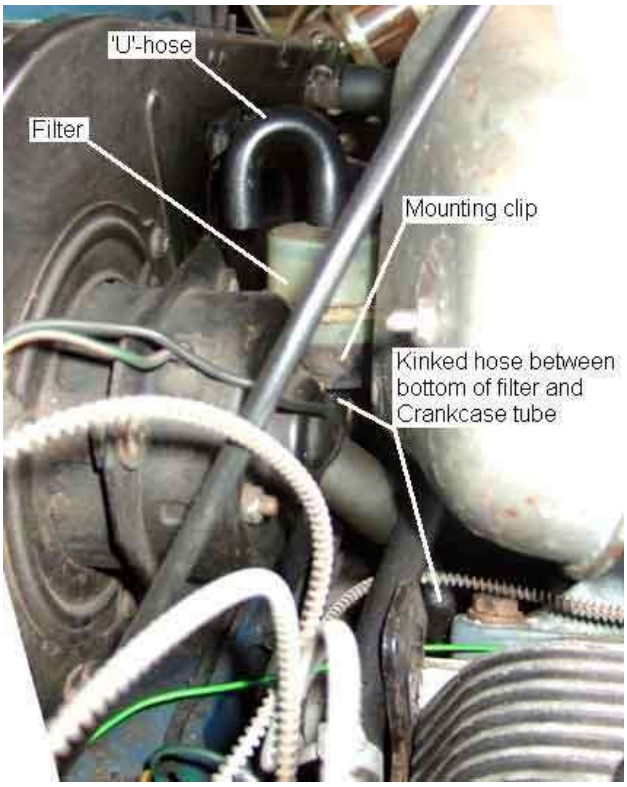
rebuilt 18GG and later engines: (*Chris Howells*)

North American spec from October 1969 with the charcoal canister. Originally with twin SUs connected to the front tappet chest cover as before, but with a non-vented oil-filler cap. This version shows the later single Zenith/Stromberg carb and anti-runon valve: (*Clausager Original MGB*)

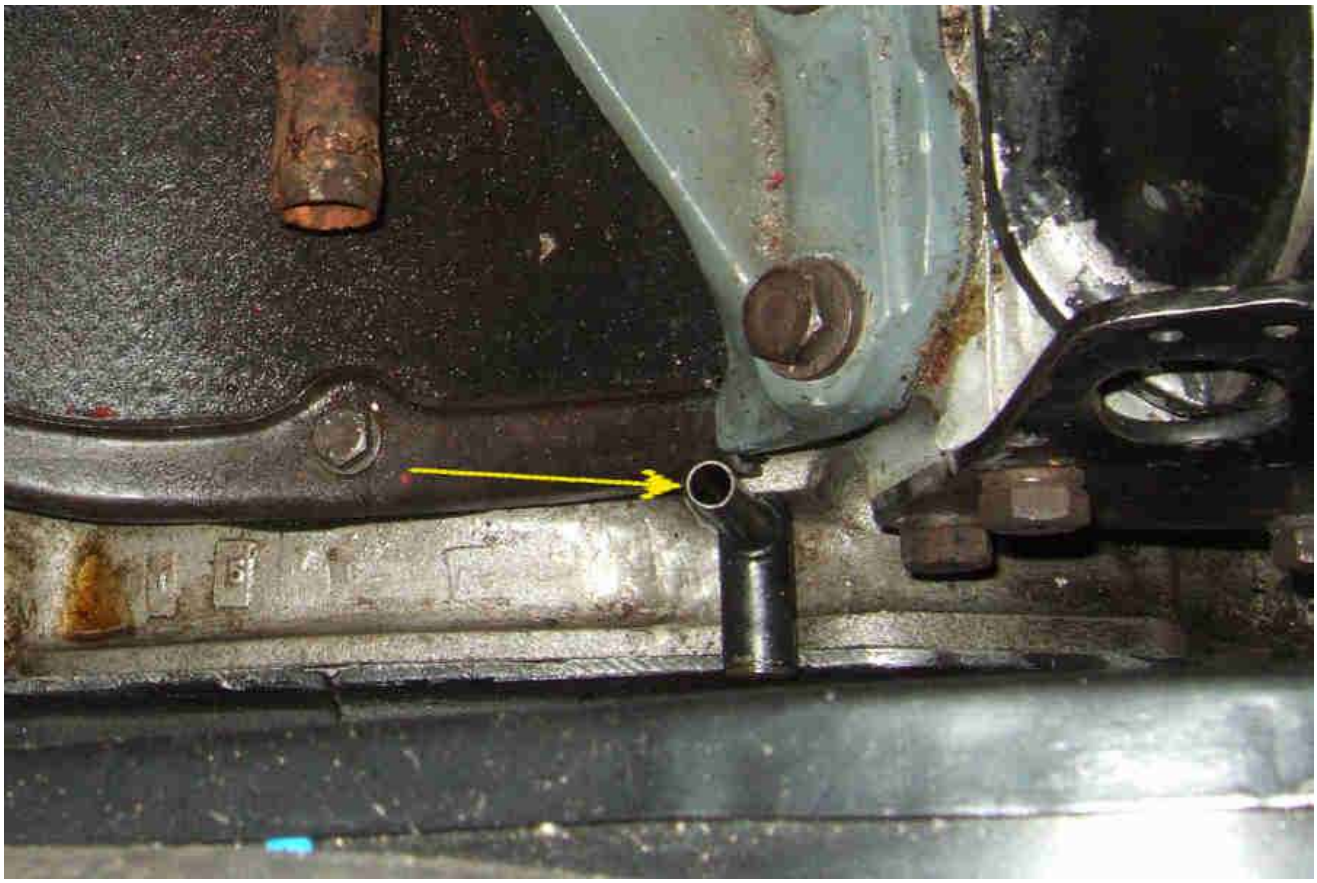


V8 with individual hoses and oil/flame traps from carbs to rocker covers:

Rear of the V8 air-cleaner box showing the breather intake filter with mounting clip and hoses, the oil filler cap in unventilated:



Clutter out of the way, the vent is a horizontal tube with a closed outer end pushed into the back of the block with a vertical tube pointing up to take the short hose to the filter:



Cylinder Block

Hole in the wall (No.1 cylinder) ...

... clearly visible with a light shone down the water jacket:

No.2 piston completely clean ...

... and covered in nicks, probably from the piece broken off the exhaust valve 10k ago:

Engine Numbers

Gold Seal Marina Engines

Gold Seal: Bee's 48G733 with 'E' suffix:

Another 48G733 this time with 'ET' suffix, and adjacent to the serial number instead of the engine type, the indented letters are said to be the engine builder's initials:

Nigel Brown's, very similar type and age but with an 'ER' suffix, same engine builders initials, but definitely flat core plugs. Something else of note is the very similar surface coating on this and the one above (more evident on the originals I cropped down to these), unlike the gold paint on mine:

However looking at the one above there does seem to be space to put flat type over the top of cup type! With mine (top picture) the outer edges of the cup-type are virtually flush with the face of the block, so no room there.

Marina Engines: Mark Holgate's 68 GT with an 18V engine:

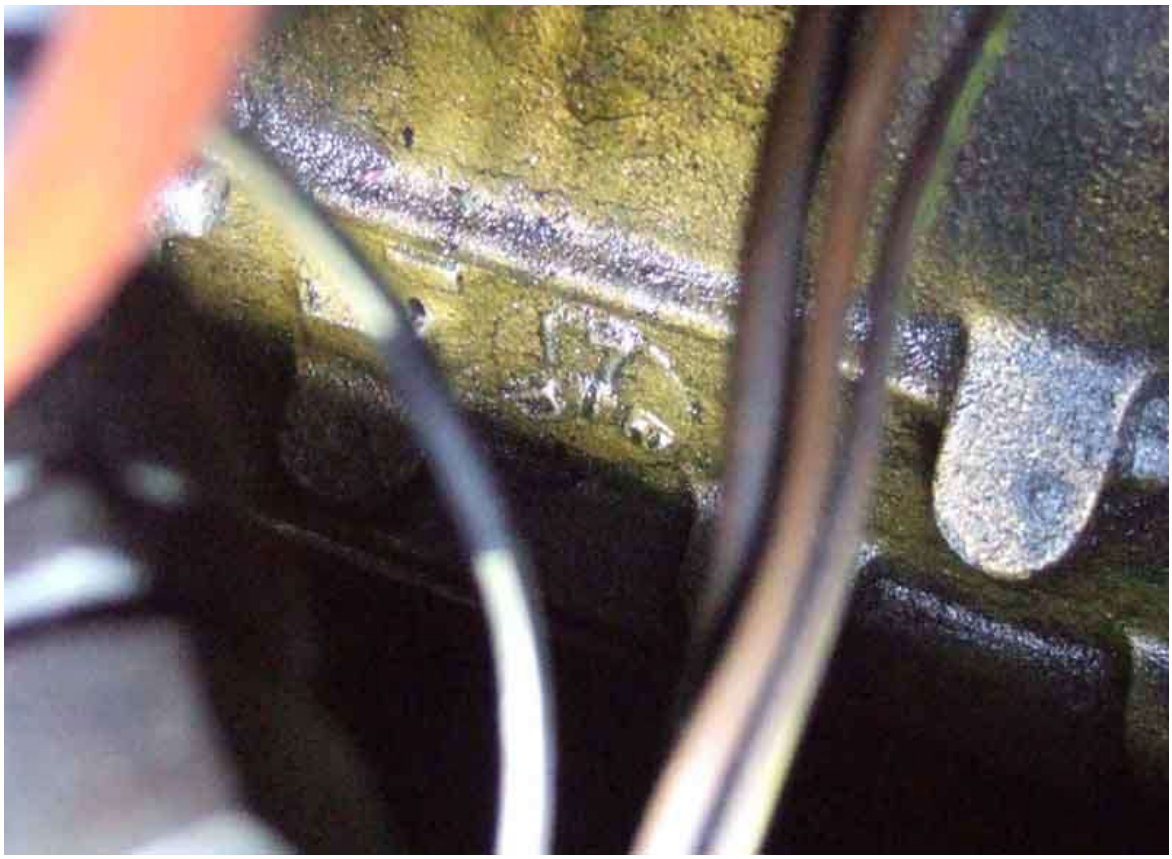
On a Marina TC engine: (*Fast Marina Magazine forum*)

In the above forum thread other 3-digit numbers stamped in the same way are 247 (a couple found in New Zealand), 464, 486 and 641 and 642 which were Police spec.

Dating the Block

Locating the date mark, relatively easy with no emissions kit and the inverted oil filter:

Although a Gold Seal engine the engine number prefix of 48G is correct for the 1972 year of manufacture of the car, and appears to be 17, D, 1972:



A scan of a BL document translating the codes into actual dates, the month letter 'I' is not used. Only covers 1970 to 1981 but apparently the system was in use from 1953. Shows a single digit for year (with 1981 being the same as 1971), prior to that two digits

were used in MGB examples. However many examples of MGB (and MGA) engines do not have this date code, and below there are examples of '70' and '71' for the year: (*Fred Horner*)

BRITISH LEYLAND (AUSTIN-MORRIS) STANDARDS

FERROUS CASTINGS

FOREWORD

These Standards for castings are based upon British Standards, and reference should be made to the British Standard number quoted for details of the manufacturing specification, heat treatment requirements, test procedure, and chemical composition.

All the ferrous castings in general use in the British Leyland (Austin-Morris) Ltd. are included: other cast ferrous materials should only be used after consultation with the appropriate Chief Metallurgist.

Investment castings shall not be repaired by welding or other means without written sanction from the Chief Inspector of the purchasing branch; reference should be made to B.S.3146—Part 1, Appendix A, for weld repair procedure.

CODING OF CASTINGS

The introduction of the U.S. Federal Regulations on Motor Vehicle Safety has made the identification of castings by make and by batch (or day) an essential requirement; all castings whether the regulations apply or not must therefore be so identified.

The following alpha-numeric coding system must be employed, unless there has been agreement in writing, to the acceptance of an alternative method of identification.

CODING SYSTEM

Day —to be identified by numbering with the day of the month.
Month—an alpha identification, in accordance with the tabulation below.
Year —a numeric identification using a single number, denoting the year of the decade.

	Day	*Month*	*Year*	
January	1–31	A	1970	0
February	1–28	B	1971	1
March	1–31	C	1972	2
April	1–30	D	1973	3
May	1–31	E	1974	4
June	1–30	F	1975	5

continued

BRITISH LEYLAND (AUSTIN-MORRIS) LTD. STANDARDS DEPARTMENT, LONGBRIDGE, BIRMINGHAM, ENGLAND | First issued March 1953 Revised February 1971 | PAGE No. FC.1

July	1–31	G	1976	6
August	1–31	H	1977	7
September	1–30	J	1978	8
October	1–31	K	1979	9
November	1–30	L	1980	0
December	1–31	M	1981	1

Examples: 2 Jan. 1970—2-A-0
28 June 1976—28-F-6

Location of Code Mark

This will be shown on the drawings or, alternatively, where agreed with the Quality Engineering Department.

PISTON RINGS

This Standard covers the normal requirements of The British Leyland (Austin-Morris) Ltd. and is related to B.S.4K6 and DTD.485.

Reference should be made to the above Standards for details of test procedures.

However this 18G 3-bearing engine has just a '2' where the date code would be i.e. directly under the oil filter housing position. '12H750', some odd numbers higher up. The flange under the dip-stick hole is full length:

The above block has a logo beside the casting number, representing the Wellingborough Iron Foundry, even though it looks more like an enclosed 'M':

Healey 3000 manifold, with the logo the right way up relative to the casting number: (*Fred Horner*)

Examples of 'MM' (Morris Motors) and the 'W' in the lozenge on T-Type blocks, again the right way up: (*MG Car Club T Register*

Info from Nick Herwegh, Netherlands, via MG EXperience and Fred Horner:

> If we're talking about the small letter W surrounded by a lozenge, that's indeed a foundry mark indicating the block was cast by the Wellingborough foundry. See: www.gracesguide.co.uk/Thomas_Butlin_and_Co.
>
> The foundry became part of the Nuffield Organization during the late forties.
>
> In the days of TD/TF production, engine machining/assembly was at the Morris Engines Branch at Courthouse Green in Coventry (or maybe at the Foleshill Works, the ex-Riley factory which became part of Engines Branch when Riley production went to Abingdon (Foleshill being "around the corner" of Courthouse Green))

Abingdon in the fifties was assembly only.... *as it ended*

The reason the Nuffield Organization bought the Butlin Foundry at Wellingborough was because they needed extra casting capacity for the Nuffield Tractor production. Especially large castings as tractor chassis and engine blocks. (See page 250 of Andrews and Brunner's "Life of Lord Nuffield" among others)

If you look at a Nuffield tractor engine or chassis you'll find exactly the same casting logo. Now it's hard to maintain that these parts were originally meant to be in a Wolseley car.... *ties in with my understanding that the B-series was a development of a tractor engine*

To be complete: the Wolseley 4/44 had a production run of almost 30,000 units.

My GUESS is that the earlier MG blocks (the ones with the MG logo) were cast at the original Morris foundry at Courthouse Green. But again; that's just a guess.

Apparently BL closed the Wellingborough foundry in 1981, i.e. about the same time as Abingdon, and again like Abingdon no strike history unlike many other factories. This Hansard Commons question from the local MP wonders "whether that is one of the reasons why BL chose Wellingborough for the chop, knowing that the workers there are not so likely to be as bloody-minded or militant as others in the group."

Examples of date strips from a 57/58 ZA/ZB, and an MGA with a 'BP15GB' engine: (*Fred Horner*)

MGB 3-synch gearbox date stamp left, 1976 4-synch right: (*Fred Horner*)

All these strips conform to the requirements even though they don't conform to the BL document.

Similar examples on an MGA 16GA engine: (*Fred Horner*)

This also has some characters upside down forward of the filter mount (image inverted for clarity). Cast by 'Bob'?

Back to MGB engines, probably 13, E or F, 1966, with an engine number of 18GB i.e. 3-bearing. Three '12Hnnnn' numbers, and 'AF2'. Flange under the dip-stick hole only going forwards:

Another 18G/Gx block with the same three '12Hnnn' numbers as above, but this time 'AF1'. Date code indicating 1967, so an 18GB or GD (*Ryan Foster, USA*):

A 1967 18GB - is that a digit '1' or a letter 'I' in the month position? Both would be counter to the BL document above: (*'Kevin'*)

Four more examples of digits where the month letter is supposed to be, the first two are from the head and block of the same engine, the other two are blocks: (*Fred Horner et al.*)

This engine has 1970 on the dating code, so an 18GG to GK, but a single 12H3248 casting number and 'AF5' (*Mustang Shire*):

A five-bearing 18GH (from the engine number tag, so Oct 68 to Aug 70), again no date code or anything else under the filter. Very different numbers at the left including '12H3503' and the West Yorkshire Foundry mark, no 'AFn' number, and rectangular bosses for the sump screws instead of rounded:

An unknown block from Stephen Howden. Clearly dated 1971 (which goes against the BL document above), and 12H3503 AF2, so could be 18GG/GK or 18V. But on the other side ...

... an unpierced moulding for the mechanical fuel pump. Clausager says one of the differences on the 18v is that this was pierced, so the implication is that 18Gx weren't, making this an 18GG/GK. Another indicator is 'MOWOG', which seem to be on 18Gx but not 18V:

If that's true then it looks like the year indicator in the date code changed from two digits to one for the 18V as well. It would be interesting to see an early 18V as they started in August 1971 to see what the year indicator is, and the fuel pump boss.

Probably 29, L, 1973. Engine number and originality to car not known.:

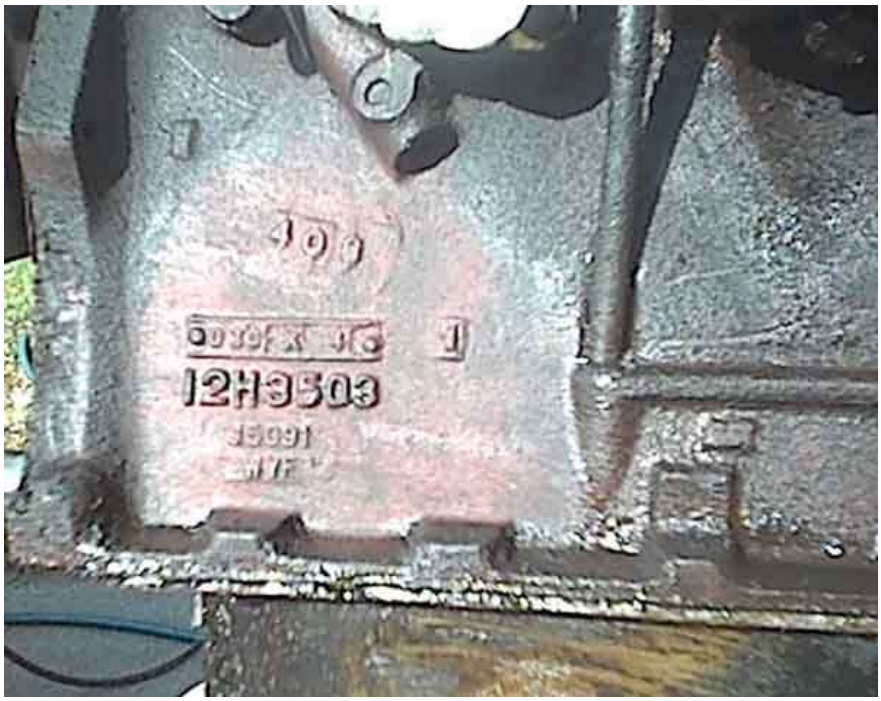
And yet this 18V673Z (going by the engine number tag) i.e. August 72 to September 74 has no date code:

Barely legible - but the year digit looks more like a 5 than a 6, the engine number dates to about October 76 so the casting could be from late 75 or early 76:

An 18V block with '12H3503' on two rows and 'AF1', and a date code indicating 1975, i.e. an 18V 846/847, 18V 797/798, or 18V 801/802. None of the other markings as on the previous engine. Back to rounded sump screw bosses: (*Jim Bronson, Canada*):

I've seen two examples where CAM1628 replaces the 12H numbers, with date wheels showing 1975 as in the next picture, and 1976: (*John Fraioli*):

Another '12H3503' with the other numbers being different and no date code, with an 18V658 engine number i.e. from a Marina. The 'WYF' at the bottom indicates West Yorkshire Foundries, part of the BL empire until 1986: (*Mark Jones in Canada*)



Three West Yorkshire Foundries 18V801, used from June 75 to June 76 for America. No circular date codes but a possible dating strip above the casting numbers:

The strip of characters near the top has a '5' on the right in both cases, is this the WYF dating info? Another WYF block (engine number unknown), but no digit at the end of the strip. Different digits above and to the right of the strip in all of the WYF blocks:

One of two 18V/801-802AEL engines from December 75-built North American cars without date codes: (*Bill Etter*)

An 18v883 of Jun 76 to Oct 80, date code with a single '7' indicating 77. The same '12H3503' (but looks like 3508, on a single row) as above, and 'AF5':

18V884 with 6, ?, 1977:

There is information about WYF on several Jaguar sites, and one of them has this picture (I bet Jaguar owners aren't impressed with the octagon!):

Another Jaguar example, a 1980s alloy V12, simple 'WYF' logo and same dating (?) strip:

The 18GB, 66 dated block (as in the top picture on this page but before degreasing) with no position for the mechanical fuel pump:

The 18GG to GK 70 dated block with no position for the mechanical fuel pump and with the 'MOWOG': (*Mustang Shire*)

The fuel pump aperture - Clausager indicates this was new for the 18Vs - and no 'MOWOG' on an 18V engine with year code '73' and 12H3503: (*Duane Timbers, Canada*):

An unknown engine with year code '71' and casting 12H3503 AF2 on the other side, 'MOWOG' and an unpierced moulding for the fuel pump this side. The implication of all that is that it is an 18GG/GK, and in fact an 18GK as the head (also dated 71) has air-

injection holes: (*Stephen Howden*)

Even odder is this one, with no provision for a distributor, and a question posed by William Revit in Tasmania. It's a B-series, not a diesel, so what is it? (Ignore the string, that was just to demonstrate the hole below the two oil ports is the block drain port).

Stumped?

Dipsticks and Sumps

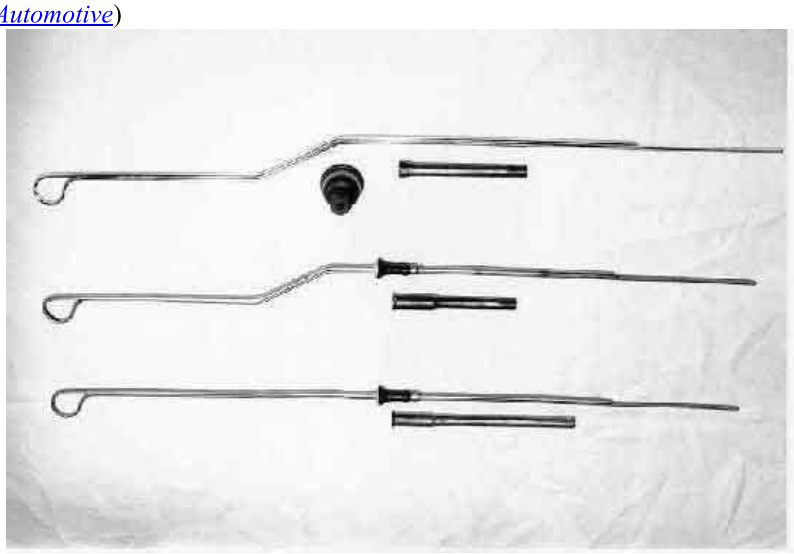
Manual Auto

Manual:

The three dipsticks and tubes:

- Top: 18G to GF, sliding dust seal, no stop. These rest on the sump bottom to give the correct oil quantity.
- Middle: 18GG to GK and early 18V581/582/583, 584/585 and 672/673. These have a stop on the stick and need the correct tube to ensure the correct oil quantity. the tube screws into the crankcase. The stop effectively wedges into the tube to give a decent seal on engines with positive crankcase ventilation, where the crankcase is under vacuum all the time the engine is running.
- Bottom: Later 18V. These also have a stop and need the correct tube to ensure the correct oil quantity. The tube is pressed in to the crankcase.

The middle and bottom sticks are said to be interchangeable, but the tubes are significantly different lengths which will give significantly different oil quantity, more with what is indicated to be the later tube in this picture. This goes against the **smaller** quantity of oil that other sources indicate was used in the later engines, unless the longer pressed-in tube goes in much further than the shorter screwed tube, which seems unlikely. I have the straight stick in my 18V673, which would be correct, and comparing the exposed length of my tube and stick, with the sticks and tubes here, with an allowance for how much might be in the block, my tube is much closer to the long tube. Which still leaves the question about oil quantity on engines with the shorter tube. (*image from British Automotive*)



18G, GA to GF, and early 18GG and GK engines had the sump plug forwards of the right rear corner, sumps 12H395 (18G and GA) and 12H1426. When used with the early dipstick without the stop the stick rests on a raised portion of the sump (arrowed).

After that the sump plug was on the corner on sump 12H3541 ...

... as that part of the sump was 'cut away' to access the torque converter bolts for the automatic gearbox via the hole in the engine back-plate. (Chris at Octarine Services)

The bolt pattern on the 3-bearing sump is different to that of the two (interchangeable) 5-bearing sumps - the 3-bearing has an extra bolt along the left-hand side which moves the front left-hand one (lower left in these images) round the corner a little way. (Chris at Octarine Services)

And what is the purpose of the vertical 'tube' in the lower right-hand corer of the 5-bearing sump, with matching hole in the 3-bearing gasket? There is a matching hole in the block right by one of the sump screws, overflow from the relief valve?

Auto:

The Auto dipstick and tube are long, the latter has a pronounced 'S' shape:

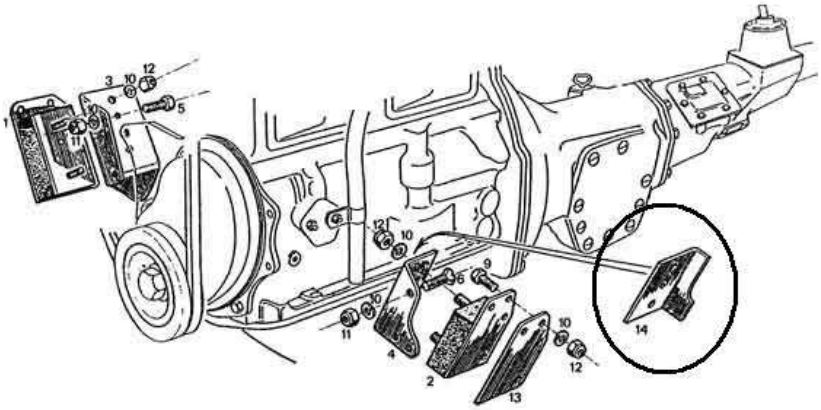
It appears to have a retaining nut that screws onto an adapter in the gearbox, similar to the oil-cooler hoses:

Showing the position of the dipstick in the sump: (*Rover P5 Club*)

Engine Mounts

Chrome bumper

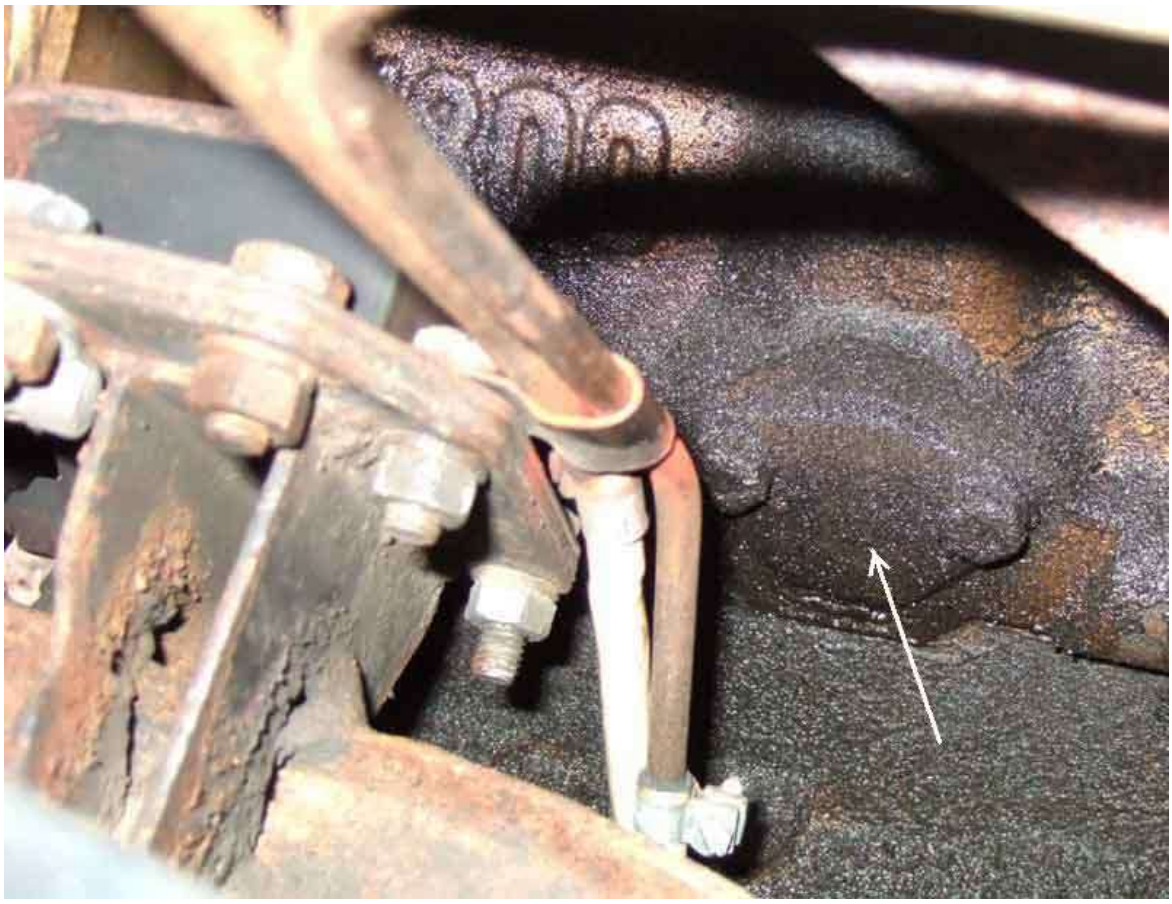
The chrome bumper control bracket (circled). The flange on the back of the bracket will contact the chassis bracket after a small amount of forward movement of the engine, preventing any further movement of the fan towards the radiator. Incidentally the two bolts that attach the mounting bracket to the engine front plate on the left-hand (carb) side, numbered 6 here, are countersunk, and there are corresponding recesses in the bracket itself. Logically this would be to prevent the heads of standard bolts rubbing against the rubber, but the two bolts on the right-hand (alternator) side are hex-head bolts. All four nuts are stiff-nuts, used with spring washers, whereas all the other nuts on the engine mounts are plain. Also note the optional spacer plate (13) which - when fitted - is always on the carb side. *Image from Moss Europe*



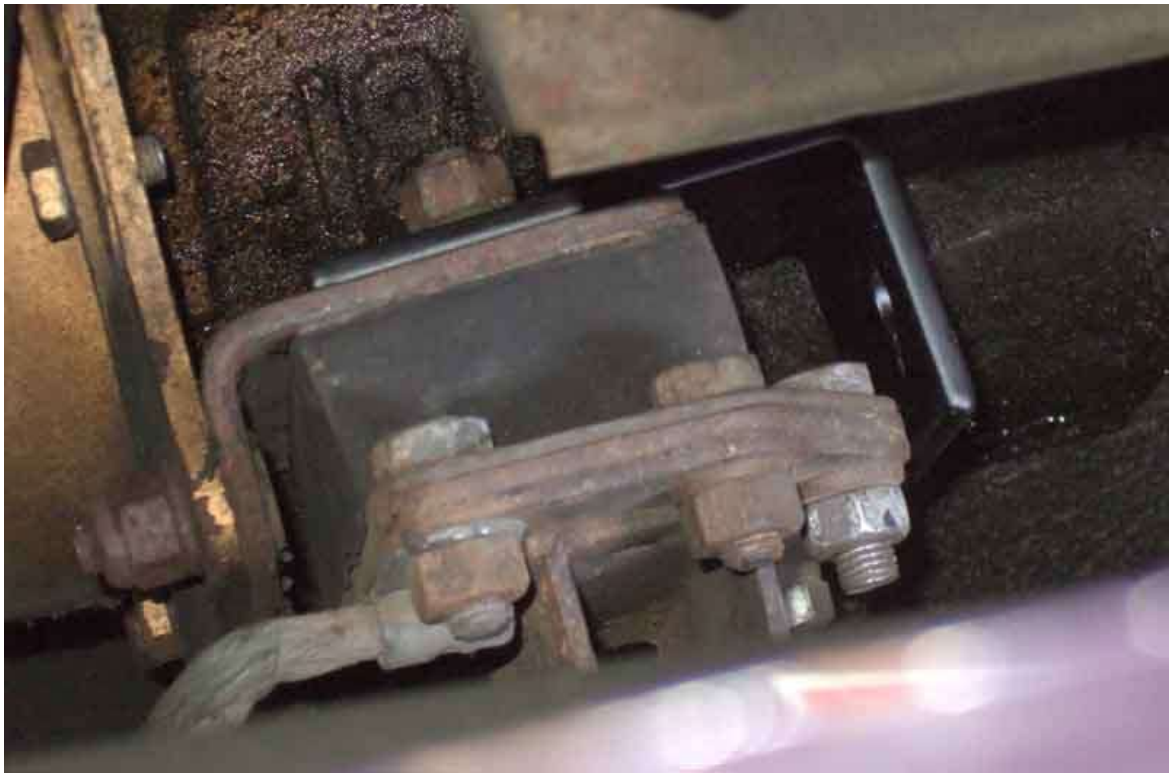
Chrome bumper restraint bracket AHH7890, one of three types listed in the Parts Catalogue this is the only on available and is suitable for all chrome bumper cars. Spot the subtle difference to the drawing above! The two holes on the left go behind the bracket attached to the engine front plate, on the mount studs. The hole in the flange is a bit of a mystery, it can be used to mount the carb vent/overflow pipes P-clip with a nut and bolt (although the correct place for it with HS carbs is to a bracket (NLA) mounted on a stud or under a bolt screwed into the block where the mechanical fuel pump goes on non-MG applications). Interestingly the image above shows the early non-positive vent pipe being clipped to the rear-most of two bolts through the blanking plate for the mechanical pump. I'd wondered why the bracket for the vent/overflow pipes was such a complicated shape, instead of the clip being held by one of the bolts directly as on rubber bumper cars. The bracket was obviously designed to fit round this early breather, which was only used until 1964, after that the clip could have attached directly to that rear bolt!

Vent/overflow pipes attached to the chassis side of the mount as I'd seen on a concourse winner (also shows the countersunk bolts and stiff-nuts, arrowed) ...

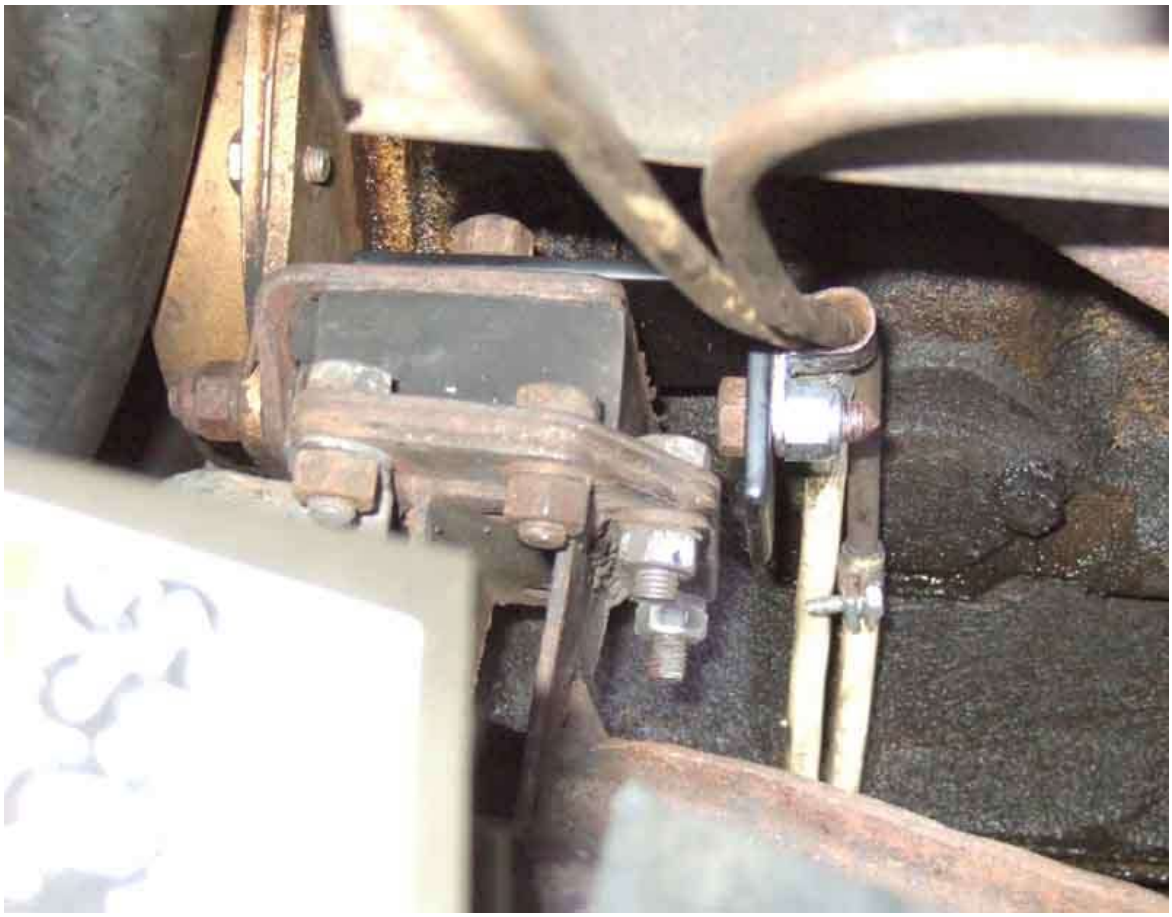
... so moving the pipes on their hoses as the engine rocked. Also shows the mechanical fuel pump blanking plate (arrowed), used for mounting the original crankcase pipe and carb pipe bracket. It's possible that the P-clip for the overflow pipes should go under the head of one of the blanking plate bolts.



Restraint bracket mounted ...



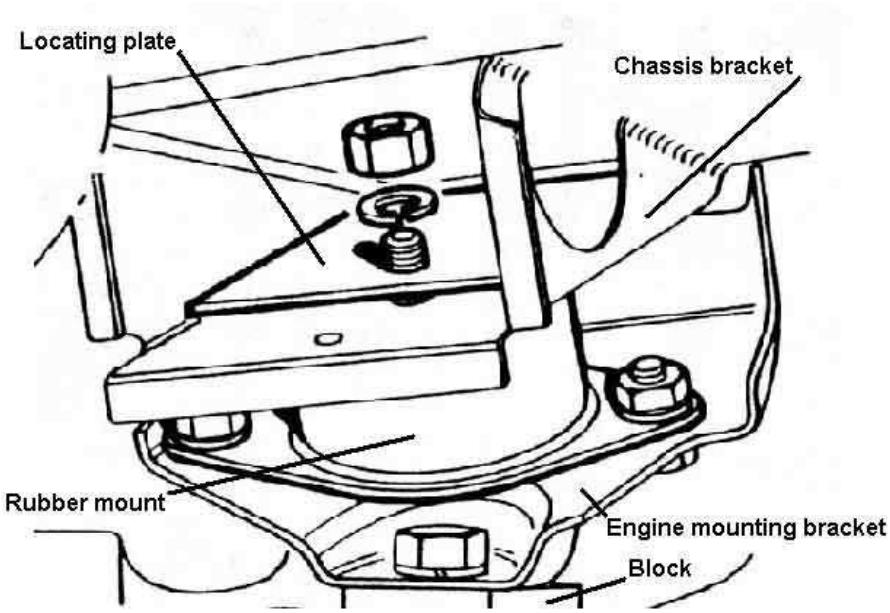
... limiting the forward movement of the engine to about 1/4", with the carb pipes attached to it using the convenient hole so they move with the engine. I opted for this point rather than a pump blanking plate bolt, as they proved pretty tight working from above and I didn't want to risk starting an oil leak (OK it looks oily already but it doesn't drip).



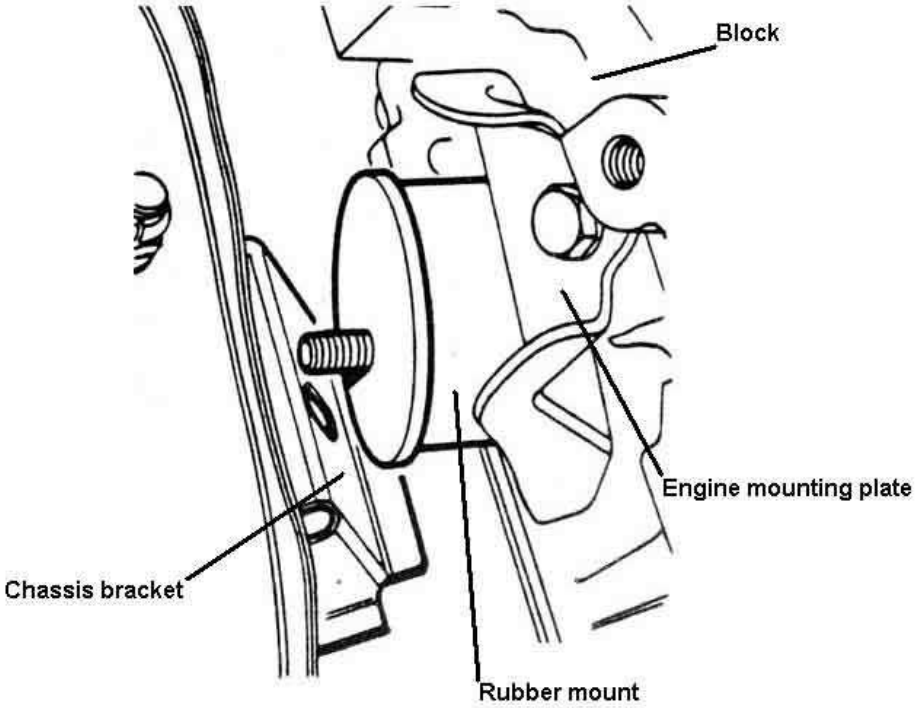
Rubber bumper

Showing the stud in the lower of the two possible positions when attached to the crankcase bracket. Note this is an old mount where the 'eared' or oval back-plate of the mount has been ripped off.

Looking up into the chassis bracket from below. The locating plate is fitted so that the hole is in the lower of the two possible positions, to ensure the mount stud is near the bottom of the chassis bracket slot. (Drawings of a V8 but the same principle must be applied to 4-cylinder cars).

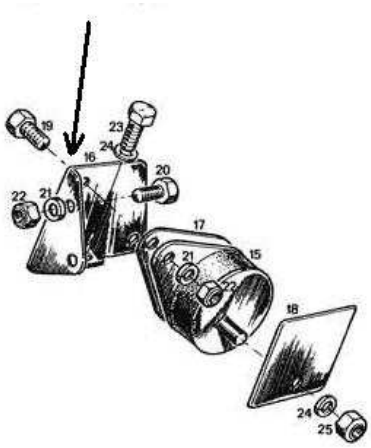


The chassis bracket from above. There must be sufficient spacers to prevent the stud lying in the bottom of the slot, but not so many that the locating plate cannot be fitted the correct way round. It's not indicated in the drawing, but this must be the near-side of a V8. The visible cross-member nut is slightly forwards of the chassis bracket, and the mounting plate is installed with its flat side towards the rear, and its angled side towards the front.



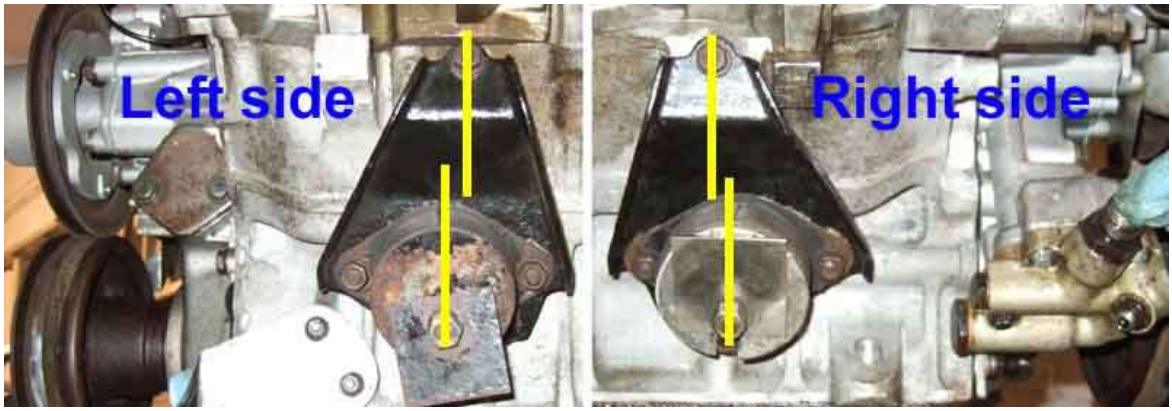
Dimensions for fabricating a spacer (applicable to V8 right-hand side)

Showing the common point of fracture on left-hand 4-cylinder rubber bumper brackets (arrowed), also the correct orientation of the rubber mount 15 and locating plate 18: *(Moss Europe)*



However Crispin Allen found both of his cracked, with the driver's side (on the right here) much worse than the passengers:

V8 mount bracket orientation: The upper bolt securing the bracket to the block must be behind the stud on the mount that goes into the chassis bracket, putting the engine in the rear-most of the two possible positions:



BRITISH MOTOR INDUSTRY HERITAGE TRUST

CERTIFIED COPY OF A FACTORY RECORD

BMIHT certifies that the details given below are a true copy of an entry in the original factory records for the vehicle with the chassis number quoted.

This Certificate does not constitute verification of the present condition of a specific vehicle. These are the details of the car as it left the assembly line. Cars were sometimes modified by the manufacturer after production and prior to shipment.

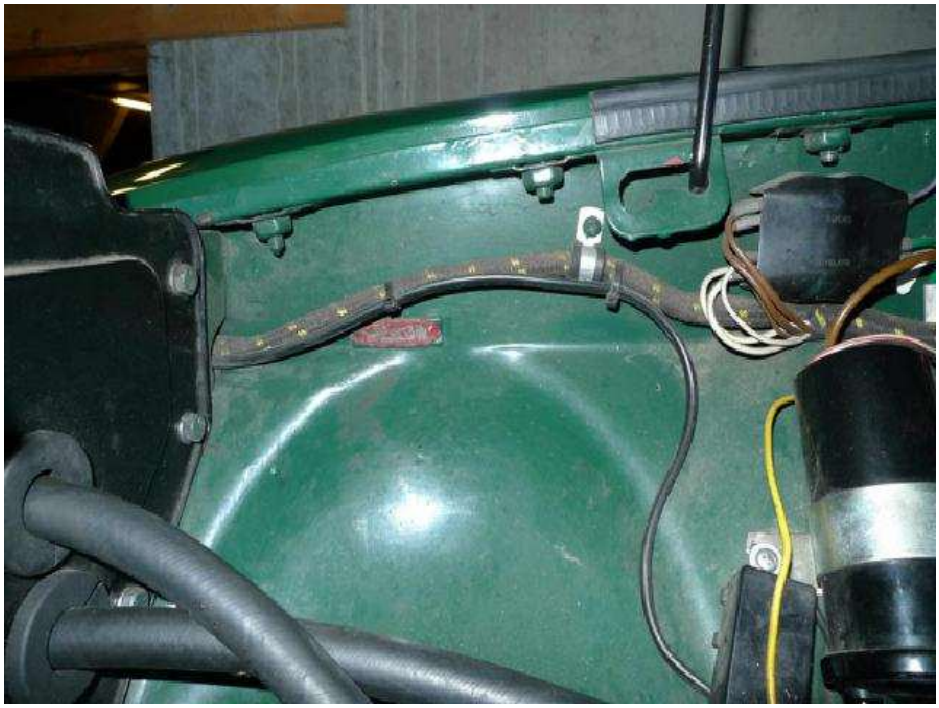
Certificate Number: **2012/26968**

1. Make & Model	**MGB GT**
2. Car/Chassis Number	**G-HD5/321199-G**
3. Engine Number	**18V-582-F-H/17847**
4. Body Number	**Not Recorded**
5. Specification	**RHD, Home Market**
6. Colour a) exterior	**Blaze**
b) trim	**Navy**
c) hood (top)	**Not Applicable**
7. Date of Build	**16 - 18 May 1973**
8. Date of Despatch	**23 May 1973**
9. Destination (Dealer)	**Henlys Limited, Bristol**
10. Other Numbers (where recorded)	**Key numbers FS.888, 2722**
11. Details of Factory Fitted Equipment	**Rostyle wheels, Overdrive, Tinted windscreen, Servo assisted brakes, Inertia reel seatbelts, Head rests**
12. Other Information	**-**
13. Issued to	**Mr Andrew Fletcher**
14. Date of Issue	**19 September 2012**
15. Signature of Archivist	

This is as displayed by The British Motor Museum, so presumably a dummy! This style with the gold 'stamp' is required by the DVLA as dating evidence.

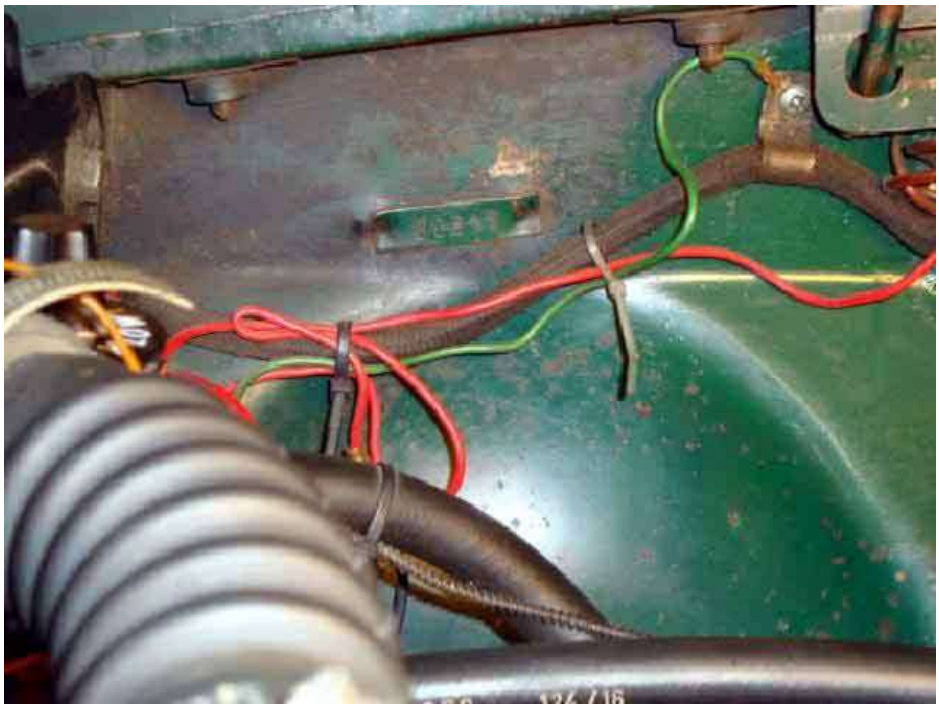
Body Numbers

Feb 1963 - unprefixed number by the dynamo (Tore)



1963 - MGB number by the carbs (Ste Brown)

May 1965 - unprefixed number by the dynamo ...



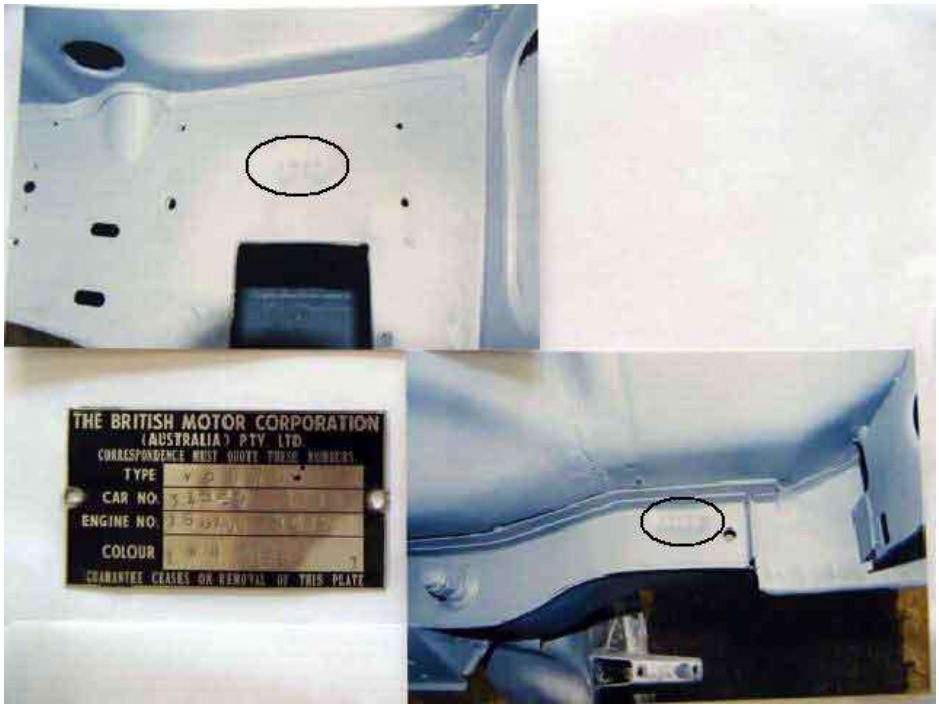
... and prefixed by the carbs (George Wilder)

About October 1966 - unprefixed number, very front edge of the inner wing on the dynamo side (Colin Parkinson) ...

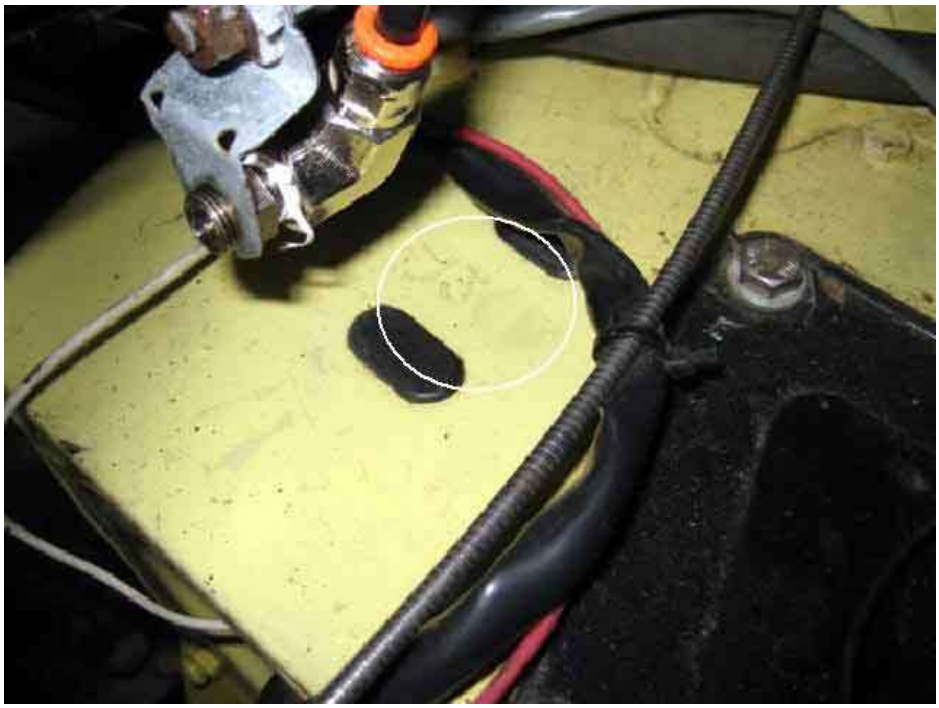
... and the MGB number, just in front of the radiator, carb side

March 1967 - unprefixed number, very front edge of the inner wing on the dynamo side (Dave O'Neill)

Australian 1963 - top-left body number by the carb-side hole for the pedals, bottom-right chassis number at the very front of the chassis rail on the carb side (Ian Buckley).



Australian October 1968/July 1969 - body number beside the hole for the pedals on the carb side (Denis) ...



... and in front of the radiator alternator side

More info on Australian CKD cars here.

Cylinder Head Remove/Refit

The 'anti-clockwise spiral' sequence of progressively loosening and tightening the nuts:

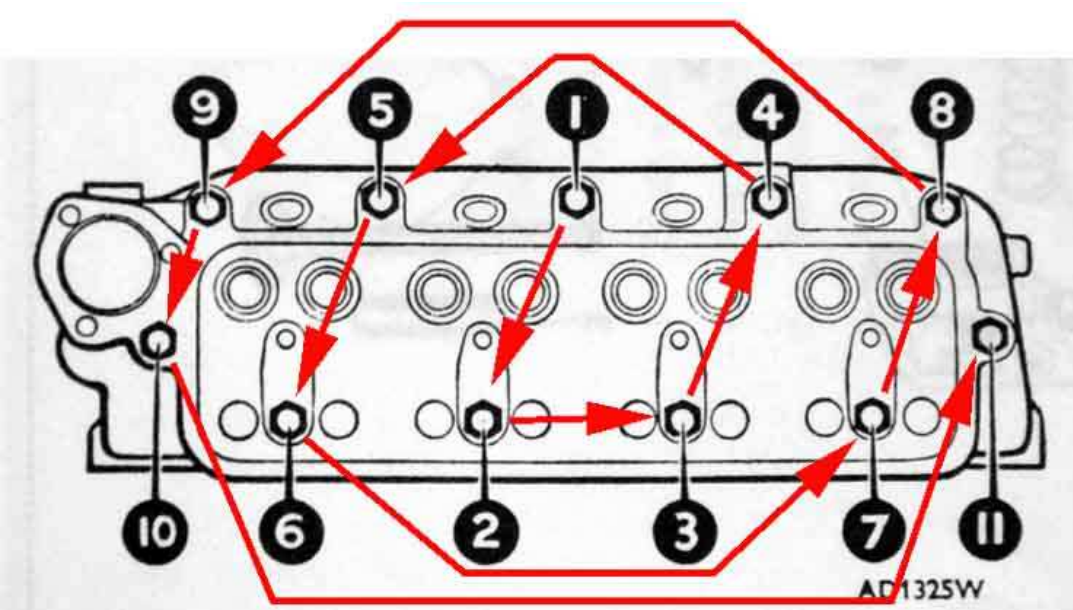
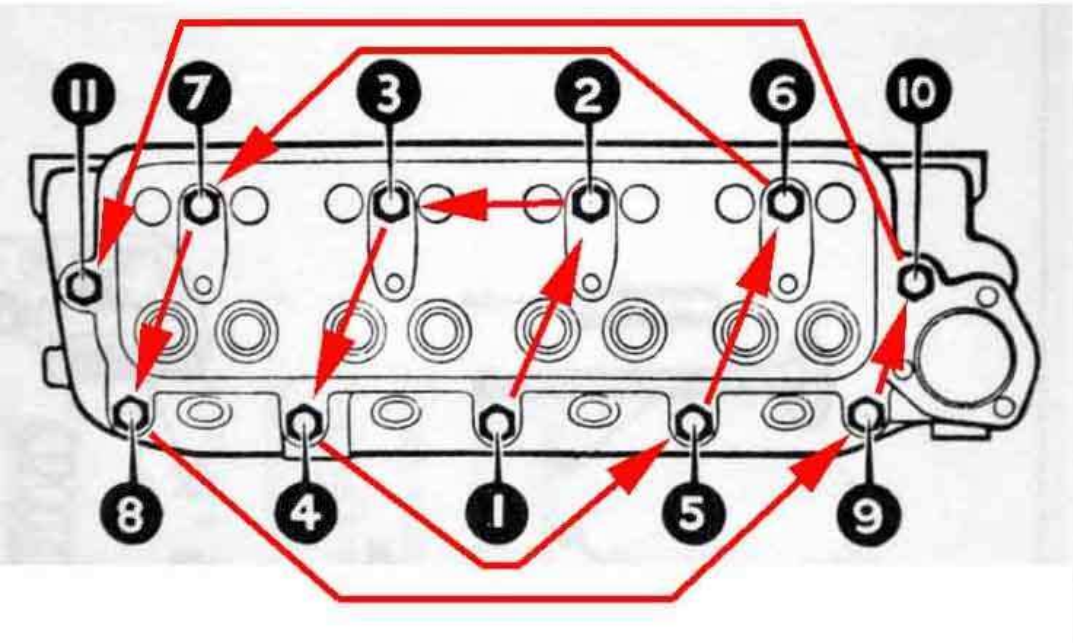
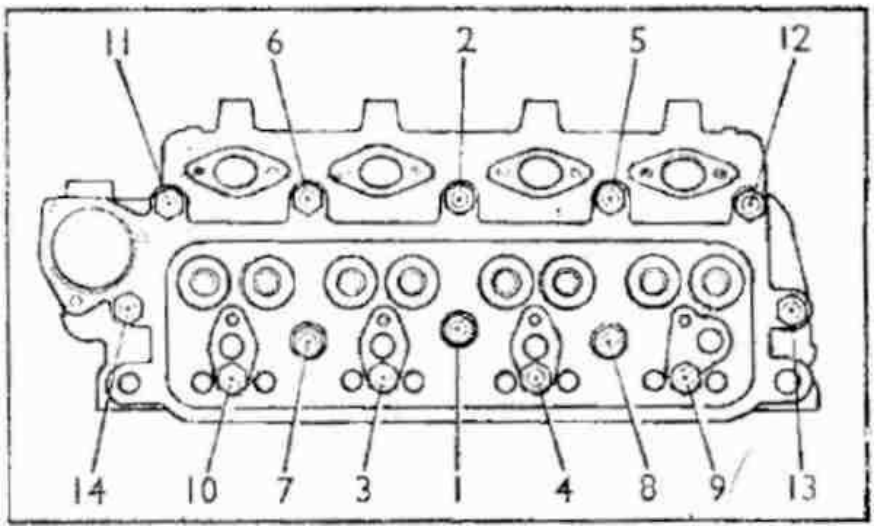


Fig. A.2
Cylinder head nut slackening and tightening sequence
MGB. Issue 6. 25729

Note that in the drawing above the operator is standing at the carb-side of the engine, whereas in my case I have more space on the alternator side so choose to do top-work from there, in which case this may help:



Three extra nuts 1, 7 and 8 (and modified sequence) under the the rocker shaft on a 1500cc B-series Diesel: (*Dave O'Neil*)

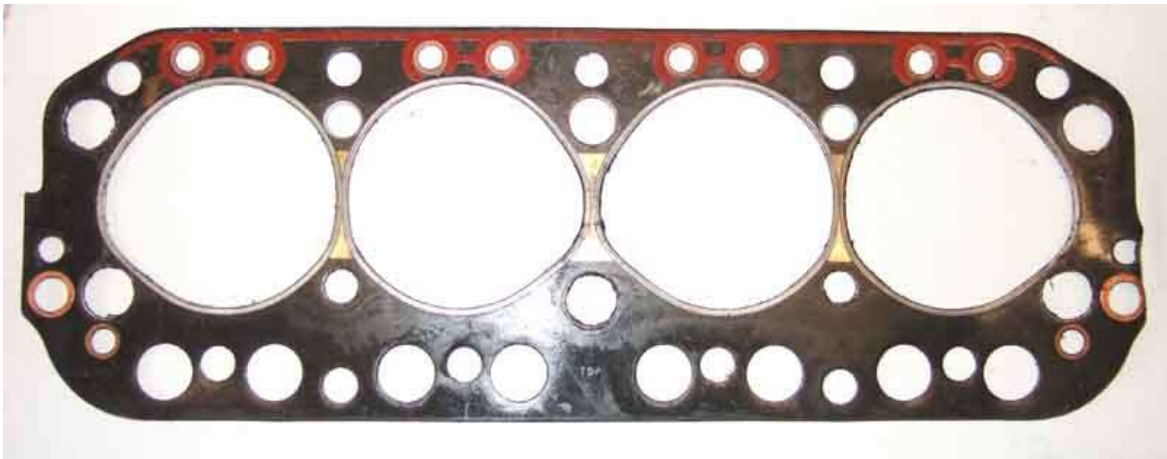


An original copper gasket copper side ...

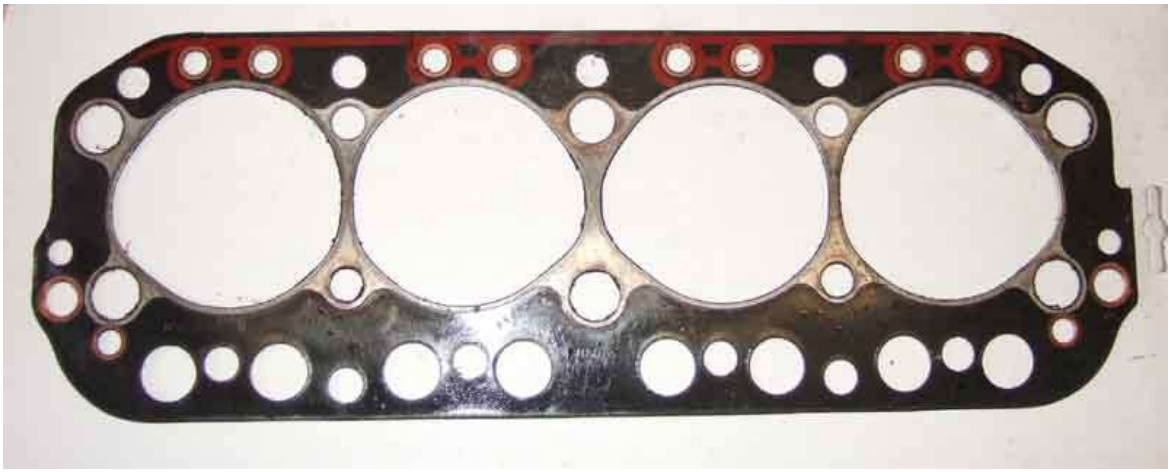
... and 'steel' side:

'Front' (left), 'MADE IN ENGLAND' and 'TOP' (centre) and '1800cc' (right) stampings very clear:

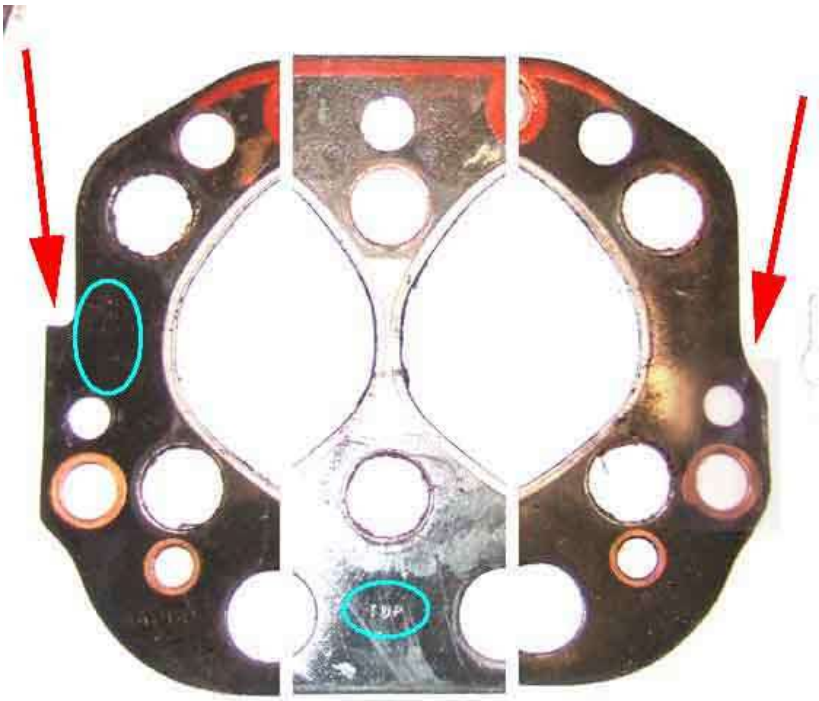
Payen top ...



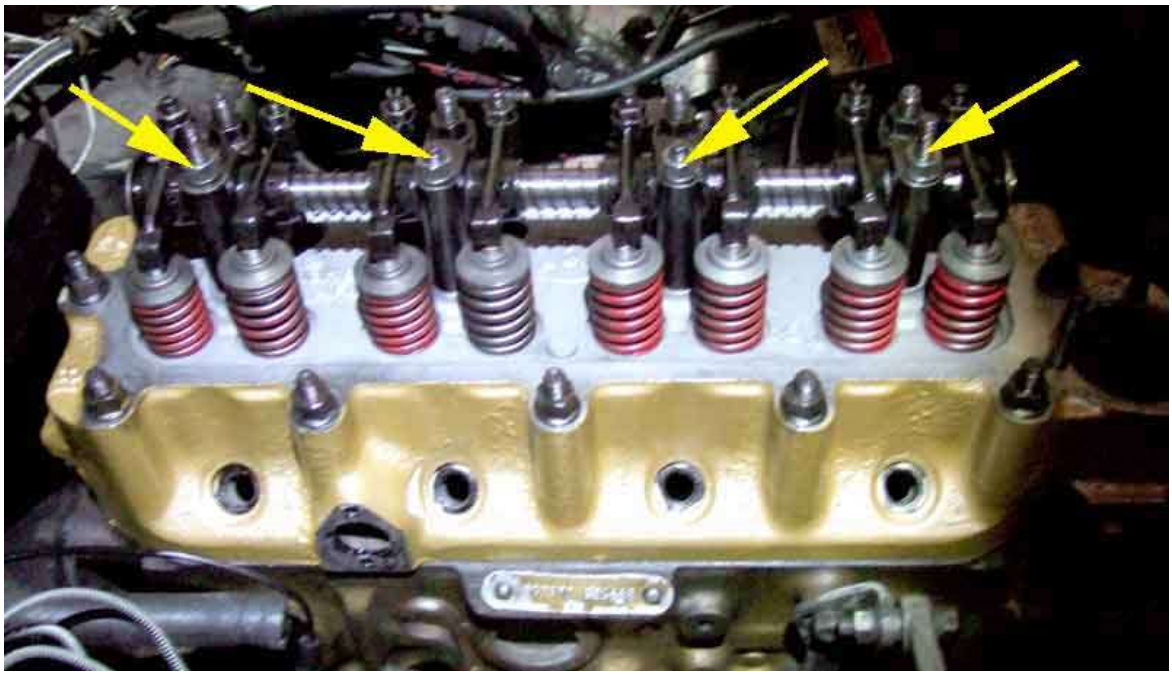
... and bottom - almost identical except for 'gold' wedges between each pair of cylinders on the top and larger 'silver areas underneath:



'FRONT' and 'TOP' markings smaller and less distinct and you have to look closely and carefully. However it has the same 'stepped' front edge and curved rear edge (arrowed) as the copper:



The indicated rocker pedestal nuts can be removed if required without affecting the cylinder head or gasket:



Exhaust System

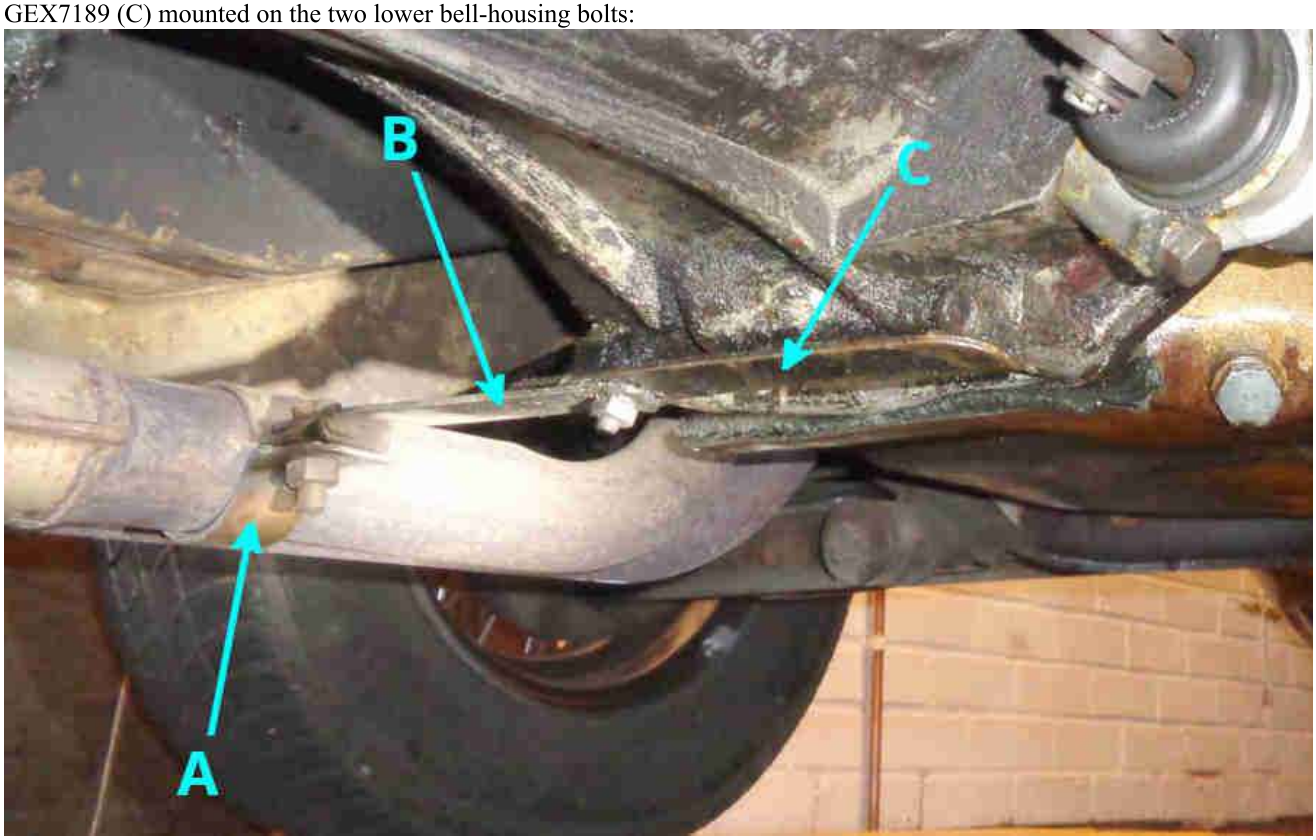
Supports Rear Boxes Pipe Clips

Supports:

Front Middle Rear

Front:

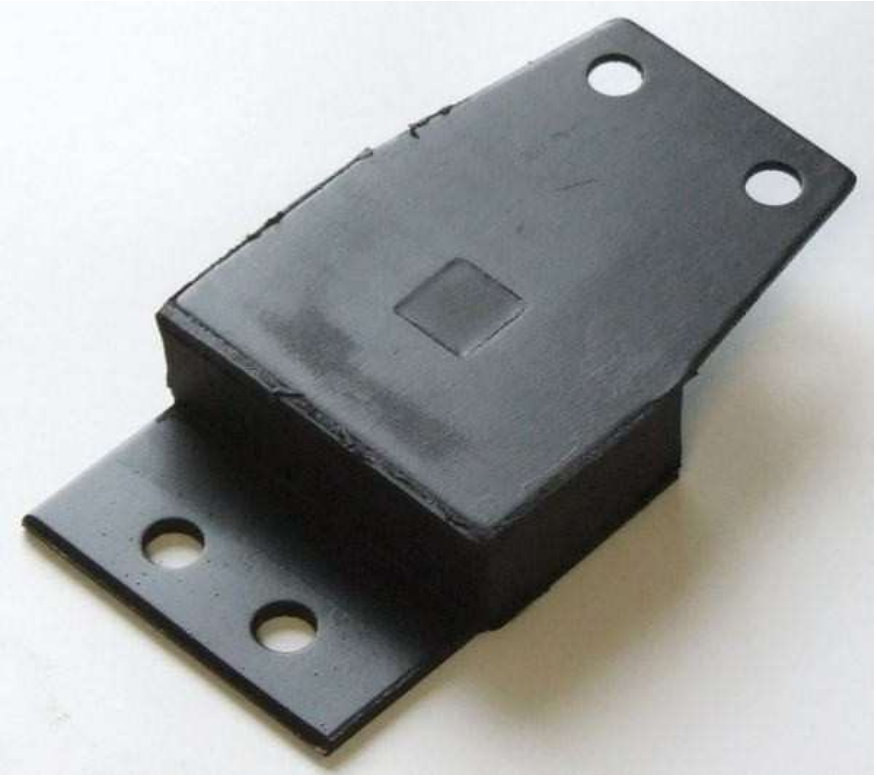
4-cylinder cars only - pipe clip GEX7074 (A) on the in-board down pipe attached to strap GEX7194 (B) bolted to bracket GEX7189 (C) mounted on the two lower bell-housing bolts:



Middle:

Multi-part assembly comprising the parts listed below. I've also welded a tab to the U-strap on both cars so I can clamp it and the pipe together, without that they fidgeted and squeaked. Some systems have the U-strap welded to the pipe which is annoying if just that part fails:

Main hanger GEX7204: (*Motaclan/Leacy*)



Heat-proof fibre bushes GEX7182 (two needed): (*Motaclan/Leacy*)

Housing for bushes GEX7183: (*Motaclan/Leacy*)

U-strap GEX7191, note this does not have the tab in the photo above to allow the pipe to be clamped to it and prevent rattles ... (*Motaclan/Leacy*)

... unlike this one from the MGOC which does, although the metal looks to be quite a bit thinner:

Plus sundry nuts, bolts and washers.

Rear:

The early one-piece clamp (GEX 7275) used up to chassis number 167815 in Feb 69 (suppliers dates vary). This uses a metal-rubber-metal bonded sandwich very similar to the middle mount. However if the bonding on either rear or middle mount should fail a lot more stress is placed on the other bonded hanger. If that fails as well the exhaust will almost certainly drag on the ground. I've read that the rear hanger has two set-screws going through the sandwich, but not in any photos I have seen, although some do have rectangular holes in the metal parts filled with rubber or bonding: (*Motaclan/Leacy*).

The earlier type from Ben Colomb:

Later six-piece 'saddle-clamp' system (GEX 7201 CB/GEX 7442 RB, 7202, 2-off 7252, 2-off 7251). This is 'fail-safe' in that if both the bonded 'cotton reel' mounts should fail the exhaust is still supported in the same position, although it is likely to move around a little more in use. I've had both fail on the V8 and didn't know anything about it until I was working in that area and noticed it. The Parts Catalogue shows GEX7201 with no chassis number information just "use prior to GEX7442" which normally means the part was changed rather than there being different versions for CB and RB. However both types are available and suppliers do differentiate between CB and RB, RB being longer:

Several suppliers show heat insulation washers AHC442 for the saddle-clamp type, although not in all the kits. When they are listed by themselves the quantity is shown as 4, but logically only two are needed - between the rubber mount and saddle-bracket bolted to the clips around the tail-pipe itself (arrowed above): (*Rimmers ... other colours are available ...*

To me the later CB clamp is much neater than the early version with the clamp bolt underneath the tailpipe:

The RB version exposes more of the bracketry, but given how much the bumper protrudes it just isn't noticeable. So much so that I hadn't realised how skewed Vee's was until looking at this picture - caused by one of the hanger screws shearing in the body bracket when first fitting this system 24 years ago, and redrilling and tapping wandered off. I'll have to remove it and redrill the hanger to get it to line up:

Corrected ... but then I realised that showed the tail pipe was twisted to the left:

So subsequently corrected that as well:

Valance bracket HZA479: (Rimmer Bros)

Rear Box:

CB box tucked up beside the tank, it and its tail-pipe pointing straight back:

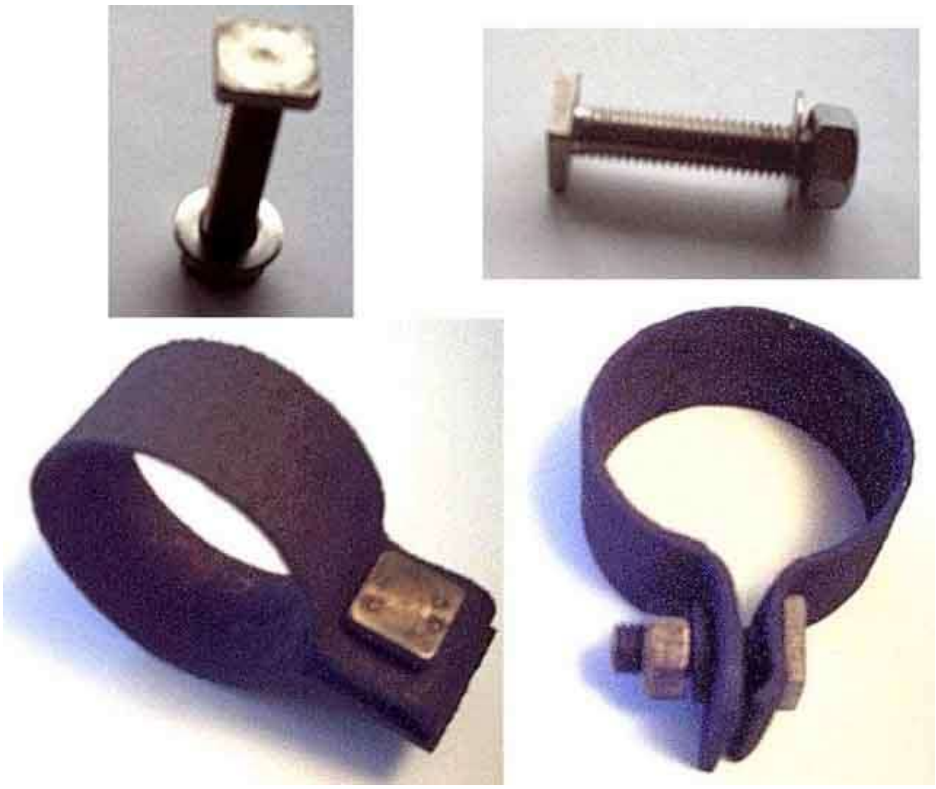
RB box lower than the tank to clear the axle, so has to be angled upwards to reach the mounting point, which also means the tail-pipe has to be angled downwards relative to the box (and ends-up angled slightly downwards relative to the ground. The rear hanger is also deeper:

Both systems are stainless with Bee's older than Vee's, but you wouldn't know it from Vee's, maybe because for some years she was our daily driver in all weathers including a lot of winter salt.

Stainless-steel exhausts can be magnetic:

Pipe Clips:

V8 manifold and Y-pipe:
Local authority 'sign affix' stainless bolts are a good fit for the original-style clips, almost certainly these from Trade Signz Manufacturing.



The stainless nut and bolt came undone easily, and peeling the clip off the pipe showed significant corrosion, so probably stretched and come loose. Temporarily replaced with a 1 7/8" conventional U-clip (which unlike the originals can be fitted without parting the pipes) pending a proper job later on. It might be tempting to use these permanently, but the two arms of the 'Y' are so close together the two clips would have to be staggered, meaning one would be partly off the end of the 'Y' and the other too close to the end of the split, so neither would clamp properly.

However Clive Wheatley is now showing this type in stainless, £3.60 inc VAT each complete.

Even better, with the screw backed right off they spring apart and can be fitted round the pipes in-situ, unlike the original type where the main exhaust pipe has to be pulled back to get the Y-connector off the down-pipes so the clip can be slid over the open end.

4-cylinder Timing Gears

Timing covers **Timing cover bolts**

Leyland Workshop Manual image, white arrows showing the positions of the keyways and black arrows showing the position of the dimples.

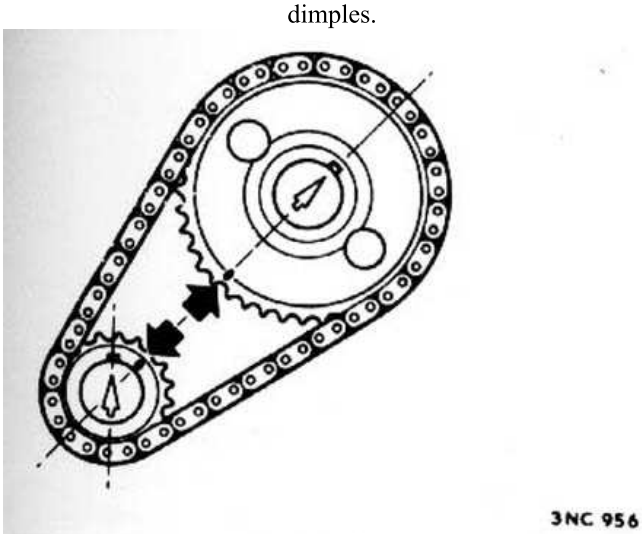
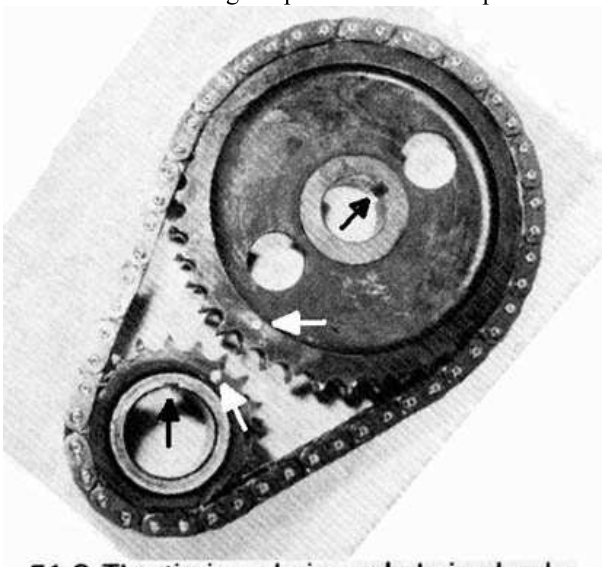


Fig. A.42
Crankshaft keyway at T.D.C. and the timing marks opposite to each other

Haynes Manual image, rotated for comparison with the Leyland image, black arrows showing the position of the key-ways and white arrows showing the position of the dimples.



51.3 The timing chain and chainwheels, correctly assembled and ready for fitting

Both images show the correct orientation of shafts and gears in preparation for fitting the chain and gears to the shafts. Note that this installs the cam such that No.4 piston is at TDC on its compression stroke, not No.1 piston.

To install the distributor drive dog correctly, using the instructions contained within the manuals which state that No.1 piston must be at TDC on its compression stroke, the crank must be turned one full turn i.e. 360 degrees. This puts the camshaft **keyway** adjacent to the crank gear, and the cam gear dimple at top-right. Then follow the instructions for inserting the drive gear.

Timing covers - flat flange on MGA (left), ribbed on (most if not all) MGB: *MGAGuru*

Timing cover bolts: It's fairly self-explanatory where the bolts go. It's obvious the four 5/16" bolts will only go in the appropriate holes, the three shorter 1/4" bolts go at the top into the engine front plate where there is no block behind it, and the two longer ones go at the bottom through the front plate into the block. Torque to 6 ft lb for 1/4" and 14 ft lb for 5/16". (*Photo: Chris Wilson*)

Rubber Bumper Apron Slots

The air-dam, showing how it scoops air into the slot for the oil cooler and lower half of the radiator and will do so even when the bumper and hanging number plate is fitted: (*MG-Cars.org.uk*)

Raised number-plate opens up the slots in the standard apron: (*V8 Register*)

Special-tuning air-dam slot:

Duct BHH1614 directs air through the under-slung oil cooler and back to the lower part of the V8 and 77 and later 4-cylinder radiators, which extend below the chassis rails. This original flat fibre-board had taken up a curved shape allowing a lot of air to bypass the cooler and radiator, I added the metal strip to force it into the correct rectangular shape:

Current stock is pre-formed plastic which should hold its shape better: (*Moss Europe*)

Duct BHH1622 (moulded plastic) on pre-77 4-cylinder rubber-bumper cars, directing the air-flow up to the radiator which doesn't extend below the chassis rails: (*MGB Tips*)

77 and later used a deeper radiator like the V8 and so used the V8 duct, as well as this mud/acoustic shield BHH2127 behind the radiator sitting on top of the chassis rails. The bottom hose passes through the shield at the top of the picture: (*MGB Experience*)

Oil Cooler

For undoing the hoses, the hose union spanner (above) must be clockwise relative to the cooler spanner, positioned such that the spanners can be squeezed together with one hand - although both may be needed for old fittings. When squeezing no rotational force must be applied to the cooler spanner, only the hose union spanner must move - anti-clockwise as you look down on it.

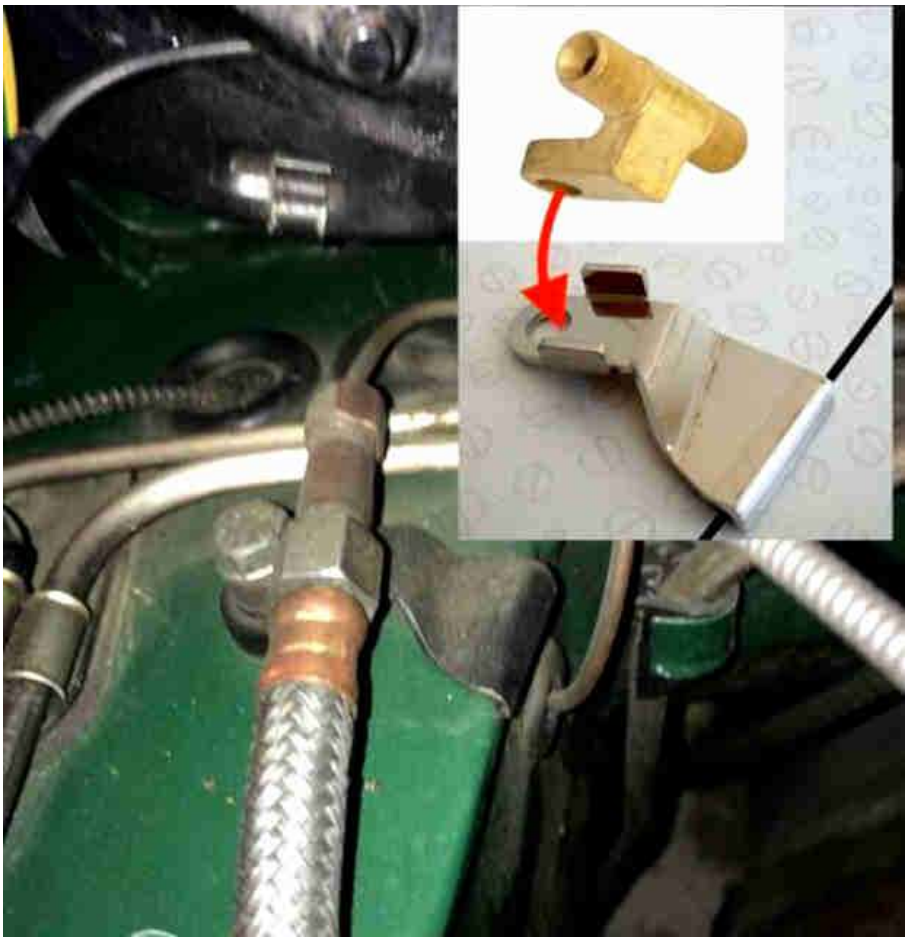
For tightening, the hose union spanner must be anti-clockwise relative to the cooler spanner, and when squeezing only the hose union spanner must move - clockwise as you look down on it.

Oil Pressure Switch

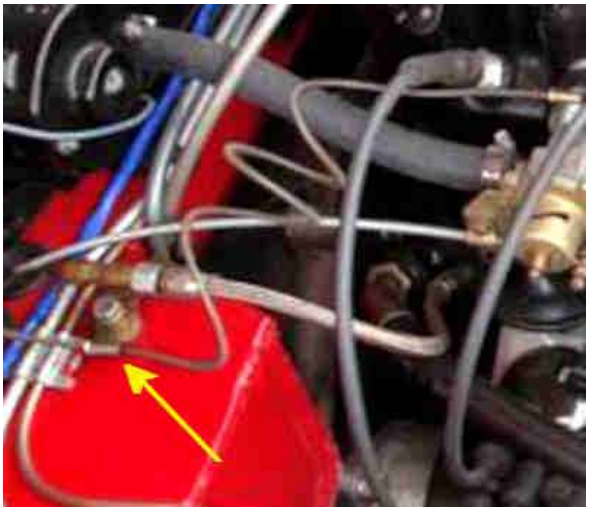
4-cylinder V8

4-cylinder: Bee's original connector as I found it - the gauge pipe has had the fitting cut off and the end of the pipe fed through the connector direct into the hose and secured with a hose clamp. Originally there would have been a short length of pipe with a fitting at this end of the pipe as there is at the block end. Presumably one of the pipes fractured at the connector, hence this cheap 'fix':

The connector has support bracket AHH6938 with spacer AHH6247 underneath. The bracket prevents the connector twisting as the hose and pipe nuts are slackened/tightened. However that does make for quite a convoluted route to go through the hole in the side of the tunnel when there is a grommeted hole almost immediately behind the connector, used for the heat control here: (*MGE*)

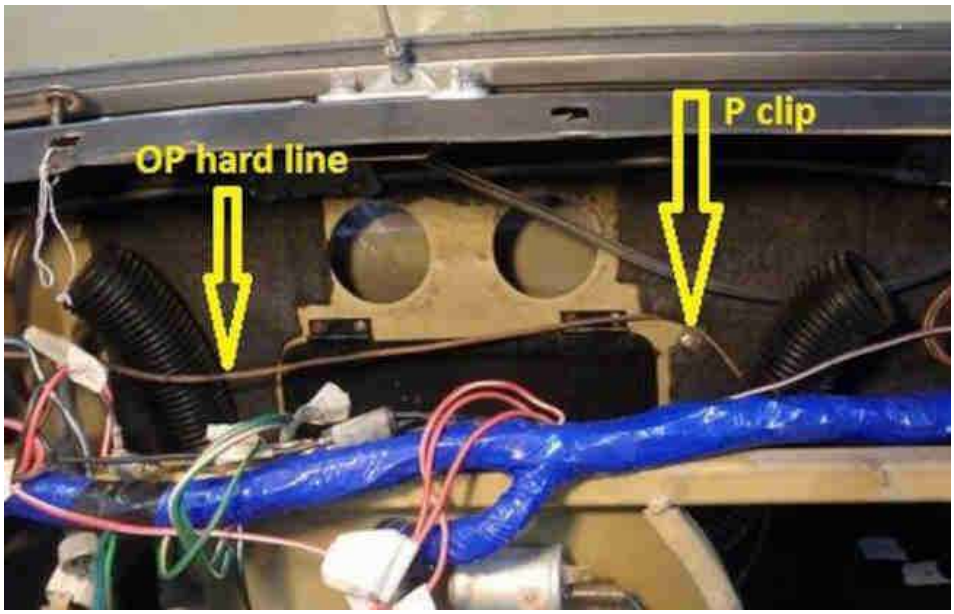


Unlike mine that shows the connector on the heater side of the screw, but other pictures including several in Clausager show the same with another P-clip for the temp gauge capillary on the master-cylinder side of the screw. This looks neat and lines up both for the grommeted holes in the heater shelf. In this image it's not clear but the oil pipe may be going through the same grommet as the heater cable: (*MGE*)



I was only aware of one P-clip on the capillary and that goes on the lower heat valve screw (not the upper one as in the same image). Also yet more pictures show the speedo cable using that side hole, although there is one for that in yet another position in the tunnel.

On 4-cylinder cars the oil gauge pipe has a P-clip in the cabin, on CB cars near the top right-hand corner of the cold-air flap as shown here: (*MG Experience*)



And on RB lower down and further to the right as here: (*Charles9, mg-cars.org.uk*)

V8s have a different route along the top of the inner wing with a P-clip to a starter relay fixing screw and into the cabin above the main harness. With a longer run behind the dash there seems to be (by touch) a P-clip above the steering column, and my 75 i.e. RB temp gauge capilary has a P-clip in the CB 4-cylinder oil pipe position, not the RB 4-cylinder position.

The North American connector with the tapping for an oil pressure switch:

New Teflon-cored hose, North American connector with pressure switch fitted, and new gauge pipe:

Installed:

Note the original connector support bracket is not fitted as I have something else mounted using the same screw.

Standard connector modified to take a switch:

Warning light unobtrusive ordinarily ...

... but very obvious when illuminated, compare it to the ignition warning light which is also on. I did intend to fit the orange version, my local Maplin were showing two so ordered one and trooped down there to be told they couldn't find them! I'm not paying postage on a 99p item, and happened to have a red one to hand, so that's what went in. Subsequently bought one and they are indistinguishable from red!

After-market warning lights modified with superbright LEDs: Visible from the driving seat, off ...

... and on in bright but not direct sunlight:

However less visible in low direct winter sun - off on the left, illuminated on the right. Maybe a cowl? They are angled towards the driving position:

V8: Hose to oil pump at the front of the engine:

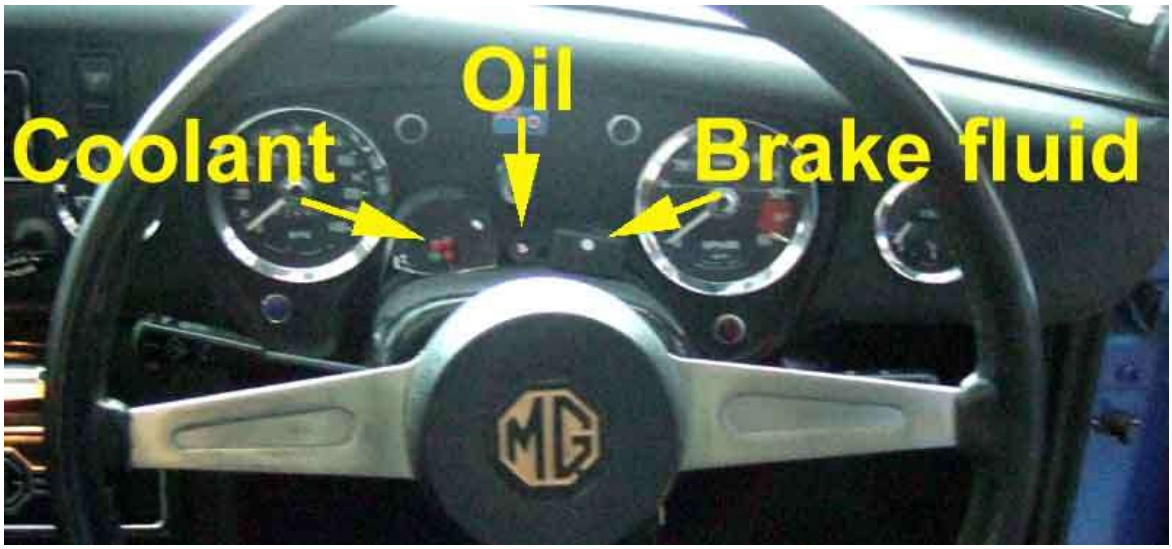
3-port connector and oil switch on the inner wing:

2-port connector by the starter relay to eliminate the original short section of hose between two pipes. This needed a blind fixing as it goes into the box-section behind the panel:

The pipe goes through the bulkhead above the main harness:

Then across behind the dash and over the wiper box (yellow arrows). There may be a P-clip above the steering column (white arrow):

As sunlight masking it is not such an issue in the GT, and I happened to have a high-brightness orange LED to hand, I fitted that in the same position as the original 'OD inhibited' warning light on the roadster, between the coolant and brake fluid level warning systems, rather than messing about getting a pukka 'oil warning' warning light and swapping the LED as I had for Bee. Not terribly elegant, really all three could do with being pukka warning lights in a mini console, but that's quite a big job. If I could have got a coolant level warning to match the brake and oil warning versions that are available, I'd have been tempted:



Hopefully won't miss that, the ignition warning light is lower right, and the 'coolant OK' green LED immediately to the left:

Not a pretty sight physically though, and winter 2018/19 gives me plenty of time to ponder options for improvement. Car Builder Solutions have a huge range of warning lights and I had used brake and oil with logo and simple black bezel for Bee. None with a

'coolant' logo though but I can use plain red and green as I intend to keep the same green for good and red for bad as now. Somehow I ended up with plain orange for the oil, and although they are £4.80 instead of £6.40 for the one with the logo, when buying four surely not even I'm that tight! As before the supplied LEDs aren't really bright enough even for the GT, so again I pick the lens off all of them except the green for the coolant as that is the only one that will be lit when driving, and swap them for high-brightness versions - the most effective being 'water-clear' types that only show colour when lit such as these from RS Components, rather than those with coloured bodies, although even those aren't quite as bright as the ones I used to be able to get from Maplins. The wires on the LEDs are bent to an angle then little springs push onto those, the other end of the springs fitting over internal spikes from the spade connections on the back, so it's not that big a job. They do contain tiny resistors as well, I use alternatives matched to the characteristics of the LEDs I'm using, and as they are physically bigger I splice them into the flying leads going back to the modules. As it happens two out of the four didn't work out of the box anyway as one of the springs wasn't seated correctly.

At 23mm dia a housing can be made that just fits under the instrument light dimmer, which can still be turned, not that I ever do. Make a former in card, then transfer that onto the inevitable black plastic square-section drain-pipe, cut out, and bend with a heat-gun. The flat panel for the lights is easy enough, but the housing is quite tricky to bend neatly due to its small size, and ends up not as good as I would like. As the coolant warning has been a bit erratic sometimes showing red at switch-on then changing to green as it warms up, probably because the calibration is not quite right and I've had to alter that once before, I design a new circuit using an op-amp (instead of discrete transistors) calibrated for the practical resistances encountered from the sensor, and include a self-check flash of red but without the beep of the brake sensor. Fit that into another little Hammond enclosure like the brake, with external wiring for the warning lights, supply and sensor. I also remove the LED from the brake module and extend that on wires to its new warning light, then slot all four into the housing and tuck the housing under the dimmer control. Reconnect to the existing wiring behind the dash, and all works in a garage-test, although with a holiday and salt on the roads since it still awaits an extended test.

All off ...

Normal running:

Full son et lumiere:

Oil Hoses

Hose supports clip AHH8300 and strap AHH6864 used on Mk1 cars: *Clarke Spares & Restorations*)

Rubber strap and hardware clipping the two hoses together for support as below: *MSC Parts*)

Cooler hoses going through the wrong holes

Undoing the cooler hose fitting: Spanners on both the cooler hex and the hose fitting hex, in such a way that squeezing the two spanners towards each other applies all the force to the hose fitting in the 'undo' direction, and little if any to the cooler port itself.

Reputable supplier and standards info, something you wouldn't know with braided.

Despite claims to the contrary there is no way these hoses could be pushed through the grommets AHA8401 if the grommets had been pre-fitted to the radiator diaphragm panel. Even split they are very difficult to fit and remove with the hose already in the panel, although the new hoses being smaller make it slightly easier.

Cooler hose routed above the gauge hose, giving better access to the distributor cap ...

... albeit closer to the filter than before.

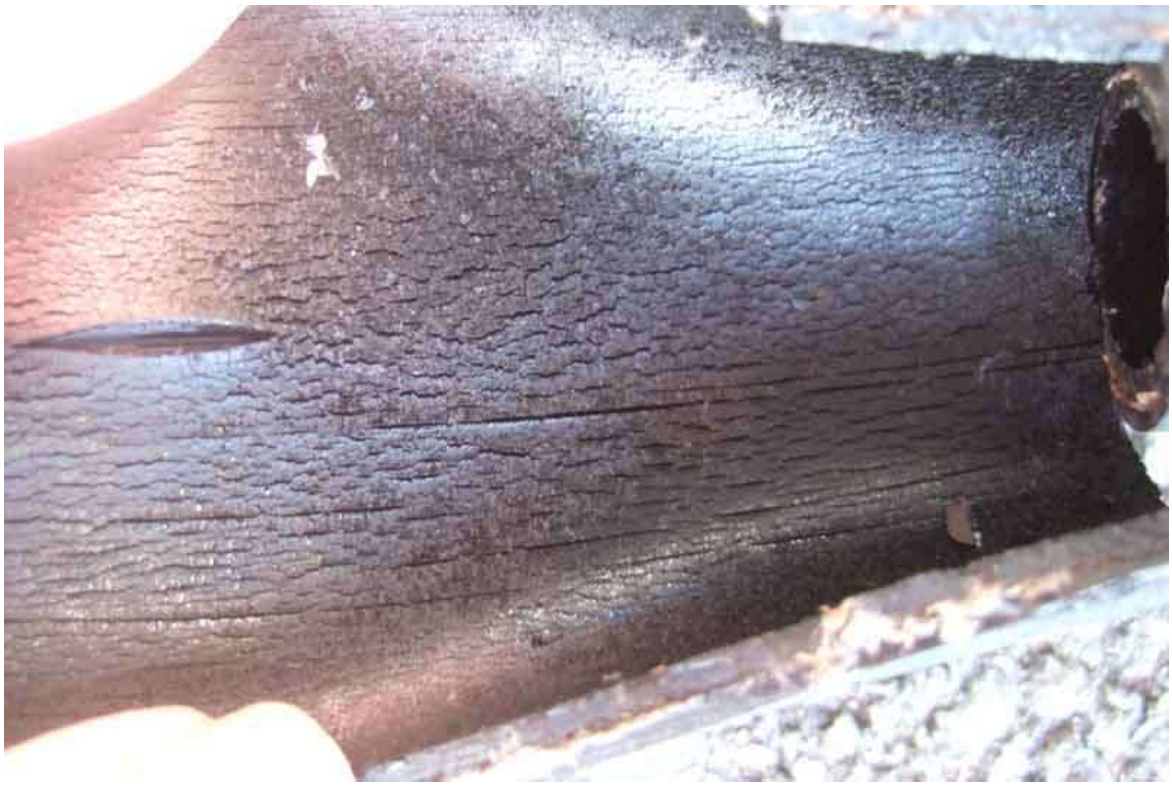
Plenty of clearance to the inner wing though, lack of which caused the problem with the original filter adapter, and had dented the panel (circled) on a bend, which is a lot stronger than a flat panel.

Bead of oil from the source of the leak ...

... which when wiped away is indistinguishable from the very fine crazing over the general area.

Internally looks ok ...

.. until slit lengthwise and opened out, then a lot of fine cracking (the long cut is from the blade I used to slit it) - worse then the external crazing.



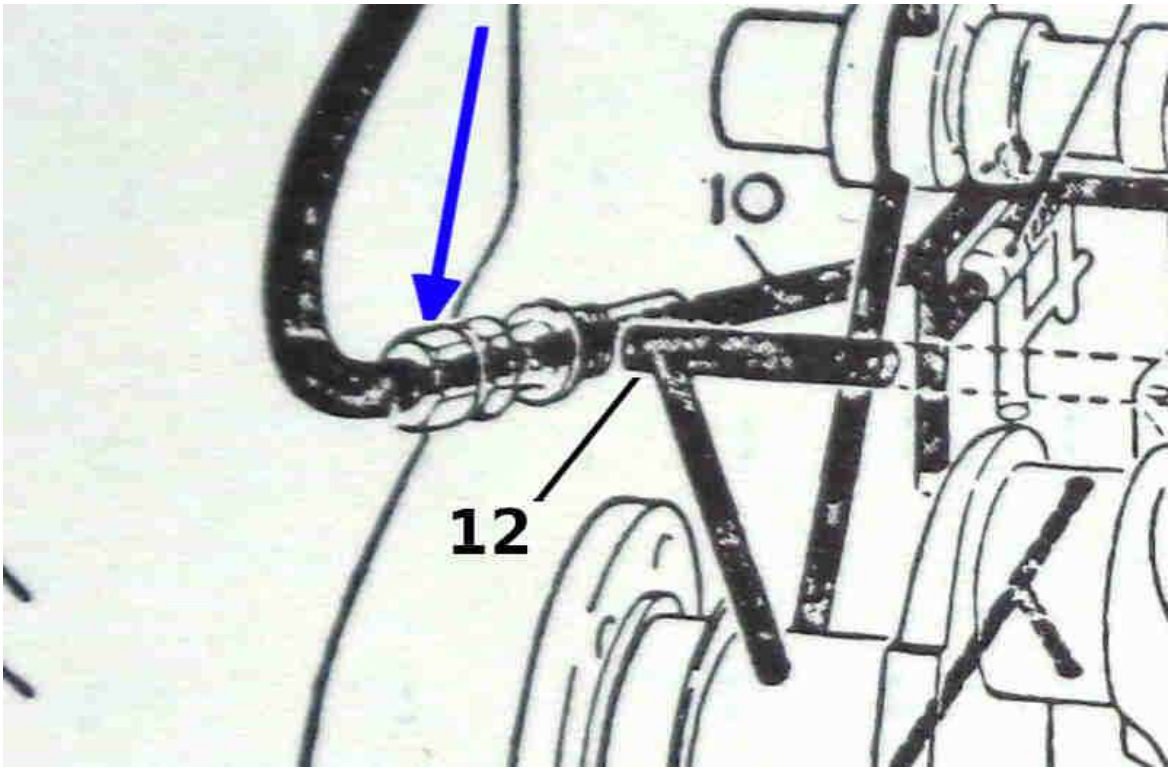
Markings on the long hose (not the failure), indicating it had perhaps already been replaced. No markings on the failed hose, perhaps original.

Oil cooler bypass hose from Rimmer (also Moss Europe and Mossmotors.com):

Oil Pipe Block Adapter

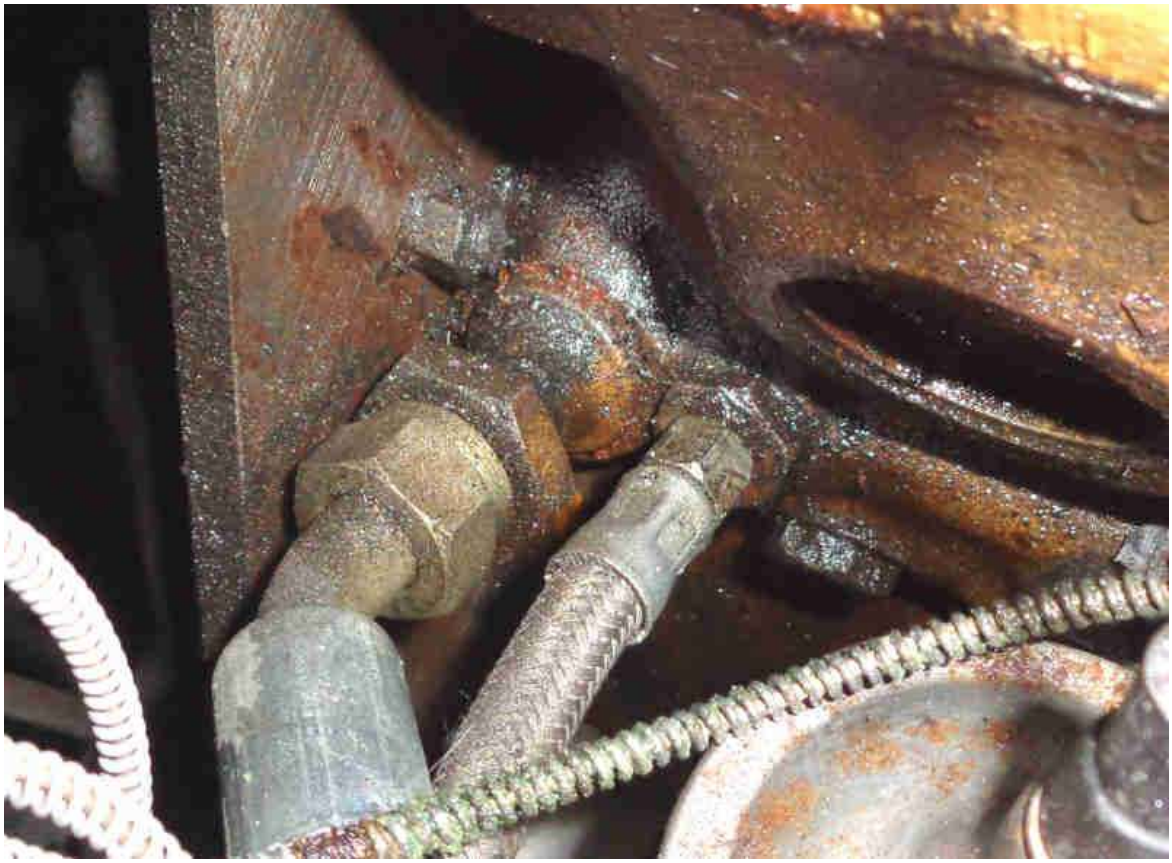
'Full-flow' oil pipe adapter 1H922 as pictured by a number of suppliers. Note this type stands the cooler hose thread away from the block by about an inch: (*Motaclan/Leacy*)

Adapter 1H922 (arrowed) screwed into the block with the spigot projecting into the oil pump gallery (10), isolating it from the main bearing and oil gauge gallery (12) ensuring the oil flows through the filter and cooler (where fitted) before it reaches the bearings:

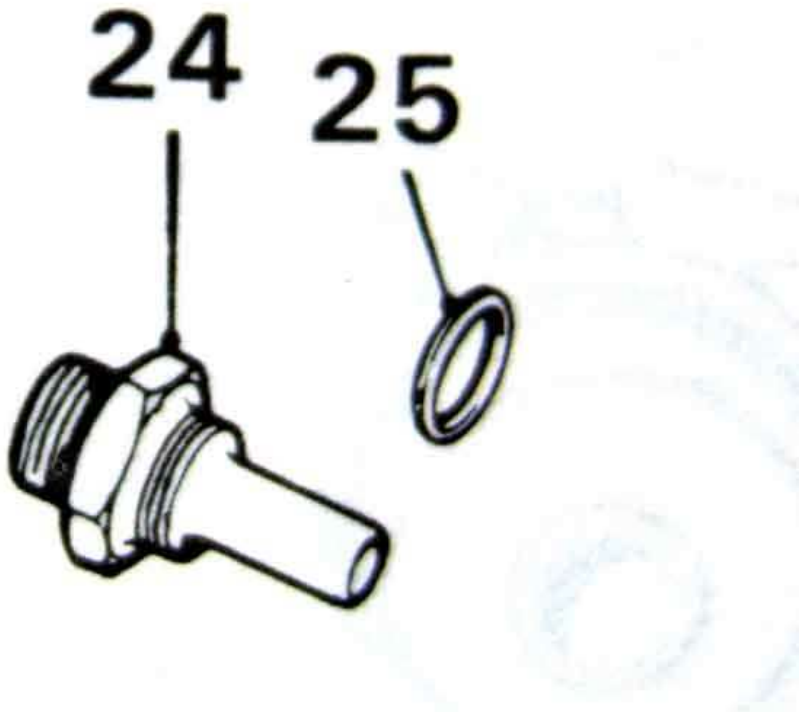


An alternative adapter pictured by NTG for the MGA (and others) and found when Googling 1H922, although NTG list it as 'B034'. This one has the cooler thread close to the block. Also the identical photograph is shown on another NTG page found by Googling 1H1291, but unlike 1H922 that part number is not referenced anywhere else: (*NTG Motor Services*)

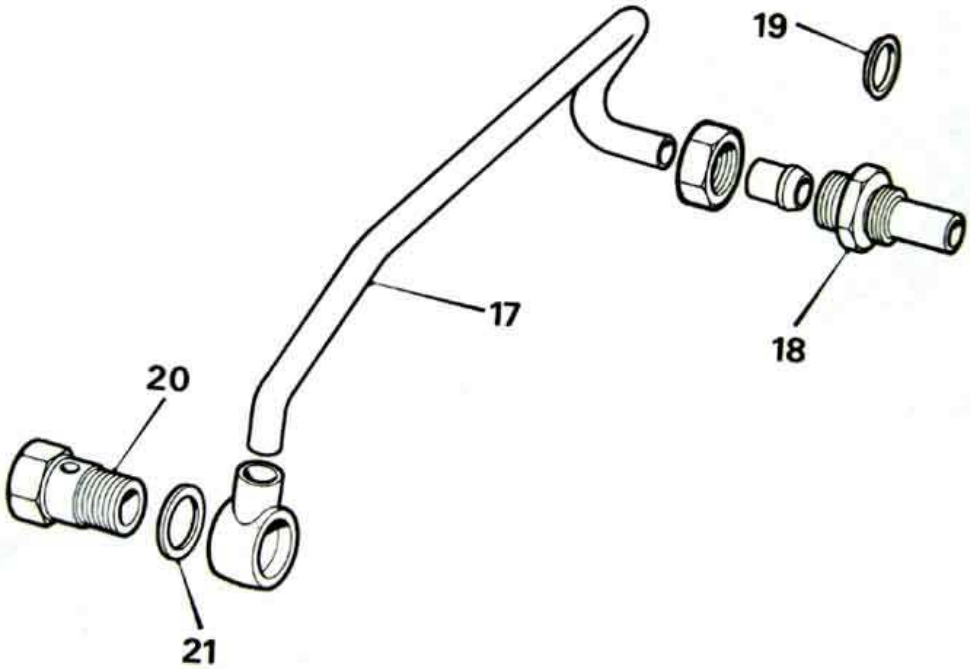
The 'stand-off' type allows a spanner (and maybe a socket) to be used on the adapter without fouling the back-plate nut that is close by, or the oil gauge adapter (it's amazing how oily an engine seems to get even when it doesn't drip ...):



The drawing in Parts Catalogue shows the same shape as the NTG item, and with the 1H922 part number. However drawings are only representative and are often carried forward from a previous version without being redrawn even though the part number has changed: (*Parts Catalogue*)



Parts catalogue drawing of direct pipe 1H1056 showing a separate ferrule of 'olive' that could be soldered further back from the end of the pipe to leave a spigot that would project into the rear gallery to largely seal that off from the main-bearing gallery. This would need plain adapter AHH6701, although a 'full flow' adapter is shown with it:



'Direct' pipe 1H1056 with the fitting right on the end of the pipe, requiring a 'full flow' adapter: (*NTG Motor Services*)

'Direct' pipe 12H4259 ditto: (*MGE*)

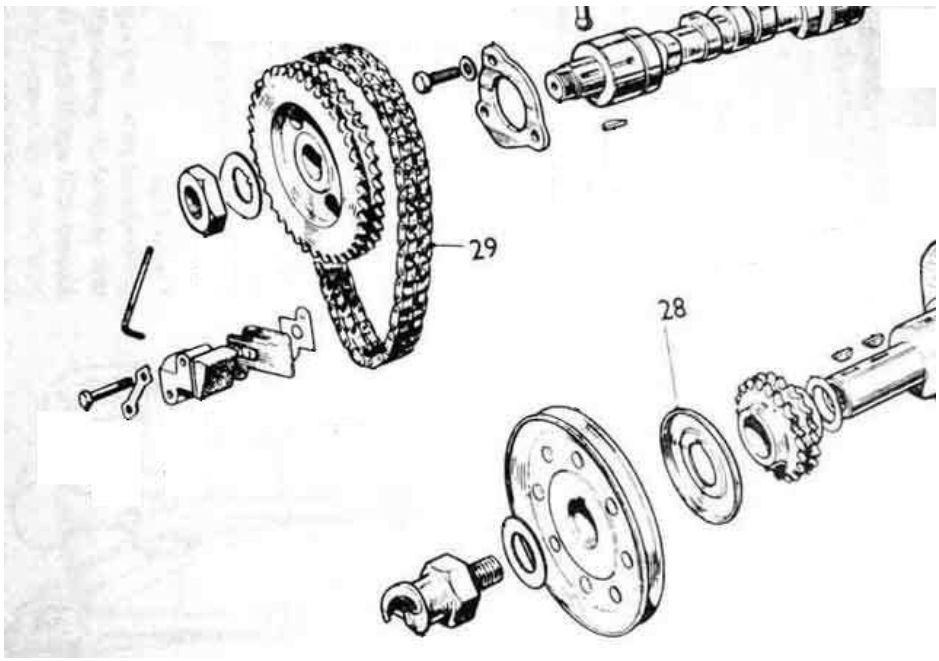
'Direct' pipe 1H1056 with adapter 1H922 attached: (*MGE*)

'Plain' adapter AHH6701, used at the filter adapter for the return hose from the cooler. However Motaclan/Leacy show a quantity of 2 which is incorrect, if this is used in the block with a cooler hose then the majority of the oil will bypass the filter:

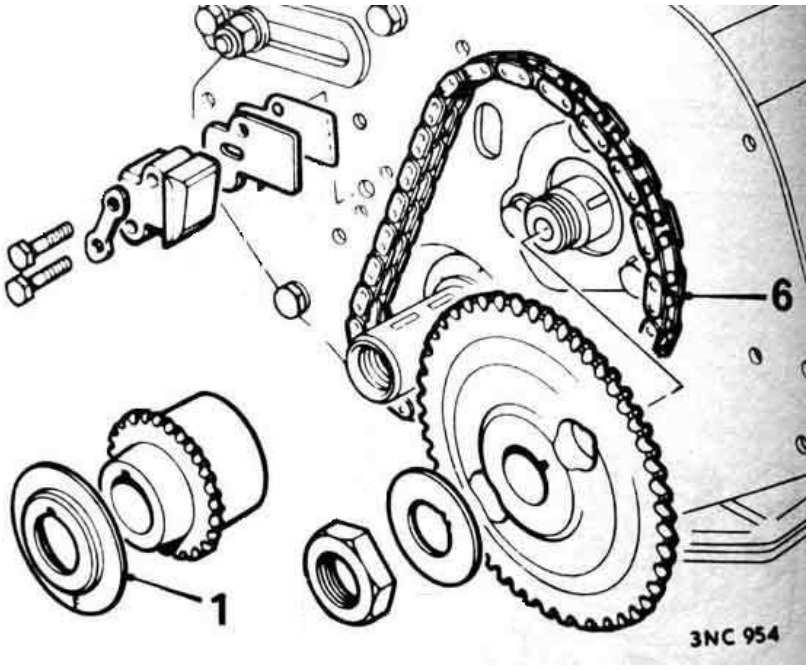
The picture on the left could be showing a stand-off 'full flow' adapter, the one on the right does not seem to be a 'full flow' adapter of either type. Both pipe unions appear to screw into the adapter, rather than on to it which would be the case with either of the 'full flow' adapters pictured above. Unless there is a spigot projecting into the oil pump gallery the majority of the oil will bypass the filter. The left image is of a 'homebrew' fitting of a spin-on filter adapter to an MGA from Barney Gaylord's pages. The right image is from Willy Revit in Tasmania and is said to be of an engine from a UK 1976, in which case someone has removed the oil cooler fitting (according to Clausager all five-bearing MGB engines had the cooler) and substituted a direct pipe using an unknown adapter:

Oil Thrower

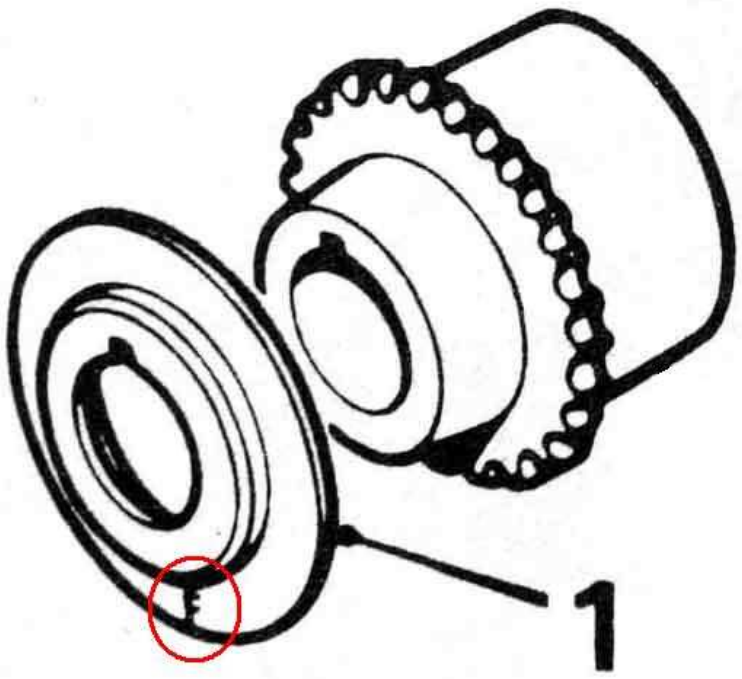
The early double-row timing chain (29) with the concave side of the thrower (28) facing away from the engine (these and the following images from Leyland Workshop Manuals).



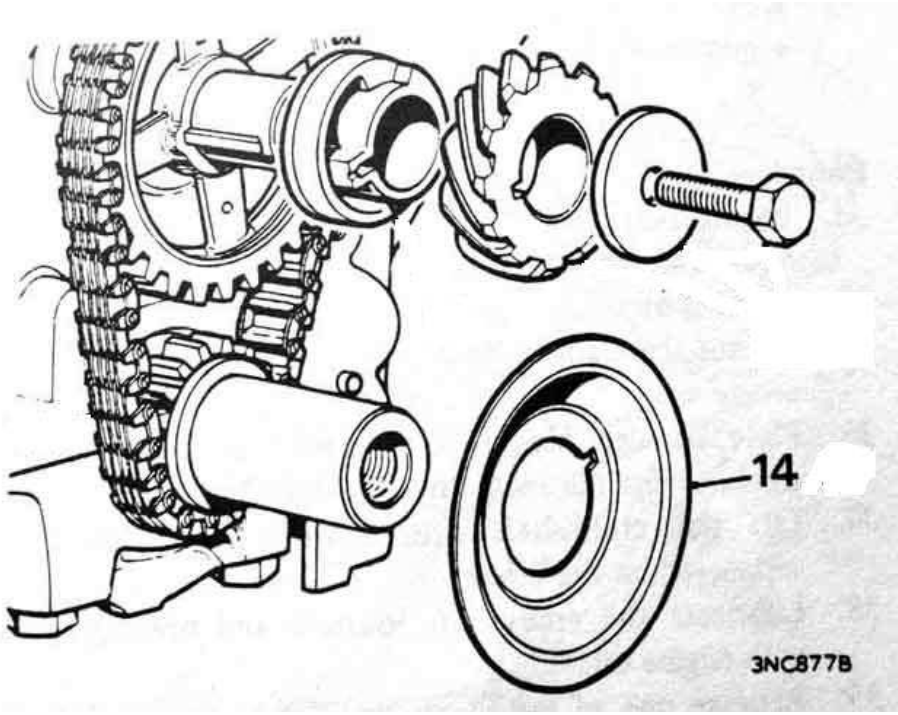
The later single-row chain (6) with the thrower (1) facing towards the engine.



Detail of the thrower showing the 'F' (circled) stamped on the side that faces away from the engine, reputedly on the appropriate side of the earlier thrower as well.

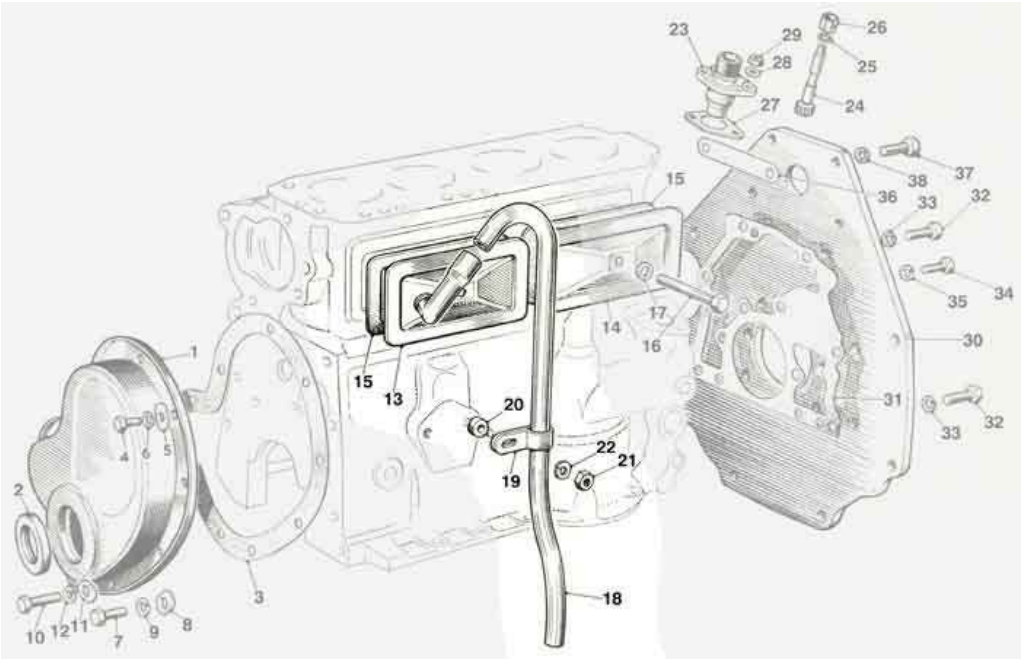


The V8 thrower (14) facing away from the engine, I can't recall if this is stamped with an 'F' or not, the text of the manual doesn't mention it.

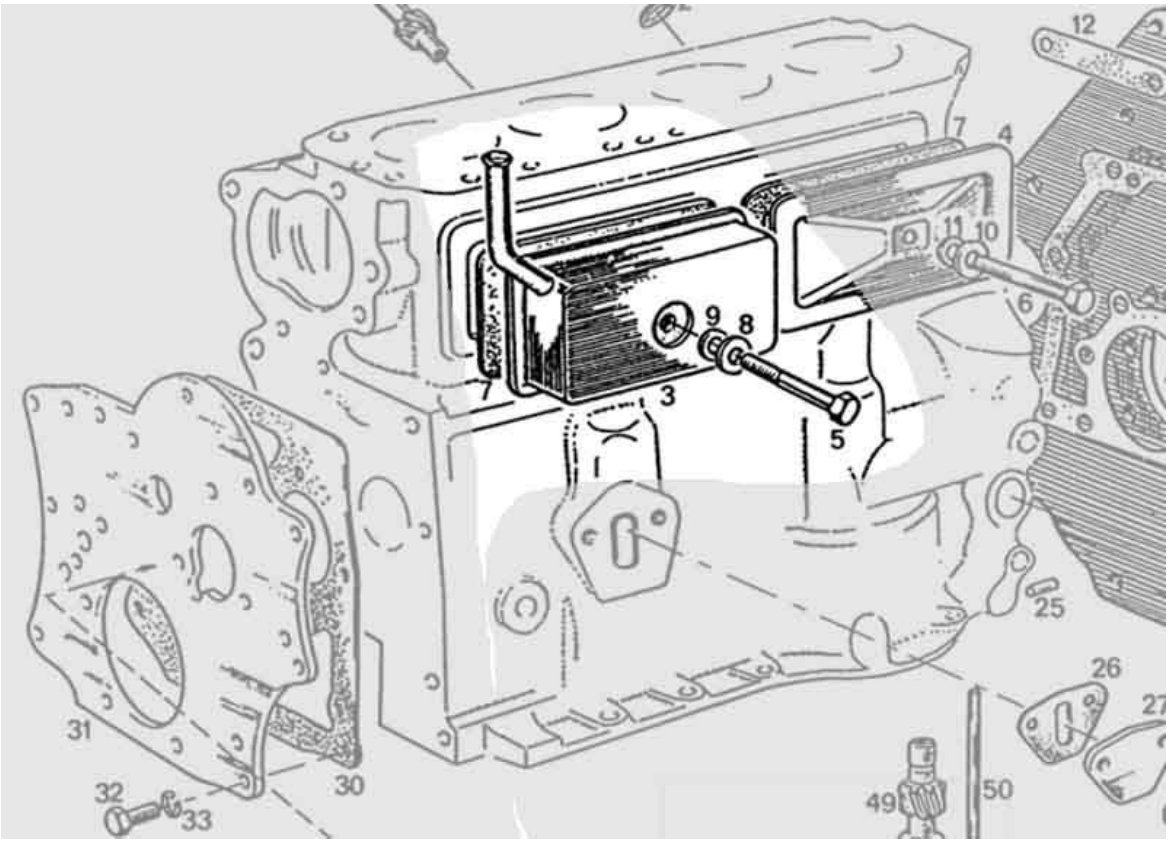


Engine Side Covers

Early unrestricted and unfiltered cover 12H950 for the 'road draught tube' used on non-positive ventilation systems. (*Auto-Part.com*)



Cover with internal filter and oil separator 12H1399 for PCV-ventilated systems. (*Moss Europe*) However despite the drawing showing it as being box-shaped one corner was flattened as per the top one here.



Cover with external filter and separator 12H3684 used when carburettor ventilation was introduced with 18GG engines (69 model year), and used until the 18V779/780 engines were introduced during the 74 model year. However the Parts Catalogue states that rebuilt engines used the cover below, as is the case on Bee's Gold Seal engine. *Image from William Revit in Tasmania via the MG Enthusiasts forum.*

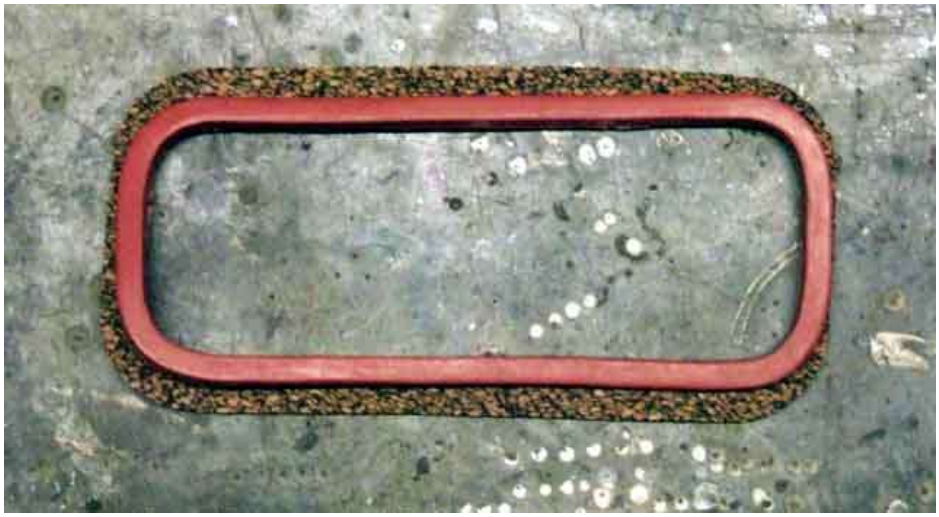
The later front cover 12H4395 ...

... with internal oil separator/flame trap steel 'pan scourer'. However at least one person has found this resulted in excessive oil burning via the cover and replaced it with the earlier PCV version 12H1399. With one corner flattened and the opposite corner changed in shape as per the lower one here.

12H1399 above, 12H4395 below. (Chris Howells)

12H1399 above, 12H4395 below. (Chris Howells)

Rubber gasket quite a bit smaller than cork



It's possible the rubber would stretch to fit the front cover, but it would be very difficult to keep it in place. The cork is an easy fit, but note how it has to seal against a 'rippled' surface where the inner and outer plates have been attached together. Note also the very long bolt, cup washer and rubber bush. The pre-September 76 Parts Catalogue indicates a copper washer (or two) was used here with only this cup and bush on the rear cover, the September 76 on catalogue shows cup and bush being used on both covers. My 1973-spec Gold Seal engine had them on both.

When fitted the bush is pushed into the cup washer, and compressed as the bolt is tightened. The bush wants to squeeze outwards, but is constrained by the cup, so squeezes onto the bolt threads instead, as well as being pressed onto the face of the cover.

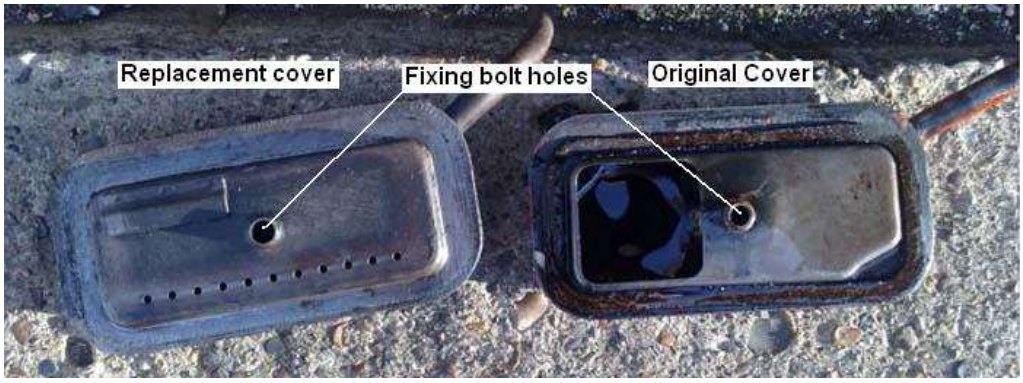
The cork gasket would never fit the rear cover, being too large and thin to fit in the channel. As it is the rubber gasket is slightly too small. This has a flat face and a slightly rounded face, the rounded face fits in the channel.

Lightly clamping it in place overnight stretches it. Note the round-edged pieces of wood so the face of the gasket isn't distorted.

When the clamps were released the gasket stayed in place, but leaving it unclamped for a while allowed it to regain its former size and pop back out.

Oil burning via the breather: Adam's original (12H4395) and replacement (12H1399) covers. The strip of metal near the top left corner of the replacement cover is positioned over another set of holes. I suspect these are nominally the inlet, with the strip of metal acting as a shield preventing oil running down the walls from trickling in. The holes at the bottom draining any oil mist converted to liquid drops by the wire wool.

If you have the problem and can't lay your hands on one of these alternative covers it seems to me you could weld a plate over the hole and drill your own holes along the bottom, although I'd remove the wire wool first, drill the holes in the right-hand half of the cover and be sure I had got all the swarf out, replace the wire wool, cut the plate to size, drill that before welding (to keep swarf out of the cover), then weld it to the cover. Or maybe weld a plate over the hole leaving just a narrow slot at the bottom.



Peter Donlan's neat catch-bottle installation

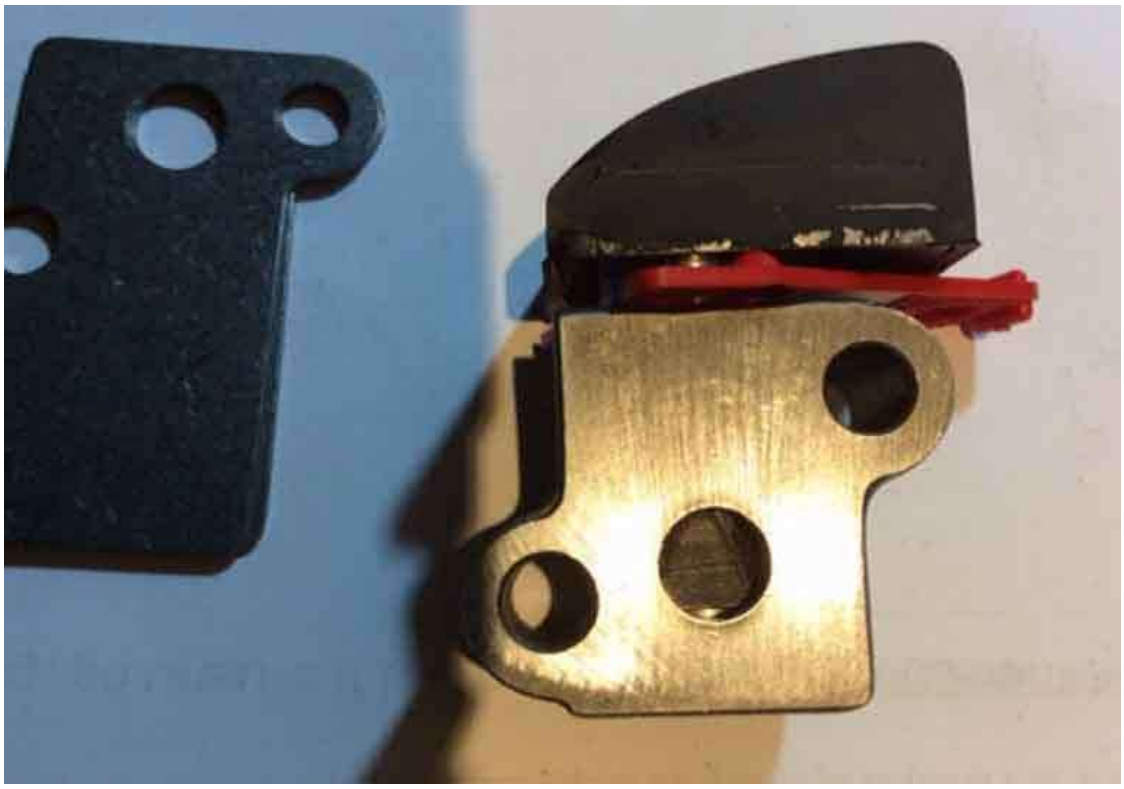
Timing Chain Tensioner

The Rolon item with the Allen key bolt, and the slipper pad the same size as the slipper base:

The Renold item - no Allen key bolt, and the slipper pad goes over the ends of the slipper base. However the Renold name is stamped in the reverse direction to mine and would be upside down when fitted:

Another Renold item with a location dowel in the oil supply port, and plastic shipping spacer which is removed once installed with the chain. Also showing the spacer plate for use with single-row chains, and the gasket, which all tensioners should be supplied with:

Peter King's advertised as 'Not Rolon', but with the large oil feed hole instead of the drilled dowel:



More worryingly (despite the plastic shipping spacer) no makers name at all, and the face showing it may have been ground off:

This looks like a failed Renold item from the part of the name that is visible, and the slipper pad overlapping the ends of the backing. The slipper pad has come off the backing and allowed the backing plunger to come out of the body, potentially very damaging if it happens at speed. However the identification marks are upside down and the overlap is triangular rather than rectangular as with the Renold item above:

A Rolon item with the plastic shipping spacer, same length slipper pad as slipper base, and obviously no dowel on the back:

An alternative design, this from Denis Welch Motorsport at Â£130, even more expensive from SNG Barratt and SC Parts:

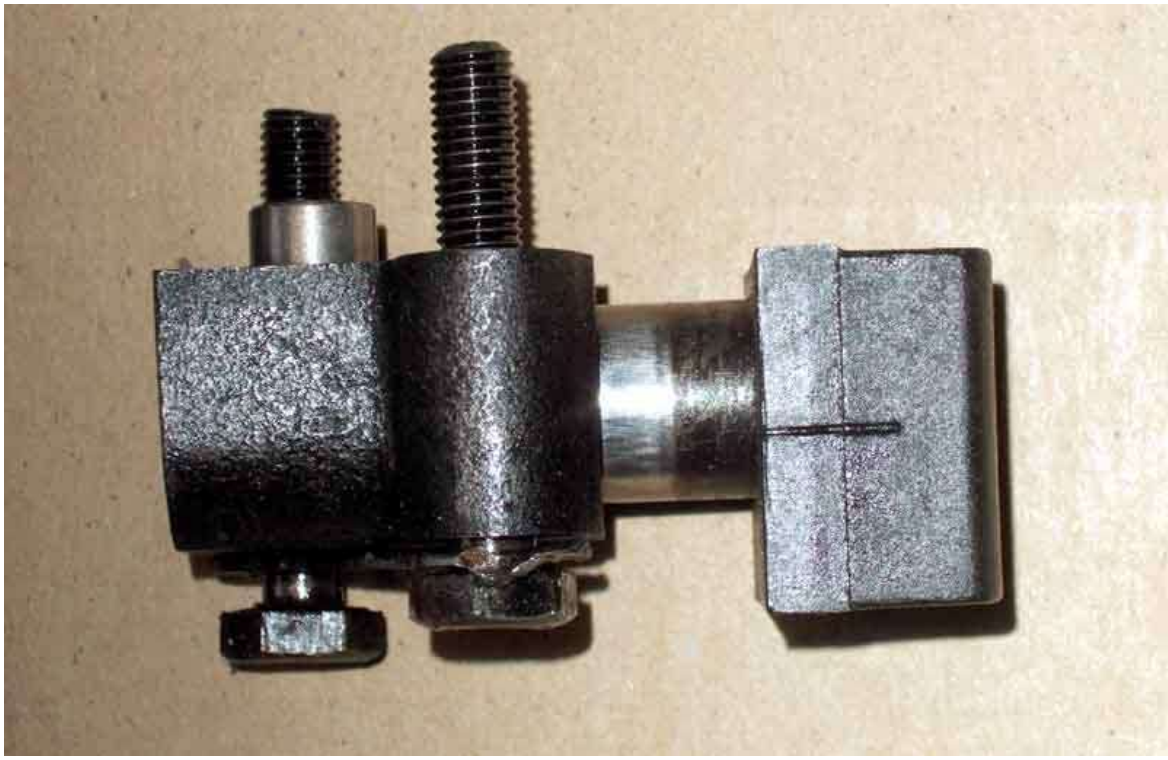
NOS BL slippers can be substituted for those that come with Rolon tensioners:

Bee's tensioner before removal ...

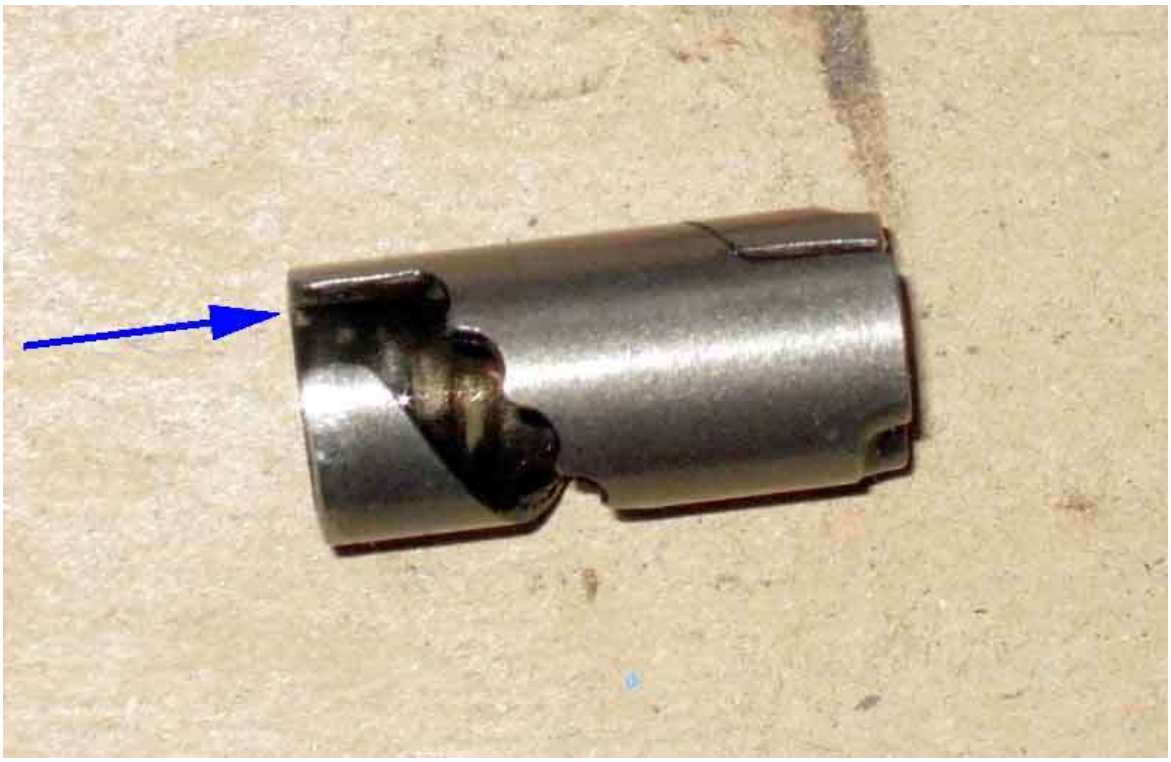
... Renold type - name under the lock-tab strip, no Allen key bolt, oil-way dowel on the back but with a smaller hole than above:

Slipper pad fully overlapping the ends of the slipper base:

Note the piston is offset behind the slipper pad, which puts it slightly offset one way to the single chain and slightly the other way to the duplex, so only one tensioner is needed for both types of chain:

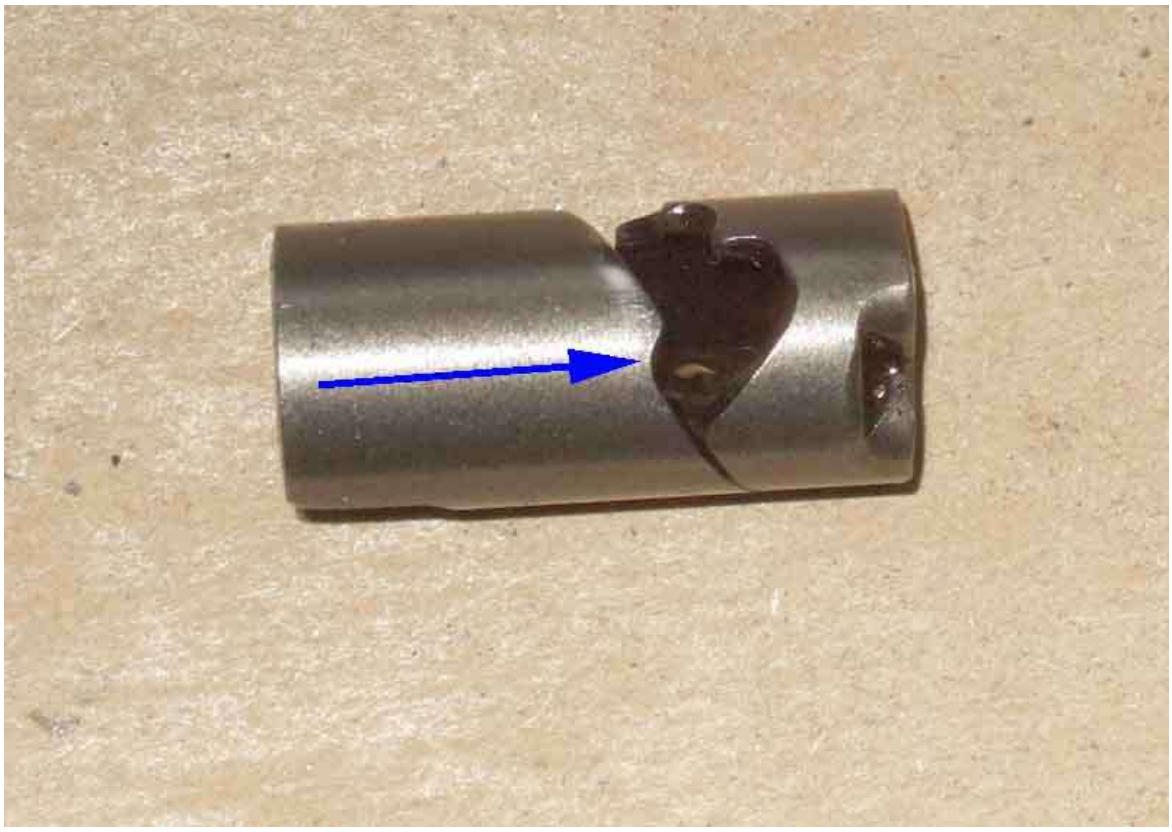


Stepper mechanism with entry slot arrowed ...



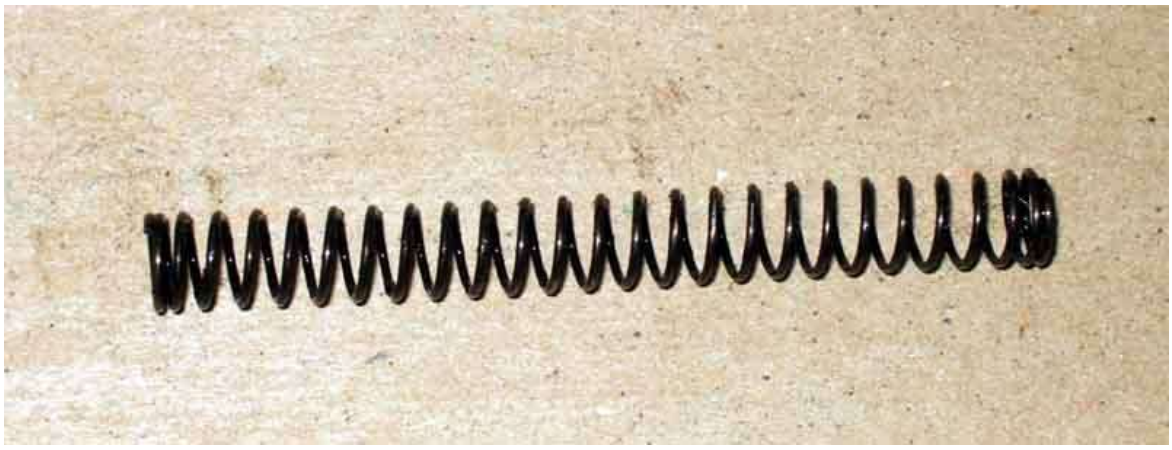
... limit teeth along the helix ...

... recess to lock the mechanism in position for installation ...



... and slot so the mechanism can be pushed and twisted into place with a screwdriver against spring pressure.

Spring ...

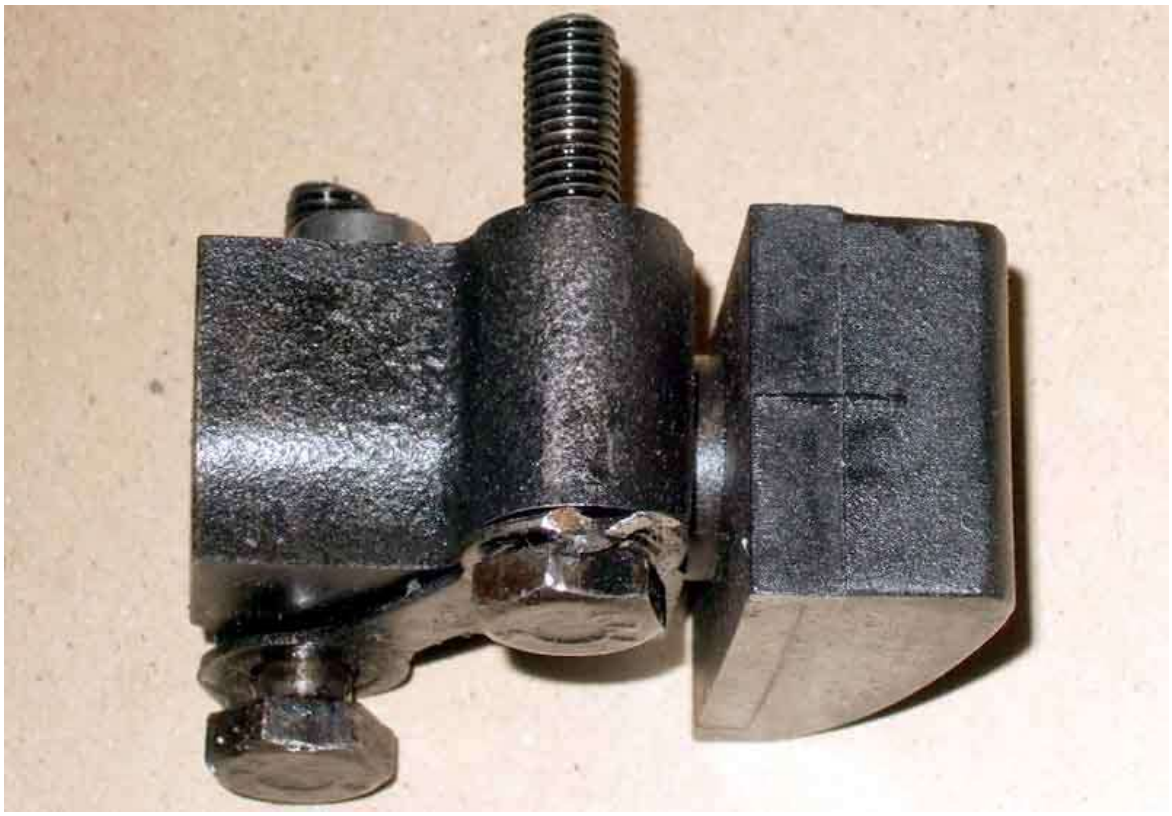


... peg (A) that passes through the entry slot and latches behind each tooth, and chamfer (B) to direct oil from the inlet to the open end of the tube on the slipper:

Slipper pad barely worn, with hole through from piston to lubricate the chain:

Reassembled - mechanism and spring fitted ready for insertion to body ...

... and slipper fully inserted ready for fitting to engine. Once mounted push the slipper back the remaining amount and it will pop forward to tension the chain. If you push the slipper back any further **before** mounting, the mechanism will rotate and the peg move from the locking position into the helix, and the slipper, mechanism and spring will fly out:



Timing Chain Tensioner - Triumph Dolomite thread

The following words and pictures have been extracted from the above thread:

1. I have a Jaguar one (Renold). This one has a small hole on the body and no hole on the slipper pad.

2. The one fitted to my car and removed was a Renold with no locating dowel and no visible hole on the slipper pad. It must have done some mileage before I stripped the engine down with no issues.

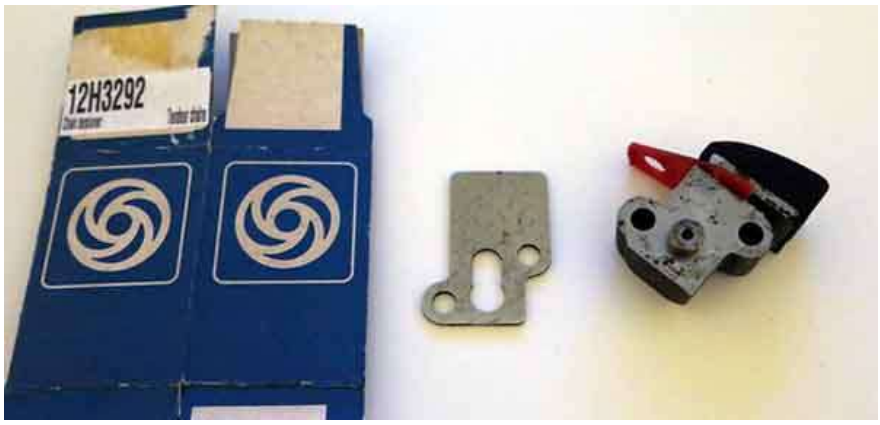
3. I also purchased another Renold one a year or so ago, again a Jaguar one. This one has a locating dowel and the slipper pad also has a small hole in it.

4. Have a look at the side of the piston under the slipper pad head. On the ones without the hole in the slipper pad, you should find a very small hole. I suspect this has two purposes. It provides an bleed for the oil feed preventing air locks and also an oil supply to the chain.

5 ..Just out of curiosity I ordered the EAC3629 one from BritshParts and this is what came, they show the part number as superseded (to C37717LG). Its flat on the back with no dowel. Doesn't look too bad though and its says Made in France on the box:

6. Update: Leacy Classics 12H3292 just arrived:

7. Here you go, this is an original 12H3292 it has a dowel and hole in the slipper pad:



8. The other crucial thing with these is how does the ratchet and spring bit work. e.g. if the internal peg breaks off on the ratchet bit then the tensioner will go loose with no oil pressure..... Surely not .....its not hydraulic, is it? The conclusion was that it was partially hydraulic I think, or should be....and the ratchet stops it rewinding as you your good self pointed out....and convinced us.

9. I purchased a genuine Jaguar tensioner, EAC3629 (Land Rover box, made in France) from SNG, strangely the manufacturer data looks like it's been machined off. Like others that have posted, I found it had no dowel and a large oil feed hole at the back, I was worried this could starve the head of oil so I pulled it apart to look at it's guts. I was very disappointed to find a very small pin hole oil bypass in the shaft, just like the later Renold ones. The 'lube' hole that goes through the rubber pad does not go all the way through the metal at the back. I'm glad I checked this as I'm sure many people buy these tensioners in the hope that their chains would get a direct oil feed, instead it just dumps the oil to the sump. Why on earth would they manufacture it like this, makes no sense to me. I did email SNG but they didn't bother replying. As if I wasn't in a bad enough mood after loosing a valve shim somewhere down my new engine:

10 Thanks. I looked at my options today and bench tested with the front cover off, it's surprising how much oil comes out of that tiny hole in the tensioner shaft. I'm going to use my old Renold tr7 tensioner body (with dowel) and fit the pad from my Renold sprint tensioner. I think the oil will squirt on the chain when it stretches a bit and the slipper moves out, so a hole in the pad isn't essential. At least I have confidence in the Renolds unlike the thing SNG sent me. At least the missing shim didn't make an appearance and cause damage, I'll worry about that later.

11 The hole in the shaft will lube the chain before it makes contact with the slipper, this will happen more and more as the slipper moves out over time as the hole is just behind the slipper pad. Not sure if drilling an extra hole would mean less oil getting to the head, I'll have to work that one out. Having tested by spinning the pump with a drill and seeing a large amount of oil squirting out of the tiny pin hole I would say that the standard Renold setup should be fine.

12 My point about the genuine Jaguar ones was that it's very easy for most of us to see a hole in the pad and just assume that it goes all the way through, how many actually pulled it apart to check before fitting it? However, it does have a pin hole behind the pad just like the Renold one, so if I had fitted one I wouldn't worry, it's probably no better or worse than any of the others available. I wouldn't chance drilling a second hole in the pad though, there's plenty oil there as it is and the head needs it more.

13 Nice. Same as mine but no hole on my pad although mine has the back-plate with limit stopper, which I like for obvious reasons. :) And yes it should splash the chain before it hits the pad, when the chain stretches there will be a kink in it as the tensioner pushes it out, so an oil coating is unavoidable. When I bench tested the engine there was oil spewing out of it just turning over with a battery, so with the engine running the chain must be getting a right soaking.