TUNING BY THE NUMBERS: BREATHING, FIRE, FUEL
MG 2016

a nearly foolproof way to tune your MG engine

We hope to accomplish:

Learn the basics of engine tuning

Discover a consistent process

Emphasize the value of note keeping

Lower the discouragement encountered

Raise the expectations of success

Have fun

Breathing

The engine is basically a big air pump

Before fuel and ignition is added, we need compression and controlled air flow both in and out

By adding fuel and ignition, we get rotational engine power

Compression

- Compression is checked with a compression tester (duh!)

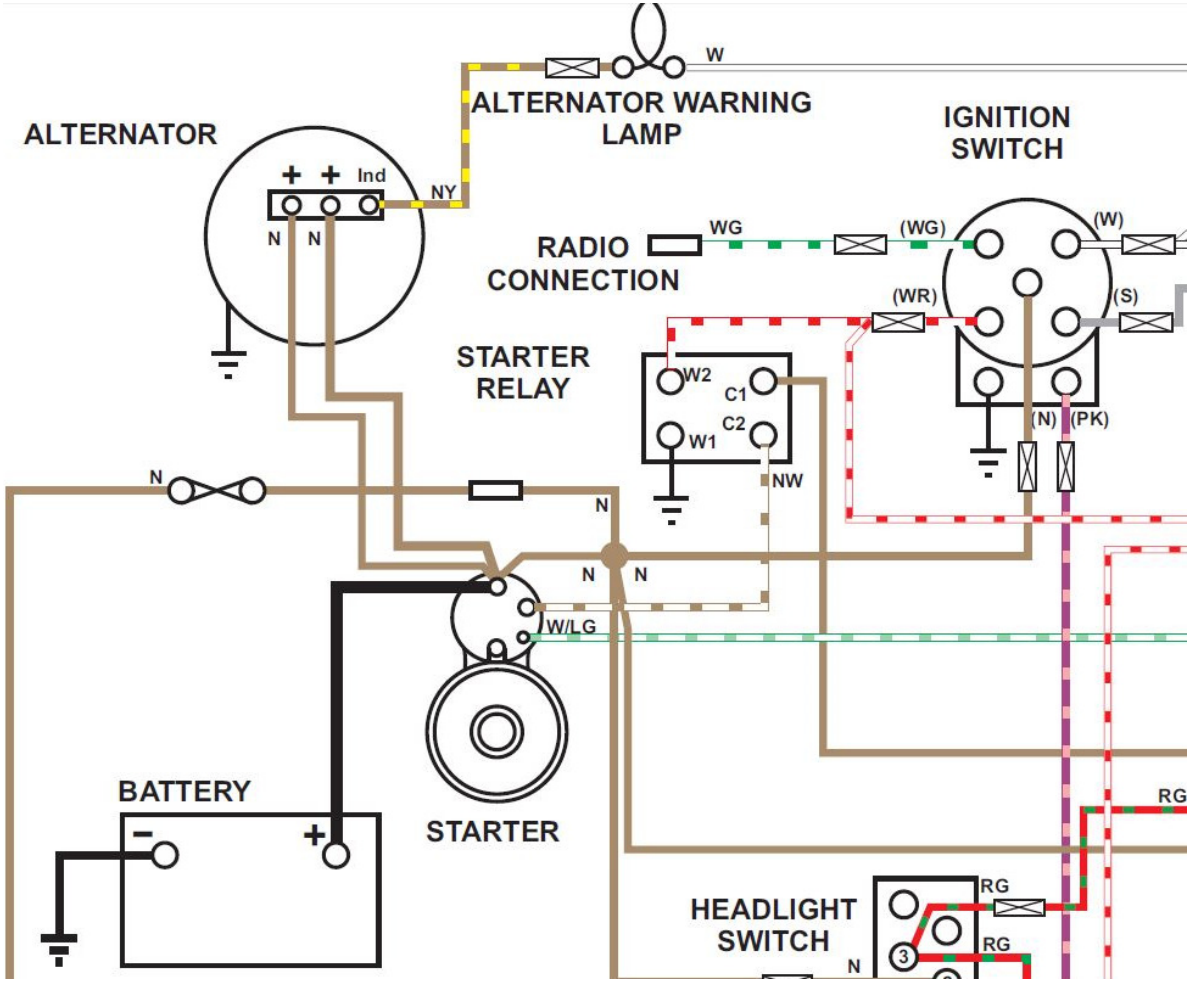
Pictures from Barney Gaylord's 'MGA with an Attitude' site

Compression

- Mark the number-one (front) spark plug wire with a piece of tape
- Remove the wires from the spark plugs
- Remove the spark plugs from the engine
- With the tester in the spark plug hole, WOT, turn the engine over six times
- Write the compression on a piece of paper
- Release the compression with the Schrader valve
- Repeat for all cylinders

Compression

- Bump start button



Compression

- Compression should be between 120 and 175 psi, depending on the model of the car and the condition of the engine
- More importantly the compression readings should be within ± 10% of each other
- 'Bad' compression may be rings, valves, cylinder scoring, a bad head gasket or other factors
- You may wish to recheck the compression after setting the valves in the next steps

Compression

- What all these numbers indicate is just how evenly each cylinder does its job moving air through the engine
- No, you can't calculate compression ratio from compression readings because of leakage built into the rings and valve overlap (nice try!)
- You can still tune an engine with 'bad' compression
- It just may not respond as well to your efforts

Valve Adjustment

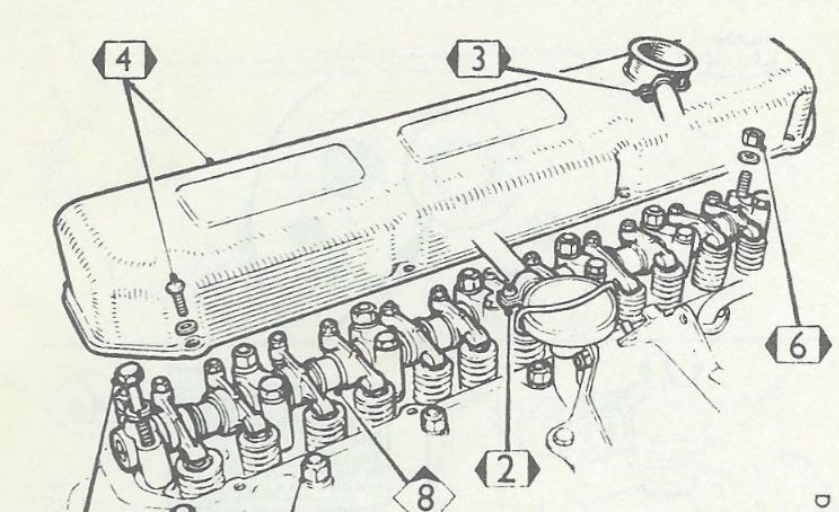
- Valves allow the air/fuel mixture to enter the engine
- The combustion gasses to leave the engine
- Seal the cylinder for compression and power
- Valve adjustment is done to cause the engine to pump air as efficiently as possible according to the cam's design
- Valve adjustment is easy to accomplish

Valve adjustment

- The spark plugs are already removed from the engine due to the compression check
- The engine is cold, if not decrease the adjustment noted 0.002 inches
- Follow the cam maker's recommendations if known, otherwise:
- Adjust the valves to .015 inches cold on any MG 'B or C Series' engine; .012 cold on MG 'A Series' engines (Midget and 1100 / 1300); or .010 (Midget 1500 Series) – Ask me about T-Series!

Valve adjustment

- Remove the valve cover, two nuts on the A or B Series engine, and relocate the heater hose; a bit more complicated on the MGC:



01.B2

VALVE ROCKER SHAFT

General tools: $\frac{1}{2}$, $\frac{11}{16}$ **A/F** [01.433]

Service tools: 18G 372, 18G 537

Removing

Valve rocker cover only, seq. 2 to 4. [01.430]

1. Drain the cooling system.
2. Disconnect hose from breather valve.
3. Disconnect hose from rocker cover.
4. Remove rocker cover.

All MGC illustrations courtesy Mike Hirschman

Valve adjustment

- Put the car in fourth gear and on a level surface, with the parking brake ‘off’
- Pull the car forward until one rocker’s adjusting screw and nut is noticeably higher than the others- that valve is fully open
- Adjust the OPPOSING rocker using the ‘rule of nine’ or the ‘rule of 13’ depending on the engine

Valve adjustment- Rule of 9

Adjust	No. 1	rocker	with	No. 8	valve	fully	open.	
,,	No. 3	,,	,,	No. 6	,,	,,	,,	
,,	No. 5	,,	,,	No. 4	,,	,,	,,	
,,	No. 2	,,	,,	No. 7	,,	,,	,,	
,,	No. 8	,,	,,	No. 1	,,	,,	,,	
,,	No. 6	,,	,,	No. 3	,,	,,	,,	
,,	No. 4	,,	,,	No. 5	,,	,,	,,	
,,	No. 7	,,	,,	No. 2	,,	,,	,,	

Valve adjustment- Rule of 13

Check	No. 1	valve	with	No. 12	fully	open	
,,	No. 7	,,	,,	No. 6	,,	,,	
,,	No. 9	,,	,,	No. 4	,,	,,	
,,	No. 2	,,	,,	No. 11	,,	,,	
,,	No. 5	,,	,,	No. 8	,,	,,	
,,	No. 10	,,	,,	No. 3	,,	,,	
,,	No. 12	,,	,,	No. 1	,,	,,	
,,	No. 6	,,	,,	No. 7	,,	,,	
,,	No. 4	,,	,,	No. 9	,,	,,	
,,	No. 11	,,	,,	No. 2	,,	,,	
,,	No. 8	,,	,,	No. 5	,,	,,	
,,	No. 3	,,	,,	No. 10	,,	,,	

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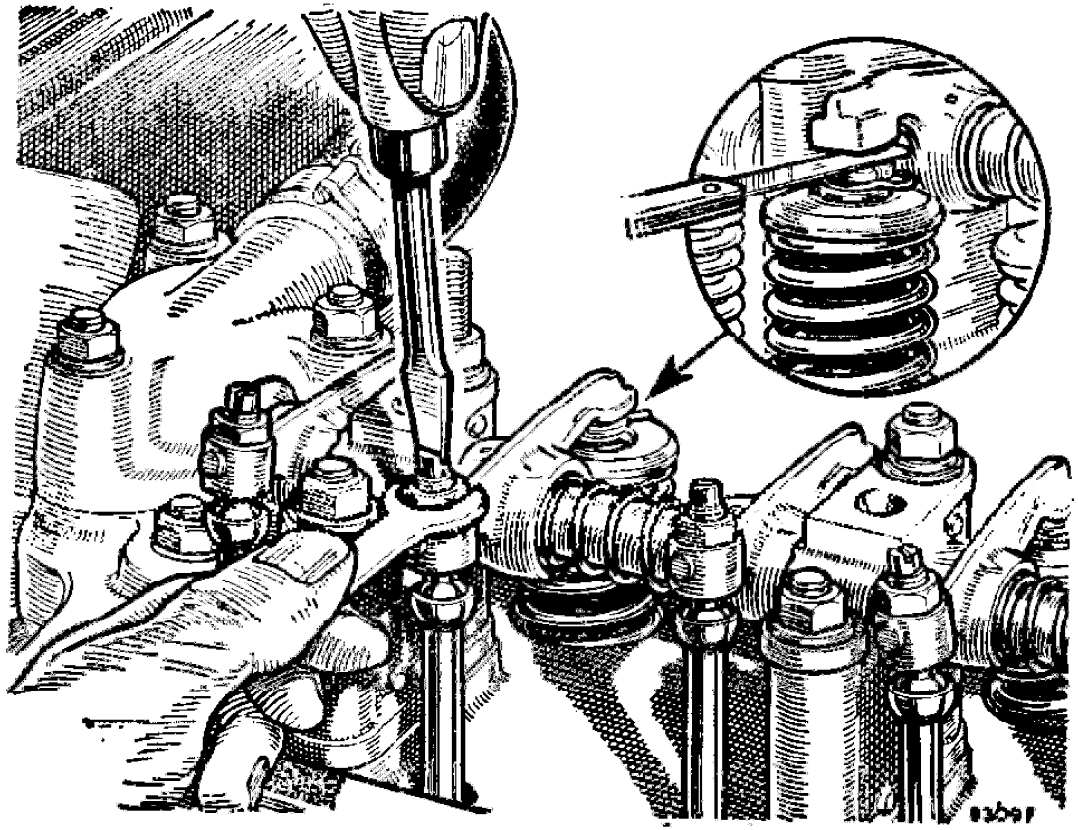
Valve adjustment



A or B Series

Fig. A.9
The method of adjusting the valve rocker clearance and the correct position for measuring it

Valve adjustment- Go No-Go

- Check the clearance of the rocker on the valve
- .014 inch feeler gauge should slip in
- .016 inch feeler gauge should not
- By elimination, clearance is .015 inch
- This method removes much of the guess work of how the clearance should 'feel'

	B and C series	A series	1500 (BL Series)
Go	.014 inch	.011 inch	.009 inch
No go	.016 inch	.013 inch	.011 inch
Desired	.015 inch	.012 inch	.010 inch

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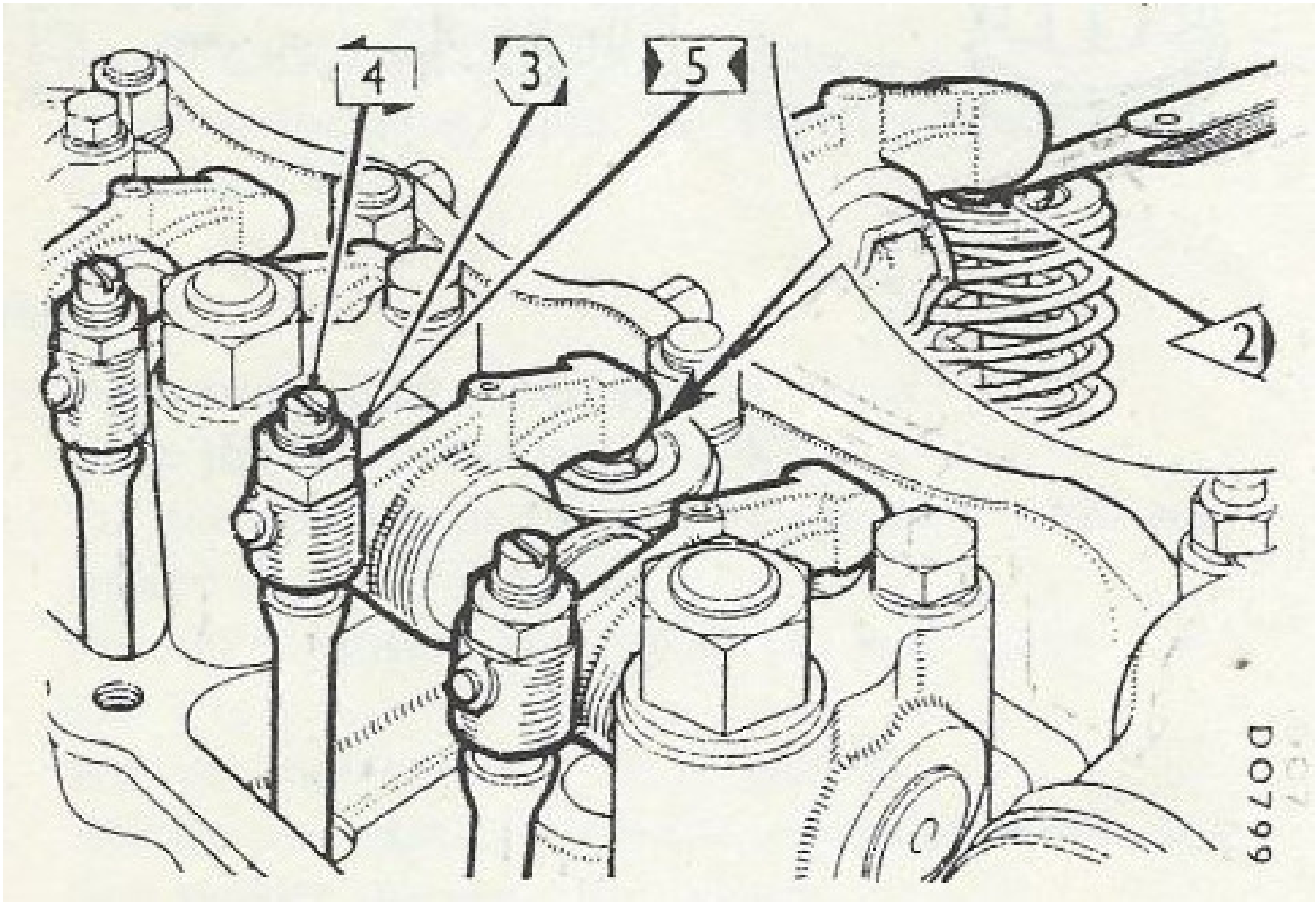
Valve adjustment



C Series

Valve adjustment

- Look at the ‘Rule of nine’ or ‘Rule of 13’ table and find the NEXT valve that will be open
- Hang the box end of a wrench on that valve
- Pull car forward until the wrench is at its highest point (valve open)
- This makes finding the point at which to adjust the opposing closed valve clearance easier
- You can also turn the crankshaft pulley nut to rotate the engine to the next position

Valve adjustment

A Series

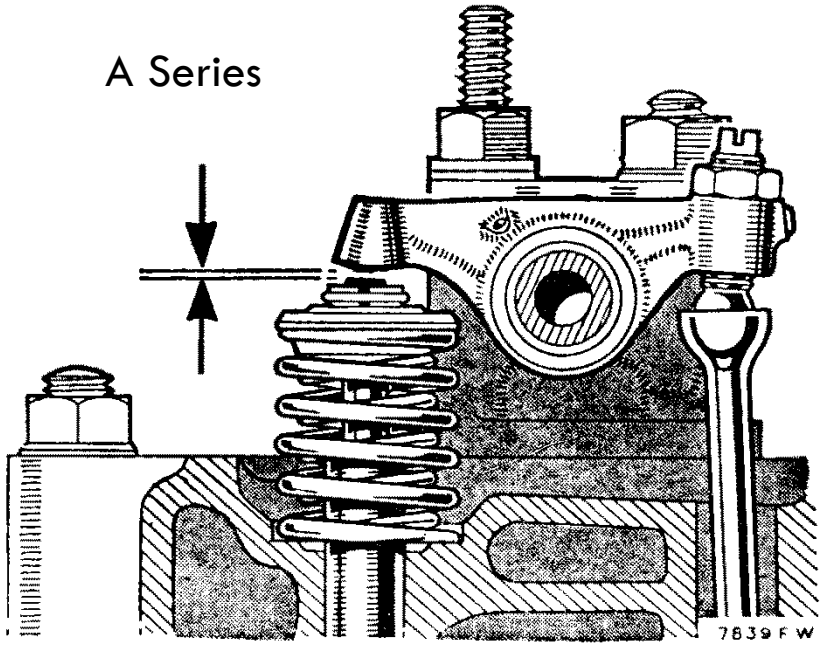
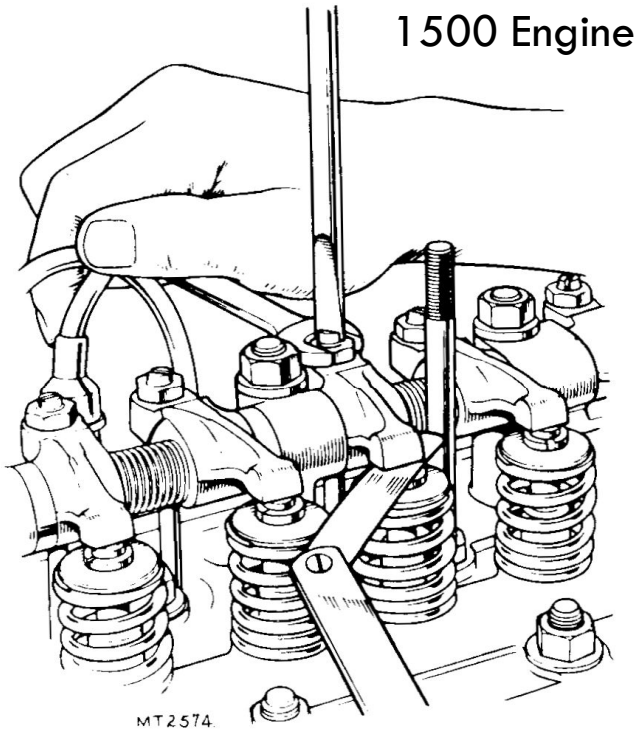


Fig. A.8

The clearance between the valve stem and rocker must be ·012 in. (·305 mm.) with the engine cold

1100. Issue 3. 52093

1500 Engine



5. Using a 0·010 in (0·25 mm) feeler gauge, check the gap between the rocker pad and valve tip of Nos. 1 and 3 valves.

Valve adjustment

- If you need to adjust a valve (or two or three…)

3. Slacken locknut.
4. Rotate screw—clockwise to decrease or anti-clockwise to increase the clearance.
5. Retighten the locknut when the clearance is correct, holding the screw against rotation.

MGC. Issue 2. 21362

Valve adjustment- John Twist

4. Counting from the front of the engin, turn the crankshaft until Nos. 8 and 6 valves are open, i.e. the valve springs fully compressed.
5. Using a 0·010 in (0·25 mm) feeler gauge, check the gap between the rocker pad and valve tip of Nos. 1 and 3 valves.
6. If adjustment is required, insert a screwdriver blade in the slot in the adjustment pin and slacken the locknut. Turn the adjustment pin clockwise to decrease and anti-clockwise to increase the gap.
7. Check and adjust the remaining valve clearances in the following sequence:
   Adjust Nos. 5 and 2 valves with Nos. 4 and 7 valves open.
   Adjust Nos. 8 and 6 valves with Nos. 1 and 3 valves open.
   Adjust Nos. 4 and 7 valves with Nos. 5 and 2 valves open.

In any case, adjust the gap according to your cam manufacturer!

MGC Open	Adjust
Nos.10 & 12	Nos. 3 & 1
2 & 5	11 & 8
7 & 9	6 & 4
3 & 1	10 & 12
11 & 8	2 & 5
6 & 4	7 & 9

Valve Adjustment- Clik Adjust

- Some folks have tried the "*Clik-Adjust*" tool
- It seems to offer a good way to hold the valve adjuster still when you tighten the nut
- Counting the 'clicks' can compensate for a worn adjuster and valve interface.

Picture courtesy Bob Lewis

Fire

With each gulp of air controlled by the intake valve and movement of the piston, fuel also enters

When the mixture is compressed, it is ready for ignition

Points allow the coil to discharge a powerful voltage to the spark plugs

Flame fronts, being a constant phenomenon must be advanced, or start sooner, the faster the engine is turning

All this happens courtesy of the ignition system

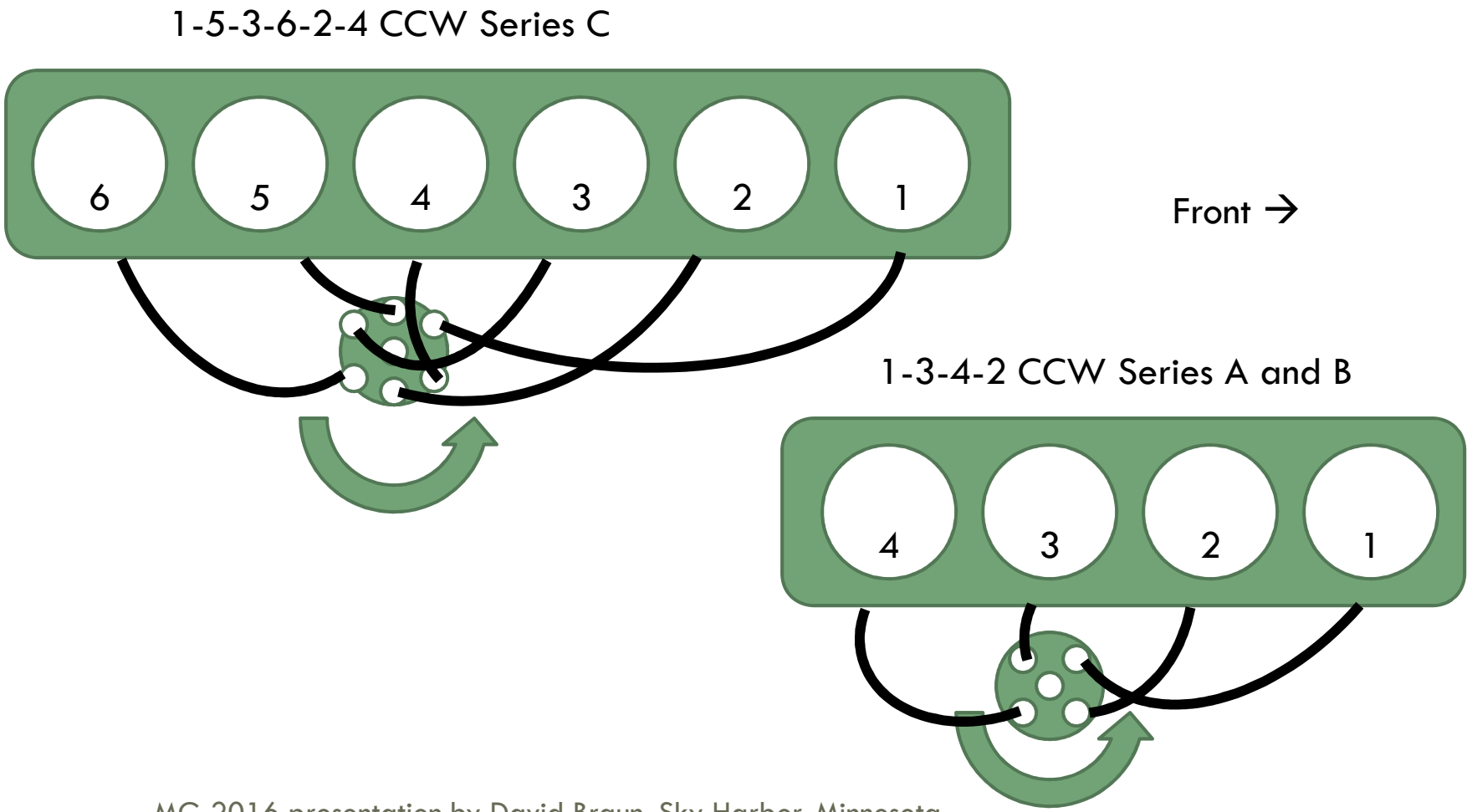
Spark

- Potential for spark comes from your car's coil
- As the points open, the field associated with the primary coil collapses
- By inductance, the secondary field in the coil is energized
- The secondary coil is what generates the spark across the spark plug gap
- A condenser is present to protect the points from (arcing) pitting and wear

Distributor

- The distributor has the following jobs:
- Create the spark by opening and closing the points
- Direct the spark at the spark plug that is on the compression stroke 1-3-4-2 CCW;
  or 1-5-3-6-2-4 CCW (C Series)
- Advance the spark so the maximum cylinder pressure due to combustion occurs as the cylinder is traveling downward

Distributor Pictorial



Wires

- Your spark plugs and wires should be in good 'knick'. Check for consistent resistance.

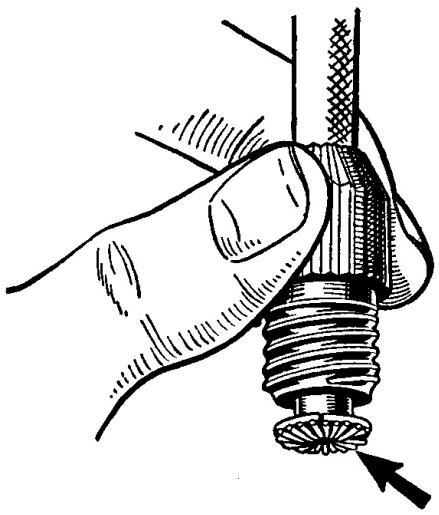


Fig. B.6
The correct method of fitting a high-tension cable to the ignition coil terminal nut

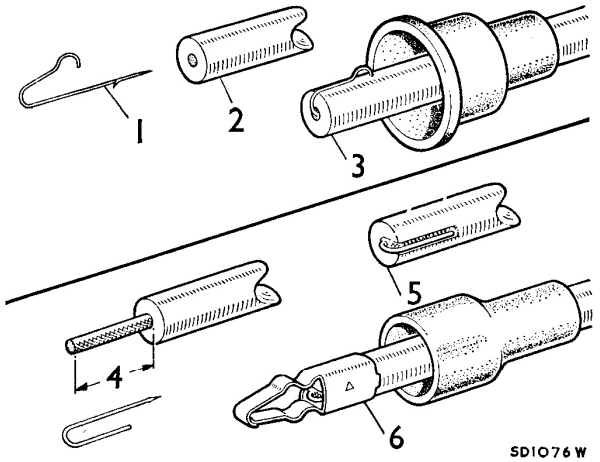


Fig. B.8
The correct assembly method for later-type suppressed high tension cables

Coil lead

1. Fish-hook connector.
2. Flush cable end.
3. Assembly of fish-hook and lead cover.

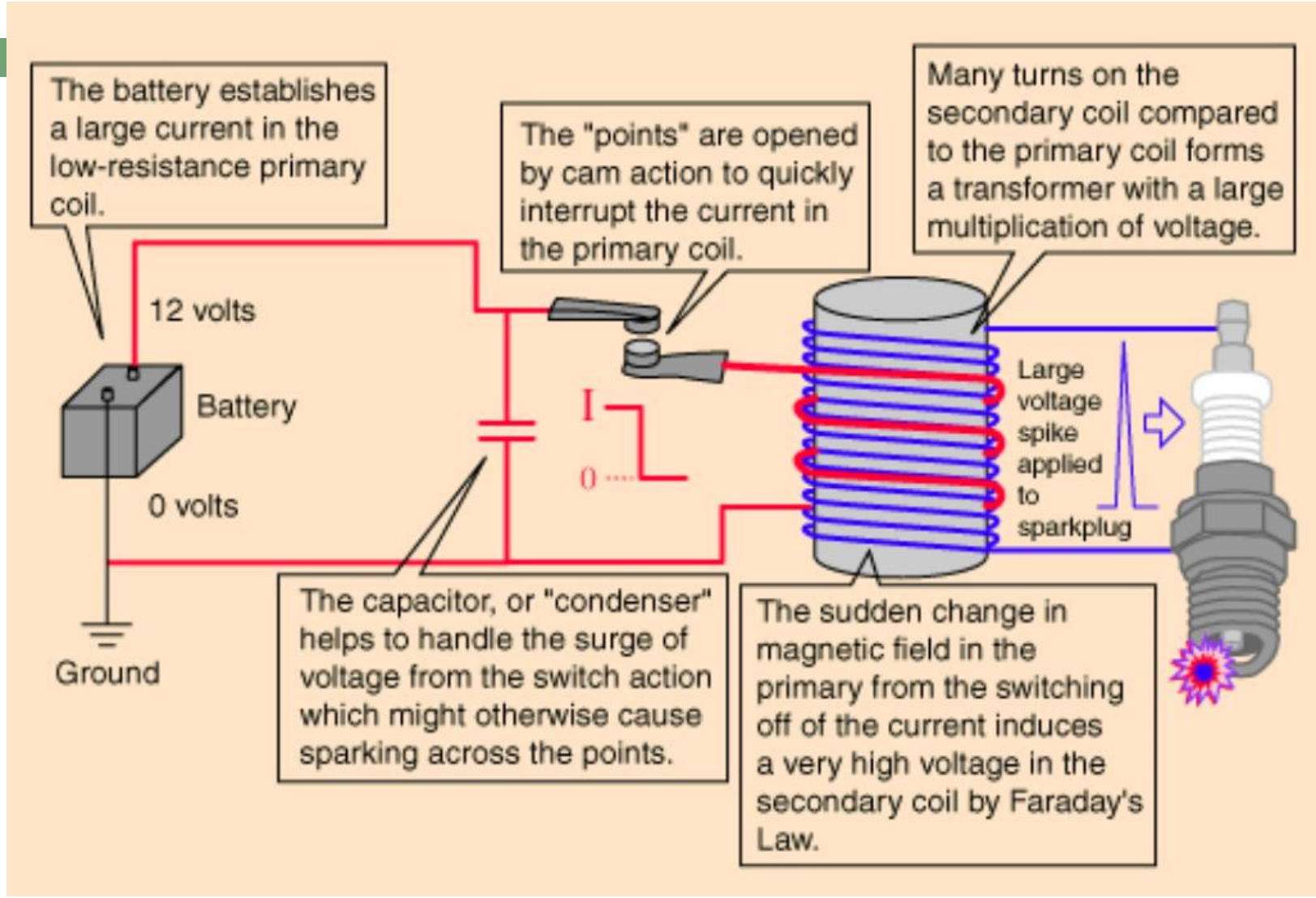
Plug leads

4. Insulation removed for ½ in. (12.7 mm.).
5. Inner cord folded onto cable, staple pushed into the centre of the cord as far as possible.
6. Cord and staple must make a good contact with body of connector.

Spark Gap

- Gap your spark plugs to .025 inch

Coil


The battery establishes a large current in the low-resistance primary coil.
The "points" are opened by cam action to quickly interrupt the current in the primary coil.
Many turns on the secondary coil compared to the primary coil forms a transformer with a large multiplication of voltage.
12 volts
Battery
0 volts
Ground
I
0
Large voltage spike applied to sparkplug
The capacitor, or "condenser" helps to handle the surge of voltage from the switch action which might otherwise cause sparking across the points.
The sudden change in magnetic field in the primary from the switching off of the current induces a very high voltage in the secondary coil by Faraday's Law.

Coil Information

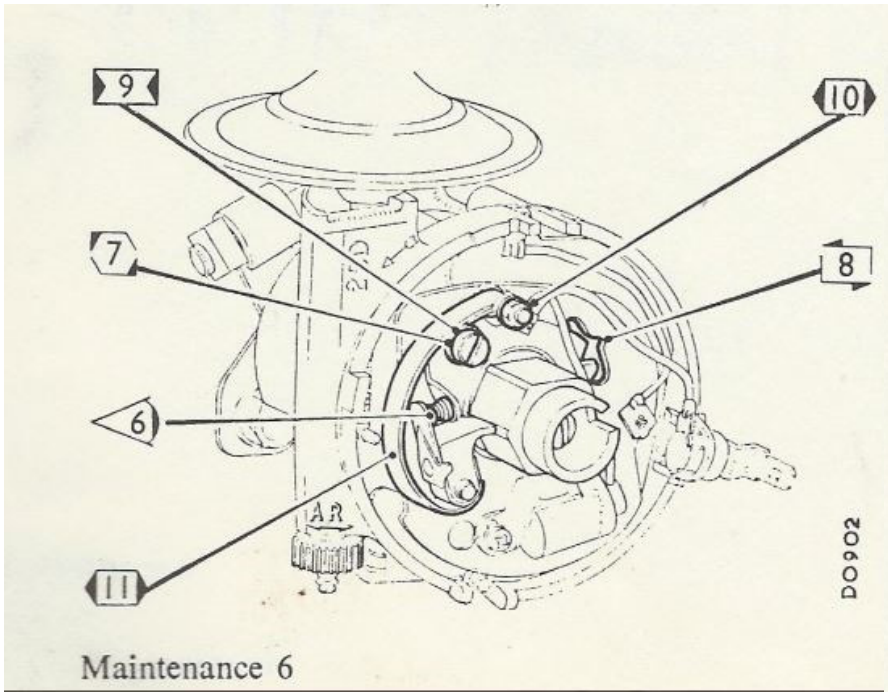
- Know your coil values:
- Some coils are meant to be fired with a reduced voltage (about 6-8 volts), delivered by means of a ballasted resistor wire; however while starting they receive a full 12 volts as an assist
- These coils have resistance across the terminals of 1.3 to 1.8 Ω; normal coils will show 3 to 3.6 Ω
- Set up your power to your coil accordingly

Points

- Adjusting points affects timing, adjust points first
- Loosen points plate
- Use go, no-go method of slipping in a .014 inch feeler gauge, and then trying a .016 feeler gauge
- If the .014 goes in, and the .016 won't; you must be at .015 inch point gap
- Tighten points plate

Adjusting Points

This is easier with the distributor removed from the engine



Maintenance 6

Contact breaker points—checking and cleaning

4. Remove the distributor cap.
5. Turn the crankshaft until the contacts are fully open.
6. Check the gap; it should be ·014 to ·016 in. (·35 to 40 mm.). If adjustment is necessary carry out seq. 7 to 9.
7. Slacken the contact plate securing screw.
8. Insert a screwdriver in the notched hole at the end of the plate and turn clockwise to decrease or anti-clockwise to increase the gap.
9. Retighten the securing screw.

If the contact breaker points are burned or blackened, clean them with a fine carborundum stone or with fine emery-cloth. Cleaning is best carried out with the moving contact breaker removed.

Reinstalling the Distributor

- The distributor is easy to reinstall

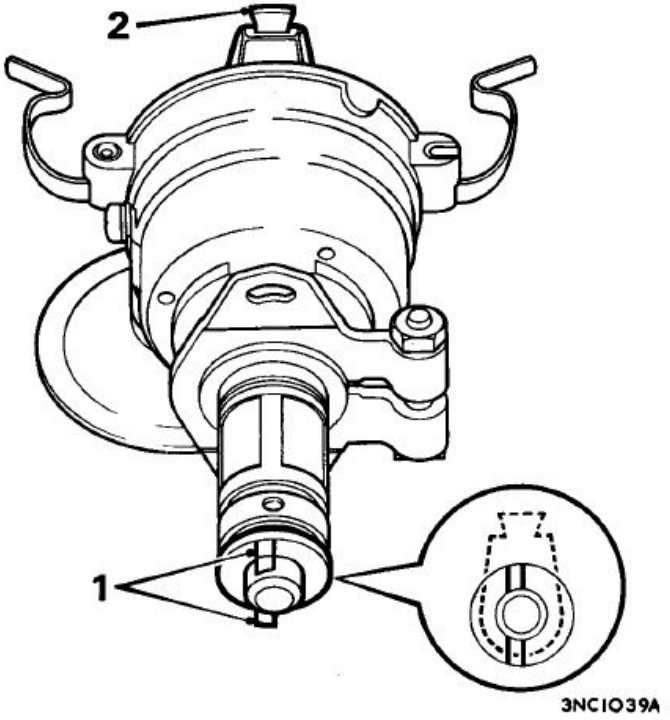


Fig. B.2

Refitting the drive dog (Lucas type 45D4)

Note the driving tongues (1) are parallel with the centre line of the rotor arm (2).

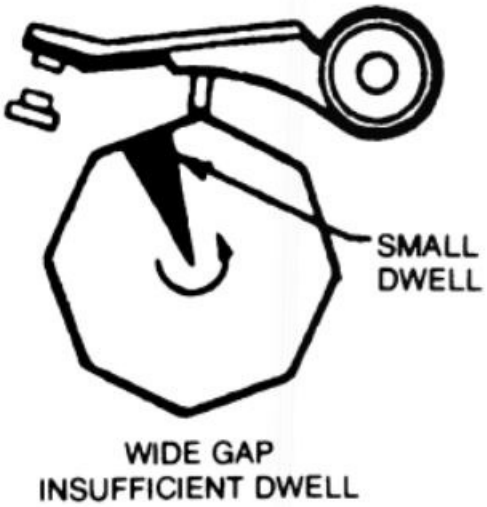
Clamp Position

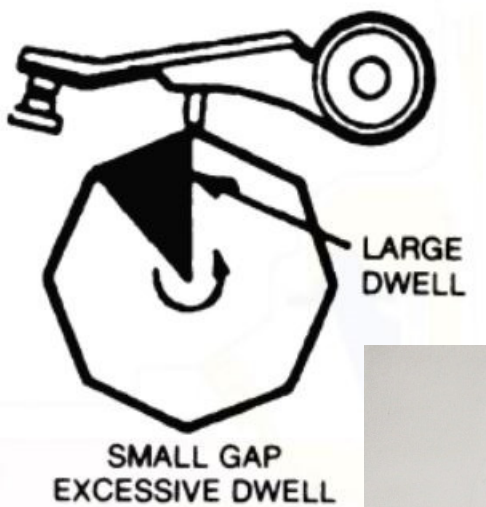
Points Closed is Dwell

- You can check your point setting with a Dwell Meter
- Dwell is the amount of time in the ignition cycle the points are closed
- Dwell meters can be inaccurate as they age so use with a grain of salt
- Dwell on an A or B Series is about 60°± 3°; on a C Series is about 35°± 2°; and on a 1500 Series is about 39°± 1°

Points Closed is Dwell

- Dwell





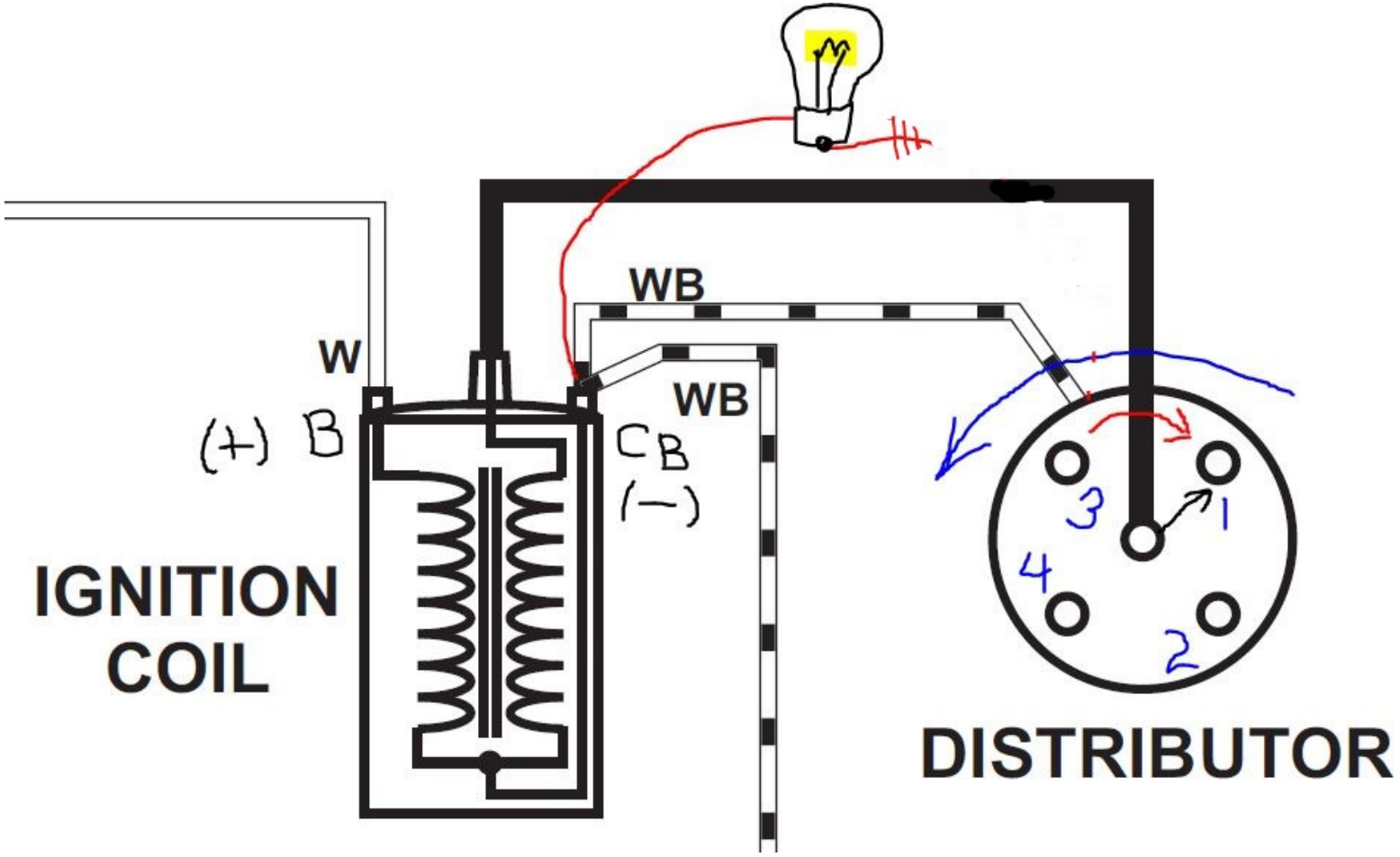
Spark Advance

- Spark advance is needed to provide the combustion at the peak cylinder pressure
- The distributor has mechanical advance and often, vacuum advance (rarely, vacuum retard)
- Because the distributor rotates at half engine speed, 10° of distributor advance is the same as 20° of crankshaft advance
- We measure timing in crankshaft degrees
- Advance is programmed in for us in the distributor

Static Timing

- Place a light bulb between the distributor terminal and the coil terminal on your system
- Turn engine to 8-10° before TDC, #1 firing
- Tweek the rotor clockwise, switch on ignition
- Turn the distributor counter-clockwise until points block is just before the cam lobe
- Turn the distributor clockwise until bulb lights
- Tighten distributor locking nut

Static Timing Technique



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Spark Plug Reinstallation

- A dab of anti-seize is popular, carefully wipe your hands or the next thing you touch will be permanently stained!
- Tighten the plugs until they are snug. New plugs have a different feel than old plugs
- Do not crack the ceramic
- Attach the wires starting with the 'marked' number 1; proceeding counter clockwise around the distributor 3-4-2, (or 5-3-6-2-4) make sure the main coil wire is intact

Dynamic Timing

- Highlight the crank pulley marks with white paint
- Place timing-light inductive pickup on number one spark plug wire
- Attach timing-light leads to the brown wires at the fuse block and a good ground respectively
- Disconnect and plug vacuum advance source
- Loosen distributor, start engine, and turn distributor until desired timing is indicated on marks usually about 15° BTDC @<1,000 RPM

All-In Advance

- Check timing at full mechanical advance
  - Run engine at 3500 RPM or until timing marks stop advancing
  - Fine tune distributor setting until the 'all in' timing is 34-35° BTDC; Back off if pinging
  - A dial back timing light is good for this, or extend your marks by using math: πd/360 x 34 = where to put the 'all in' timing mark

Timing Marks A and B Series

A and B Series

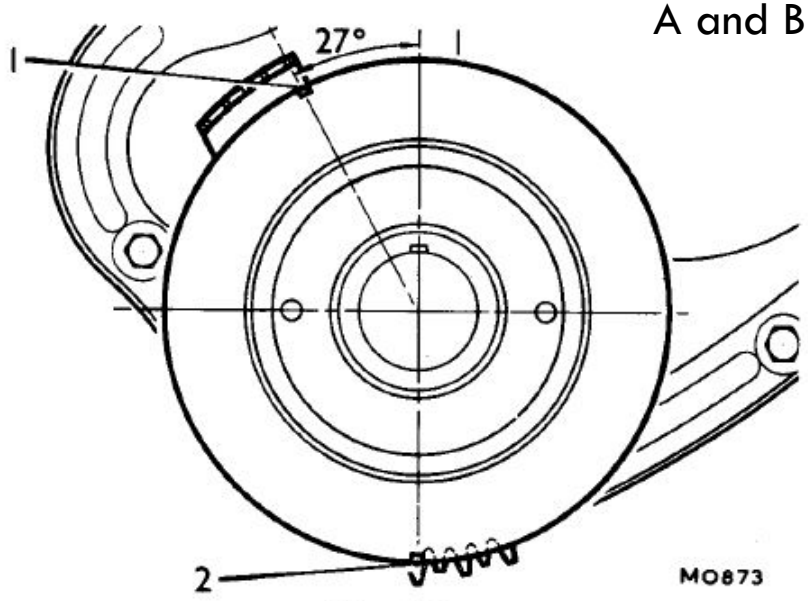
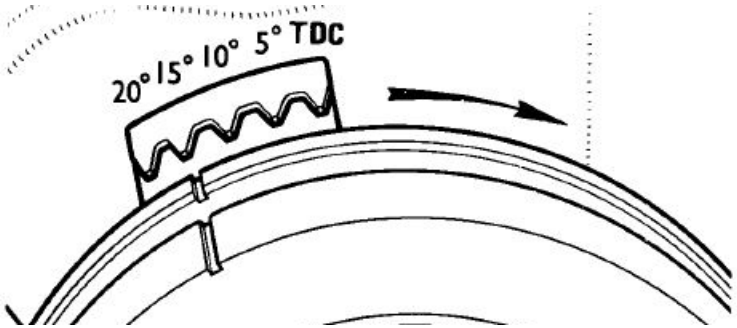


Fig. A.36

The relationship of the timing groove to the crankshaft pulley keyway

1. Position when indicator is above pulley.
2. Position when indicator is below pulley.



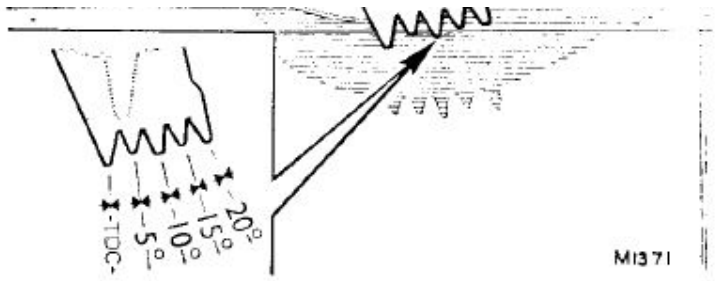
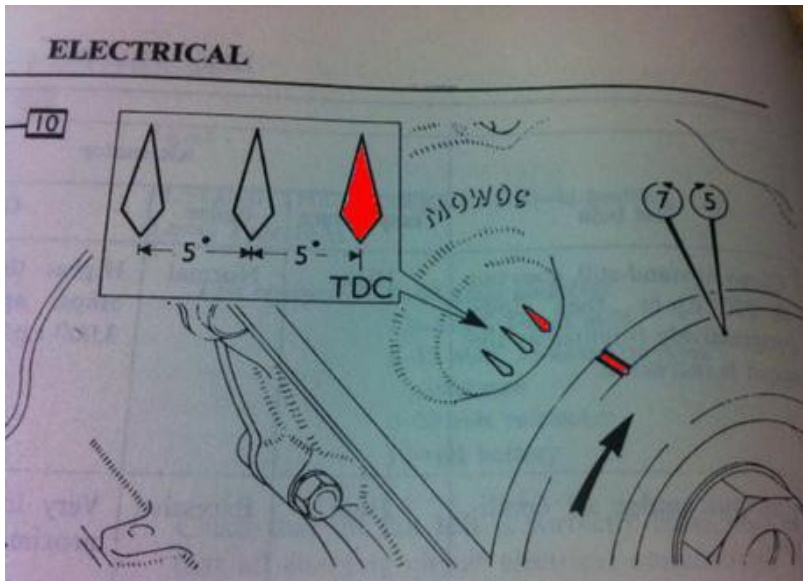


Fig. B.4

The notch in the pulley approaching the T.D.C. position for pistons 1 and 4. The inset shows the timing scale 5° marks

Timing Marks C Series



C Series

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Timing Marks 1100 or 1300

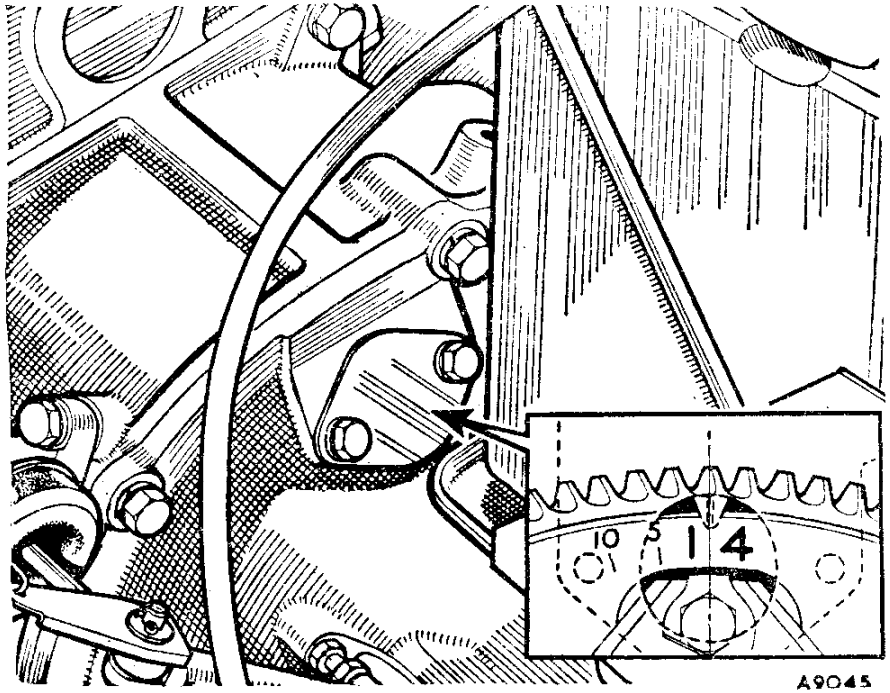


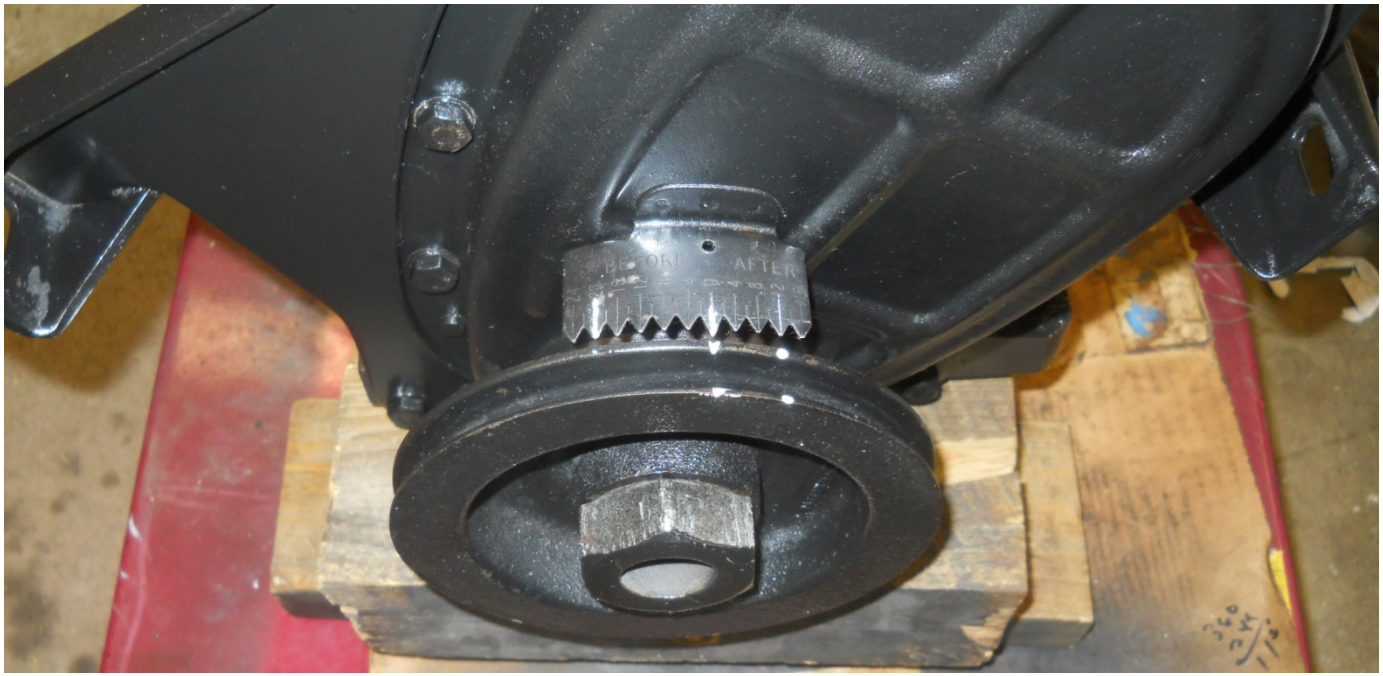
Fig. A.10

The timing marks on the flywheel can be seen with the aid of a mirror after removing the inspection cover. T.D.C. position is indicated by the mark 1/4 shown inset; 5° and 10° marks are also provided

A Series in 1100 or 1300

Timing Marks 1500 Series

- 1500 Series all-in marks, similar marks can be made on other engines



Recheck and Record

- Once the 'all-in' firing advance is set (34-35° BTDC) and pinging checked, go back to the idle setting and re-check your timing
- Write down the setting and the idle RPM
- This is the proper timing at idle for your engine with your distributor, and points setting
- You can use this value to quickly check or set timing in the future
- Reconnect your vacuum advance

Early B Series Tuning Data

ENGINE TUNING DATA
18G, 18GA, AND 18GB ENGINES

ENGINE	
Type	18G, 18GA, 18GB.
Displacement	109.8 cu. in. (1798 c.c.).
Firing order	1, 3, 4, 2.
Compression ratio: H.C.	8.8 : 1.
L.C.	8.0 : 1.
Compression pressure: H.C.	160 lb./sq. in. (11.25 kg./cm.²).
L.C.	130 lb./sq. in. (9.15 kg./cm.²).
Idle speed	500 r.p.m.
Valve rocker clearance	.015 in. (.38 mm.) set cold.
Static ignition timing: H.C.	10° B.T.D.C.
L.C.	8° B.T.D.C.
Stroboscopic ignition timing: H.C.	14° B.T.D.C. at 600 r.p.m.
L.C.	12° B.T.D.C. at 600 r.p.m.
Timing mark location	Pointer on timing case, notch on crankshaft pulley.
DISTRIBUTOR	
Make/Type	Lucas/25D4.
Contact breaker gap	.014 to .016 in. (.35 to .40 mm.).
Contact spring tension	18 to 24 oz. (510 to 680 gm.).
Rotation of rotor	Anti-clockwise.
Dwell angle	60°±3°.

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Later B Series Tuning Data

ENGINE TUNING DATA

18V 581Y, 18V 582Y, AND 18V 583Y ENGINES

ENGINE	
Type	18V.
Displacement	109.8 cu. in. (1798 c.c.).
Firing order	1, 3, 4, 2.
Compression ratio: H.C.	9.0 : 1.
L.C.	8.0 : 1.
Cranking pressure	Nominal 170 lbf./sq. in. (11.95 kgf./cm.²) at 275 r.p.m.
Idle speed	750 to 800 r.p.m.
Valve rocker clearance: Set cold	.015 in. (.38 mm.).
Set hot	.013 in. (.33 mm.).
Static ignition timing: H.C.	10° B.T.D.C.
L.C.	10° B.T.D.C.
Stroboscopic ignition timing: H.C.	13° B.T.D.C. at 600 r.p.m.
L.C.	13° B.T.D.C. at 600 r.p.m.
Timing mark location	Pointer on timing case, notch on crankshaft pulley.

C Series Tuning Data

DATA

ENGINE TUNING DATA	Model: MGC
Engine	
Type	29G
Displacement	2,912 c.c. (177·7 cu. in.)
Compression ratio	9 : 1
Compression pressure	175 p.s.i. (12·3 kg./cm.²)
Firing order	1, 5, 3, 6, 2, 4
Valve rocker clearance	·015 in. (·38 mm.) set cold
Idle speed: Manual	680 r.p.m.
Automatic ('P' selected)	800 r.p.m.
Fast idle speed:	1,000 r.p.m.
Ignition timing: Static	8° B.T.D.C.
Stroboscopic	20° B.T.D.C. at 1,000 r.p.m.
Timing mark location	Marks on front cover and notch on crankshaft pulley
Distributor	
Make/type	Lucas/25D6
Serial number	41201
Contact breaker gap	·014 to ·016 in. (·35 to ·40 mm.)
Contact breaker spring tension	18 to 24 oz. (510 to 680 gm.)
Rotation of rotor	Anti-clockwise
Dwell angle	35° ± 2°
Condenser capacity	·22 mF
Centrifugal advance	
Crankshaft degrees and r.p.m. (Vacuum pipe disconnected)	No advance below 500 r.p.m. 0° to 6° at 700 r.p.m. 6° to 12° at 900 r.p.m. 12° to 16° at 1,200 r.p.m. 16° to 20° at 2,600 r.p.m. 24° to 28° at 5,300 r.p.m.

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1500 Series Tuning Data

- The Midget 1500 used (I think) three different distributors and timing specs, including some retard specs
- If you are setting up to stock; use the manual's settings
- If you have modified your engine, start at 10° BTDC and check for 'all in' timing with vacuum disconnected – Adjust accordingly
- You may choose to run with the vacuum retard disconnected

Fuel

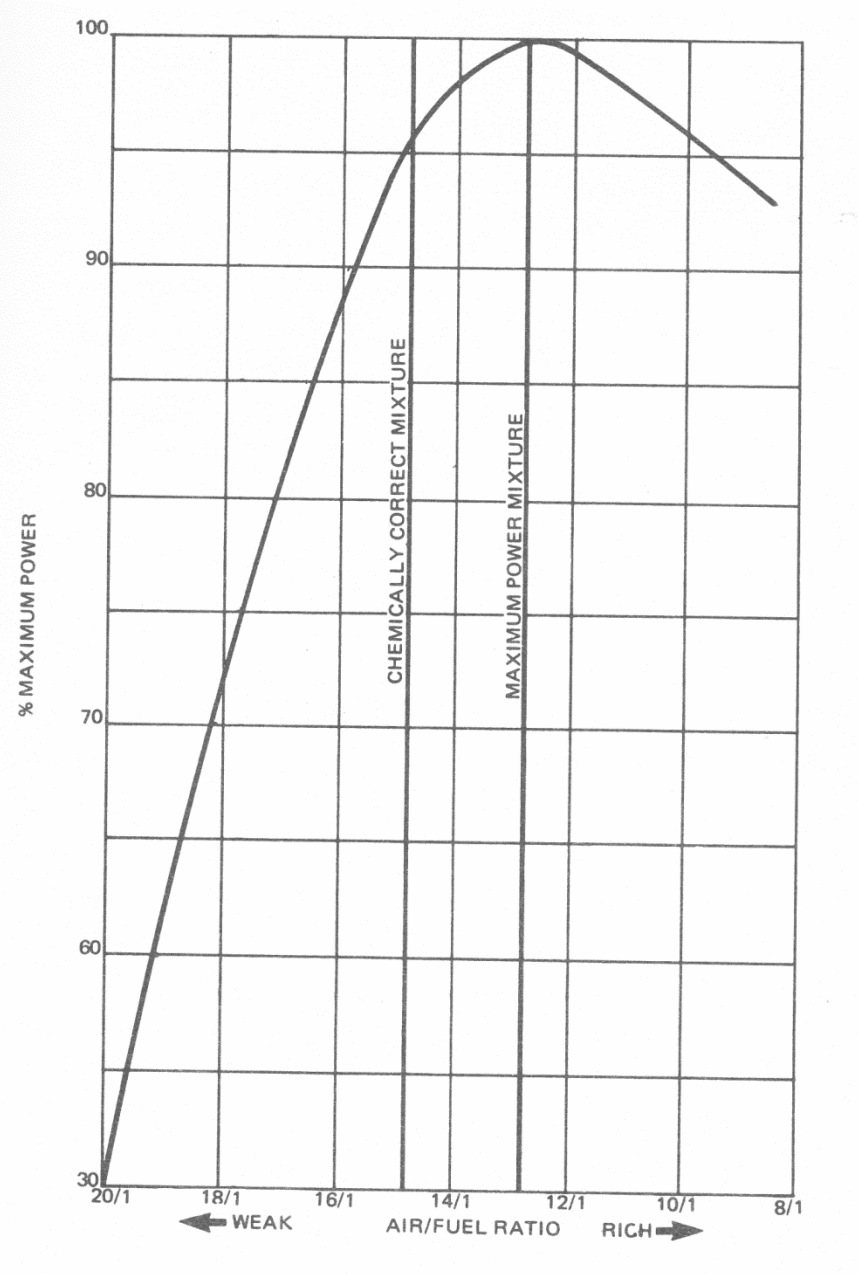
The engine needs an air/fuel ratio that is slightly rich at idle and full acceleration; and close to stoichometric at cruise

The job of delivering the fuel to the air coming into the engine belongs to the carburetors

The carburetors are always the last item to be adjusted in a tune-up

Stoichometric A/F

- What is Stoichometric?
- Compare at Best Power
- Compare at idle



Basic Semi Side Draft

- The SU (and Zenith Stromberg) Carburetors have four basic moving parts

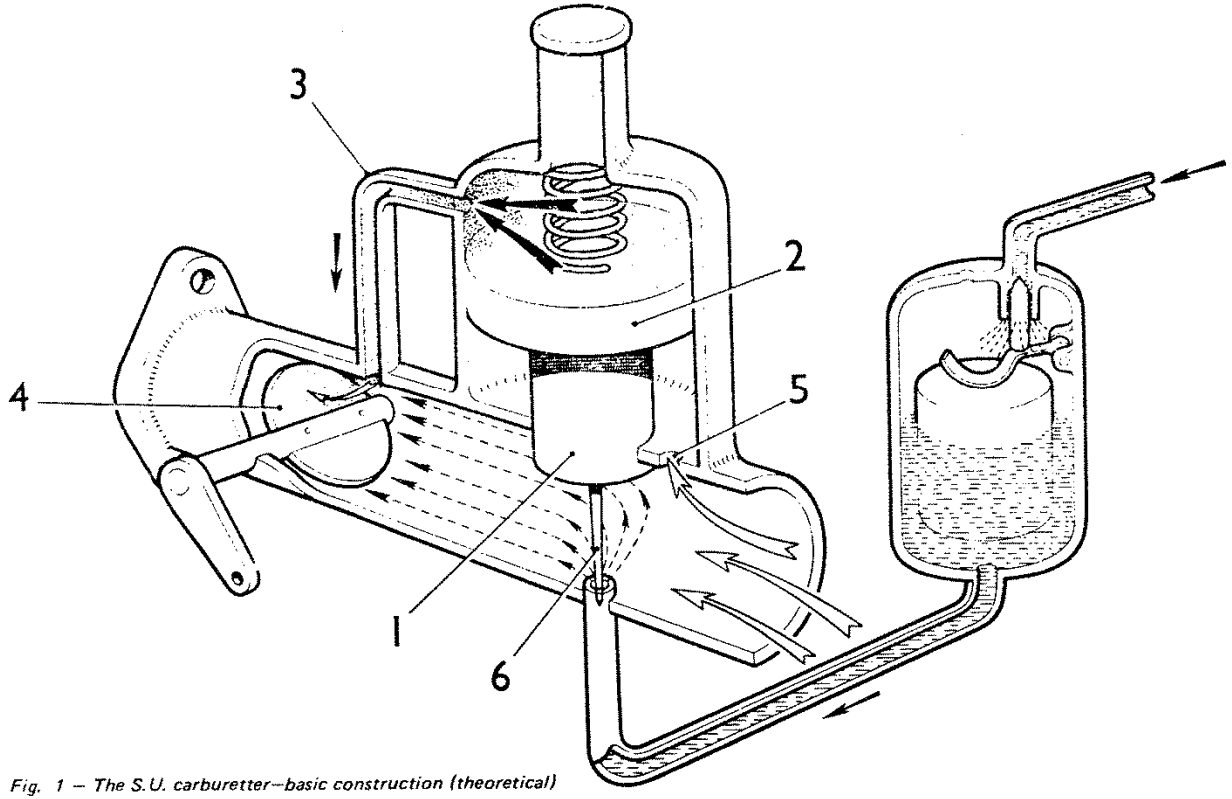


Fig. 1 – The S.U. carburetter–basic construction (theoretical)

Four Basic Moving Parts

- The float and float bowl needle
- The jet for setting and enrichment
- The piston and metering needle to set running condition A/F mixture
- The throttle disk and spindle to regulate air into the engine

Theory of Operation

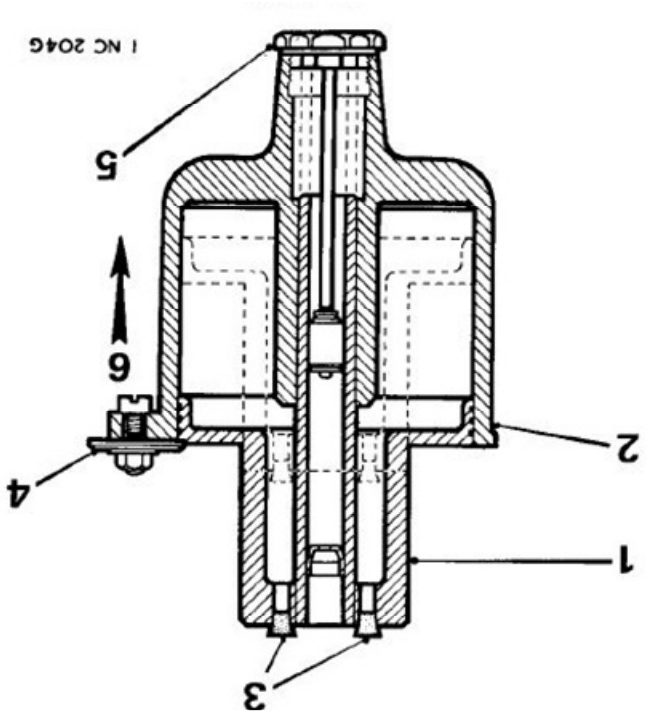
- The piston rises, finds equilibrium and falls based on the positive pressure under the piston
- Once the pressure under the piston is equalized by the pressure in the suction chamber, the piston becomes stationary
- The entire range of airflow can have a 'matching' fuel input based on the tapered needle rising and falling with the piston

Theory of Operation

- This equalization of pressure above and below the piston gave rise to the Zenith Stromberg term 'Constant Depression' hence their carburetors are typically called '150-CD' or '175-CD'
- Where SU decided to create this carefully metered air bleed by machining parts to close tolerances, Zenith Stromberg uses a rubber diaphragm

Constant Depression

- The drop test diagram (inverted) clearly shows SU's approach, ZS approach is on the right



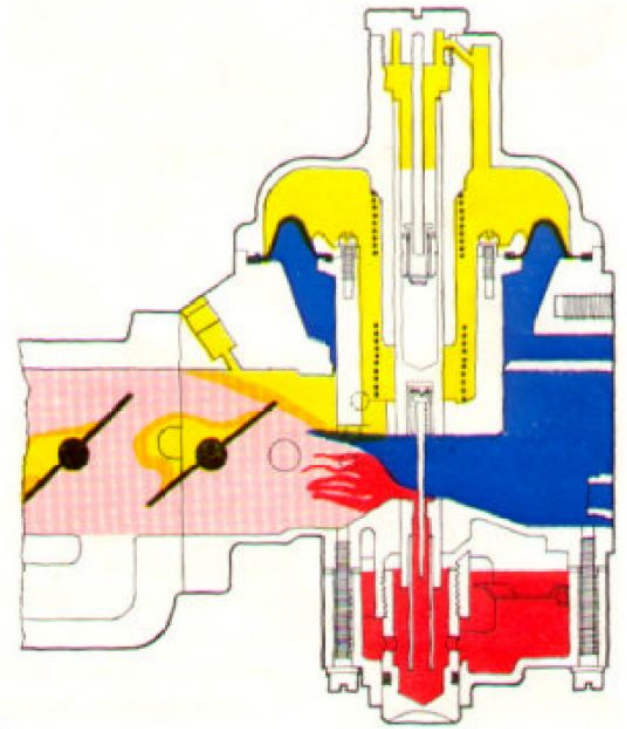


Fig. 74 Normal operation (with secondary throttle)

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Needles Program Entire Range

- With a given set of needles a stock engine will get the proper amount of fuel for any condition 'programmed' into the needles
- For non-stock engines a bit of searching and imagination may be needed
- The factory provided guidance for standard, rich, and lean settings

CARBURETTERS

Make/Type	SU/HS4.
Jet	.090 in. (2.2 mm.).
Needle	Standard, FX; Rich, No. 5; Weak, GZ.
Piston spring	Red.

Needles

- Other needle specifications; the point is, once the needles are selected or 'programmed' adjusting at idle is all that is needed for the full range of operation

FUEL SYSTEM

Carburetters	Twin S.U. type HS4.
Choke diameter	1½ in. (38.1 mm.).
Jet size	.090 in. (2.2 mm.).
Needles	No. 5 (Standard), No. 6 (Rich), No. 21 (Weak).
Piston spring	Red.

CARBURETTERS

Make/Type	SU/HIF4.
Jet	.090 in. (2.2 mm.).
Needle	AAU.
Piston spring	Red.

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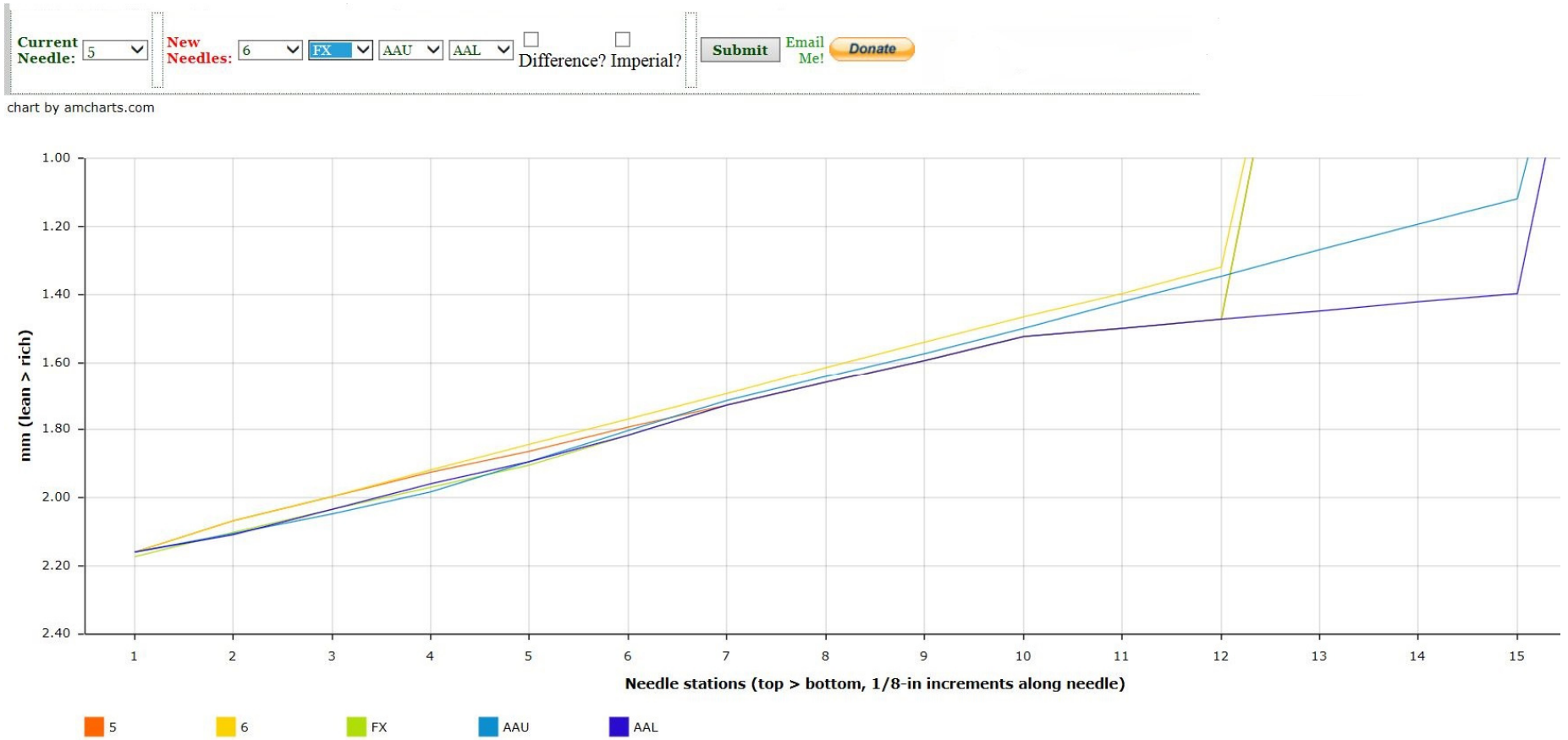
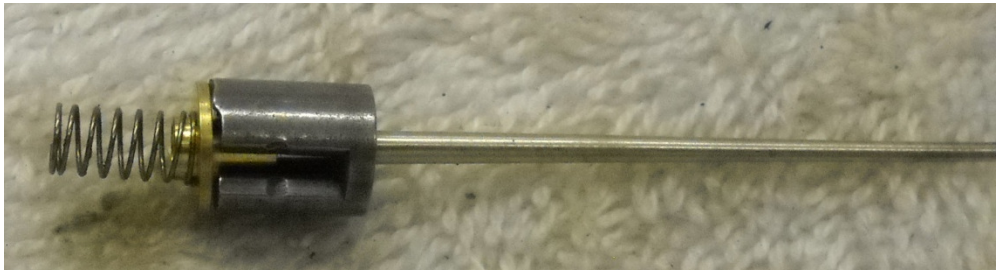
Needles Comparator

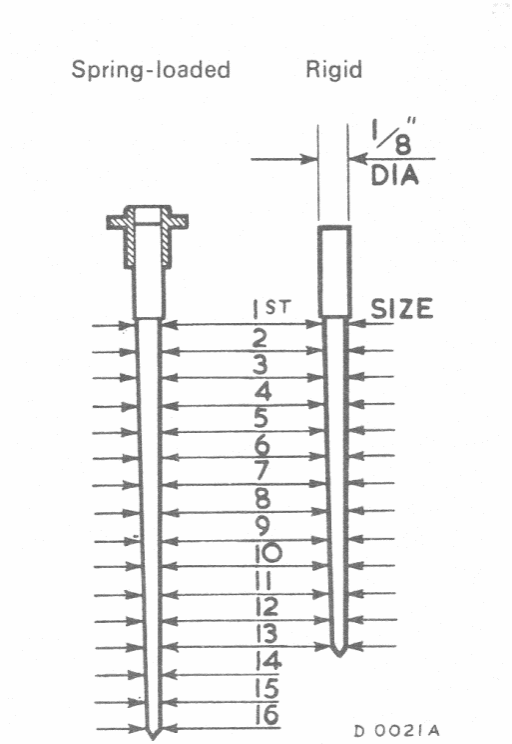
- On-line needle comparator: www.MintyLamb.co.uk



Fixed and Biased Difference

- Original needles are 'fixed' and shorter
- Fixed requires 'centering the jet'
- Later needles are 'biased' or spring loaded and longer
- Except for idle, typically only stations 3-10 are utilized





Sizes taken every $\frac{1}{8}$" from top shoulder

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Depth of Fuel in the Jet

- The depth of fuel in the jet has an impact on how much fuel is placed into the airstream via the annulus formed by the jet and the needle
- The column of fuel in the float chamber on external float carburetors like the H or HS series controlled the depth
- Directly in integral float carburetors like the HIF series or the ZS
- The depth of fuel should be 0.16 ±0.04 inches below the height of the bridge

Depth of Fuel in the Jet

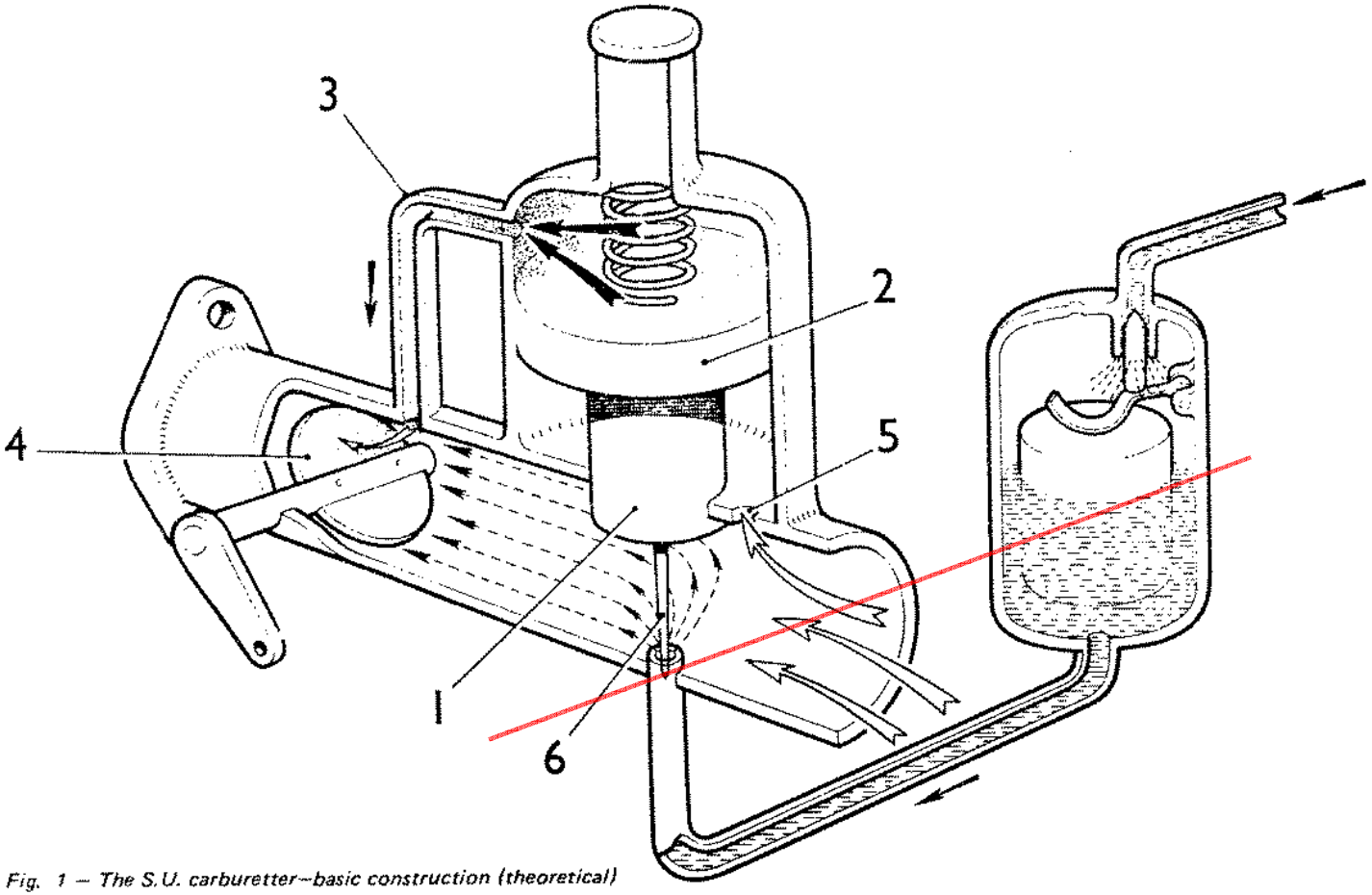

Fig. 1 — The S.U. carburetter—basic construction (theoretical)

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Measuring Float Height

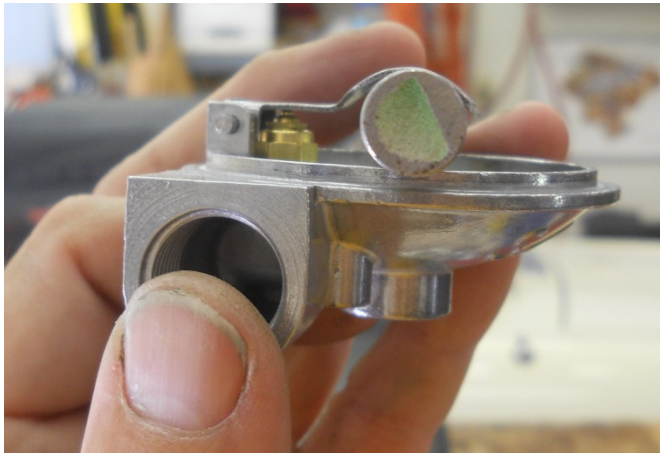
- The first step to setting a carburetor is to adjust the float height properly- Inverted

HIF 0.04 ± .02 inch

HS 1/8 - 3/16 inch

Measuring Float Height

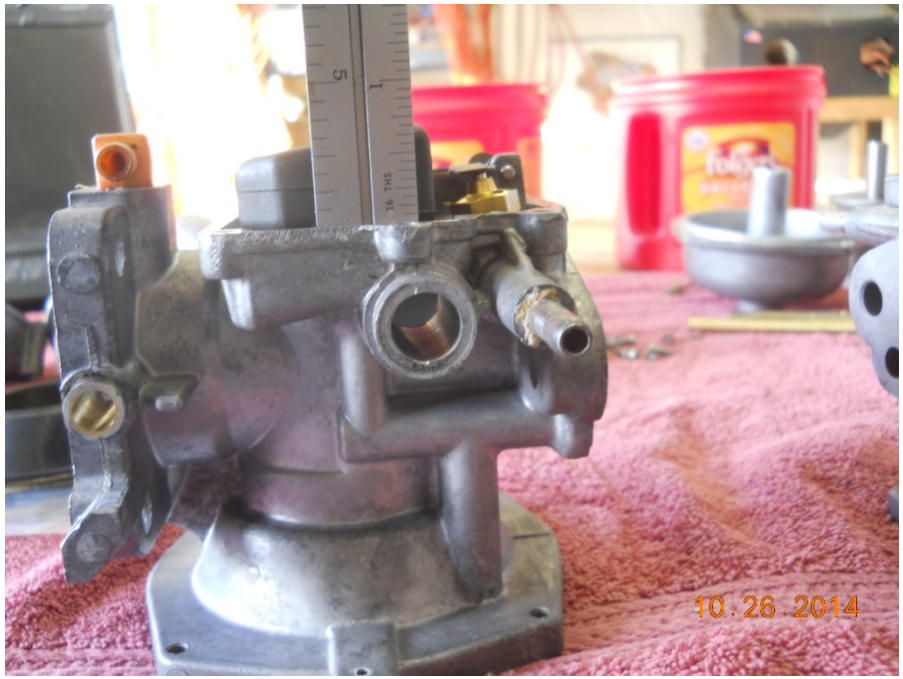
- H Series (MGA, T-Series)



H Series
7/16 inch

Measuring Float Height

- Zenith Stromberg:
  - The highest level of the float above the body with the inlet valve closed should be 0.725 – 0.787



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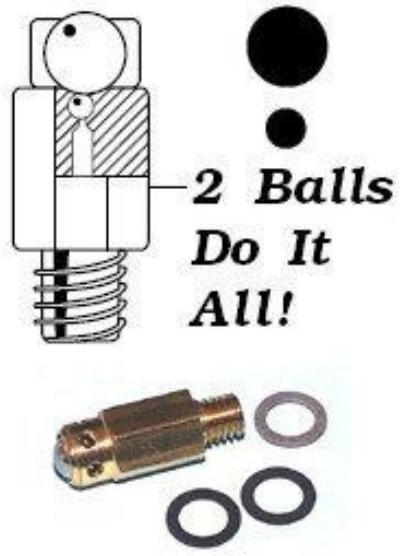
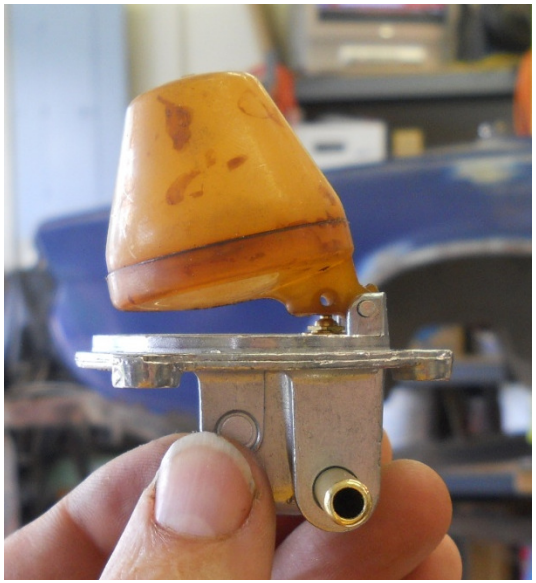
Float Needle Valves

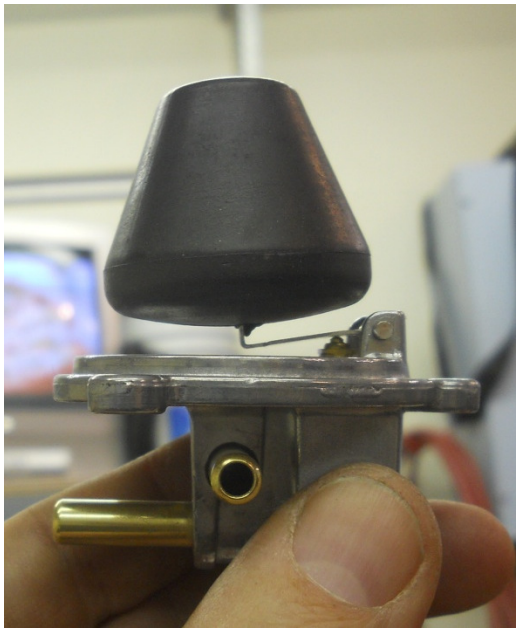
- Two common types:



A word about Gross Jet float valves

Fixed and Adjustable Floats





Verify Fuel Height in Jet

- To check, fuel level height:
- Remove the suction chambers and the pistons, keeping them organized
- Lower the jet position as you would for enrichment and measure the level of the jet when it is level with the fuel- use a dial caliper
- Adjust float dimension as necessary
- Remove fuel from float bowl with a suction bulb if you need to readjust the fuel level; use the car's fuel pump to refill the float bowl
- Not as critical on ZS carburetors

Set Jet Height at Bridge for Mixture

- Next set the jet height below the bridge at 0.065 - 0.070 inch (but set each the same)

HS Series

HIF Series

Adjusting Jet Height

- On SU H and HS Series carburetors the adjusting nut is below the jet bearing tube
- On SU HIF carburetors the mixture screw goes counter clockwise to raise (lean) the jet and clockwise to lower (enrichen) the jet
- On ZS carburetors you use the tool, a 1/8 Allan wrench within a pinned tube; note- not all ZS carburetors have adjustable jets; turn the wrench clockwise to enrichen the jet

Adjusting Jet Height

- Adjusting the jet HS Series

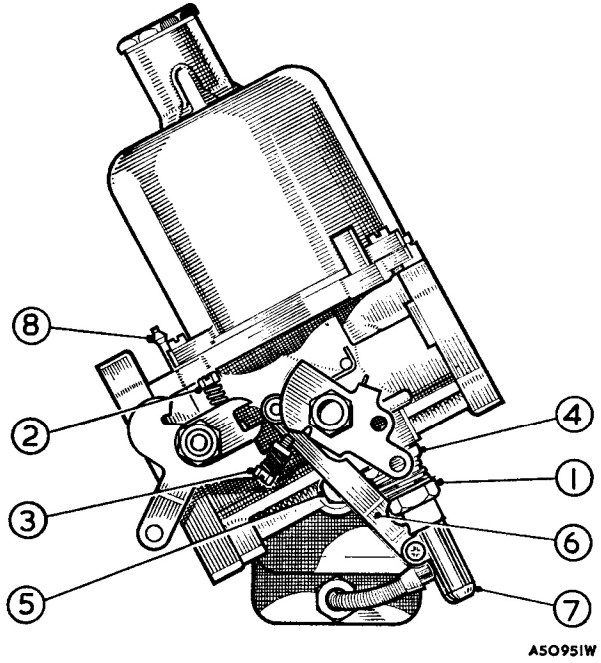
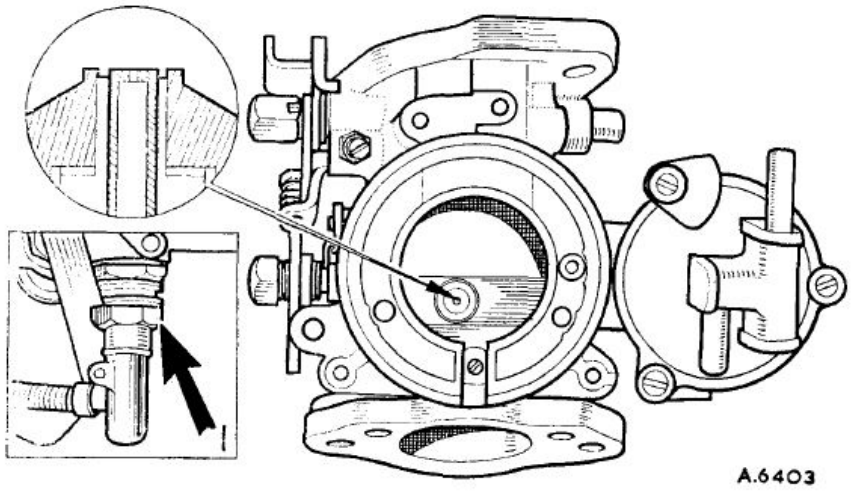


Fig. D.9
The HS4 carburetter

1. Jet adjusting nut.
2. Throttle stop screw.
3. Choke or fast-idle screw.
4. Jet locking nut.
5. Float-chamber securing nut.
6. Jet link.
7. Jet head.
8. Vacuum ignition take-off.

MGB. Issue 5. 69615

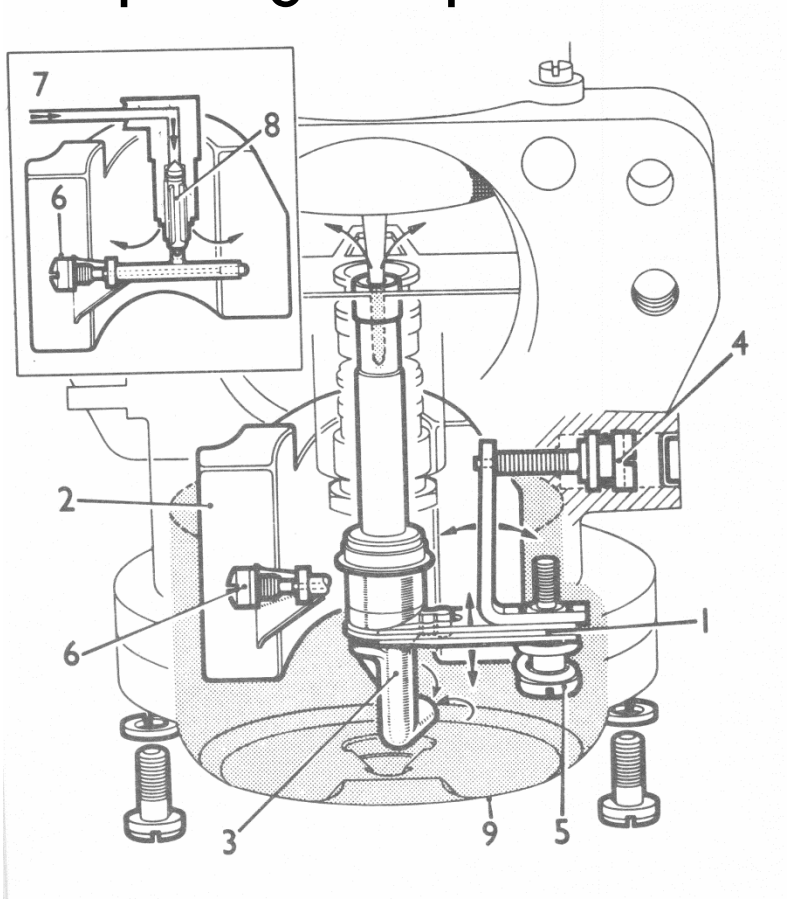


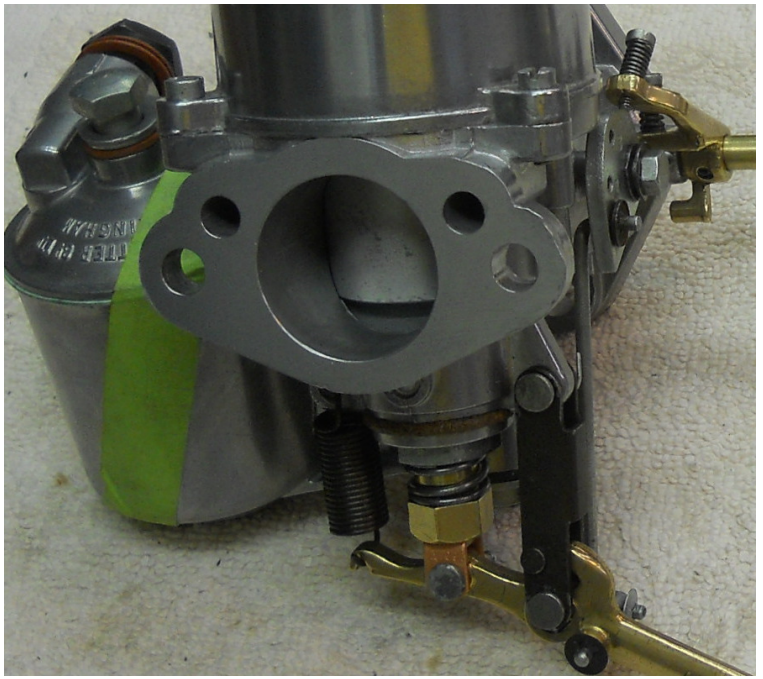
2

A. Mark for reassembly and remove piston/suction chamber unit.
B. Disconnect mixture control wire.
C. Screw the jet adjusting nut (1) until the jet is flush with the bridge of the carburetter or fully up if this position cannot be obtained.

Adjusting Jet Height

- Adjusting the jet HIF Series and H Series





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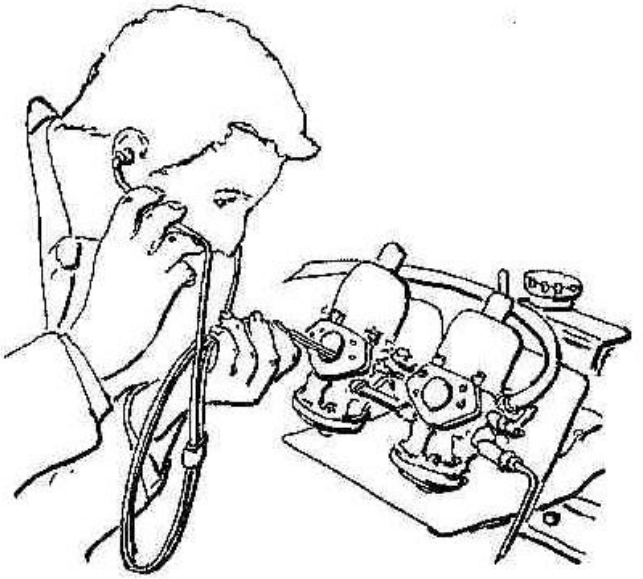
Balance Multiple Carburetors

- Reinstall the suction chambers and pistons
- With the air cleaners off, start the engine and allow it to warm up
- Balance the airflow between the two carburetors by loosening the connection shaft and adjust the idle of each with a Unisyn, cat's whiskers or listening tube
- Retighten the connection between the carburetors
- From here, make all idle adjustments equally on both carburetors
- Make sure the fast idle circuit is not fouling the adjustment

Balance




Sight tube
adjust free floating
indicator to center
by rotating air adjust
Air flow
adjuster
Fixed
Rotates

Adjust the Mixture H or HS Series

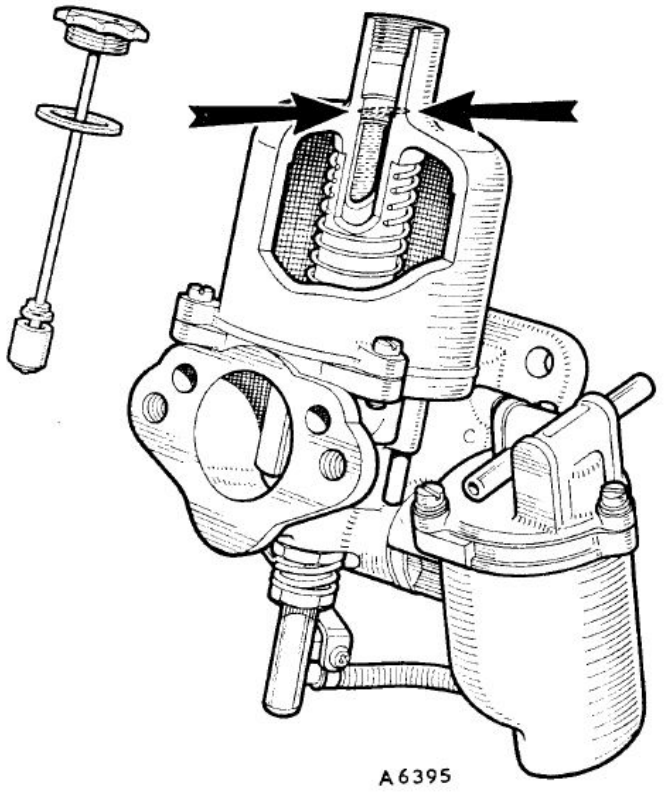
- Allow the engine to idle at 850-900 RPM; reset if necessary (timing also affects idle)
- Raise the adjusting nut two flats and note any RPM changes
- If there are none, lower the adjusting nut four flats and note any changes
- Where you find a rise in RPM stop there and lower the adjusting nut one flat for a slightly richer setting
- Always count your flats!

Adjust the Mixture HIF Series

- On HIF Series Carburetors turn the mixture adjusting screw ¼ turn at a time out and note if you hear a rise in RPM
- If not, turn the return the adjusting screw to the original position continue to turn the screw in further ¼ turn at a time and note if you hear a rise in RPM
- Turn the adjusting screw an additional ¼ turn in once the rise in RPM is found

Dampener Oil

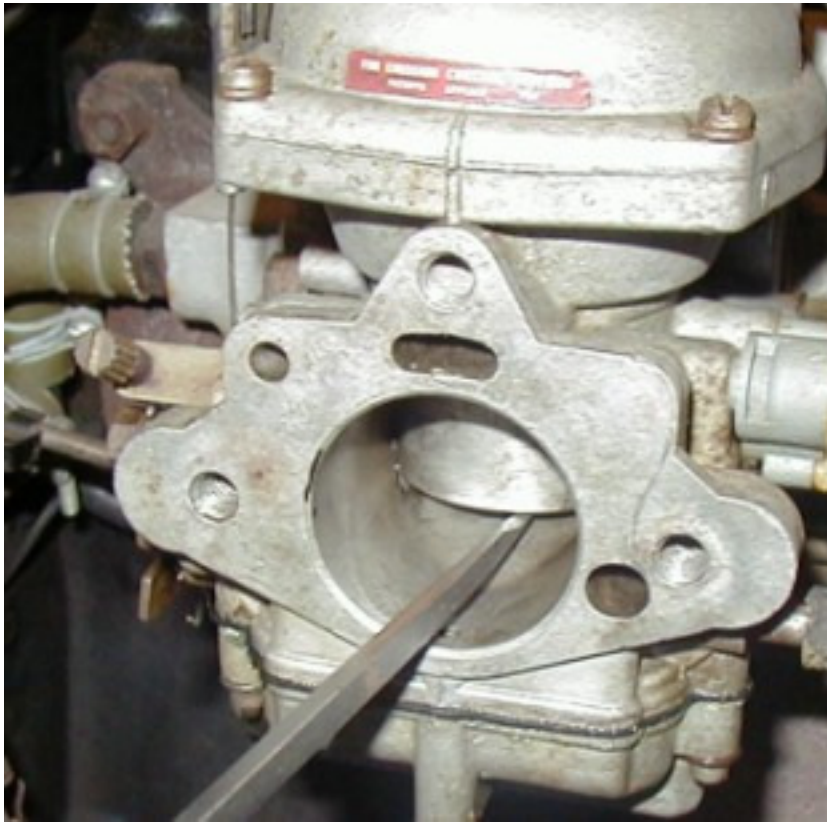
- Clear the engine between adjustments; bump the throttle bell cranks
- Some carburetors respond better with the dampeners filled with oil, try adding oil before continuing
- Which oil? I use the same as the oil I place in the engine

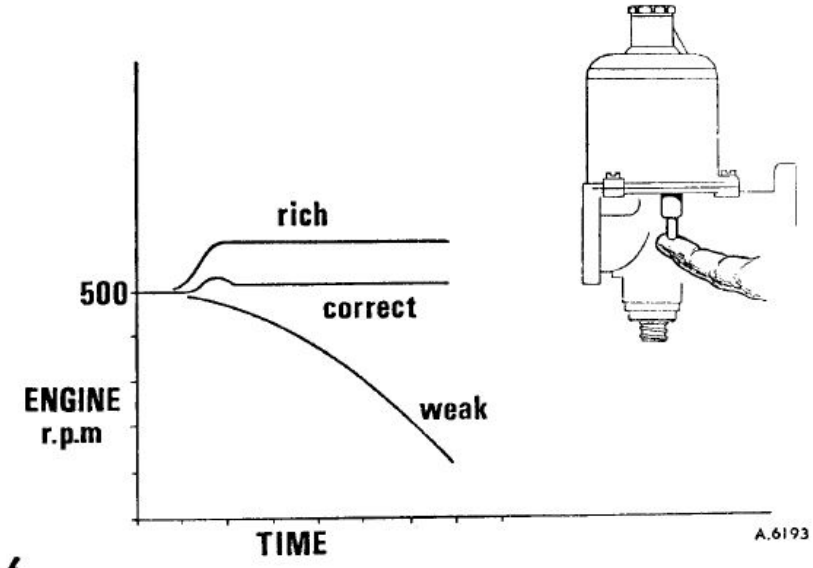


Idle Speed and Mixture Check

- Adjust the idle speed as needed to as low as reasonable
- Use a flat blade of a screwdriver just under the piston, and with a twisting motion raise the piston 1/32nd of an inch
- Note the response of the engine as follows
  - No change or rise- slightly rich
  - Slight rise and then fall off- perfect
  - Drop in RPM with no recovery- slightly lean

Idle Speed and Mixture Check





6

A. Check for correct mixture by gently pushing the lifting pin up about $\frac{1}{32}$ in. (·8 mm.) after free movement has been taken up.

B. The graph illustrates the effect on engine r.p.m. when the lifting pin raises the piston, indicating the mixture strength.

RICH MIXTURE:	r.p.m. increase considerably.
CORRECT MIXTURE:	r.p.m. increase very slightly.
WEAK MIXTURE:	r.p.m. immediately decrease.

C. Readjust the mixture strength if necessary.

Verify Jet Height

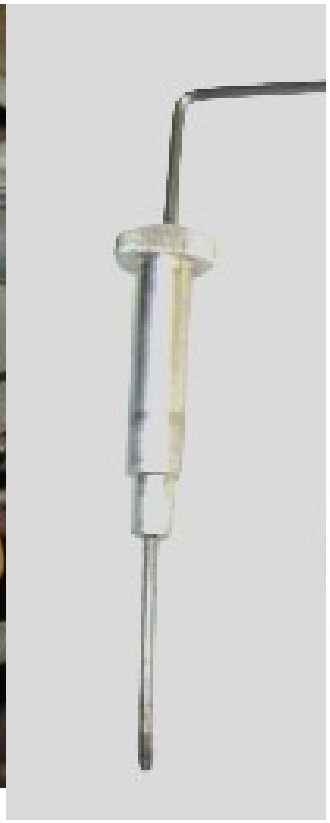
- Continuing for H, HS and HIF Series
- Again, remove the suction chamber and piston
- Measure the height of the jet below the bridge
- If it is less than .050 inches below the bridge, your float level may be high
- If it is greater than .080 inches below the bridge your float level may be low
- Ideal range is .060 to .070 below the bridge
- Reinstall the suction chamber and piston

ZS Carburetor Tips

- Special notes for ZS carburetors:
  - The air bleed screw on the side of the carburetor is useful for trimming mixture
  - The choke assembly is prone to sticking; make sure it is free
  - Assure the rubber diaphragm is intact; never spray carburetor cleaner in a ZS carburetor; it may degrade the diaphragm
  - Check the plug at the bottom of the float bowl

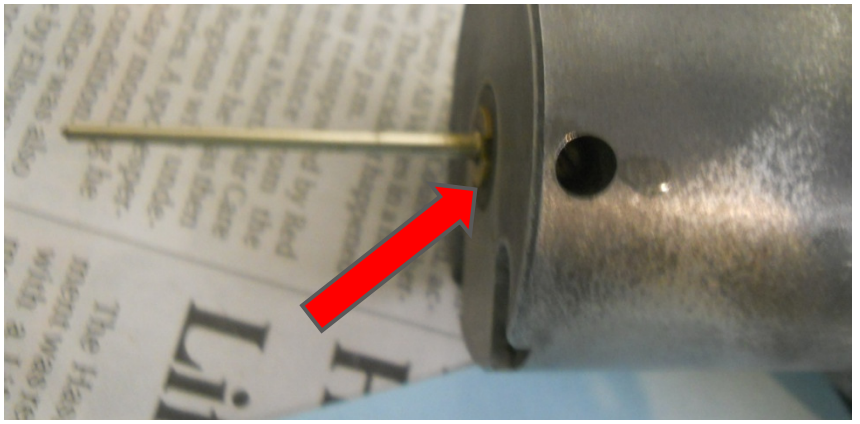
Adjust the Mixture CD Series

- Adjusting the jet Zenith Stromberg



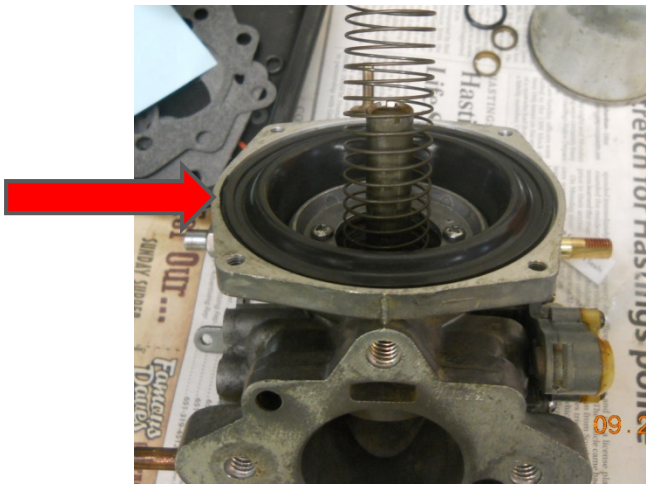
ZS Carburetor Procedure

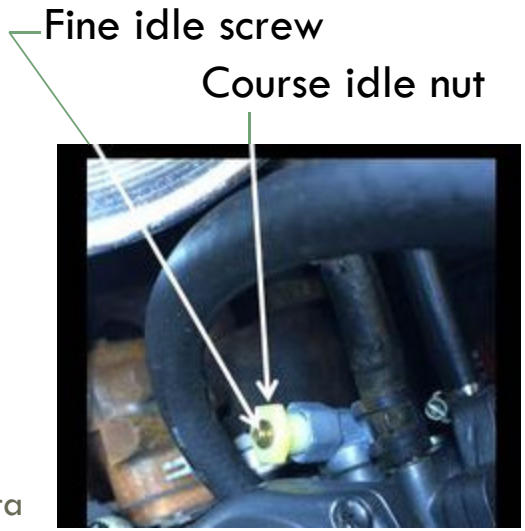
- Assumes no vacuum leaks
- Assumes choke is working
- Assumes stock needle and air cleaner
- Use the adjusting tool and set the needle so the barrel shaped carrier sits flush with the bottom of the piston



ZS Carburetor Procedure

- Note position of diaphragm
- Next gently screw both the plastic nut and small screw that adjust idle mixture all the way in
- Turn them both out from their stops 2 turns
- The plastic nut is first, the small screw second





ZS Carburetor Procedure

- Allow the engine to warm up
- Adjust the idle screw with the spring and bring the idle to 850-900 RPM
- Adjust the main idle stop (10mm nut stop nut)
- Adjust the fine center screw in the coarse nylon nut until the idle peaks and the engine smooths; adjust the idle screw with the spring to bring the idle to 850-900 RPM
- Readjust the main idle stop if needed

ZS Carburetor Procedure

- If you run out of adjustment (three turns either way) on the center screw, move the coarse nylon nut slightly in or out as needed to give more fine adjustment
- You probably don't have to adjust the needle with the adjuster tool, but if you do, move it no more than a turn in either direction, CW to enrichen, CCW to lean

Record Your Numbers

- Note the setting of the jet depth or ZS settings for future reference
- If your car accelerates nicely at a different setting, and gets reasonable mileage, no problems- every engine has different needs
- The important thing is to know the settings for your engine once you achieve them

Hopefully-

We have identified the key concerns on setting up or tuning an engine; Breathing, Fire, Fuel

We have shown you some consistent approaches to adjusting Breathing, Fire, Fuel and explained why the order is important

We have identified the differences between models so you can assist your friends

We have convinced you to keep notes of your efforts

Engage a mentor if you would like to learn more

Back-up

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HIF by-pass

- Additional HIF information

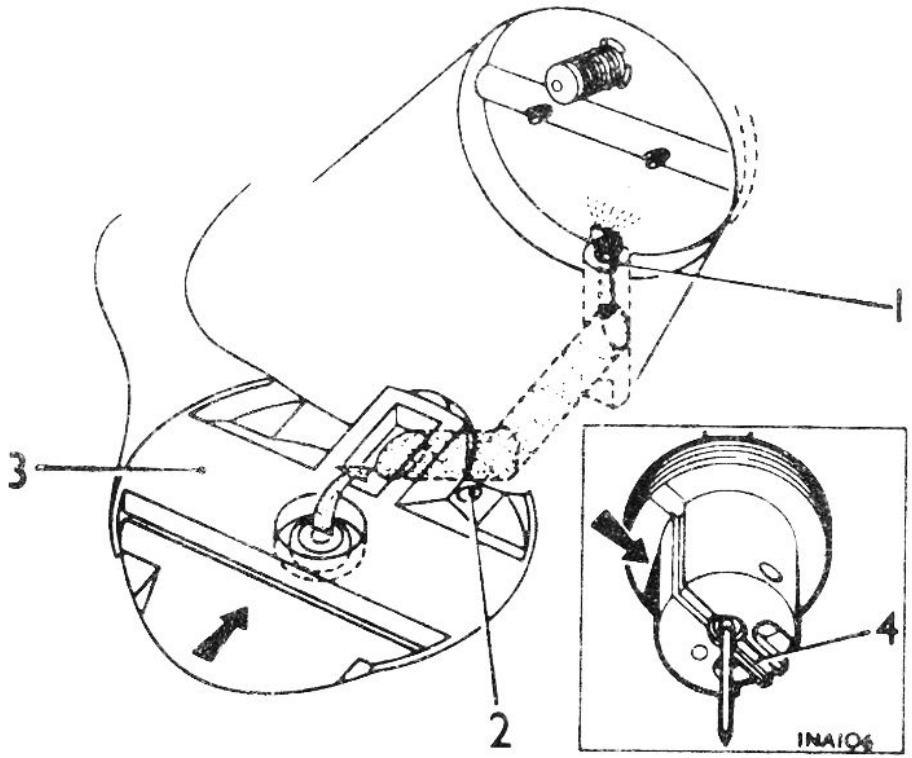
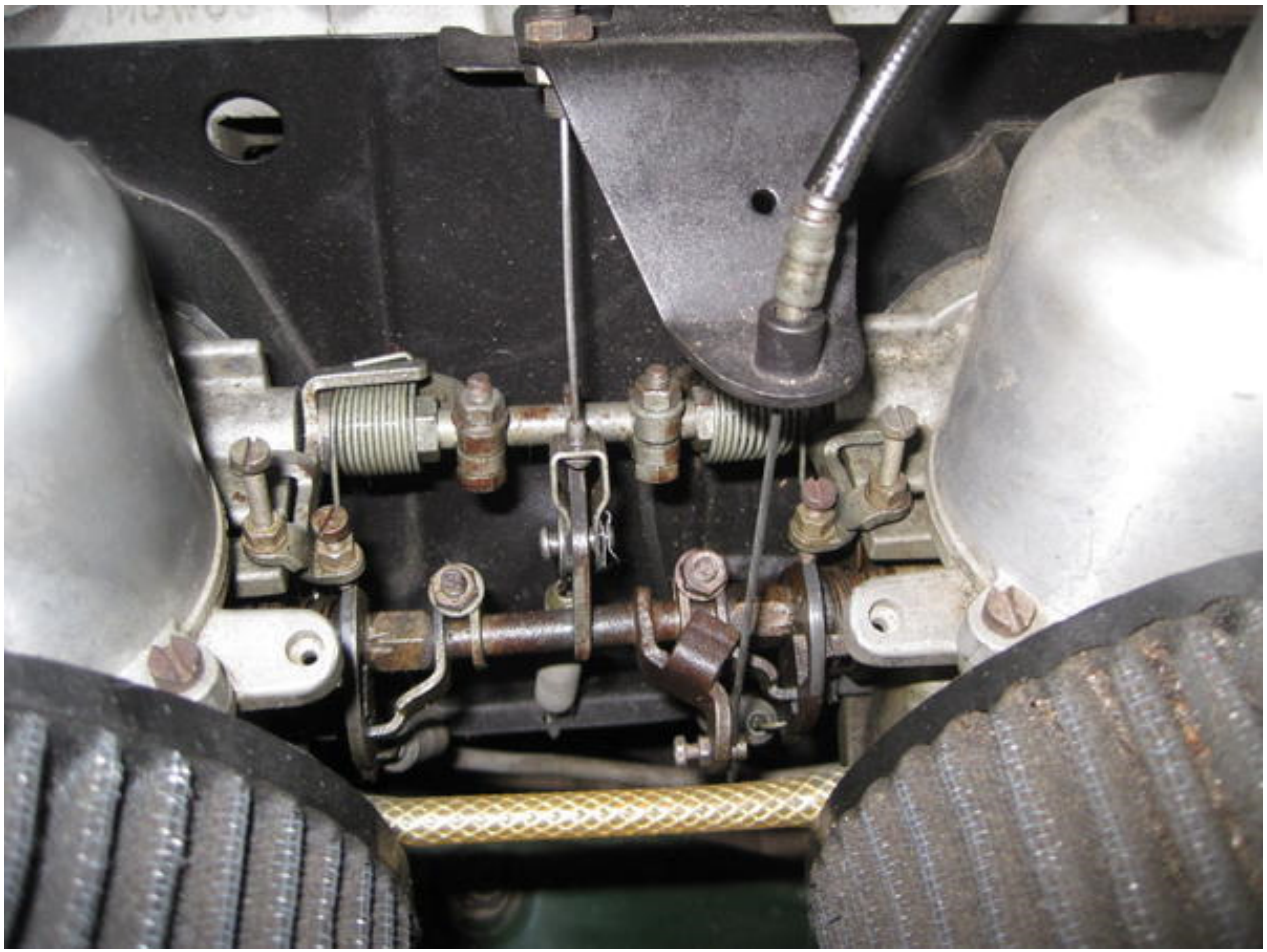


Fig. 77 — Part throttle by-pass emulsion system

1. *By-pass emulsion outlet*
2. *Cold start enrichment outlet*
3. *Carburetter bridge*
4. *Slot in piston*

HIF Linkage



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Float Chamber Adaptors for HS Carburetters

AUD 2062
HS Float Chamber Adaptor
30 deg. for L.H. Chamber Carb
or Horiz. for R.H. Chamber Carb
Diecast - solid

AUD 2063
HS Float Chamber Adaptor
30 deg. for R.H. Chamber Carb
or Horiz. for L.H. Chamber Carb
Diecast - solid

AUD 2071
HS Float Chamber Adaptor
10 deg. for R.H. Chamber Carb
or 20 deg. for L.H. Chamber Carb
Diecast - solid

AUD 2072
HS Float Chamber Adaptor
10 deg. for L.H. Chamber Carb
or 20 deg. for R.H. Chamber Carb
Diecast - solid

AUC 1366 Red
AUD 2676 Green
HS Float Chamber Adaptor
20 deg. for R.H. Chamber Carb
or 10 deg. for L.H. Chamber Carb
MG Midget, MGB, Sprite Rear Carb
**Flexible neoprene rubber*

AUC 1367 Black
AUD 2677 Grey
HS Float Chamber Adaptor
20 deg. for L.H. Chamber Carb
or 10 deg. for R.H. Chamber Carb
MG Midget, MGB, Sprite Front Carb
**Flexible neoprene rubber*

AUC 1316 Orange
AUD 2178 Brick Red
HS Float Chamber Adaptor
30 deg. for L.H. Chamber Carb
or Horiz. for R.H. Chamber Carb
Morris Mini Cooper LH Carb
Triumph Spitfire RH Carb
**Flexible neoprene rubber*

AUC 1336 Mauve
AUD 2179 Blue
HS Float Chamber Adaptor
30 deg. for R.H. Chamber Carb
or Horiz. for L.H. Chamber Carb
Morris Mini Cooper's RH Carb
Triumph Spitfire LH Carb
**Flexible neoprene rubber*

AUC 1318
HS Float Chamber Bolt Grommet
All HS Type Carbs with flexible Chambers
Under head of bolt for flexible adaptor

AUC 1534
H Type Flexible Grommet
Austin Healey Sprite Mk1, MGA 1500,
MGA Twin Cam, Triumph TR2, TR3, TR4

*The AUD part numbers are a much harder compound. Refer to carburetter spec sheet for correct fitment.

Piston Stops

- Piston Stops

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Using Jet Bearing Centering Tool

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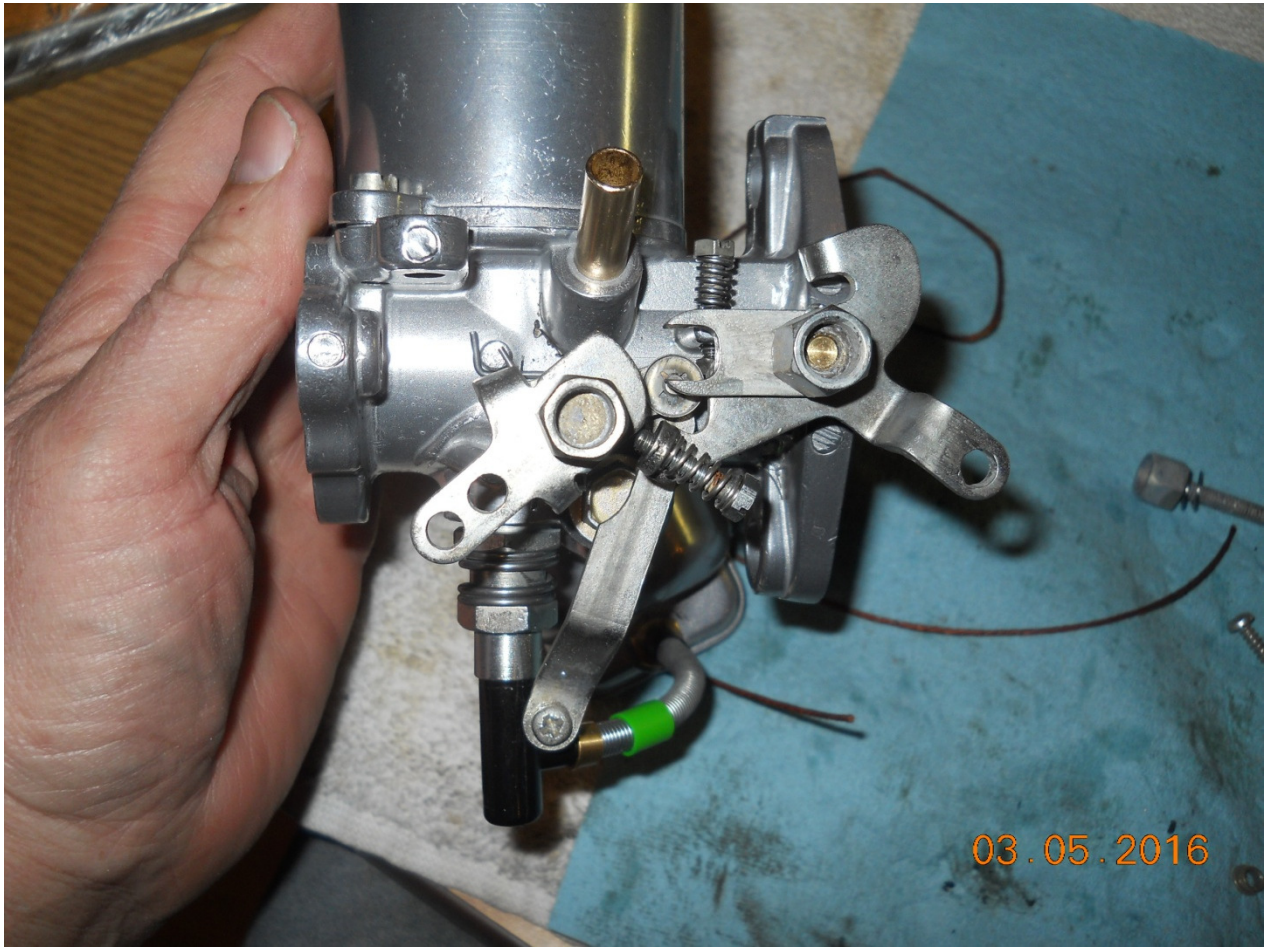
HS2 Enrichment Linkage



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HS4 Enrichment Linkage

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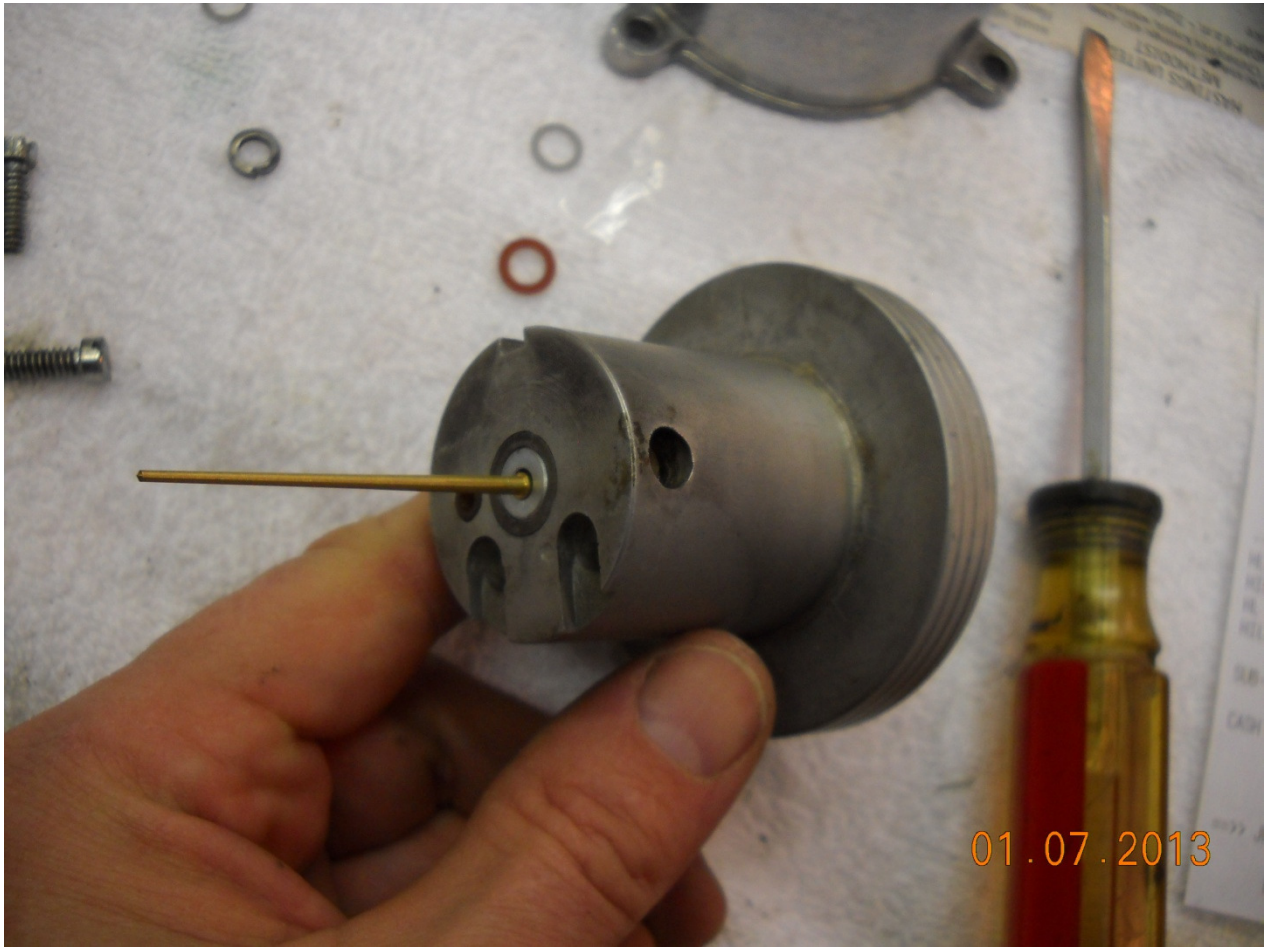
Proper Depth of Biased Needle



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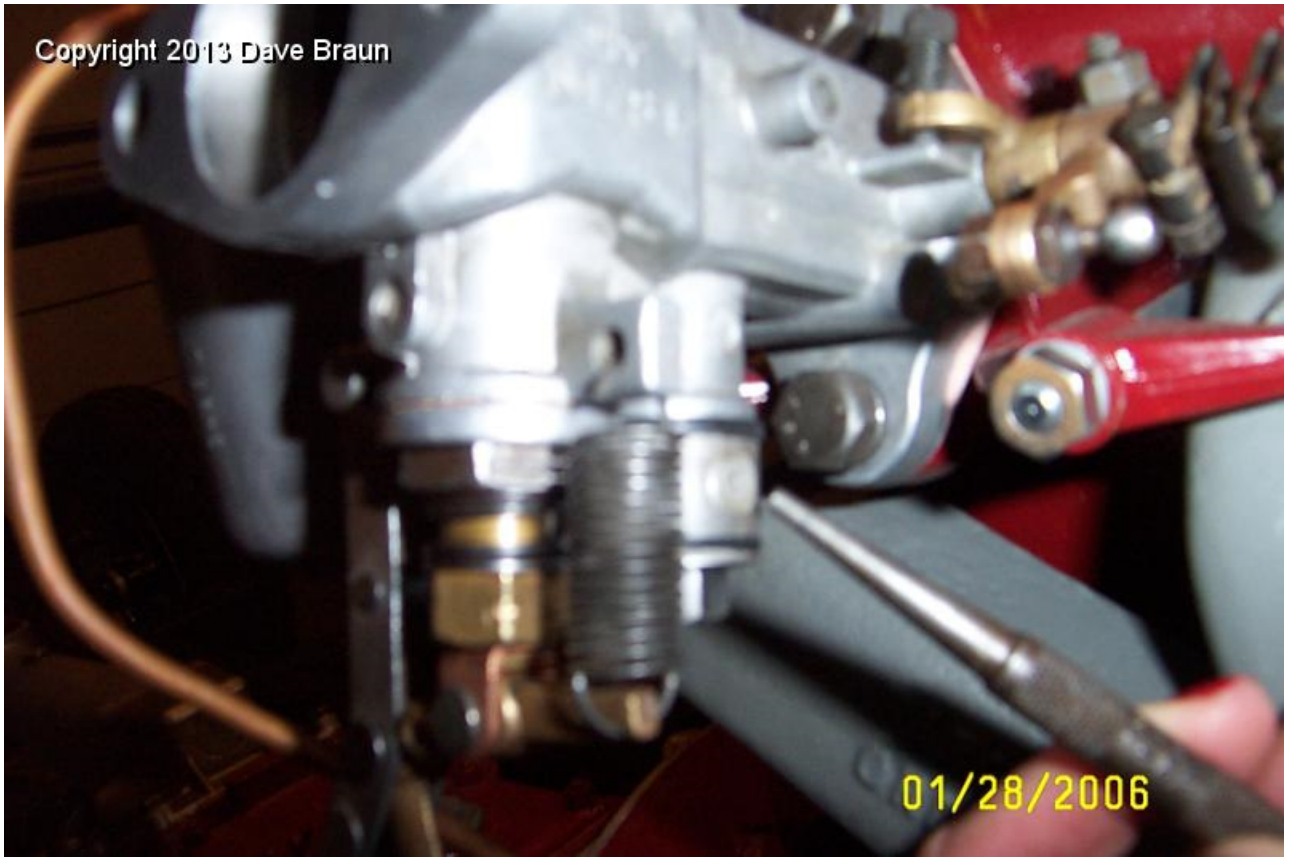
Transverse Tube Leaks

- XPAG H Series



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XPAG Manifold Balancer Nut

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Adjuster on XPAG (TC) Clamp

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Shouldered Bolt for Distributor