

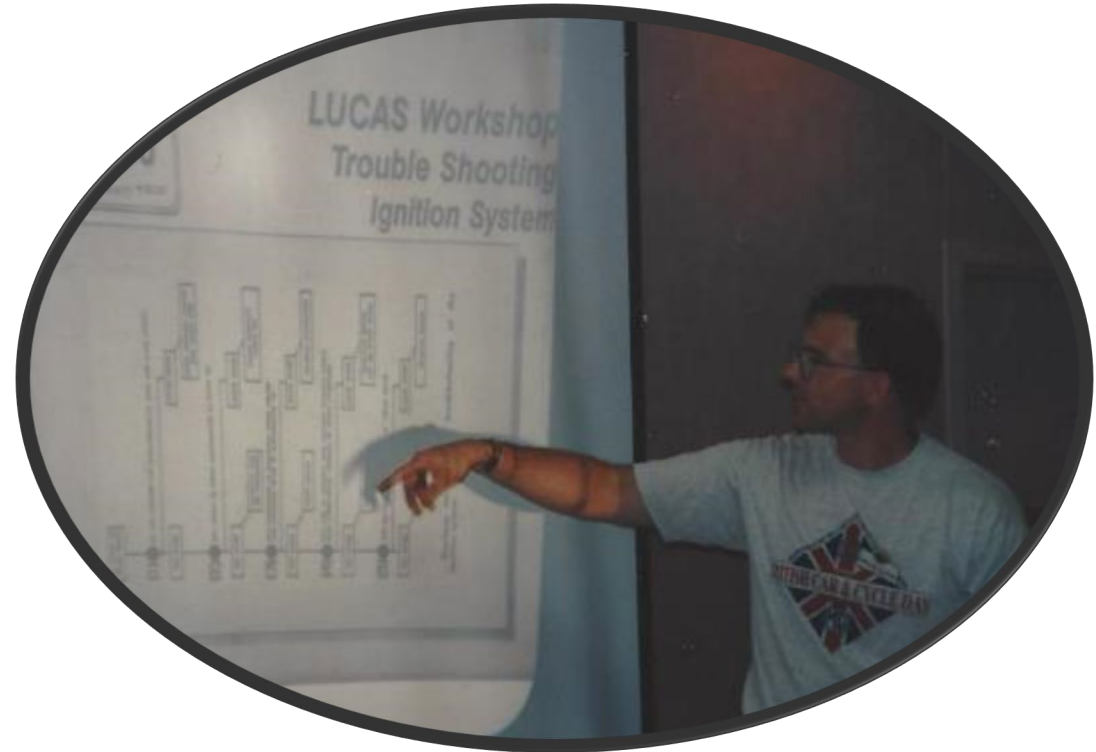


# TRA 2023 Fuel Pump Workshop

**Bruce Clough – Miami Valley Triumphs**

*Inspired from the events of prior TRA  
National Meetings tech sessions...*

*Materials available from  
[tcf1760lo@gmail.com](mailto:tcf1760lo@gmail.com)*





# ***Fuel Pump Workshop Agenda***



- What it does & How It Works
- Common Problems
- Rebuilding and Rebuilding Issues
- New Pumps – Good & Not-So-Good – hands-on time!
- What About Electric Pumps?
- Carry Along

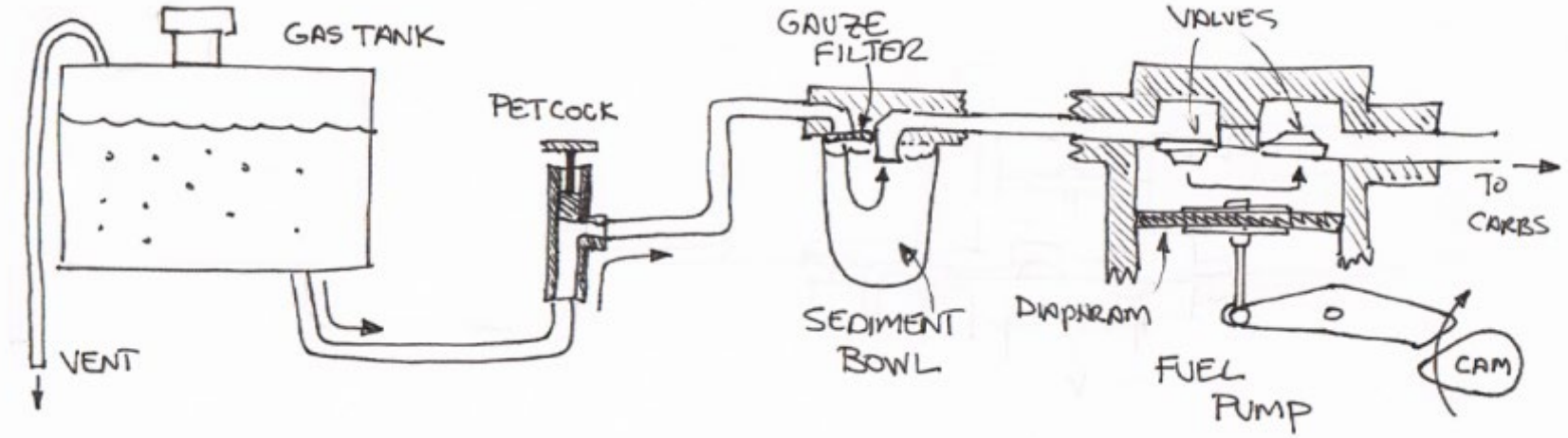


# ***Fuel Pump Workshop Agenda***



- **What it does & How It Works**
- Maintenance
- Rebuilding and Rebuilding Issues
- New Pumps – Good & Not-So-Good
- Electric Pumps
- Carry Along

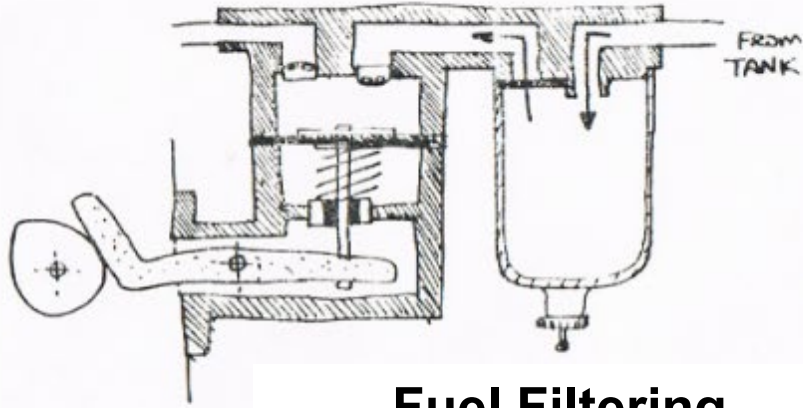
# Fuel System Cheesy Pictorial



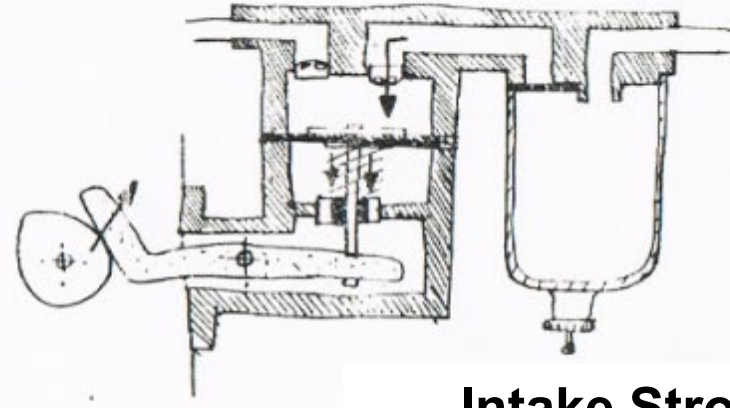
- Fuel is gravity fed to fuel pump – does have some suction capability
- Fuel Pump
  - Filters Gas
  - Pumps fuel to carbs

\* - yes, I know diagram of filter bowl is wrong as far as the in/out goes – too lazy to redraw this...

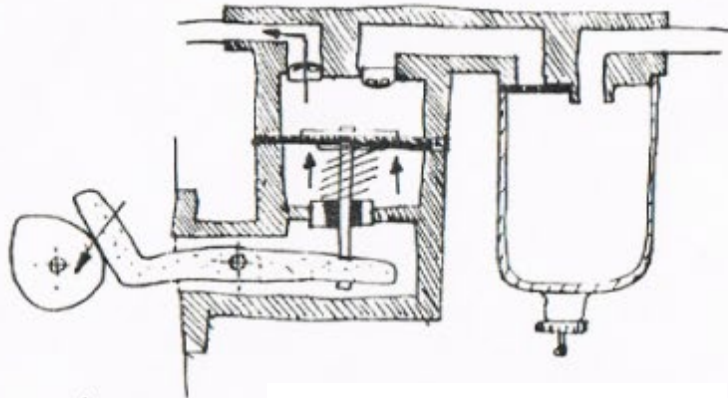
# How the pump works



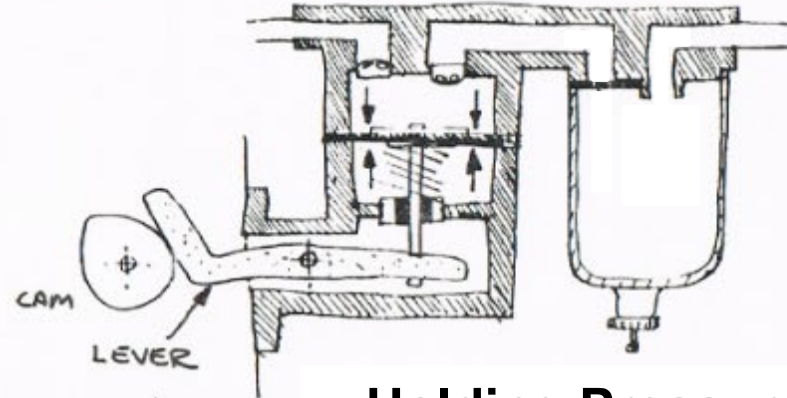
Fuel Filtering



Intake Stroke



Pump Stroke

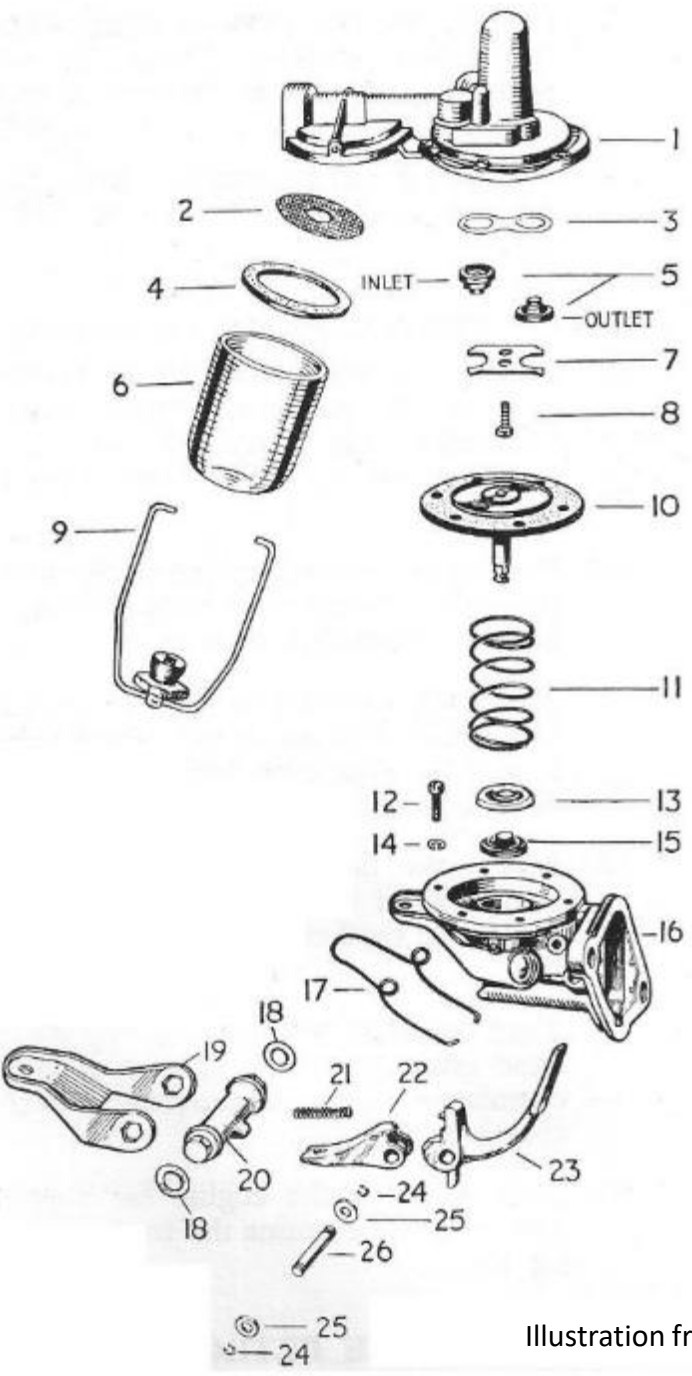


Holding Pressure





# Fuel Pump Components (Early AC Pump)



- | Ref.<br>No. | Description                        |
|-------------|------------------------------------|
| 1           | Upper body.                        |
| 2           | Gauze filter.                      |
| 3           | Valve gasket.                      |
| 4           | Cork seal                          |
| 5*          | Inlet and outlet valve assemblies. |
| 6           | Glass sediment bowl.               |
| 7           | Valve retaining plate.             |
| 8           | Screw for retaining plate.         |
| 9           | Wire cage.                         |
| 10          | Diaphragm assembly.                |
| 11          | Diaphragm spring.                  |
| 12          | Body securing screw.               |
| 13          | Oil seal retainer.                 |
| 14          | Lock washer.                       |
| 15          | Oil seal.                          |
| 16          | Lower body.                        |
| 17          | Hand primer spring.                |
| 18          | Cork washer.                       |
| 19          | Hand primer lever.                 |
| 20          | Hand primer lever shaft.           |
| 21          | Rocker arm spring.                 |
| 22          | Link lever.                        |
| 23          | Rocker arm.                        |
| 24          | Retainer ring.                     |
| 25          | Washer.                            |
| 26          | Rocker arm pin.                    |

**43 pieces total**

**Three different versions of the AC pump: Early, Middle, Late - Changes were made to simplify manufacturing**

Illustration from TR3 Workshop Manual



# ***Fuel Pump Workshop Agenda***



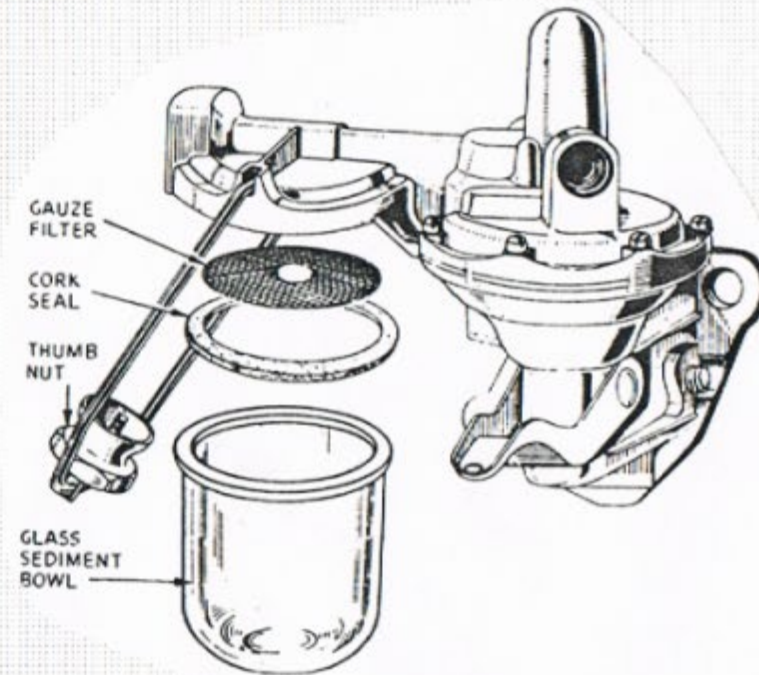
- What it does & How It Works
- **Maintenance**
- Rebuilding and Rebuilding Issues
- New Pumps – Good & Not-So-Good
- Electric Pumps
- Carry Along



# Routine Service



- Fuel Pump Relatively Maintenance Free
- Clean And/Or Replace Gauze Filter Every 1000 Miles
  - Loosen Thumb Nut
  - Dump And Clean Sediment Bowl
  - Clean Filter Using Air Or Clean Gas
  - Reverse Process And Install
  - Don't Overtighten Thumb Nut Or Seal Can Be Damaged!
- Examine Pump For Wear
  - Worst Place: Rocker Arm Pin-Can Wear Leading To Pump Failure



Cleaning the Pump Filter.





# ***Fuel Pump Workshop Agenda***



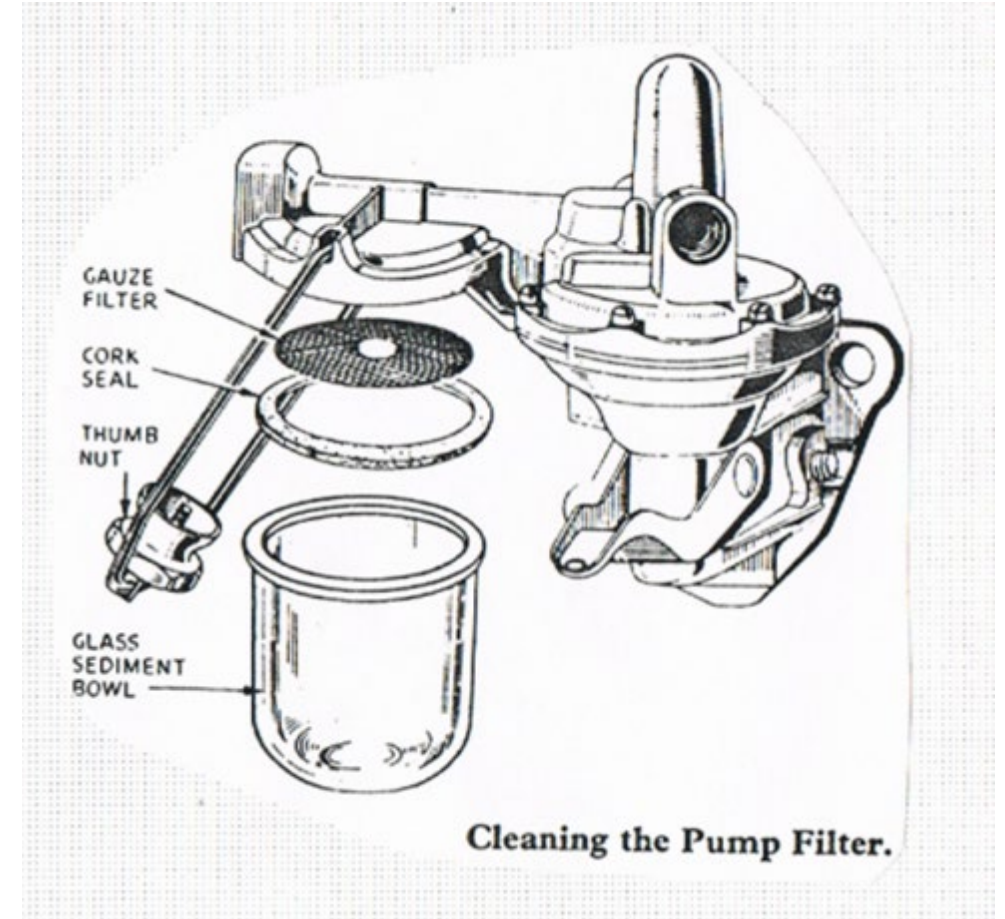
- What it does & How It Works
- Maintenance
- **Rebuilding and Rebuilding Issues**
- New Pumps – Good & Not-So-Good
- Electric Pumps
- Spares

# Fuel Pump Workshop

## When to rebuild



- **Manual: Rebuild pump every 50K miles**
  - Moving parts subject to wear
  - Seals subject to wear, aging
  - Rubber parts subject to aging, cracks, leaks
  - Nowadays rebuild on inspection
- **Consequences of neglect**
  - Probable: Normal on-road breakdown hassles. Oil leak from pump weep hole
  - Improbable: Gas in sump
  - Very Improbable: Fire
  - Very, Very, Very Improbable: Death





# Fuel Pump Workshop

## Getting it off - Tools



- **Appropriate Factory Service Manual**
- **Normal garage tool assortment**
- **Special Tools**
  - *0.5" line wrench*
  - *0.5", 1/4" drive Shallow Socket with 3", 1/4" Wobble Extension and narrow 1/4" Ratchet*
  - *Pinching pliers/Vise Grip if no working fuel line petcock*
- **Pan and solvent (I use spray brake cleaner – I put that sh\*t on everything)**
- **Clean workspace**
- **Rags**



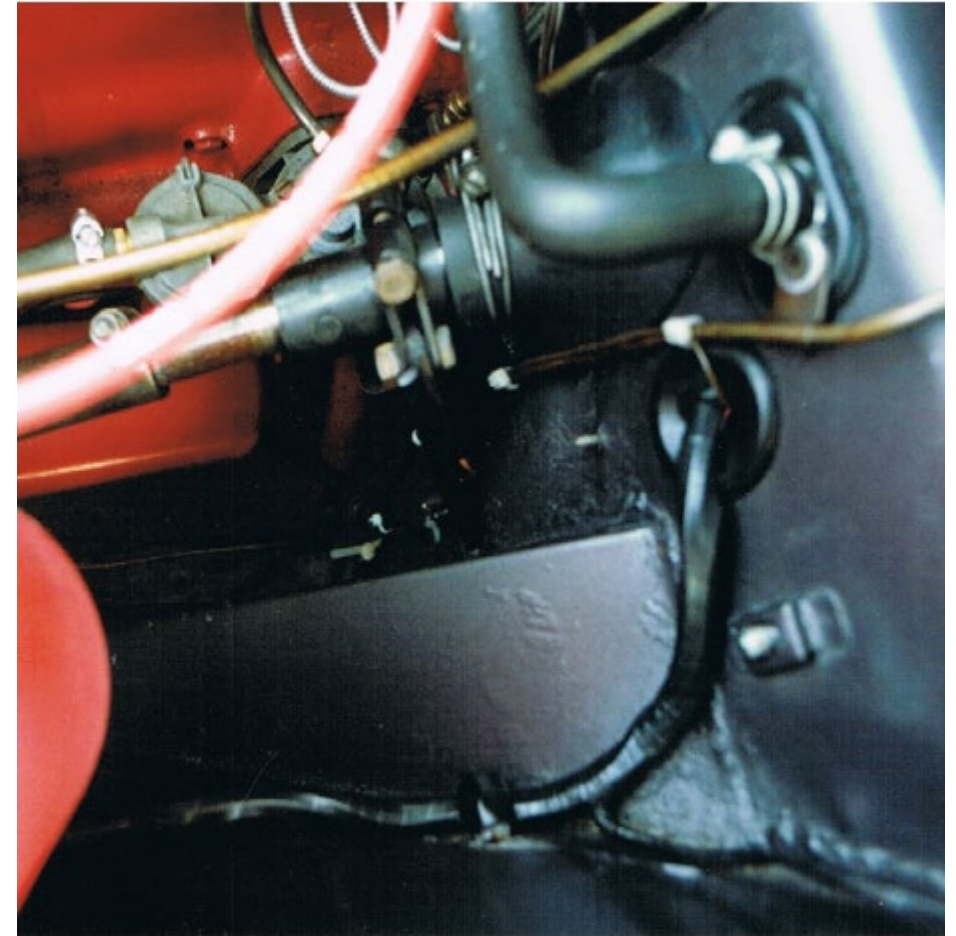


# ***Fuel Pump Workshop***

## ***Removing Pump***



- Read manual
- Block Gas Flow using petcock if working, if not, pinching pliers/Vise Grip
- Remove sediment bowl – be ready with rag
- Take input gas line off
  - Original: remove compression nut at petcock then line from pump intake
  - Usual: take off hose clamp and pull rubber off fitting on pump intake
- Take support bracket off if you have a split steering shaft
- Use 1/2" line wrench to remove jam nut on line to carbs. Fuel will flow from this – be ready with rag
- Use 1/2" socket on 1/4" wobble-drive ratchet to remove fuel pump mounting nuts.
- Pull off oil line clamp if present
- Withdraw pump carefully around steering shaft
- Remove old pump to block gasket

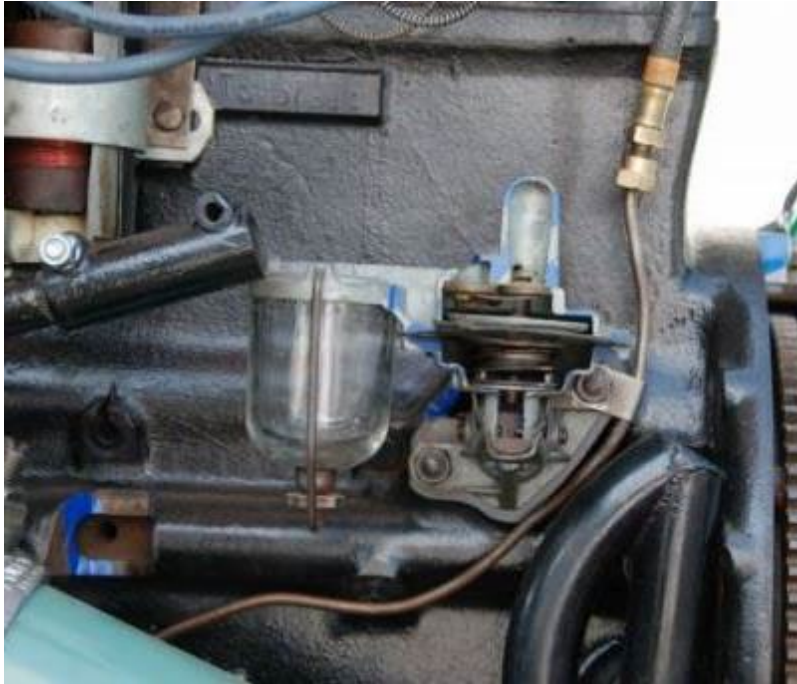


**Bird's Eye View Late TR3A/B**





# ***Fuel Pump Workshop That @#\$\$% back nut!***



- **Clean area prior to trying to remove**
- **Hard to get to location due to body, split steering shaft support**
- **Back nut also holds on oil line clamp**
- **Need three very small hands or the right tools!**



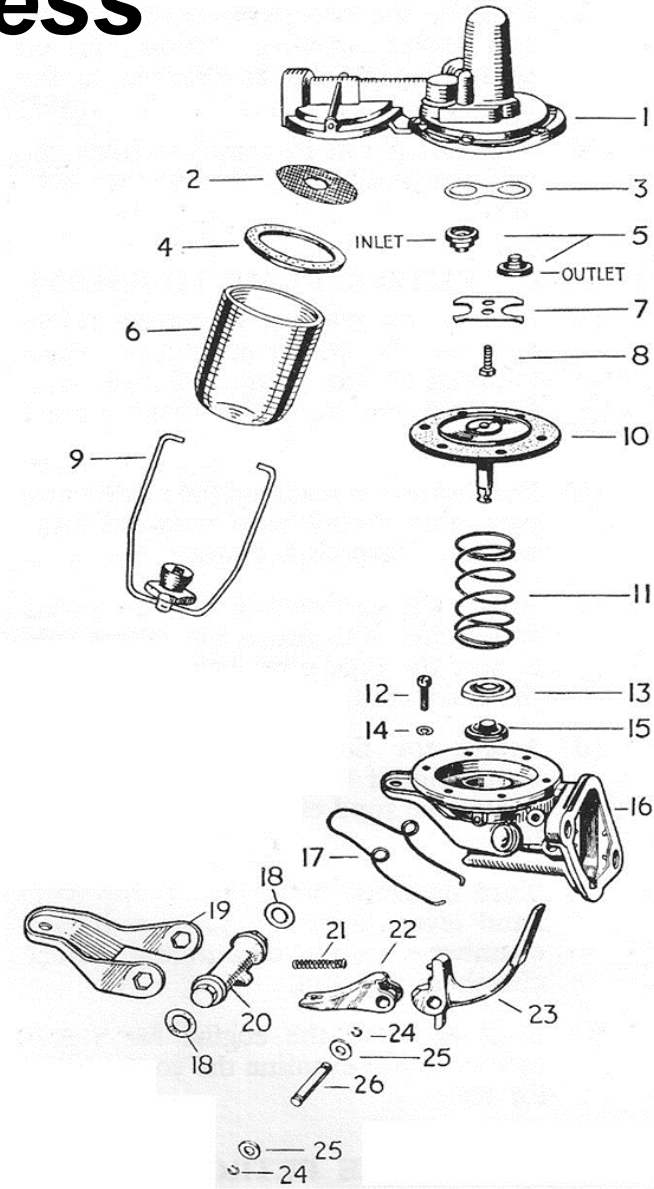
# Fuel Pump Workshop

## Rebuilding Process



- Lay out new replacement parts
- Tear down as per manual – if unsure – take pictures
- Put parts due for replacement aside – compare w/kit
- Clean rest of parts in solvent
- Put parts in container you won't knock off the workbench!
- Examine pump parts – make sure they are good before reusing
- Reassemble, installing new parts as required
- Check operation when done – resistance should be felt and noise should be heard – it should pull a suction from the input port

**Yeah, there might be a few more things to consider...**

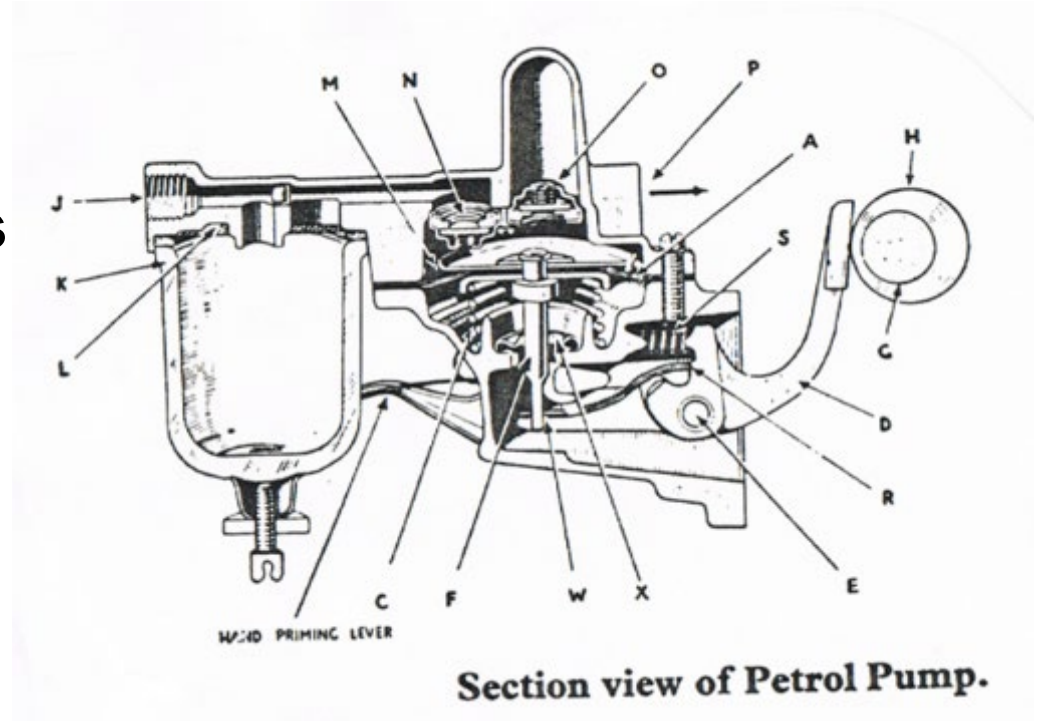


# *Fuel Pump Workshop*

## *What Fuel Pump do I have?*



- Before you rebuild it's useful to know type of pump you have
- As stated earlier, at least three versions of AC pumps were made.
  - “Early”, “Mid”, and “Late”
  - All fit, all work, only some fully re-buildable
  - Can't tell until after it's off and apart
- As a general rule aftermarkets are not fully re-buildable





# Fuel Pump Workshop

*Fully Re-buildable = Inlet/Outlet Valves Replaceable*



Early, Mid, and some Late AC pumps used a clip to hold in inlet/outlet valves



Everyone else stakes them in

**Re-staking staked valves is an iffy proposition due to right tools and metal fatigue, but you can swap tops between models**



# Fuel Pump Workshop

## Rebuild Kits – not the same



Original (L) vs  
Powertune Kit (R)

Original vs Powertune Kit



Original (L) vs  
TRF Kit (R)

Original vs TRF Kit

**Quality varies, also these are missing gauze filter and oil seal**



# Fuel Pump Workshop

## So let's talk about the Oil Seal



- Keeps oil from leaking out during hard cornering
- Keeps gas from failed pump diaphragm from getting into engine
- Not in TR pump rebuilding kits from any major vendors
- Older aftermarket kits, NOS AC kits have them
- Available Massey Ferguson Tractor rebuild kits (Sparex Kit S.41634 for instance) – none of the other parts except the one-way valves will fit, but at least you can get a seal...

– <https://www.lindstromequipment.com/engine/pid1718446/fuel-lift-pump-repair-kit/>





# ***Fuel Pump Workshop***

## ***Quality Issues with Powertune Kit***



**The holes and actuation rod notches do not line up correctly, the actuation rod notches in the pump level will not be perpendicular to the slot – not a killer, but sloppy**

**The one-way valve gasket is too big – to fit you have to cut it apart into two ring gaskets then trim those down – C'mon man!**



**Original on left, Powertune on right - Rubber vs phenolic valve pads, steel/aluminum vs brass housings. Original one-way valves clean up by soaking them in white vinegar for a day**

# Fuel Pump Workshop

## Matching Ferrule & Jam Nut



- Long ferrule and short jam nut, or short ferrule and long jam nut – only!
- Short ferrule and short jam nut will not seat – IT WILL LEAK!
- Long ferrule and long jam nut will not engage as many fuel pump body threads – chance of stripping threads in soft cast pump top



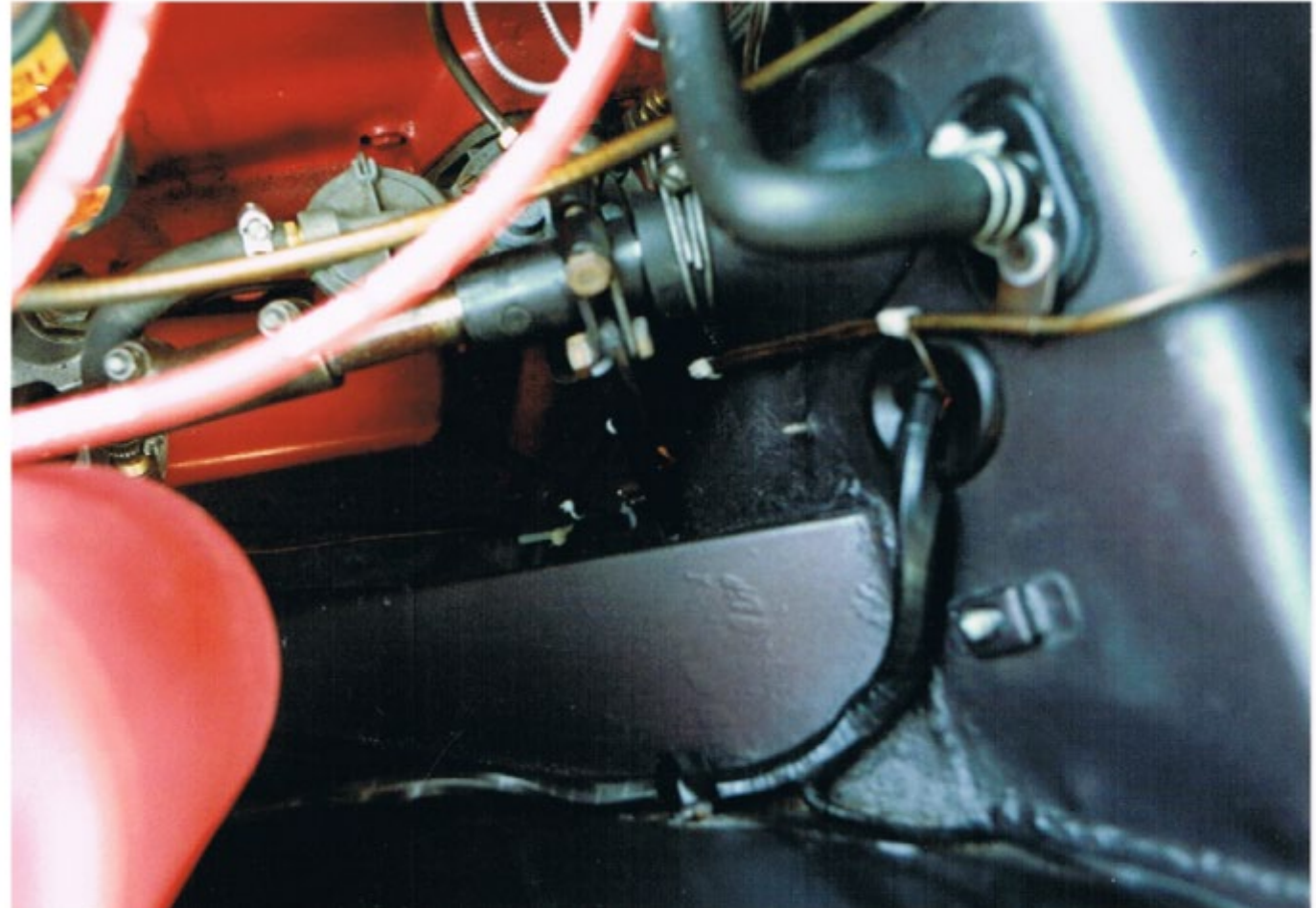


# ***Fuel Pump Workshop***

## ***Installing Pump***



- **Reverse order of removal**
- **Use new pump to block gasket**
- **Ensure rocker arm is on cam correctly**
- **Remember oil pressure line clamp**
- **Attach fuel line, remove line clamps/ and/or open petcock**
- **Check for leaks using priming lever, check hoses & tubes for damage**
- **Start engine and check for leaks**
- **Use family friendly curses please!**





# ***Fuel Pump Workshop Agenda***



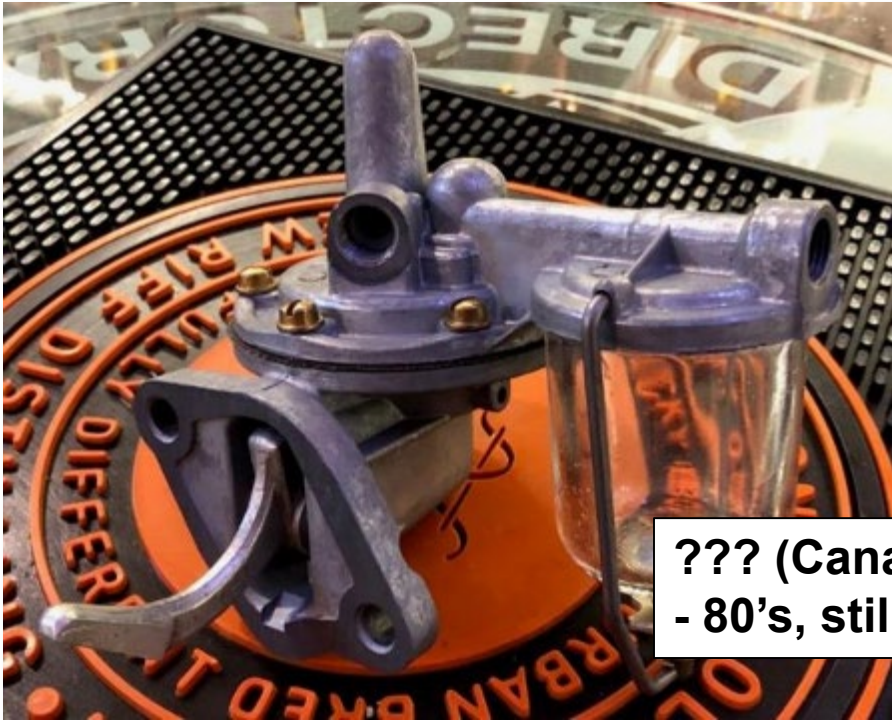
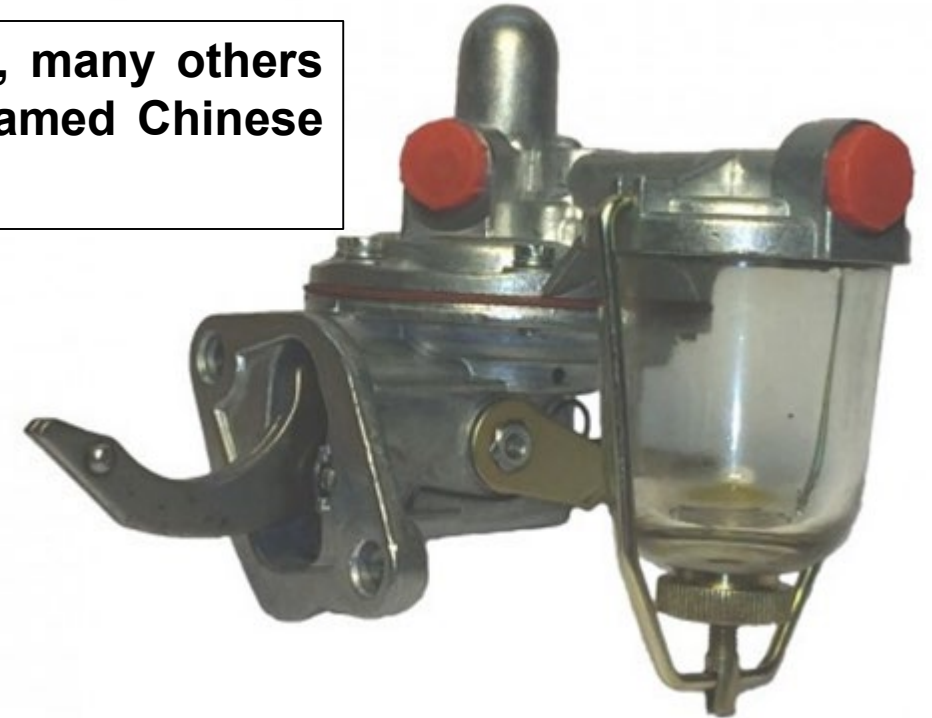
- What it does & How It Works
- Maintenance
- Rebuilding and Rebuilding Issues
- **New Pumps – Good & Not-So-Good**
- Electric Pumps
- Carry Along

# ***Fuel Pump Workshop***

## ***Aftermarket pumps***



??? (China) - Inexpensive pump sold by Moss, BPNW, Rimmers, many others vendors, especially on ebay - \$30 and up - Sourced from non-named Chinese companies, exact configuration varies



??? (Canada) - No manufacturer ID on pump, sold by many vendors Late 70's - 80's, still can find them NOS on ebay for \$50 and up

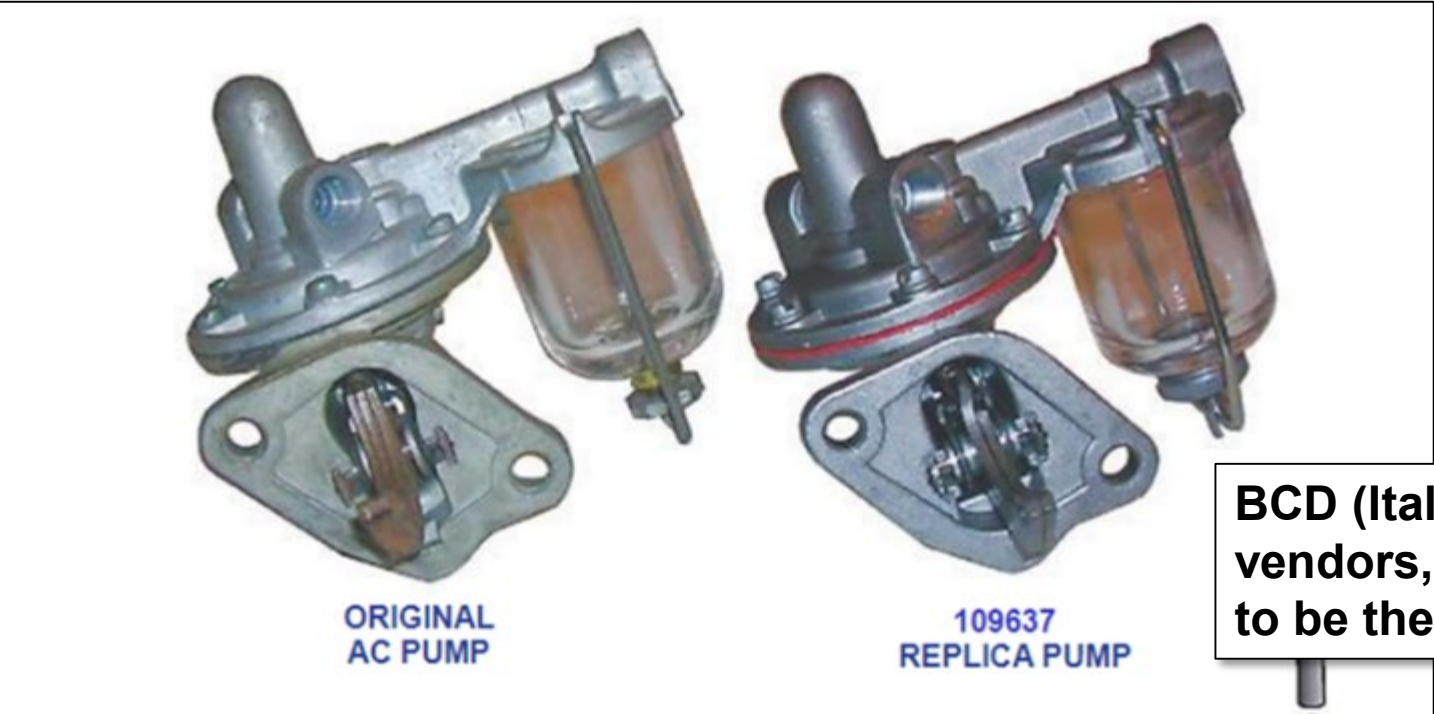


# Fuel Pump Workshop

## Aftermarket: PTZ pump



PTZ (Slovenia) - Sold by some non-USA vendors, also on ebay, \$80 and up



BCD (Italy) - Sold by TRF, some other on-line vendors, \$200 but can find on sale for less, touted to be the highest quality aftermarket pump



# *Fuel Pump Workshop*

## *Aftermarket pump issues*



- Chinese pumps have internal mechanical failures - more on that next chart
- Canadian pumps can lose lever arm pin, see Macy's write up at <https://www.macysgarage.com/fuel%20pumps.htm>



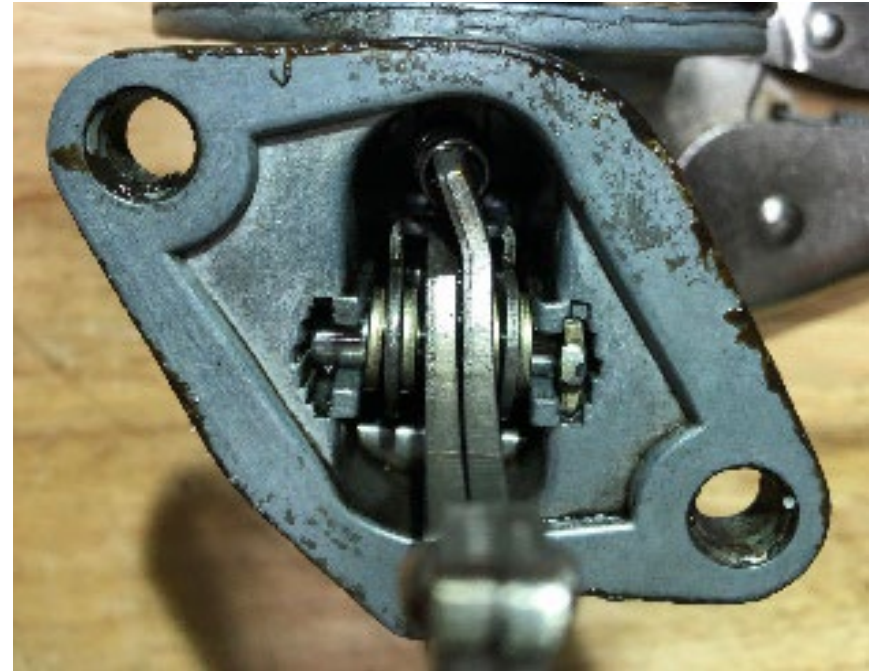


# *Fuel Pump Workshop*

## *Rocker arm pins stake failure on Chinese units*



New Chinese Pump



Failed Stake holding in shaft  
on Chinese Pump

**Peened “ears” holding shaft blocks failed due to repeated stressing (high cycle fatigue) – failed metal falls into oil sump, fuel pump stops working**



# ***Fuel Pump Workshop***

## ***New Pumps: Staked Shafts, Cast or Laminated Levers***



**Chinese & BCD pumps – small staked sections on to wedges, laminated levers**



**PTZ pump – wide staked sections, no wedges, forged lever**

- **Staked shafts reduce production time and complexity, they also can introduce failure modes - resistance to stake failure will depend on design, manufacturing process, and metallurgy of casting**
- **Laminated arms are also easier/cheaper to produce than cast/forged ones**
- **Consider these things as part of the cost/benefit trade-off when buying aftermarket pumps**

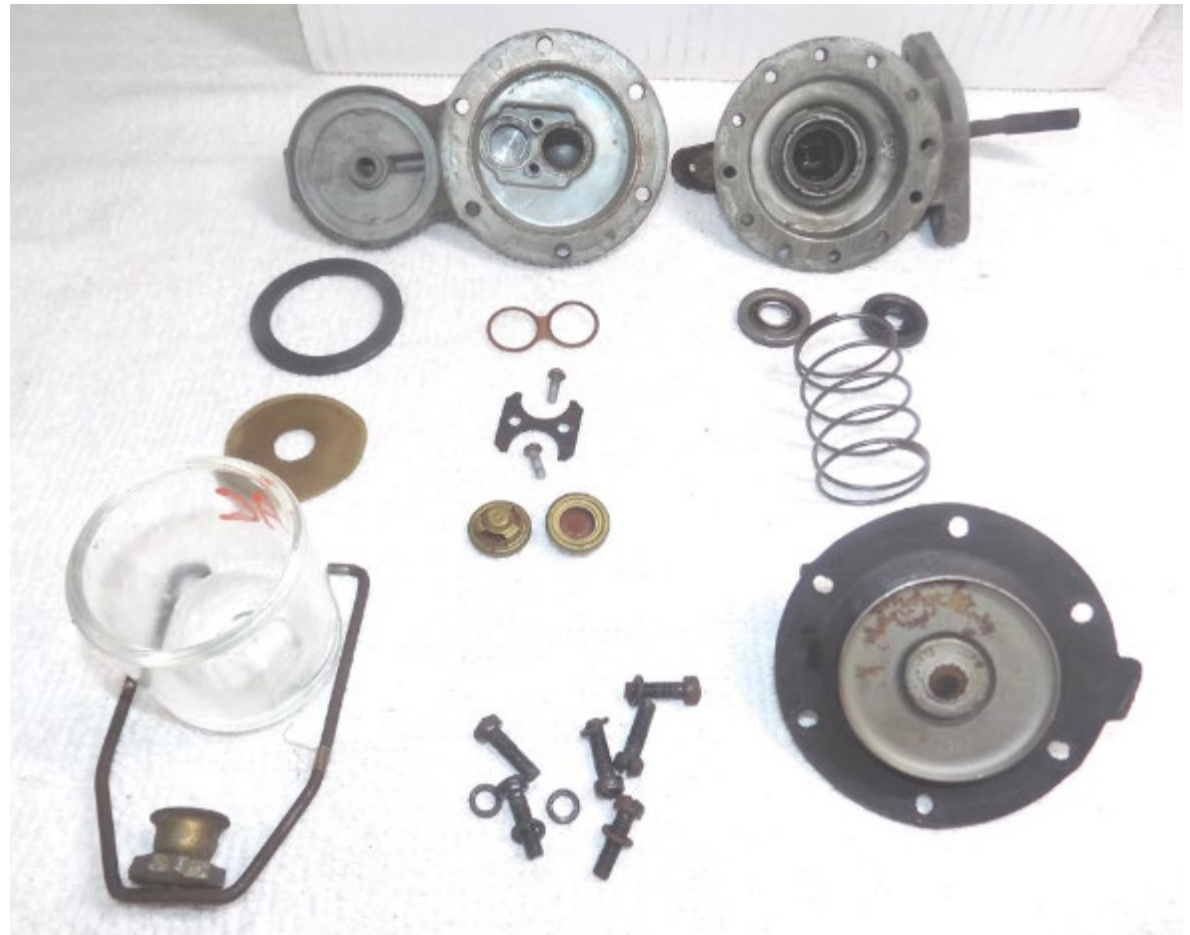


# Fuel Pump Workshop

*So Bruce, would you rebuild an original or buy new?*



- **Easy – Original**
- **Assuming it is serviceable, rebuild an original early AC pump, drop the mic**
  - They are made better
  - They are made to maintain
  - Availability might be an issue
- **If you buy new, buy PTZ – I cannot recommend Chinese pumps, and BCD are suspect**





# ***Fuel Pump Workshop Agenda***



- What it does & How It Works
- Maintenance
- Rebuilding and Rebuilding Issues
- New Pumps – Good & Not-So-Good
- **Electric Pumps**
- Carry Along



# ***Fuel Pump Workshop***

## ***Electric Fuel Pump***



- **4-7psi - Holley, Edelbrock - \$60-ish - with cheaper ones you run a greater risk of failure**
- **Should not need pressure regulator**
- **If you are going for a permanent install\***
  - **Install under car - engine bay second choice due to heat**
  - **Use separate fuse, please**
  - **Use relay control the power from the ignition switch**
  - **Consider safety inertial switch for collision – suggest TR7 FI switch**
- **Put one in emergency repair bag? I do.**



\* - why would you do this for a stock engine?



# ***Fuel Pump Workshop Agenda***



- What it does
- How It Works
- Maintenance
- Rebuilding and Rebuilding Issues
- New Pumps – Good & Not-So-Good
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- **Carry Along**



# *Fuel Pump Workshop*

## *Whither thou goest, goest with spares*



- I carry two
  - one known good mechanical
  - one known good electrical
  - came in handy for TRA 2019
- Carry proper tools
- Carry gaskets, extra fuel line, hose clamps, nylon cable ties in various sizes
- I do not recommend just carrying a rebuild kit – wastes time and the failure might be something different







# ***Fuel Pump Workshop***

## ***Necessity is the Mother of Invention***



- **On the way to TRA 2019, TR3A died from BCD fuel pump failure**
- **Back-up Moss (Chinese) pump had shaft retainer failure**
- **Put on the electric pump & away we went!**



**Moral of the story – use the electric pump for fast repairs on the road and replace mechanical pump when you get to destination**

# ***Fuel Pump Workshop Summary***



- **Fuel pumps are not rocket science – very simple devices**
- **Easily re-buildable if you get the right pump, and the right kit (Early AC pump, TRF kit, Sparex seal)**
- **Stay away from inexpensive aftermarket pumps**
- **Road trip? Carry a spare mechanical pump and electric pump (not rebuild kit), and the right tools!**





Questions?