

How to Drill a VW Head for Dual Ignition

James Braley

Today's Presenter: James Braley

- Leonard Millholland Double Eagle Builder
 - 1300 hours in and will be done any decade now.
- Commercial Pilot AMEL/ASEL, Instrument rated
- EAA 32 Member (KSET)
- Supplier Management on F/A-18 Program
- Married with two teens



Retrieved from: <https://legaleagleairplane.com/double-eagle/>

Content of Presentation

- Setting the “need” to do this.
- Tools needed
- Getting up to practice
- Head selection
- Steps to Bore heads
- Tips and Tricks
- Q/A

Why would anyone do this?

- MOFOCO has questionable reviews.
- Great Plains is out of business.
- Sonex was willing at one time to sell heads but unsure of size.
 - Might still be willing, I asked before the new ownership.
- Hummel engines is really the only game in town.
- Heads are somewhat disposable, If you get a crack or need to rework valves, it can be faster just to make a new head.
- You work on your own timeline on exactly the head you want.



[View Larger Image](#)

Mofoco 040A 40mmX35.5mm Cylinder Head DUAL 12mm spark plug holes, 92mm bore SINGLE

MFC-CCH040A Mofoco

Good...

MOFOCO manufactures the only truly MADE IN THE USA VW aircooled cylinder head on the market. The 040A is specifically designed for constant run RPM engines.

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Head Selection

What I used

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JBUGS.com < Engine Parts < Engine Components < Cylinder Heads

EMPI GTV-2 VW Cylinder Head - Dual Port - for 94mm w/Comp Valve Job - Single Valve Springs

Does this part fit? [Select your vehicle](#)

Part Number: 98-1335-B

Usually Ships in 5-7 days

~~\$479.95~~ **\$407.96** (15% off)

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1/4

Description Fits Years Shipping & Returns Q&A

Additional Material for Porting

Mild or Wild with no welding needed

Clear Air Passages for proper cooling

How to Drill a VW Head for Dual Ignition

Some folks rave about the Panchito head.



Mon-Fri, 6:30am-3:00pm PST
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1673 Panchito 044™ (40 x 35.5) 94 Bore (each)

List Price: \$502.95

Your Price: \$436.95

You save \$66.00!

Price with Selected Options: **\$436.95**

Availability: Usually Ships in 1 to 2 Weeks

Product Code: 1673

Valves*:

SUPERGRIP Valves (included)

Springs:

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Stock Heads (single port)



They could be Brittle!

VW Volkswagen 1500 1600 Single Port Heads Beetle Bus Bug Type 3 Ghia 311101373A



type3guy (545)

100% positive · Seller's other items ·

Message



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Condition: **Used** ⓘ

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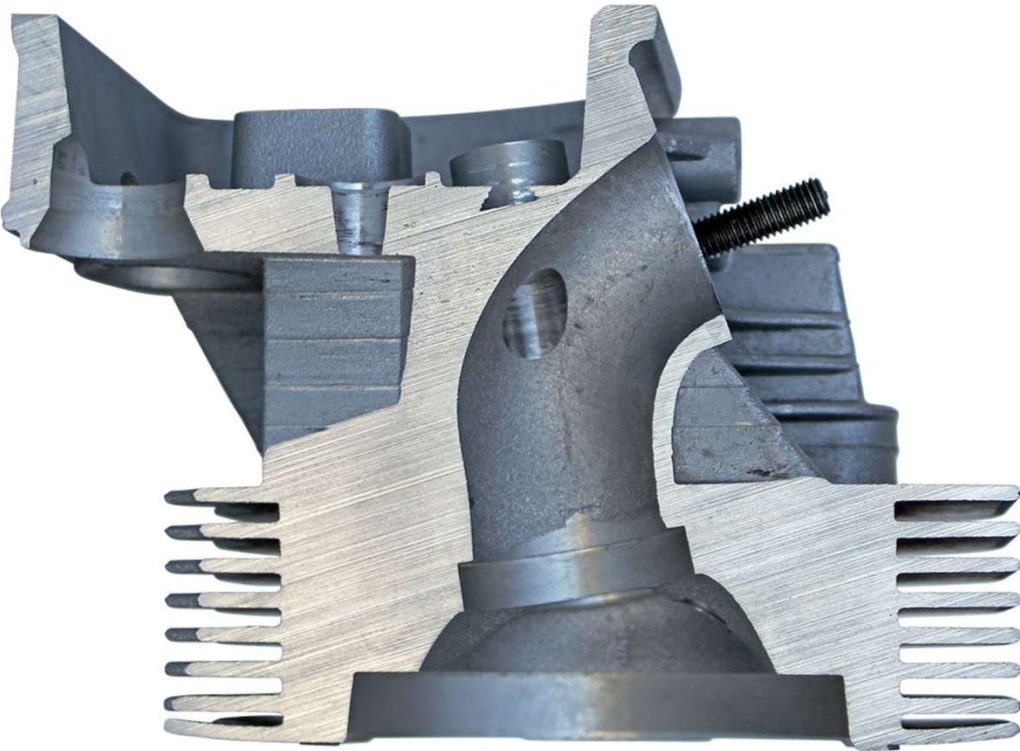
Additional service available

☐ 1-year protection plan from Allstate - **\$19.99**

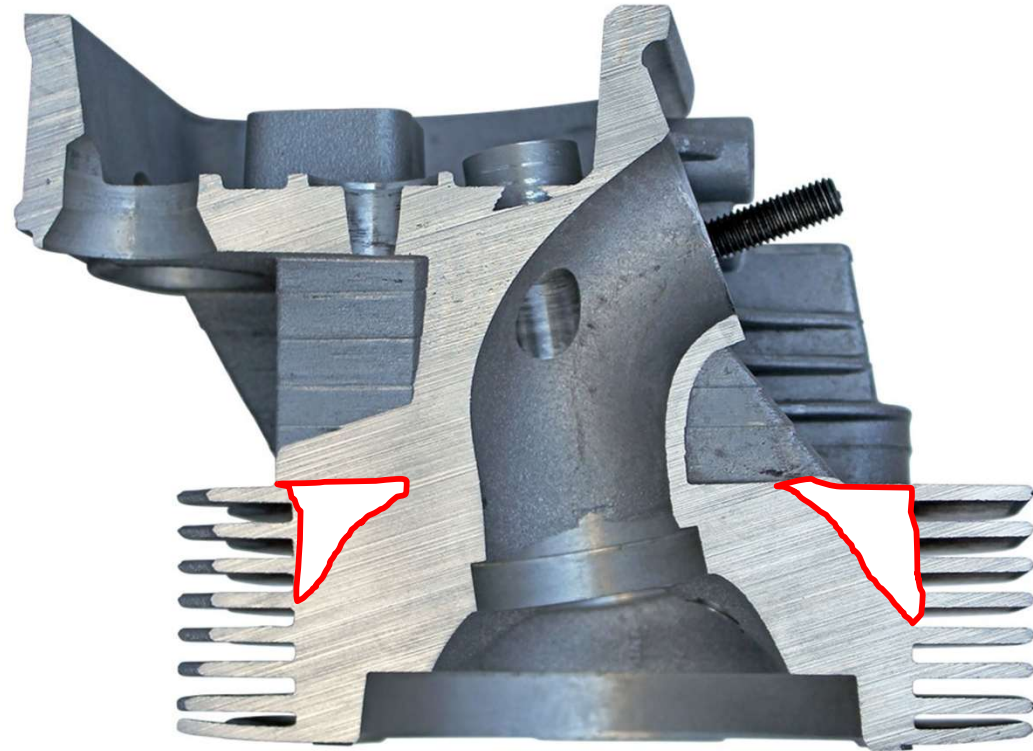


Hurry before it's gone. 1 person is watching this item.

Note on aftermarket vs stock



Panchito Head Cross Section



Rough Sketch Stock Head Cross Section

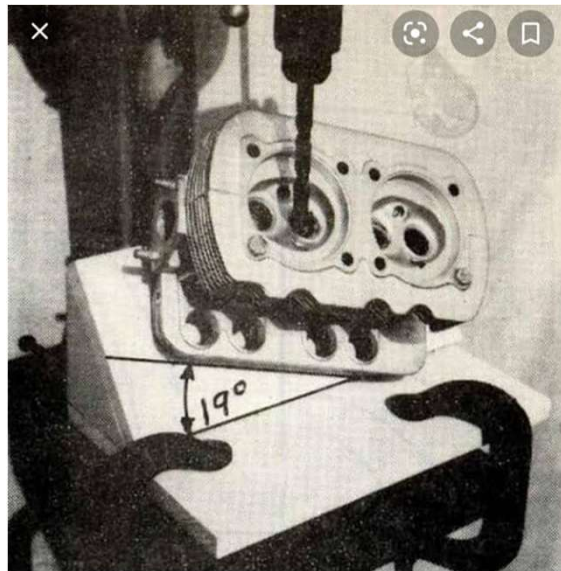
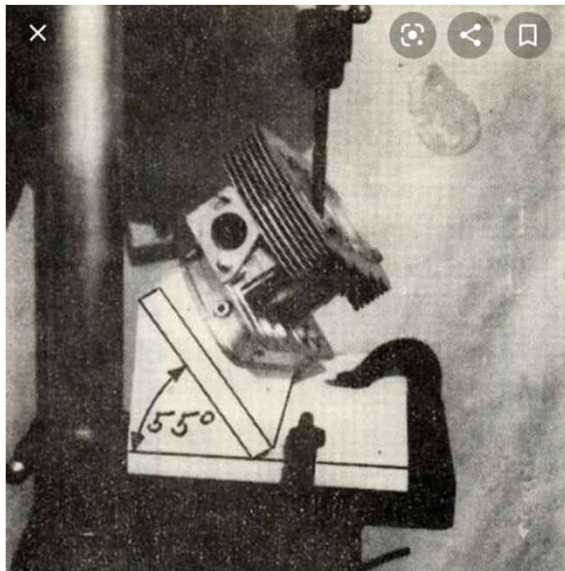
Plug placement and historical manufacturing methods

The Pro Way to do this: On a Mill, with fixture



Note the machining fixture

The Peacock? Way: Might also be from LAA

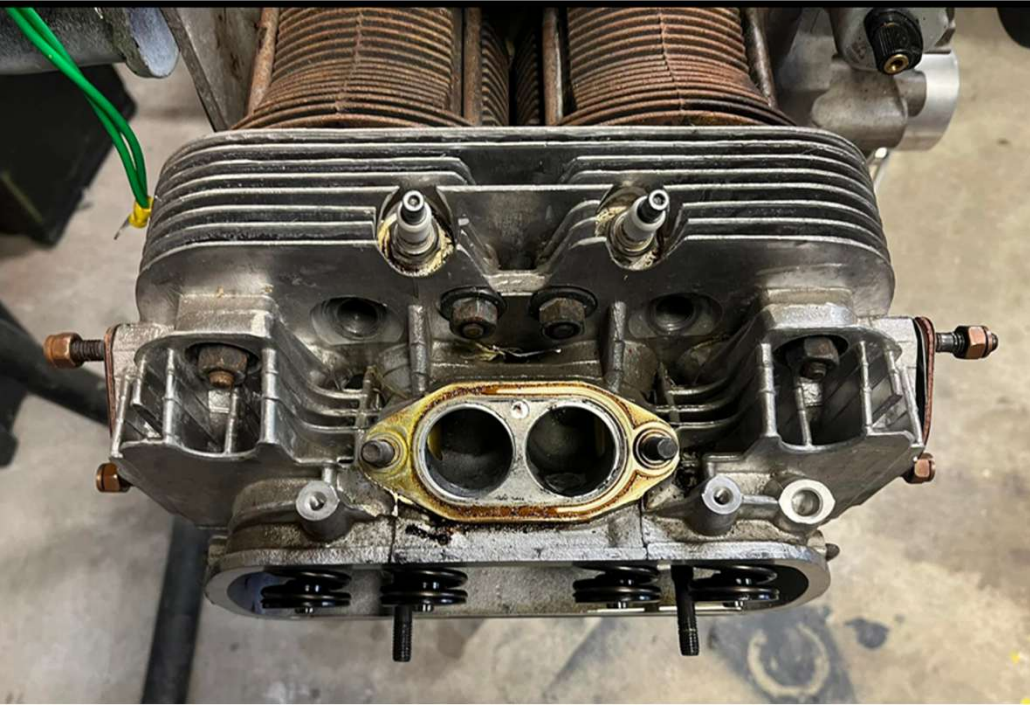


Josh Duff



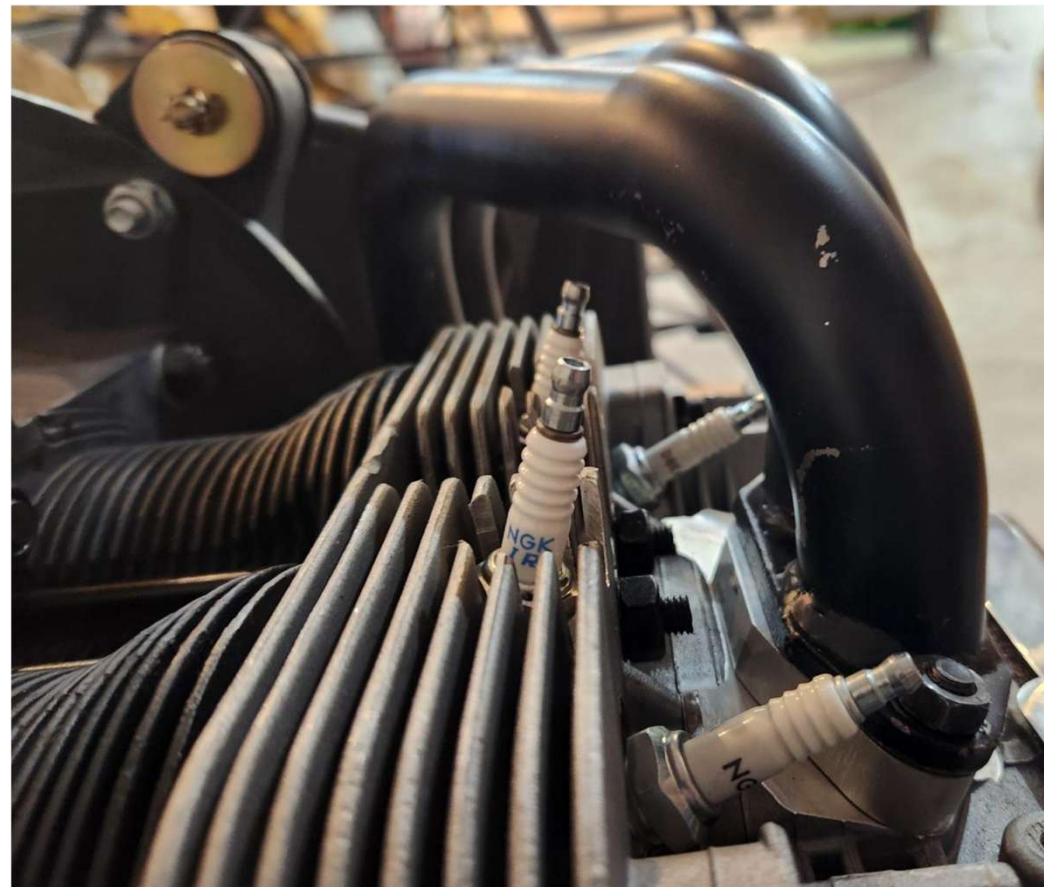
Facebook post on 9/11/2021 in the “1/2 VW Aircraft Engine” group details how he hand drilled these.

Shawn Wiedenhoeft (FB Aviation Volkswagen Engine conversions)



How to Drill a VW Head for
Dual Ignition

Think about Intake/plug interference



Tools

Drill Press

- You can use a normal drill press as long as you have enough depth.
- A Shop Smith is probably the best drill press ever as you can move the table or the drill head up and down.



Clamps

To hold jig to
table



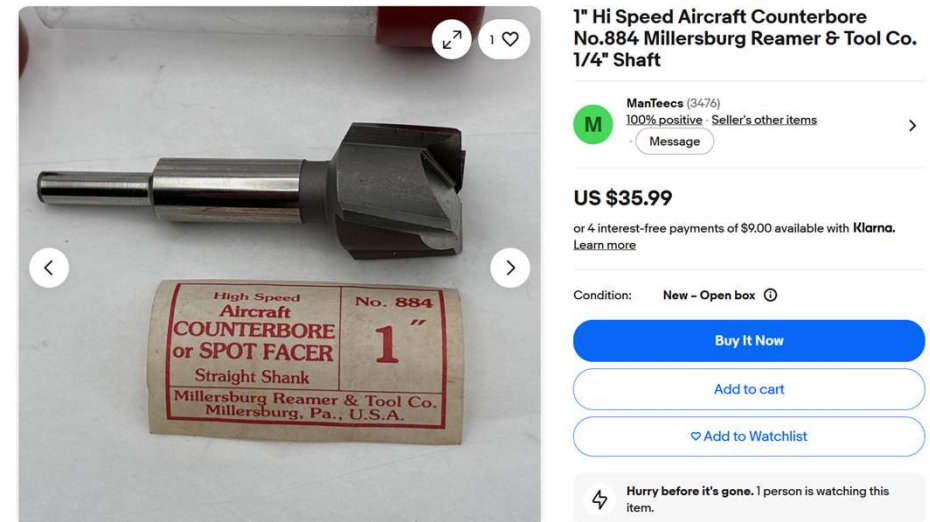
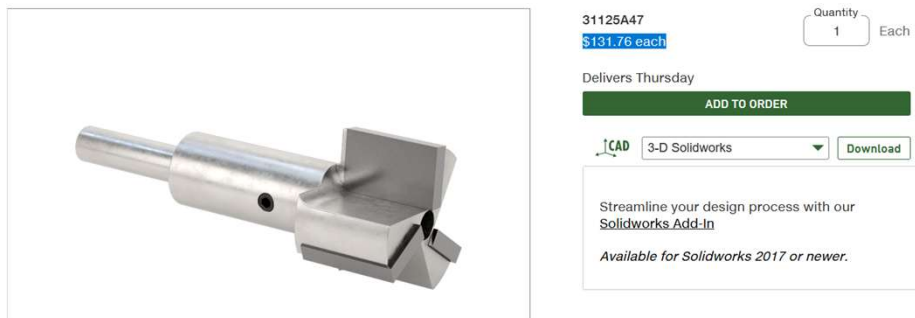
Cutting tools

- Center drill
- Long reach .250 drill jobber bit.
- 1 inch Spot face tool with pilot
- 9MM drill bit
- M10x.1.0 TAP



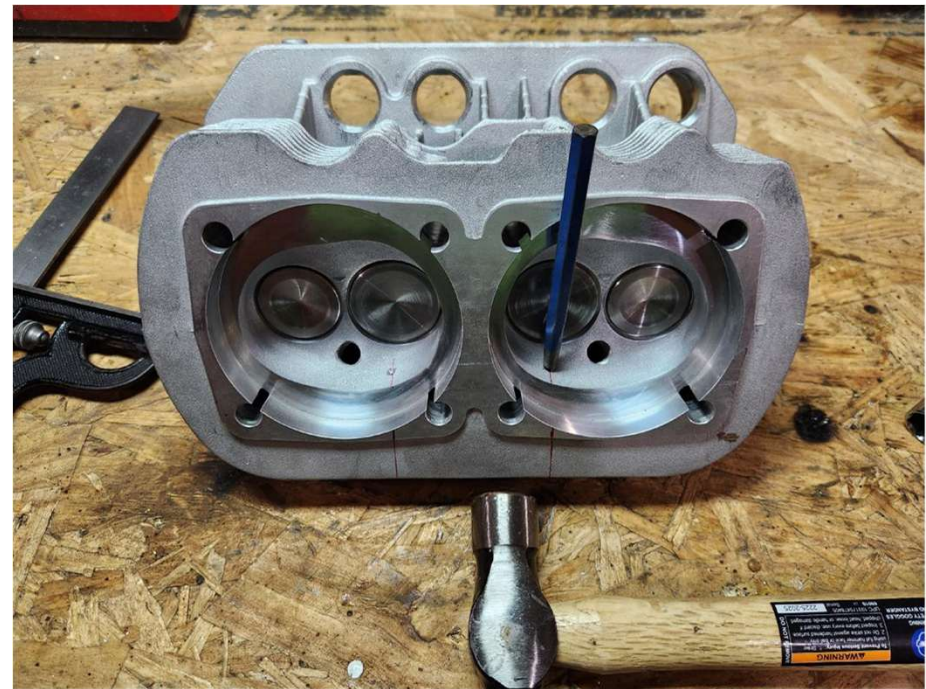
1 Inch Spot Facer or Aircraft Counterbore

- We are spec'ing a pretty unique tool.
- You want to get a “1-inch reduced shank spot facer, with interchangeable pilot”.
 - And you want a .250 pilot.
 - <https://www.mcmaster.com/31125A47/>
 - Check Ebay for deals.



Misc

- Punch.
- Dead blow hammer.
- Regular hammer.
- Square.
- Fine point sharpie.
- Dial caliper is a nice to have.



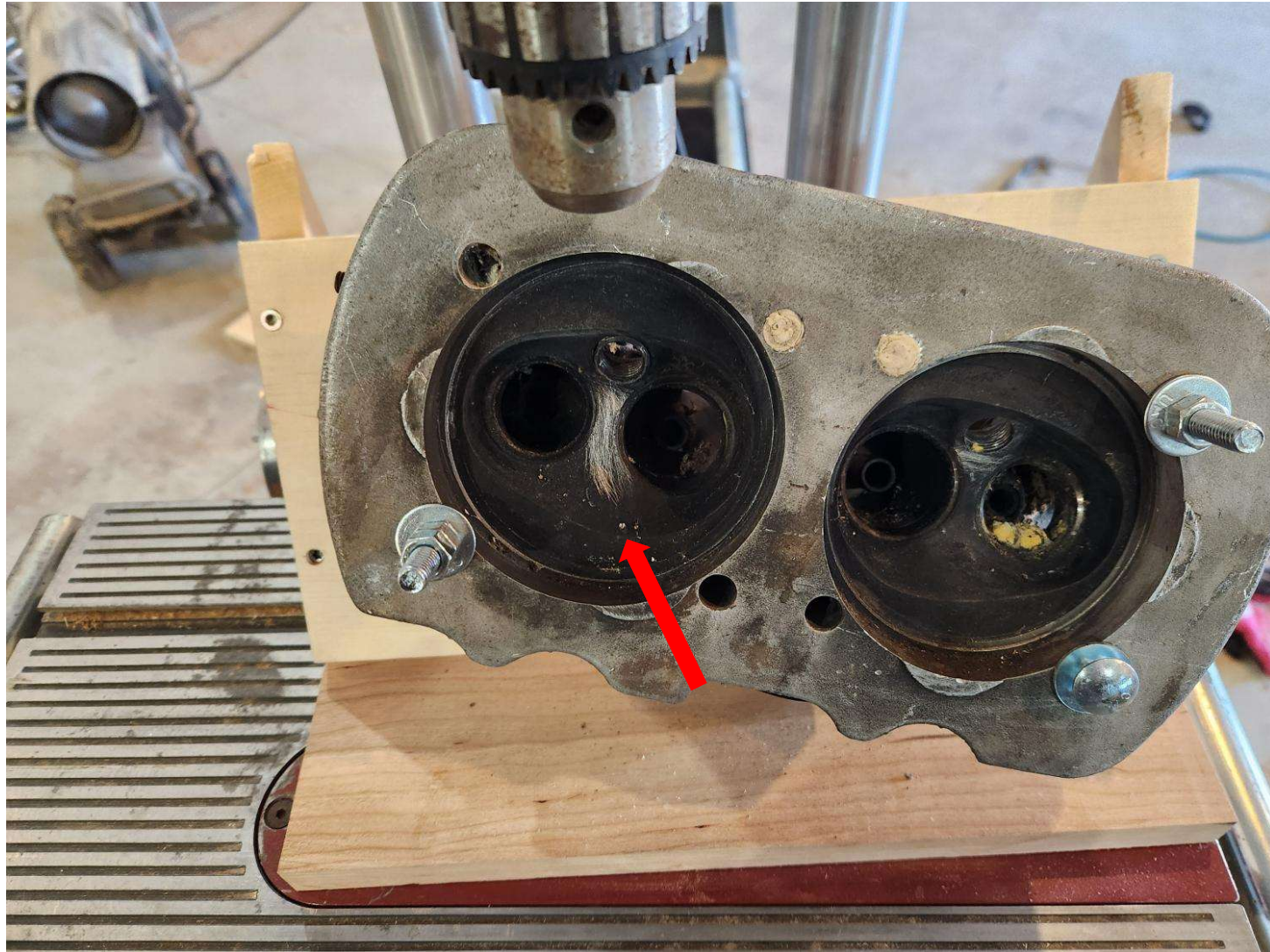
Boring for bottom plugs

Build a Jig

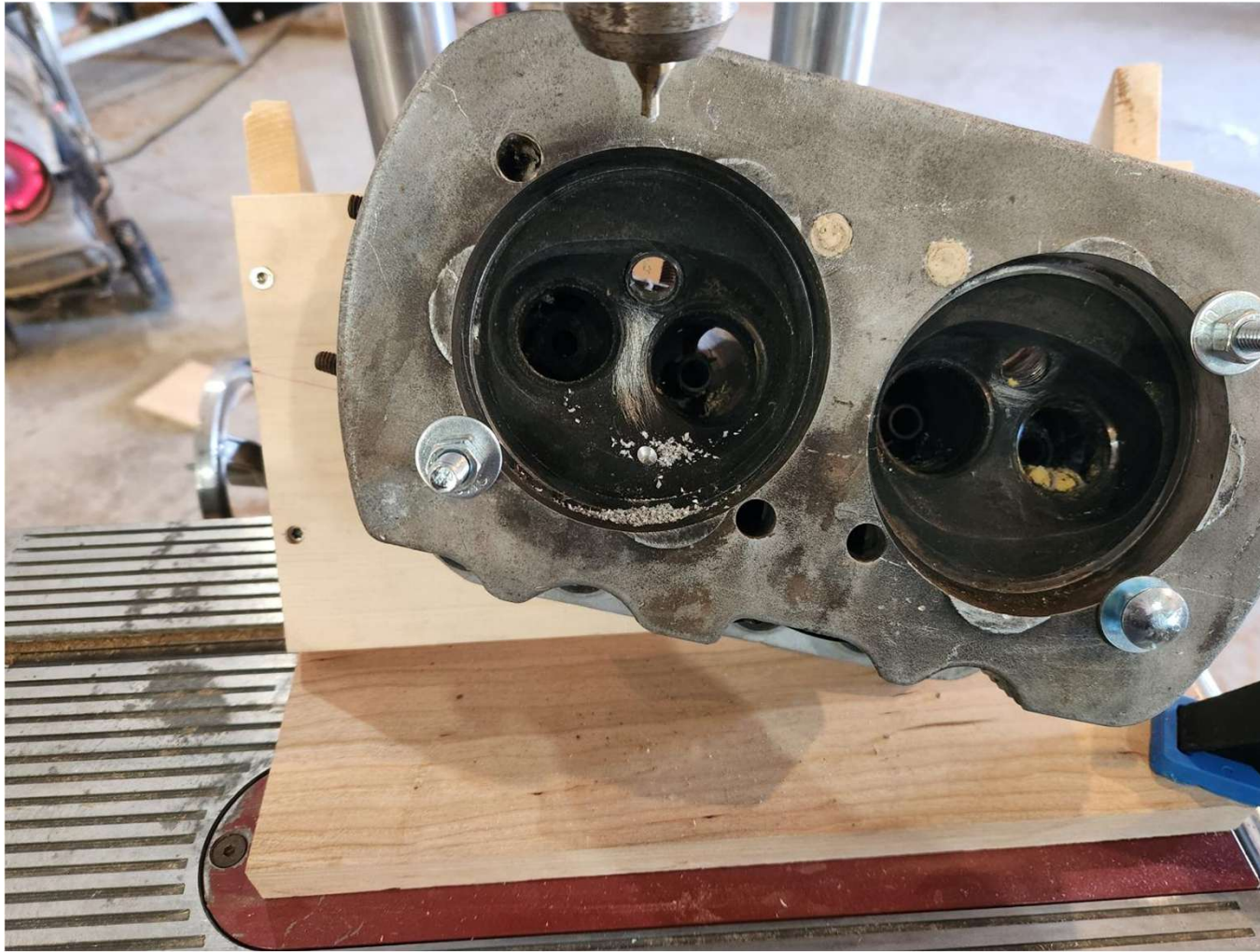


This one is a copy of the Peacock Jig and is a 55-degree lean back and a 19-degree elevation.

Locate and center punch hole in combustion chamber.



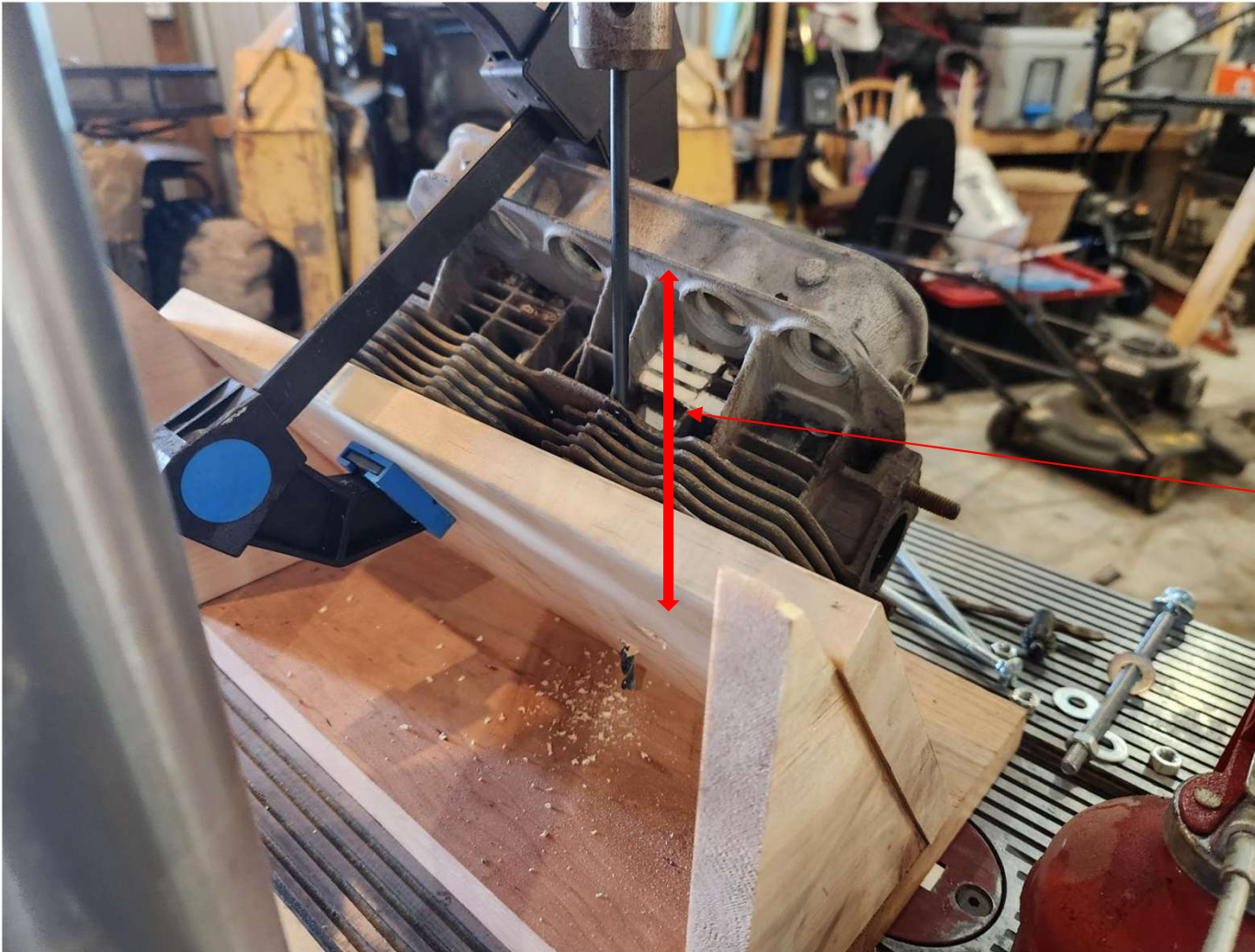
Fixture Jig on Drill press so that drill start will be on center punch. Then Center drill.



Follow up with through drilling with .250 drill bit.



Unclamp Jig, unbolt head, invert and bolt head, then locate and clamp jig to table using long .250 bit as a center guide.



After the jig is clamped to the table, we want this drill bit to go up and down with no “binding”. That’s when you know the hole is coaxial to the drill.

Drill counterbore

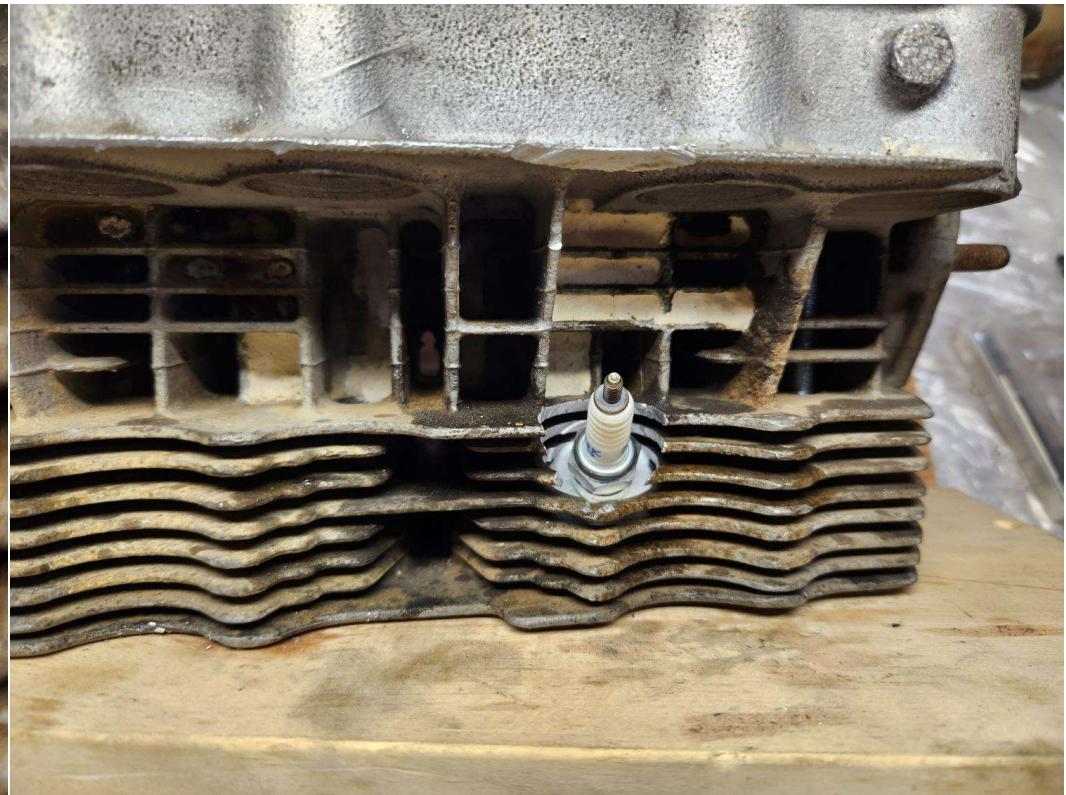


Drill hole 9MM then tap to M10x1.0



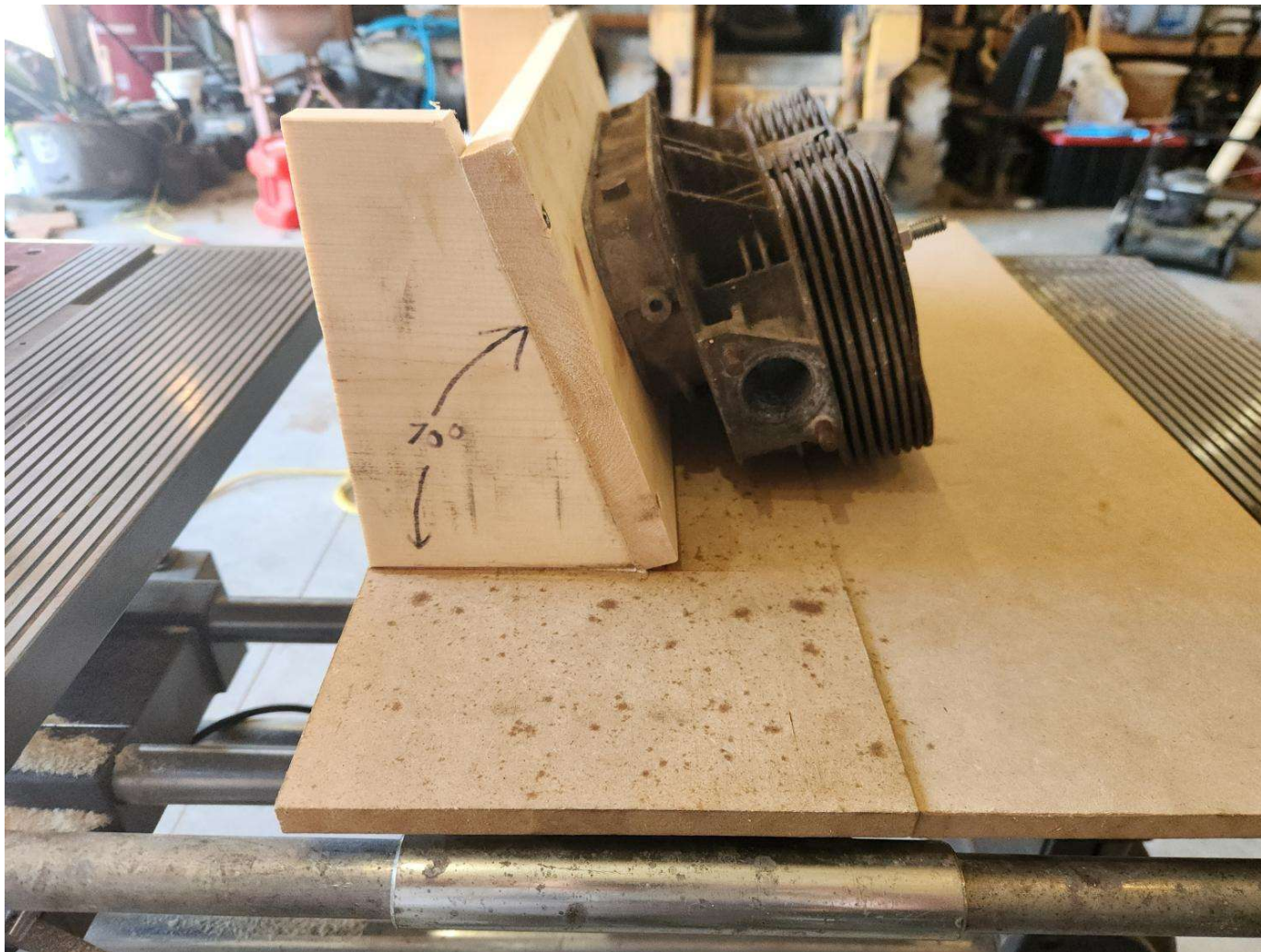
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Remove loose fins and test plug

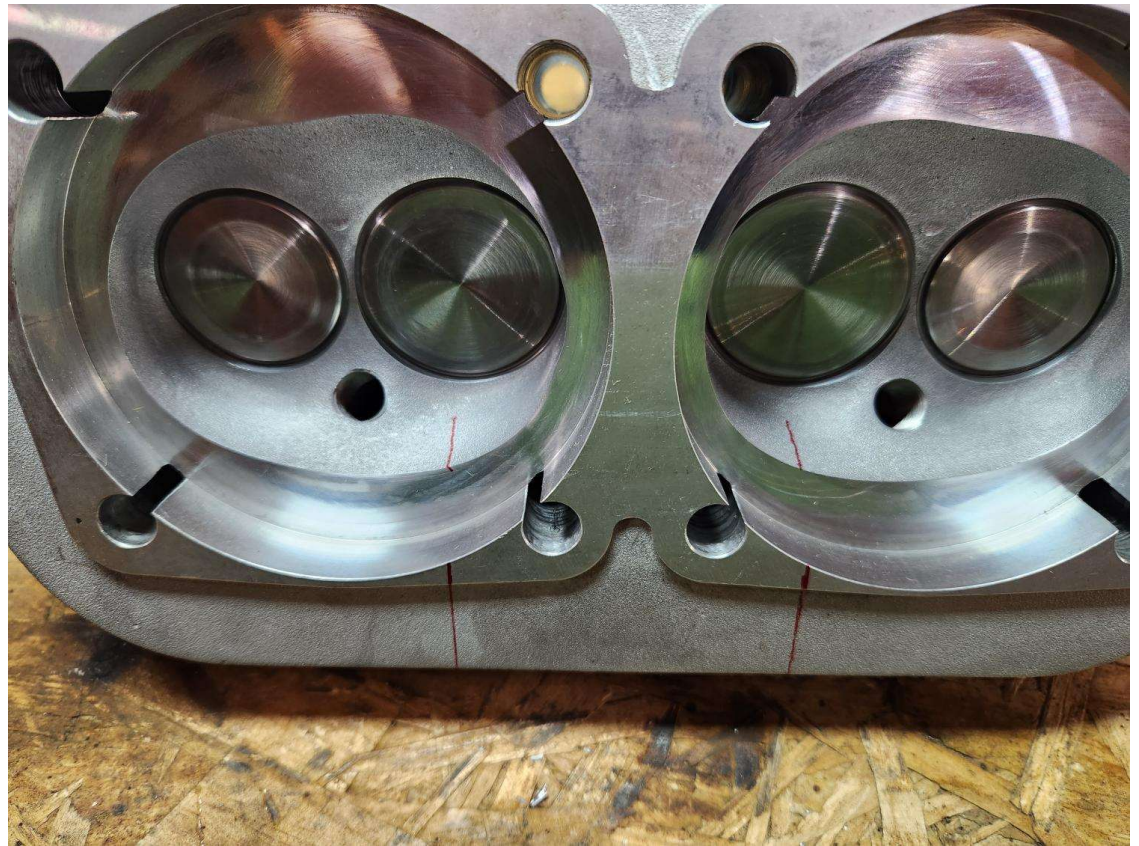
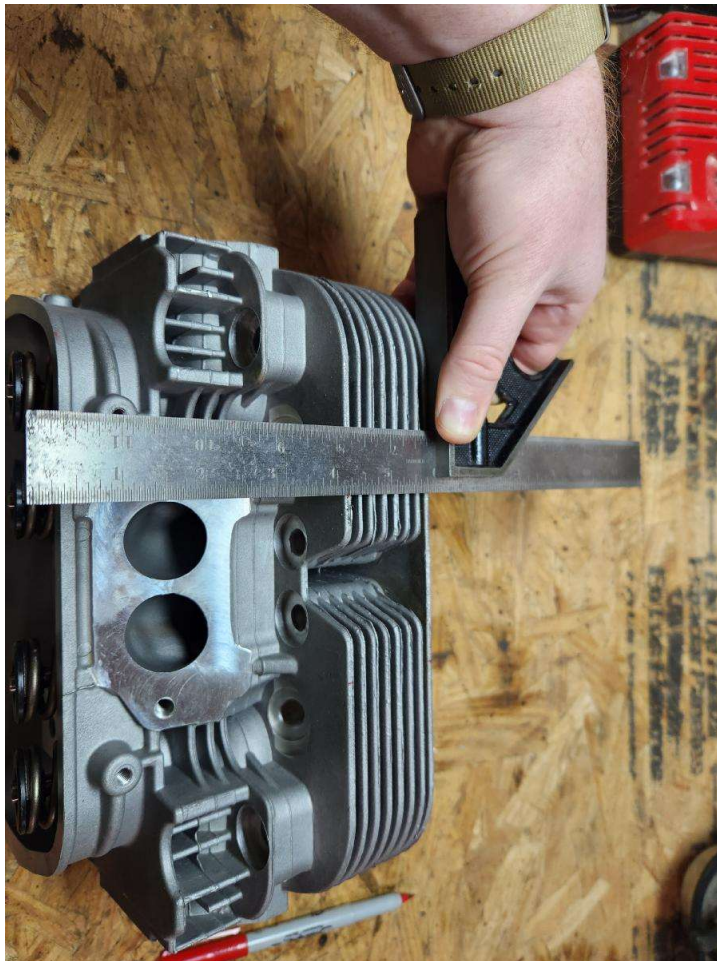


Boring for Top plugs

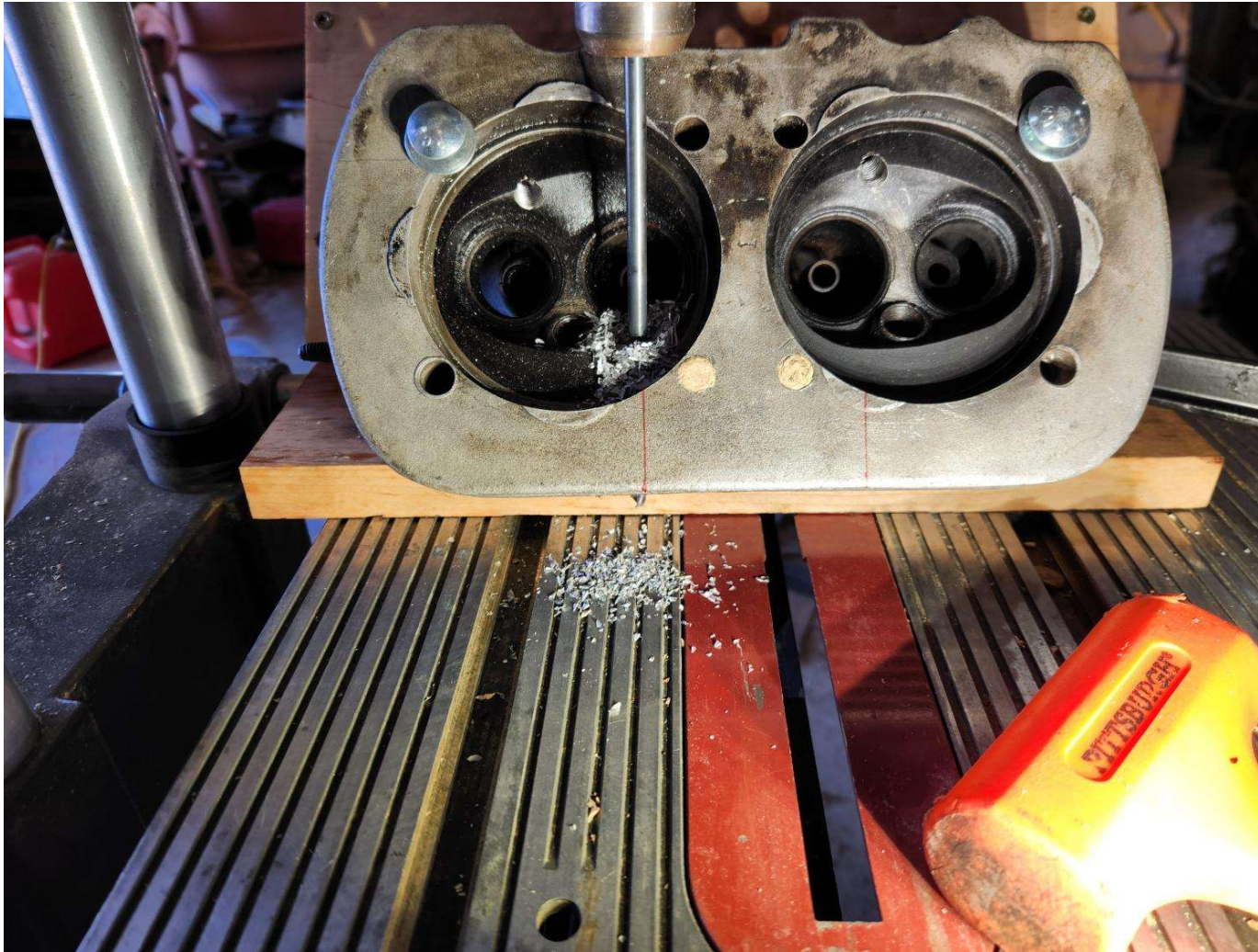
Build 70-degree jig, no elevation angle



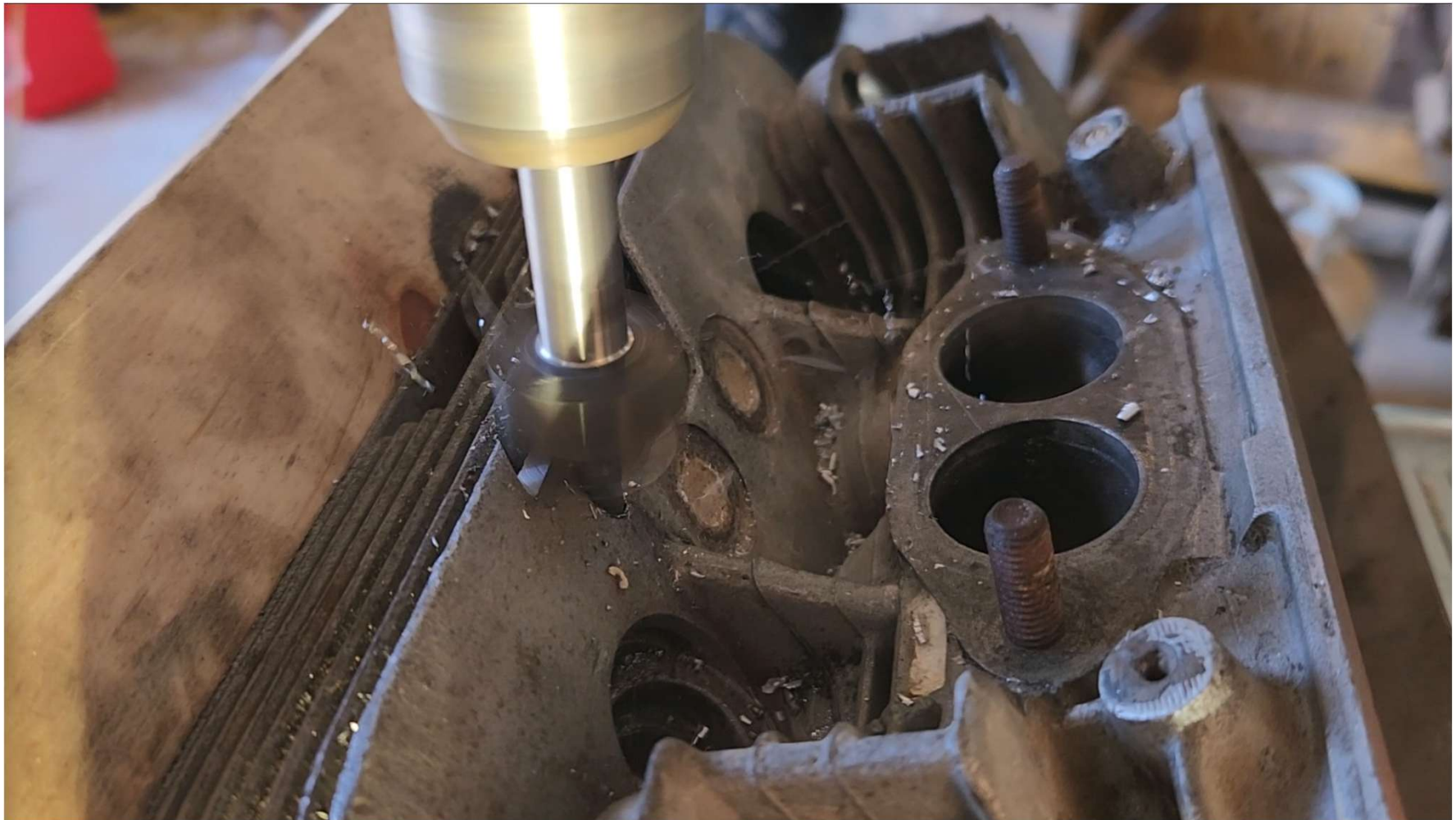
Use a square to scribe over location to combustion chamber.



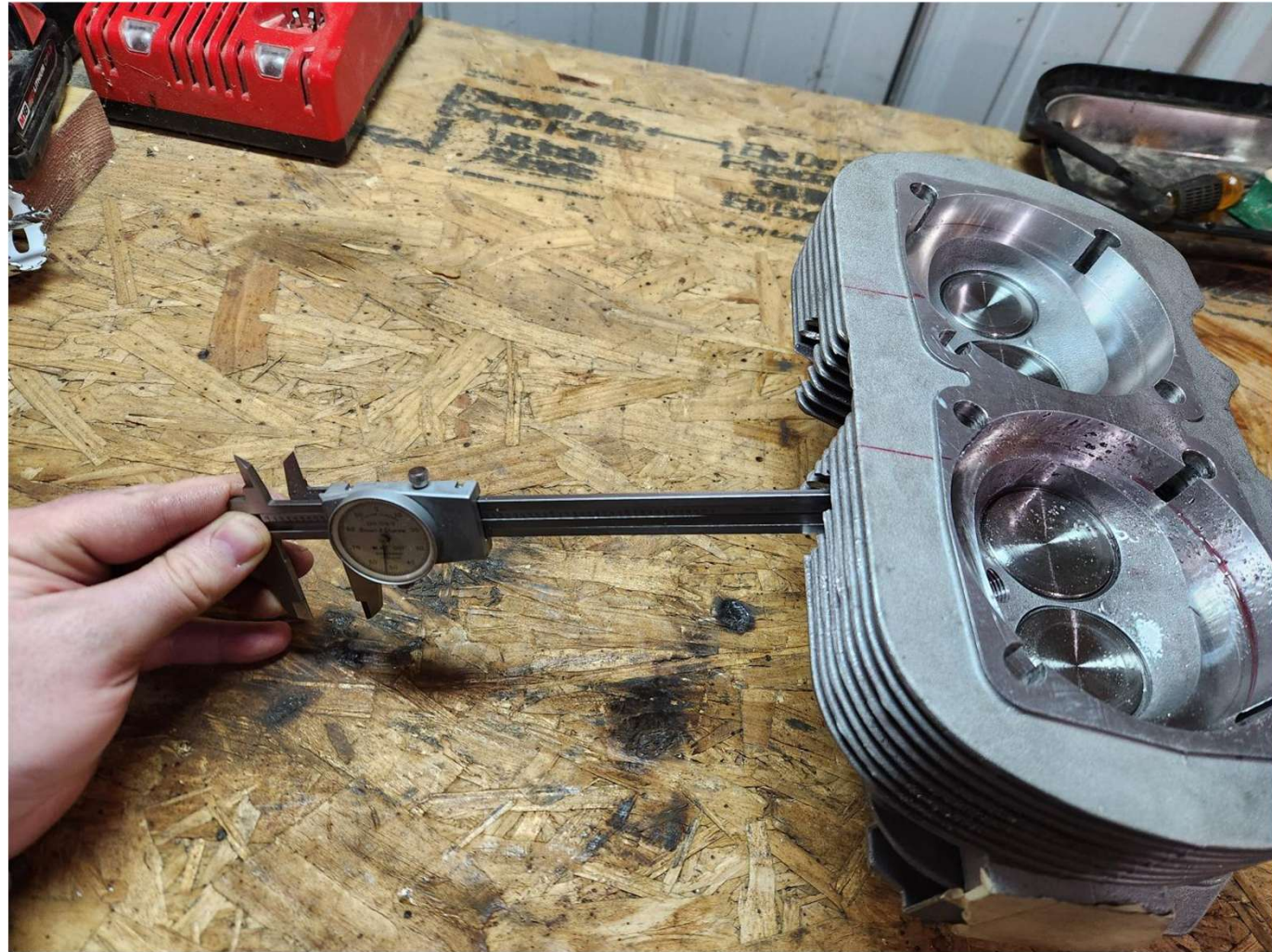
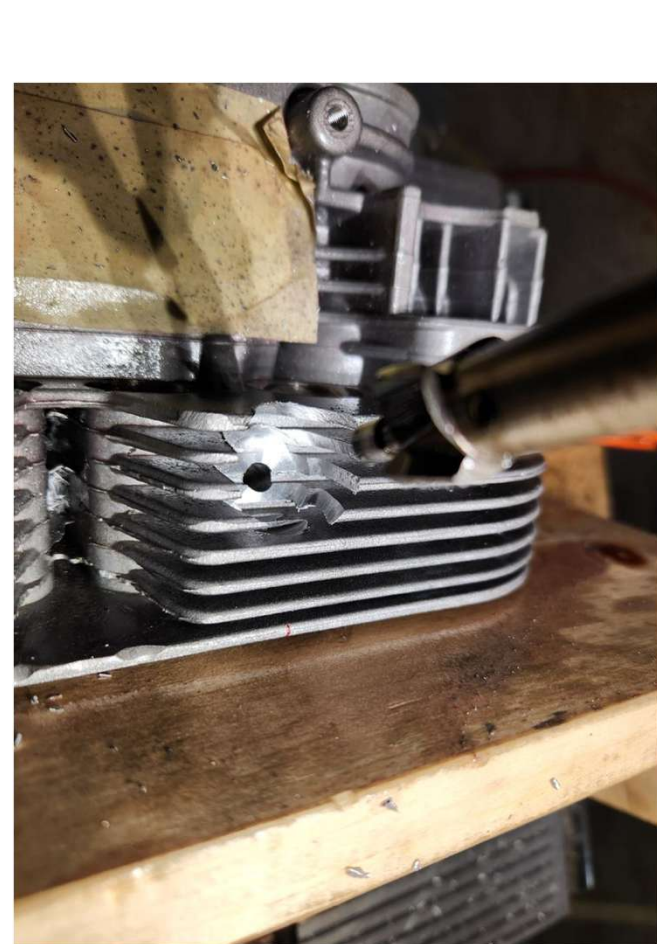
Locate, Center punch, Center drill, and then through drill plug location with .250 drill bit.



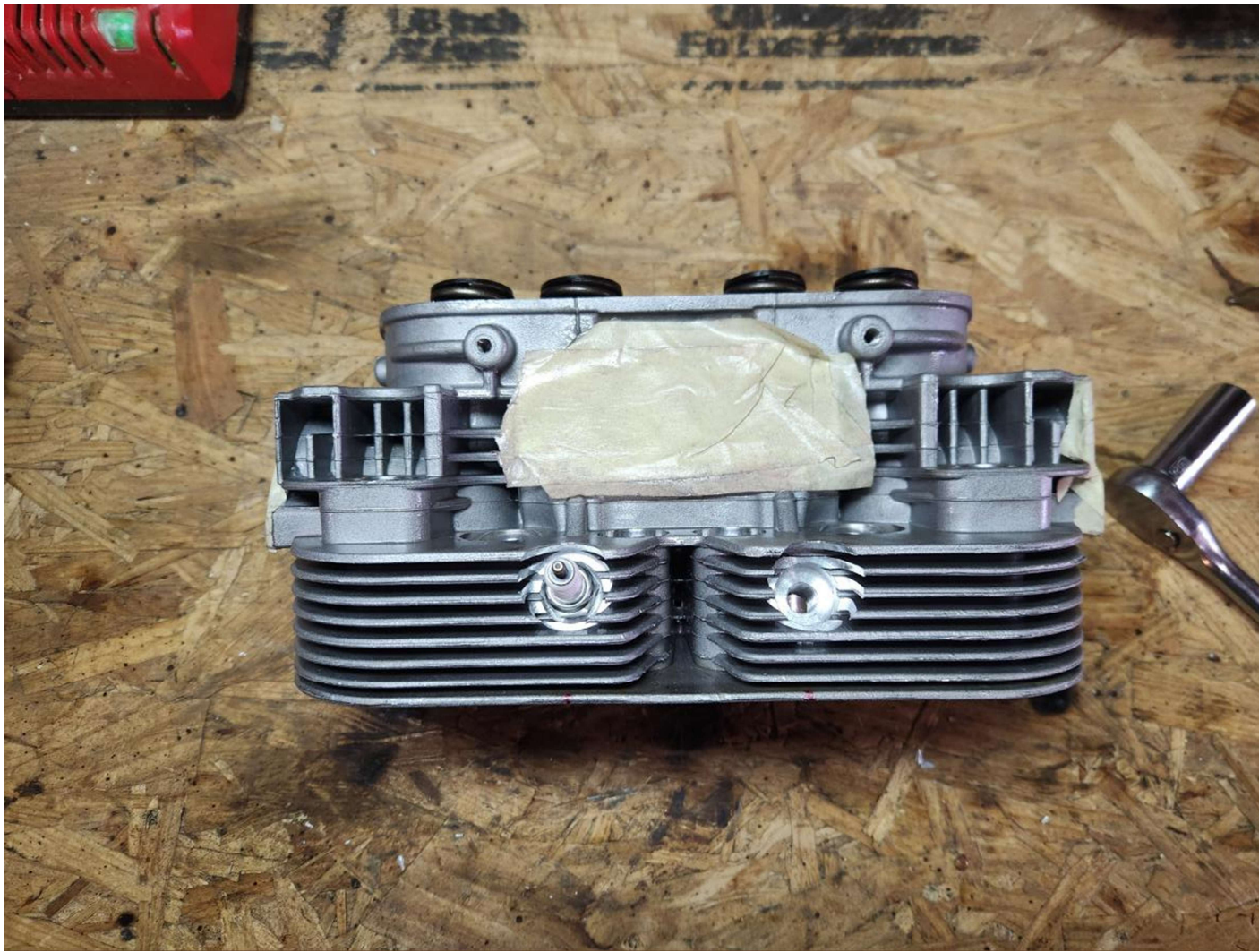
Unbolt head, rotate, coaxial locate, then counterbore to clean up.



Once you achieve clean up, measure hole depth and rebore till you achieve .750 of depth.



Drill to tap size, tap, then clean up fins.



Tips and Tricks

Practice on a junk head

- I bought a bunch of junk VW engines for \$250.00



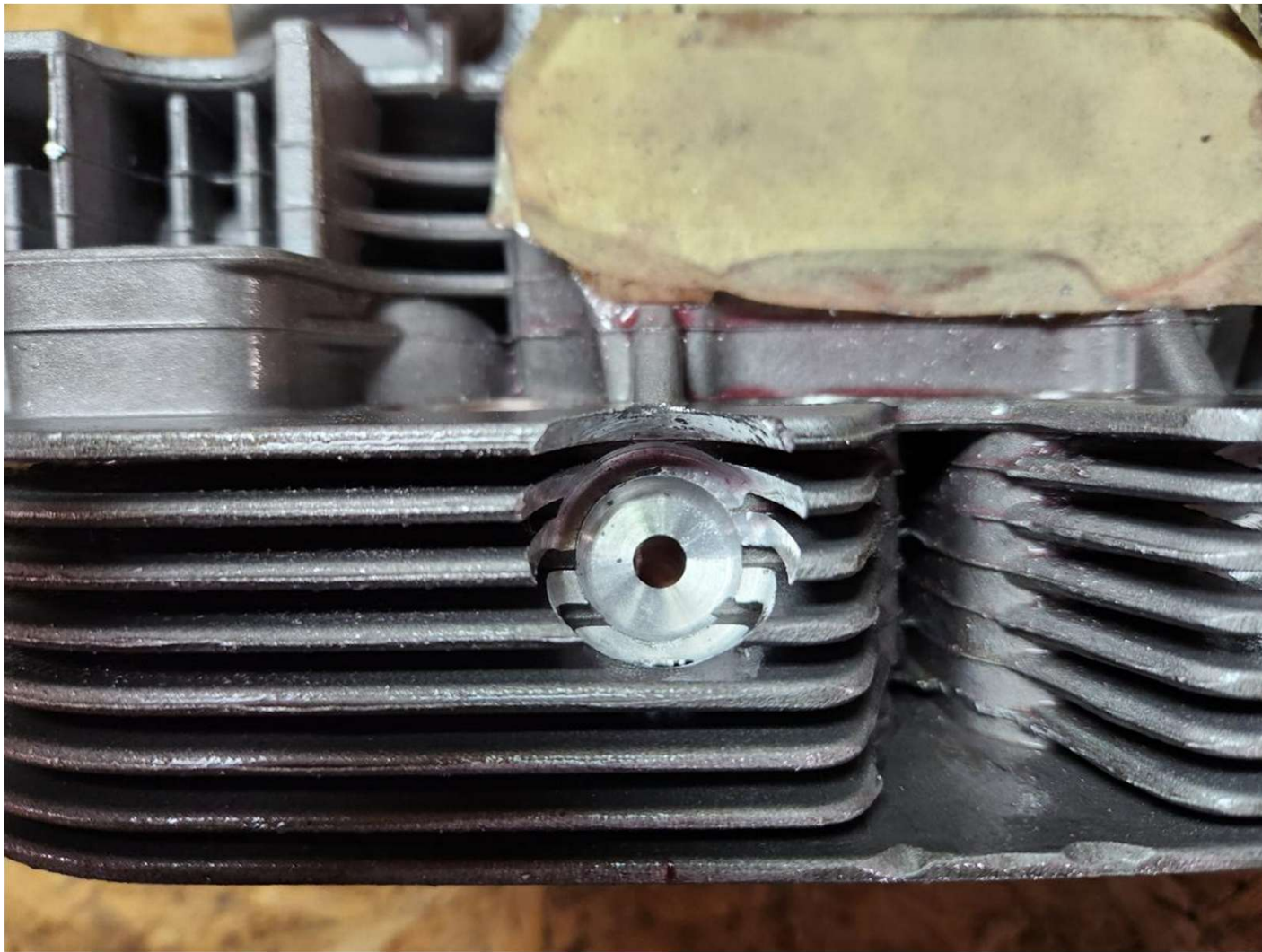
If you don't want to disassemble valves, you can drill holes in your jig.



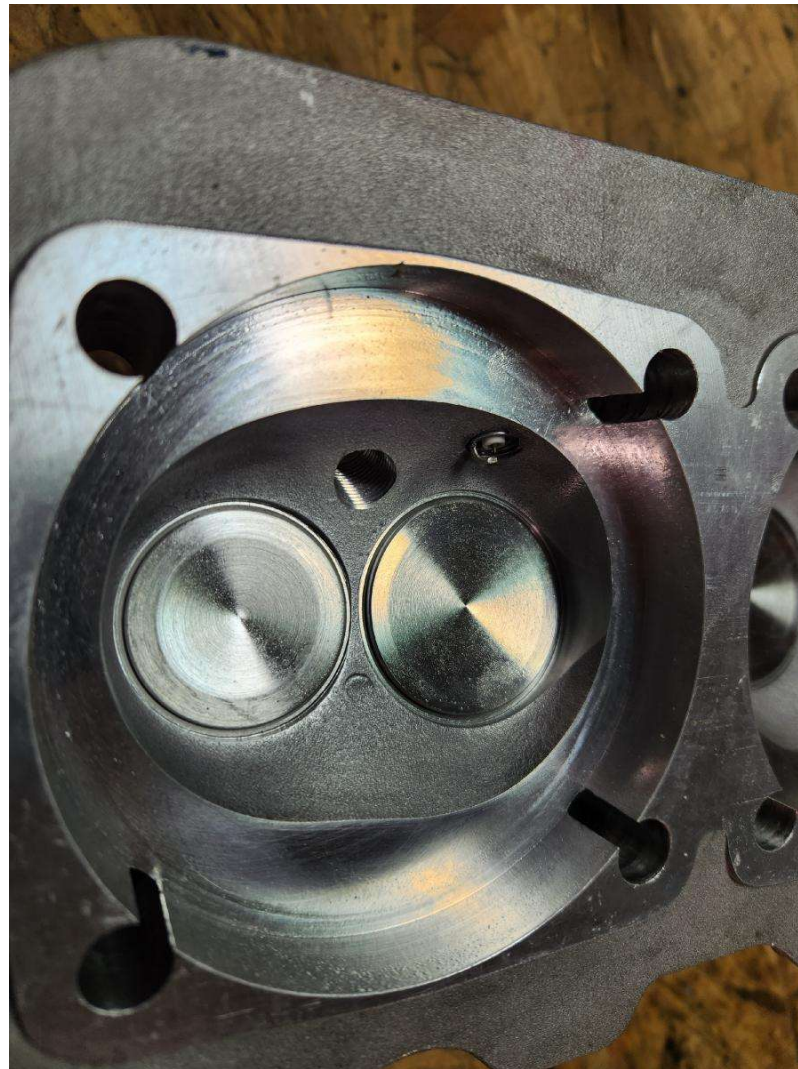
Tape up your intake and exhaust ports, It makes clean up easier.



Double Counter boring allows for less material removal.



Experiment with depth to get electrode into combustion chamber. (this is a .730 depth)



Its ok to hand drill the center drill a bit out of angle, it will clean up.



This can happen!

Note: The process of machining the spark lug holes for the secondary ignition often damages neighboring cooling fins. Missing fins is normal. You may wish to sand/file the rough edges to make them smooth.



Note: "Grooves" in the seat of the secondary ignition spark plug hole are normal and do not impact the seal of the spark plug washer



Credit: AEROVEE 2.1
ASSEMBLY and INSTALLATION

What plugs do you use?

NGK SPARK PLUG NUMBERING SYSTEMS

Wondering what the numbers and letters on an NGK spark plug mean? These NGK spark plug charts explain how NGK's numbering system works.

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NGK CR6EIA-9 Iridium IX Spark Plug
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Core Material Iridium
Thread Size 14mm
Top Material Metal
Type
Vehicle Service Car, Truck
Type

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3/4-inch reach, suppressed, Iridium plug



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Report an issue with seller or item

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1/2 inch reach, non suppressed plug

NGK SPARK PLUGS					
B	P	6	E	S	-11
SHELL	CONSTRUCTION	HEAT RANGE	REACH (mm)	FIRING END CONSTRUCTION	GAP
Thread x Hex Pitch ISO Height Taper Seat	L - Compact Type M - Compact Type (Bantam) 3/4" Hex Size P - Projected Insulator R - Resistor U - Semi-Surface Discharge Supplementary Gap Surface Gap Inductive Resistor Z - Inductive Resistor	2 4 5 6 7 8 8.5 9 9.5 10 10.5 11 12	E - 19.0mm (3/4") EH - 19.0mm (3/4") Reach Half Thread (12.7mm Threaded) H - 12.7mm (1/2") L - 11.2mm (7/16") S - 9.5mm (3/8") Z - 21mm Bantam Type BM_A 8_LM and CMR_A - 9.5mm (3/8") Tapered Seat A_F - 10.9mm B_F - 11.2mm (7/16") B_EF - 17.5mm (.708") 5/8" Hex BM_F - 7.8mm BPM_F - 7.8mm No Symbol A_Type - 12.0mm B_Type - 9.5mm LM_Type - 9.5mm BM_Type - 9.5mm CM_Type - 8.5mm G_Type - 22.5mm 14mm Thread - 9.5mm 18mm Thread - 12mm	A - Special Design B - Special Design C - Low Angle G.E. CM - Low Angle G.E. Compact (18.5mm Insulator) CS - Low Angle G.E. D - Special Design E - V-Groove C.E. (14mm Only) 1.5mm Projected Insulator -E - Special Resistance -Tapered Seat G - Fine Wire Nickel Alloy C.E. -G - Copper Core G.E. GP - Platinum Alloy Fine Wire GV - Gold-Palladium C.E. IX - Iridium Tipped C.E. K - 2 Ground Electrodes Intermittent Gap KC - 2 Ground Electrodes KUB - 2 Ground Electrodes Semi Surface Discharge -L - Half Heat Range -LM - Compact Type 14.5mm Insulator Length -LPG - Specially Designed for LPG N - Special Design -N - Strengthened G.E. P - Platinum Tip Q - 4 Ground Electrodes S - Stand.2.5mm Copper Core C.E. -S - Special Gasket T - 3 Hybrid Ground Electrodes U - Semi-Surface Discharge V - 1.0mm Fine Wire Gold Pallad. C.E. -VG - V-Groove C.E. VX - 0.8mm Fine Wire Platinum C.E. W - Tungsten Electrode X - Booster Gap (Except VX/IX Type) Y - V-Groove C.E. (14mm Only) 2.5mm Insulator Projection -Fouling Resistant Z - Thick 2.9mm C.E. (Except DPR_Zand G-2Z) No Symbol V-Groove C.E. (14mm Plugs w/ 19mm Reach Only)	6 - 0.6mm (.024") 7 - 0.7mm (.028") 8 - 0.8mm (.032") 9 - 0.9mm (.035") 10 - 1.0mm (.040") 11 - 1.1mm (.044") 13 - 1.3mm (.050") 14 - 1.4mm (.055") 15 - 1.5mm (.060") None Cars: 0.8-0.9mm M.C.: 0.7-0.8mm

property of sparkplugs.com

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Questions?

For a copy of the slides email me:
James Braley
boxchevyman@gmail.com