

P.

PUSH ROD

ROD TUBES

AFTER Alteration For
"O" RING SEALS

APR 29 / 86

outside D.I.D. of
END FLANGE

"O" RING DIA.
Before Installation
in Engine Block

outside Dia.

Double "O" Rings
or "Quad X" Rings

.899"

outside D.I.D. of
END FLANGE

.300"

"O" RING DIA.
Before Installation
in Engine Block

CYLINDER BLOCK
END

CROSS SECTION OF PUSH
ROD TUBE

CYL TOP
END

.750"

TUBE
EXPANDING TOOL

Cylinder Block End
Cylinder Head End

TAPER RATIO

1.6 : 1
Per Foot

TAPER DRIVER used to EXPAND to Above Dimensions

Note: Original tool was a
Steel MARLINSPIKE, 13 inches
long, 1 inch O.D. at one end of
TAPER and about .300" at the
Point. Use well Greased when
Expanding Tubes. Grip in hand or VISE, Hammer to size.

Block End O.D. = .692"

TAPER DRIVER AT FINISH
Diameter - Avg. Reading

.687" O.D.
CYLINDER END

Note: Don't EXPAND with one tube end
on hard SURFACE - You might Peel it!

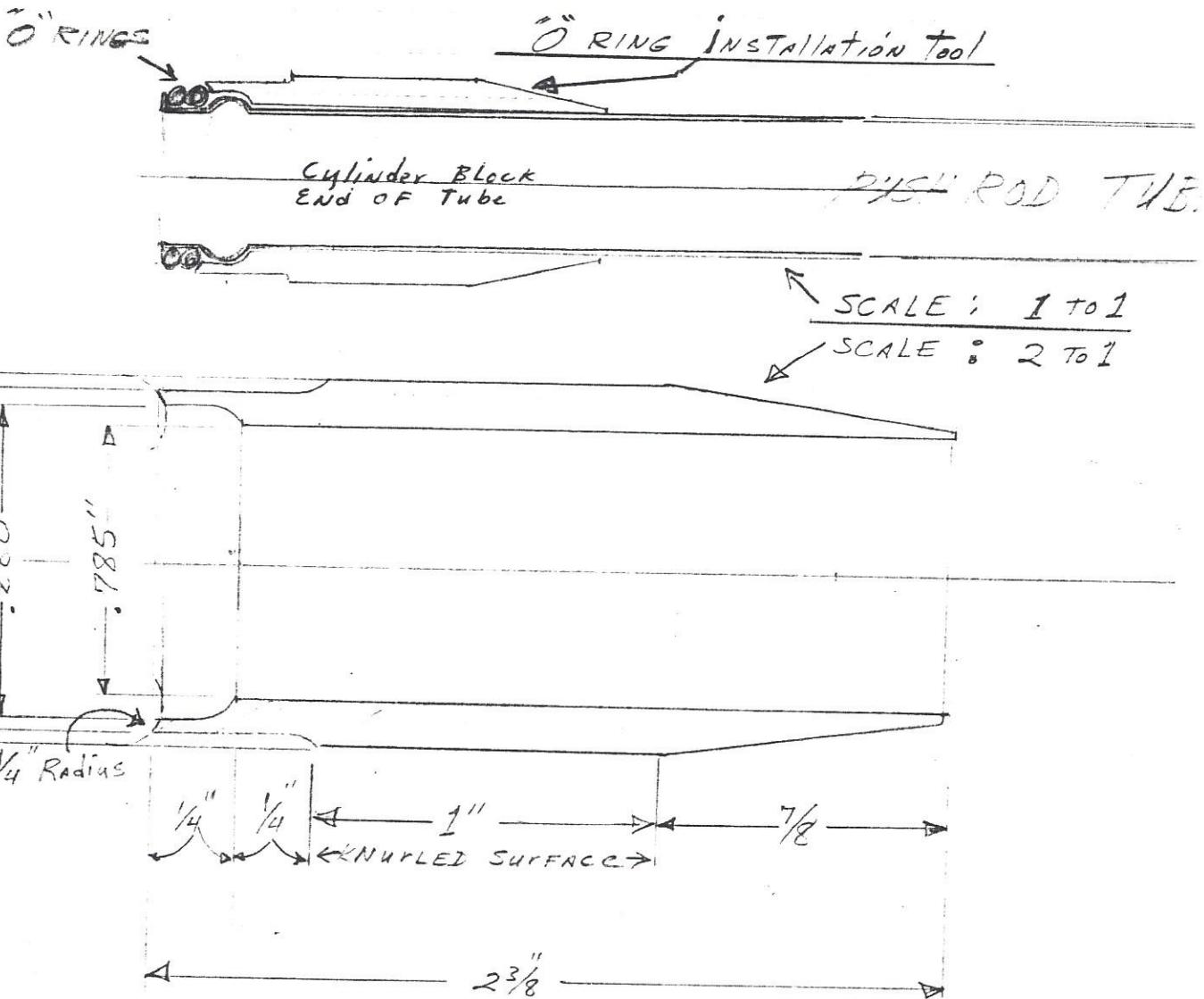
"O" RING SEALS are -210 size, Neoprene and Viton material
QUAD "X" SEALS are 4210 size, 514AD, for Viton Compounds

Installation Notes: ALL aluminum surfaces that contact "O" rings, or Quad X
RINGS must be cleaned of all Residue & Sealants. Engine Oil Coating on
Surfaces & Seals, Only - Install by Pushing on Outer End with any
Tool such as a Screwdriver, or Nutdriver handle, Using 6" Vise grip
Pliers to oscillate Tube while pushing into Place - Once they are
IN place they will stay there till manually removed. Assuming
Tubes Expanded as Above for Sufficient Interference Fit.

Apr 29 /26 F

SPECIAL TOOLS FOR
B-8-F & B-9-F
CYLINDER & PUSH-ROD TUBE
INSTALLATION

GEORGE POWERON
1980 Reichen Ave.
Skokie Village, IL 60077



Notes: Fabricate by turning from Aluminum Stock - ANY Hard Alloy is Suitable. AFTER TURNING, SAW in HALF Longitudinally.

To Use, SLIDE both halves down PUSH-ROD-TUBE to Lower End, Touching "O" RINGS with Light Pressure. Use 6" Vise Grip Pliers To Clamp in PLACE. Use V.G. Pliers as Handle To Rotate tube while Pushing into Cam-Follower hole - Use Screw Driver Handle, or other Suitable "Handle" To APPLY Pressure on outer end of tube while inserting tube into Final Assembly Position.

© Geo Pomeroy

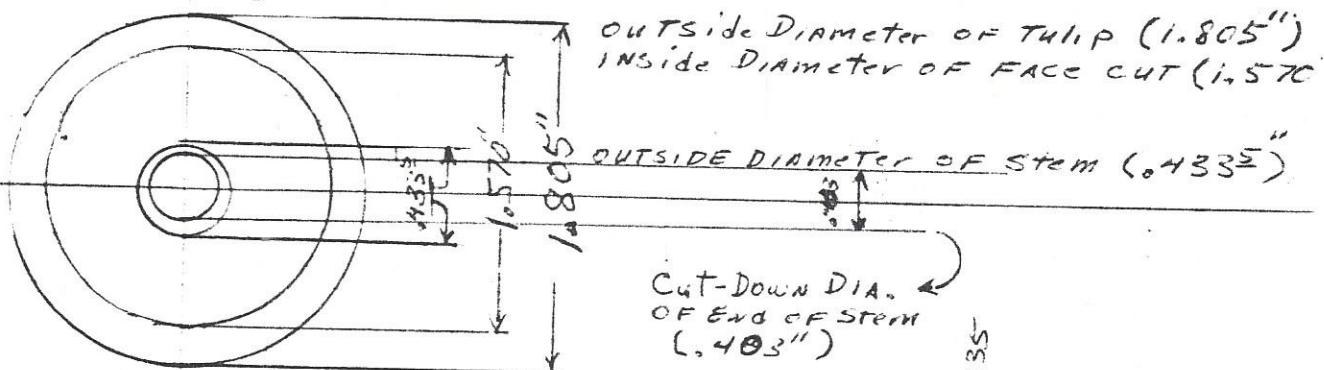
Oct, 1988

Replacement Exhaust Valve Specs
For Franklin B-8 & B-9 Seabee Engine
For Non Certified (Experimental) use
only - MADE FROM TRW, AS 2215
VALVES - This is Stellite Rimmed.

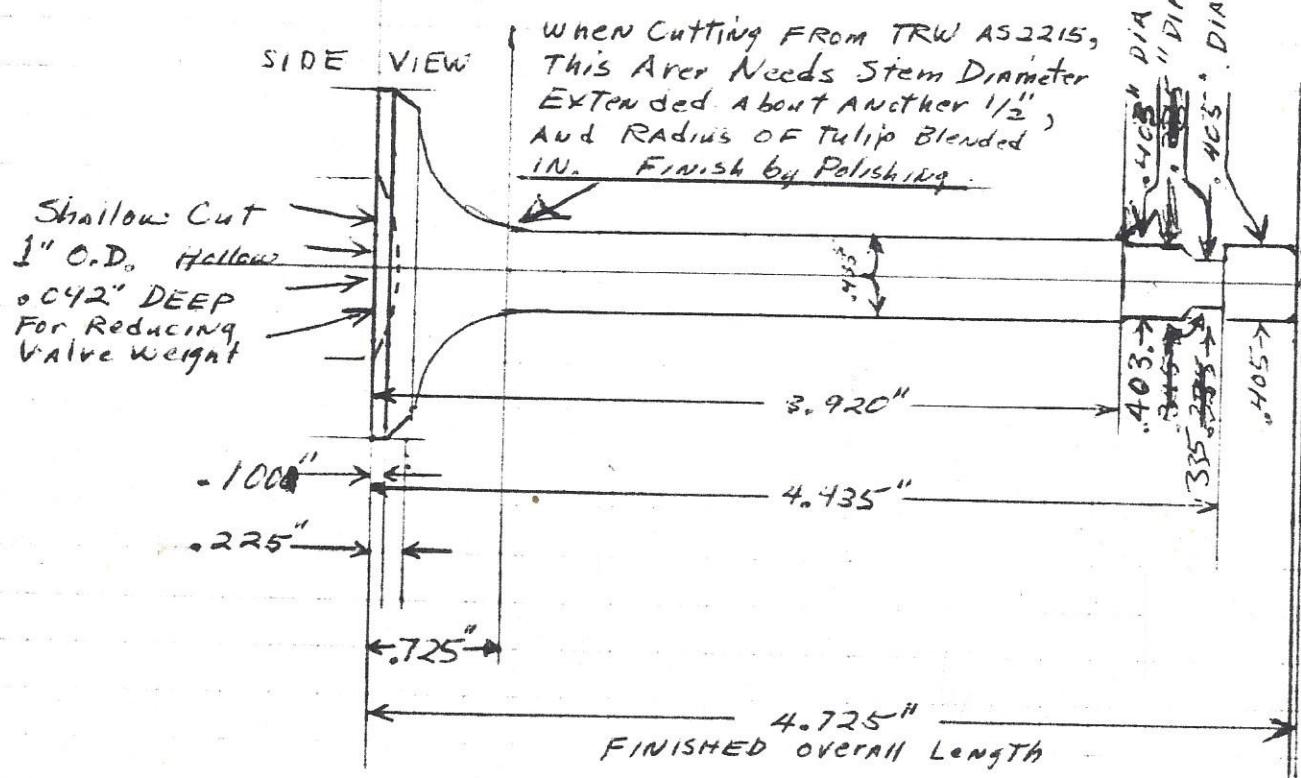
GEORGE POMEROY
1080 Rechert Ave.
Oak Village, IL 60410

AT THIS TIME, Mickey's Auto Machine
in Chicago Heights, ILL (312-754-0716)
CAN OBTAIN THE TRW - AS 2215 valves
FOR YOU - (New - Ready To Rework)

END VIEW



SIDE VIEW



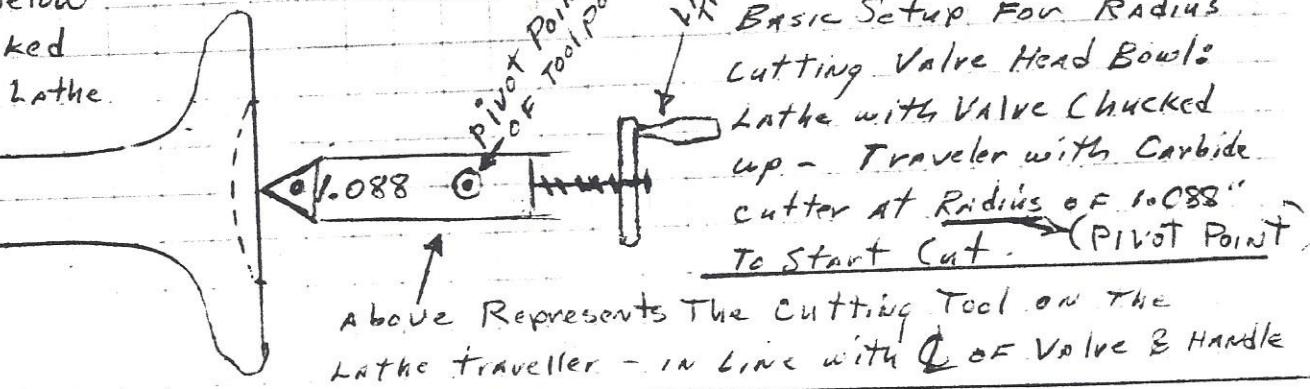
Note: LEAVE SMALL RADIUS'S AT ALL CUT ANGLES - LEAVE
NO SHARP CORNERS - Polish Cut End of Stem
To FLAT For Max Resistance to wear -
Dont Forget To Polish 3 Parallel Rocker Arm Ends

Exhaust Valve Head Rework

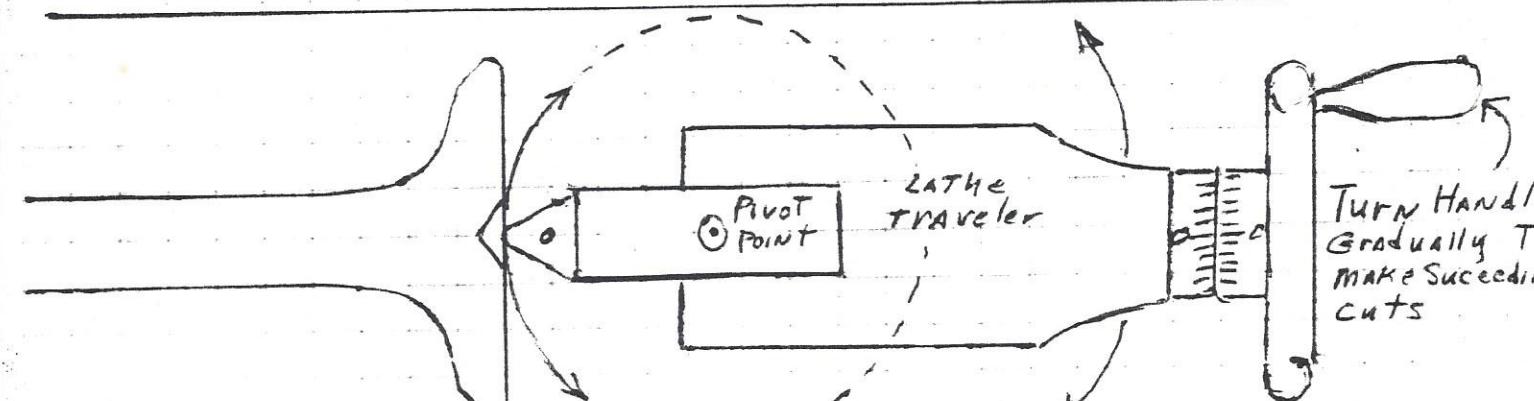
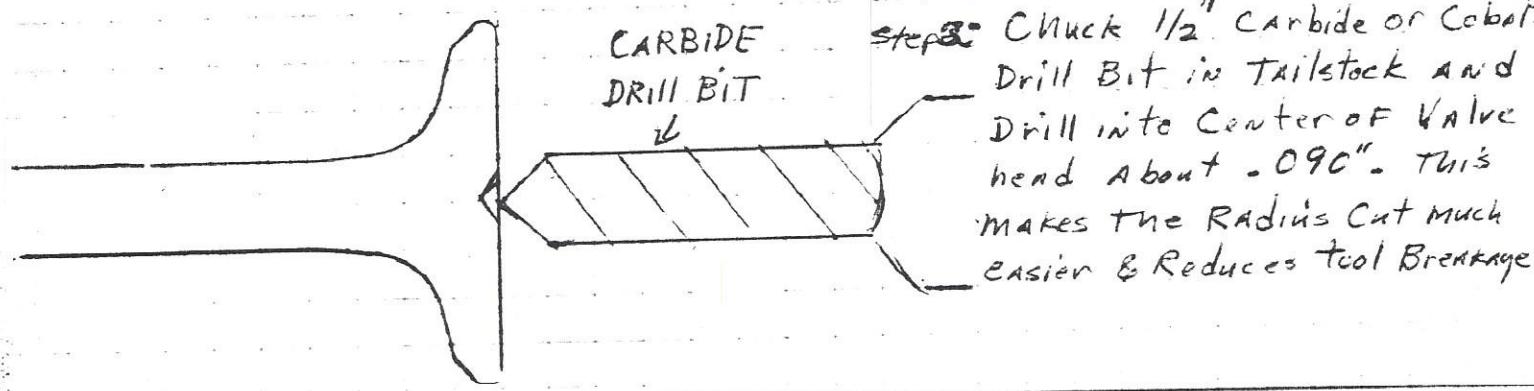
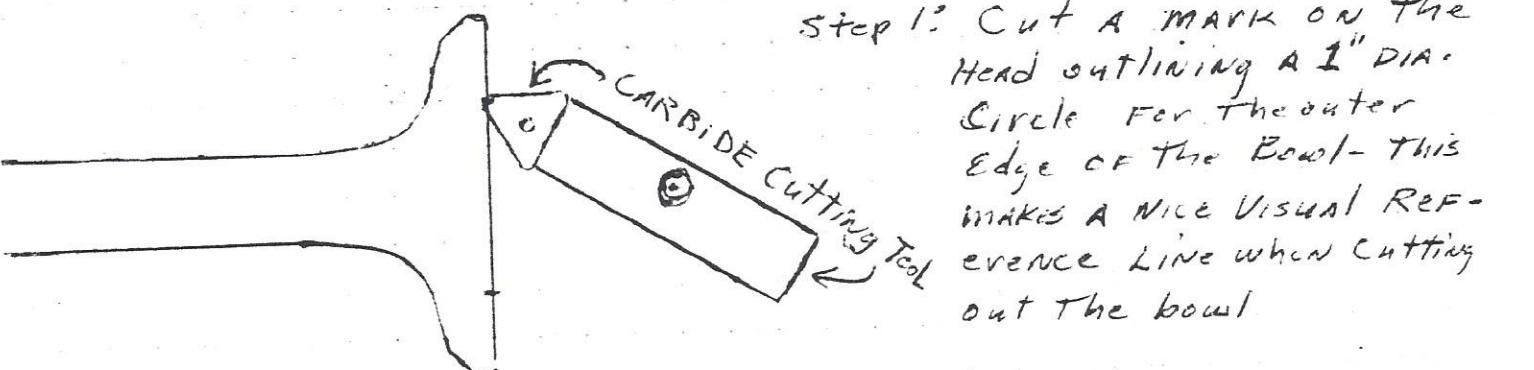
Oct, 1988

GEORGE POWERDAY
1260 Reichert Ave.
Stevie Village, IL 60409

Valves below
are chucked
up in a Lathe.



Basic Setup For Radius Cutting Valve Head Bowl
Lathe with Valve Chucked up - Traveler with Carbide cutter at Radius of 0.088" To start Cut. (PIVOT POINT)



Step 3: Leaving Traveler Loose Enough To Manually Rotate at Pivot Point, CAREFULLY MAKE SWINGING CUTS, INCREASING DEPTH OF CUTTER till Finally Reaching about .090" depth - And 1" Dia. —

With regard to the two types of Liners, Straight & Stepped, the Stepped type came later. It was found that under overheating condition the Straight Liners came loose and, in at least a couple of cases, slipped to the point of having a piston ring catch on top of the liner and seize the engines. This particular problem also caused abandonment of the McCullough Supercharged, "Super 260 hp" Seabee by Seatas at Detroit - "Too much heat to keep the liners in place", he told me in 1970.

I will make straight liners to specification, but won't put them in my engines and strongly discourage their use because of the above mentioned reasons. Another problem with the straight liners comes when the cyls are being bored. The pins that are ~~soldered~~ inserted into drilled holes in the cyl & the liner to hold the liners in place cause difficulty by tending to catch the boring tool and damaging it. Since the stepped liners aren't pinned, they are a lot easier to bore to finish specs.

I find that use of a special collar that locks on the last outer inch of the liners is sometimes a great help in extracting liners & inserting liners that are a little "sticky" in inserting - the collar also makes sure of getting exactly 1 inch of the liner to stick out when the assembly is done - (on the straight type liner)

The stepped liner is already made to stop entering the cyl at the 1 inch mark, but cyls must be - Filed flat at their bases and slightly chamfered at the lip so as to avoid having the cyl liner "hang-up" just before "bottoming out" against the cyl. base. A weight should be set on top of the cooling cyl so as to avoid having the liner "creep" out during the cooling period.

Later, ~~when~~ ^{After cooling}, fit the cylinder to the block to make certain that the liner is not causing any interference and is not resting on the step recessed in the block. Because the cyl must rest its base to the block face, any interference of the liner holding the cyl out must be eliminated before final assembly of engine - use appropriate methods, such as slight filing off the outer end of the liner or re-heating and pressing liner down in cyl slightly, or both - (liners are to be bored ^{8 Honed To} 5.000" to 5.001" ~~& honed~~ after being inserted correct distance into cyl)

LINERS

The B8 & B9 Cyls are basically the same & are interchangeable between different Engine Blocks, so far as I have ever seen or heard.

Replacement of the Removable, cast iron Liners is done in accordance with the overhaul manual. There are several things which the manual doesn't mention which can be important in such Overhaul Procedures -

The Liner is to be from 12 to 17 thousands of an inch oversize, in relation to the Bore diameter of the empty, cool Aluminum Cylinder in which it is to be installed, if it is to be within Factory Specs. I generally shoot for about 13 thousands because I have found it to be too difficult to insert the larger diameter Liners without chance of getting them caught during the insertion process - (If they do get caught, it takes a lot higher temp [over the normal 650°F] to get them loose again.)

Do not assume that the Cyls are at any particular Inside Diameter. The Factory did make various oversize Cyls, inspite of claiming that there is only one permitted I.D. They are usually stamped with 1/4" numbers on the Cyl Base to indicate the I.D. oversize, such as $+ .15"$. Always measure the empty, cold Cyl before ordering or making new Liners.

The ordinary I.D. of the Cyl Bore is $5.125"$. So, you need Liners that are at least $5.137"$ O.D. to fit in factory standard Cyls, and additional diameters to make up for an overbored Cyl. diameter increases.

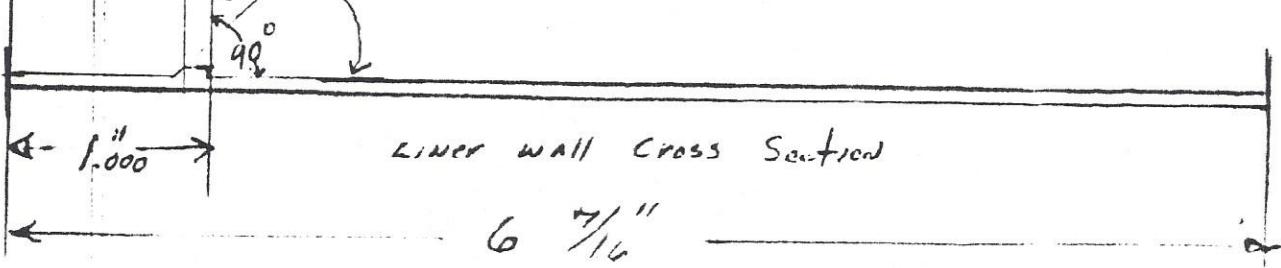
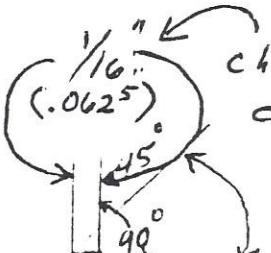
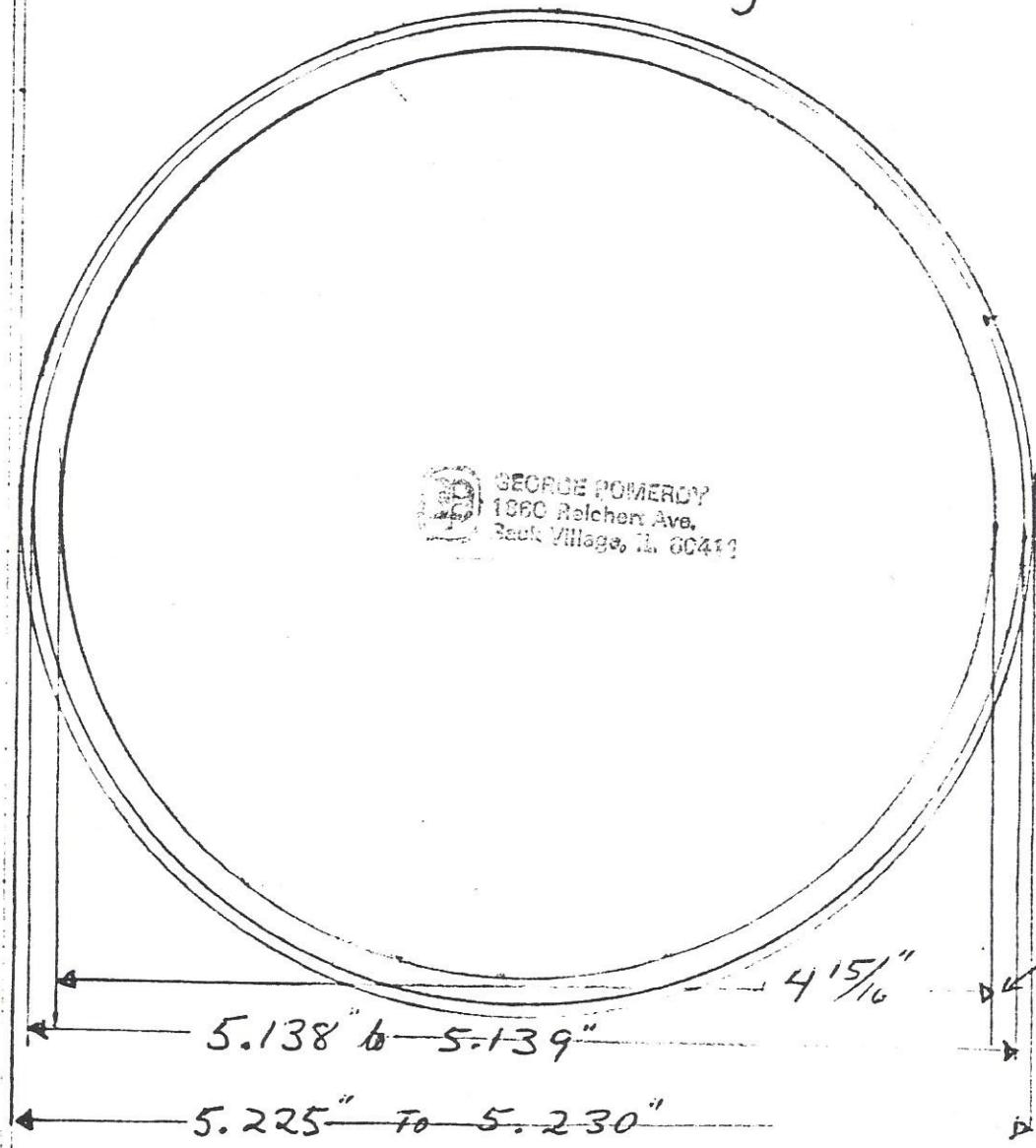
There is an important thing to remember when making Liners - the stepped Liners & for that matter, the straight sided Liners, need to have the last inch (the inch that extends outside the Cyl Base) outside diameter limited to $5.125 + .017$, or 5.142 , in order to fit easily into the machined recess of the Engine Block. (Except for the step itself, of course)



GEORGE POMEROY
1880 Reichert Ave.
Sauk Village, IL 60411

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Measurements for Cylinder Cutting Data



Cyl Overhaul
Valve Guides -

GEORGE HOMERDY
1820 Rancher Ave.
Pauls Valley, OK 73070

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April 84

When a person changes from Stellite Exhaust Valves to the Sodium Cooled Valves, they tend to think that all they have to do is Ream out the exhaust Guide to $\frac{7}{16}$ " and all will be O.K.

IT Doesn't work that way!

You can never seem to have a Reamer or Drill Follow Center for that amount of metal removal. Many have claimed that "they" could do it. Most of them sent me the cylinders for a proper job after making a try at it. I suspect the others sent the Jugs to someone else after making the same try.

There is a way that would work. Using a long reach boring bar on a BRIDGEPORT mill, after centering in the Valve Seat Ring, should enable a competent machinist to do the job. Otherwise, just put in a new guide, using methods similar to mine.

AFTER Guides are installed and cooled, run sizing Reamer thru for one last time, the aluminum squeeze will slightly diminish the I.D. of the cast iron, so this will give you correct clearance again.

- 30 -

Cyl Exhaust Port Clamps

Some Cyls get Exhaust ^{Tube} sleeve looseness over a time. The steel flanges rot off from rust and you get a loose exhaust system. I have made some thick flanges out of stainless steel & some out of 4130 that will NEVER give that trouble and will cure it on your engine. Exchange only \$35 each - I don't care about your old flanges, but I don't have many extra exhaust tubes.

- 30 -

Cyl Overhaul
Valve Guides

ROBERT C. GIERERT
1000 Reichenert Ave.
Oak Village, IL 60453

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April 84

Suspect
I tend to believe that allowing off-center contact of the valve on the valve seat tends to loosen the seat & perhaps even to the point of having the seat come loose during operation of the engine. But, even if this is not correct, the centering of the valve stem to the rocker arm can only be done by re-boring the guide boss each time a new guide is to be installed.

Regarding the Guides Themselves:

Having tried both cast-iron & silicon-bronze guides, I have to come out strongly on the side of the cast iron. Amongst other things, bronze guides seem to need quite a bit of extra inside clearance and if they get a bit dry, they tend to gall, pickup metal on the valve stem, and cause a sticking or stuck valve. On the other hand, the cast iron guides will rust & stick a valve if the engine is left un-used for long periods, like all winter.

I have learned that a clearance^(cast iron) of about .003⁵" is a pretty good clearance for a new guide - that's about the middle of the new clearance specs - (.002⁵" to .004⁵"). Guide-stem clearances near the minimum seem to be troublesome sometimes, but those with middle or looser clearances never seem to cause stuck valves - (add about an extra .001" for sodium valve stems with bronze guides.)

Original valves (exhaust) are in short supply now days but some pretty near original valves are available as substitutes if you shorten the stems after cutting new retainer-clip grooves - These substitutes are made of the same alloys & sizes, except for stem length -

The original sodium filled valves are very good but they cool the valves so well that the heat transferred down to the rocker arm end of the stem tends to make coke out of the oil in the valve spring pocket - the buildup is rapid. I had to clean mine out at every oil change - if you don't mind that, they are probably safer to use for long term - (I suspect that is why they were only used in some early engines, but I've never been told.)

Guide Removal: If you can do it, it is safer to mill off guides down to aluminum shoulders. Then heat cyl to 650F and drive cutoff guide out toward inside of cyl. This way, aluminum sticking to guide won't cause possible splitting of guide boss during guide extraction -

Cyl Overhaul
Valve Guides

GEORGE SCHMIDT
1380 Leichen Ave.
Sauk Village, IL 60471

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April 84

Valve guide Removal & Replacement seems to be a simple, relatively easy thing to accomplish, but it has a number of pit falls waiting for those who like the simplistic approach of taking one out & putting one in that is .003" bigger on the O.D.

The problems I am going to describe are particularly noticeable at the exhaust valve guide - and to a lesser degree at the intake valve guide. The great heat that attacks the exhaust guide is responsible for the difference, as it softens the Al₂ and allows it to flow slightly.

Exhaust Valveguide Replacement Always requires the use of some mechanical alignment & re-boring, in order to assure the replacement of the new guide as close to the center of the valve seat as possible. If this re-boring is not done, and a guide is simply replaced with one that measures +.003" larger than the extracted guide, you will find that the new valve is tipped toward the outside wall of the cyl. This is because, when the expanded cyl cools down after insertion of the new guide, the thinner aluminum to the outside of the guide boss does all the stress relieving. You can tell if the guides are second or third removed by looking at the seats and seeing if they are ground concentric to themselves, or toward one edge. (usually the outside-of-cyl-edge. If ~~they~~ ^{seats} show signs of being ground off-center you will find that the guides have been replaced one or more times -

To show how bad the movement of the first set of guides usually is (the factory originals usually measure .625" O.D. when removed.) I have usually found that in order to get a new clean bore prepared in the valve guide boss, where an original .625" diameter guide was extracted from a 650°F hot cyl, I had usually to bore out to .635 minimum, and sometimes to as much as .654" I.D. I have never had one come in to a clean, centered bore at less than .634" I.D.

I stress the above to show that you can never simply change a valve guide without re-centering the guide bore, unless you don't care about moving the valve ^{over} to hammer down on one side of the valve seat, instead of in the center, during engine operation.

There is some question as to whether small cracks around the valve seats are as dangerous as previously thought. Although there is no question that we would all much rather have no cracks in the cylinders, the fact is, that it is quite common to open up a good running engine that has cracks in most or all of its cylinders (near the valve seats). Time in service doesn't seem to be related to the frequency of crack appearance, so it is clear that most of these engines can and do run for hundreds of hours with cracks in the cylinders near the valve seats.

Seats do come out sometimes, but it doesn't seem to be as common as you would expect, considering the large number of cracked cylinders that are being run. I only have personal knowledge of this happening twice (to others, not to me) over the last twenty years.

I have a tendency to think that if the cracks are small, short ($\frac{1}{4}$ "), and hard to see; they probably don't represent much danger of allowing the seat to drop out. This is particularly true if the aluminum around the seat is rolled nicely over the top corner edge of the seats, and the seat gives no evidence of being loose already. (Don't try to tighten up a loose seat - it won't last.) Whenever I do work on a cyl I re-roll the seats to help make them safer in the future, but only if they don't appear to be loose already.

Seats can be replaced, using common procedures, but I tend to avoid disturbing them if they are not causing trouble.

Cracks can be welded & seats replaced but it is expensive and presently it seems cheaper & easier to simply save those really badly cracked cylinders for repair in future years when the supply of fairly good cylinders becomes scarcer, and of course, more costly as a natural consequence of scarcity.

George Pomeroy's Personal copy

List of Seals & 'O' Rings Used
on the SEABEE

by George Mojonnier

The number in parentheses is
the number required per assy.
The 'O' ring number in paren-
theses is the replacement.

=====

- * Main Gear Leg
 - Through bolt (1) AN6227-07
 - Inner (1) AN6230-10
 - Outer (2) AN6227-37
- * Main Gear Cross Tube Seal
 - (2) # 416956 (National)
 - or # 2157 (Garlock)
 - or # 47512 (Victor)
- * Flap & Tailwheel Hyd. Cyl.
 - Shaft (1) An6227-10
 - Piston & Ends (2) An6227-19
- * Master Brake Cyl.
 - Valve (1) AN6227-05
 - Rod (1) AN6227-07
 - Piston (1) AN6227-16
 - Cap (1) AN6227-21
 - On Late Series Cyl. Only
- * Hydraulic Pump
 - Valves (8) AN6227-01
 - Seats (2) AN6227-06
 - Piston (1) AN6227-15
 - Reservoir (1) ELB 20-13
(AN6230-13)
 - Relief Valve (2) ELB 19-5
(AN6227-05)
 - Plug (10) ELB 19-6
(AN6227-06)
 - Bolt (1) ELB 19-5
(AN6227-05)
 - Retainer (1) ELB 19-16
(AN6227-16)
- * Prop Cylinder
 - Inner (1) AN6227-44
 - Outer (1) AN6227-67
(small cyl.)
 - Outer (1) AN6227-72
(large cyl.)
- * Inspection Plate Ring
 - (1) 351-8327

Mfg. by Precision Rubber Corp.
Unless otherwise noted

=====

Copied by Donn Booth 2/80



MAIN Bearings

SPLIT $\frac{1}{2}$ Shells

SHOP SPECIFICATIONS

UNDERSIZES	STANDARD SHAFT SIZE	HOUSING BORE	OIL CLEARANCE	MAX. WALL THICKNESS	OVERALL LENGTH	FRANKLIN overall length
2-10-20-30	2.9980/2.9990	3.1910/3.1920	.0019/.0049	.0955	1.390	1.375

The specs are listed here from the Megis Catalogue

- ① You can see that the Overall Length is .015" Greater than the Franklin Original Shells, And up to .001" under Franklin Shaft Size, Std.
- ② you will also see, upon insertion, that the Locking Tab is about $\frac{1}{16}$ " more to one side than is the Franklin's. Since, if you use these bearing shells you are outside Franklin original measurements, you probably should cut the Aluminum Notch $\frac{1}{16}$ " wider so as to avoid losing Locating-Tang Surface Area - Dealers Choice -!
- ③ The inner oil groove should be completely finished like the originals were for correct oil flow - Again, your choice if you didn't have me take care of that for you -

These Bearings should be installed in the correctly torqued together crankcase, inside bore diameter determined, and then order crankshaft cut to whatever oil clearance you desire - (suggest that .003" is about right in most cases - tighter clearances are not so safe.)

Connecting Rod Bearings

These Shells are correctly sized on the O.D. to snap right into the Con-Rods -

However, you will see that they are not so wide as the original, and the tang makes them offset from each other.

My source says that the narrowness won't do anything but reduce internal friction (I don't know - never ran a set yet) and the offset won't be troublesome either - make your own judgement on this - I don't know of any other bearings closer in size that are commonly available since Carl Baker ran out.

1-312-758-1622

1-708-758-1622 (After Nov. 1989)

General Notes on Cylinder Liner Fabrication

① Parallelism:

During Last .020" Cut Along O.D., Be Sure to Measure O.D. at Each end, and make Adjustments at Tailstock if Out of Parallel is Shown by these O.D. Measurements.

② Cuts: about .010" to .015" and at ^{Feed} Lever Positions of E & 7 (Slowest Feed) seem easiest on the Carbide Bits - Faster RPMs & ~~Feeds~~ Heavier Feeds seem to Destroy the Carbide Quickly —

③ MAKE your First SKINNING Cuts Carefully & Lightly so as to be sure you don't Go Below Step Dimension (5.230") INadvertantly - Also use these to initially Check Parallelism of the Cuts

④ Initially Cut to your Step O.D. of 5.230" and Then Cut the Step Square Face 1 inch from End of Liner and about .040" deep so as to Leave a $\frac{3}{8}$ " wide pocket there, almost at Finish Depth of O.D. 5.140".

D ^{Starrett} Use Precision Level (12") To Level Lathe bed ↔ East & West & N. & S.

② Be Sure 4 Jaw Chuck is Tight where it Threads into Lathe Spindle (make sure No Dirt in Threads There)

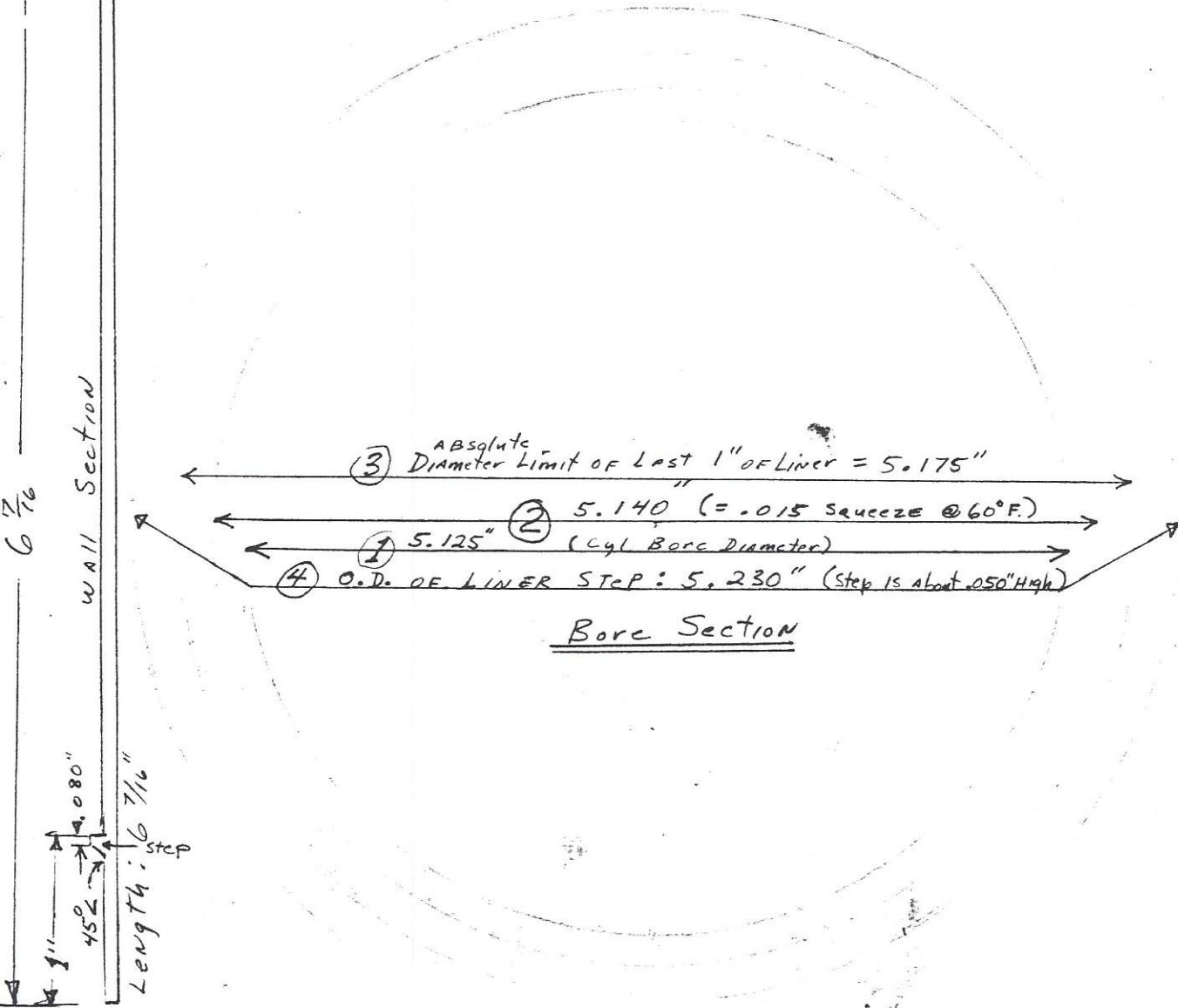
③ Chuck up Hollow Liner Holding Fixture - use Dial Indicator to center at Chuck Jaws and at Near end of Liner ^{ON} Fixture.

④ Put Stock Liner Holding Plug Fixture in Liner and insert into Tailstock, Sliding Entire Assy toward Chuck till Tight - Tighten Tailstock wheel till plug Seats Snugly

⑤ Dial Indicate T-S. Plug till its O.D. and Rear Face are Reasonably near zero on the Dial Indicator

⑥ MAKE initial SKINNING cut (3 above)

Seabee Cylinder LINER Specs. (Diameters)



1. Cold measurement of standard empty aluminum cylinder bore without liner
2. Finished O.D. of Liner = .015" greater diameter than Cyl bore at 60°F Temp.
3. Outside diameter of last 1" of Liner projecting into Engine Block, Absolute Limit: 5.175". Normally cut to 5.140" Diameter To 5.125" (Step is about .050 H.)
4. O.D. of LINER STEP: 5.230"

CUTTING INSTRUCTIONS & LIMITS

Cut with carbide tools at 300 RPM (Rough cuts @ 300 feet/minute) 8400 RPM Finish cuts

O.D. Step = 5.230 (max. diameter of stepped part of cyl)

O.D. 1st inch = 5.140

$$\text{O.D. Liner inserted section} = \left[(\text{Standard 5.125 Bore}) + .015 \right] = 5.140$$

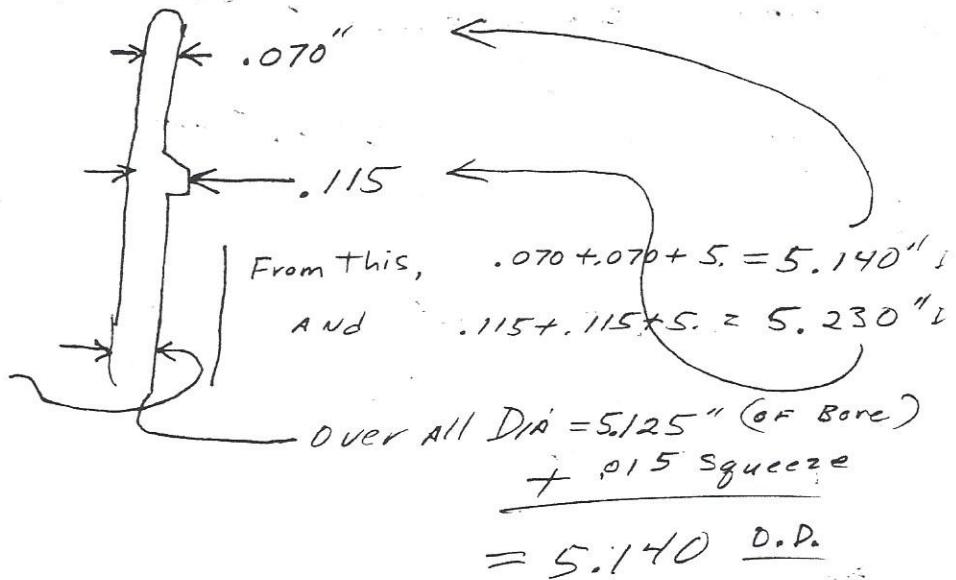
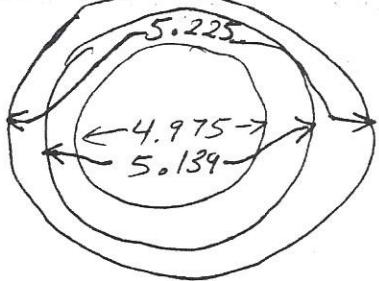
17

8
7

3

- ① Set Lathe Level with Precision
- ② Level Mandrels with Dial Indicator inch
- ③ Cut Liners IN HALF -

Liner Specs -



Cutting speeds

Cast IRON: Roughing Cuts $.010 \text{ to } .020" = 60 \text{ FPM} = 57 \text{ RPM}$

Finish $.002 \text{ to } .010" = 80 \text{ FPM} = 75 \text{ RPM}$

Carbide may increase 100% to 800%

$120 = \text{FPM} = 120 \text{ RPM} =$

$160 =$

Cleaning Cyl 15

- ① Use Long Shank .440" End Reamer to Clean Carbon From Exhaust Guides.
- ② Use $5/16$ " Tap to Clean All Threaded Stanchion Bolt Holes on top of Cyl. Head -
- ③ Then Using Gunout Spray cans with Long Thin Nozzle Pipes, Hold Cyl head Downward & wash out to clean Condition all Stanchion Bolt holes & Cyl Head temp Thermocouple hole (Between Spark Plug holes)

$$\begin{aligned} \alpha_L &= .04043 \\ @ 5'' &= .040'' \end{aligned}$$



Expansion Factors

Coefficient Tables, 0° F

$$\alpha_L = .0001244''/\text{Deg F}$$

$$S_{\text{Steel}} = .00000633 / \text{Deg F}$$

$$\text{Steel - IRON}$$

$$\text{Liner at } 650^\circ \text{ F} = .020''$$

This suggests about .020" clearance + 750
~~.015"~~ interference
 .005" Actual clearance

Liner Insertion:

- ① Clean Bore of Cyl, then heat to 650° or more
 in Burner or Elect oven
- ② Clean Liner O.D. - Put insertion Stop Collar on outer
 end of LINER

Page 155, Sec: 18 John Deere 2771 CP Thickness .114:
Length 3.438
.020" under only

Page 155 Sec: 17 John Deere

Page 201 Sec 21 Pontiac - Pos. 5 2438 AP.

Page 6 - Sec 13 Allis C. Pos 1 4086M Looks Good - ++
Pos 1-3 2441 AP

Up. 20 Sec 1 Buick 301 (4.9) #5 main 2339 CP Looks + ++

Up 22 Sec 10 Buick 400 (C.6) #5 main 2438 AP Looks +++

Up 29 Sec 7 Case (267) 1-3-5 2431 CPA Looks +++

Note: Sec 8 has 2431 set (4 to 6 per set if sets only available)
For a 451 Engine

Up 30, Sec 14, Case (267) -

Up 30 Sec 16,

Up 37 Sec 7 Cat. Rod Bearings (4 per set) 2040 AP Looks +++
10-20-30-40-50

Up 41 Sec 23B Cat Rod Bearings (4-6 per set) 2530 AP Looks +++

Up 68 Sec 27 Cont. (6 Rod Brngs) 1410 CP (wall thick. 1000) XXX

Up 71 Sec 38 Cont (6 Rod Bearing) 3355 CPA

P114 Sec 46 GMC (#5 MAIN) 10-20-30 2564 AP (.093²) +++

	LIST	Net
# 20	14.69	
5.07	- 390	

3125 C.P.