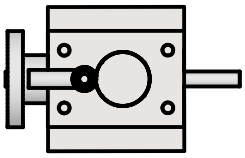
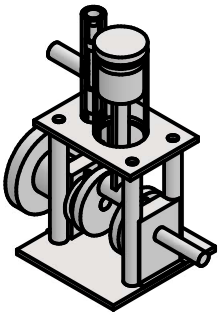
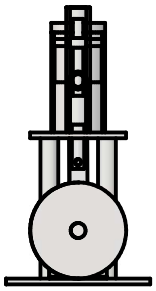
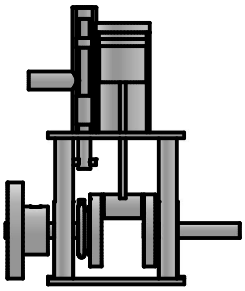
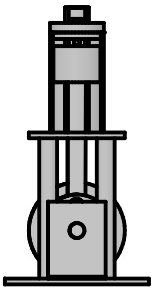










DRAWN tommy	3/27/2023			
CHECKED		TITLE Les Steam Engine Part List as Cad Modelled by Tommy Rohmann		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 1		SHEET 1 OF 24

This is an engine designed by Leslie Proper who made his own engines for model boats. He also built other engines which boast a greater complexity than the design outlined in this document. His design was the inspiration behind making the engine shown, and his Youtube Channel: https://www.youtube.com/@LesliePproper

The original plans were sent to me by Leslie Proper by Email, however I had a lot of trouble deciphering the drawings sent to me, so I went about redesigning and modeling the engine in Autodesk Inventor during the 2023 Spring Semester, which these drawings were generated from.

I built this engine starting during the school year, but did the bulk of the work during Summer Sea Term aboard the T.S. Kennedy, which had a machine shop with limited capabilities, where the schedule, state of the machinery, and tool availability made working on this engine rather challenging. Additionally, the method of assembly (Silver Soldering) was new to me, and could not be feasibly used to assemble the pieces. In all, I would say that the engine took around 50 hours of working time to complete, though this may be less given experience with silver soldering and better equipment. I would not recommend this project for anyone, but would like to make it available still for those interested.

If I were to do this project over again, I would make the engine slightly larger, which would make it much easier to machine and assemble, especially given the tools available at school. I would also change the design in a few ways before building again, such as combining the frame posts and bearings by machining them from bar stock, which cuts down on assembly and the number of parts machined, making the assembly more accurate in the process. Furthermore, I would make the piston from one part, as the cylinder should be adequate to keep the wrist pin captive, and make the assembly easier to take apart if needed.

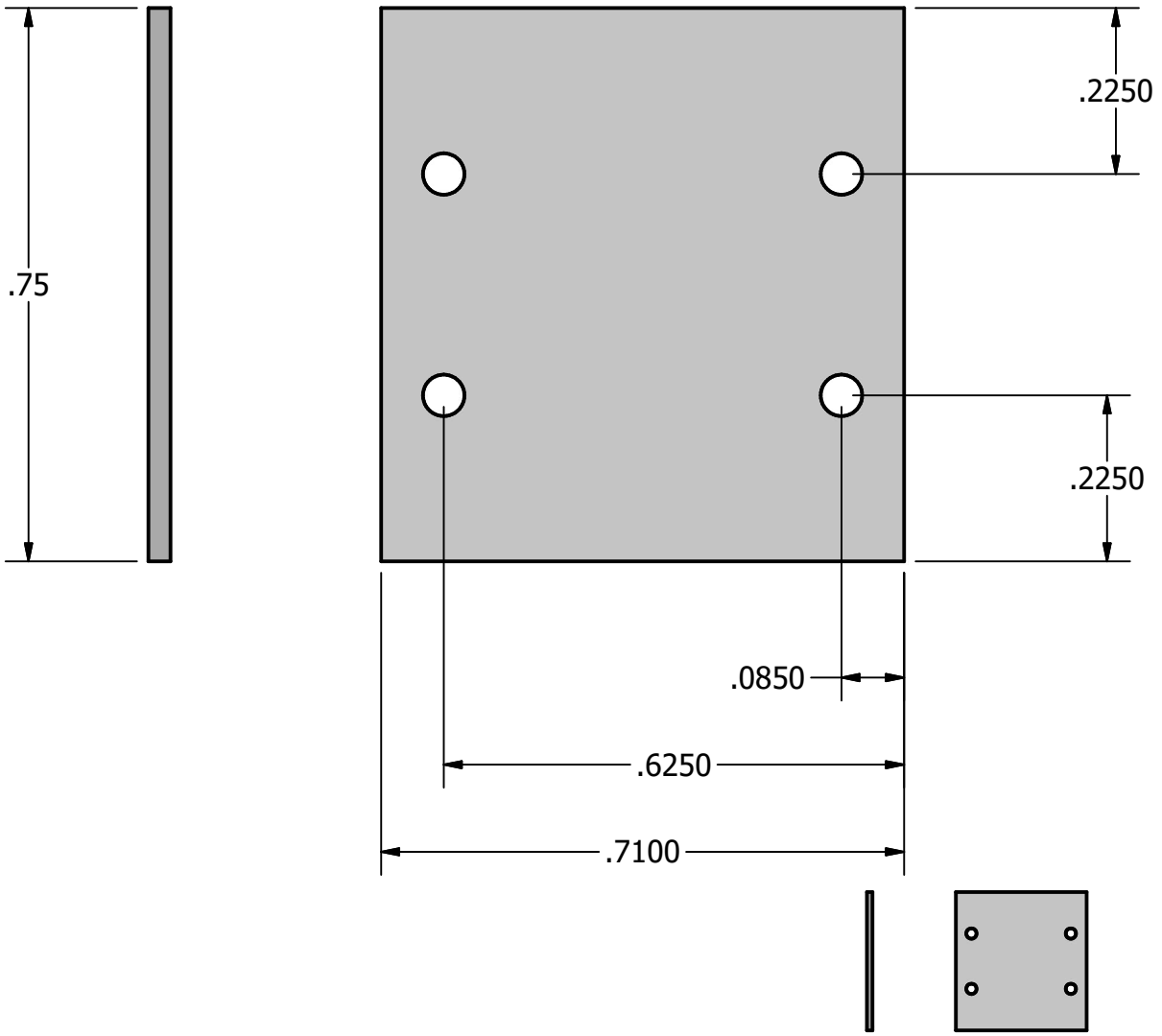
If you do end up making this engine, I would recommend building it with the idea in mind that these parts do not need to be perfect in order to run. The only especially important components are the piston and valve, which need to have a tight tolerance to make a seal. Understand the purpose for the size of each hole and dimension, and if there isn't one, it can change. If there is a relationship, understand what kind of tolerance would be acceptable such as in the case of bearings and the flywheel. Don't lose your drill bits, since you'll need the same size hole for various parts.

DRAWN tommy	3/27/2023			
CHECKED		TITLE Note from the Author		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE		SHEET 2 OF 24

Part #1

Machined from .75" ____ Gage Plate/Bar Stock

Holes Countersunk on one side for Machine Screws

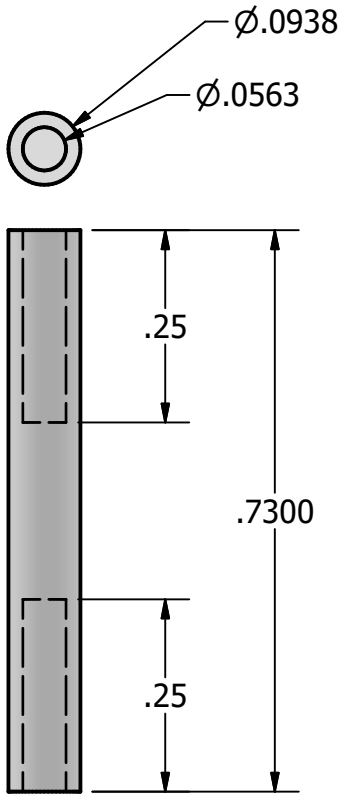


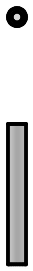
DRAWN tommy	3/27/2023			
CHECKED		TITLE Engine Frame Bottom		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 1/1	SHEET 3 OF 24	

Part #2

3/64" Drill Bit for 0-80 tap

Holes Drilled are Tapped for 0-80 Machine Screws

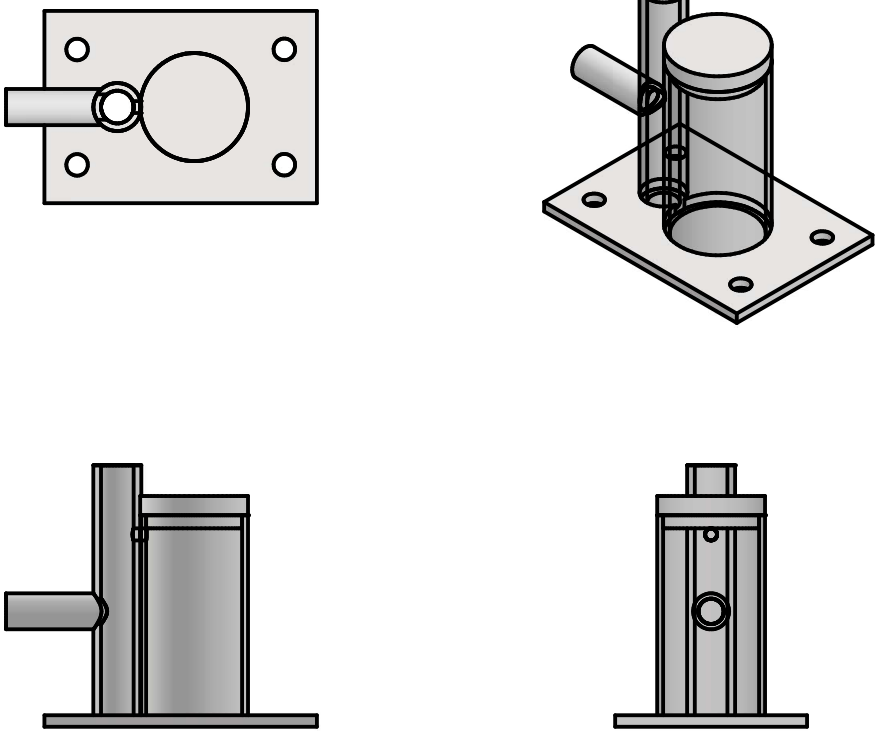




4x needed for engine assembly

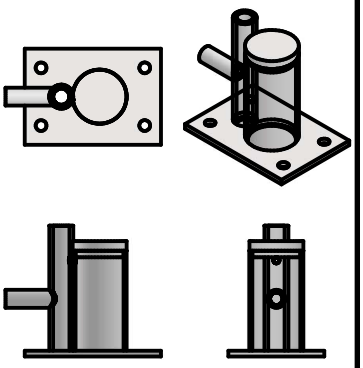
DRAWN tommy	3/27/2023			
CHECKED		TITLE Frame Post		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 4 : 1		SHEET 4 OF 24

Assembly #1



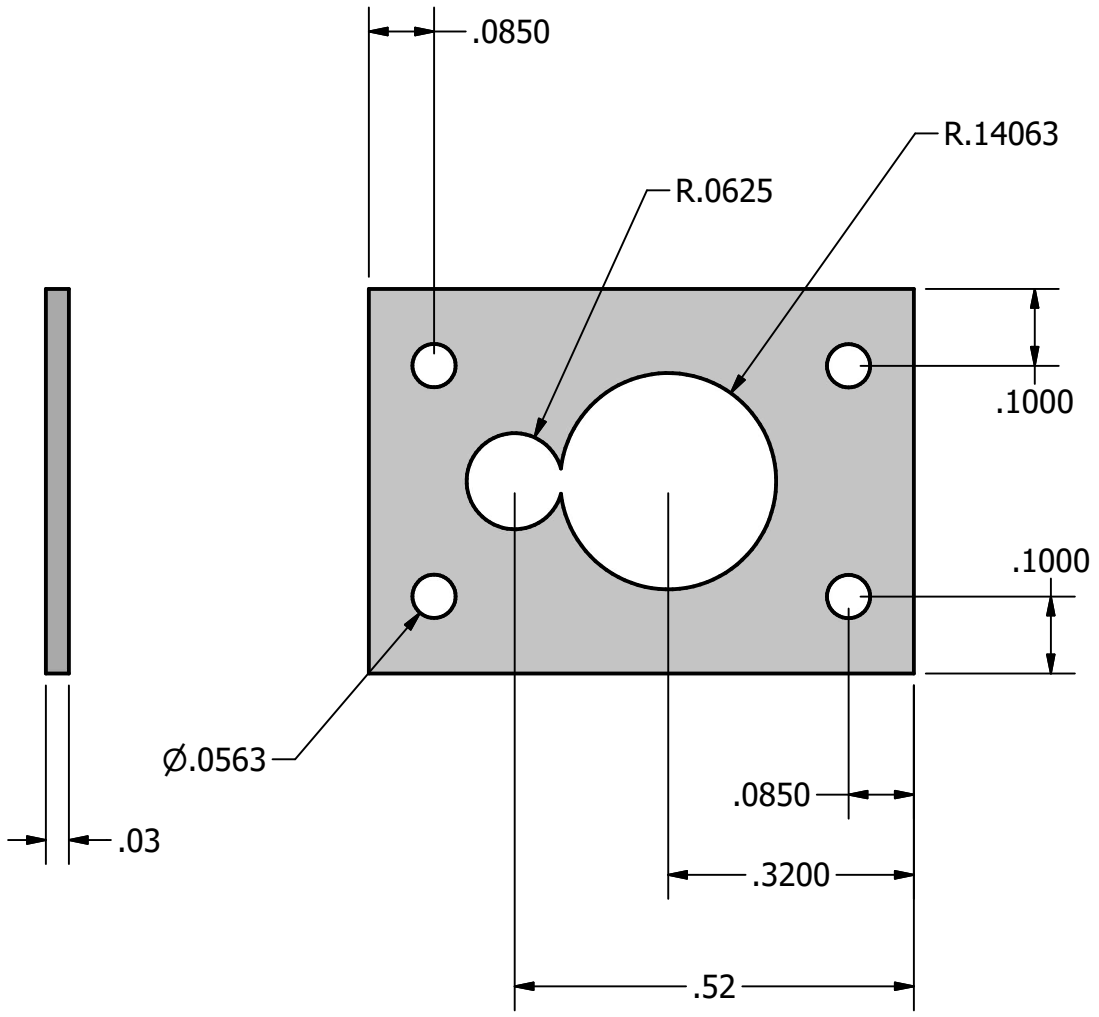
Soldering joints did not work during assembly. to assemble this component, clear JB Weld was used, which is easy to remove is messed up.

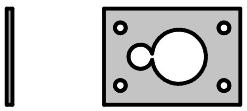
Plug inlet holes with lead and then make a tool to poke it out after JB Weld has dried, otherwise the joint will close the inlet, which would result in the engine not being able to run



DRAWN tommy	3/27/2023			
CHECKED		TITLE Engine Top Assembly		
QA				
MFG				
APPROVED		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 1	SHEET 5 OF 24	

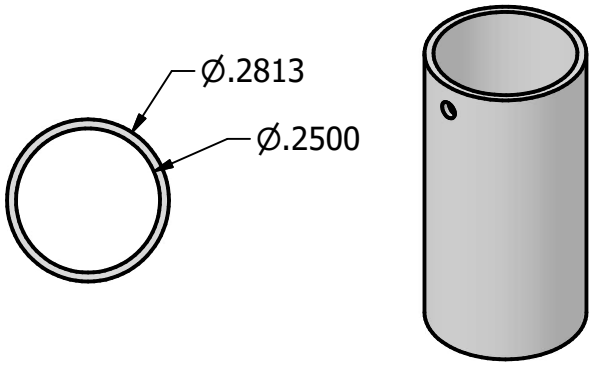
Part #3

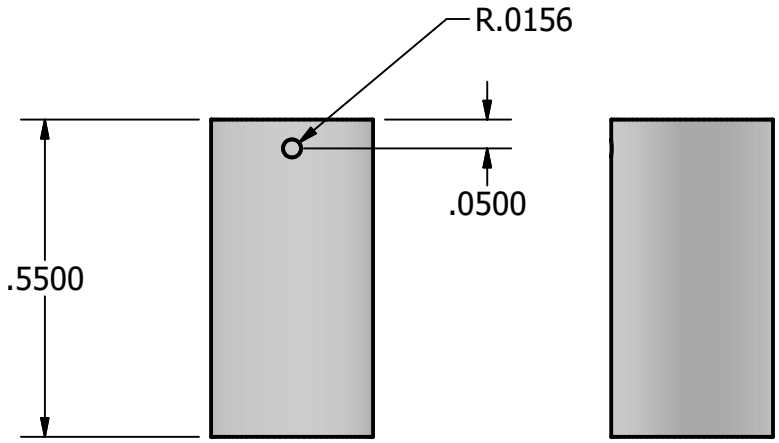




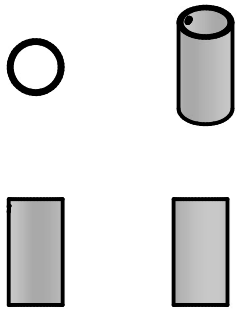
DRAWN tommy	3/27/2023			
CHECKED		TITLE Engine Frame Top		
QA				
MFG				
APPROVED		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 4/1	SHEET 6 OF 24	

Part #4



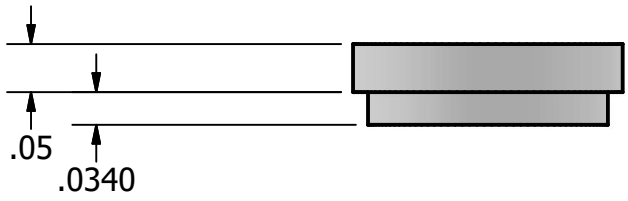


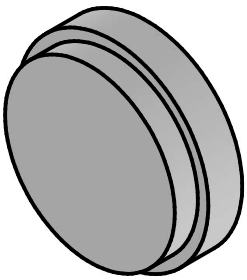
Machined from 1/4" Brass Tubing, cut with pipe cutter, deburred with larger drill bit, Steam inlet/outlet drilled using 5/128 bit (Smallest found available)

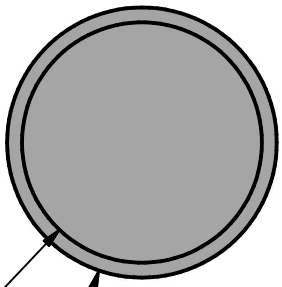


DRAWN tommy	3/27/2023			
CHECKED				
QA		TITLE Cylinder		
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 3	SHEET 7 OF 24	

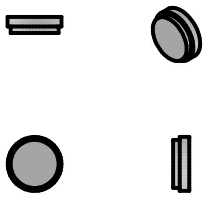
Part #5





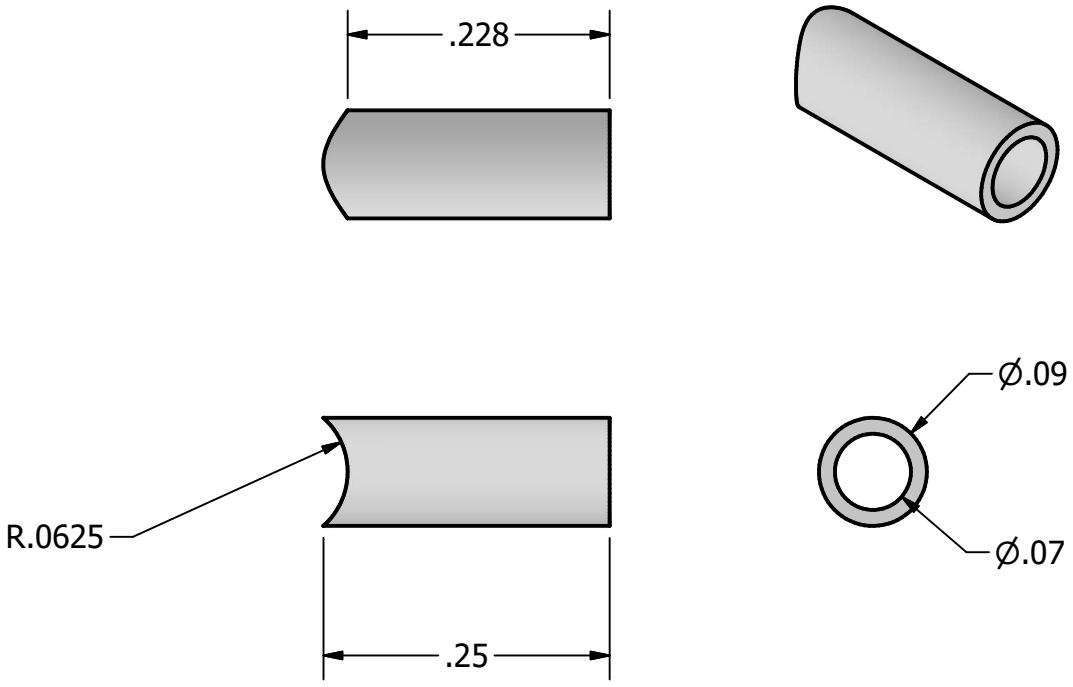


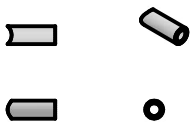
Turned from brass stock on lathe



DRAWN tommy	3/27/2023			
CHECKED		TITLE Cylinder Top		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 5		SHEET 8 OF 24

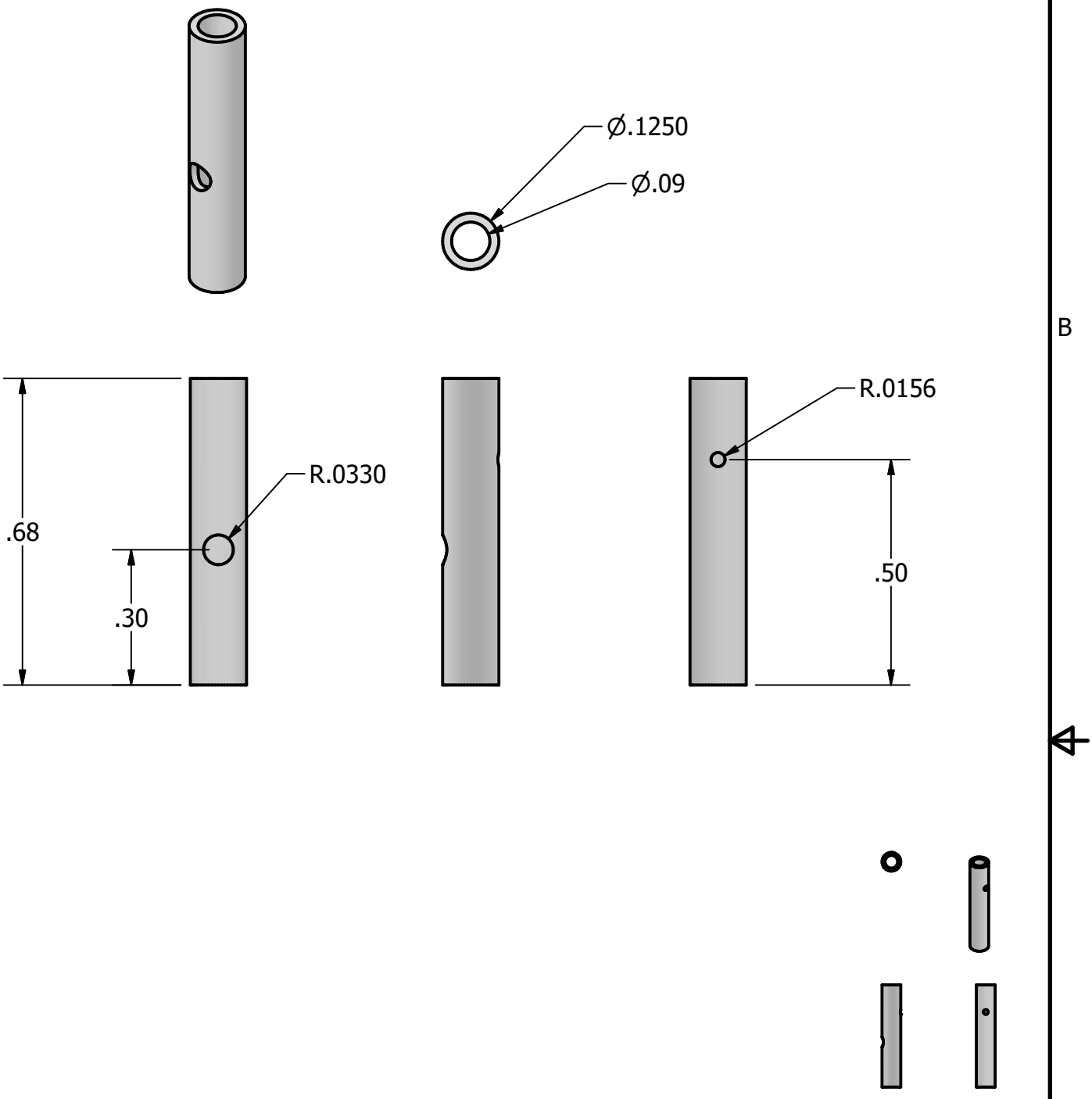
Part #6





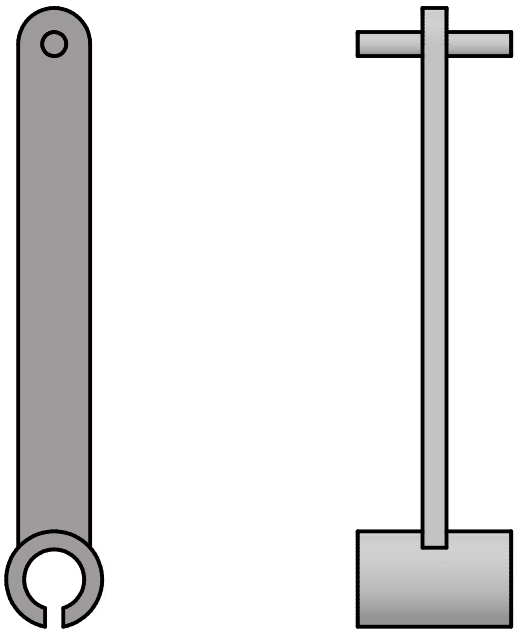
DRAWN tommy	3/27/2023			
CHECKED		TITLE Inlet Manifold		
QA				
MFG				
APPROVED		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 6	SHEET 9 OF 24	

Part #7



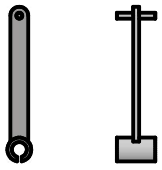
DRAWN tommy	3/27/2023			
CHECKED		TITLE: Valve Tube		
QA				
MFG				
APPROVED		SIZE: A	DWG NO: Engine Assembly Final	REV
		SCALE: 3	SHEET 10 OF 24	

Assembly 2



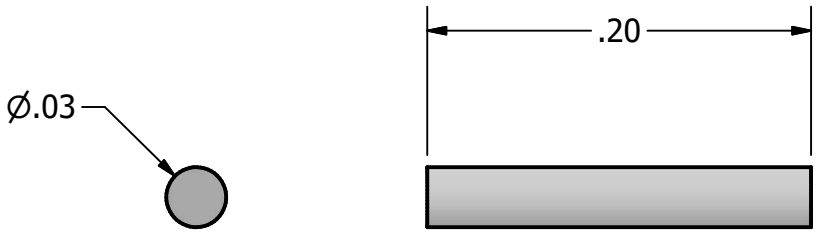
Connecting Rod and Connecting Rod Crank Sleeve soldered together. Wrist Pin is not adhered to any component in the assembly.

Note: Wrist Pin mates with Piston Connector, and connot be attached once the piston is assembled. Ensure the Connecting Rod Assembly is attached by the Wrist Pin to the Piston Connector before soldering the Piston together.



DRAWN tommy	3/27/2023			
CHECKED		TITLE Assembled Connecting Rod		
QA				
MFG				
APPROVED		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 4:1	SHEET 11 OF 24	

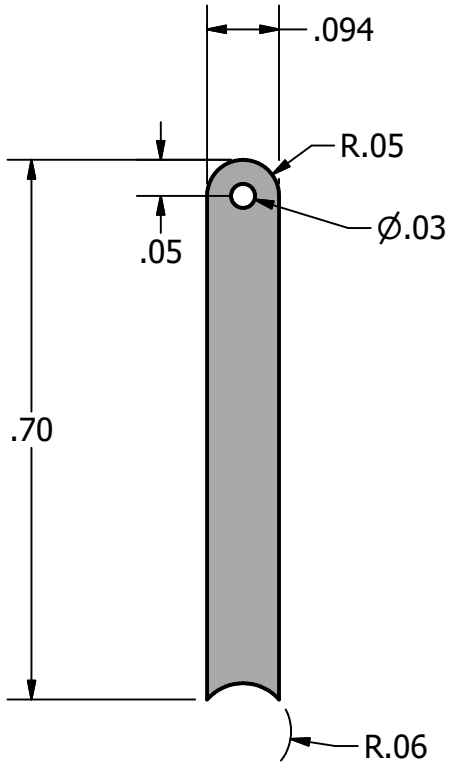
Part #8

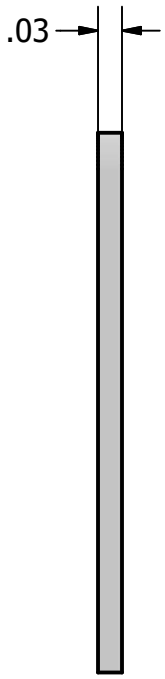


Cut from Brass Wire used to make Valve Connector

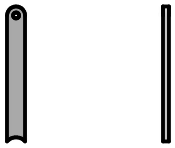
DRAWN tommy	3/27/2023			
CHECKED		TITLE Piston Wrist Pin		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 10 : 1		SHEET 12 OF 24

Part #9



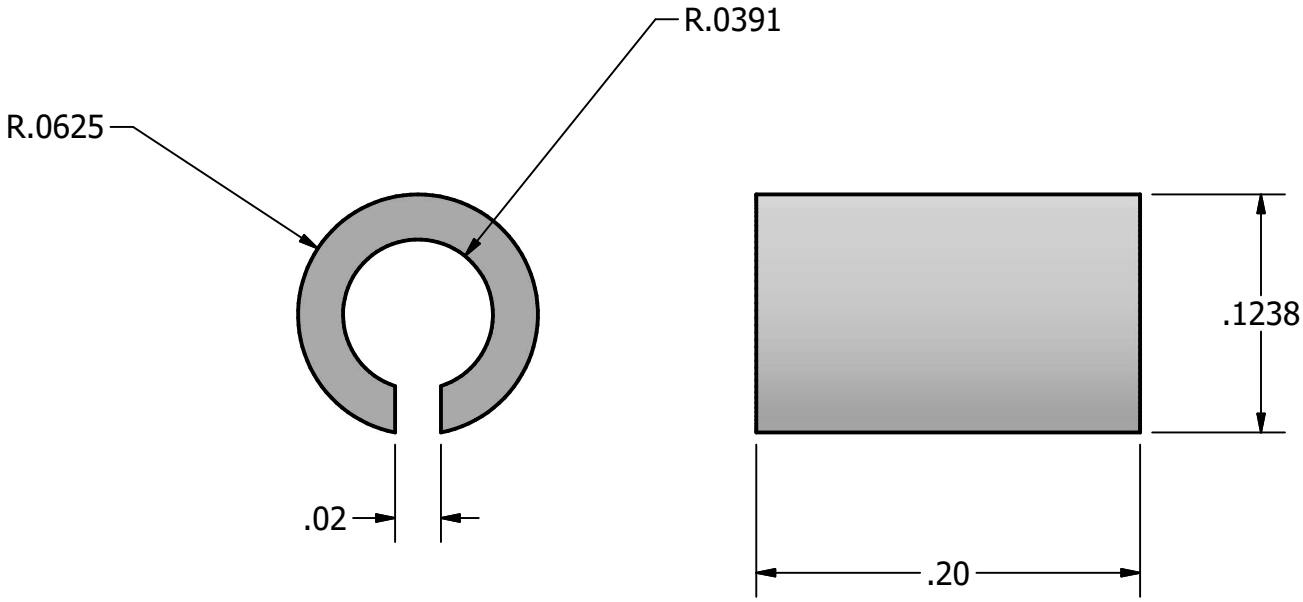


Cut from Sheet Metal



DRAWN tommy	3/27/2023			
CHECKED		TITLE Connecting Rod		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 4 : 1		SHEET 13 OF 24

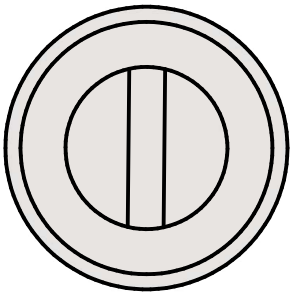
Part #10

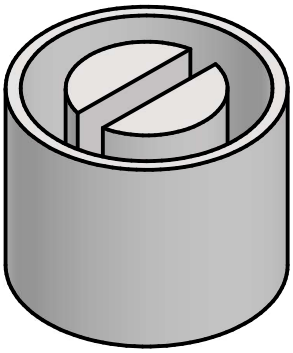


After assembly, Connecting Rod Crank Sleeve is attached to Crankshaft Assembly by bending open, and then loosely clamping around crank so that the connecting rod can freely rotate.

DRAWN tommy	3/27/2023				
CHECKED					
QA		TITLE Connecting Rod Crank Sleeve			
MFG					
APPROVED					
		SIZE A		DWG NO Engine Assembly Final	REV
		SCALE 10 : 1		SHEET 14 OF 24	

Assembly #3

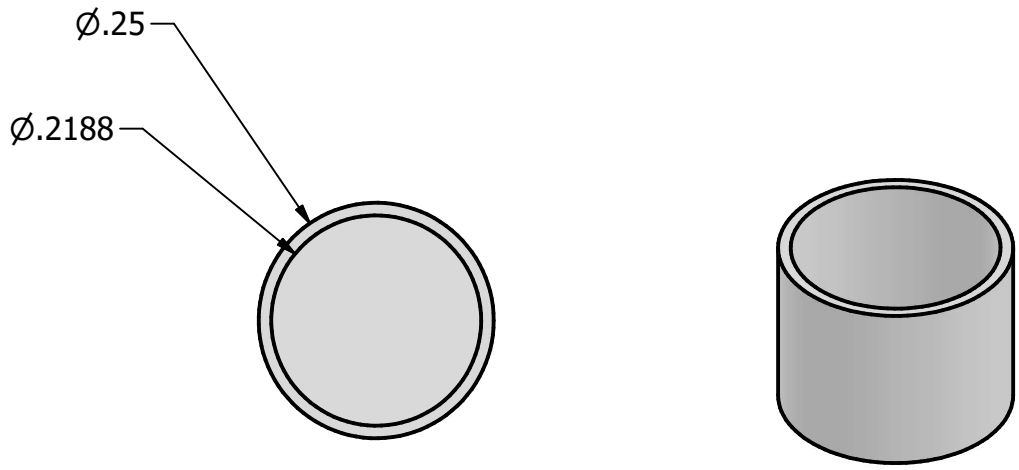


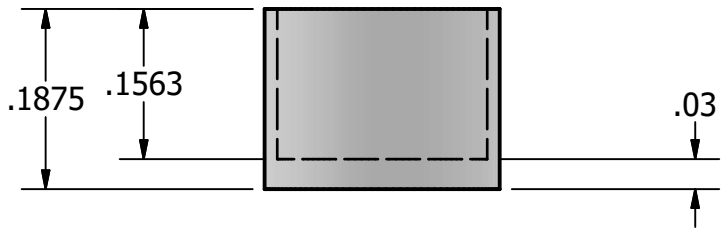


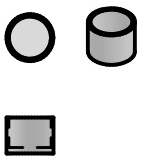
Note: Piston is soldered together, but must have wrist pin inserted and attached to connecting rod prior to soldering.

DRAWN tommy	3/27/2023				
CHECKED		TITLE Piston Assembly			
QA					
MFG					
APPROVED					
		SIZE A		DWG NO Engine Assembly Final	REV
		SCALE 6		SHEET 15 OF 24	

Part #11

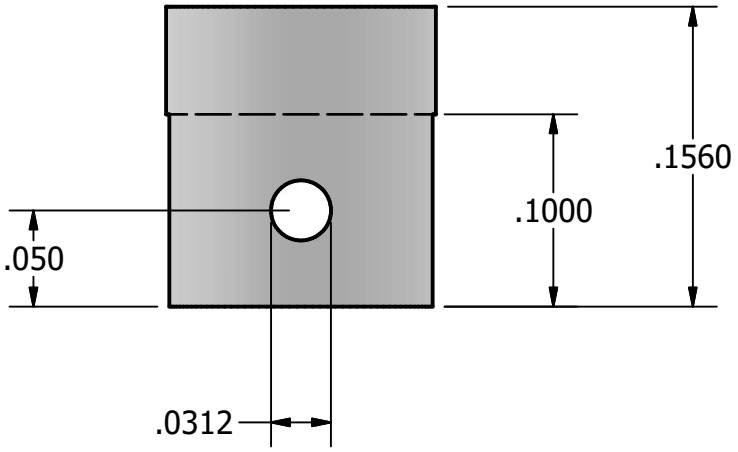


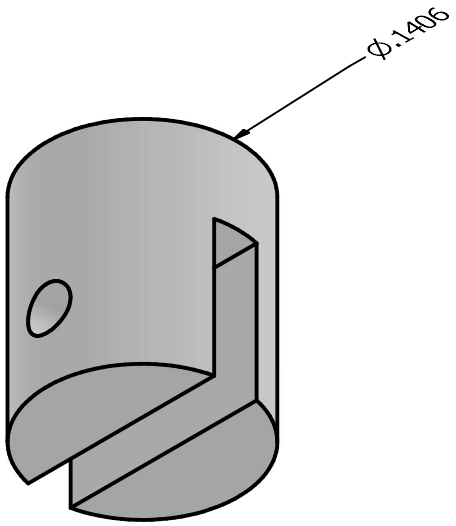


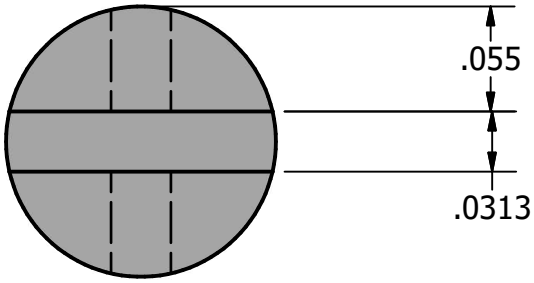


DRAWN tommy	3/27/2023			
CHECKED		TITLE Piston Crown		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 5	SHEET 16 OF 24	

Part #12



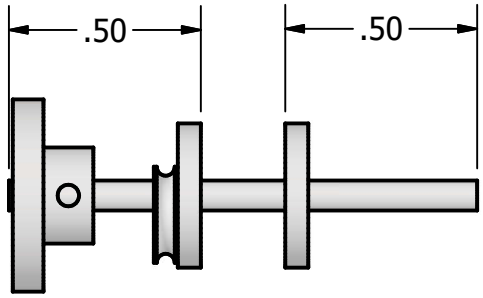


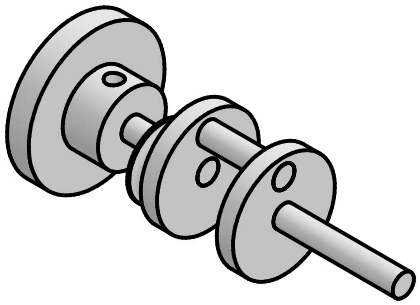


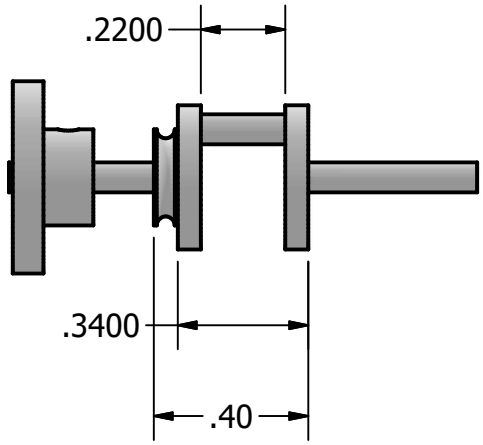
DRAWN tommy	3/27/2023			
CHECKED		TITLE Piston Connector		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 10	SHEET 17 OF 24	

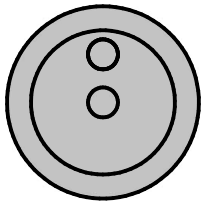
Assembly #4

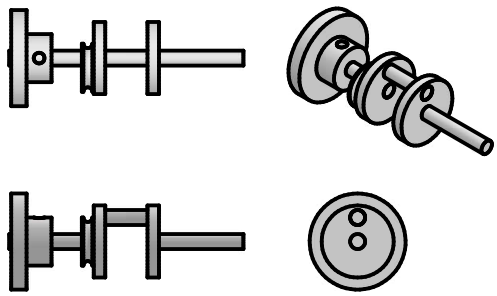
Soldering for this assembly did not work, the crankshaft parts had to be TIG welded together





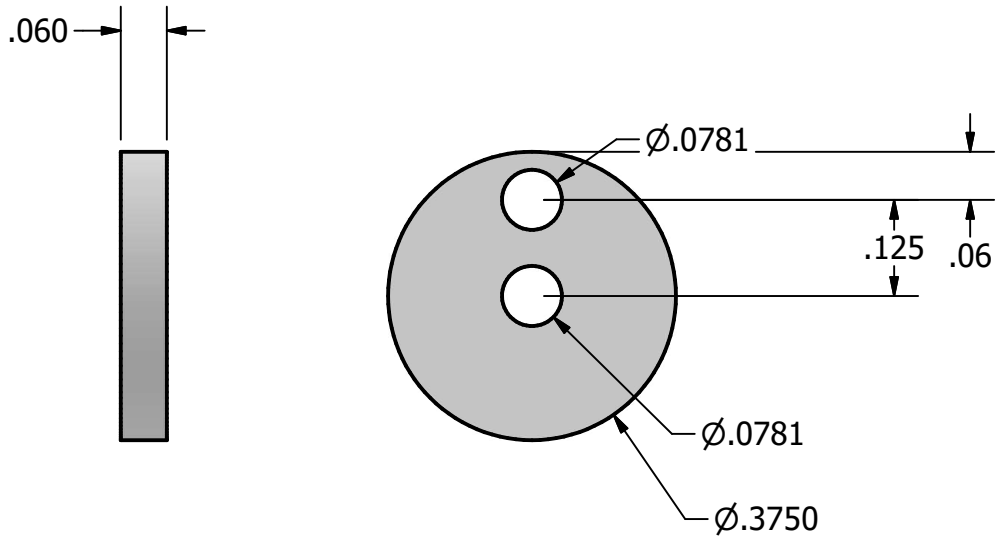






DRAWN tommy	3/27/2023			
CHECKED		TITLE Assembled Crankshaft		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 2 : 1	SHEET 18 OF 24	

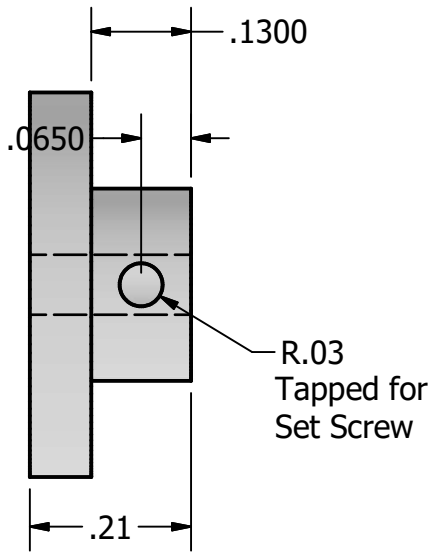
Part #13

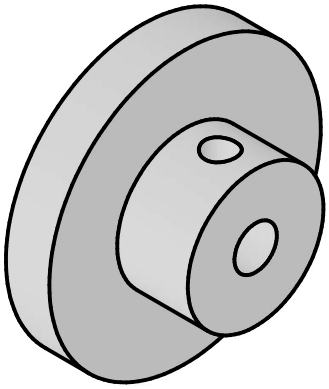


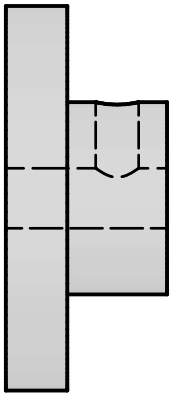
Machined from .375" Stainless Steel Stock

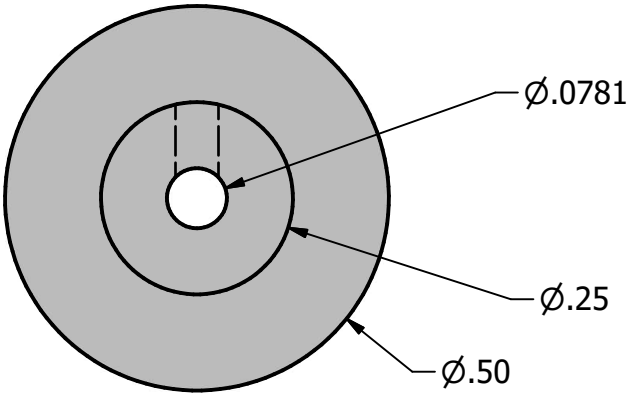
DRAWN tommy	3/27/2023			
CHECKED		TITLE Crank Portion of Crankshaft		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 4	SHEET 19 OF 24	

Part #14



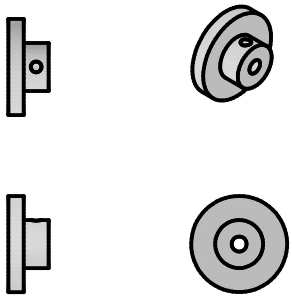






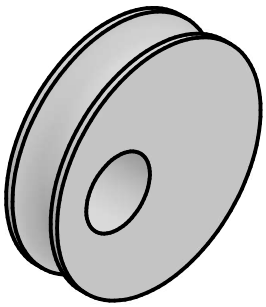
3/64" Drill Bit for 0-80 tap

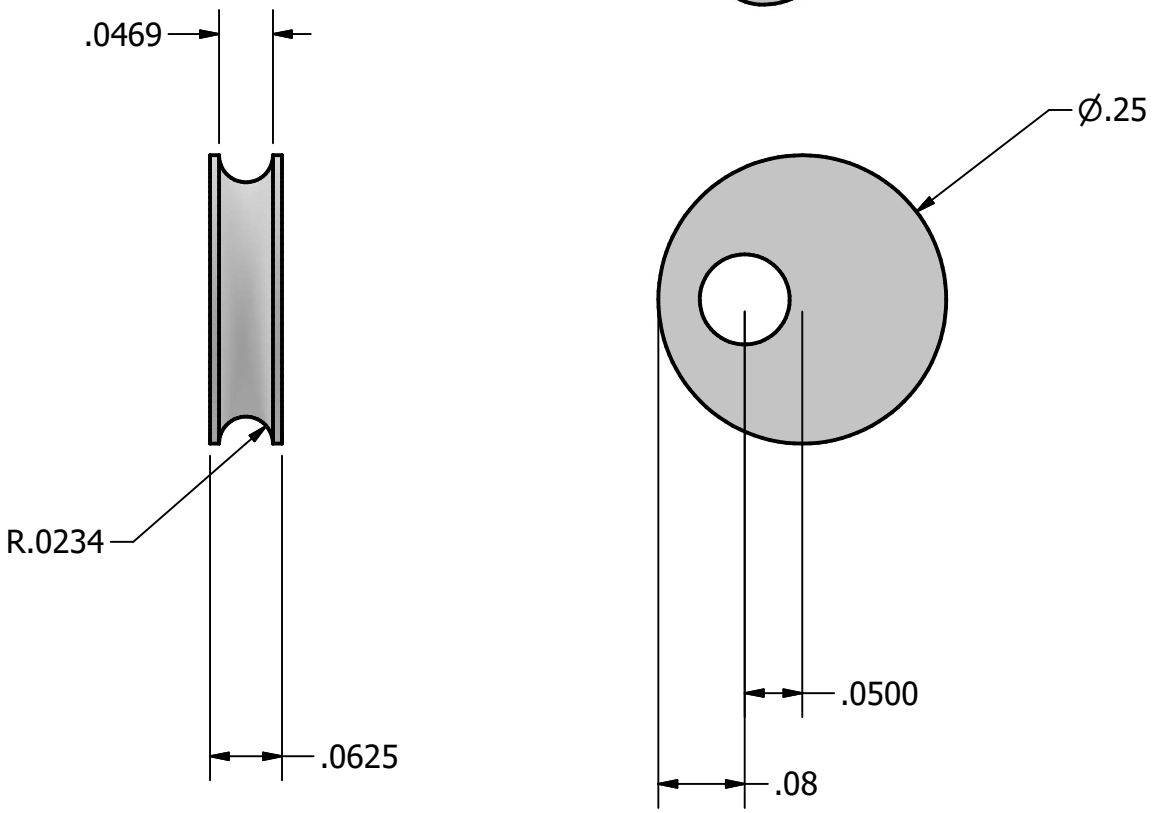
Holes Drilled are Tapped for 0-80
Machine Screws



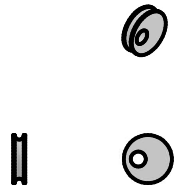
DRAWN tommy	3/27/2023			
CHECKED		TITLE Flywheel		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 4 : 1	SHEET 20 OF 24	

Part #15



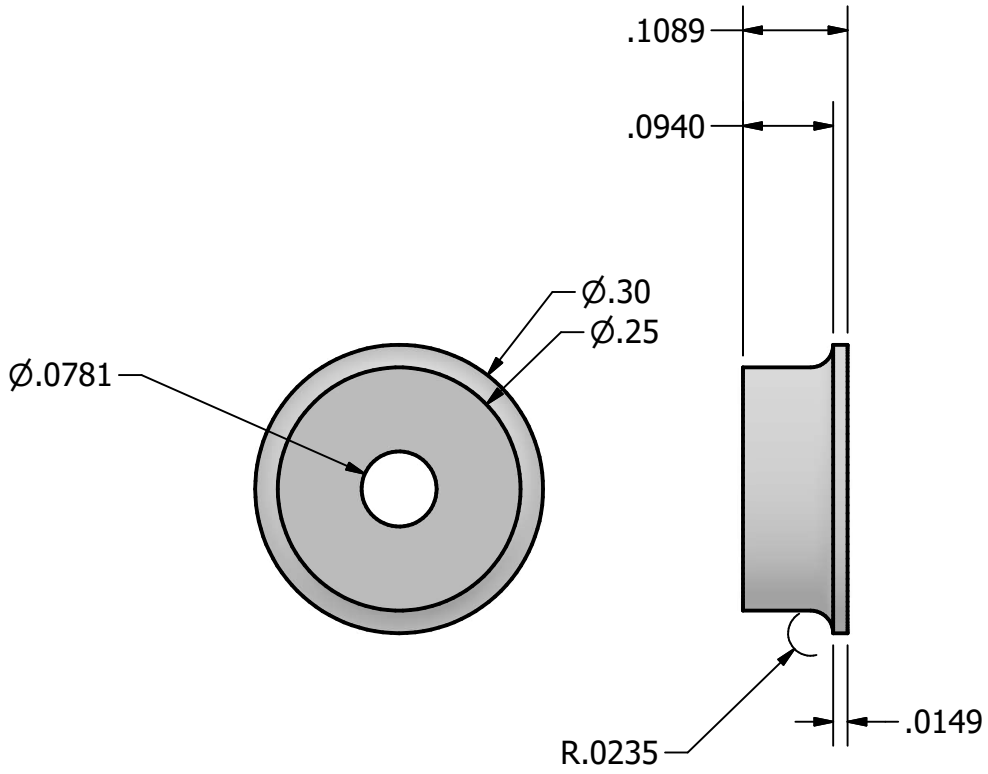


Radius Groove does not need to be precise.
Machined with file prior to parting from stock



DRAWN tommy	3/27/2023			
CHECKED		TITLE Eccentric		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 6	SHEET 21 OF 24	

Part #16

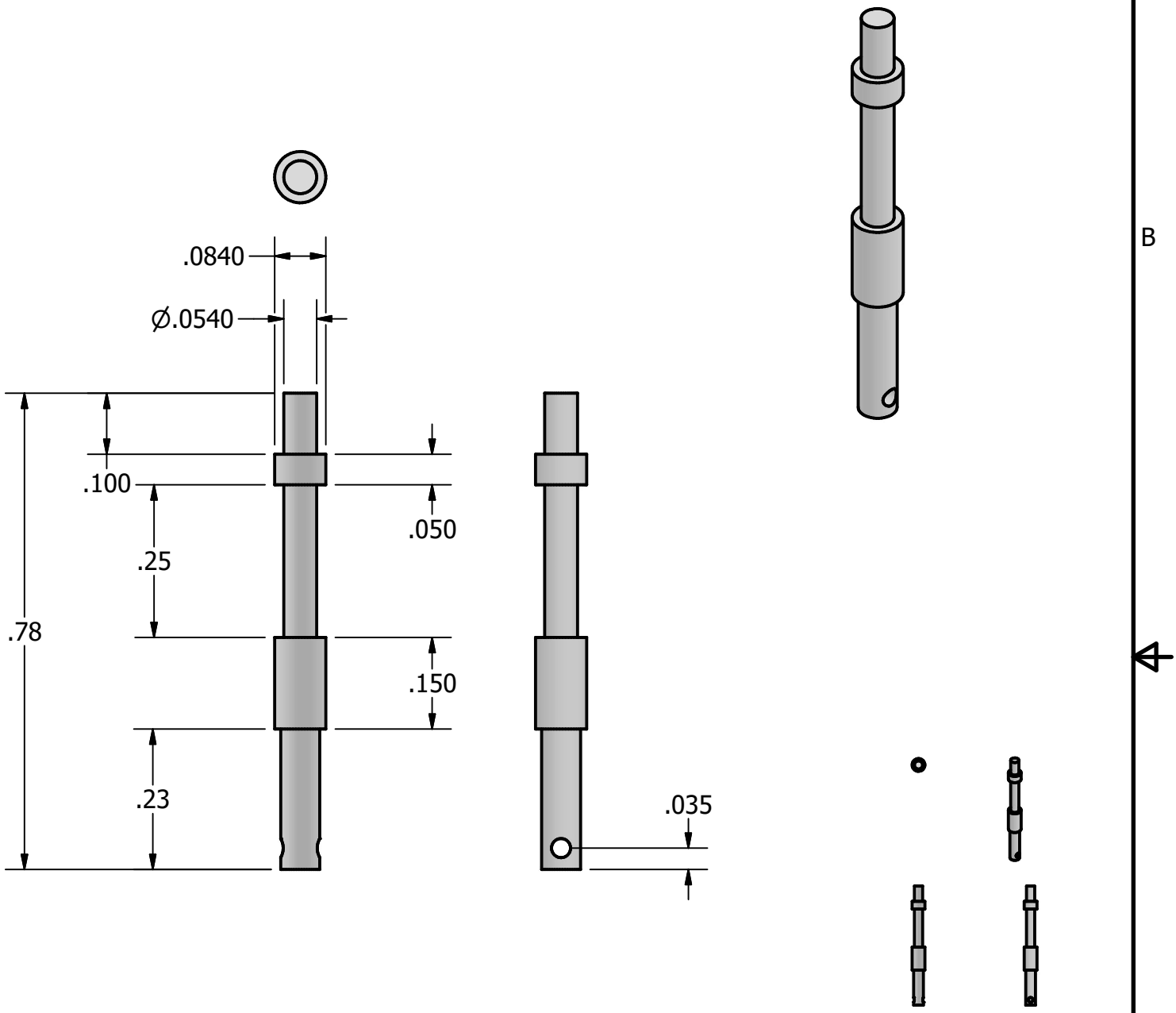


x2 Required for Assembly

Turned from Round Stock on Lathe

DRAWN tommy	3/27/2023			
CHECKED		TITLE Bearing		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 5	SHEET 22 OF 24	

Part #17



DRAWN tommy	3/27/2023			
CHECKED		TITLE Steam Valve		
QA				
MFG				
APPROVED		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE 1	SHEET 23 OF 24	

Part #18

Not depicted, this part is made to connect the eccentric to the valve, and is more made to match the engine the way it ended up being assembled with the machined parts more than any specific measurement. Ensure that the valve is in the correct position in both top dead center (of the eccentric) and bottom dead center at the given height of the valve connector.

DRAWN tommy	3/27/2023			
CHECKED		TITLE Valve Connector		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO Engine Assembly Final	REV
		SCALE		SHEET 24 OF 24