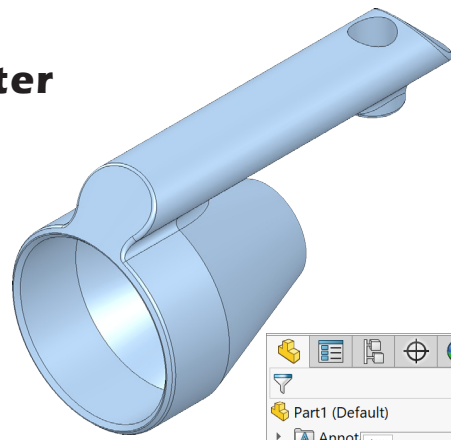




# The Watermaster Nozzle



## A. Extrude1.

Step 1. Click File Menu > New, click **Part Metric** and OK.

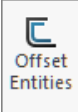
Step 2. Click **Front Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 1**.

Step 3. Click **Circle**  on the Sketch toolbar.

Step 4. Sketch circle starting at the Origin , **Fig. 2**.

Step 5. Click **Smart Dimension**  (S) on the Sketch toolbar.

Step 6. Dimension circle **diameters 12.1**, **Fig. 2**.

Step 7. Click **Offset Entities**  on the Sketch toolbar.

Step 8. In the Offset Entities Property Manager set:  
under Parameters, **Fig. 3**

**Distance**  **.12**  
(clearance of Out Pipe)

uncheck **Reverse**

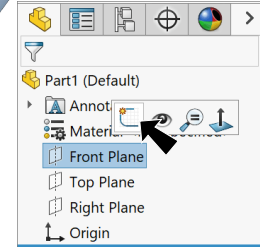
uncheck **Bi-directional**

under Construction geometry  
check **Base geometry**

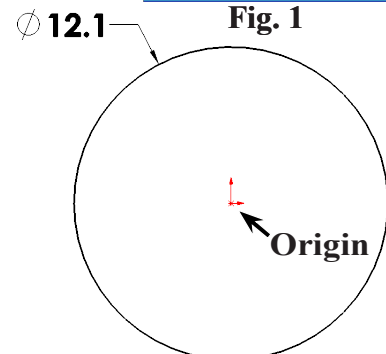
click **circle**, **Fig. 4**  
**Yellow offset circle on outside -**  
**base geometry (construction)**  
**on inside.**

Click **Keep Visible**  and OK .

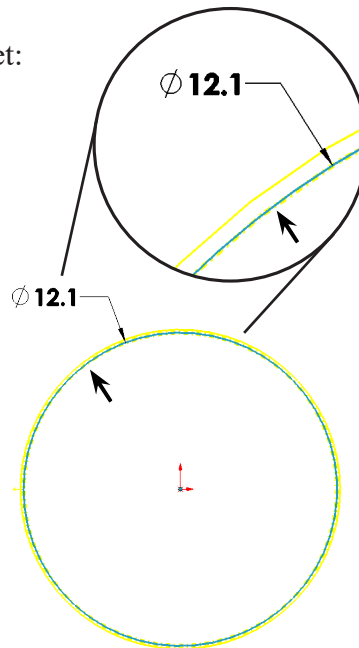
The Push Pin  on allows selection of another offset.



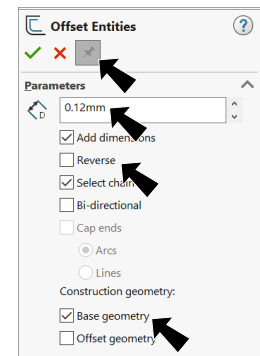
**Fig. 1**



**Fig. 2**





**Fig. 4**



**Fig. 3**

Step 9. Still in the Offset Entities Property Manager set:  
 under Parameters, Fig. 5

**Distance**  **.7**  
 under Construction geometry  
 uncheck **Base geometry**  
 click **offset circle**, Fig. 6  
**Yellow offset circle on outside**  
 click OK  twice.

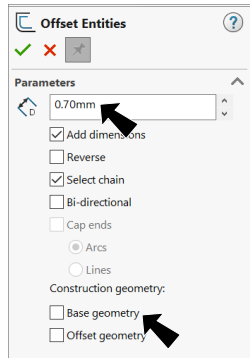


Fig. 5

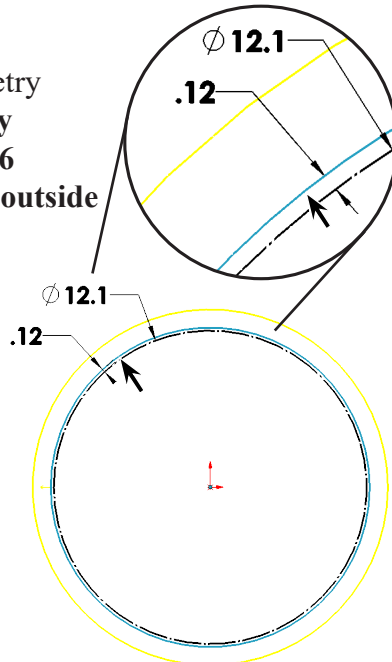


Fig. 6

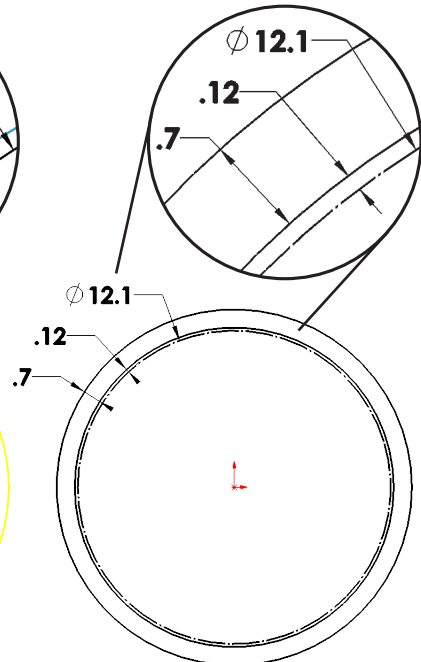



Fig. 7

Step 10. Click **Features**  on the Command Manager toolbar.

Step 11. Click **Extruded Boss/Base**  on the Features toolbar.

Step 12. In the Boss-Extrude Property Manager set:  
 under Direction 1, Fig. 8  
 End Condition **Blind**

**Depth**  **5**  
**Reverse Direction**   
 click OK .

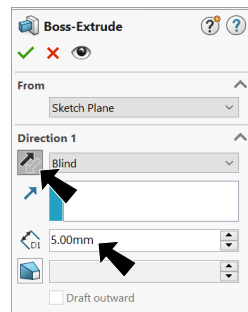


Fig. 8

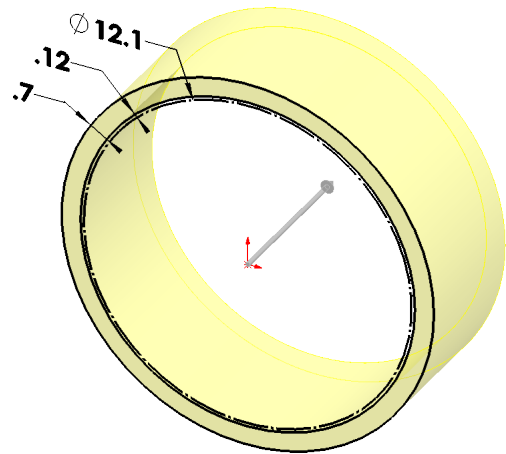




Fig. 9

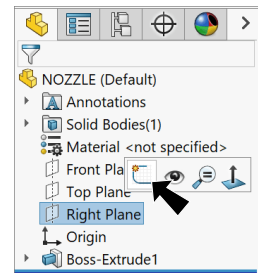
## B. Save as "NOZZLE".

Step 1. Click File Menu > Save As.


Step 2. Key-in **NOZZLE** for the filename and press ENTER.



## C. Revolve.


Step 1. Click **Right Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 10**.

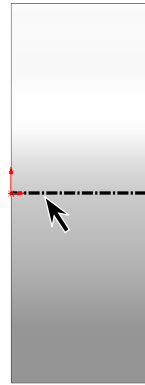


**Fig. 10**

Step 2. Click **Normal To**  on the Standard Views toolbar. (**Ctrl-8**)

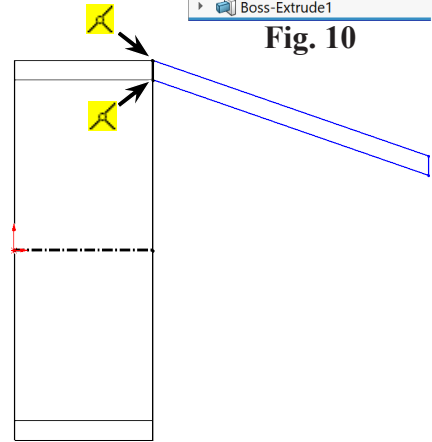
Step 3. Click **Centerline**  in the **Line flyout**  on the Sketch toolbar.

Step 4. Sketch **horizontal centerline** from Origin , **Fig. 11**.




**Fig. 11**

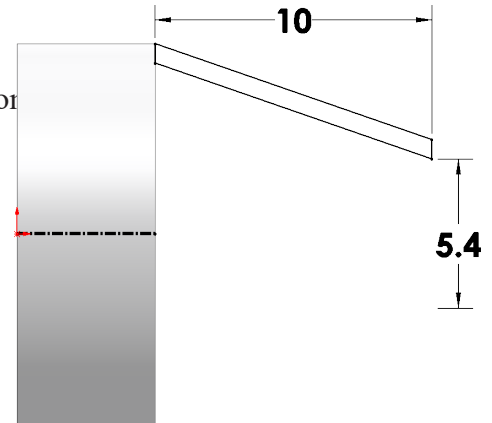
Step 5. Click **Wireframe**  on the View toolbar.



**Fig. 12**

Step 6. Click **Parallelogram**  in the **Rectangle flyout**  on the Sketch toolbar.

Step 7. Sketch parallelogram coincident  with the top and bottom edges of Extrude1, **Fig. 12**.



**Fig. 13**



Step 8. Click **Shaded With Edges**  on the View toolbar.

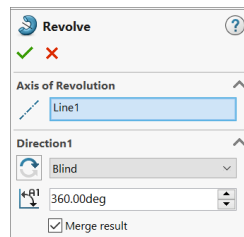
Step 9. Click **Smart Dimension**  (**S**) on Sketch toolbar.

Step 10. Add dimensions, **Fig. 13**. Dimension **double distance** 5.4. To double distance dimension, click centerline and then bottom right vertex of parallelogram and place dimension.

Step 11. Click **Features**  on the Command Manager toolbar.

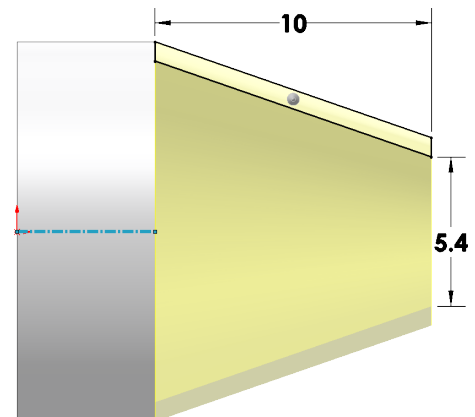
Step 12. Click **Revolved Boss/Base**  on Features toolbar.

Step 13. In the Revolve Property Manger set:  
 under Axis of Revolution   
 centerline line will be selected,  
**Fig. 14**  
 click OK .





**Fig. 14**

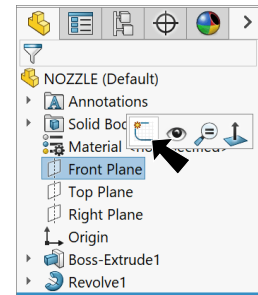
Step 14. Save  (**Ctrl-S**).




**Fig. 15**

## D. Extrude2 Sketch3 Rudder Arm.

Step 1. Click **Front Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 16**.




**Fig. 16**


Step 2. Click **Normal To**  on the Standard Views toolbar. (**Ctrl-8**)

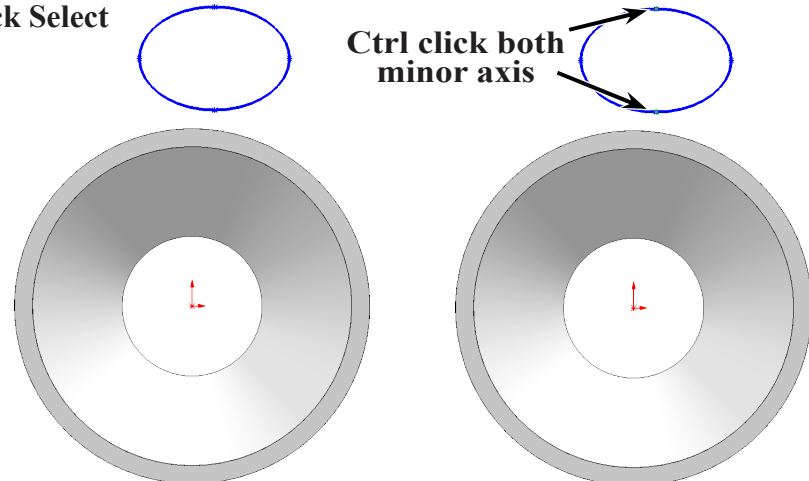
Step 3. Click **Ellipse**  in the **Ellipse flyout**  on the Sketch toolbar.

Step 4. Sketch ellipse above part, **Fig. 17**.

Step 5. **Unselect Ellipse tool**. To unselect, **right click graphics area and click Select**  from menu.






Step 6. **Ctrl click both minor axis** to select both. Release Ctrl key and click **Make Vertical**  on the context toolbar, **Fig. 18**.



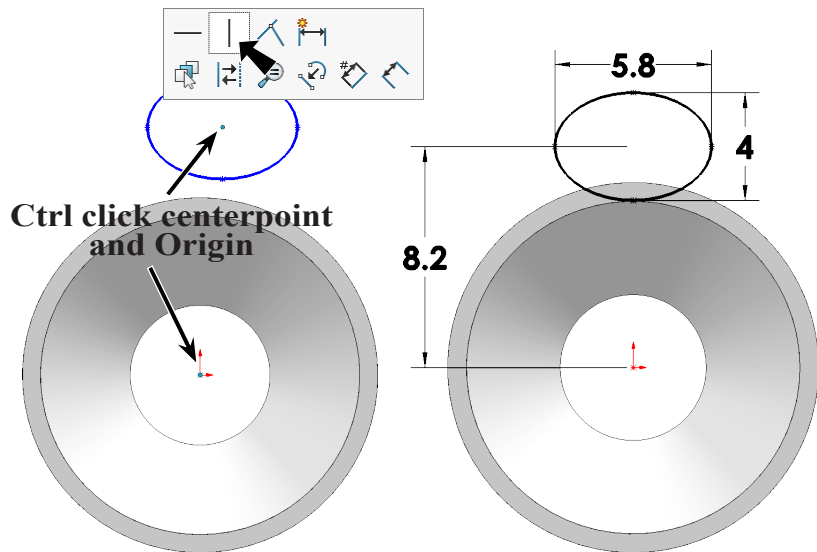
**Fig. 17**

**Fig. 18**

Step 7. **Ctrl click centerpoint of ellipse and Origin**  to select both. Release Ctrl key and click **Make Vertical**  on the context toolbar, **Fig. 19**.


Step 8. Click **Smart Dimension**  (S) on the Sketch toolbar.

Step 9. Add dimensions, **Fig. 20**.






**Fig. 19**

**Fig. 20**

Step 10. Click **Isometric**  on the Standard Views toolbar. (Ctrl-7)

Step 11. Click **Features**  on the Command Manager toolbar.

Step 12. Click **Extruded Boss/Base**  on the Features toolbar.

Step 13. In the Boss-Extrude Property Manager set:  
under Direction 1, **Fig. 21**  
End Condition **Blind**  
**Depth**  **30**  
**Reverse Direction**   
click OK .

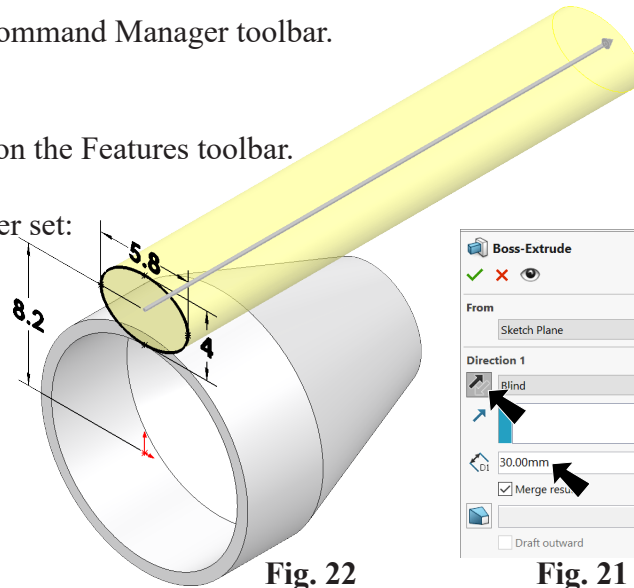


Fig. 22

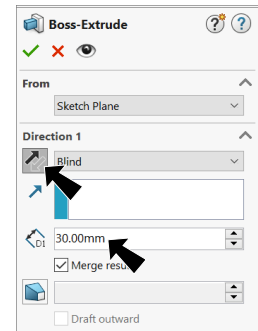



Fig. 21


Step 14. Save  (Ctrl-S).

## E. Revolved Cut Sketch4 Rudder Arm.

Step 1. Click **Right Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 23**.

Step 2. Click **Normal To**  on the Standard Views toolbar. (Ctrl-8)

Step 3. Click **Convert Entities**  on the Sketch toolbar.

Step 4. In the Convert Entities Property Manager:  
under Entities to Convert, **Fig. 24**  
click **top and side silhouette edges of Extrude2 (arm)**, **Fig. 25**  
click OK .

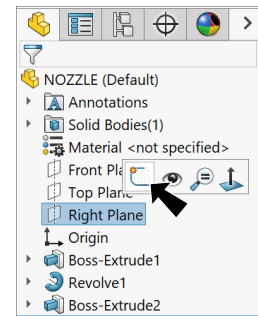


Fig. 23

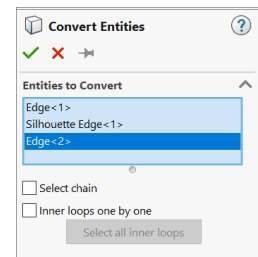


Fig. 24

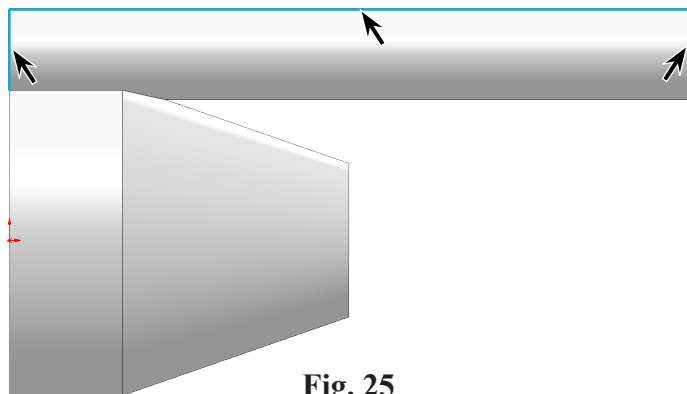


Fig. 25

Step 5. Drag the **bottom endpoint of left converted edge up slightly**, Fig. 26 and Fig. 27.

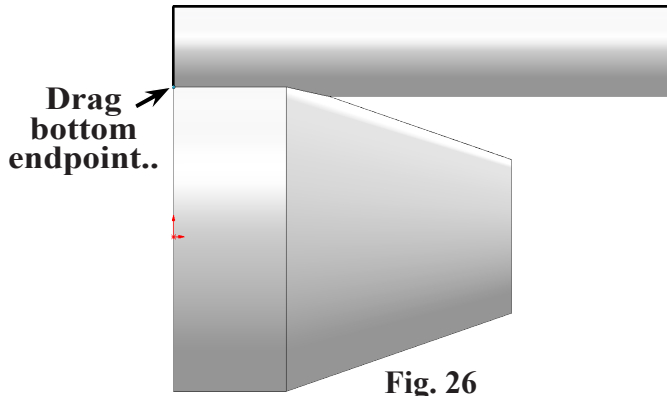


Fig. 26

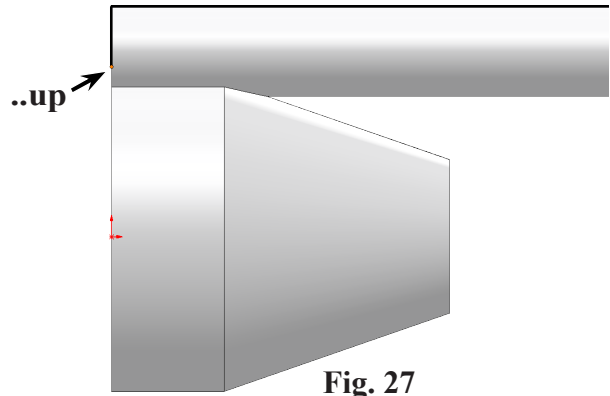


Fig. 27

Step 6. Click **Line**  (L) on the Sketch toolbar.

Step 7. Sketch **line from angled line up to horizontal converted line at both ends of arm**, Fig. 28. Double click to terminate the chain.

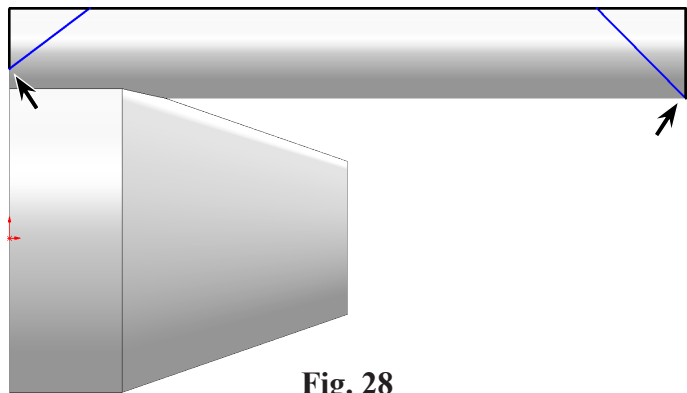





Fig. 28

Step 8. Click **Centerline**  in the **Line flyout**  on the Sketch toolbar.

Step 9. Sketch **horizontal centerline from Origin** , Fig. 29.

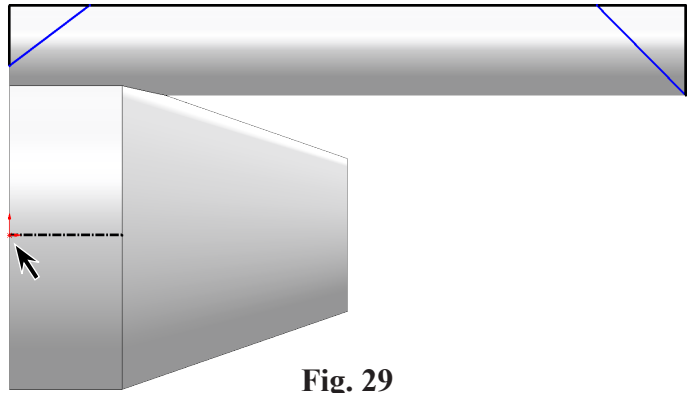



Fig. 29

Step 10. Click **Smart Dimension**  (S) on the Sketch toolbar.

Step 11. Add dimensions, Fig. 30.

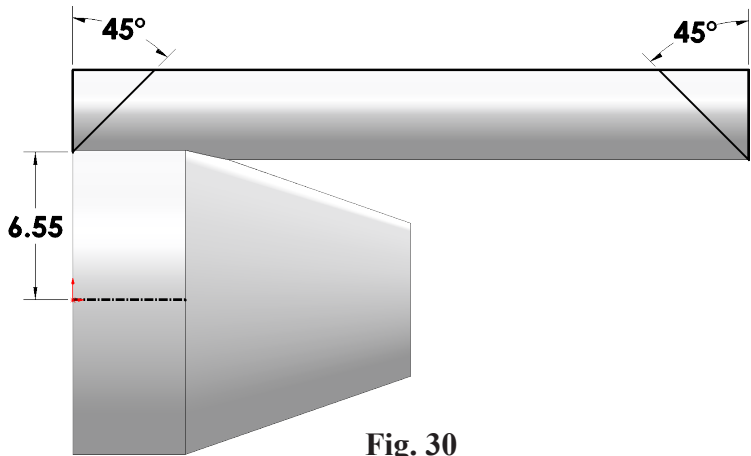





Fig. 30

Step 12. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

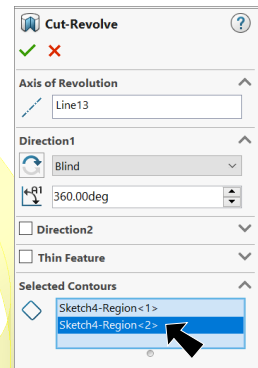
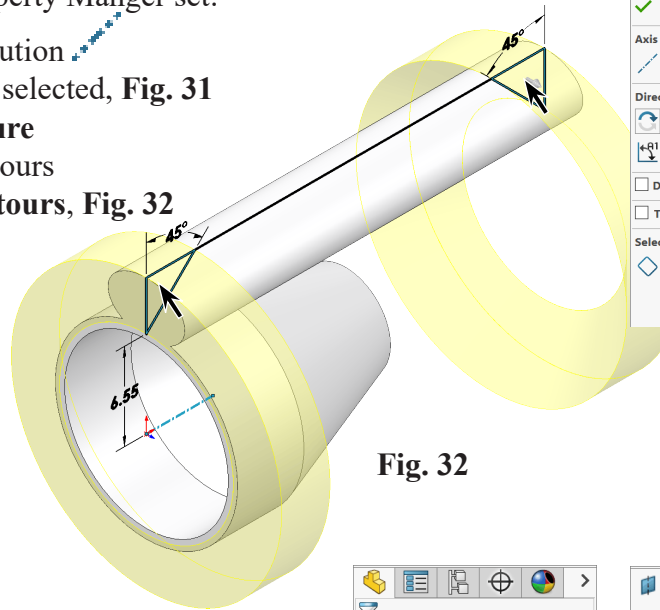
Step 13. Click **Features**  on the Command Manager toolbar.

Step 14. Click **Revolved Cut**  on the Features toolbar.

Step 15. In the Cut-Revolve Property Manger set:

- under Axis of Revolution  centerline will be selected, **Fig. 31**
- uncheck **Thin Feature**
- under Selected Contours click the **two contours**, **Fig. 32**
- click OK  .

Step 16. Save  (**Ctrl-S**).



**Fig. 31**

**Fig. 32**

## F. Create Plane.

Step 1. Click **Top Plane**  in the Feature Manager to display Plane is graphics area, **Fig. 33**.

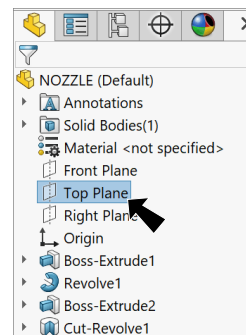
Step 2. In graphics area **Ctrl drag Top plane up** and release, **Fig. 34**.

Step 3. In the Plane Property Manager set:  
under First Reference, **Fig. 35**

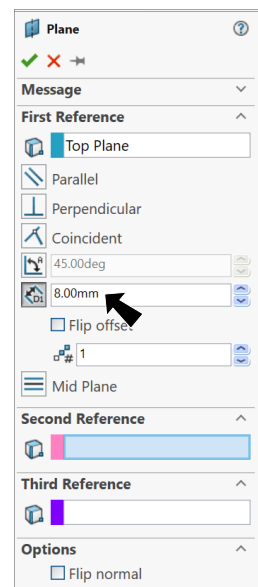
**Distance**  **8**  
and press **ENTER**.

The new plane should be above Top plane, **Fig. 34**.

Click OK  .



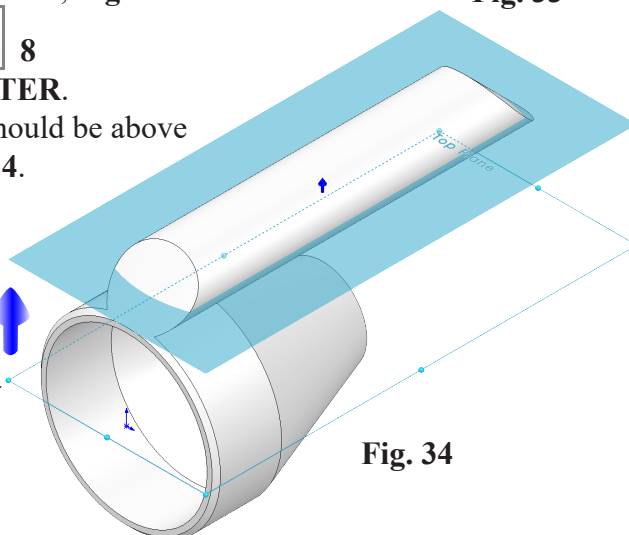
**Fig. 33**



**Fig. 35**




**Set distance 8** 

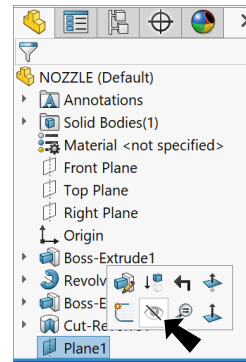
**Hold down Ctrl drag plane up** 





**Fig. 34**

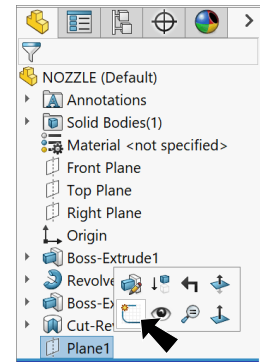
## G. Extrude2 Sketch5 Rudder Mount.

Step 1. **Hide Plane1** . To hide, click **Plane1**  in the graphics area and **Hide**  on the context toolbar, **Fig. 36**.



**Fig. 36**


Step 2. Click **Plane1**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 37**.

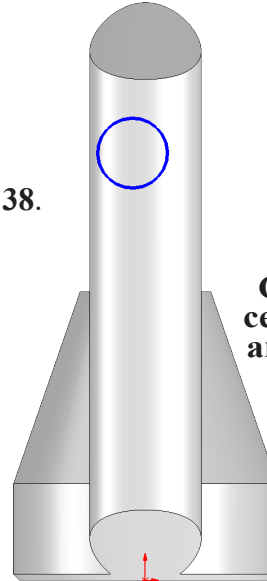


**Fig. 37**

Step 3. Click **Normal To**  on the Standard Views toolbar. (**Ctrl-8**)



Step 4. Click **Circle**  on the Sketch toolbar.

Step 5. Sketch a circle above the Origin , **Fig. 38**.

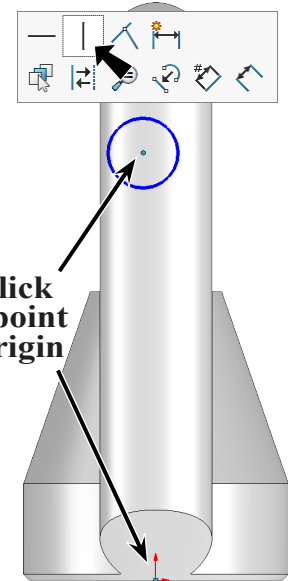


**Fig. 38**

Step 6. **Unselect Circle tool**. To unselect, **right click graphics area and click Select**  from menu.

Step 7. **Ctrl click centerpoint of circle and Origin**  to select both. Release Ctrl key and click **Make Vertical**  on the context toolbar, **Fig. 39**.

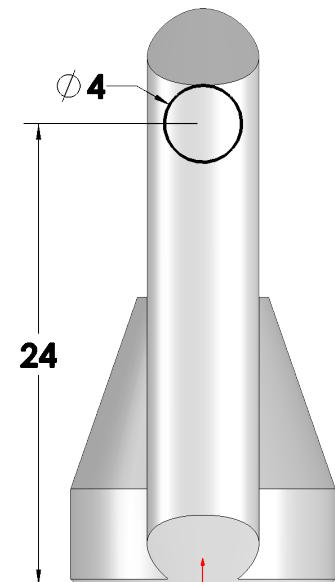
**Ctrl click centerpoint and Origin**



**Fig. 39**


Step 8. Click **Smart Dimension**  (S) on the Sketch toolbar.

Step 9. Add dimensions, **Fig. 40**.



**Fig. 40**



Step 10. Click **Isometric**  on the Standard Views toolbar. (Ctrl-7)

Step 11. Click **Features**  on the Command Manager toolbar.

Step 12. Click **Extruded Boss/Base**  on the Features toolbar.

Step 13. In the Boss-Extrude Property Manager set:

under Direction 1, **Fig. 41**

End Condition **Blind**

Depth  **3**

Reverse Direction 

click OK .

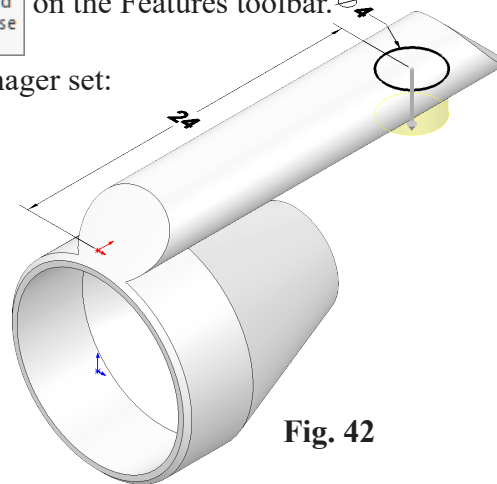


Fig. 42

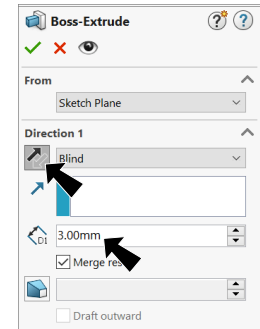


Fig. 41

Step 14. Save  (Ctrl-S).


## H. Cut Extrude Sketch6 Rudder Hole.

Step 1. Click **Plane1**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 43**.

Step 2. Click **Bottom**  on the Standard Views toolbar. (Ctrl-6)

Step 3. Click **Circle**  (S) on the Sketch toolbar.

Step 4. Sketch **circle at centerpoint of Boss**, **Fig. 44**. To wake up centerpoint, hover cursor over circular edge.

Step 5. Click **Smart Dimension**  (S) on the Sketch toolbar.

Step 6. Dimension **diameter 3**, **Fig. 45**.

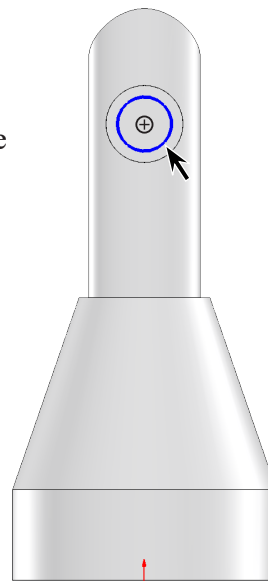


Fig. 44



Fig. 45

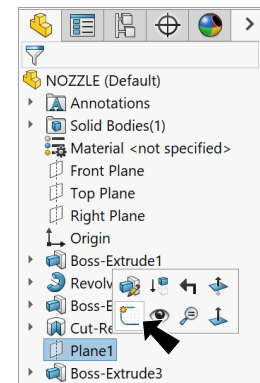




Fig. 43

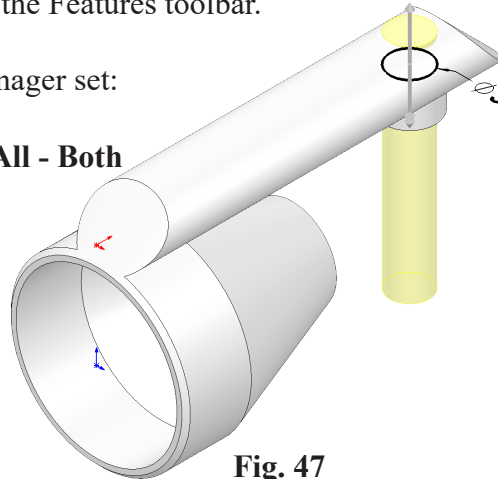
Step 7. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

Step 8. Click **Features**  on the Command Manager toolbar.

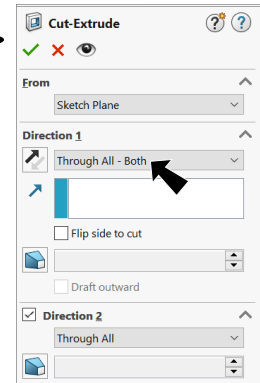
Step 9. Click **Extruded Cut**  on the Features toolbar.

Step 10. In the Cut-Extrude Property Manager set:  
under Direction 1, **Fig. 46**  
End Condition **Through All - Both**  
click OK .

Step 11. Save  (**Ctrl-S**).




**Fig. 47**



**Fig. 46**

## I. Chamfer 1.

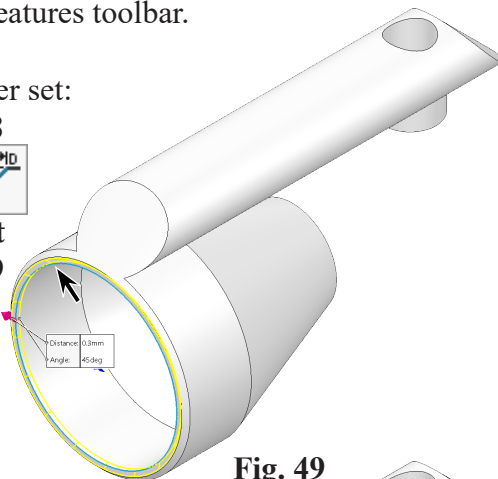
Step 1. Click **Chamfer**  on the Features toolbar.

Step 2. In the Chamfer Property Manager set:  
under Chamfer Type, **Fig. 48**  
select **Angle Distance**   
click **inside circular front edge of Extrude2**, **Fig. 49**  
under Chamfer Parameters

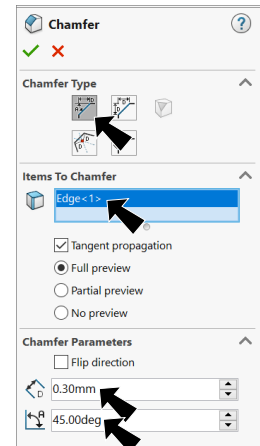
**Distance**  .3

**Angle**  45°

click OK .

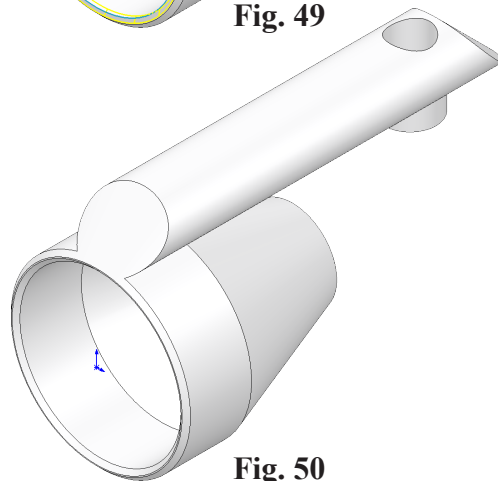


**Fig. 49**



**Fig. 48**

Step 3. Save  (**Ctrl-S**).



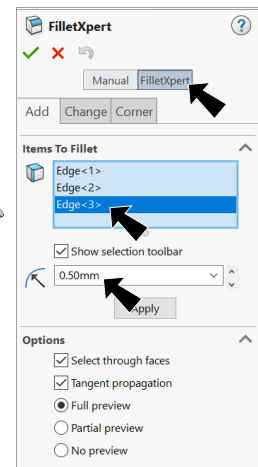
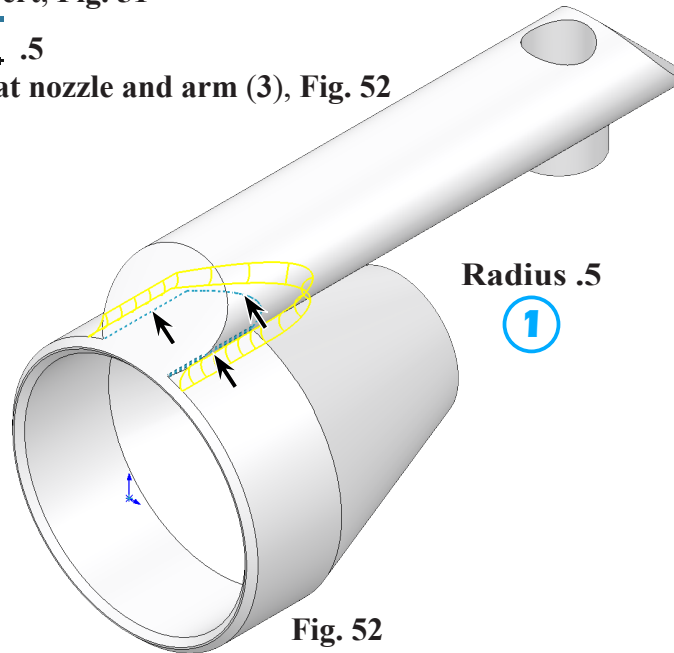
**Fig. 50**


## J. Fillets 1-4.

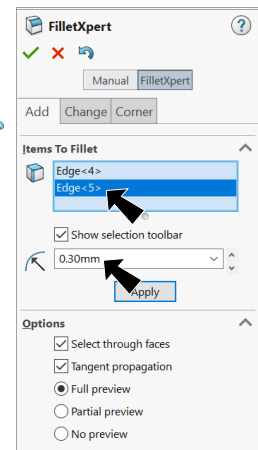
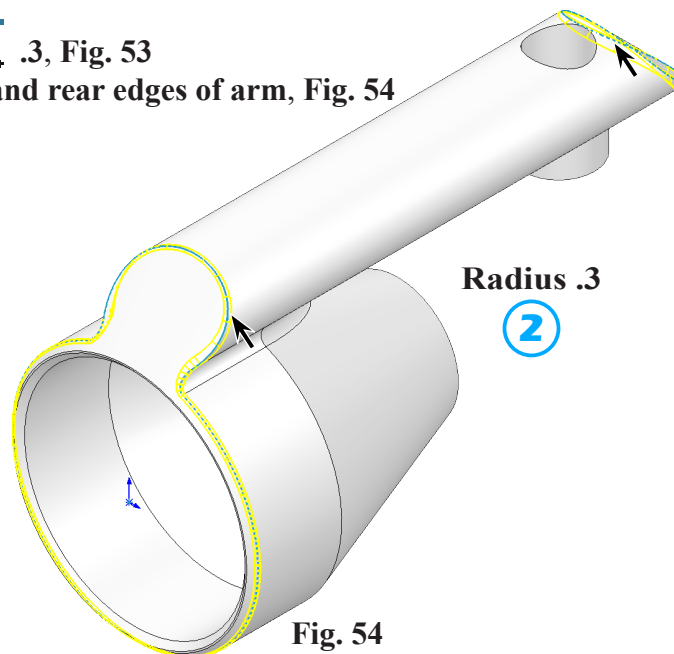
Step 1. Click **Fillet**  on the Features toolbar.

Step 2. In the Fillet Property Manager set:  
select **FilletXpert**, **Fig. 51**

- 1 Radius  .5  
click edges at nozzle and arm (3), **Fig. 52**  
click **Apply**



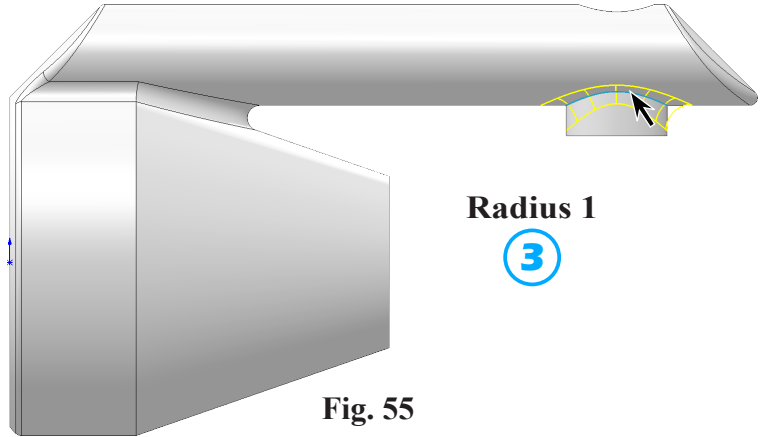
- 2 Radius  .3, **Fig. 53**  
click front and rear edges of arm, **Fig. 54**  
click **Apply**



Step 3. Click **Right**  on the Standard Views toolbar. (Ctrl-4)

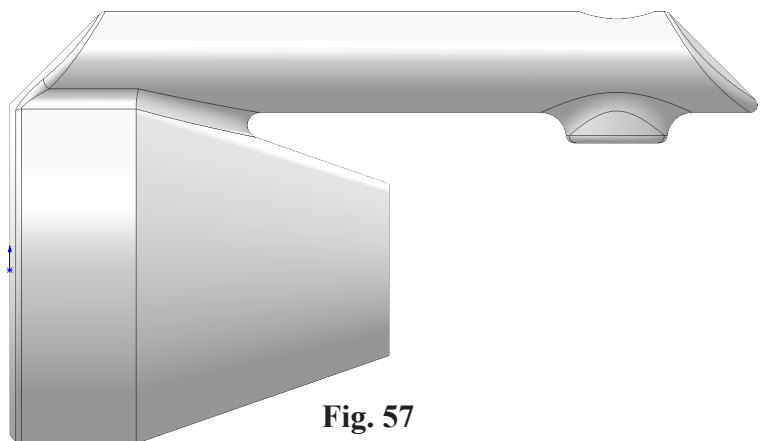
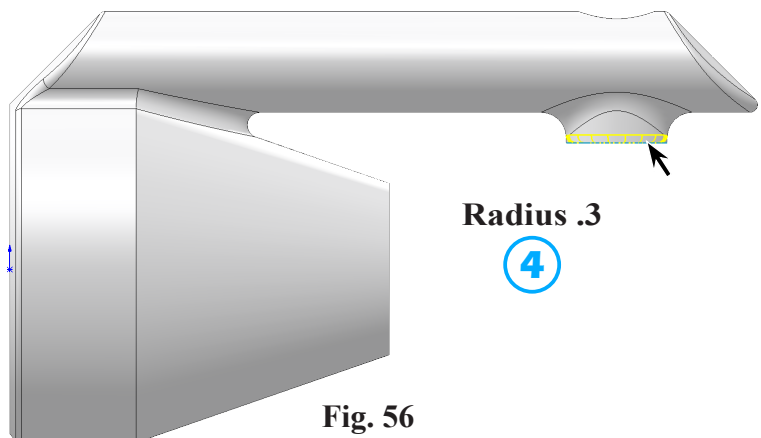
Step 4. Still in the Fillet Property Manager set:

- ③ **Radius**  **1**  
click edge at arm and rudder mount, Fig. 55  
click **Apply**





- ④ **Radius**  **.3**  
click bottom outside edge of rudder mount, Fig. 56  
click **OK** .


Step 5. Save  (Ctrl-S).



## K. Appearance: Blue.

Step 1. Click **Isometric**  on the Standard Views toolbar. (Ctrl-7)

Step 2. Click part, click **Appearance Callout**  on the context toolbar and click **NOZZLE** , Fig. 58.

Step 3. In Appearances Property Manager:  
under Color, Fig. 59  
set RGB values to:  
**R 174**  
**G 204**  
**B 235**  
click OK .

Step 4. Save  (Ctrl-S).

