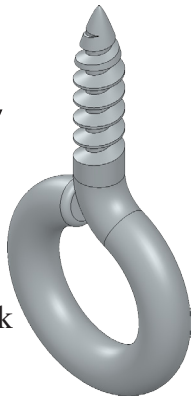
Chapter 10

CO2 Rail Car E
Eye Screw



A. Sweep Path Sketch.

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**.

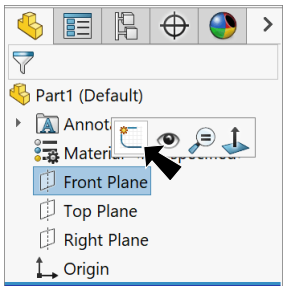


Fig. 1

Step 3. Click **Centerpoint Arc** **(S)** in the **Arc flyout** on the Sketch toolbar.

Step 4. Sketch a slightly open arc starting from the Origin, **Fig. 2**. To sketch the arc, click the Origin to place the center of the arc. Start the first arc endpoint directly above the Origin, then swing the arc to the right around counterclockwise. Click to place the second endpoint leaving a gap between endpoints.

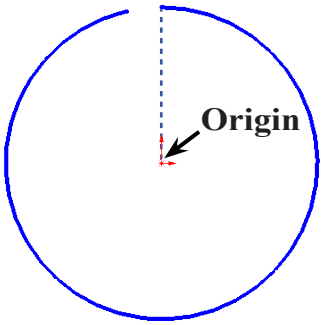


Fig. 2

Step 5. Click **Line** **(L)** on the Sketch toolbar.

Step 6. Sketch line up from arc endpoint that is directly above Origin, **Fig. 3**.

Step 7. Click **Smart Dimension** **(S)** on the Sketch toolbar.

Step 8. Add dimensions, **Fig. 4**. To dimension angle between the two arc endpoints, click Origin for vertex of angle and then click the two arc endpoints. Move the cursor and click to place dimension. Key in 13 and press ENTER.

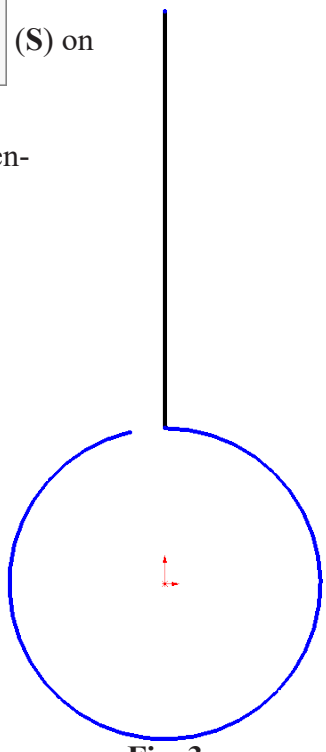


Fig. 3

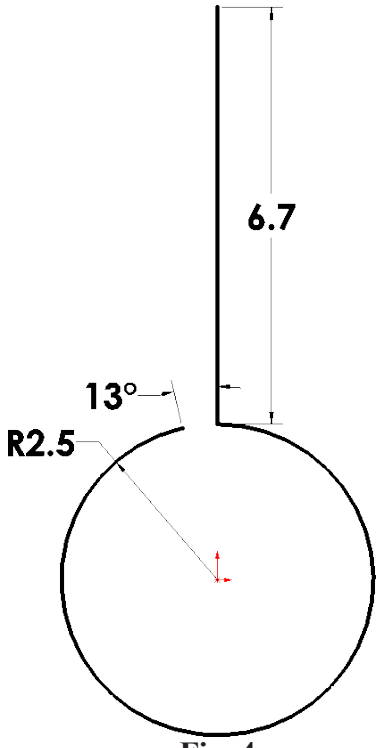


Fig. 4

Step 9. Click **Sketch Fillet** (**S**) on the Sketch toolbar.

Step 10. In the Sketch Fillet Property Manager set:
under Fillet Parameters, **Fig. 5**
Radius **1.5**
click intersection of line and arc, **Fig. 7**
click OK **twice**.

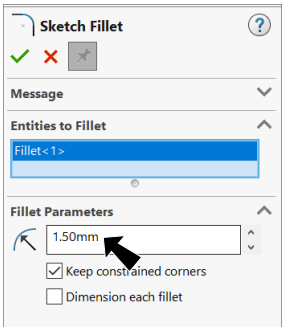


Fig. 5

B. Save as "EYE SCREW".

Step 1. Click File Menu > Save As.

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

C. Sweep.

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

Step 2. Click **Features** on the Command Manager toolbar.

Step 3. Click **Swept Boss/Base** on the Features toolbar.

Step 4. In the Swept Boss/Base Property Manager:
under Profile and Path, **Fig. 7**
select **Circular Profile**
Path click any geometry in Sketch1
Diameter **1.4**
click OK .

Step 5. Save (**Ctrl-S**).

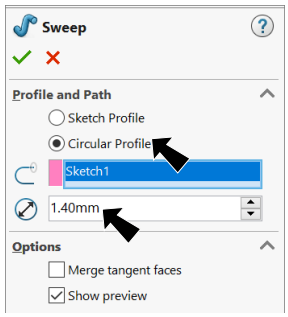


Fig. 7

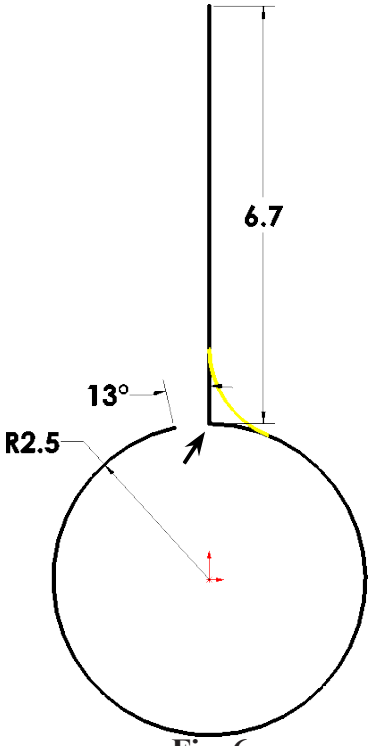


Fig. 6

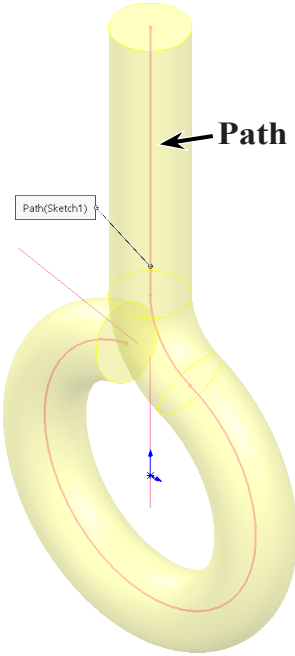


Fig. 8

D. Fillets.

Step 1. Click **Fillet** 

on the Features toolbar.

Step 2. In the Fillet Property Manager set:
select **FilletXpert**, **Fig. 9**
Radius .2
click **edge at bottom end of sweep**, **Fig. 10**
click **Apply**

Step 3. In the Fillet Property Manager,
select **Manual**, **Fig. 11**
under Fillet Type
select **Constant Size Fillet**
under Items To Fillet
click **top edge**, **Fig 12**
under Fillet Parameter
select **Asymmetric**
Distance 1 .69
Distance 2 2.1
Profile: **Conic Rho**
Ratio .15
click OK .

Step 4. Save (**Ctrl-S**).

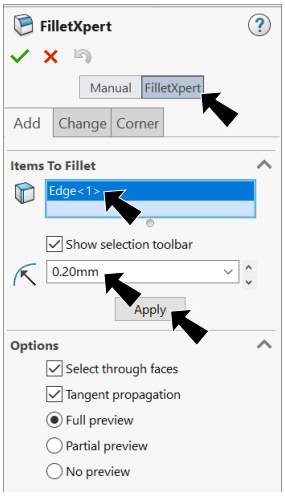


Fig. 9

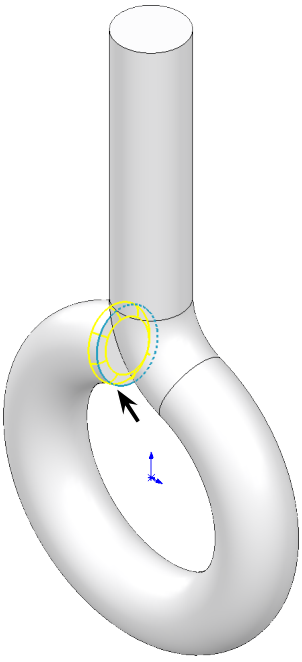


Fig. 10

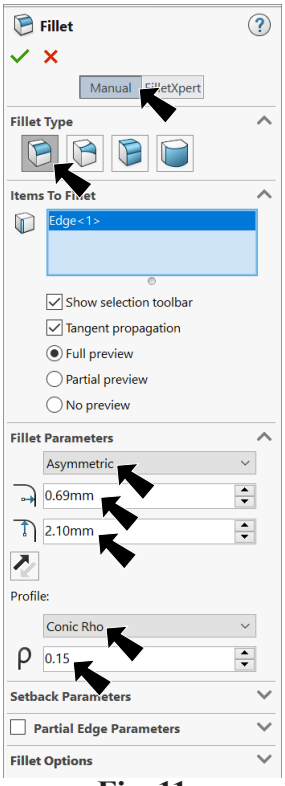


Fig. 11

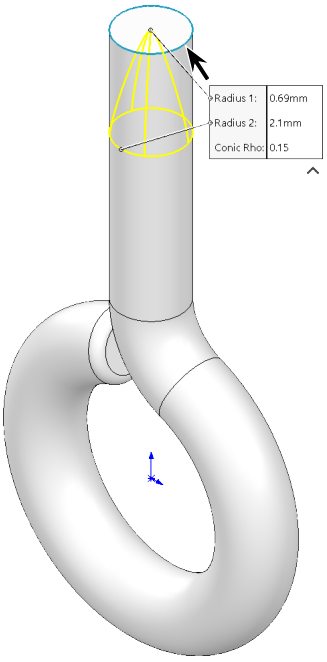


Fig. 12

E. Thread Wizard.

Step 1. Click **Thread**  in the **Hole Wizard flyout**  on the Features toolbar.

Step 2. In the Thread Property Manager set:

under Thread Location, **Fig. 13**

for Edge of Cylinder 

click **edge of sweep at sketch fillet**, **Fig. 14**

check **Offset**

Offset Distance .5

Start Angle  **180**

under End Condition

Depth  **5**

under Specification

Type **Inch die**

Size **#4 - 40**

click OK  .

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

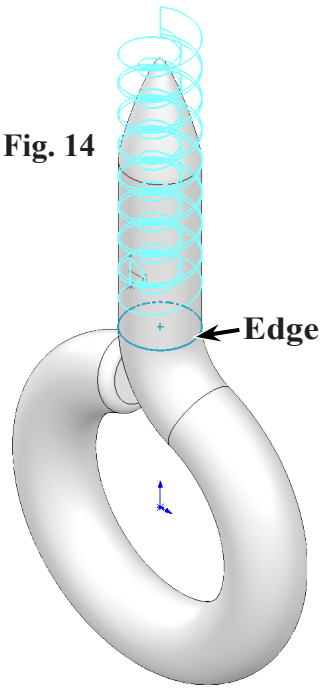


Fig. 14

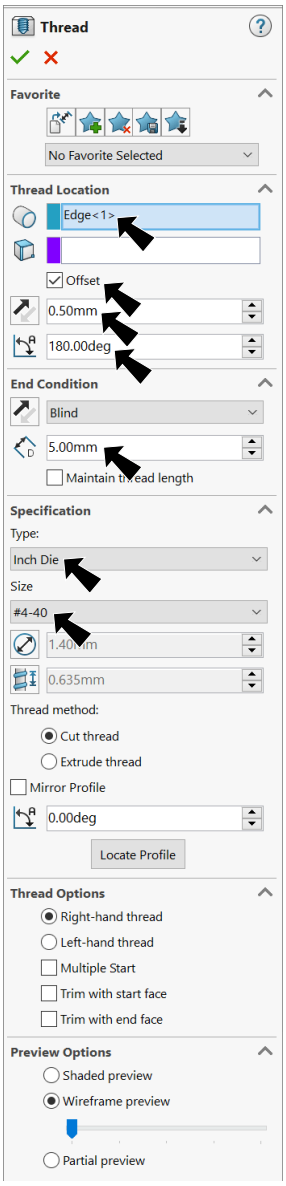


Fig. 13

F. Material Steel 304.

Step 1. **Right click Material**  in the Feature Manager and click **Edit Material**, **Fig. 15**.

Step 2. Expand **Steel** in the material tree and select **Chrome Stainless Steel**. Click **Apply** and **Close**.

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

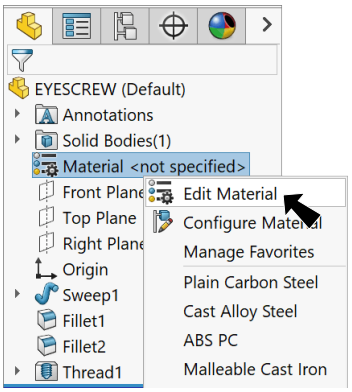


Fig. 15

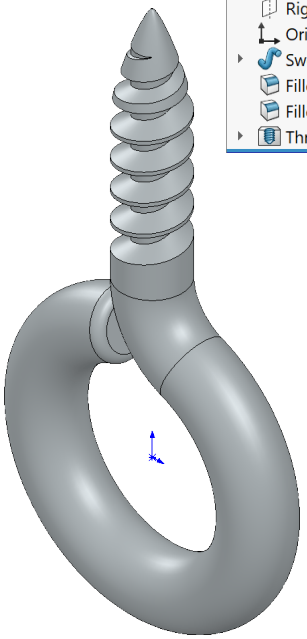


Fig. 16

G. Open Assembly File.

Step 1. Open your RAIL CAR E ASSEMBLY file.

Step 2. Click **BODY RAIL E** in the Feature Manager and click **Open Part** on the context toolbar, **Fig. 17**.

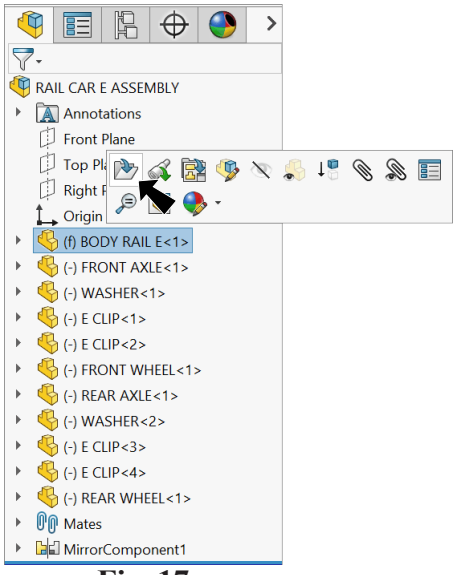


Fig. 17

H. Hole Wizard.

Step 1. Click **Bottom** on the Standard Views toolbar (**Ctrl-6**).

Step 2. Click **Hole Wizard** on the Features toolbar.

Step 3. In the Property Manager set:
under Hole Type, **Fig. 18**
click **Hole**
under Standard:
select **ANSI Metric**
under Type:
Drill sizes
under Size:
select **.9**
under End Condition
Blind
Blind Hole Depth 3

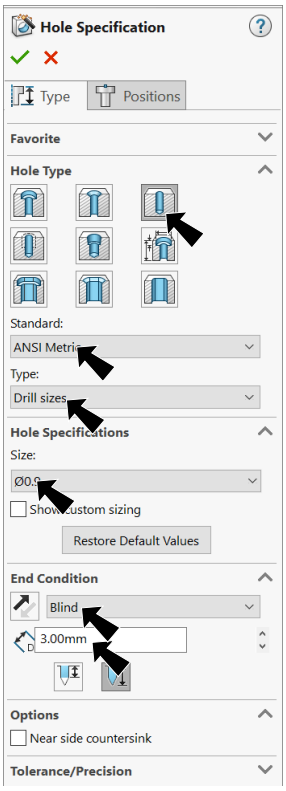


Fig. 18

Step 4. Click **Positions tab** Positions at top of Property Manager:
under Sketch Options, **Fig. 19**
uncheck **Create instances on sketch geometry**

Step 5. Expand the flyout Feature Manager design tree in the top left corner of the graphics area and click **Top Plane**, **Fig. 20**.

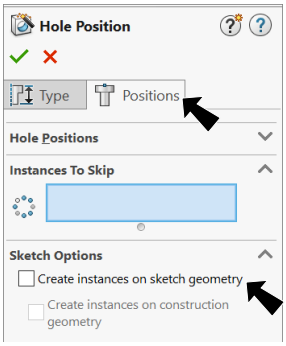


Fig. 19

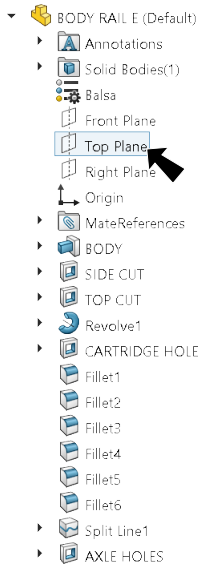


Fig. 20

Step 6. Click to place hole in the center of Body **forward of Front Axle** and click **forward of Rear Axle**, **Fig. 21**.

Step 7. **Unselect Point tool**. To unselect, **right click graphics area and click Select** from menu.

Step 8. **Ctrl click vertex at front of body and both Points**. Release Ctrl key and click **Make Vertical** on the context toolbar, **Fig. 22**.

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

Step 10 . Add dimensions, **Fig. 23**.

Step 11. Click OK in the Hole Wizard Property Manager.

Step 12. Click **Shaded With Edges** on the View toolbar.

Step 13. Save (**Ctrl-S**).

Fig. 21

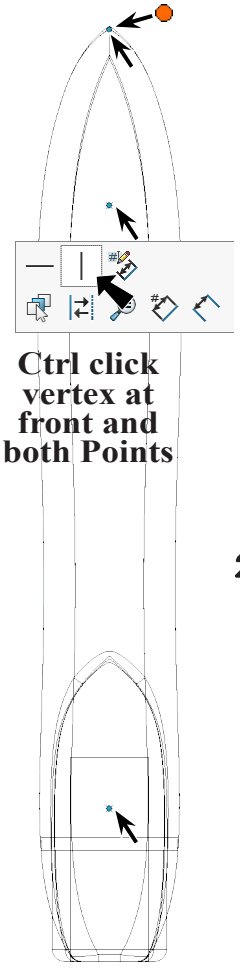


Fig. 22

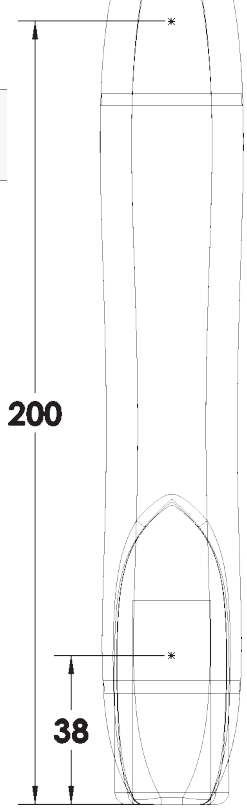


Fig. 23

I. Insert Eye Screws into Assembly.

Step 1. Switch back to the ASSEMBLY file. Use **Ctrl-Tab**.

Step 2. Rotate view to bottom side, click **Isometric** on the Standard Views toolbar (**Ctrl-7**), then **Shift click the Z axis of the Reference Triad** **twice** (bottom left corner of graphics area), **Fig. 24**.

Step 3. Click **Insert Components** on the Assembly toolbar.

Step 4. Click **Keep Visible** in the Property Manager.

Step 5. Click **Browse** in the Property Manager, select your **EYE SCREW** file and click Open.

Step 6. **Insert two Eye Screws**, **Fig. 24**. Click OK in the Property Manager when done.

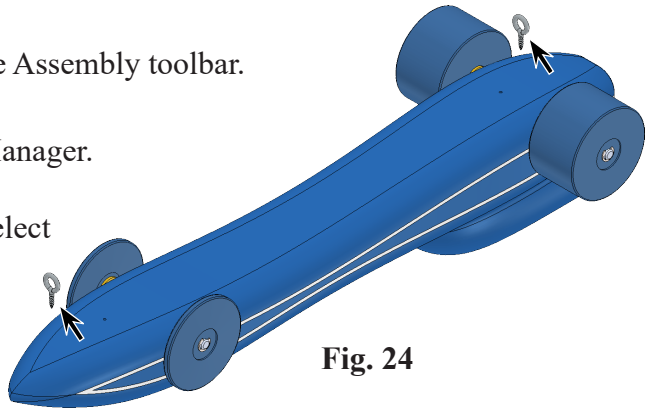


Fig. 24

J. Mate: Eye Screws and Body.

Step 1. Zoom in around **front Eye Screw and hole**, **Fig. 25**.

Step 2. Click **Mate** 

on the Assembly toolbar.

Step 3. Click **cylindrical face of the hole in Body** and **cylindrical face of Eye Screw**, **Fig. 26**.

Step 4. Check **Lock Rotation** and Add/Finish Mate  in Mate pop-up toolbar to add a **Concentric** mate, **Fig. 27**.

Fig. 27

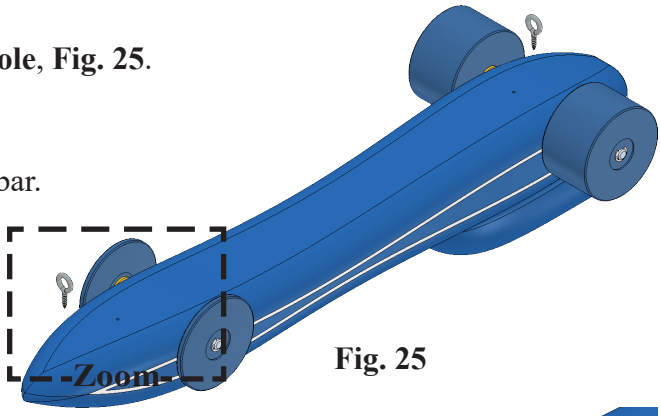


Fig. 25

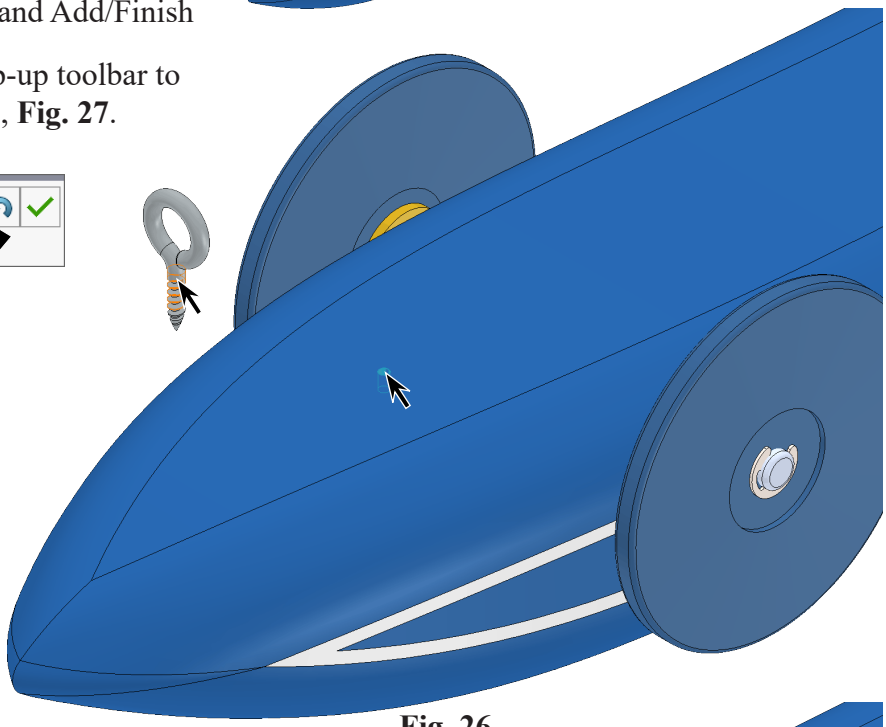


Fig. 26

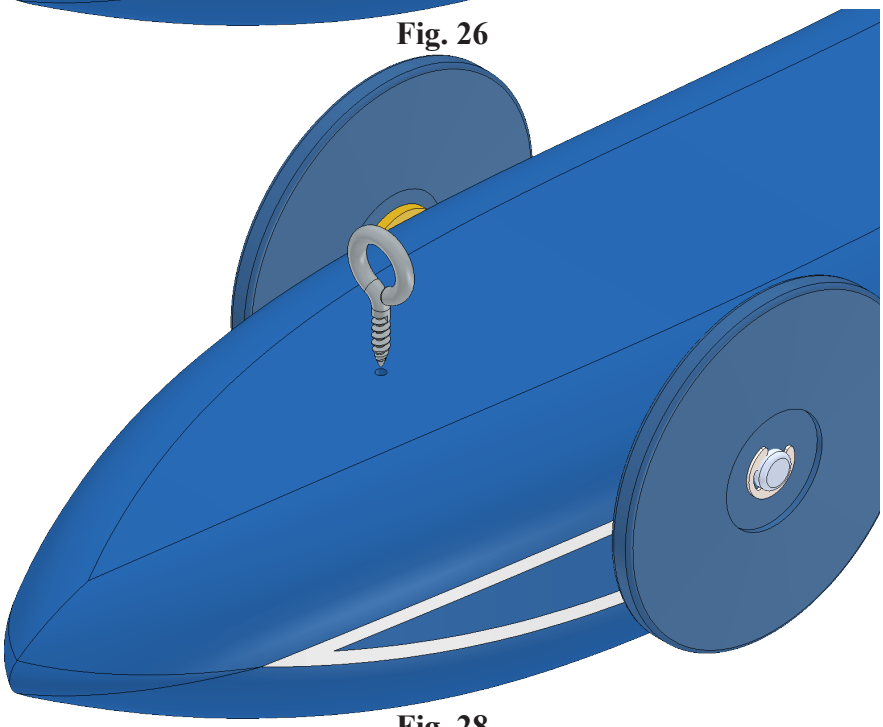


Fig. 28

Step 5. Expand the flyout Feature Manager design tree in the top left corner of the graphics area and click **Top Plane**, **Fig. 29**.

Step 6. Expand **EYE SCREW<1>** and click **Top Plane**, **Fig. 29**.

Step 7. Click **Distance** in Mate pop-up, **Fig. 30**. Set **distance 1.6** and press ENTER. The Eye Screw should sit into the Body, **Fig. 31**. If positioned in opposite direction, click **Flip Dimension** in the Mate pop-up. Click Add/Finish Mate to add Distance mate.

Fig. 30

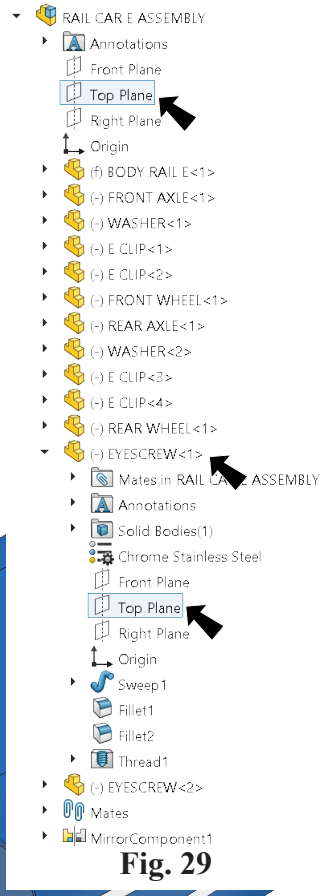


Fig. 29

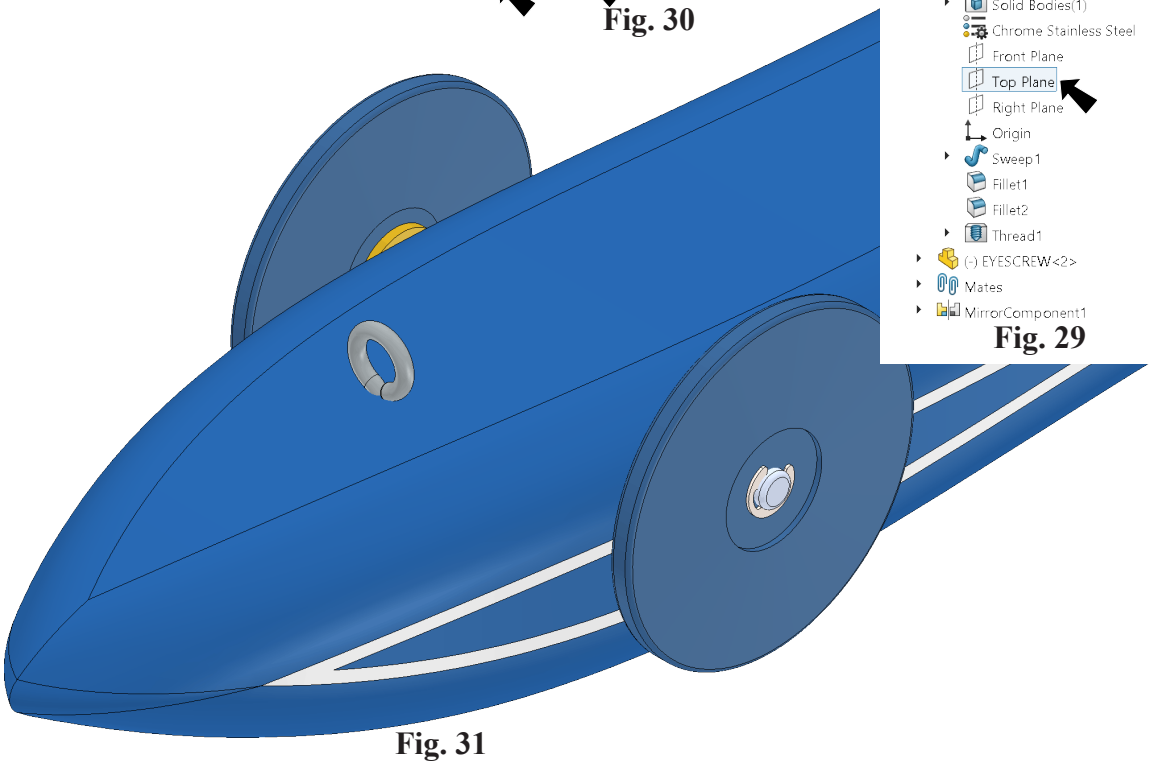


Fig. 31

Step 8. Use **Ctrl-Left Arrow key** and **Ctrl-Down Arrow key** to pan to rear Eye Screw, **Fig. 32**.

Step 9. Click **cylindrical inside face of the hole in Body** and **cylindrical face of Eye Screw<2>**, **Fig. 32**.

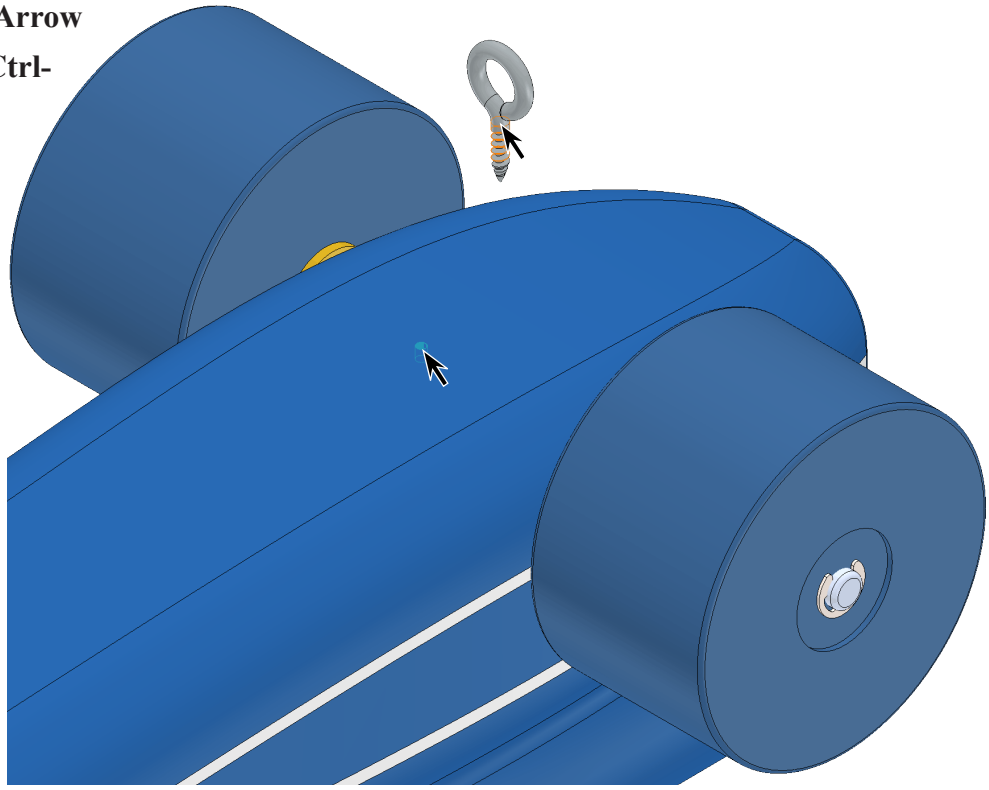


Fig. 32

Step 10. Click **Lock Rotation** and Add/Finish Mate in Mate pop-up toolbar to add a **Concentric** mate, **Fig. 33**.

Fig. 33

Fig. 34

Step 11. Expand the flyout Feature Manager design tree and click **Top Plane**, **Fig. 35**.

Step 12. Expand **EYE SCREW<2>** and click **Top Plane**, **Fig. 35**.

Step 13. Click **Distance** in Mate pop-up, **Fig. 36**. Set **distance 1** and press ENTER. The Eye Screw should sit into the Body, **Fig. 37**. If positioned in opposite direction, click **Flip Dimension** in the Mate pop-up. Click Add/Finish Mate to add Distance mate.

Step 14. Click OK in the Property Manager when done.

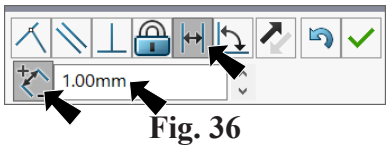


Fig. 36

Step 15. Save (**Ctrl-S**).

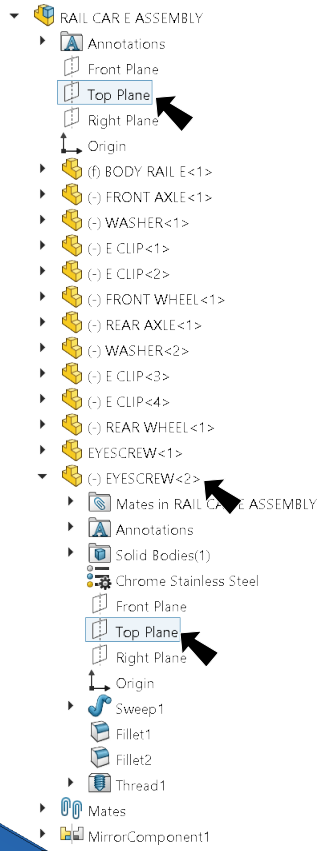


Fig. 35

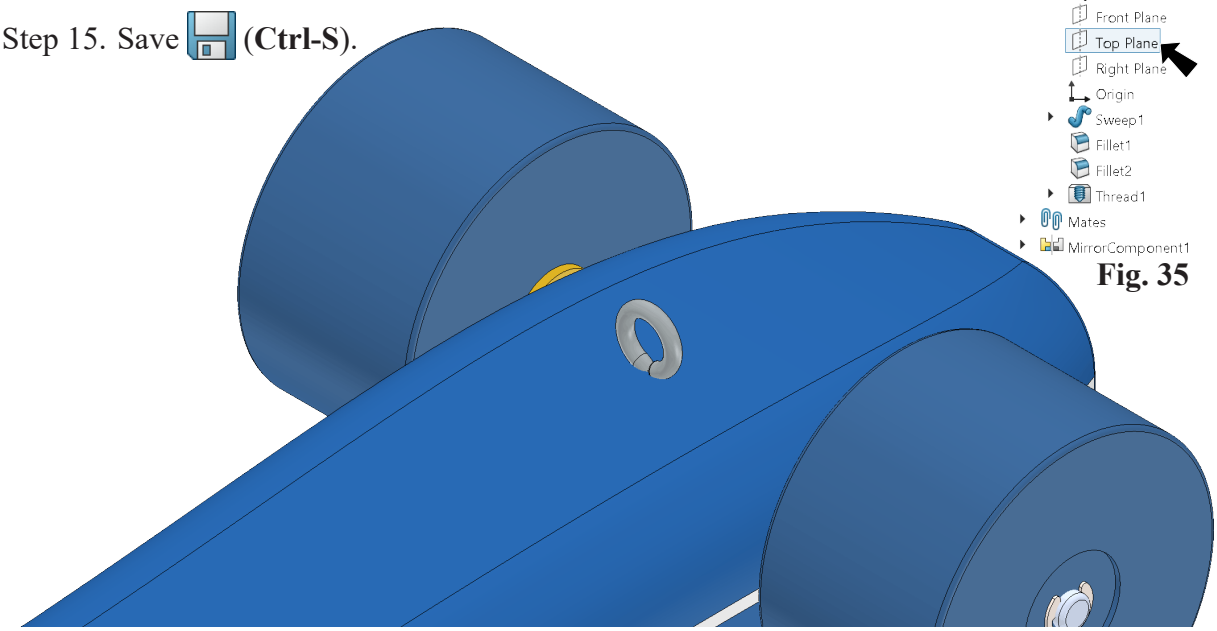


Fig. 37

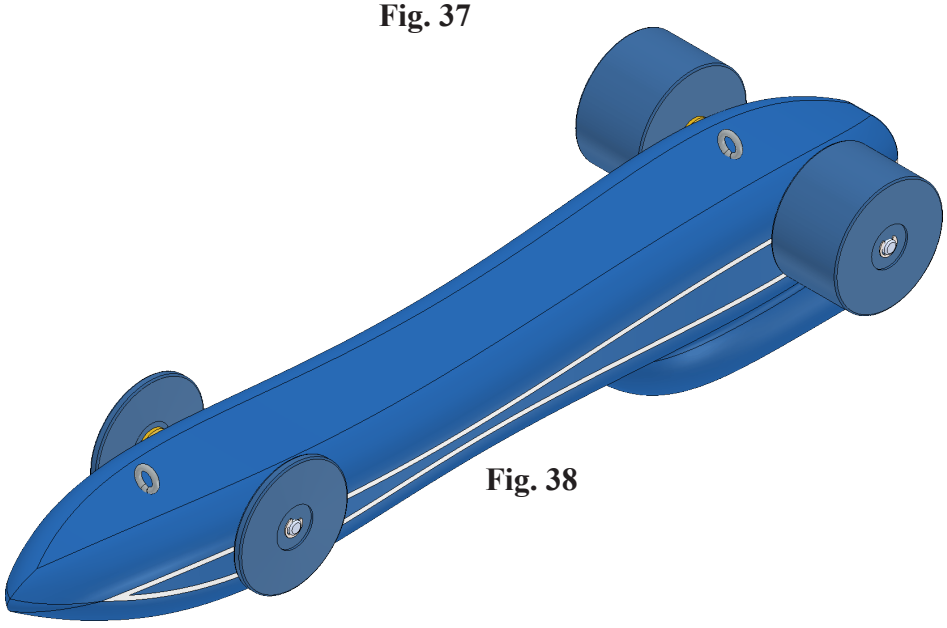


Fig. 38