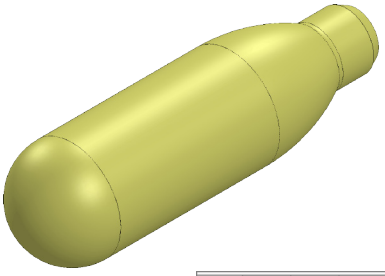
Chapter 16

CO2 Rail Car
Cartridge



A. Sketch Lines.

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

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

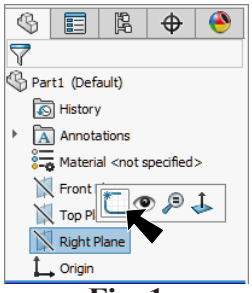


Fig. 1

Step 3. Click **Line** (**L**) on the Sketch toolbar.

Step 4. Draw **3 lines** starting at Origin, **Fig. 2**.

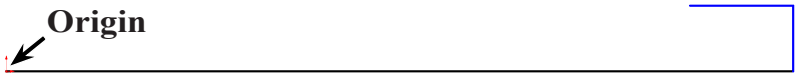


Fig. 2

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

Step 6. Add dimensions **Fig. 3**.

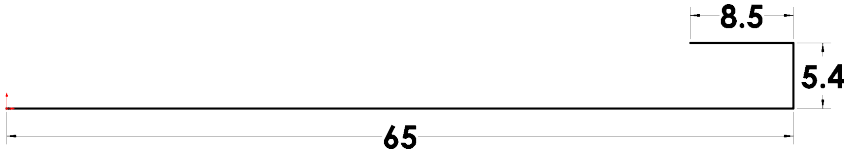


Fig. 3

B. Save as "CARTRIDGE".

Step 1. Click File Menu > Save As.

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

C. Centerpoint Arc.

Step 1. Confirm Snap Angle is turned on. To confirm, click Options on the Standard toolbar, on the System Options tab, select **Relations/Snaps** and **Angle** should be checked.

Step 2. Click **Centerpoint Arc** (**S**) in the **Arc flyout** on the Sketch toolbar.

Step 3. Click the bottom horizontal line close to the Origin to place the center of the arc. Click the Origin to start the first arc endpoint, then move cursor around clockwise to swing arc 90 degrees. Click to place the second endpoint, **Fig. 4**. Use the inferencing line, the dotted line that appears when you draw the arc 90 degrees.

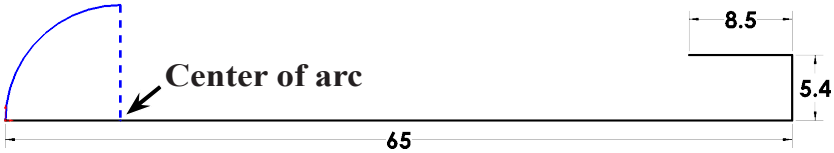


Fig. 4

D. Line.

Step 1. Click **Line** (**L**) on the Sketch toolbar.

Step 2. Starting from the end of the arc, draw a horizontal line across the sketch, **Fig. 5**. Use the automatic **horizontal relation**, cursor will change to yellow vertical horizontal tangent icon as you draw. Keep the line away from the short horizontal line.

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

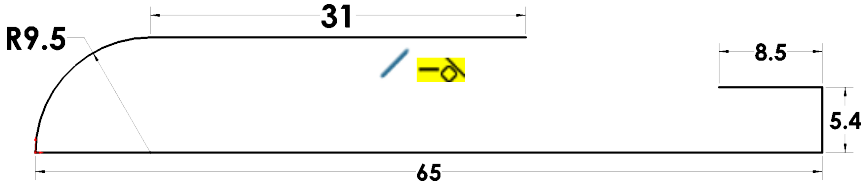


Fig. 5

Step 4. Dimension line and arc, **Fig. 5**.

Step 5. Save. Use **Ctrl-S**.

E. Tangent Arc.

Step 1. Click **Tangent Arc** in the **Arc flyout** on the Sketch toolbar.

Step 2. Draw an arc between endpoints of lines, **Fig. 6**.

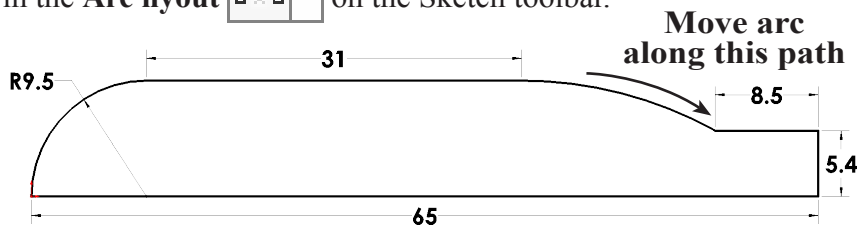


Fig. 6

F. Sketch Fillet.

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

Step 2. In the Sketch Fillet Property Manager set:
under Fillet Parameters, **Fig. 7**

Radius **2**
click corner, **Fig. 8**
click OK **twice**.

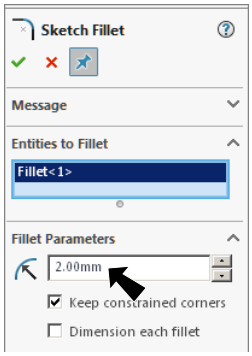


Fig. 7

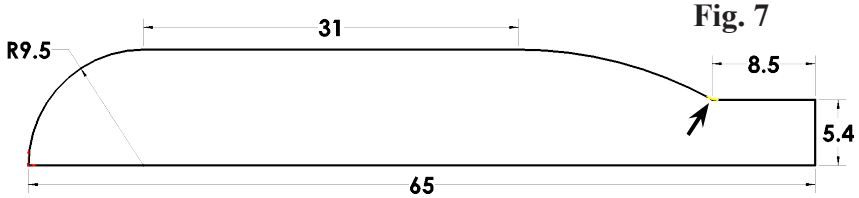


Fig. 8

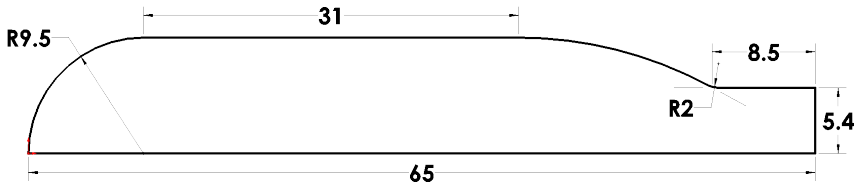


Fig. 9

G. Revolve.

Step 1. Click **Features** Features on the Command Manager toolbar.

Step 2. Click **Revolved Boss/Base** Revolved Boss/Base on the Features toolbar.

Step 3. In the Revolve Property Manger,

under Axis of Revolution click **bottom line of sketch**, **Fig. 11**

click OK ✔.

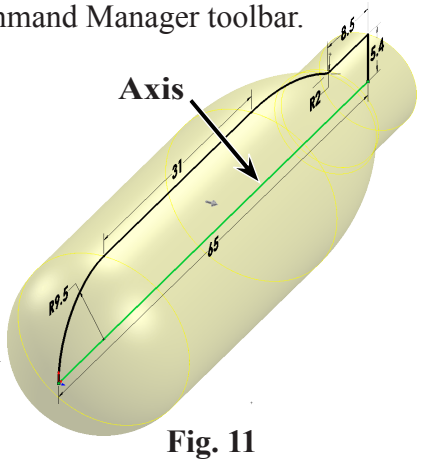


Fig. 11

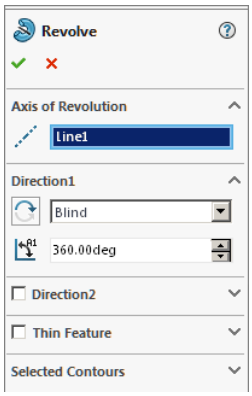


Fig. 10

H. Chamfer.

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

Step 2. In the Chamfer Property Manager set:

under Chamfer Parameters, **Fig. 12**

select **Distance distance**

Depth 1 D1 **1**

Depth 2 D2 **2**

click **end edge**, **Fig. 13**

click OK ✔.

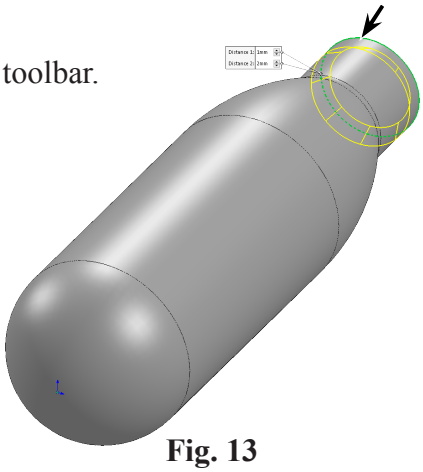


Fig. 13

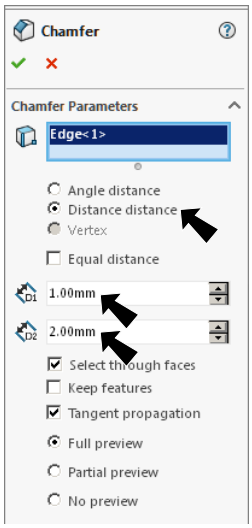


Fig. 12

Step 3. Save. Use **Ctrl-S**.

I. Shell.

Step 1. Click **Wireframe** on the View toolbar.

Step 2. Click **Shell** Shell on the Features toolbar.

Step 3. In the Shell Property Manager:

under Parameters**, Fig. 14**

Distance D1 **1.25**

click OK ✔.

The Shell shells out inside of cartridge.

Step 4. Click **Shaded With Edges** on the View toolbar.

Step 5. Save. Use **Ctrl-S**.

Before shell

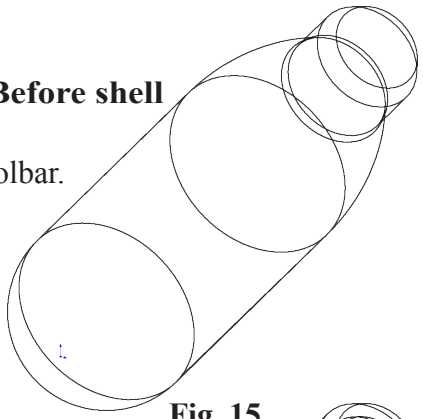


Fig. 15

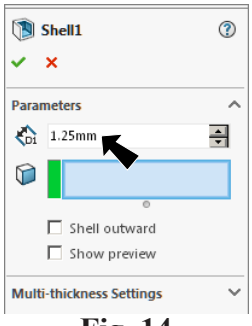


Fig. 14

After shell

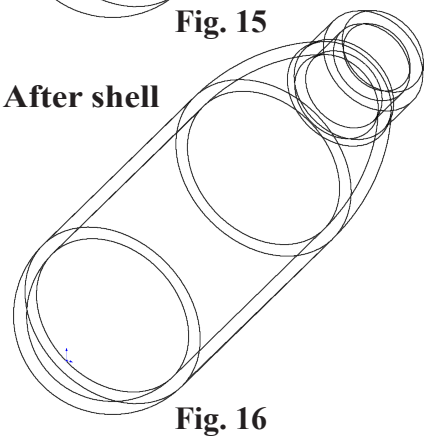


Fig. 16

J. Material Steel 304.

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

Step 2. Expand **Steel** in the material tree and select **Steel AISI 304**. Click **Apply** and **Close**.

K. Appearance Color.

Step 1. Click the part, expand **Appearance Callout** on the context toolbar and click **CARTRIDGE**, **Fig. 17**.

Step 2. In the Appearances Property Manager
under Color, **Fig. 18**
click **second from top Yellow** swatch
click OK .

Step 3. Save. Use **Ctrl-S**.

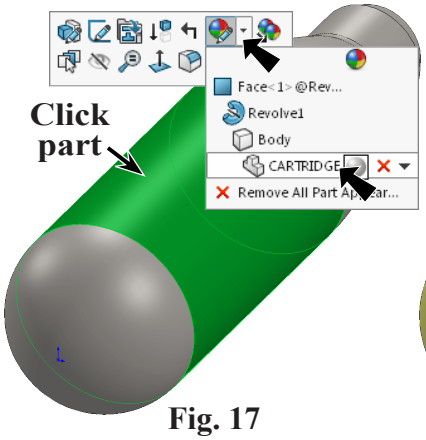


Fig. 17

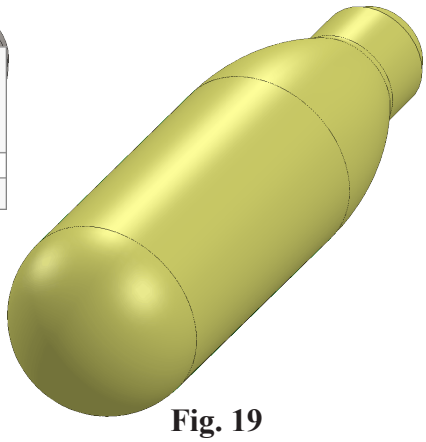


Fig. 19

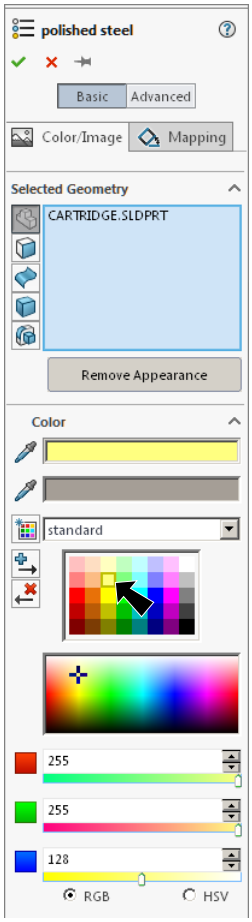


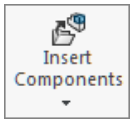
Fig. 18

L. Insert Cartridge in Assembly.

Step 1. Open your **RAIL CAR ASSEMBLY** file.

Step 2. Rotate view to view **bottom of cartridge hole in Body**, hold down middle mouse button (wheel) and drag to rotate view, **Fig. 20**.

Step 3. Click **Insert Components**



on the Assembly toolbar.

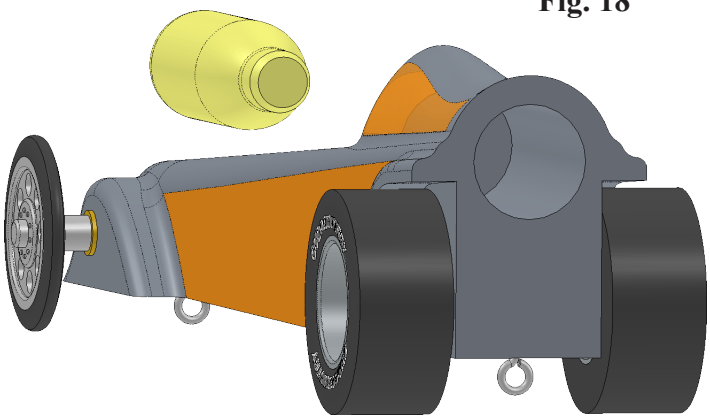


Fig. 20

Step 4. Click **Browse** in the Property Manager, select your **CARTRIDGE** file and place approximately where the cartridge is positioned in **Fig. 20**.

M. Mate: Cartridge and Body.

Step 1. Click **Mate** 

on the Assembly toolbar.

Step 2. Click **cylindrical face of cartridge hole** and **cylindrical face of cartridge**, **Fig. 21**.

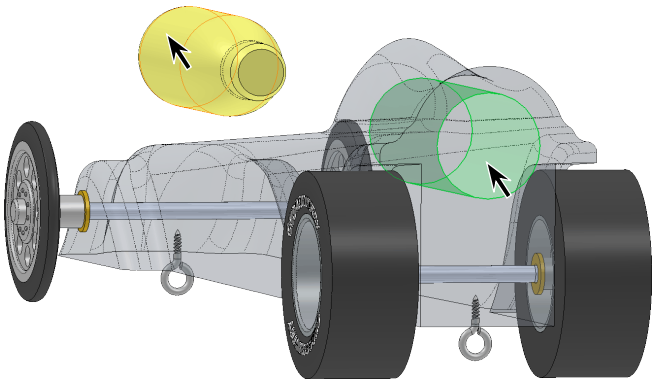


Fig. 21

Step 3. Click Add/Finish Mate  in Mate pop-up toolbar to add a **Concentric** mate.

Step 4. Click **bottom face of cartridge hole**, **Fig. 22**.

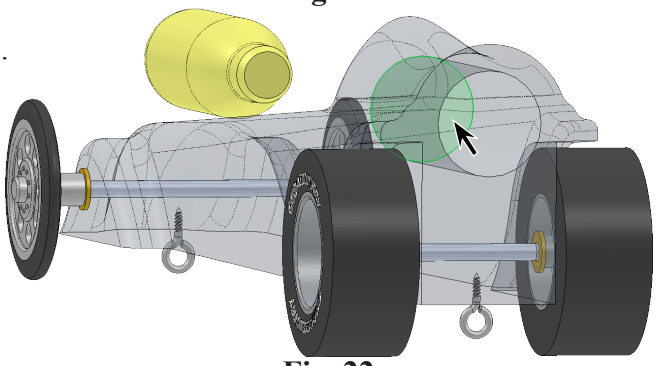


Fig. 22

Step 5. Rotate view to view **bottom of cartridge**, **Fig. 23**.

Step 6. Click **bottom face of cartridge**, **Fig. 23**.

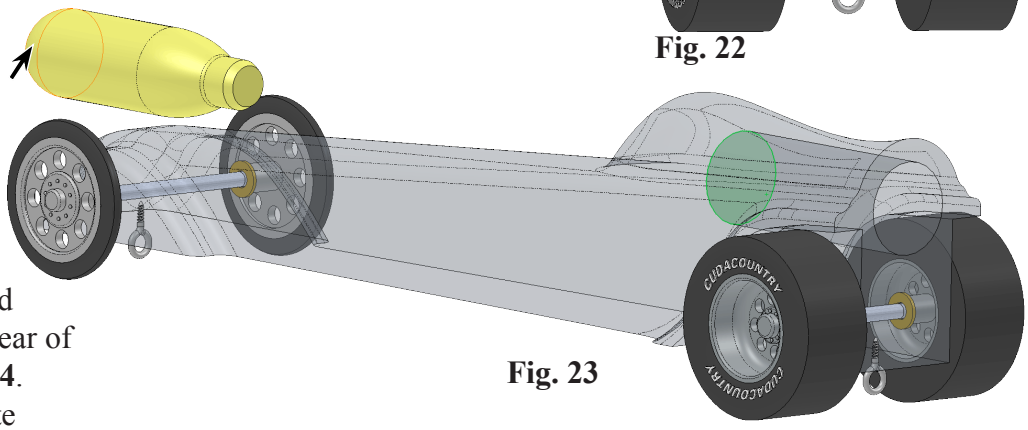


Fig. 23

Step 7. The cartridge should extend out rear of body, **Fig. 24**. If in opposite direction, click **Flip Mate Alignment**  in the Mate pop-up, **Fig. 25**.

Fig. 25

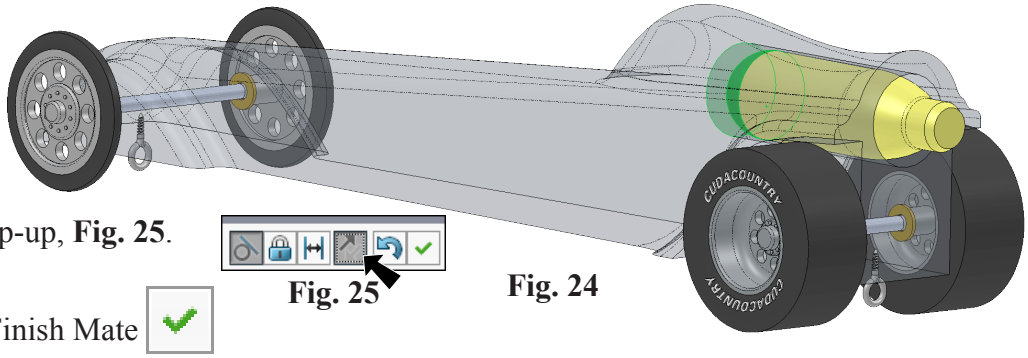


Fig. 24

Step 8. Click Add/Finish Mate  in Mate pop-up toolbar to add a **Tangent** mate.

Step 9. Click OK  in the Property Manager when done and Save. Use **Ctrl-S**.

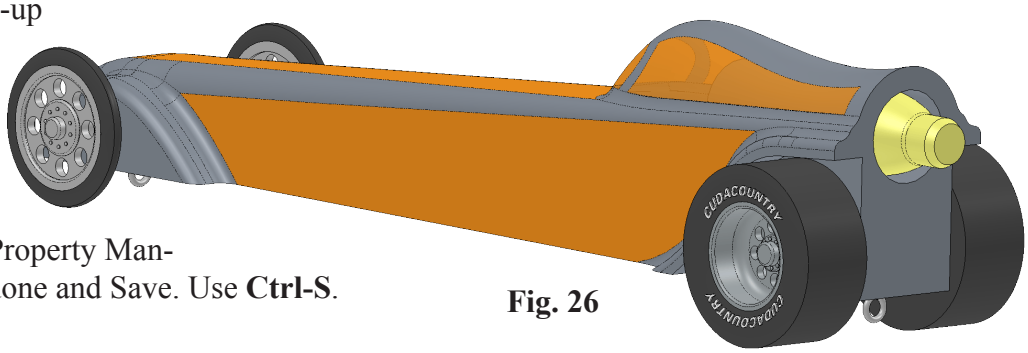


Fig. 26