Chapter 3

CO2 Rail Car
Front Rim Lx

A. Sketch Construction Lines.

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**.

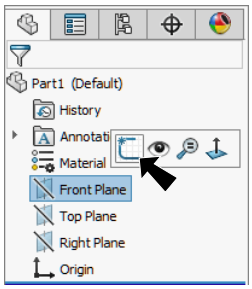


Fig. 1

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

Step 4. Starting at the Origin, sketch a vertical centerline up from the Origin and a construction line out to the left from the top endpoint of centerline, **Fig. 2**. Use the inferencing line, the dotted line that appears when you sketch.

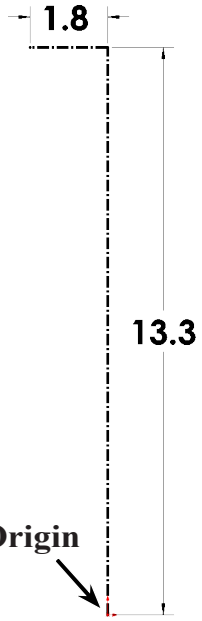


Fig. 2

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

Step 6. Dimension the centerline **13.3** and horizontal construction line **1.8**, **Fig. 2**.

B. Save as "FRONT RIM LX".

Step 1. Click File Menu > Save As.

Step 2. Key-in **FRONT RIM LX** for the filename and press ENTER.

C. Sketch Lines.

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

Step 2. Sketch the **three lines**, **Fig. 3**.

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

Step 4. Add dimensions, **Fig. 4**.

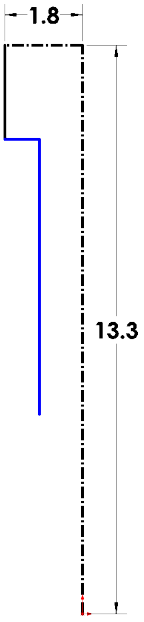


Fig. 3

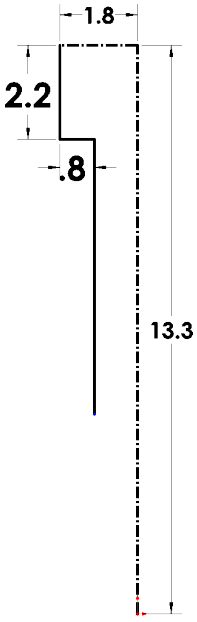


Fig. 4

D. Mirror Sketch.

Step 1. **Right click graphics area and click Select** from menu to unselect Smart Dimension.

Step 2. **Ctrl click short vertical line, short horizontal line and centerline**, **Fig. 5**.

Step 3. Click **Mirror Entities** 

on the Sketch toolbar, **Fig. 6**.

E. 3 Point Arc.

Step 1. Click **3 Point Arc**  **(S)** in the **Arc flyout**  on the Sketch toolbar.

Step 2. Sketch an arc between the Position 1, Position 2 and Position 3 in **Fig. 7**. To sketch the arc, first click Position 1, then Position 2. Swing the arc down to Position 3 and click.

Step 3. Click **Smart Dimension** 

(S) on the Sketch toolbar.

Step 4. Dimension arc **5**, **Fig. 8**.

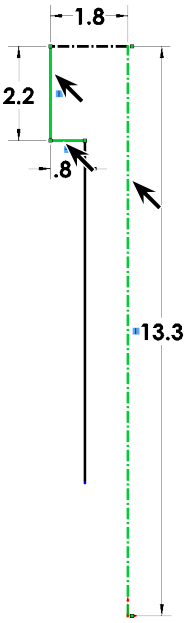


Fig. 5

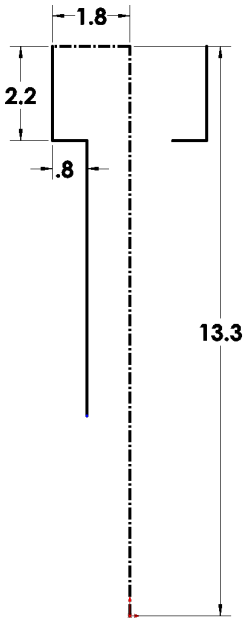


Fig. 6

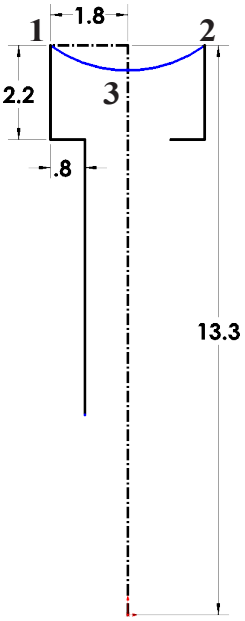


Fig. 7

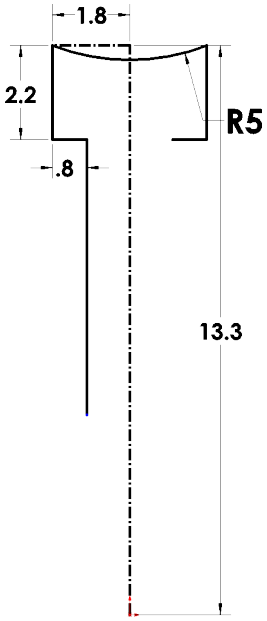


Fig. 8

F. Lines Inside Rim.

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

Step 2. Sketch the **three lines**,**Fig. 9**.

Step 3. Click **Smart Dimension** 

(**S**) on the Sketch toolbar.

Step 4. Add dimensions, **Fig. 10**.

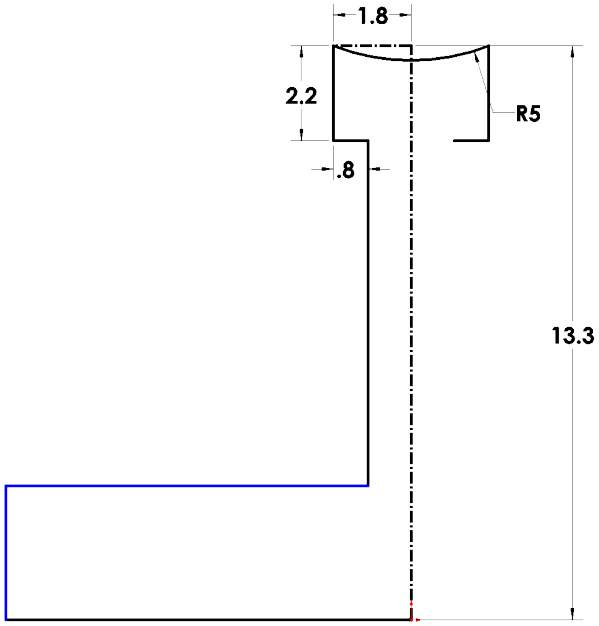


Fig. 9

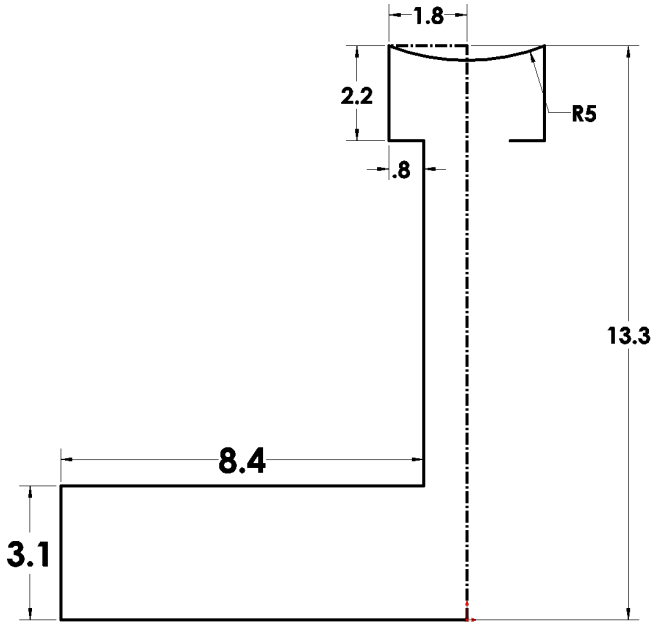


Fig. 10

G. Lines Outside Rim.

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

Step 2. Sketch the **6 lines**, **Fig. 11**.

Step 3. Click **Smart Dimension** 

(S) on the Sketch toolbar.

Step 4. Add dimensions, **Fig. 12**.

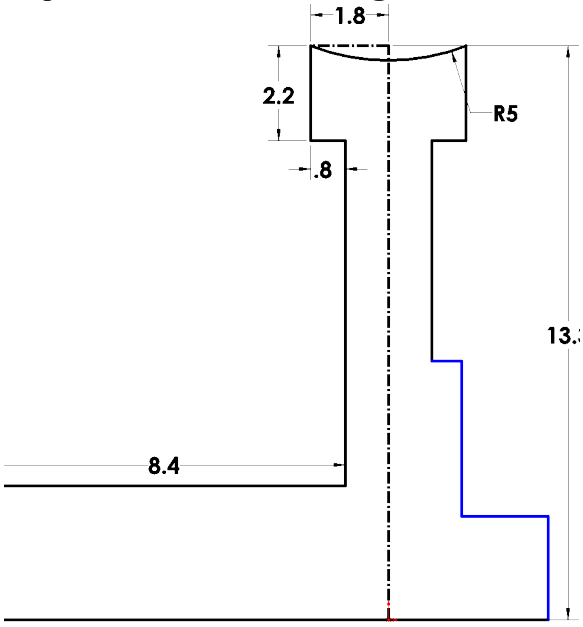


Fig. 11

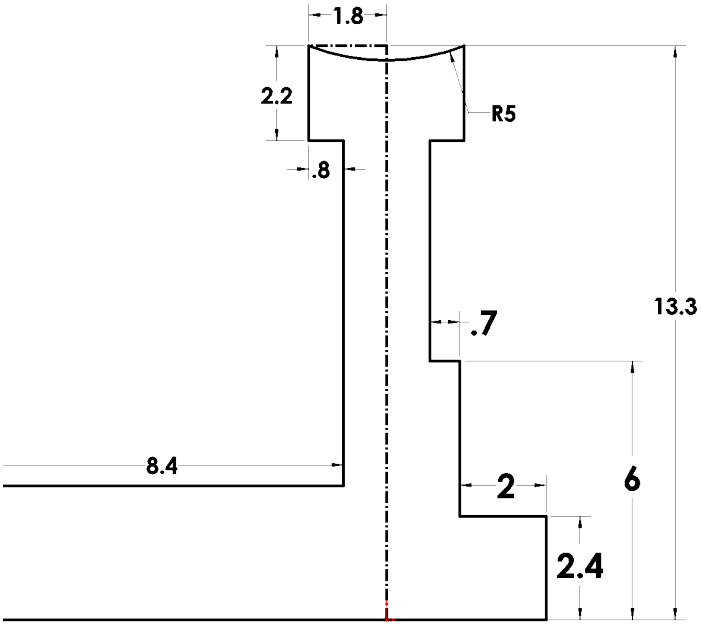


Fig. 12

H. Revolved Boss/Base.

Step 1. Click **Features** 

on the Command Manager toolbar.

Step 2. Click **Revolved Boss/Base** 

on the Features toolbar.

Step 3. In the Revolve Property Manger:

under Axis of Revolution  , **Fig. 13**
click **bottom line of sketch**, **Fig. 14**.
Your bottom line of sketch does not have to show in Property Manager as Line11.

Click OK  .

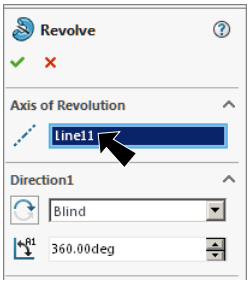


Fig. 13

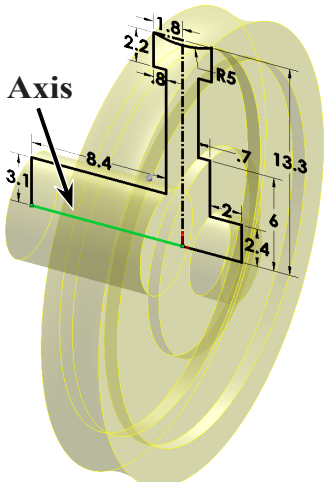


Fig. 14

Step 4. Click Zoom to Fit  **(F)** on the View toolbar.

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

I. Hole for Axle.

Step 1. Rotate view slightly to view **inside of rim**, hold down middle mouse button (wheel) and drag to rotate view, **Fig. 15**.

Step 2. Click **inside face of hub** and click **Sketch**  on the context toolbar, **Fig. 15**.

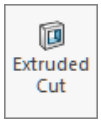
Step 3. Click **Circle**  **(S)** on the Sketch toolbar.

Step 4. Sketch a circle for hole starting at the Origin  , **Fig. 16**.

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

Step 6. Dimension **diameter 3.5**, **Fig. 16**.

Step 7. Click **Features**  on the Command Manager toolbar.

Step 8. Click **Extruded Cut**  on the Features toolbar.

Step 9. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 17**
Depth  **9**
click OK  .

Step 10. Save. Use **Ctrl-S**.

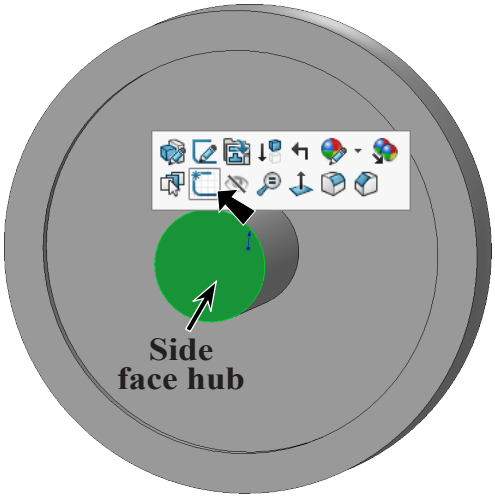


Fig. 15

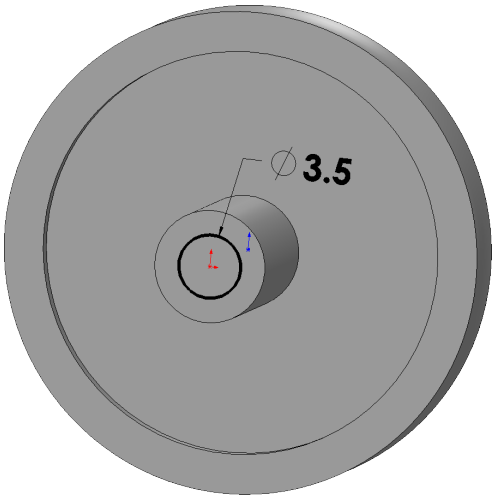


Fig. 16

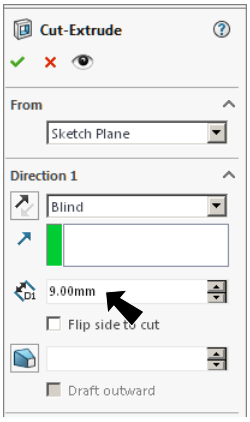


Fig. 17

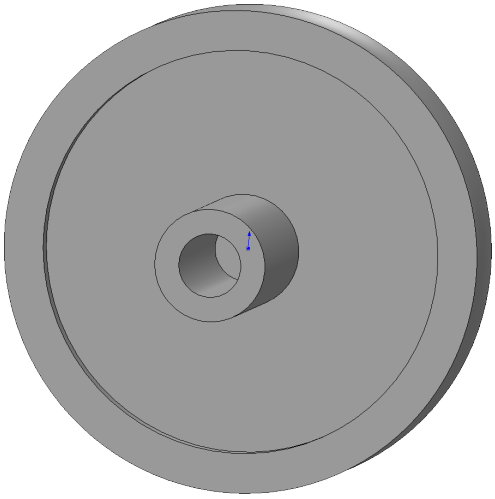


Fig. 18

J. Hole in Rim.

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

Step 2. Click **side face of rim** and click **Sketch** on the context toolbar, **Fig. 19**.

Step 3. Click **Normal To** on the Standard Views toolbar.

Step 4. Click **Circle** (**S**) on the Sketch toolbar.

Step 5. Sketch a circle for the hole above the Origin , **Fig. 20**.

Step 6. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 7. Add dimensions, **Fig. 20**.

Step 8. **Right click graphics area and click Select** from menu to unselect Smart Dimension.

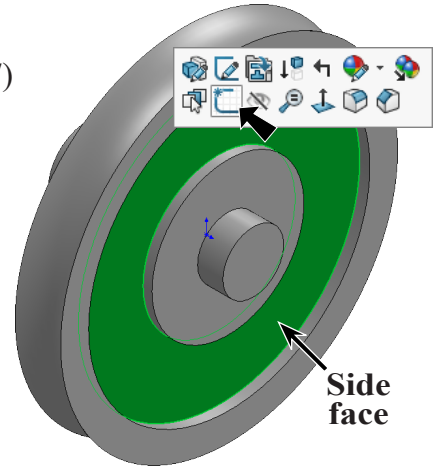


Fig. 19

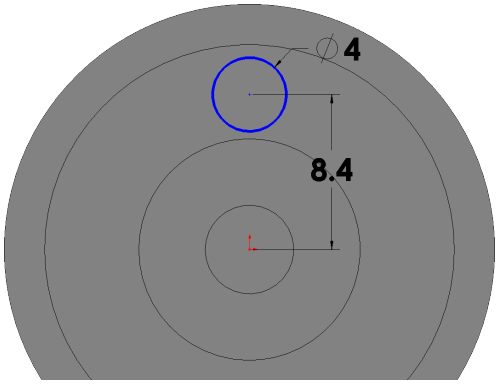


Fig. 20

Step 9. **Ctrl click centerpoint of circle** and **Origin** to select both. Release Ctrl key and click **Make Vertical** on the context toolbar, **Fig. 21**.

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

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

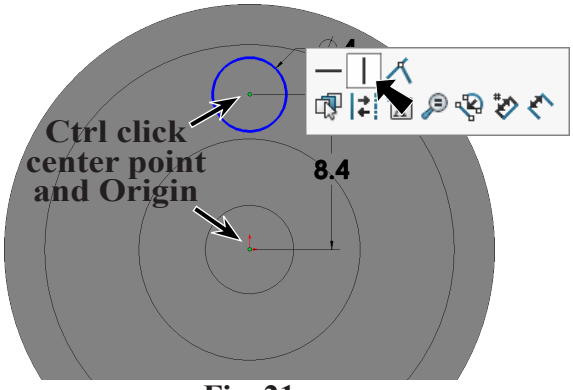


Fig. 21

Step 12. Click **Extruded Cut** on the Features toolbar.

Step 13. In the Cut-Extrude Property Manager:
under Direction1, **Fig. 22**
End Condition **Through All**
click OK .

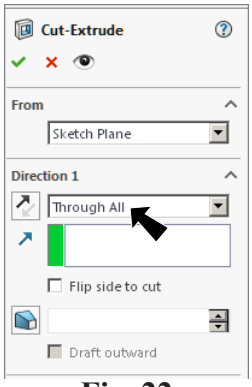


Fig. 22

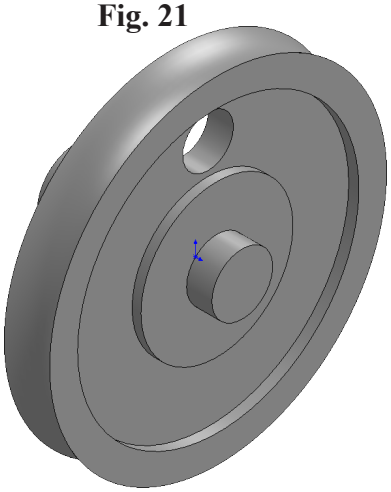
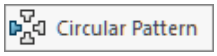


Fig. 23

K. Circular Pattern for Hole.

Step 1. Click **Circular Pattern** 

in the **Linear Pattern flyout** 

on the Features toolbar.

Step 2. In the Circular Pattern Property Manager set:
under Features and Faces, **Fig. 24**
click **hole in Rim feature**, **Fig. 25**
under Parameters
click in **Pattern Axes** box
click **cylindrical face of hub**
Number of Instances **8**
check **Equal spacing**
click OK .

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

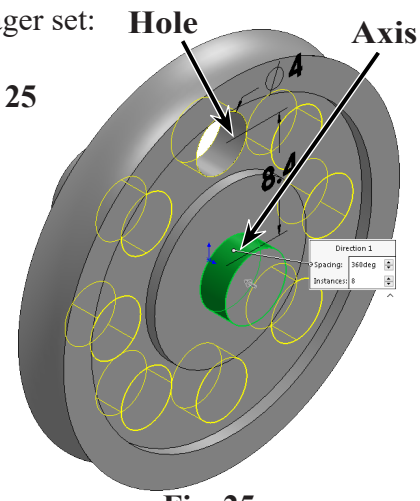


Fig. 25

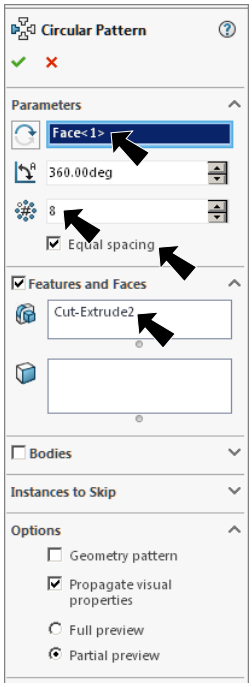


Fig. 24

L. Bolt.

Step 1. Click **side face of wheel cap** and click **Sketch**  on the context toolbar, **Fig. 26**.

Step 2. Click **Normal To**  on the Standard Views toolbar.

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

Step 4. Sketch a circle above Origin  , **Fig. 27**.

Step 5. Click **Smart Dimension** 

(S) on the Sketch toolbar.

Step 6. Add dimensions, **Fig. 27**.

Step 7. **Right click graphics area and click Select** from menu to unselect Smart Dimension.

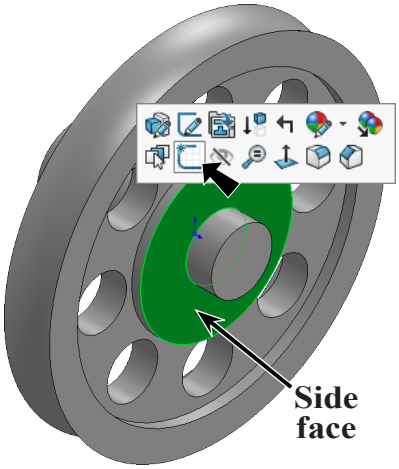


Fig. 26

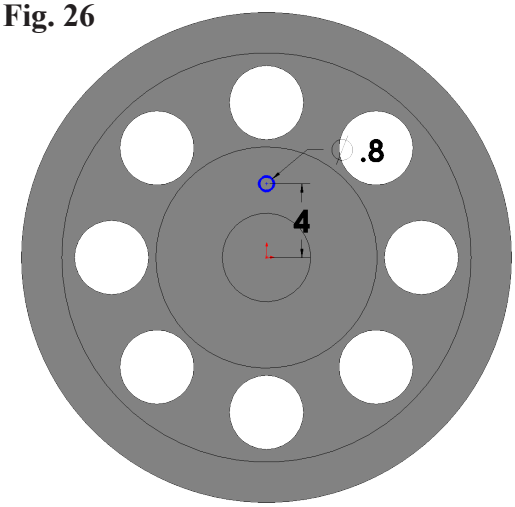


Fig. 27

Step 8. **Ctrl click centerpoint of circle** and **Origin** to select both. Release Ctrl key and click **Make Vertical** on the context toolbar, **Fig. 28**.

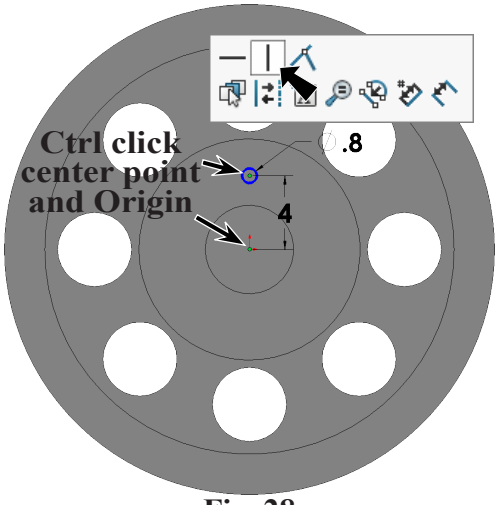


Fig. 28

Step 9. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 10. Press Q key on keyboard to **Zoom to Selection** (**Q**) to zoom to extrude.

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

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

Step 13. In the Extrude Property Manager set:
under Direction 1, **Fig. 29**
Depth **.2**
click OK .

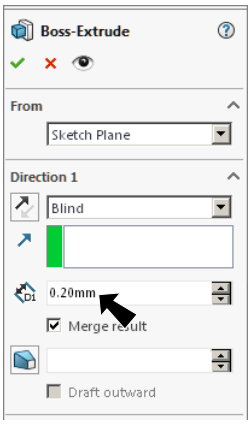


Fig. 29

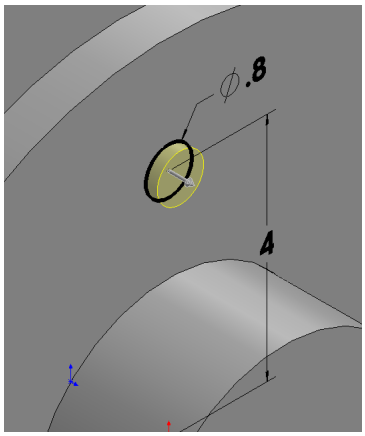


Fig. 30

Step 14. Save. Use **Ctrl-S**.

M. Dome Top Face of Bolt.

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

Step 2. In the Dome Property Manager set:
under Parameters, **Fig. 31**
click **top face of extruded boss**, **Fig. 32**
Distance **.2**
click OK .

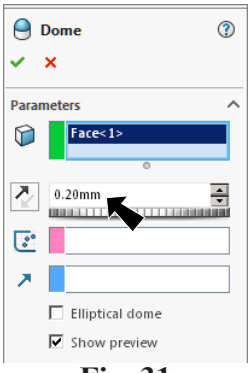


Fig. 31

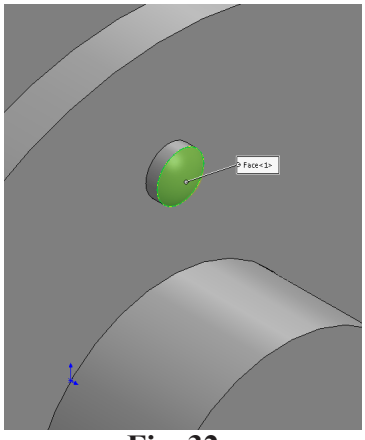
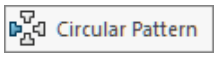


Fig. 32

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

N. Circular Pattern for Bolt.

Step 1. Click **Circular Pattern**  in the **Linear Pattern flyout**  on the Features toolbar.

Step 2. In the Circular Pattern Property Manager set:
under Features and Faces, **Fig. 33**
click **Dome1** and **Extrude1**, **Fig. 34**
under Parameters
click in **Pattern Axes** box
click **cylindrical face of hub**
Number of Instances **10**
check **Equal spacing**
click OK .

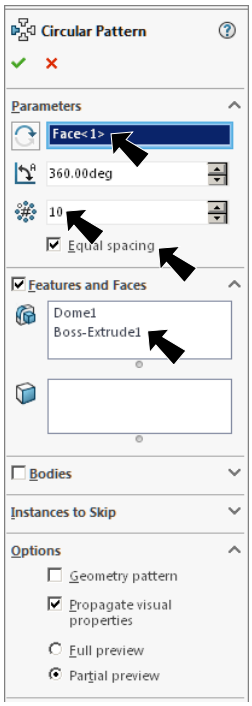


Fig. 33

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

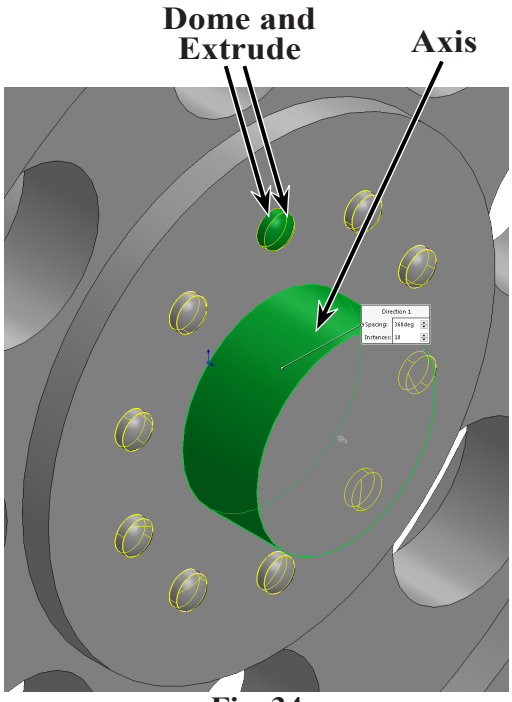


Fig. 34

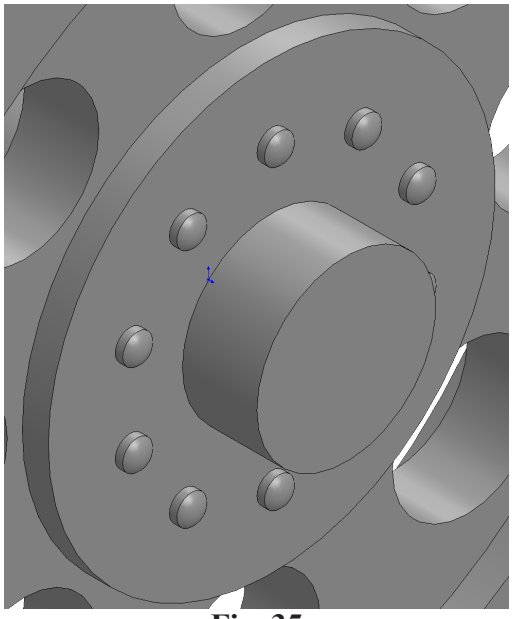


Fig. 35

O. Fillet Edges of Rim.

Step 1. Click **Fillet** 

on the Features toolbar.

Step 2. In the Fillet Property Manager set:
select **FilletXpert**, **Fig. 36**
set **Radius** .5
click **4 edges of rim**, **Fig. 37**
click **Apply**
click OK .

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

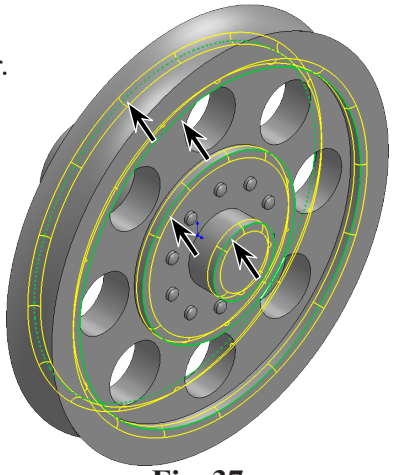


Fig. 37

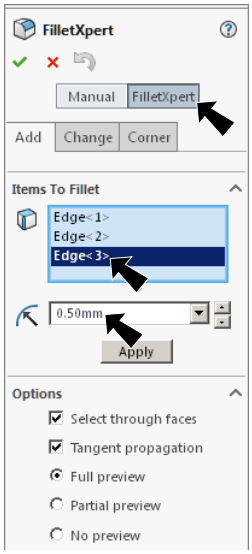


Fig. 36

P. Material Chrome Stainless Steel.

Step 1. **Right click Material** in the Feature Manager and click **Edit Material**, **Fig. 38**.

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

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

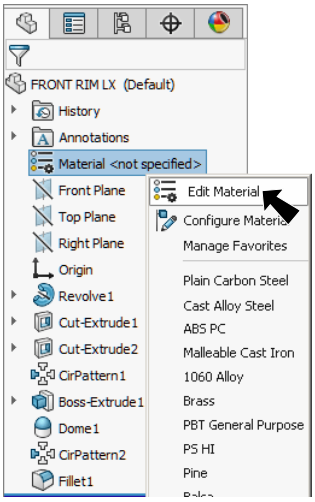


Fig. 38

Fig. 39