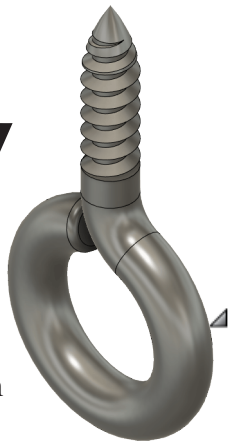
Chapter 14

Rail Car Form

Eye Screw



A. New Metric Document.

Step 1. Confirm new document and **units are mm**, **Fig. 1**.

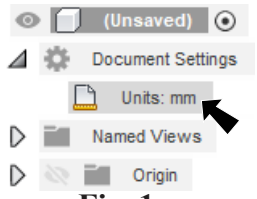
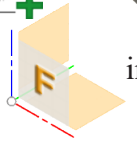


Fig. 1

B. Sweep Path Sketch.

Step 1. On the Solid tab SOLID click **Create Sketch**  in the Sketch area of toolbar and click **Front plane**  in canvas.

Step 2. On the Solid tab SOLID click Create Menu > Arc > Center Point Arc  .

Step 3. 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.

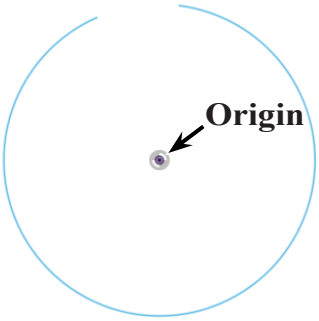


Fig. 2

Step 4. Click **Line**  (**L**) on the toolbar.

Step 5. Sketch vertical line up from arc endpoint that is directly above Origin, **Fig. 3**.

Step 6. Click **Coincident**  in the Constraints area of toolbar and click **vertical line and Origin**, **Fig. 4**.

Step 7. Click **Dimension**  (**D**) on the toolbar.

Step 8. Add dimensions, **Fig. 5**. To dimension angle between the two arc endpoints, **click arc endpoint**, **Origin** and **other arc endpoint**. Move the cursor and click to place dimension. Key in 13 and press ENTER.

Fig. 3

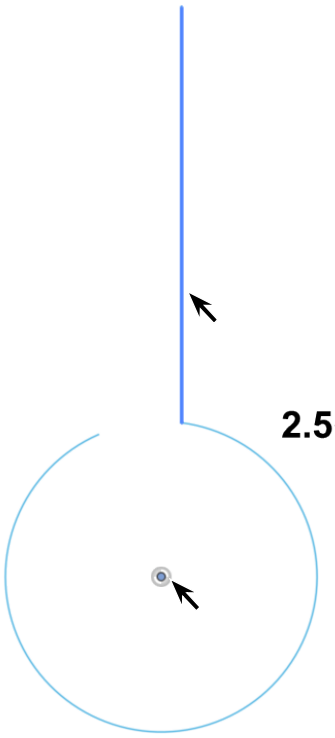


Fig. 4

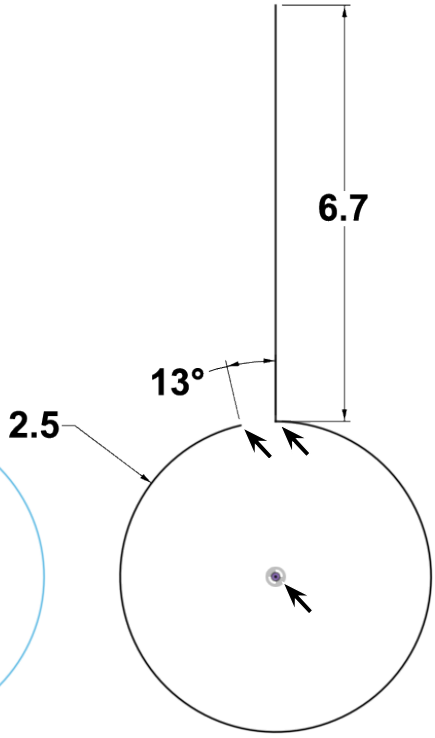


Fig. 5

2/21/20

Step 9. Click **Fit** (**F6**) on the Navigation Bar.

Step 10. Click **Fillet** in the Modify area of toolbar.

Step 11. Click **intersection point of line and arc**, **Fig. 6**
Key-in 1.5
Press ENTER to complete the command.

Step 12. Click **Finish Sketch** on the toolbar.

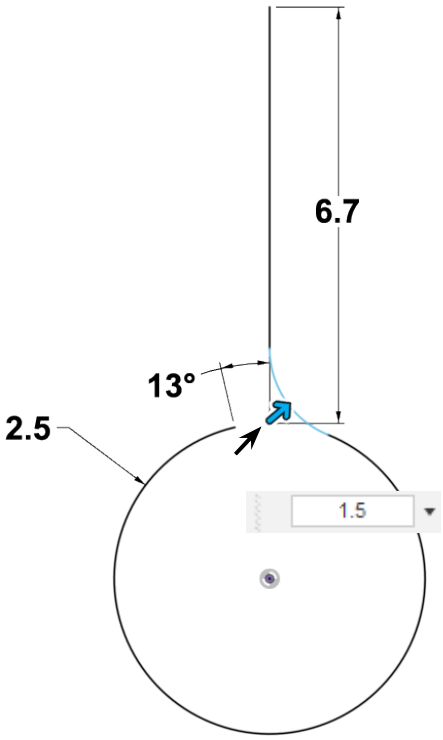


Fig. 6

C. Save as "E CLIP".

Step 1. Click File Menu > Save.

Step 2. In the Save dialog box:
Key-in **EYE SCREW** for filename
click Save.

D. Profile Plane.

Step 1. Click **Home** (Isometric) on View Cube .

Step 2. On the Solid tab SOLID click Construct Menu > Plane Along Path .

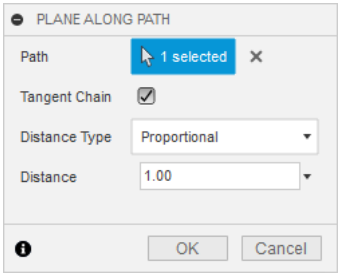


Fig. 7

Step 3. In the Plane Along Path panel set, **Fig. 7**
Click **top of path line**, **Fig. 8**
click OK.

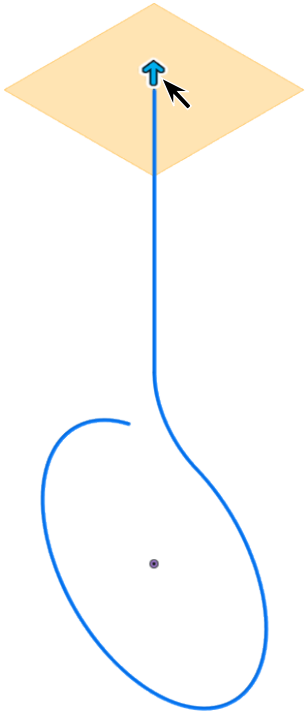


Fig. 8

E. Profile Sketch.

Step 1. On the Solid tab SOLID click **Create Sketch** in the Sketch area of toolbar and click **Plane1** in canvas, **Fig. 0**.

Step 2. Click **Center Diameter Circle** (**C**) in the Create area of toolbar.

Step 3. Sketch **circle** at Origin , **Fig. 10**.

Step 4. Click **Dimension** (**D**) on the toolbar.

Step 5. Dimension circle **diameter 1.4**, **Fig. 10**.

Step 6. Click **Finish Sketch** on the toolbar.

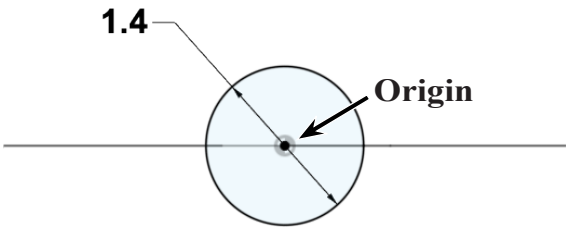


Fig. 10

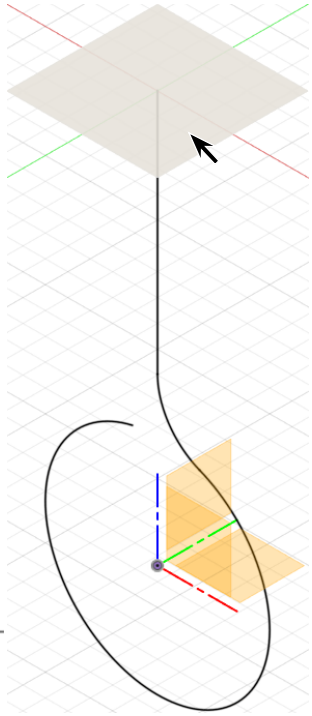


Fig. 9

F. Sweep.

Step 1. On the Solid tab SOLID click Create Menu > Sweep .

Step 2. In the Sweep panel:
Type Single Path, **Fig. 11**
Profile click **circle**, **Fig. 12**
Path click Path button and click **path**
Orientation **Perpendicular**
Operation **New Body**
Click OK.

Step 3. Save. **Ctrl-S** and press ENTER.

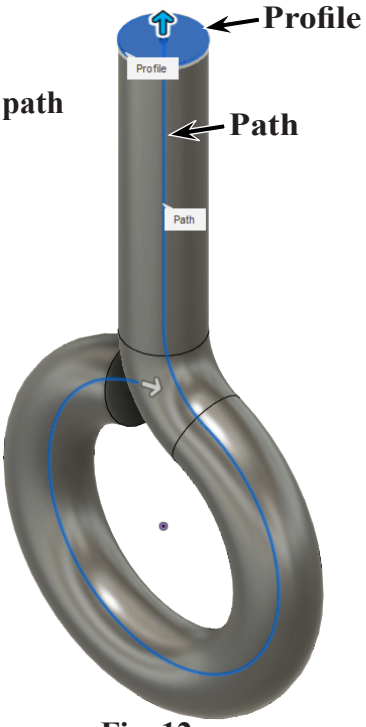


Fig. 12

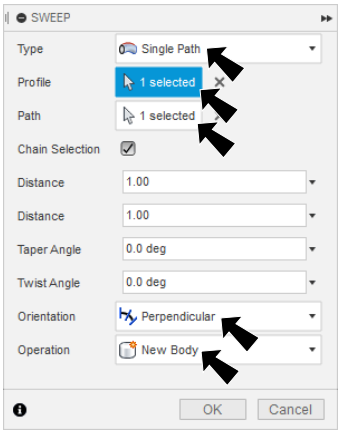


Fig. 11

G. Threads.

Step 1. On the Solid tab SOLID click Create Menu > Thread .

Step 2. In the Threads panel, **Fig. 13**
Faces click **cylinder face of Eye Screw**, **Fig. 14**
check **Modeled**
uncheck **Full Length**
Offset **.8**
Thread Type **GOST self-tapping Screw**
Click OK.

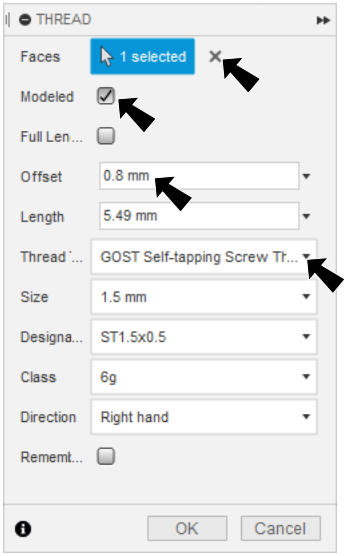


Fig. 13

Step 3. Save. **Ctrl-S** and press ENTER.

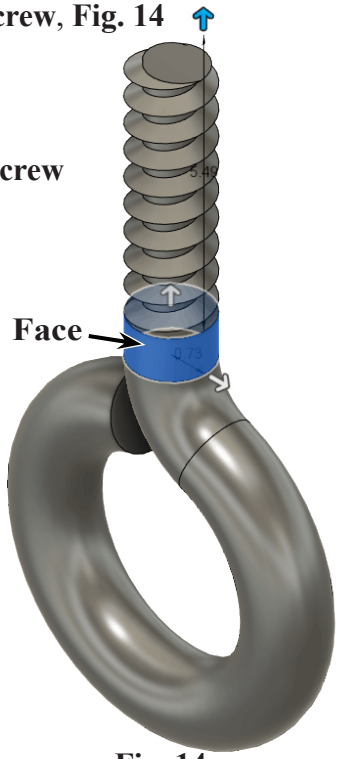
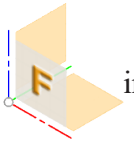


Fig. 14

H. Revolve Cut.

Step 1. On the Solid tab SOLID click **Create Sketch** in the Sketch area of toolbar and click **Front plane**


in canvas.

Step 2. Click **Line** (**L**) on the toolbar.

Step 3. Sketch **3 lines.** Start from the **Origin** , sketch line up vertically to top of threads, then out to right horizontally and vertical line back down, **Fig. 15**.

Step 4. Click Create Menu > Arc > Three Point Arc .

Step 5. Sketch **arc between left endpoint of horizontal line and bottom endpoint of vertical line**, **Fig. 16**.

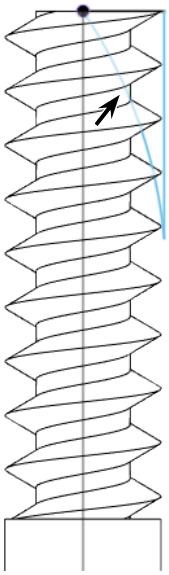


Fig. 16

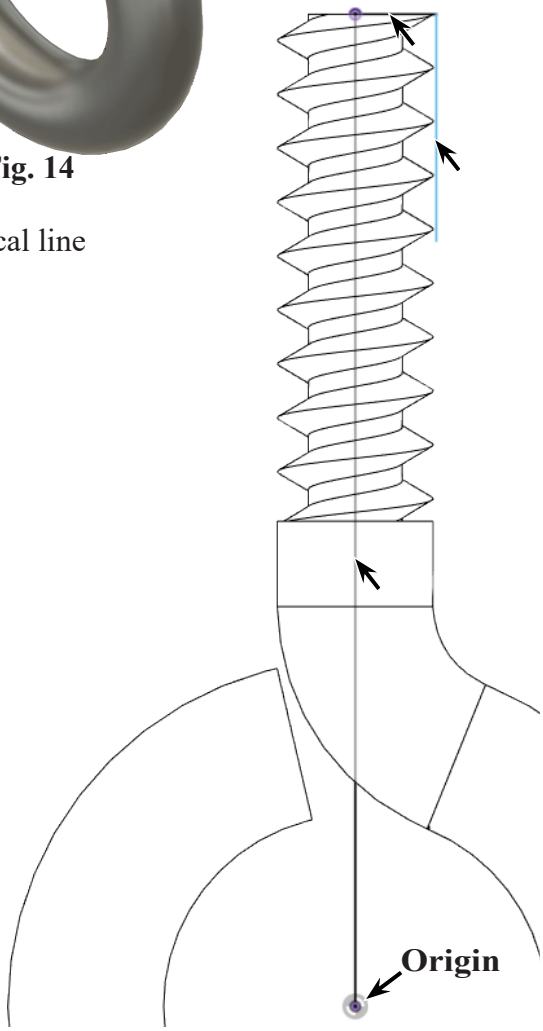


Fig. 15

Step 6. Click **Dimension** (**D**) in the sketch area of toolbar.

Step 7. Add dimensions, **Fig. 17**.

Step 8. On the Solid tab SOLID click **Revolve**.

Step 9. In the Revolve panel set, **Fig. 18**
Profile Fusion selects Profile
Axis click **centerline**, **Fig. 19**
Direction **One Side**
Operation **Cut**
click OK.

Step 10. Save. **Ctrl-S** and press ENTER.

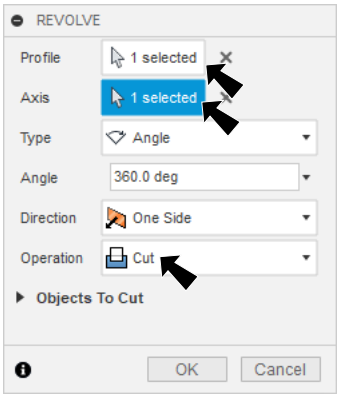


Fig. 18

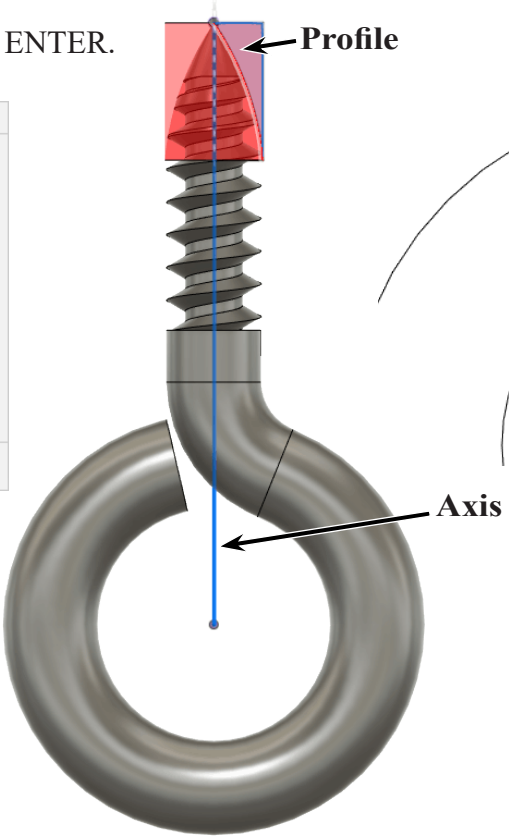


Fig. 19

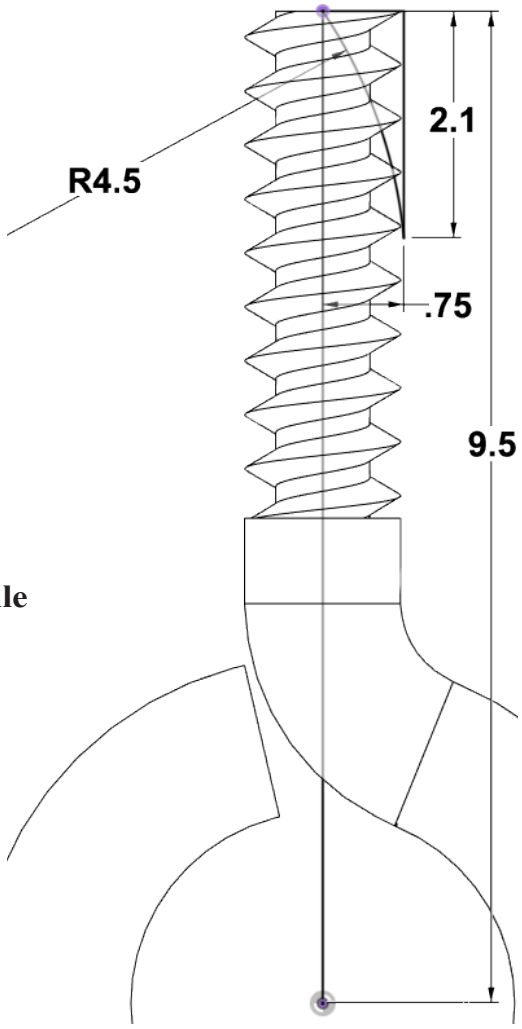


Fig. 17

I. Fillet Edge.

Step 1. Click **Home** (Isometric) on View Cube .

Step 2. On the Solid tab SOLID click **Fillet** **(F)** in the Modify area of toolbar.

Step 3. In the Fillet panel set, **Fig. 20**
click **edge at bottom end of sweep**, **Fig. 21**
Radius .2
click OK.

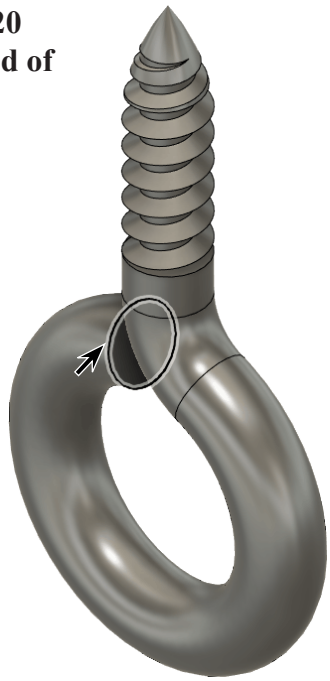


Fig. 21

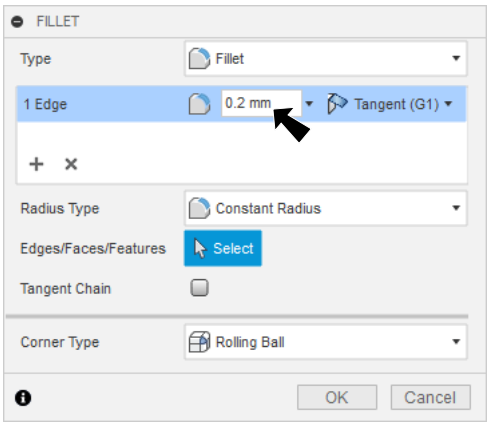


Fig. 20

J. Material Stainless Steel.

Step 1. On the Solid tab SOLID click Modify Menu > Physical Material.

Step 2. In the Physical Material Panel:
under Library, **Fig. 22**.
expand **Metal**
scroll down to
Steel AISI 1522 304 HR
and drag onto the body.
Close panel.

Step 3. Save. **Ctrl-S** and press ENTER.

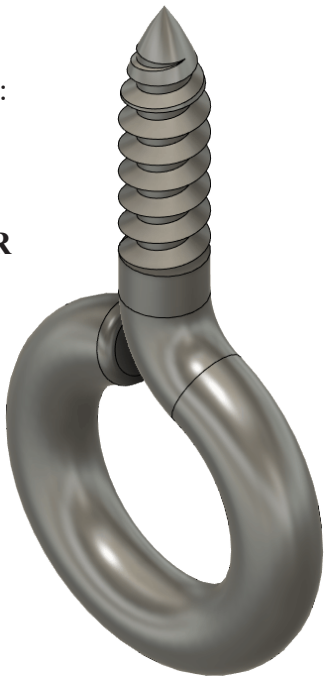


Fig. 23

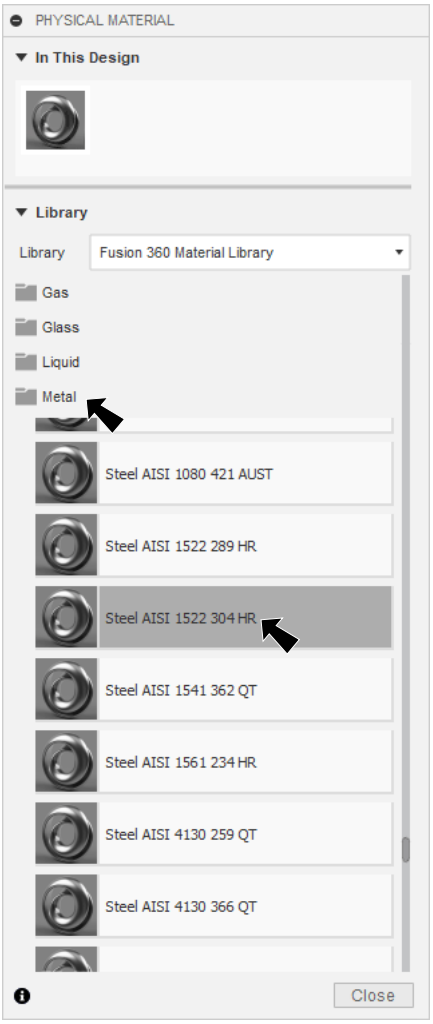


Fig. 22

K. Open Body Rail Form File and Roll Timeline Back.

Step 1. Open your **BODY RAIL FORM** file.

Step 2. In the Timeline at the bottom of the canvas, **right click Ground2** feature (second Ground) and click **Roll History Marker Here**, **Fig. 24**.

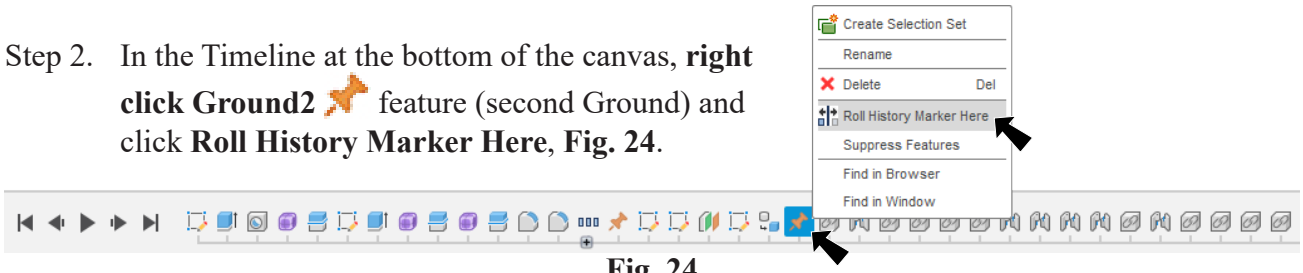
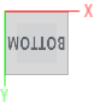


Fig. 24

Step 3. Click **Bottom View**  on View Cube.

Step 4. Switch Visible Style to **Wireframe** (**Ctrl-7**). To switch to Wireframe, click the Display Settings pull-down in the Navigation Bar at the bottom of the canvas and select **Visual Style > Wireframe**, **Fig. 25**.

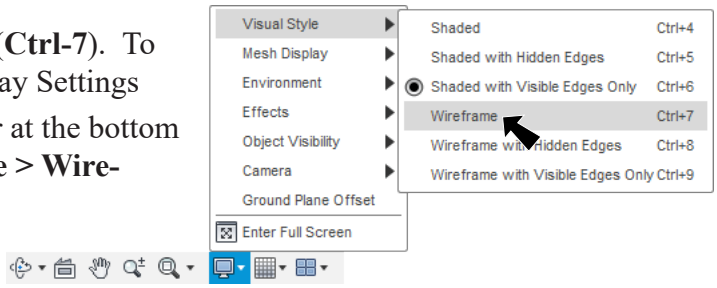


Fig. 25

L. Hole Wizard Sketch.

Step 1. On the Solid tab SOLID click **Create Sketch** in the toolbar and click **Top plane** in canvas, **Fig. 26**.

Step 2. Click Create Menu > Point .

Step 3. Click to place Points in the center of Body **forward of Front Axle** and **forward of Rear Axle**, **Fig. 27**.

Step 4. Press EXCAPE to unselect Point tool.

Step 5. **Ctrl click midpoint of rear edge of Body and both Points** to select all three. Release Ctrl and click **Horizontal/Vertical** in the Constraints area of toolbar, **Fig. 28**.

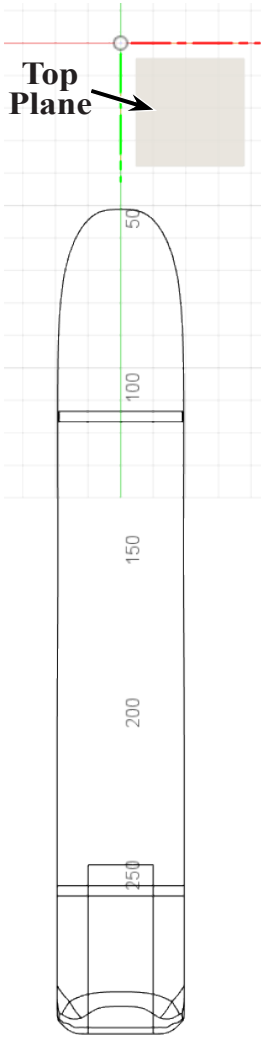


Fig. 26

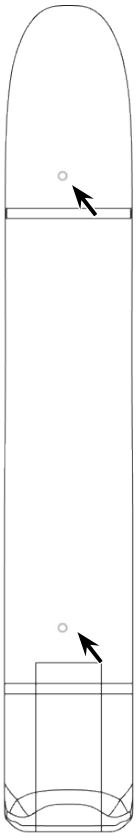


Fig. 27

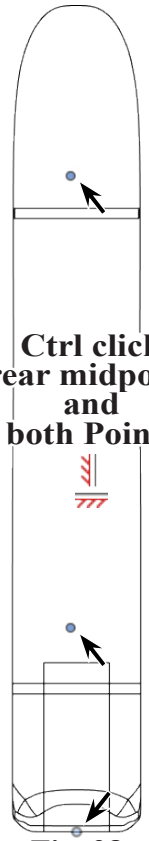


Fig. 28

Step 6. Click **Dimension** (**D**) on the toolbar.

Step 7. Dimensions Points to midpoint of rear edge, **Fig. 29**.

Step 8. Click **Finish Sketch** on the toolbar.

Step 9. Save. **Ctrl-S** and press ENTER.

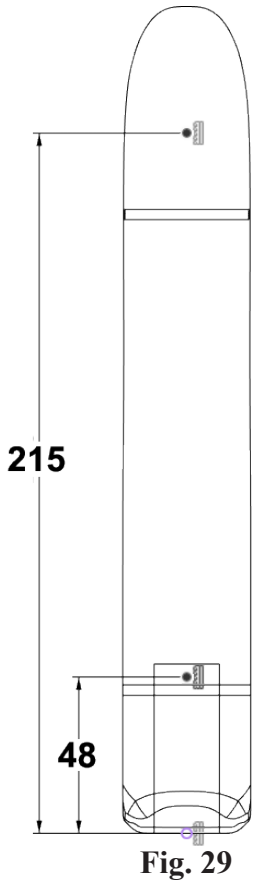


Fig. 29

M. Eye Screw Hole 1.

Step 1. Click **Right View** on View Cube .

Step 2. On the Solid tab click **Hole** (**H**) in the Create area of toolbar.

Step 3. In the Hole panel set, **Fig. 10**
Sketch Points click **forward most Point**, **Fig. 11**
Extents **Distance**
Click **Flip Direction**
Hole **Depth 3**
Hole **Diameter .9**
click OK.

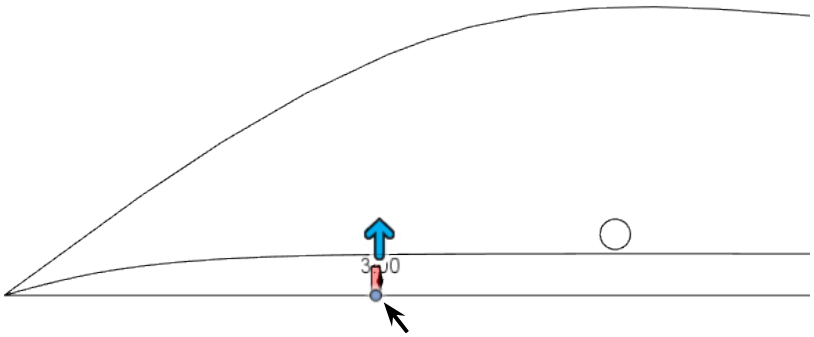


Fig. 31

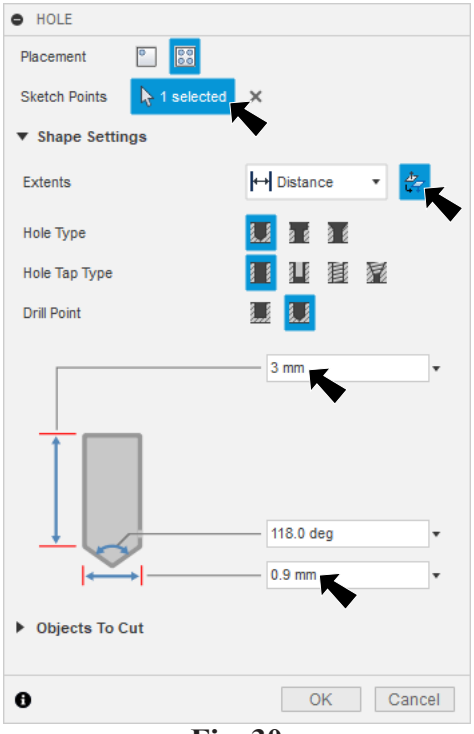


Fig. 30

N. Eye Screw Hole 2.

Step 1. Expand Sketches in the Browser, **Show** **Sketch6** (holes sketch), **Fig. 32**.

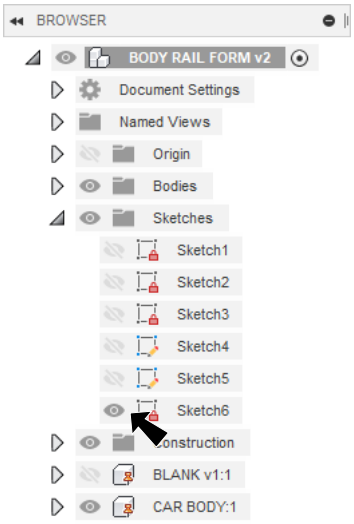


Fig. 32

Step 2. Click **Hole** **(H)** in the toolbar.

Step 3. In the Hole panel set, **Fig. 33**
Sketch Points click **rear Point**, **Fig. 34**
Flip Direction should be selected
Hole **Depth 5**
Hole **Diameter .9**
click OK.

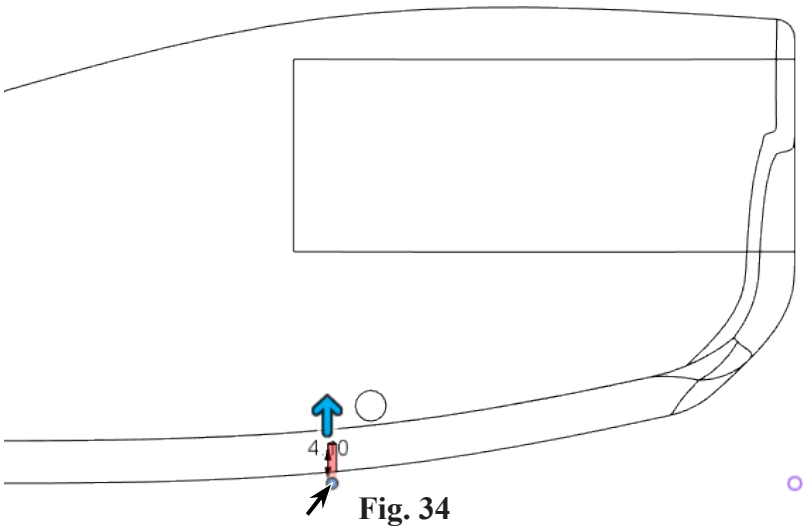


Fig. 34

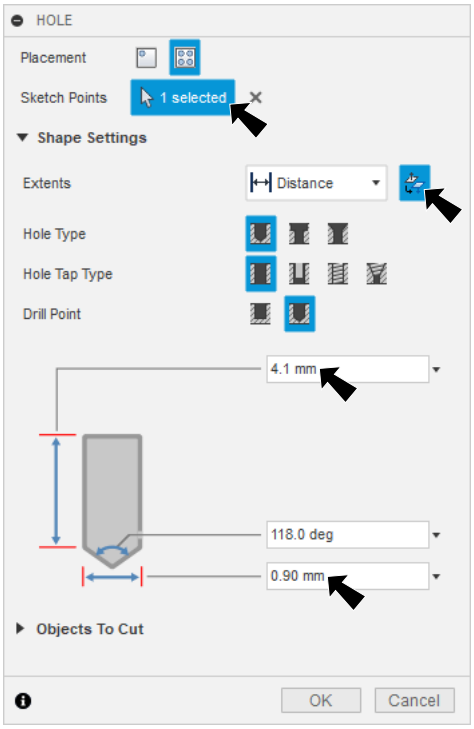


Fig. 33

Step 4. In the Browser, **Hide** **Sketch6**, **Fig. 35**.

Step 5. Save. **Ctrl-S** and press ENTER.

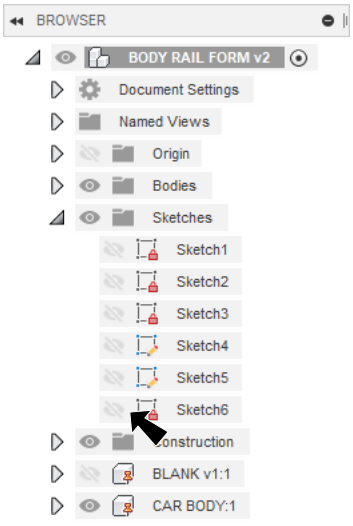


Fig. 35

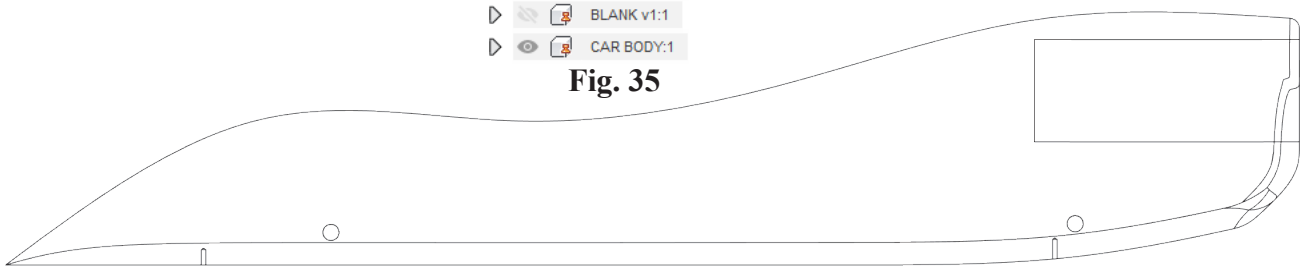


Fig. 36

O. Roll Timeline to End.

Step 1. In the Timeline click **Move to End** , **Fig. 37**.

Fig. 37

Step 2. Switch Visible Style to **Shaded with visible Edges Only (Ctrl-6)**. To switch to Wireframe, click the Display Settings pull-down in the Navigation Bar at the bottom of the canvas and select **Visual Style > Shaded with visible Edges Only**, **Fig. 38**.

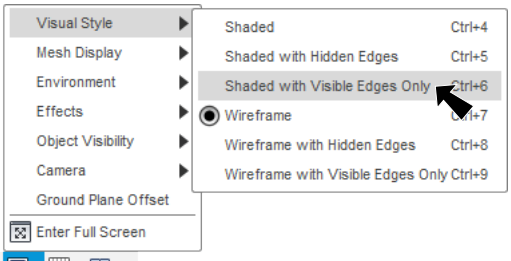


Fig. 38

Step 1. Click **bottom left corner** on View Cube 

to rotate to bottom view.

P. Insert Front Eye Screw and Add Joint.

Step 1. Open Data Panel .

Step 2. Drag **Eye Screw** from Data Panel onto the canvas, **Fig. 39**.

Step 3. Zoom in on the Eye Screw and front Eye Screw Hole in Body.

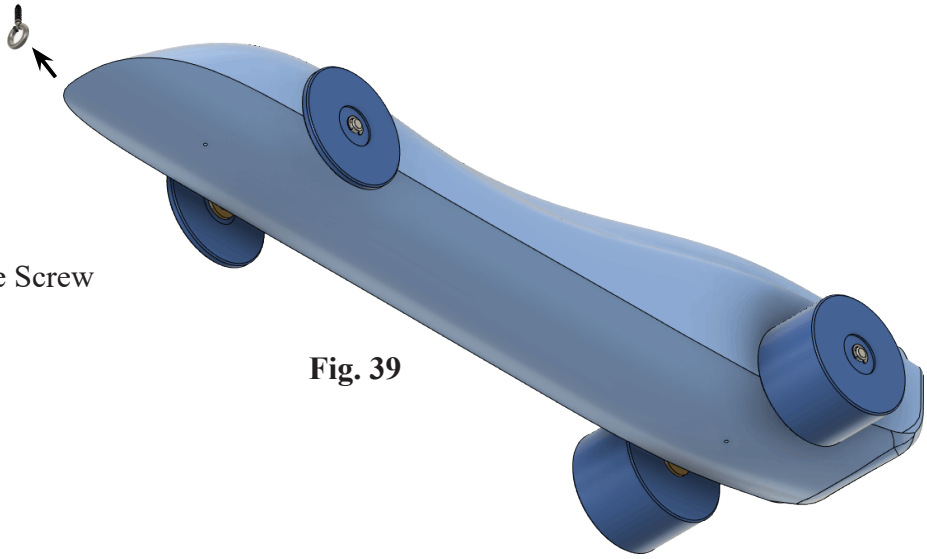


Fig. 39

Step 4. On the Solid tab SOLID click **Joint** (**J**) in the Assembly area of toolbar.

Step 5. Click **cylindrical edge at end of sweep on the Eye Screw for Joint Origin** and **edge of front eye screw hole in Body for Joint Origin**, **Fig. 40**.

Step 6. In the Joint panel set:
under Motion, **Fig. 41**
Type **Ridgid**
click OK.

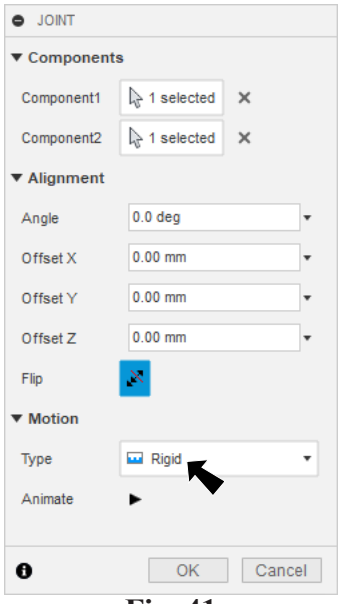


Fig. 41

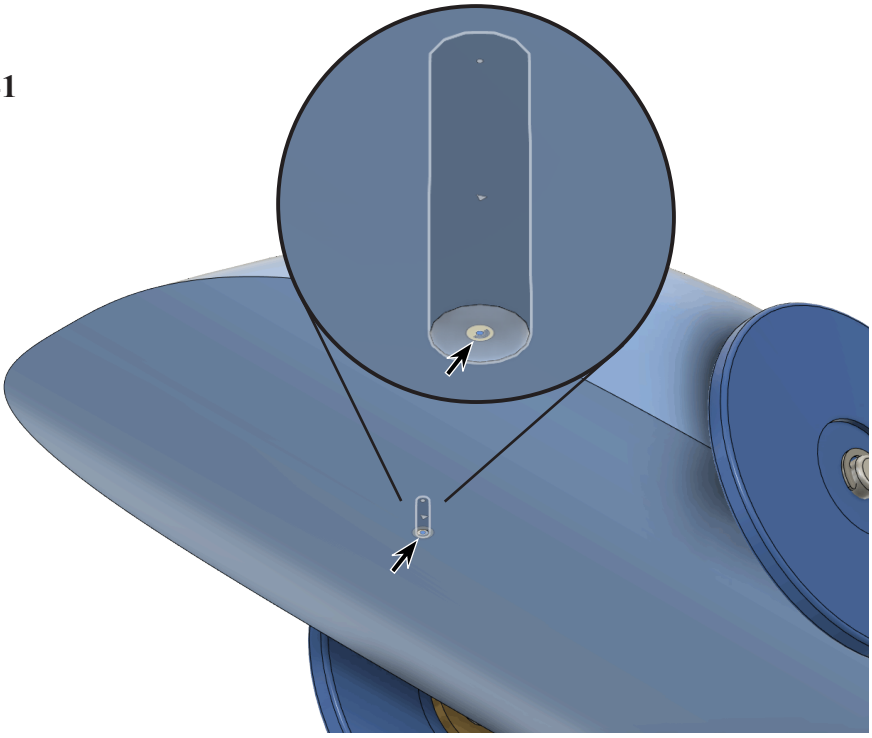


Fig. 40

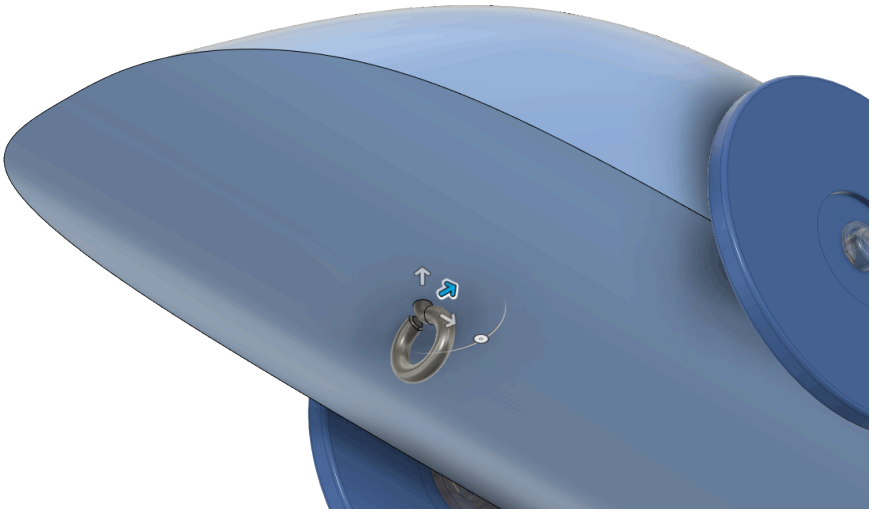


Fig. 42

Q. Insert Rear Eye Screw and Add Joint.

Step 1. Open Data Panel .

Step 2. Drag Eye Screw from Data Panel onto the canvas, **Fig. 43**.

Step 3. Use the **Y Manipulator** to drag Eye Screw just past rear of Body, **Fig. 44**.

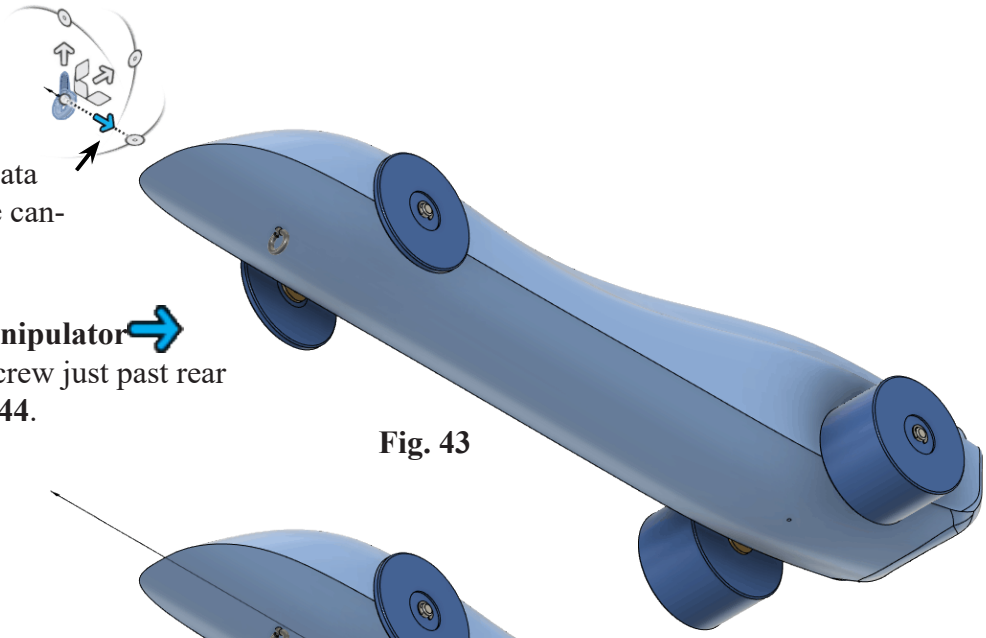


Fig. 43

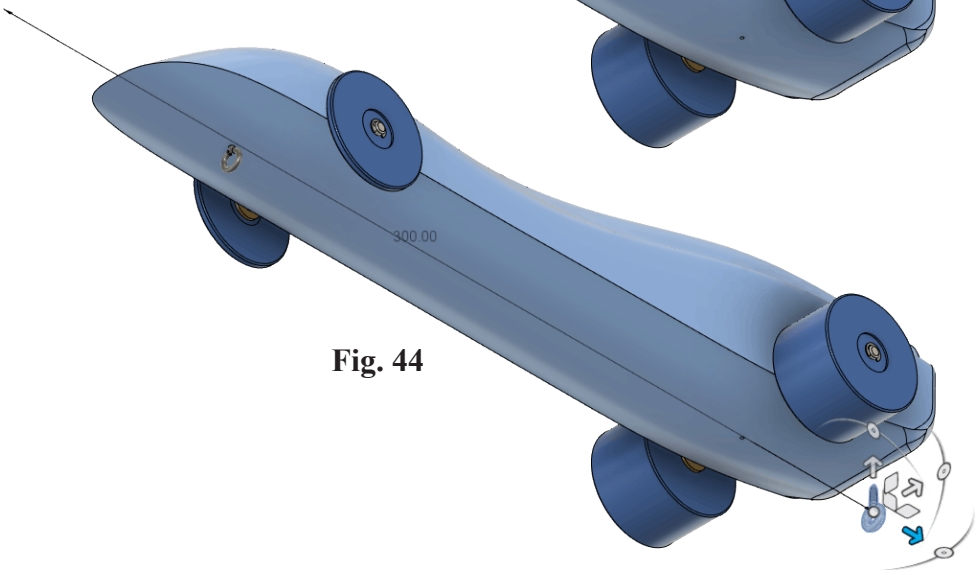


Fig. 44

Step 4. Zoom in on the Eye Screw and rear Eye Screw Hole in Body.

Step 5. Click **Joint** (**J**) in toolbar.

Step 6. Click **cylindrical edge at end of sweep on the Eye Screw for Joint Origin** and **edge of rear eye screw hole in Body for Joint Origin**, **Fig. 45**.

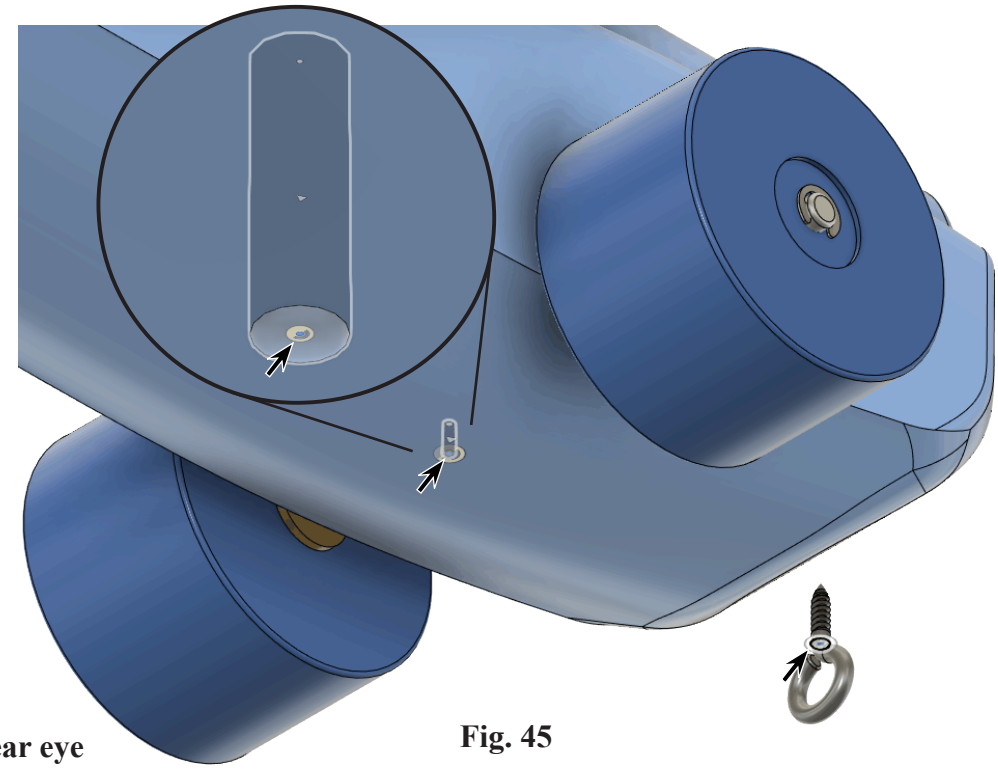


Fig. 45

Step 7. In the Joint panel set:
under Motion
Type **Ridgid**
click OK.

Step 8. Save. **Ctrl-S** and press ENTER.

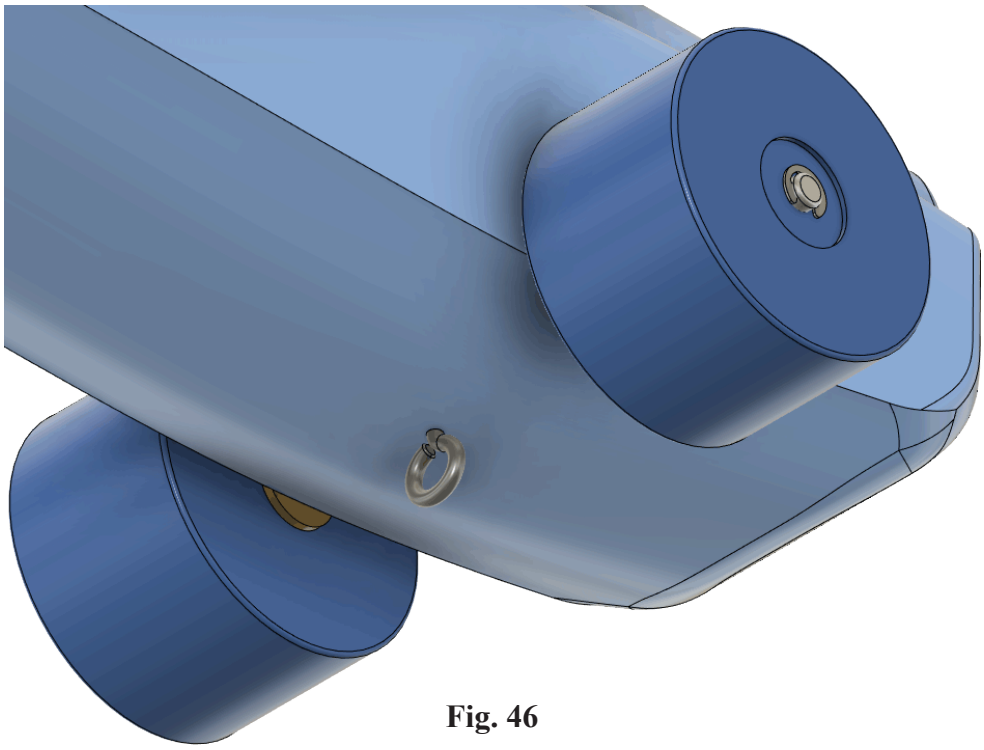


Fig. 46