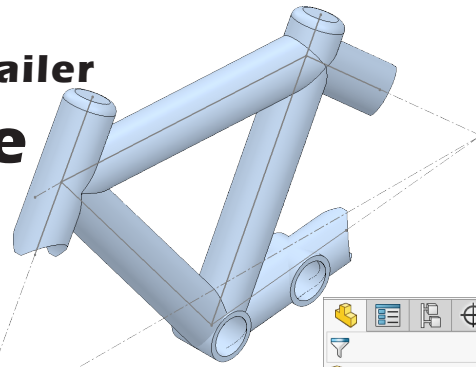


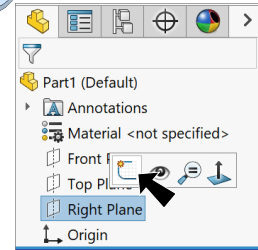
# Bike and Trailer Frame



## A. Sketch 1.

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

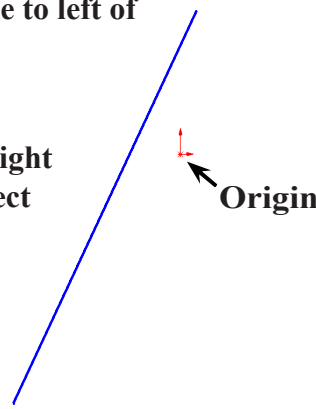
Step 2. Click **Right Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 1**.




**Fig. 1**



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

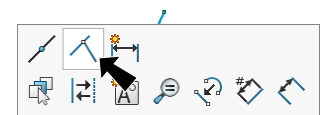
Step 4. Sketch a line (**Head Tube**) at angle to left of **Origin** , **Fig. 2**.



**Fig. 2**

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

Step 6. **Ctrl click line and Origin**  to select both. Release Ctrl key and click **Make Coincident**  on the context toolbar, **Fig. 3**.

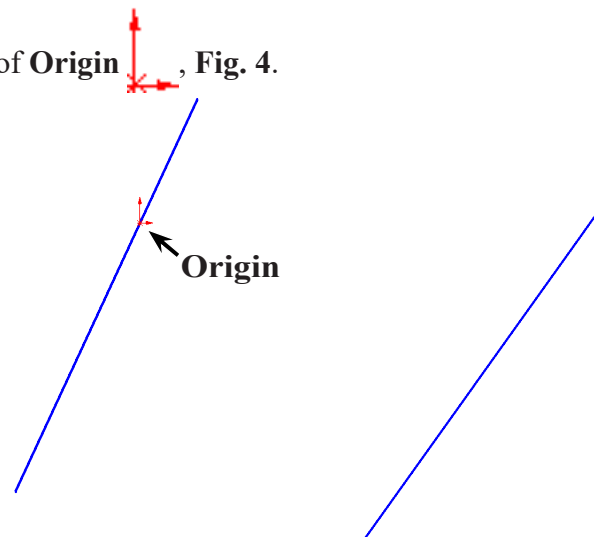


**Ctrl click line and Origin**

**Fig. 3**

Step 7. Click **Line**  (L) on the Sketch toolbar.

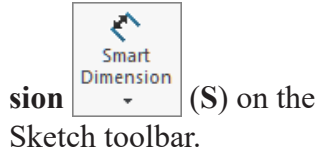
Step 8. Sketch Seat Tube line at an angle off to right of **Origin** , **Fig. 4**.



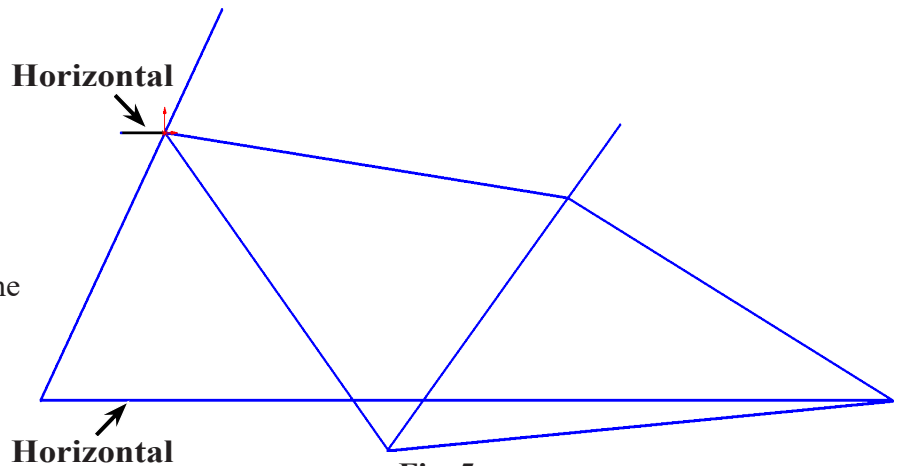
**Fig. 4**

Step 9. Sketch the other 6 lines. Line 7 and 8 are horizontal, **Fig. 5**.

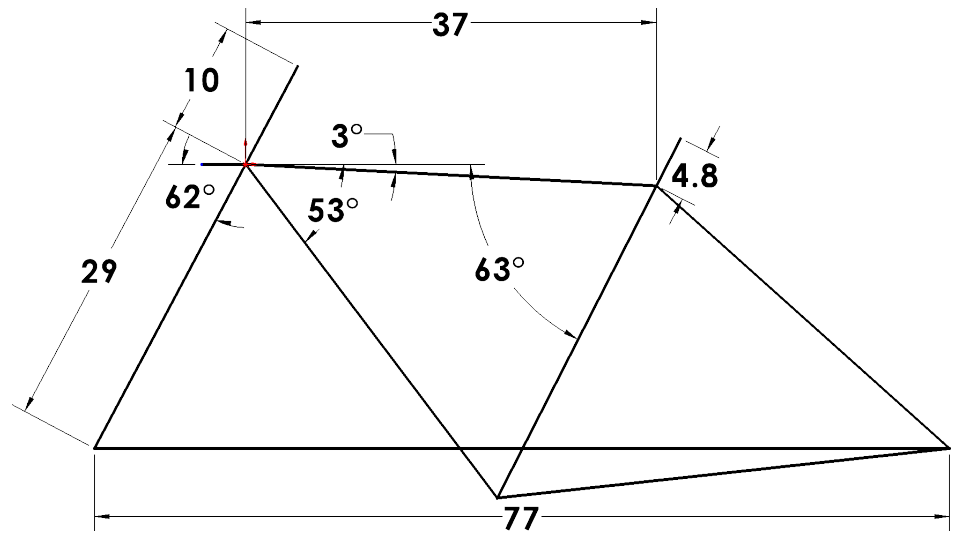
Step 10. Click **Smart Dimension**



Step 11. Add dimensions, **Fig. 6**.



**Fig. 5**



**Fig. 6**

### **B. Save as "FRAME".**

Step 1. Click File Menu > Save As.


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


## C. Split Entities.

Step 1. Click Tools Menu > Sketch Tools > Split Entities.

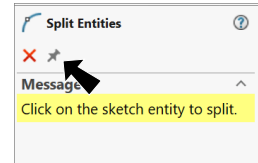
Step 2. In the Split Entities set:

**Keep Visible**  should be selected, **Fig. 7**.

The Push Pin  on allows split of more than one entity.


click **3 lines** (not at the mid-points ) , **Fig. 8**

click **Cancel** .




**Fig. 7**

Step 3. **Ctrl click the 3 line segments and both horizontal lines**, then click **Construction Geometry**


 on the context toolbar **Fig. 9**.


Step 4. Click **Smart Dimension**

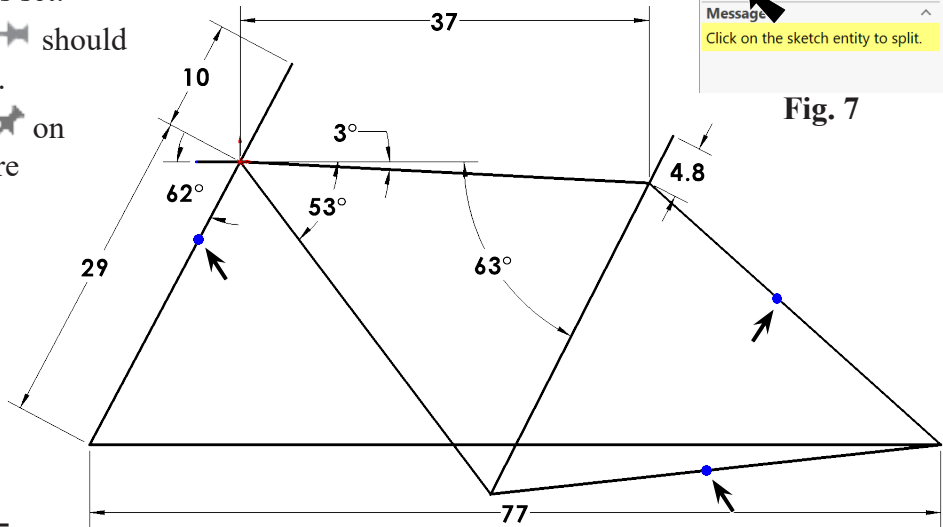
 (S) on the Sketch toolbar.

Step 5. Dimension length of each construction line segment **20.5**, **Fig. 10**.

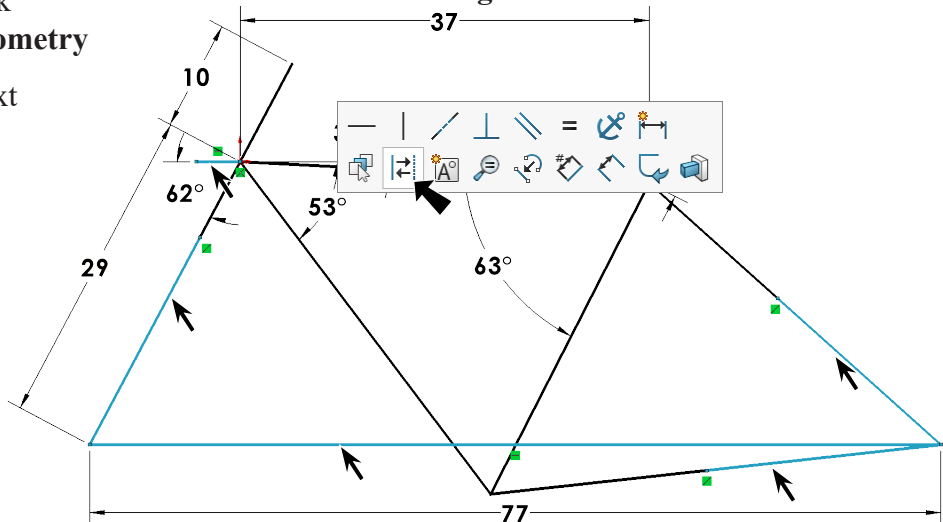
Step 6. Click **Exit Sketch**

 on the Sketch toolbar.

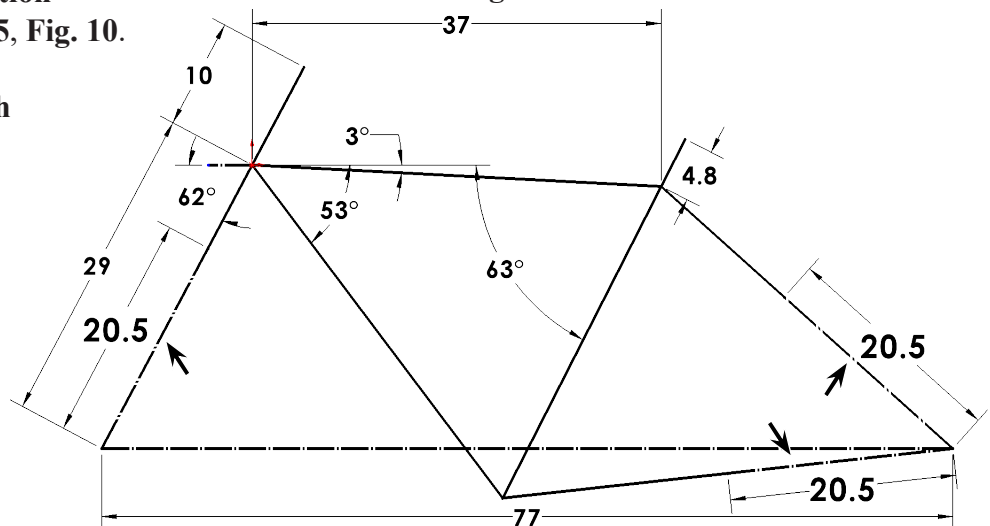
Step 7. Save  (Ctrl-S).



**Fig. 8**



**Fig. 9**



**Fig. 10**

## D. Weldment Structural Member.

Step 1. Click Insert Menu > Weldment > Structural Member.

Step 2. In the Structural Member Property Manager set:

under Standard, **Fig. 11**

**gb**

under Type:

**round-rods**

under Size:

**ROUND BAR 6 (6mm dia)**

click **Head Tube line**, **Fig. 12**

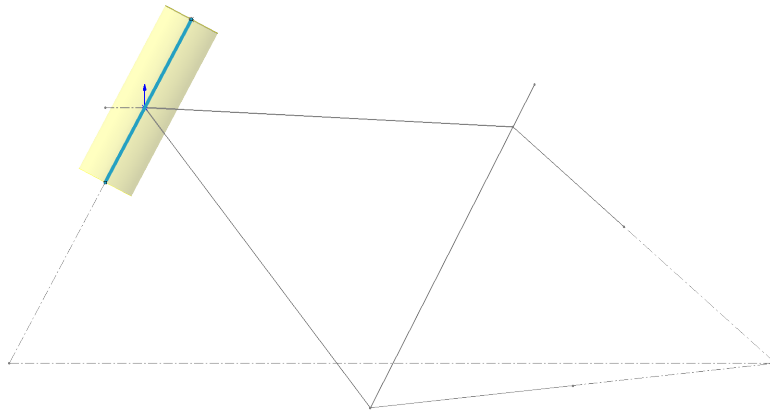


Fig. 12

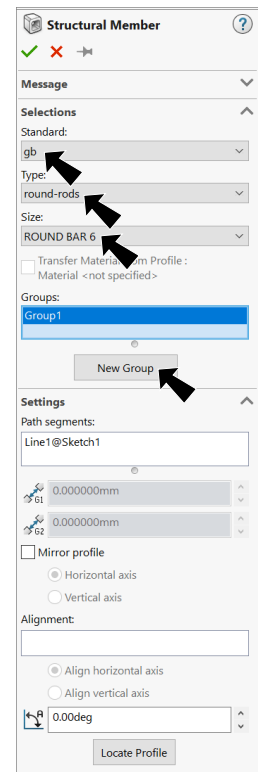


Fig. 11

click **New Group (2)** **New Group** button, **Fig. 13**

click **Top Tube** and **Seat Stay** lines, **Fig. 14**

under Settings

check **Apply corner treatment**

select **End Miter** 

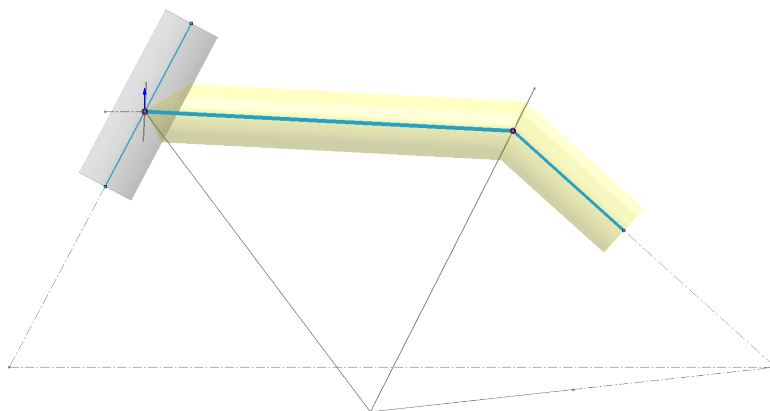


Fig. 14

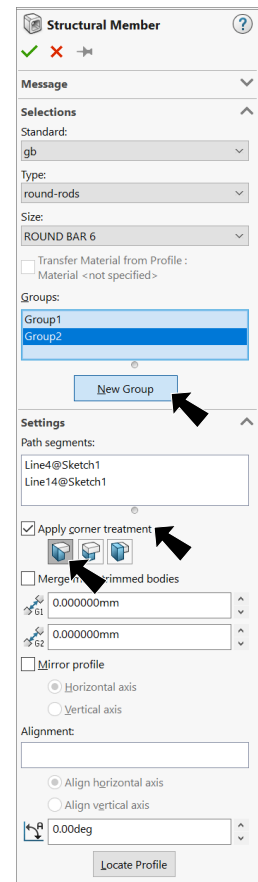
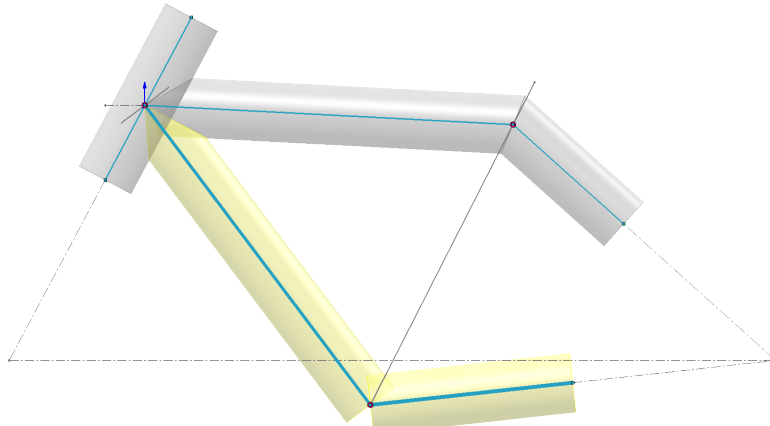


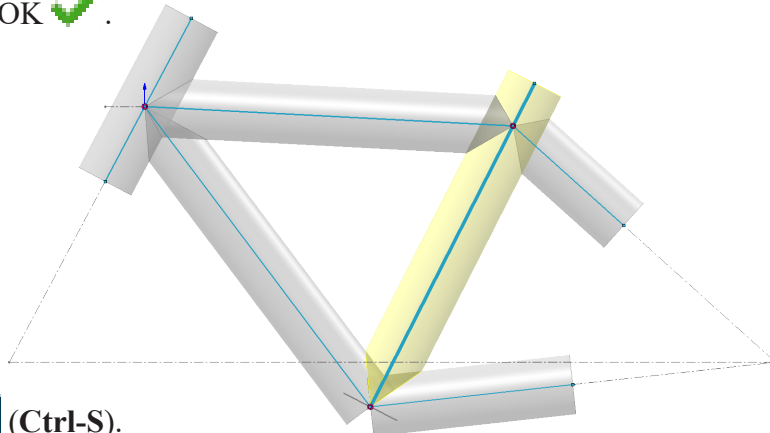
Fig. 13

click **New Group** (3) **New Group** button, **Fig. 15**  
 click **Down Tube** and **Chain Stays** lines, **Fig. 16**  
 under Setting  
 uncheck **Apply Corner Treatment**



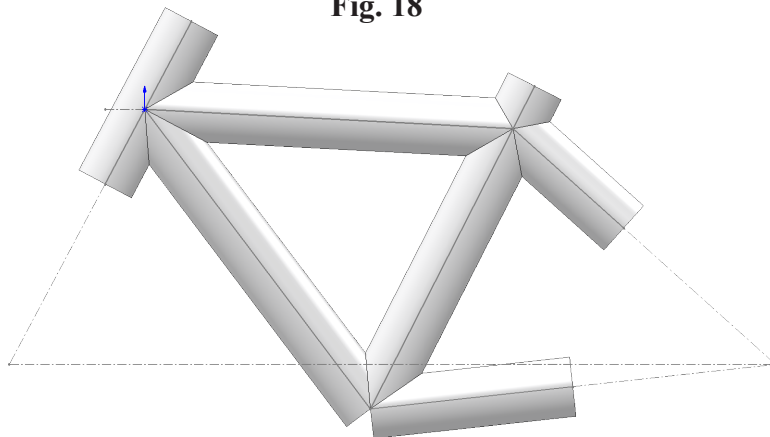
**Fig. 16**

click **New Group** (4) **New Group** button, **Fig. 17**  
 click **Seat Tube** line, **Fig. 18**  
 click **OK** ✓.

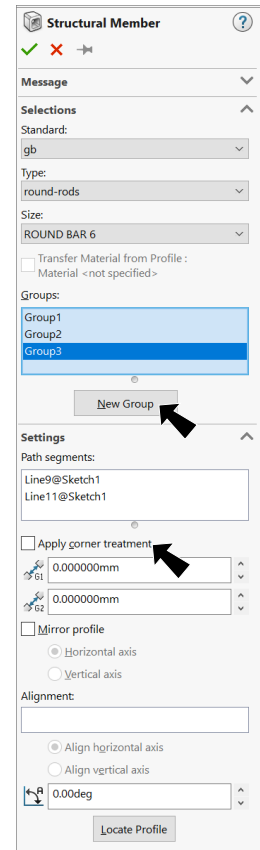


**Fig. 18**

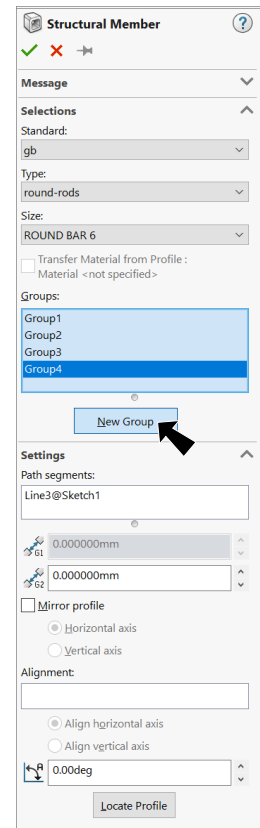
Step 3. Save  (Ctrl-S).



**Fig. 19**





**Fig. 15**



**Fig. 17**

## E. Cut-Extrude1 Head Tube Fork.

Step 1. Rotate view to view bottom face of Head Tube, Fig. 20. Use Isometric  on the Standard Views toolbar (Ctrl-7), then Up Arrow key  4 times.

Step 2. Click bottom face of Head Tube member and click Sketch  on the context toolbar, Fig. 20.

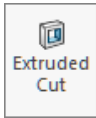
Step 3. Click Circle  (S) on the Sketch toolbar.



Step 4. Sketch a circle at Origin , Fig. 21.

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

Step 6. Dimension diameter 4.2, Fig. 21.

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. 22  
 End Condition **Blind**  
 Depth  7  
 click OK .

Step 10. Save  (Ctrl-S).

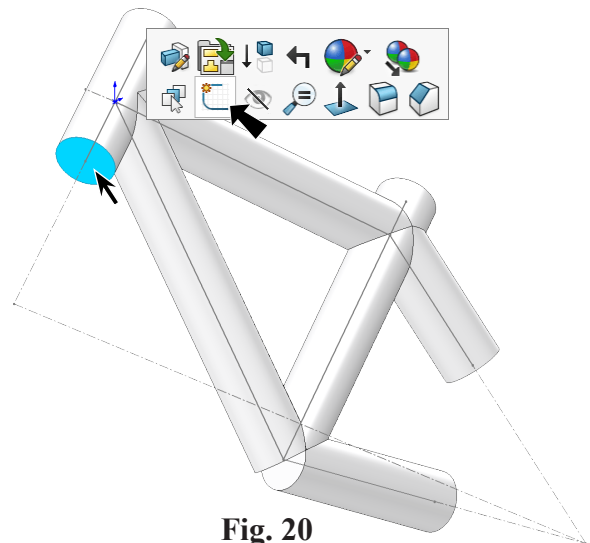


Fig. 20

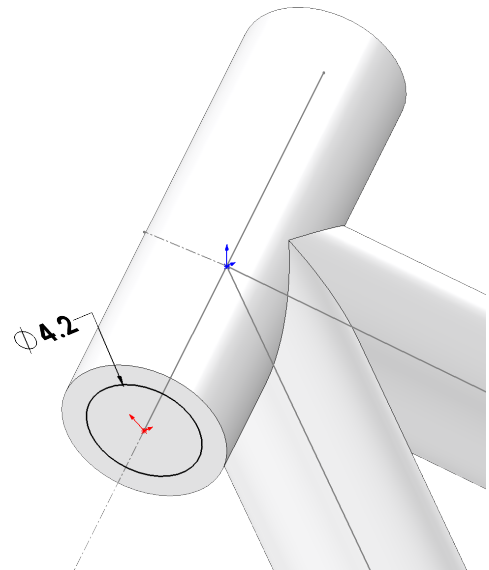


Fig. 21

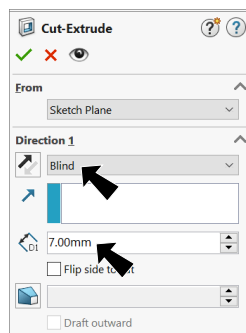


Fig. 22

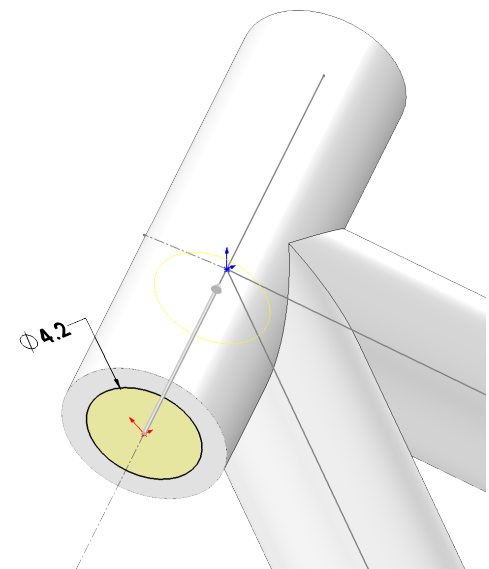


Fig. 23

## F. Duplicate Cut-Extrude1 Once.

Step 1. Rotate view to view bottom face of Chain Stay tube and Seat Stay tube, Fig. 25. Use Left Arrow key  several times.

Step 2. In Feature Manager Ctrl drag Cut-Extrude1 to bottom face of Chain Stay tube in graphics area and release, Fig. 24 and Fig. 25.

Step 3. In the Confirm Copy dialog box Click Delete button, Fig. 26.

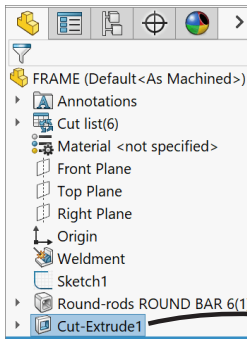


Fig. 24

Ctrl drag feature

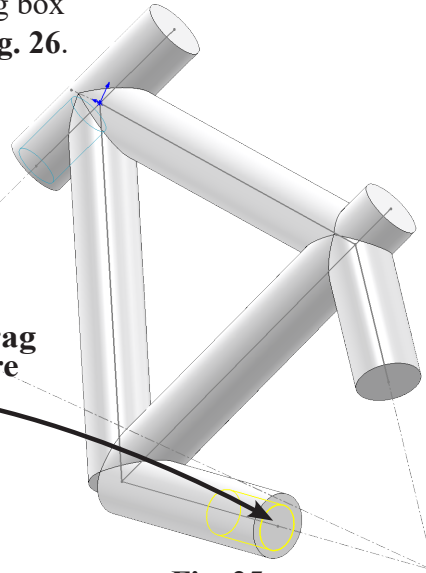


Fig. 25

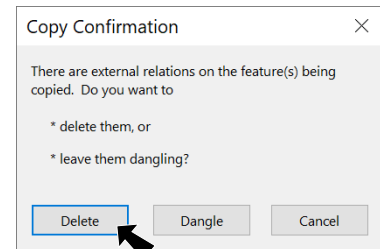



Fig. 26

Step 4. Click Cut-Extrude2 in the Feature Manager and Edit Sketch  in the content toolbar, Fig. 27.

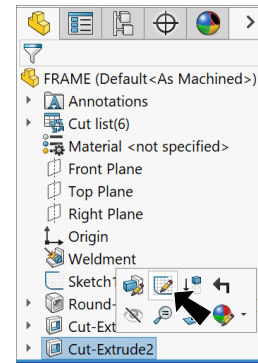
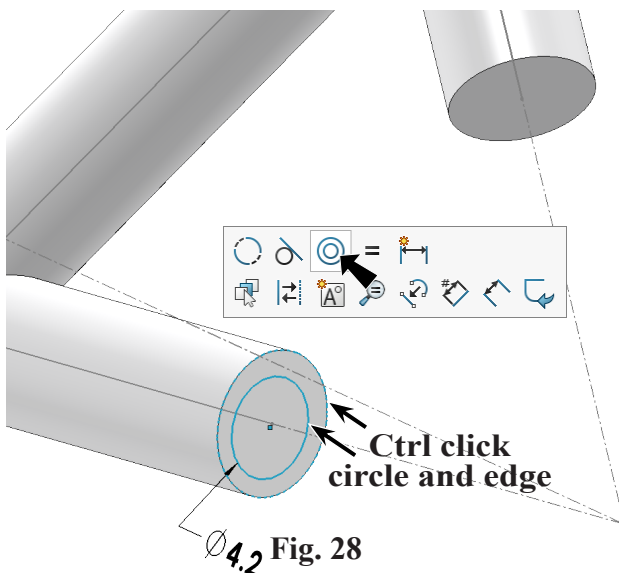


Fig. 27

Step 5. Ctrl click circle and circular edge of tube to select both. Release Ctrl key and click Make Concentric  on the context toolbar, Fig. 28.

Step 6. Click Exit Sketch  on the Sketch toolbar.



$\varnothing 4.2$  Fig. 28

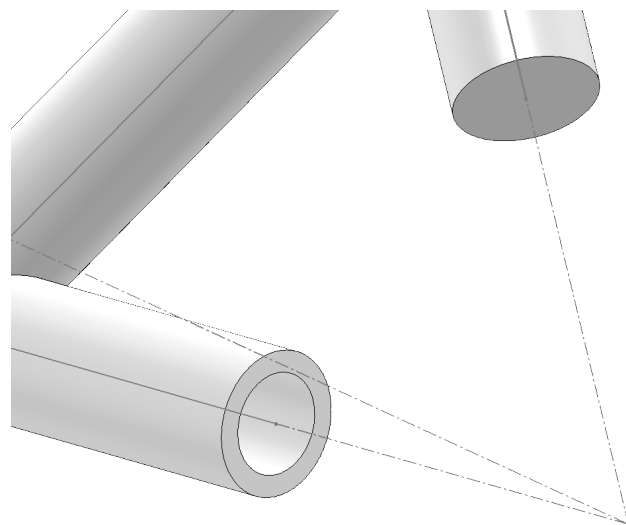
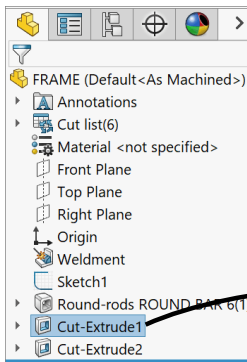


Fig. 29

## G. Duplicate Cut-Extrude 1 Twice.

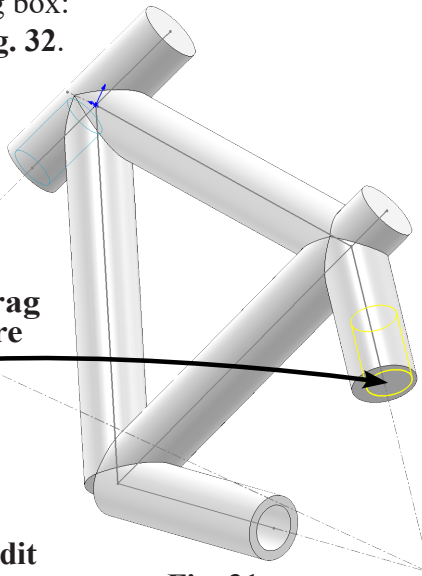
Step 7. In Feature Manager **Ctrl drag Cut-Extrude1** to bottom face of Seat Stay tube in graphics area and release, **Fig. 30** and **Fig. 31**.

Step 8. In the Confirm Copy dialog box:  
Click **Delete** button, **Fig. 32**.

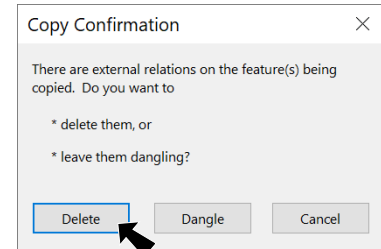


**Fig. 30**


**Ctrl drag feature**



**Fig. 31**



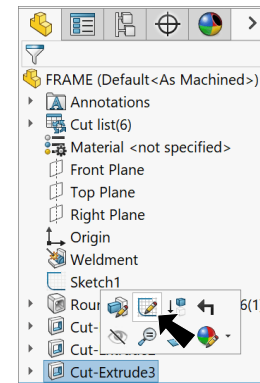
**Fig. 32**

Step 9. Click **Cut-Extrude3** in the Feature Manager and **Edit Sketch**  in the content toolbar, **Fig. 33**.

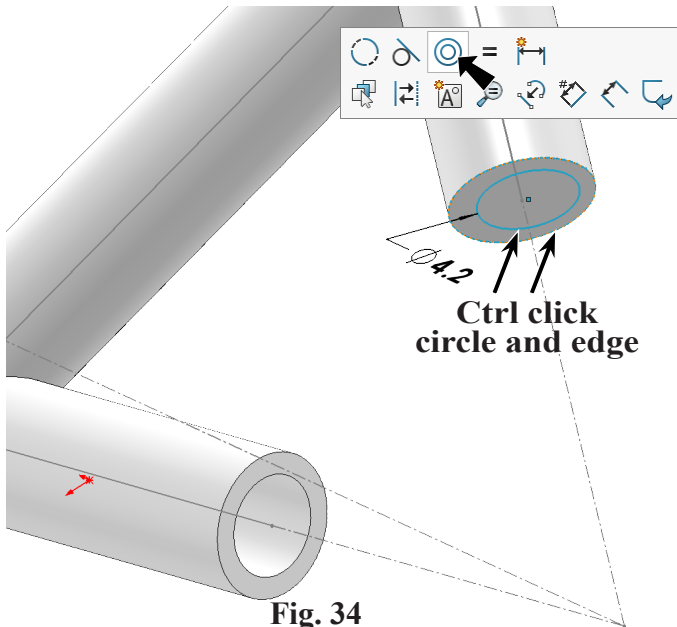
Step 10. **Ctrl click circle and circular edge of tube** to select both. Release Ctrl key and click **Make Concentric**  on the context toolbar, **Fig. 34**.

Step 11. Click **Exit Sketch**  on the Sketch toolbar.

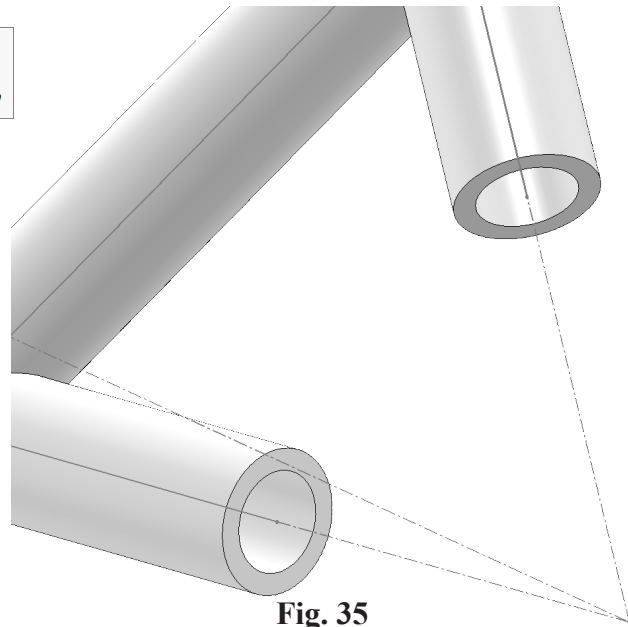
Step 12. Save  (Ctrl-S).



**Fig. 33**



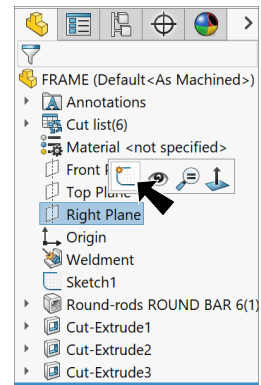
**Fig. 34**




**Fig. 35**

## H. Cut-Extrude4 3 Cuts to Seat Forks.

Step 1. Click **Right Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 36**.

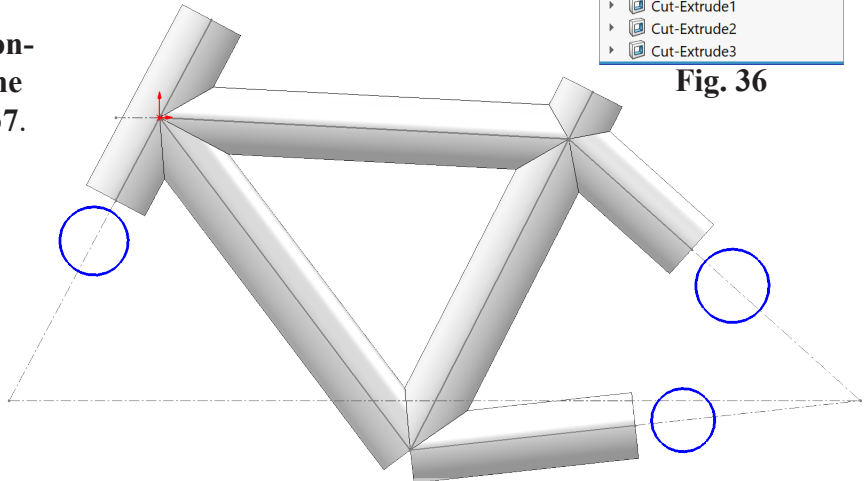


**Fig. 36**


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


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

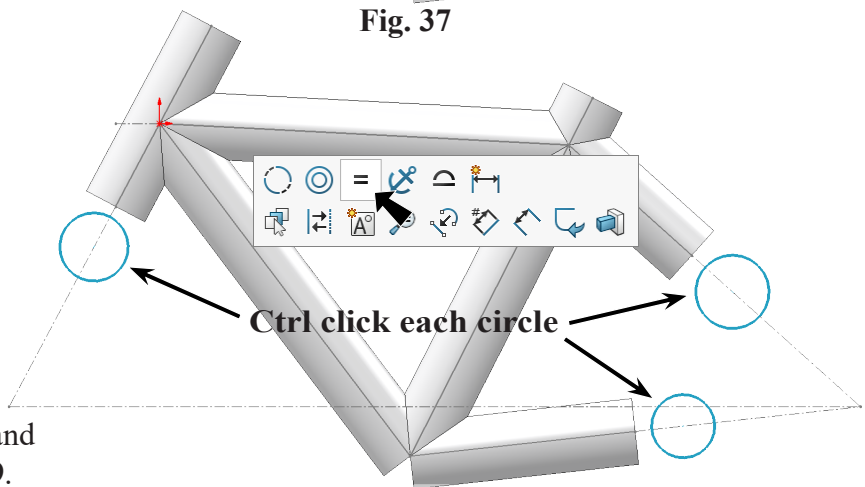
Step 4. Sketch a **circle on each construction line segment line close to split point**, **Fig. 37**.




**Fig. 37**

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

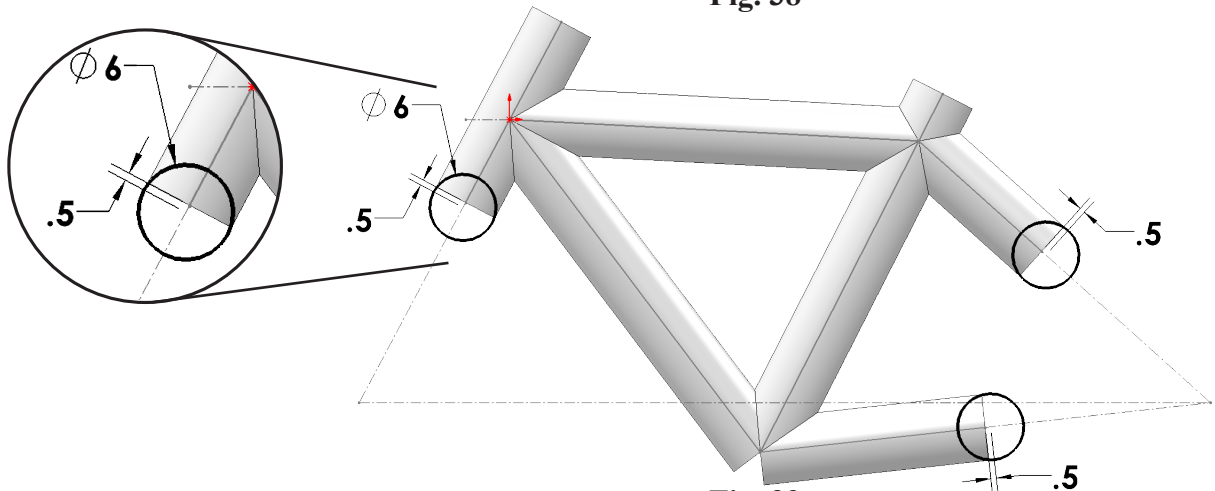
Step 6. **Ctrl click each circle** to select all three. Release Ctrl key and click **Make Equal**  on the context toolbar, **Fig. 38**.




**Fig. 38**

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

Step 8. Dimension a **diameter 6** and add **.5** dimensions, **Fig. 39**.




**Fig. 39**

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

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

Step 11. Click **Extruded Cut**  on the Features toolbar.

Step 12. In the Cut-Extrude Property Manager set:  
under Direction 1, **Fig. 40**  
End Condition **Through All - Both**  
click OK .

Step 13. Save  (Ctrl-S).

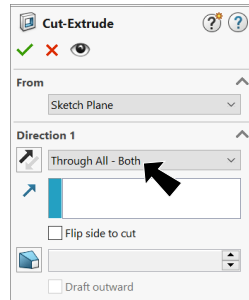


Fig. 40

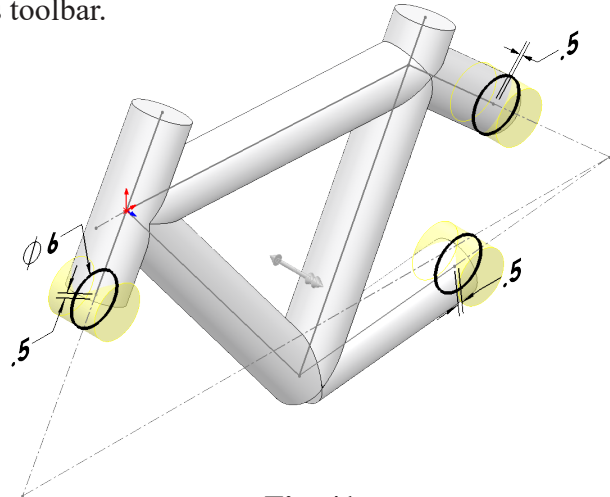





Fig. 41

## I. Extrude1 Bottom Bracket and Kick Stand Bracket.

Step 1. Click **Right Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, Fig. 42.

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

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

Step 4. Sketch two circles, one at intersection of Down Tube and Chain Stay and another on Chain Stay line, Fig. 43.

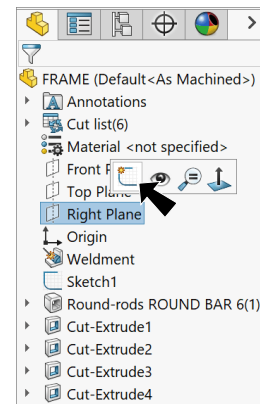


Fig. 42

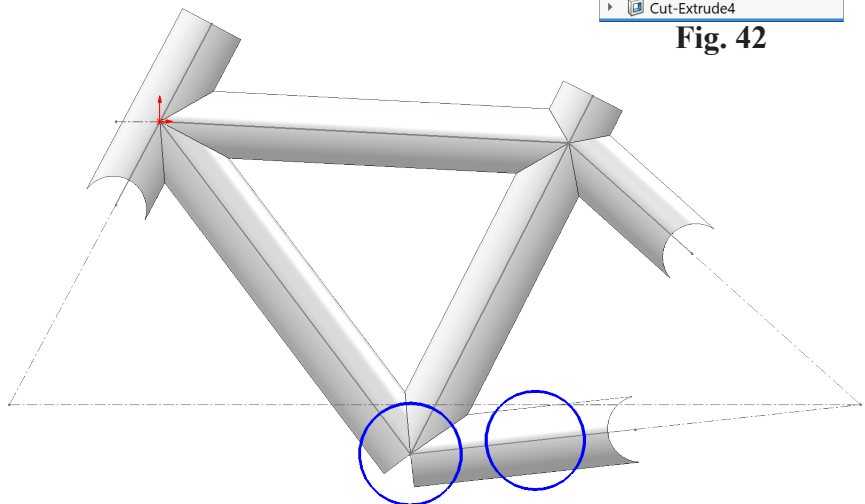
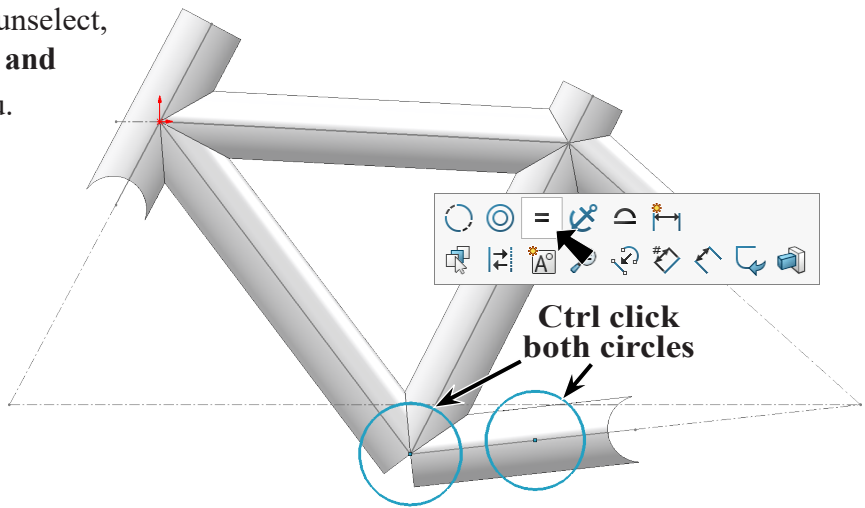


Fig. 43

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

Step 6. **Ctrl click both circles** to select both. Release Ctrl key and click **Make Equal** on the context toolbar, **Fig. 44.**

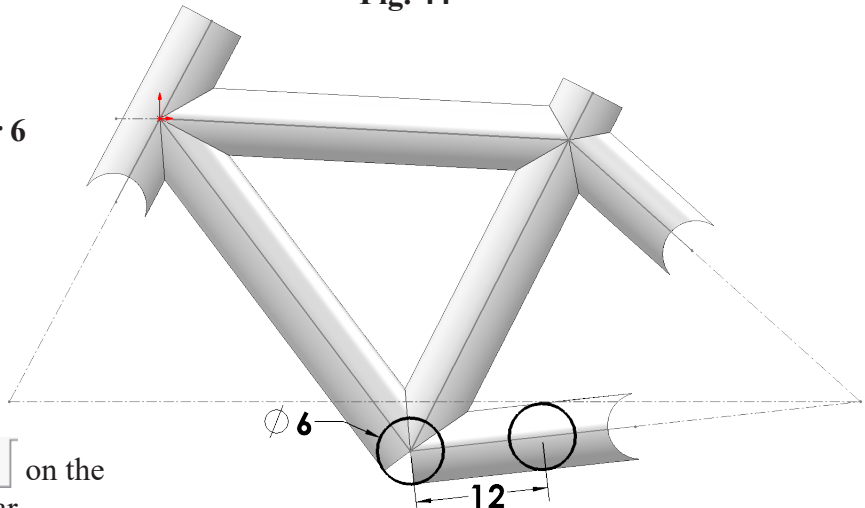


**Fig. 44**

Step 7. Click **Smart Dimension** on the Sketch toolbar.



Step 8. Add dimensions **diameter 6 and 12 between circles**, **Fig. 45.**



**Fig. 45**

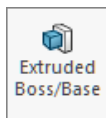
Step 9. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)



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

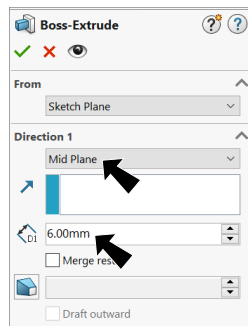


Step 11. Click **Extruded Boss/Base** on the Features toolbar.



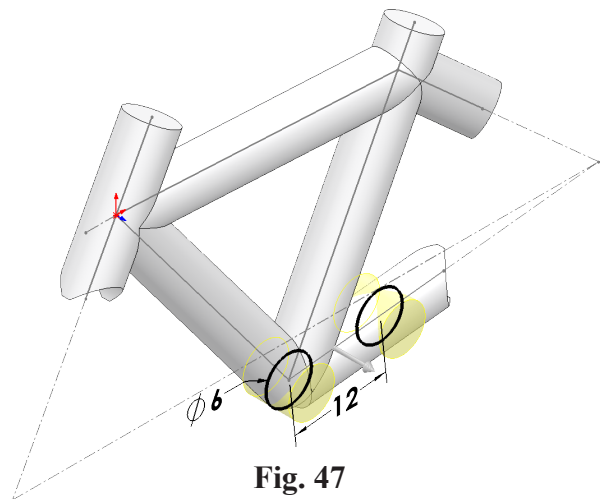
Step 12. In the Boss-Extrude Property Manager set: under Direction 1, **Fig. 46**  
End Condition **Mid Plane**

**Depth 6**  
click **OK**.





**Fig. 46**

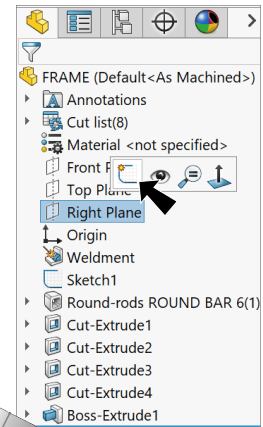
Step 13. Save (**Ctrl-S**).




**Fig. 47**

## J. Cut-Extrude4 Bottom Bracket and Kick Stand Bracket.

Step 1. Click **Right Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 48**.

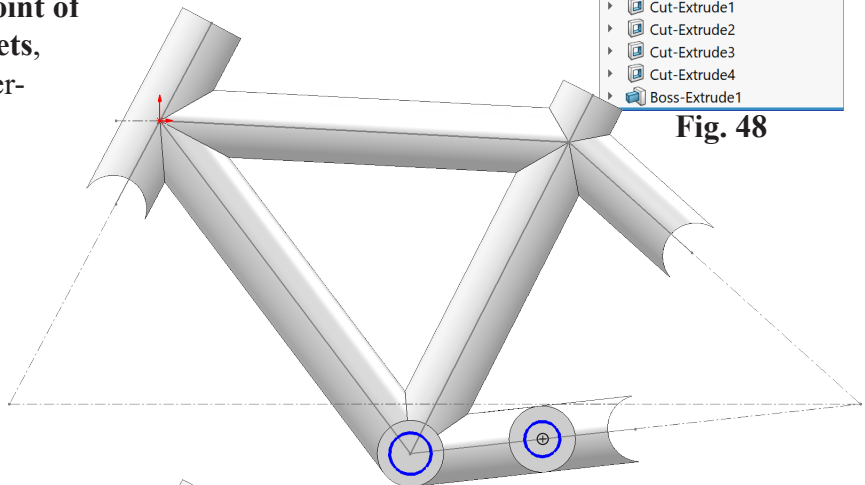


**Fig. 48**


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

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


Step 4. Sketch **circles at centerpoint of cylindrical face of brackets, Fig. 49**. To wake up center-point, hover cursor over circular edge.




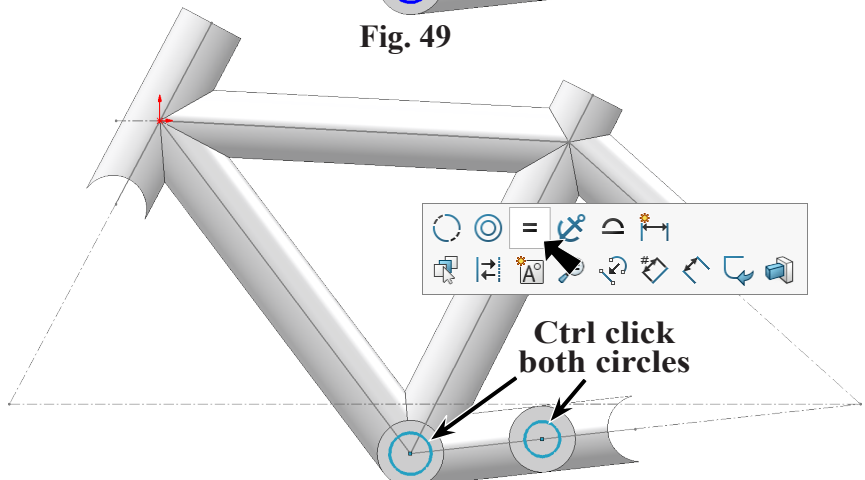
**Fig. 49**

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

Step 6. **Ctrl click each circle** to select both. Release Ctrl key and click **Make**

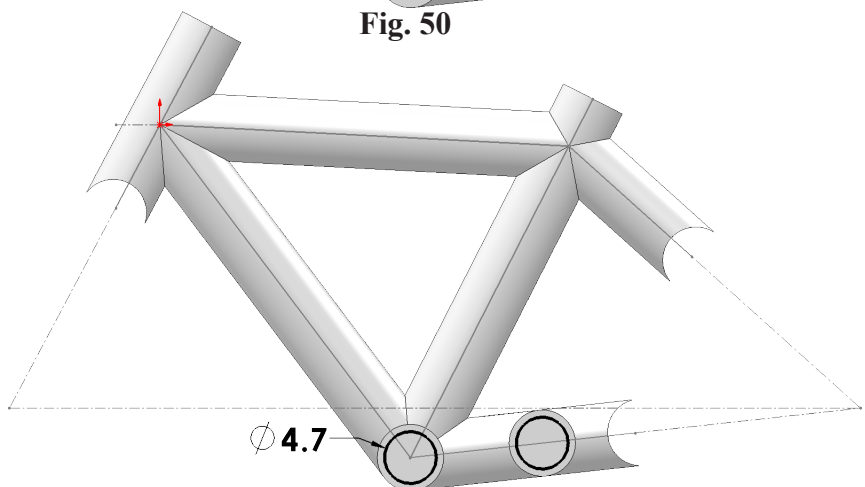
**Equal**  on the context toolbar, **Fig. 50**.

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




**Fig. 50**

Step 8. Dimension **diameter 4.7, Fig. 51**.




**Fig. 51**

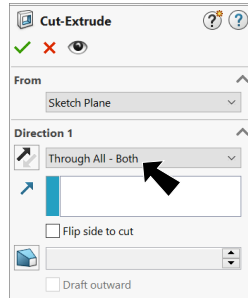
Step 9. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

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

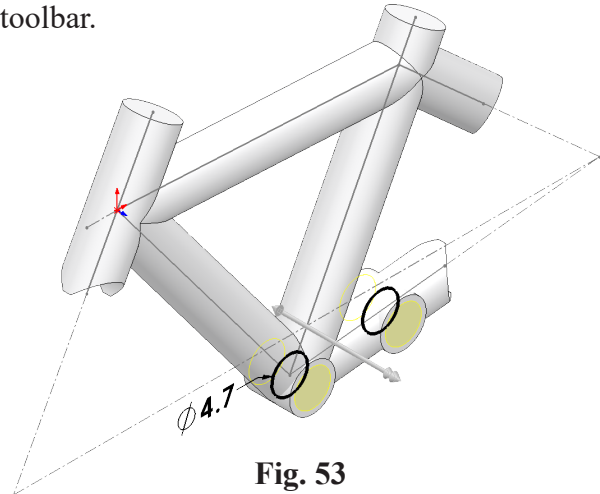
Step 11. Click **Extruded Cut**  on the Features toolbar.

Step 12. In the Cut-Extrude Property Manager set:  
under Direction 1, **Fig. 52**  
End Condition **Through All - Both**  
click OK .

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




**Fig. 52**





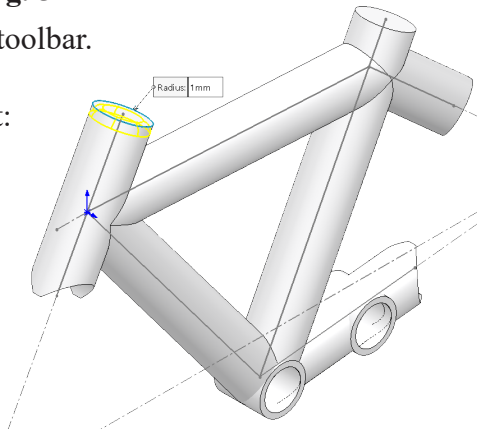
**Fig. 53**

## K. Fillet1.

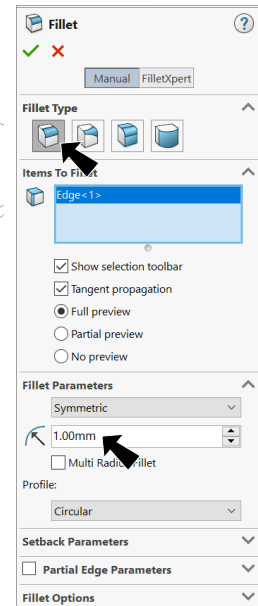
Step 1. Click **Fillet**  on the Features toolbar.

Step 2. In the Fillet Property Manager set:  
under Fillet Type, **Fig. 54**  
select **Constant Size** 

**Radius**  **1**  
click **top circular edge of Head Tube**, **Fig. 55**  
click OK .



**Fig. 55**





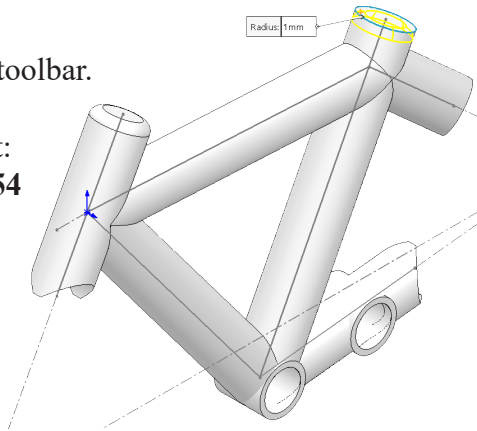
**Fig. 54**

## L. Fillet2.

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

Step 2. In the Fillet Property Manager set:  
under Fillet Parameters, **Fig. 54**



**Radius**  **1**  
click **top circular edge of Seat Tube**, **Fig. 56**  
click OK .




**Fig. 56**

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

## M. Appearance: Blue Paint.

Step 1. Click the part to select part, click **Appearances Callout**  on the context toolbar and click **FRAME** , Fig. 57.

Step 2. In the Appearances Task pane, expand **Painted**, click **Car** and in the lower pane select **gloss blue**, Fig. 58.

Step 3. In the Appearances Property Manager set:  
 under Color, Fig. 59  
 set **RGB** values  
**R 207**  
**G 229**  
**B 255**  
 click **OK** .

Step 4. Save  (Ctrl-S).

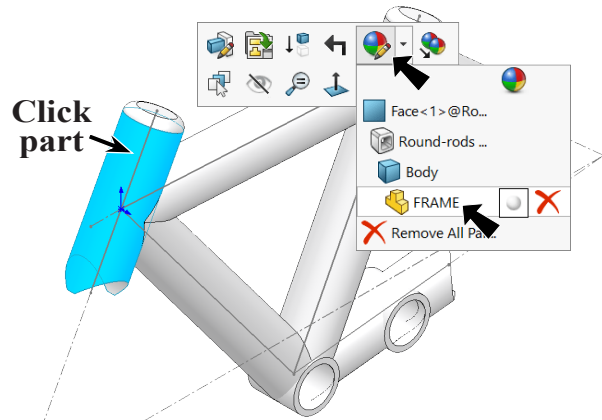


Fig. 57

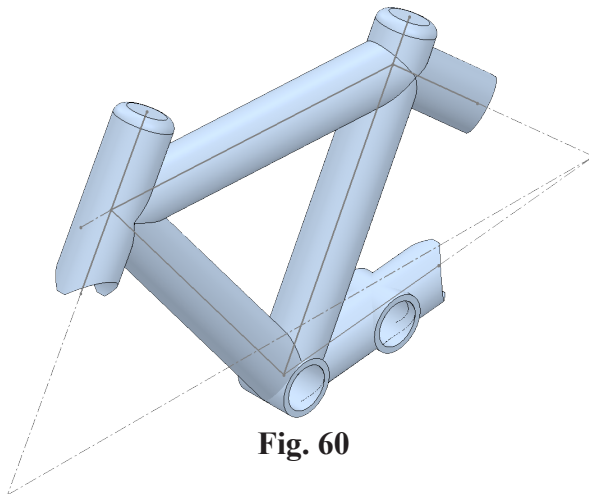


Fig. 60

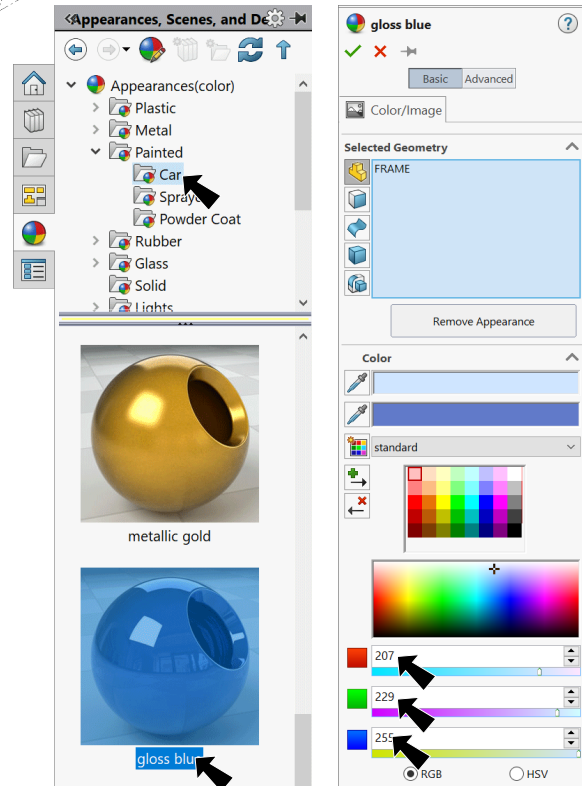


Fig. 58

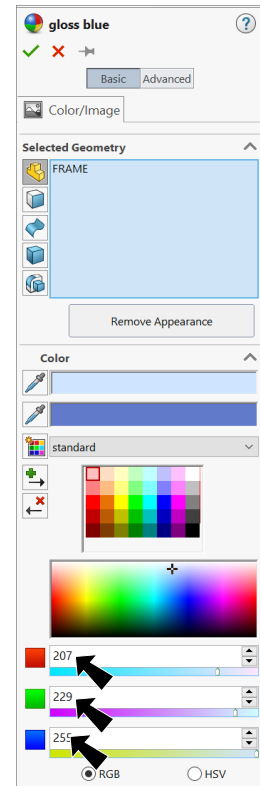


Fig. 59