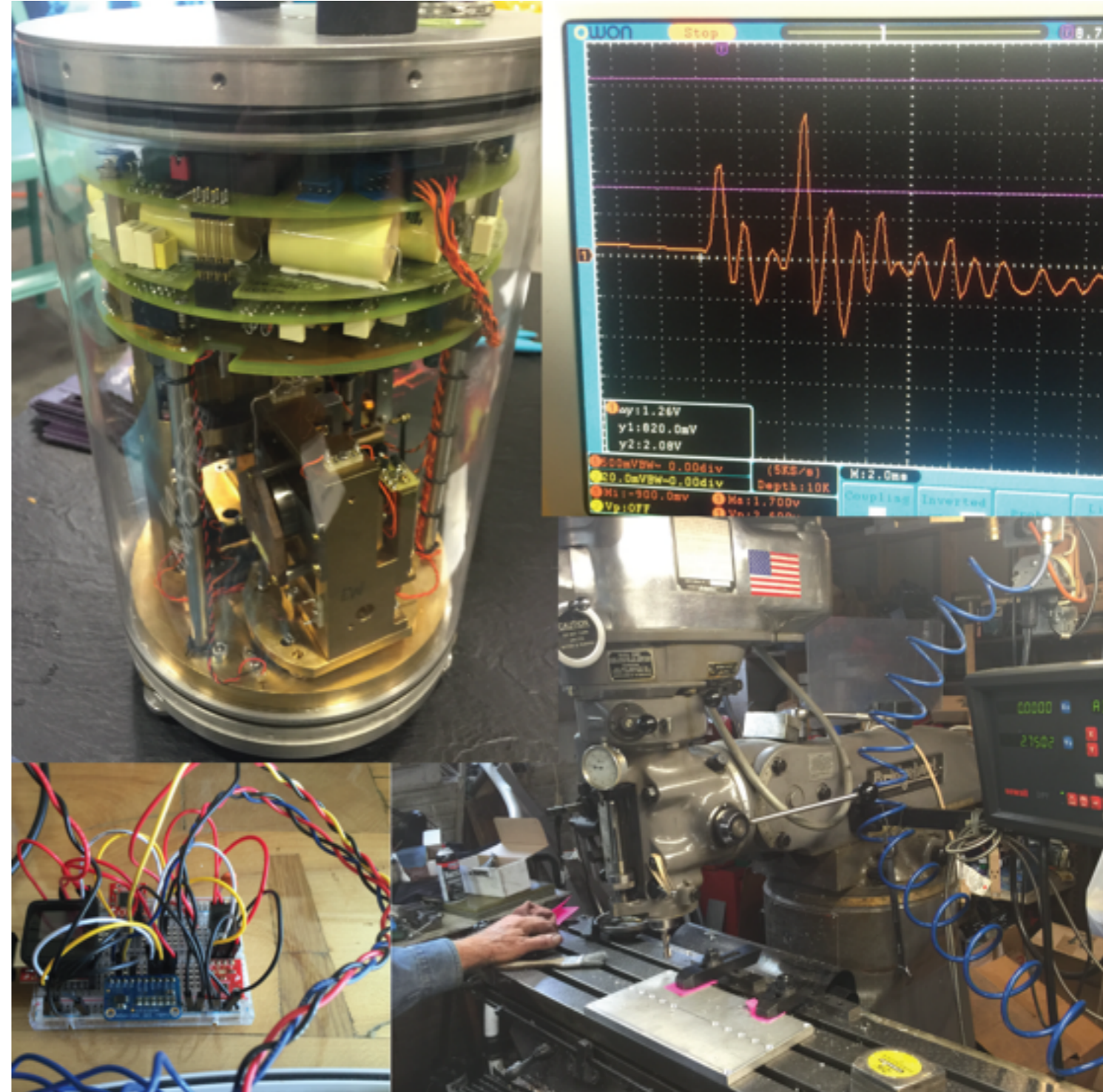


Mechanical Drawing

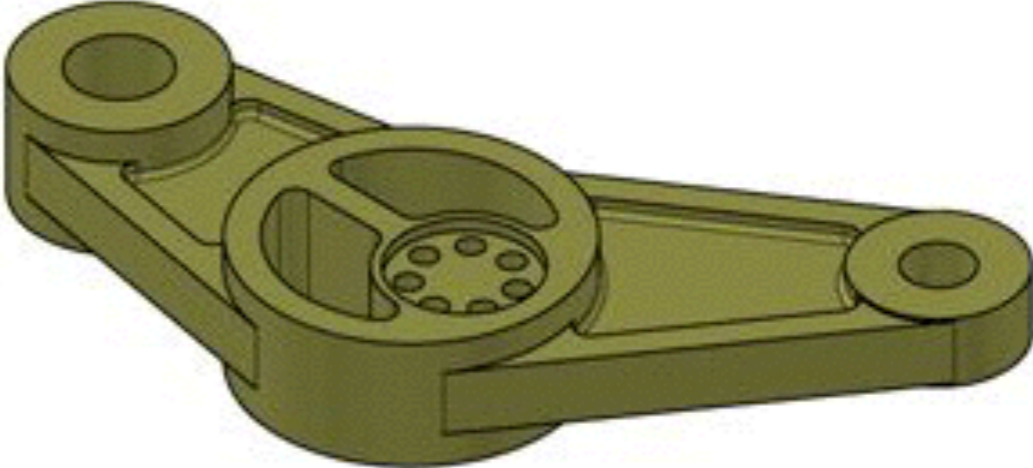
J.R. Leeman and C. Marone

Techniques of Geoscientific
Experimentation

September 22, 2016



You've got an idea - now you need to tell the shop what to make and communicate your idea to others



You've got an idea - now you need to tell the shop what to make and communicate your idea to others

The image displays a technical drawing of a control arm, including a top view, an aligned section A-A, and two 3D perspective views. The top view (1:2) shows a central hub with a 7x Ø8 hole pattern, a 20mm offset, and a 127mm total length. It features two Ø30 mounting holes, a 20x R5 fillet, and various radii (R40, R12, 2x R25). A section line A-A is shown. The aligned section A-A (1:2) shows a cross-section with a 40mm thickness, a 10mm offset, and a 32mm hole diameter. The 3D views show the part in olive green and yellow, highlighting its complex geometry and mounting features.

TOP VIEW (1:2)

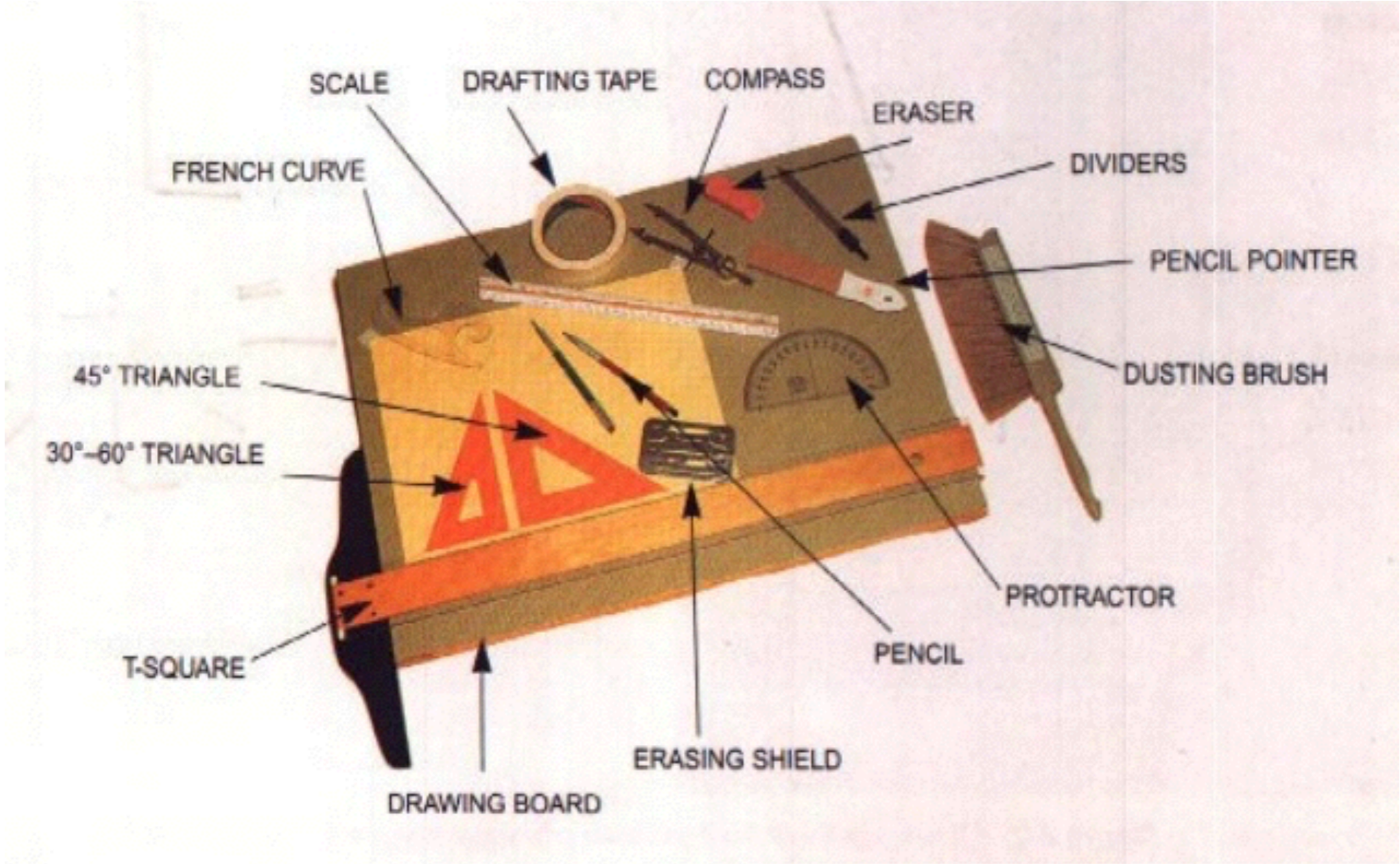
3D VIEW #1

ALIGNED SECTION A-A (1:2)

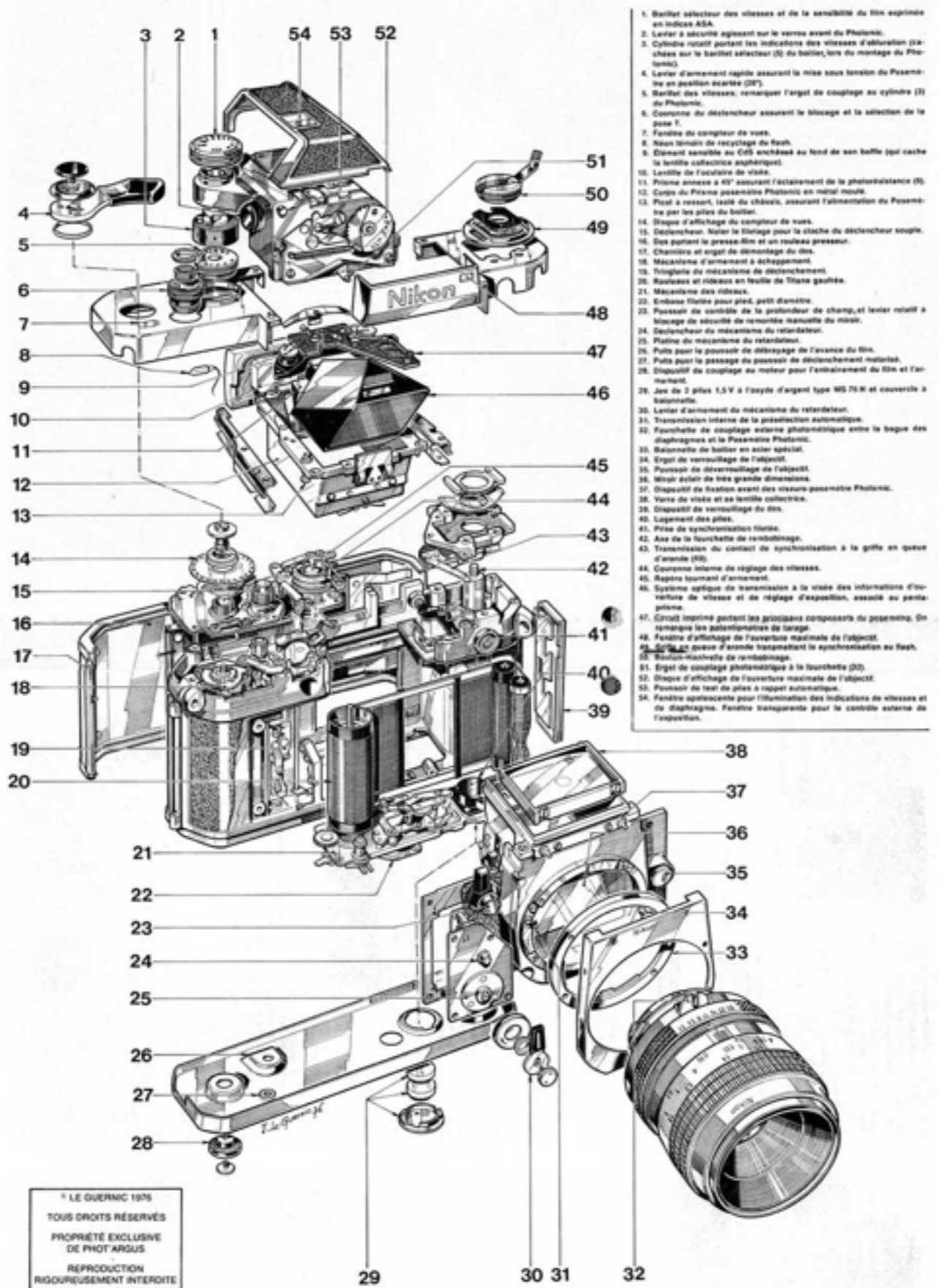
3D VIEW #2

AutoCAD 3	
3D Modeling	
PROJECT:	Lesson 14 Practice 14_2
DRAWING TITLE:	CONTROL ARM
DRAWN BY:	KJ
DATE:	03/08/2013
SCALE:	1:2
CLASS:	CADD3
DRAWN BY:	KJ
DRAWING NUMBER:	M-1

Drawing has been traditionally accomplished with drafting tools

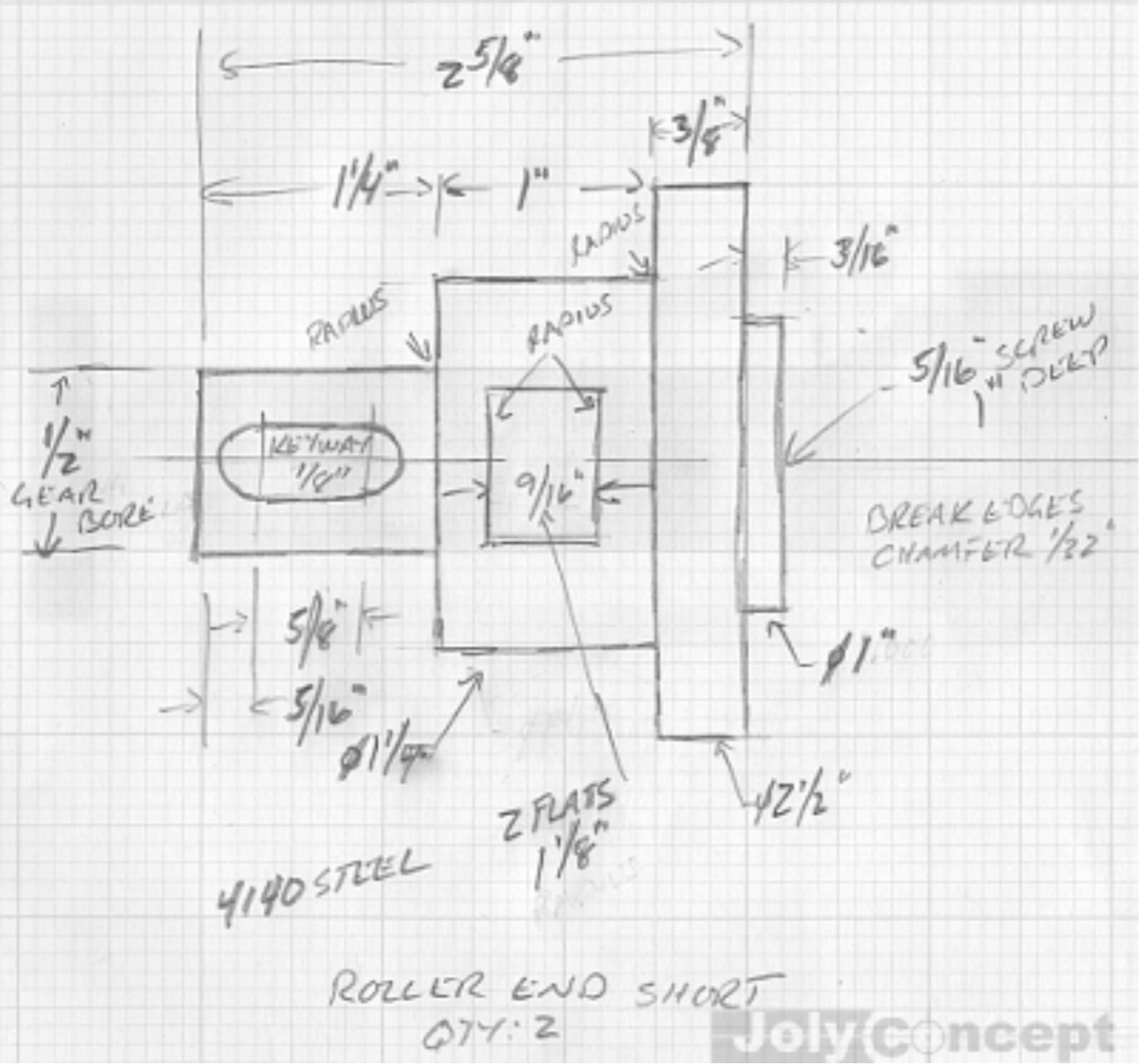


Drawing has been traditionally accomplished with drafting tools

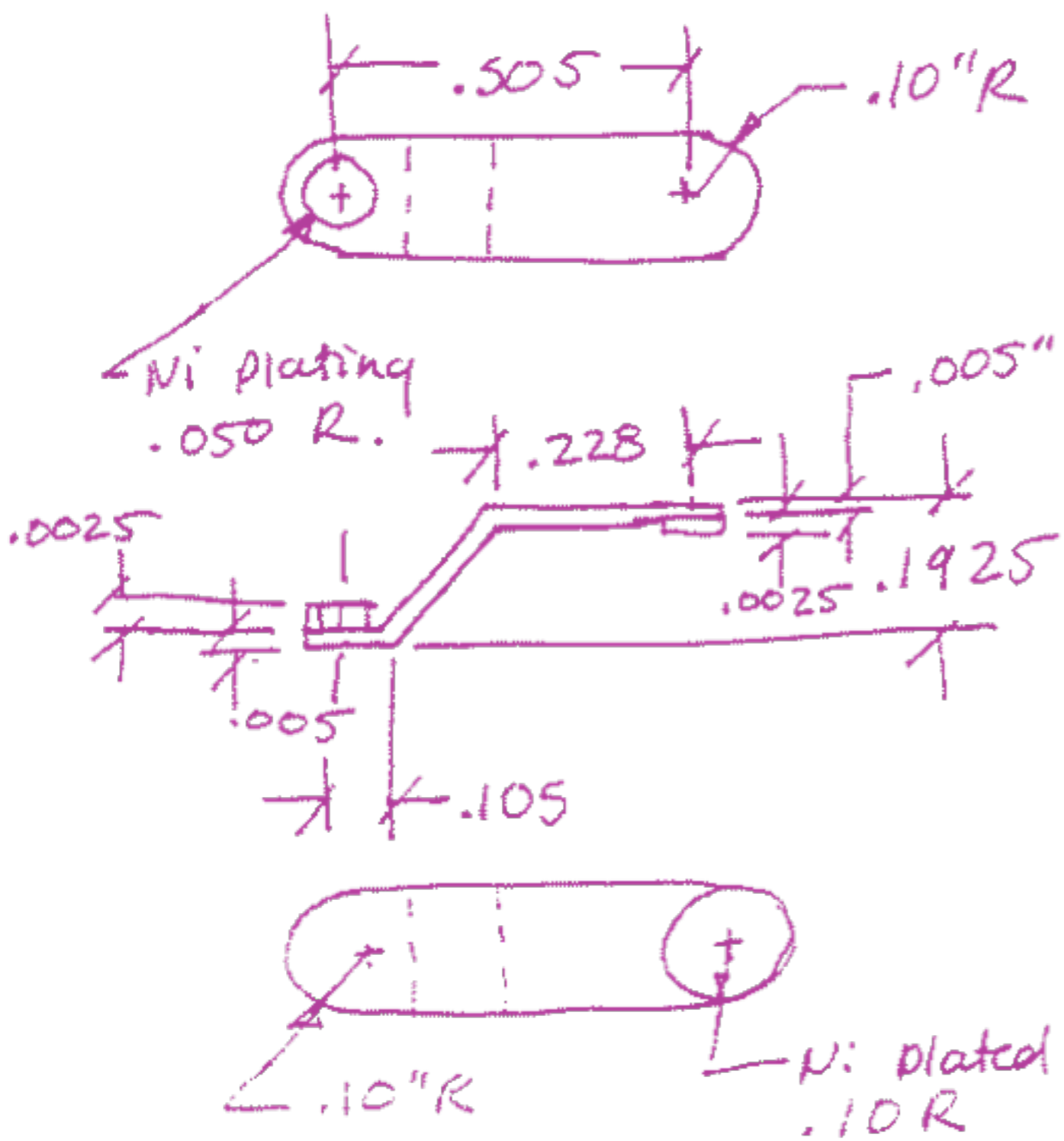


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 PROPRIÉTÉ EXCLUSIVE
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 REPRODUCTION
 RIGOREUSEMENT INTERDITE

Drawing has been traditionally accomplished with drafting tools



Drawing has been traditionally accomplished with drafting tools

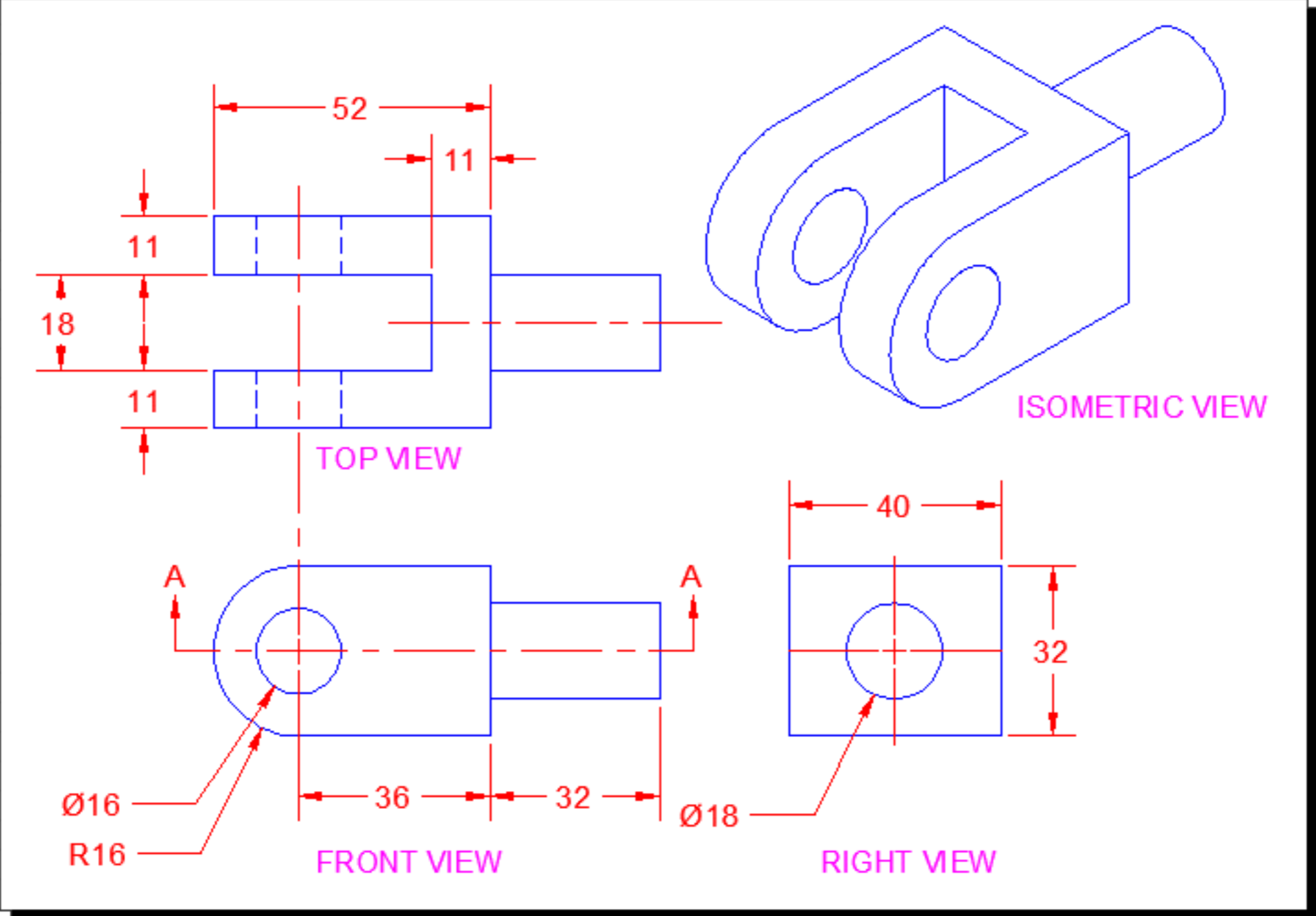


CONTACT #2

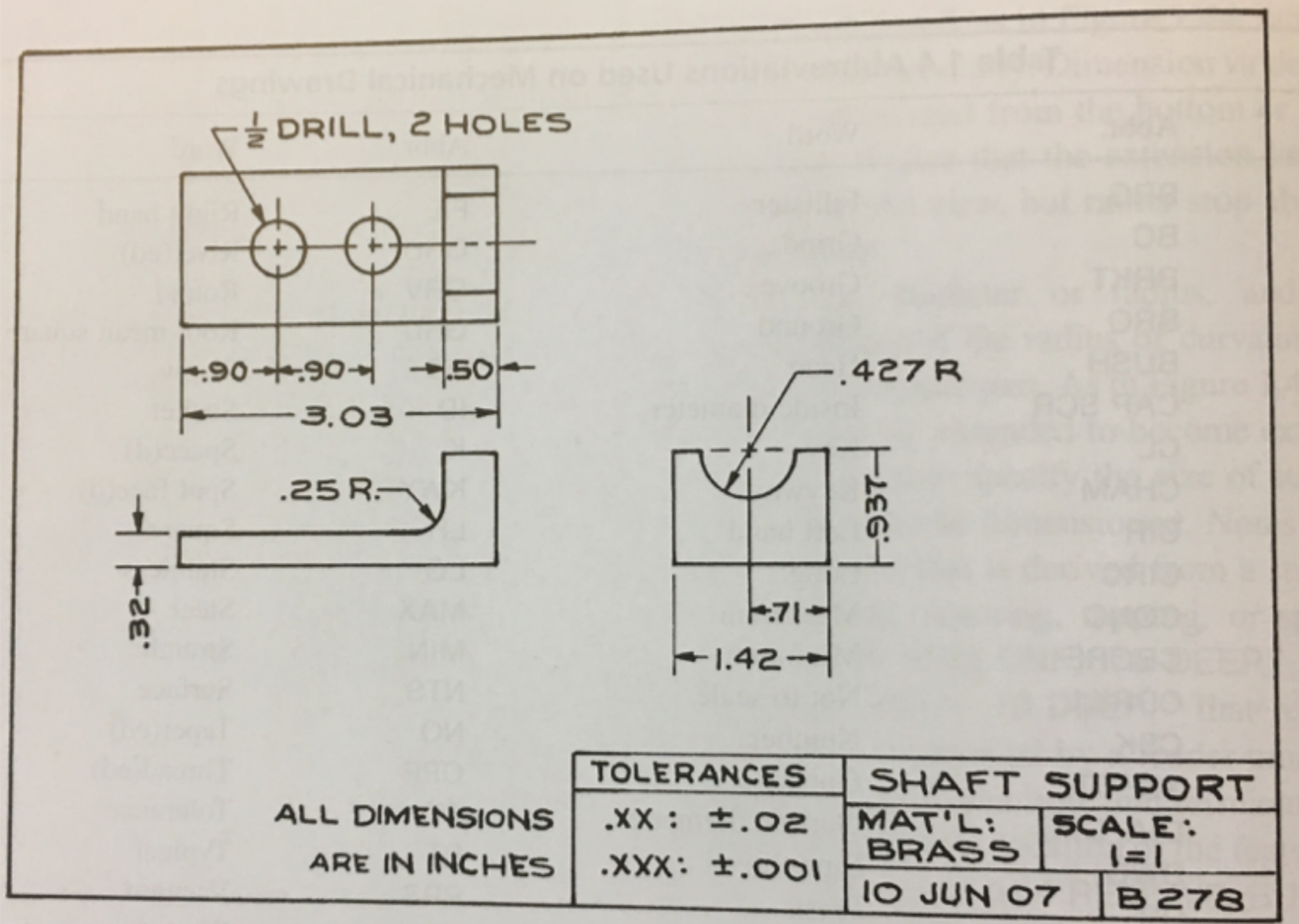
TOP OF ONE BATTERY TO THE NEGATIVE CONTACT ON CIRCUIT BOARD.

- BE COPPER
- ~~A~~ GLUED TO TOP HALF OF ENVELOPE.
- BEND RADIUS TO BE $.05R$

We generally use CAD tools now, but not always for one-offs



A mechanical drawing has several important parts

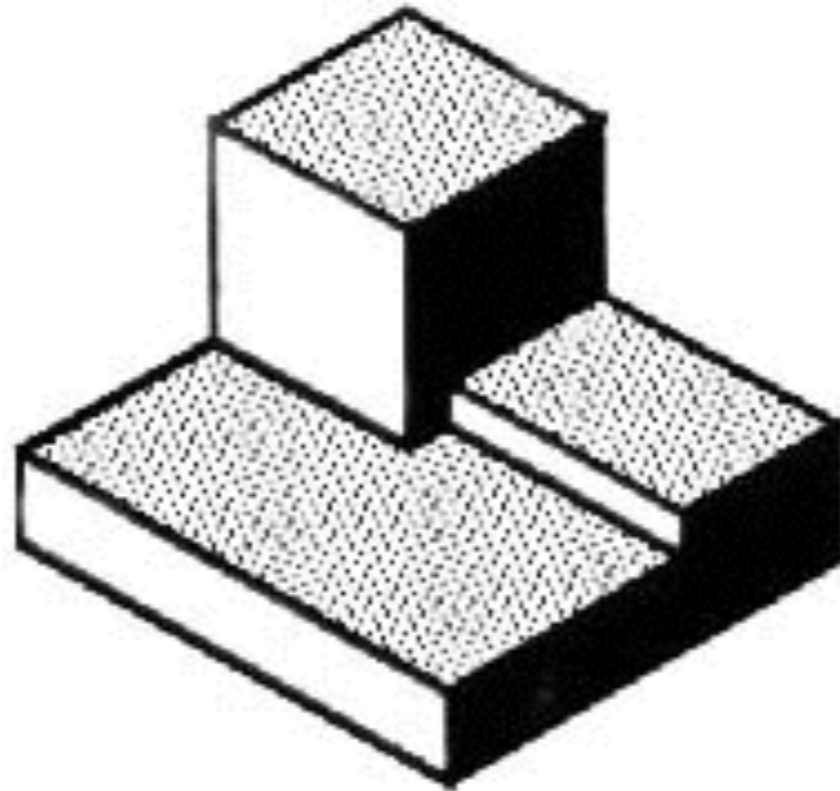


You'll see lots of abbreviations on drawings

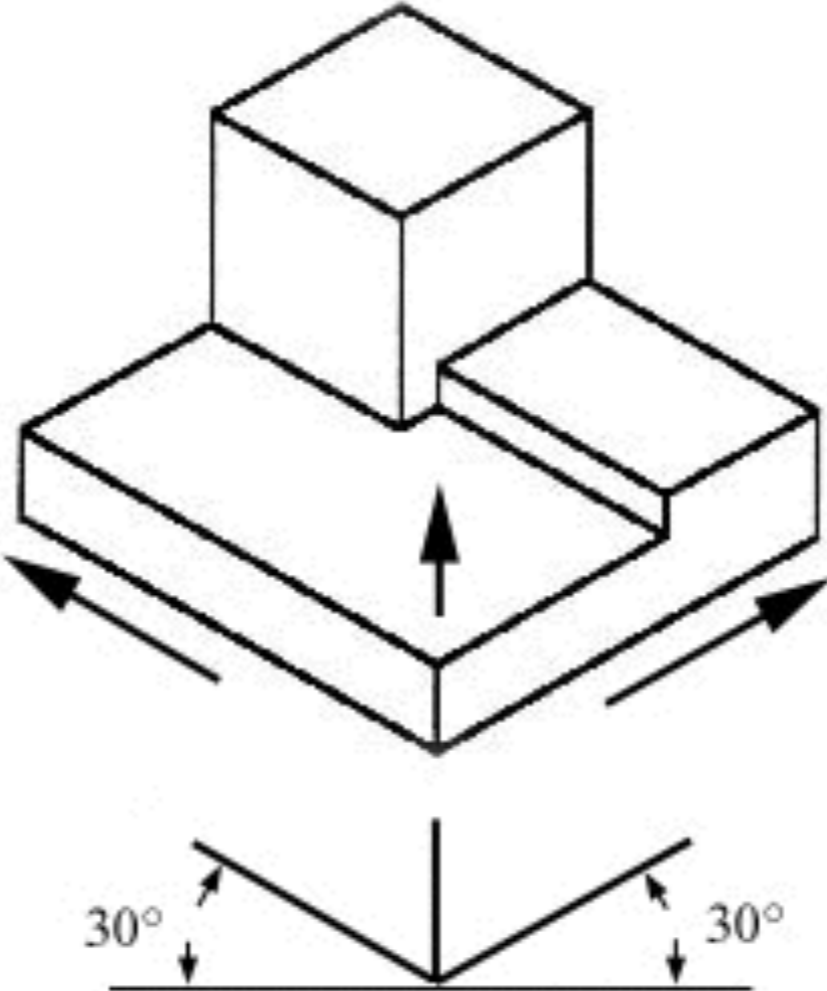
Table 1.4 Abbreviations Used on Mechanical Drawings

Word	Abbr.	Word	Abbr.	Word	Abbr.
Bearing	BRG	Fillister	FIL	Right hand	RH
Bolt circle	BC	Grind	GRD	Rivet(ed)	RIV
Bracket	BRKT	Groove	GRV	Round	RD
Broach(ed)	BRO	Ground	GRD	Root mean square	RMS
Bushing	BUSH	Head	HD	Screw	SCR
Cap screw	CAP SCR	Inside diameter	ID	Socket	SOC
Center line	CL	Key	K	Space(d)	SP
Chamfer	CHAM	Keyway	KWY	Spot face(d)	SF
Circle	CIR	Left hand	LH	Square	SQ
Circumference	CIRC	Long	LG	Stainless	STN
Concentric	CONC	Maximum	MAX	Steel	STL
Counterbore	CBORE	Minimum	MIN	Straight	STR
Counterdrill	CDRILL	Not to scale	NTS	Surface	SUR
Countersink	CSK	Number	NO	Taper(ed)	TPR
Cross section	XSECT	Opposite	OPP	Thread(ed)	THD
Diameter	DIA, D, Ø	Outside diameter	OD	Tolerance	TOL
Drawing	DWG	Pipe thread	PT	Typical	TYP
Drill(ed)	DR	Press	PRS	Vacuum	VAC
Each	EA	Punch	PCH	Washer	WASH
Equal(ly)	EQ	Radius	R	With	W/
Fillet	FIL	Reference line	REF	Without	W/O

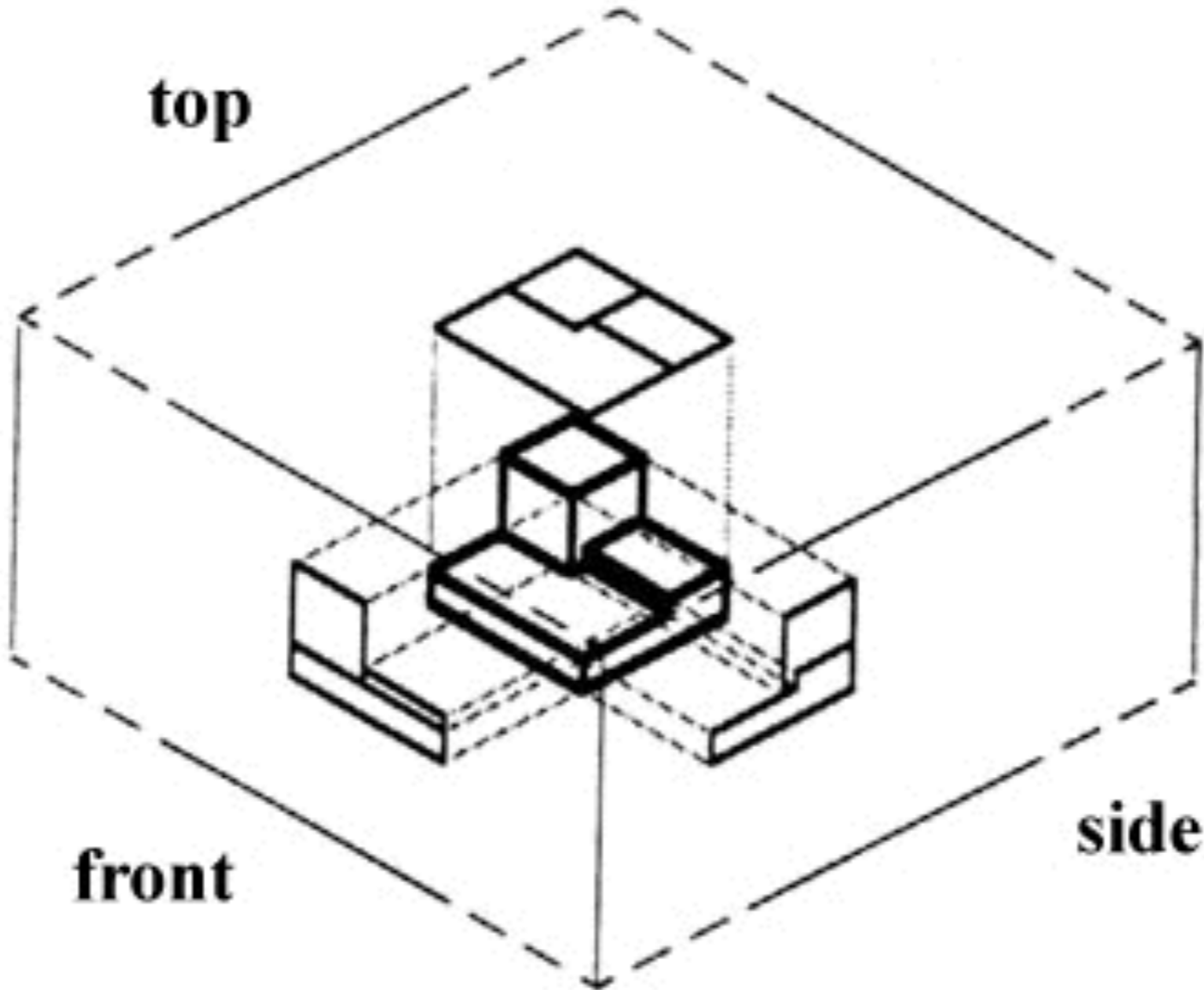
We will use this simple machined part to illustrate how to make a drawing



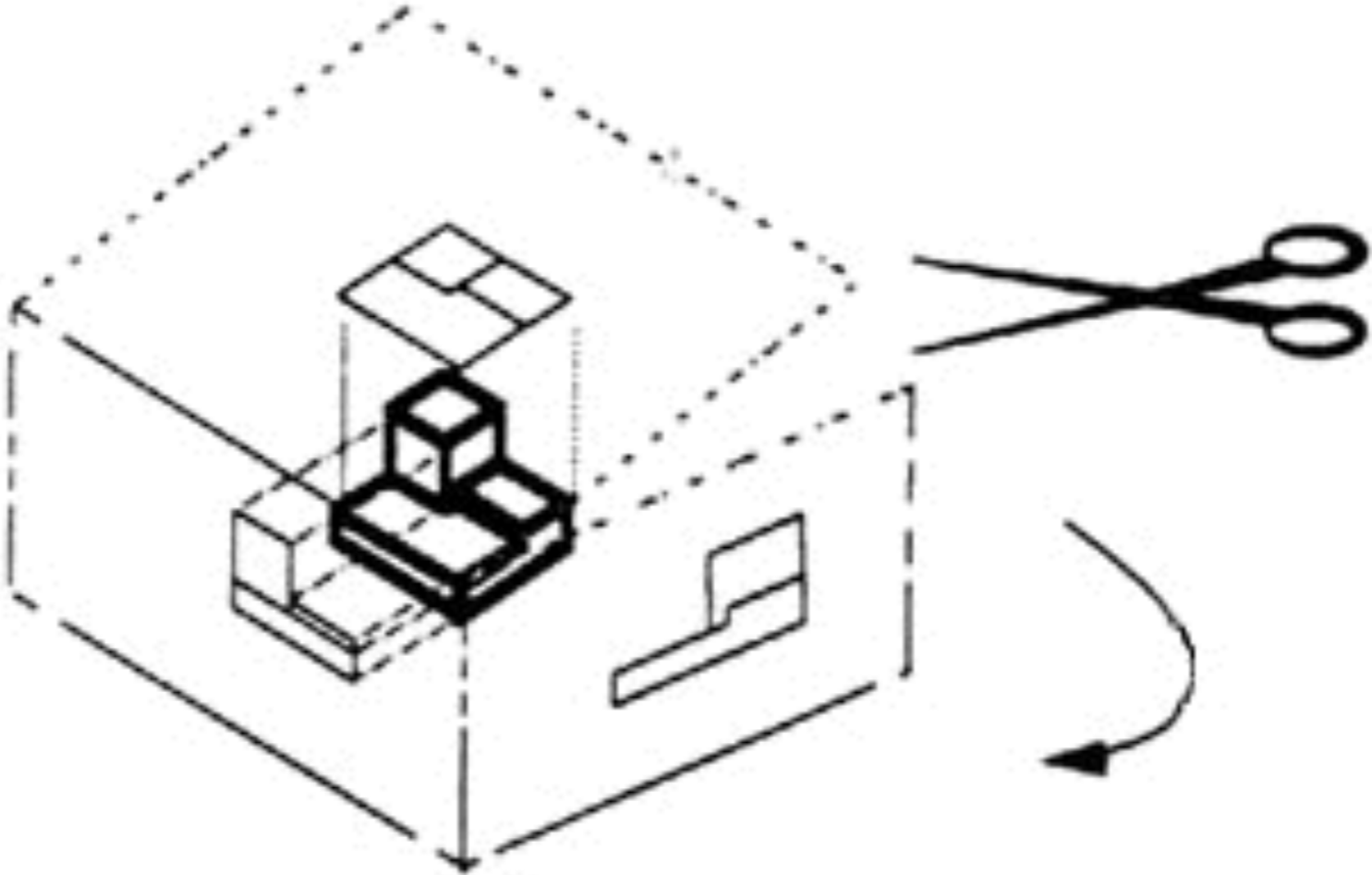
We show parts using isometric and orthogonal drawings



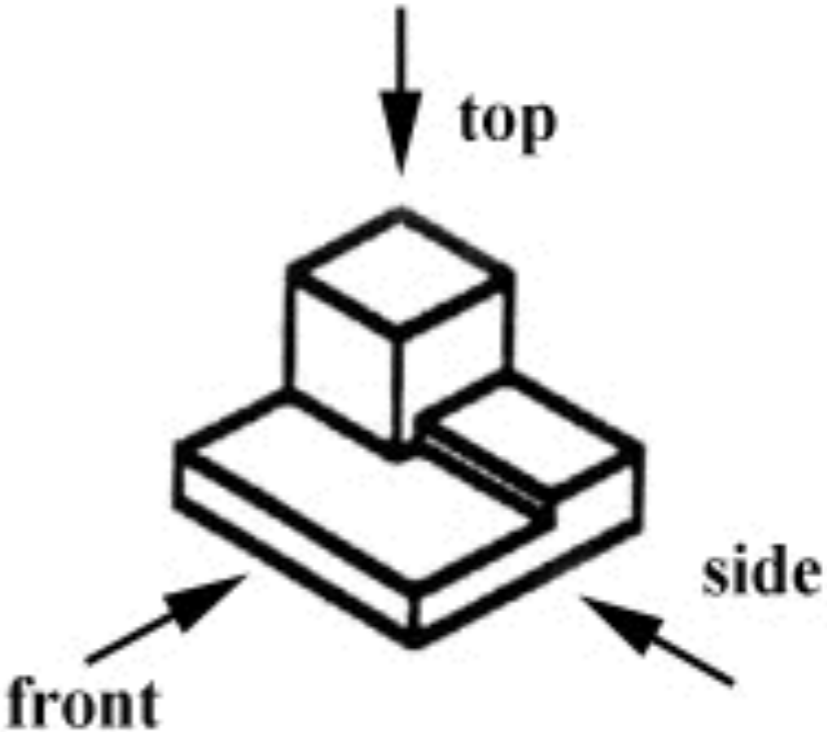
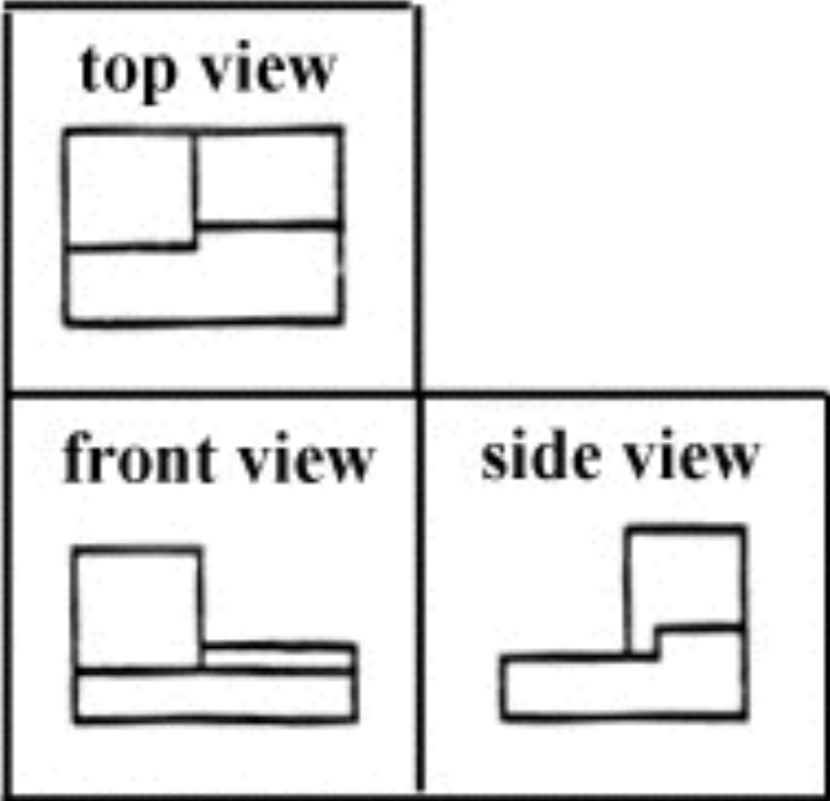
Imagine looking at the object from the fundamental 6 directions



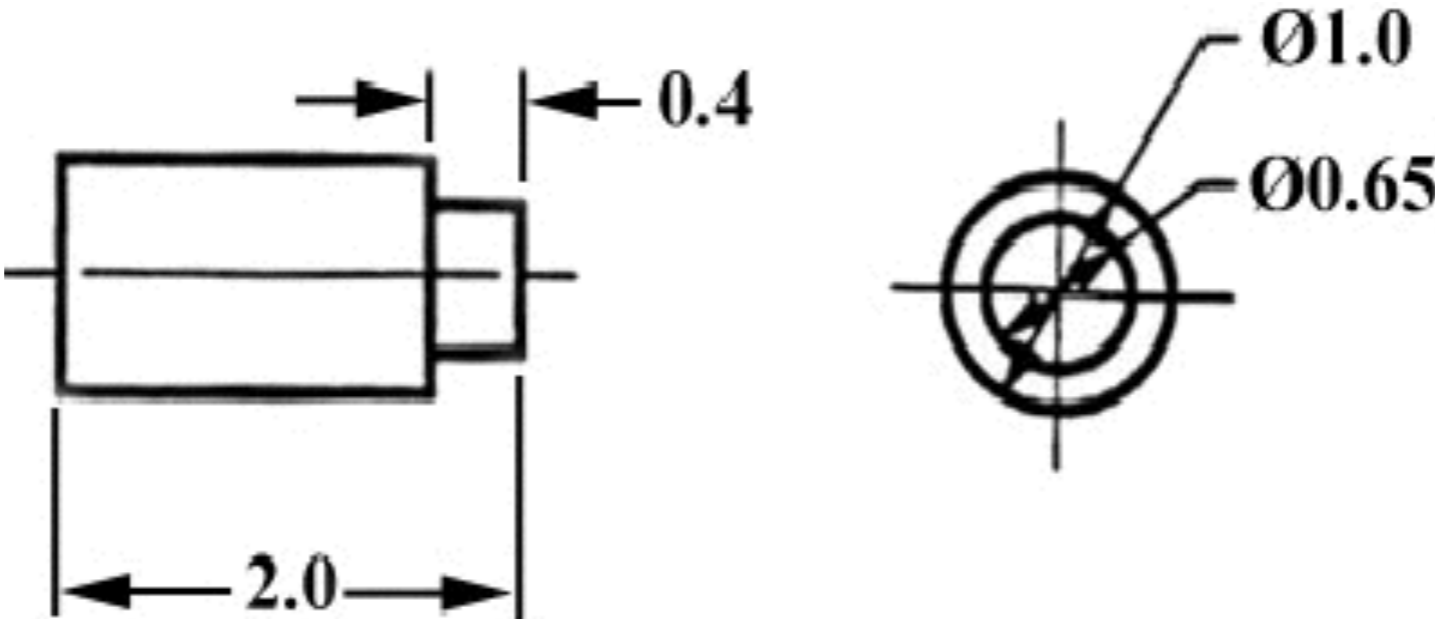
Unfold that view box and you've created an orthogonal drawing



Unfold that view box and you've created an orthogonal drawing



Parts could take only 2 views or many views to describe



Not all angles will be required for most parts

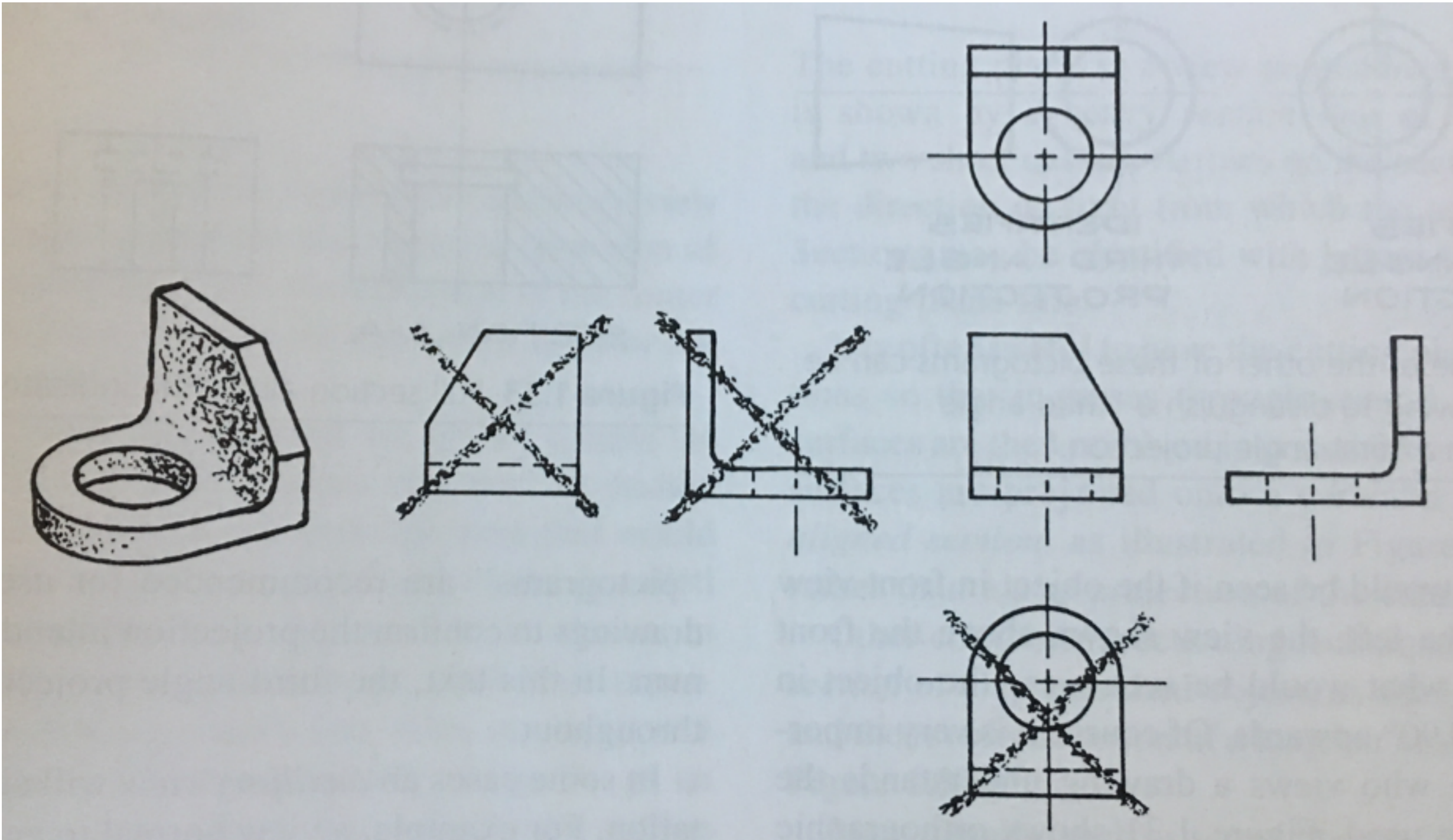
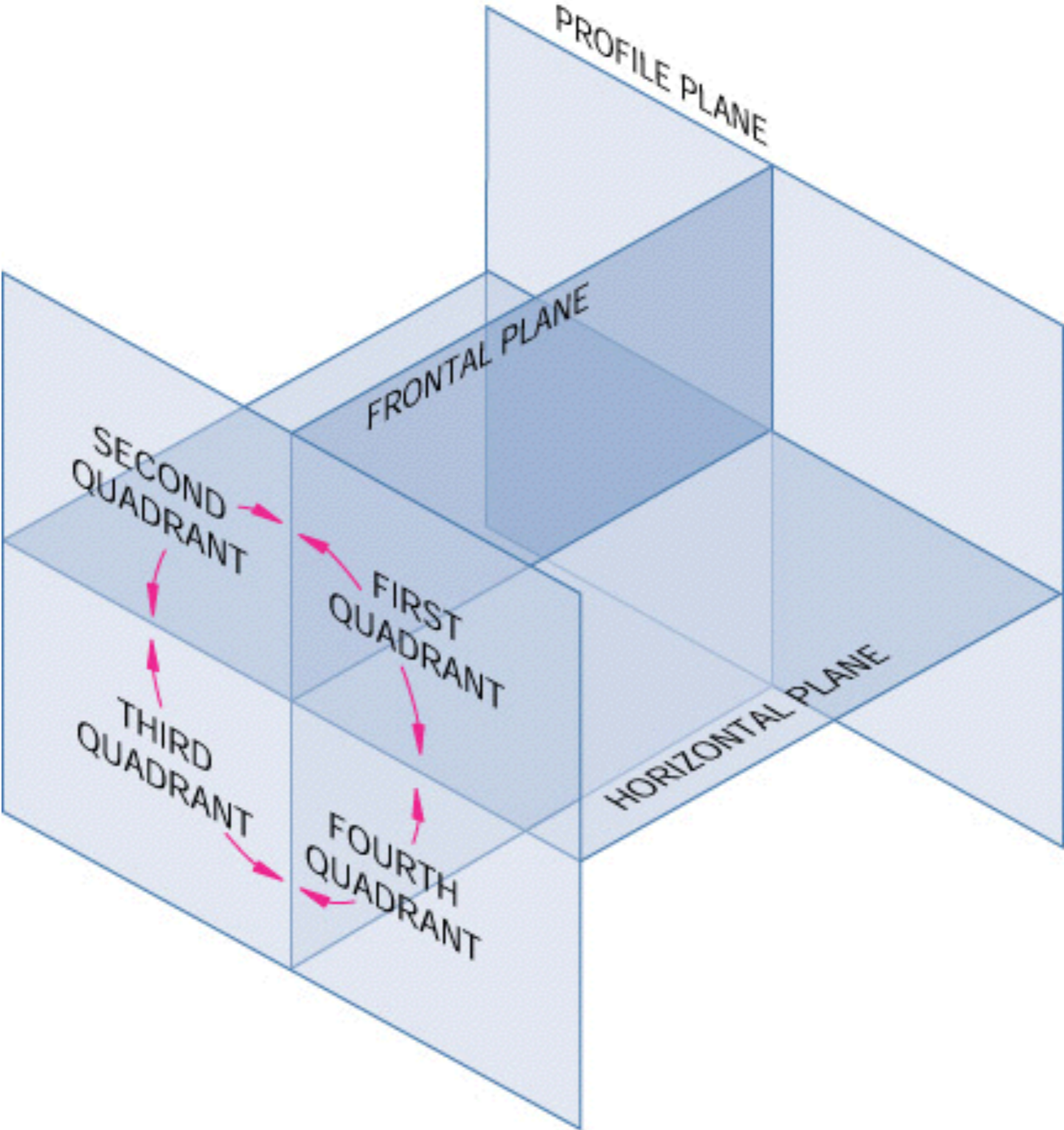
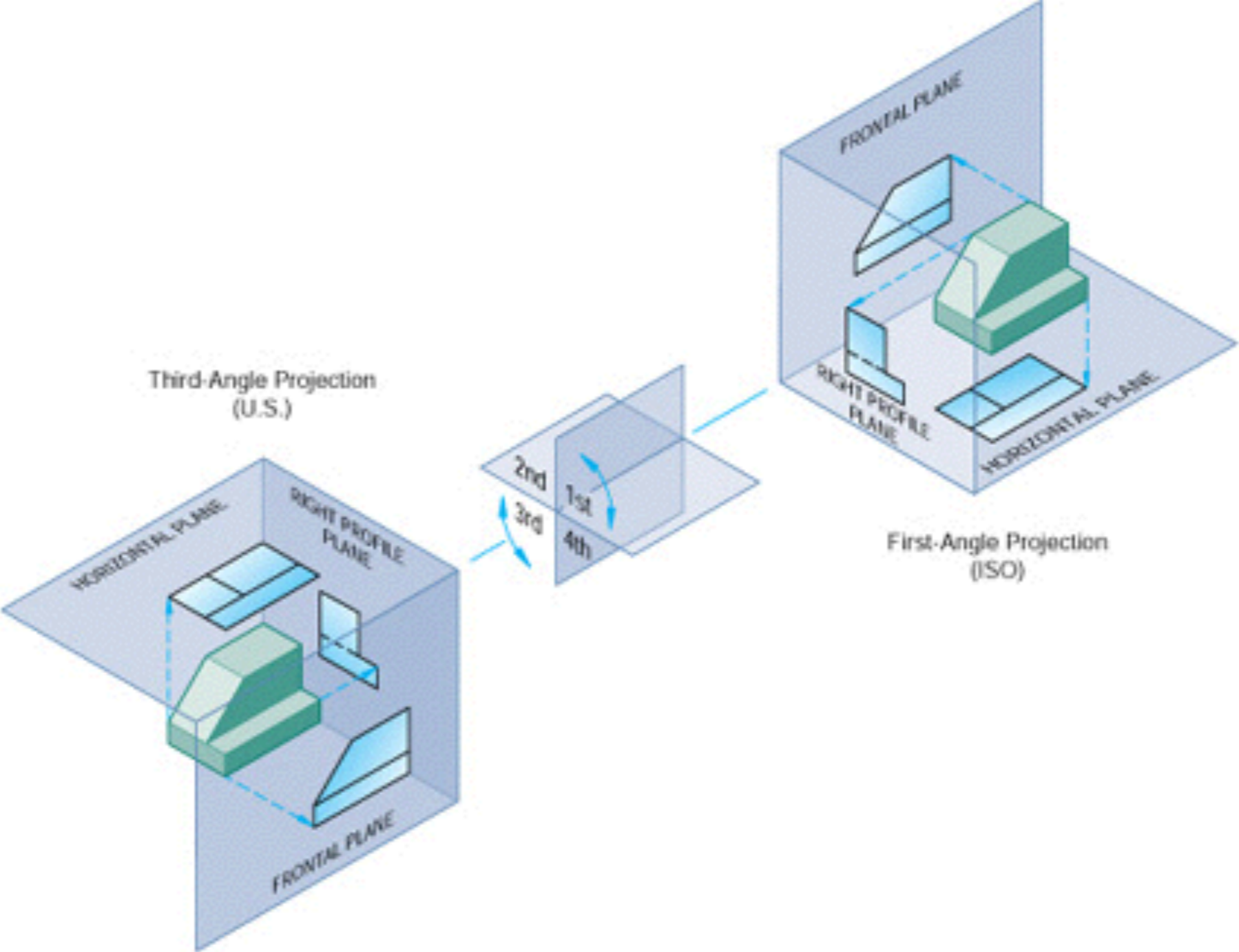


Image: Building Scientific Apparatus

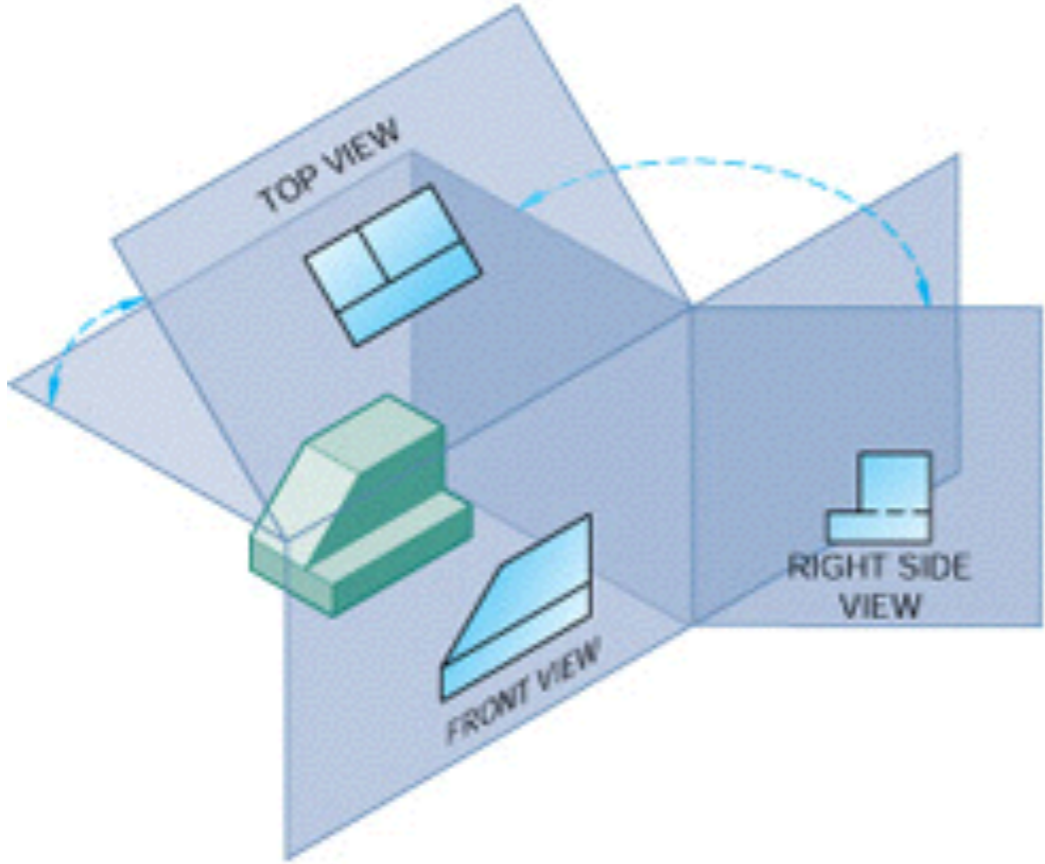
We generally prefer the third-angle projection in the US



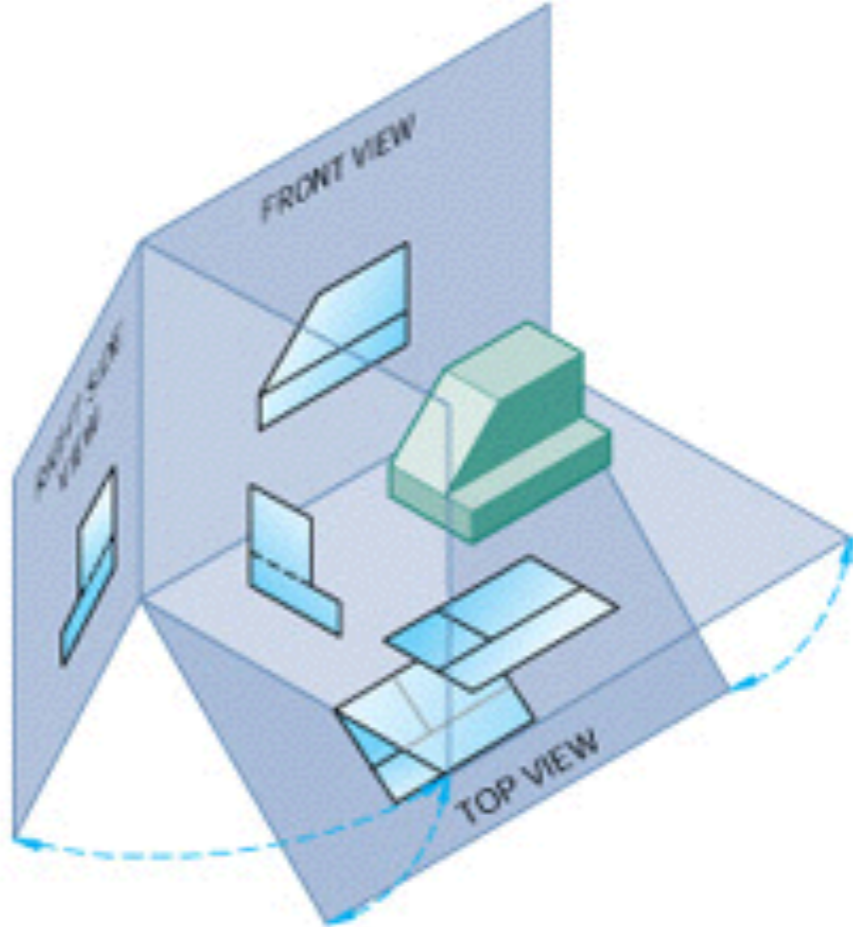
We generally prefer the third-angle projection in the US



We generally prefer the third-angle projection in the US

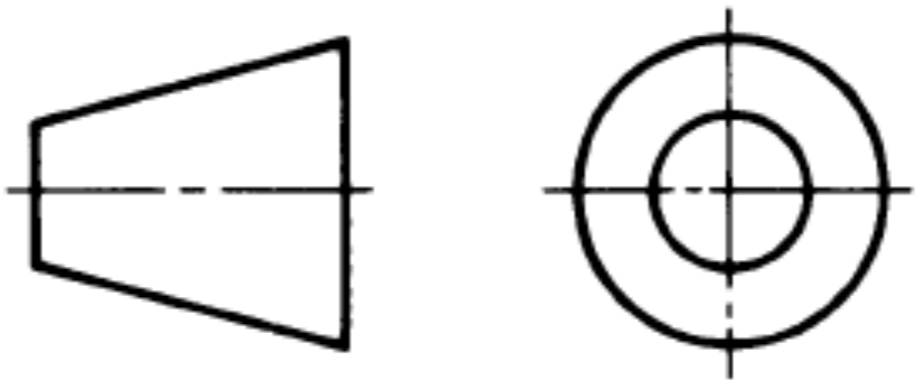
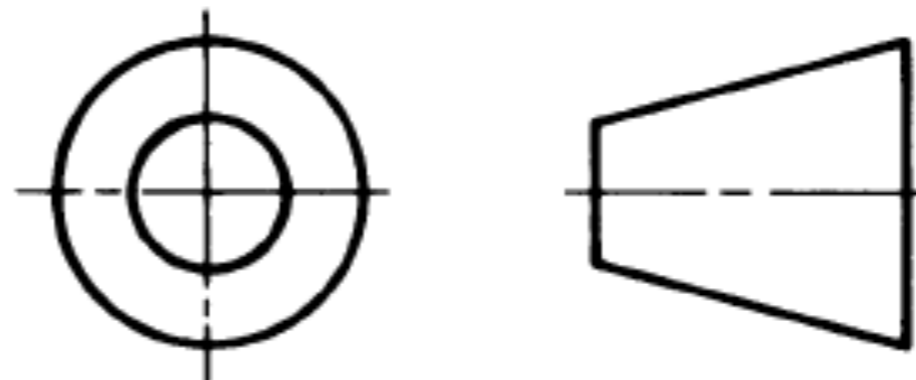


(A) Third-Angle Projection

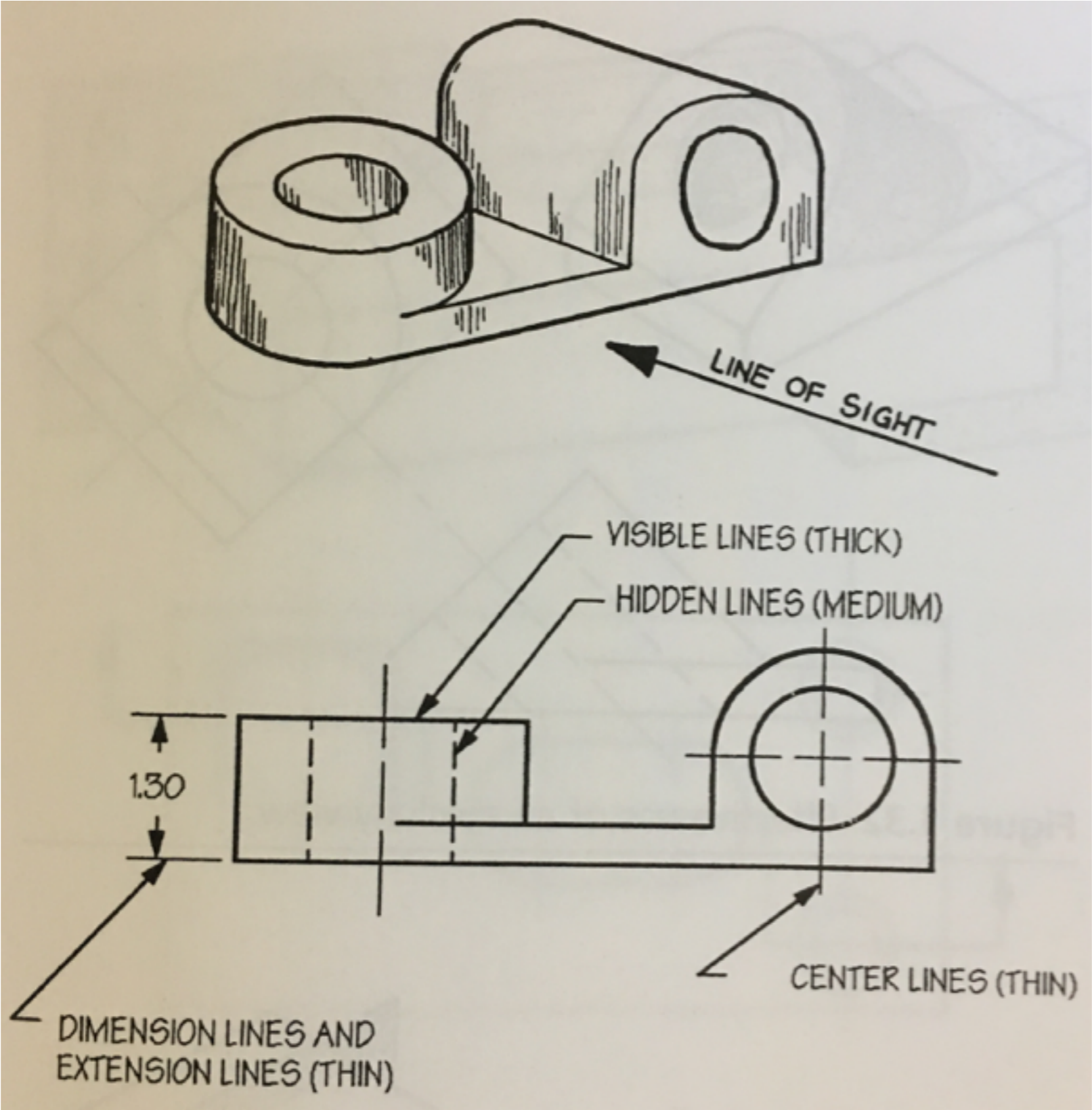


(B) First-Angle Projection

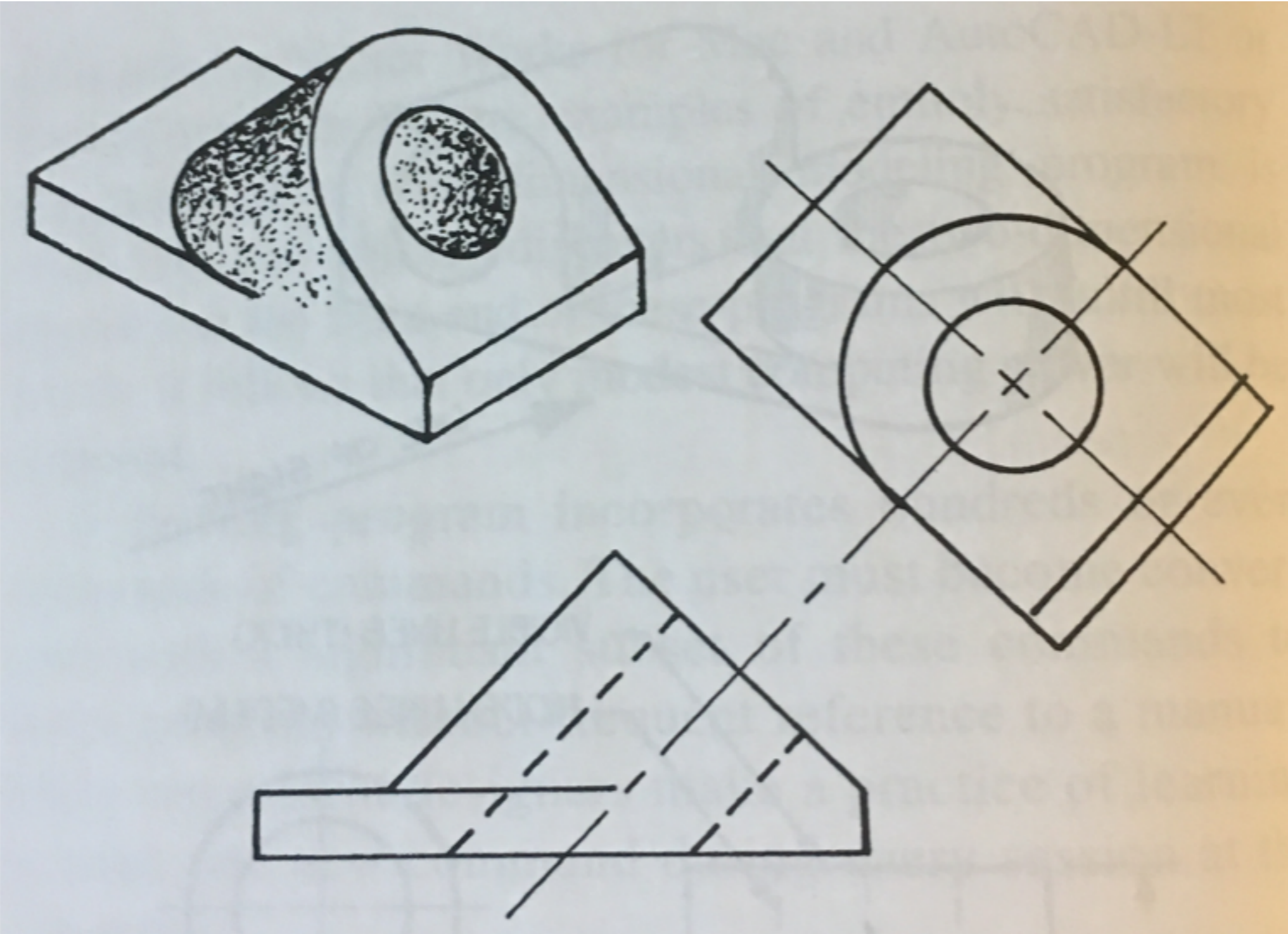
We generally prefer the third-angle projection in the US

Projection	Symbol
First angle	
Third angle	

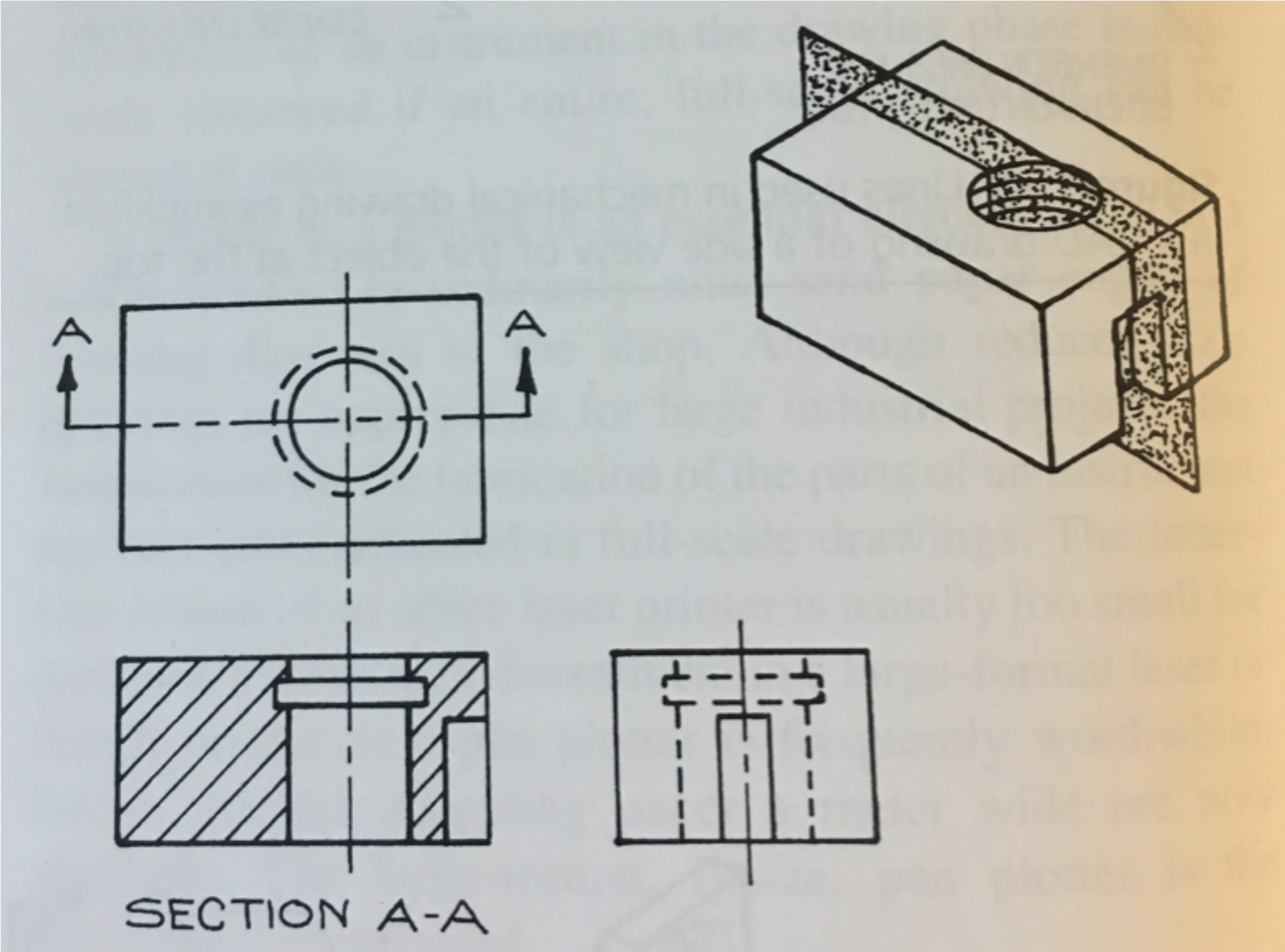
We use different line weights and styles in drawings



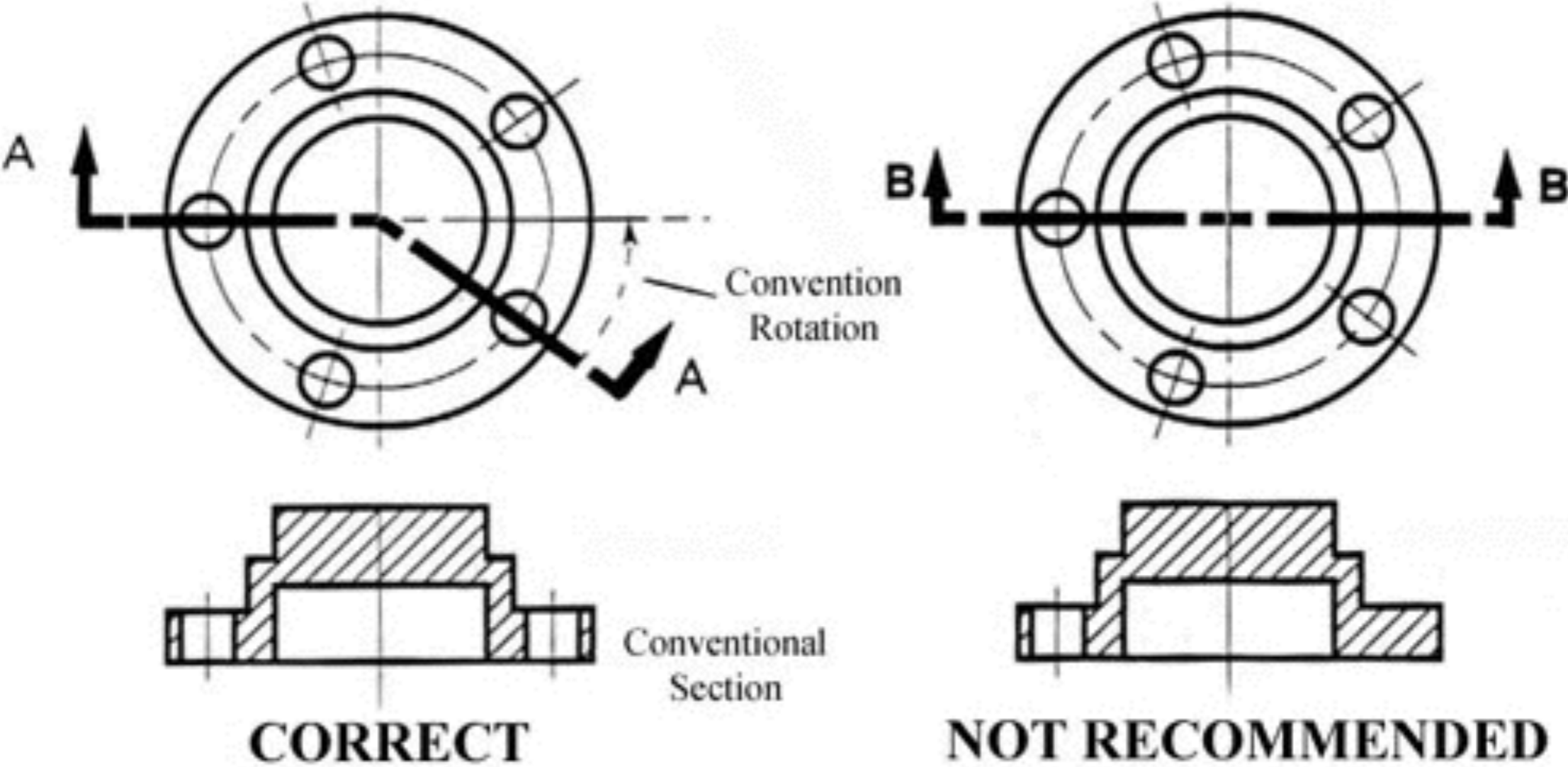
Auxiliary views can be used on strange surfaces/angles



A full section is similar to sawing the part along the section line



Using bent sections is often advised on cylindrical parts



Aligned views/sections reduce the number of sections needed

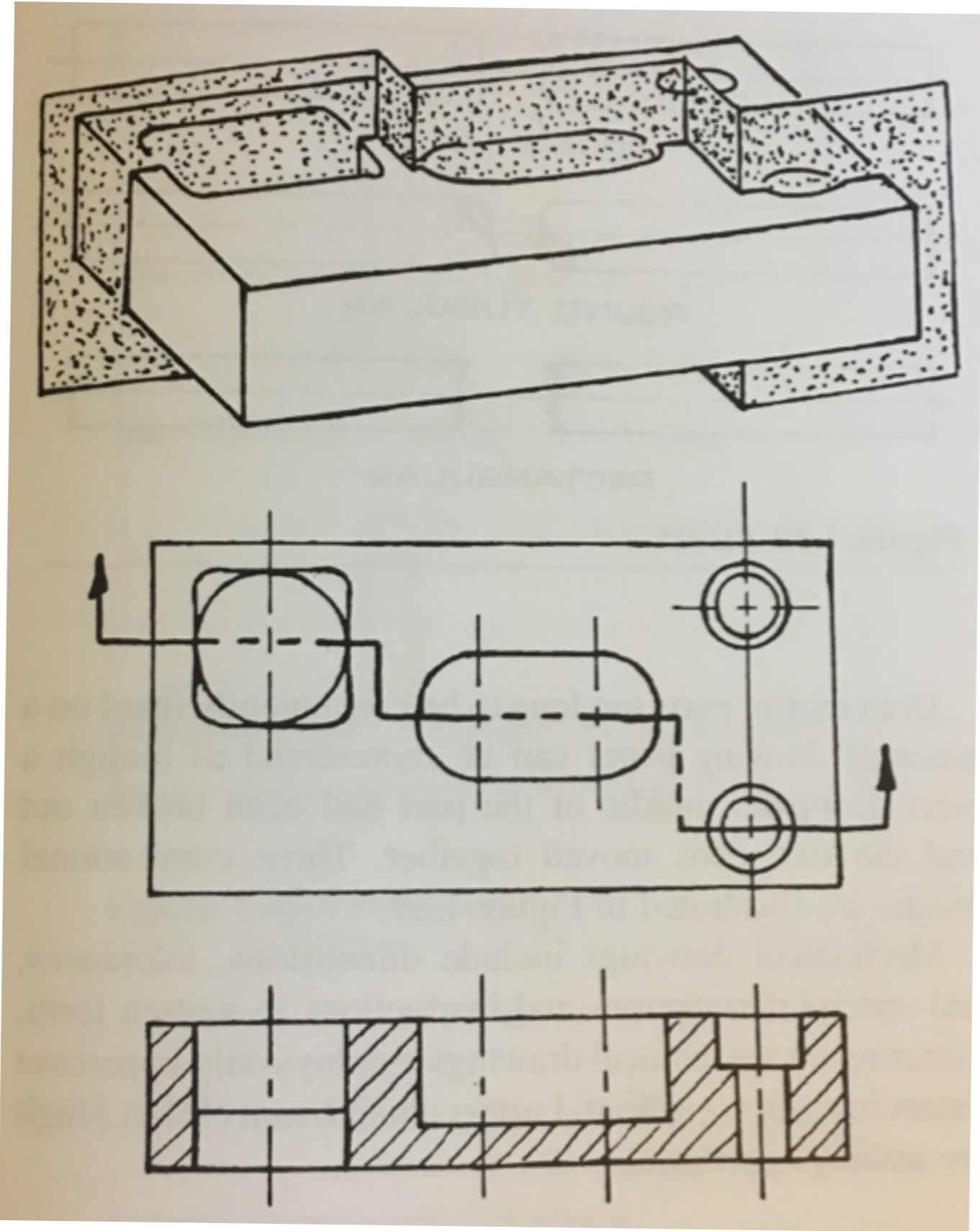


Image: Building Scientific Apparatus

We can also rotate features in aligned sections

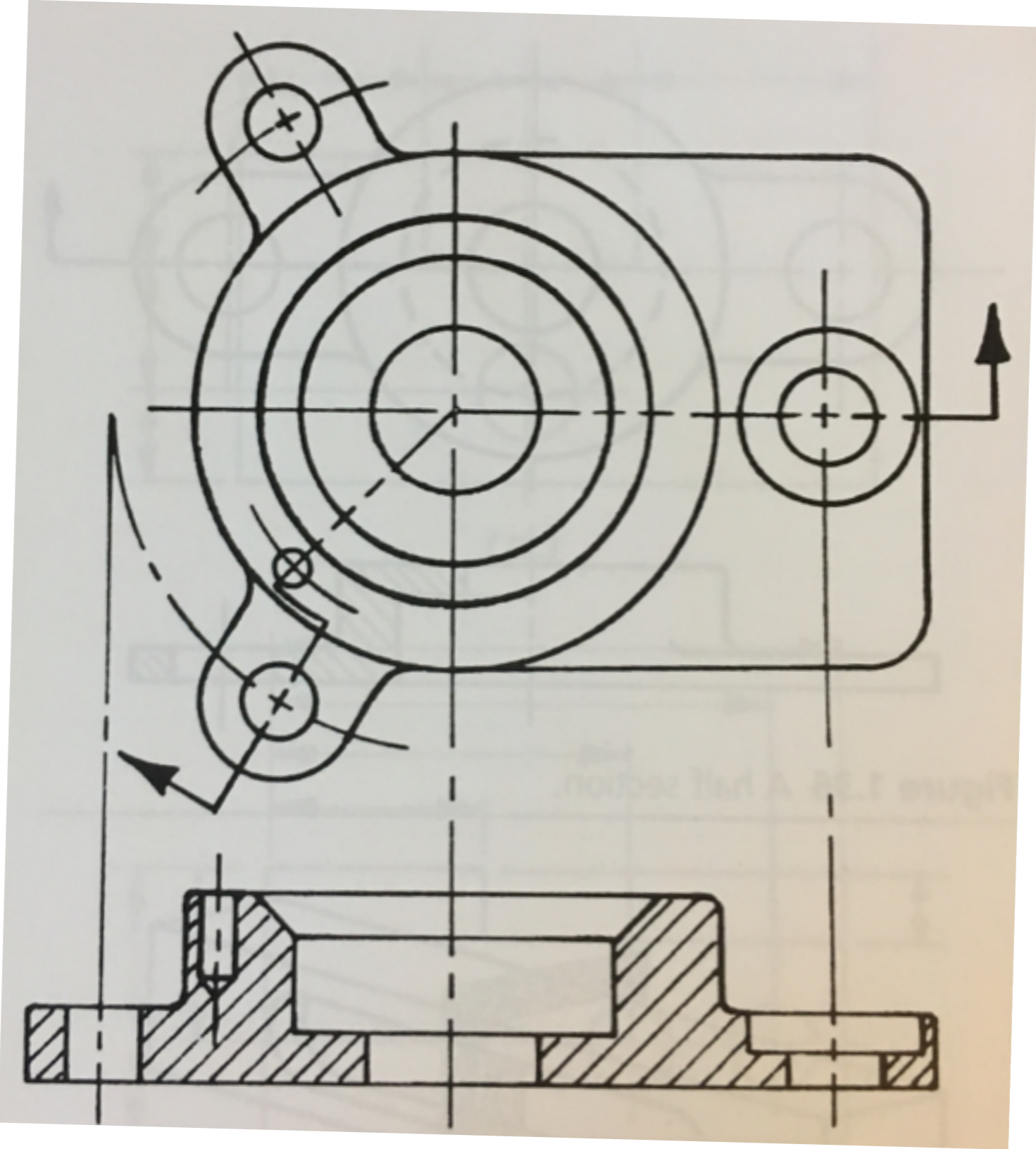


Image: Building Scientific Apparatus

Half sections can show complex geometry easily

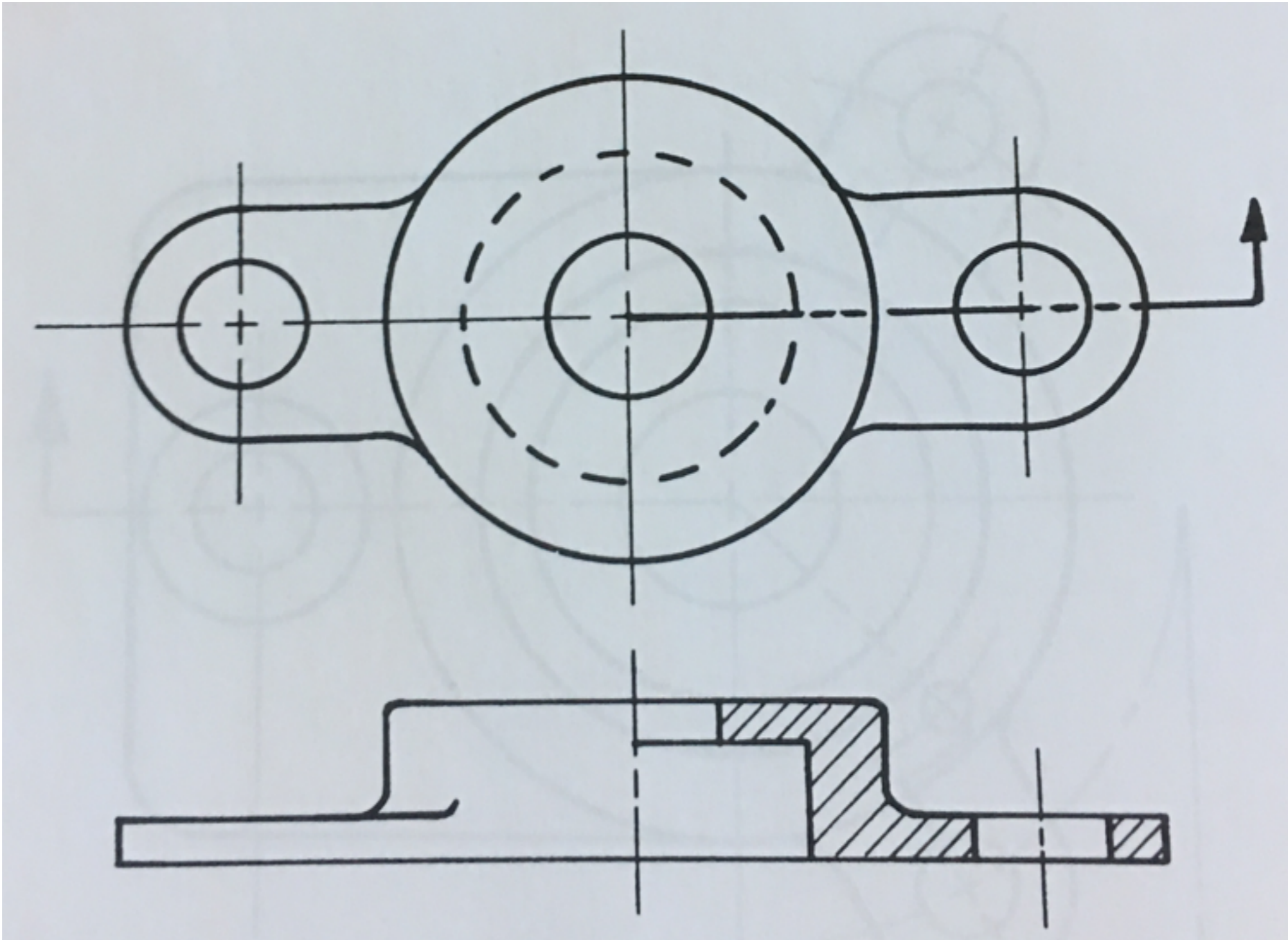
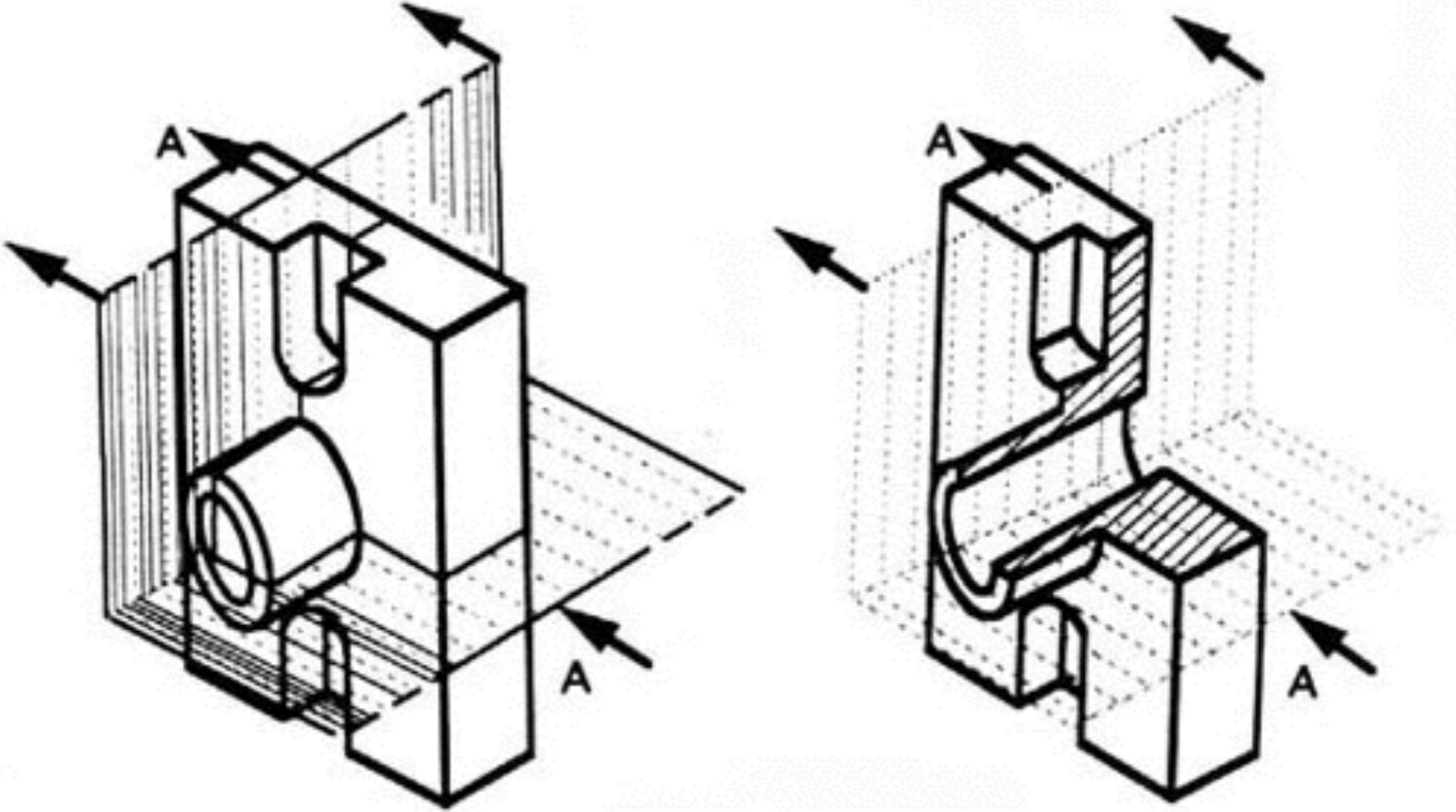
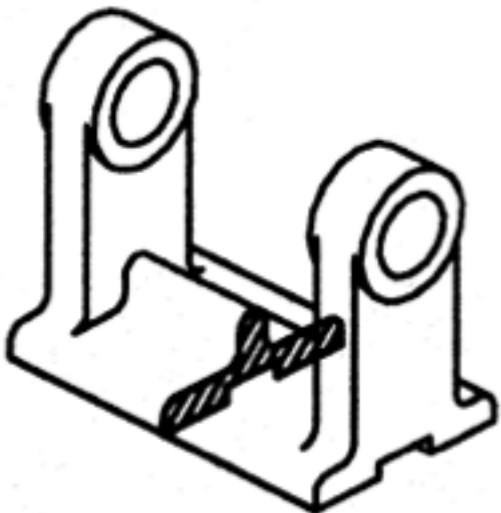


Image: Building Scientific Apparatus

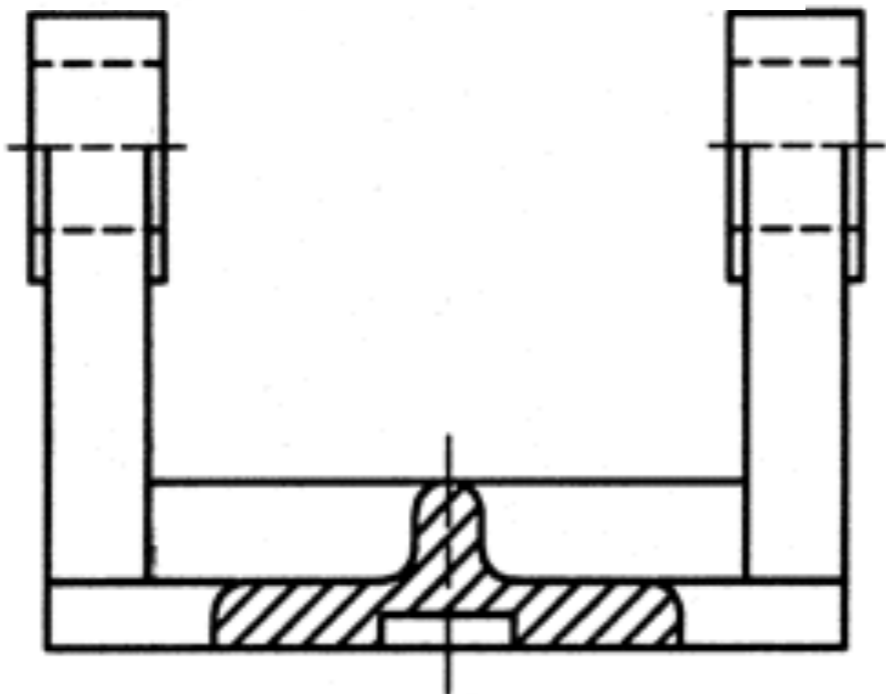
Half sections can show complex geometry easily



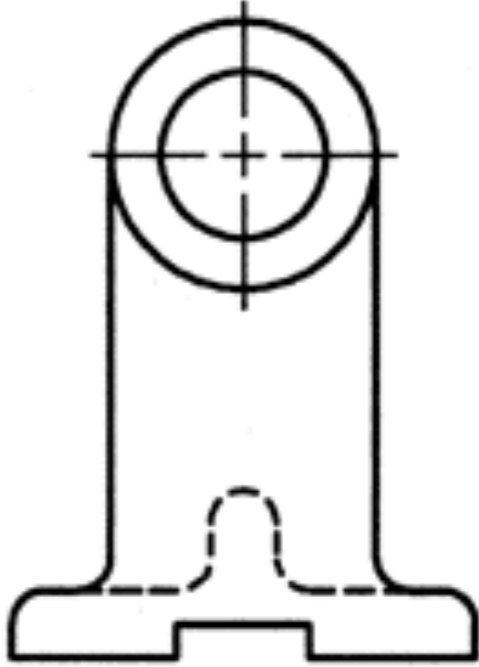
Revolved sections are in a different plane than the rest of the drawing



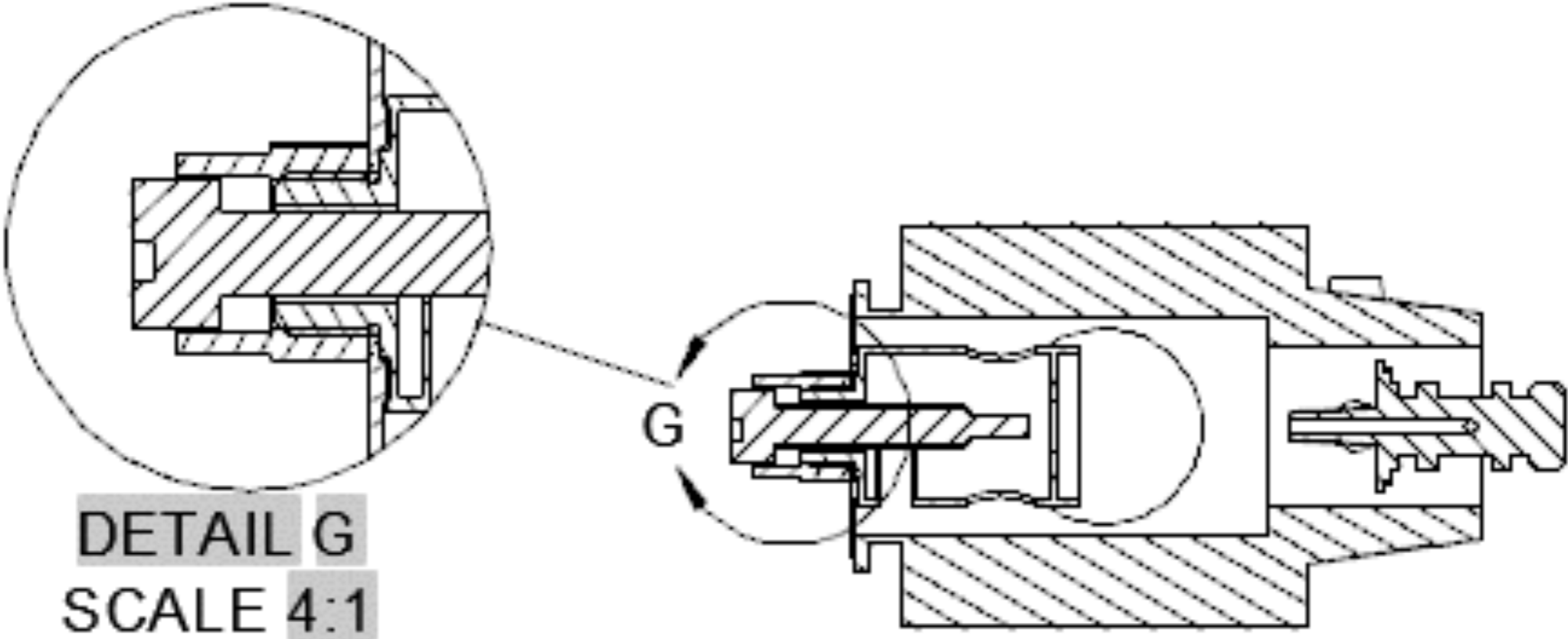
CUT SECTION OF SOLID MODEL



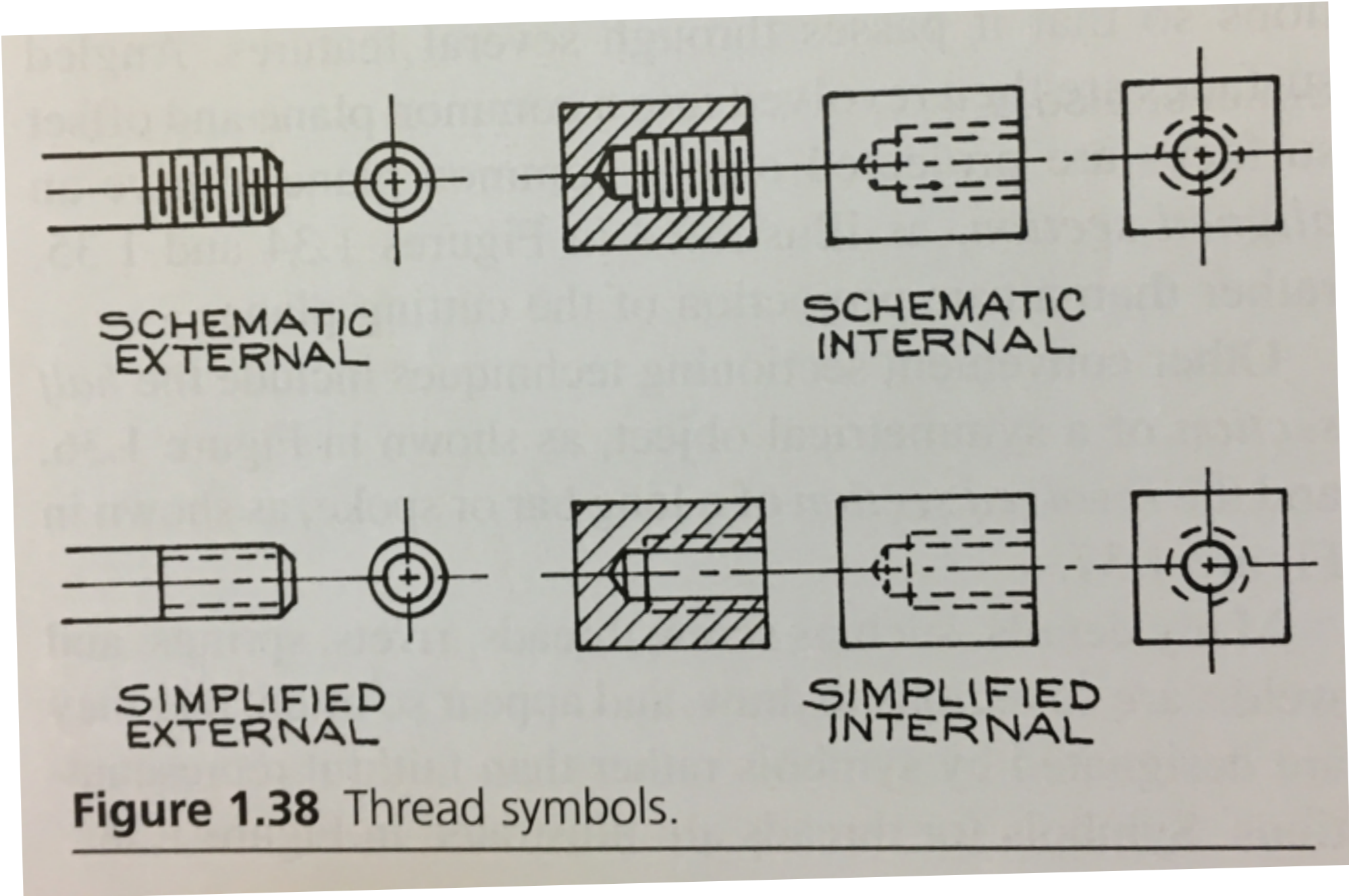
REVOLVED SECTION



Detail views can show complex areas of parts



We often don't draw threads accurately, its unnecessary



We often don't draw threads accurately, its unnecessary

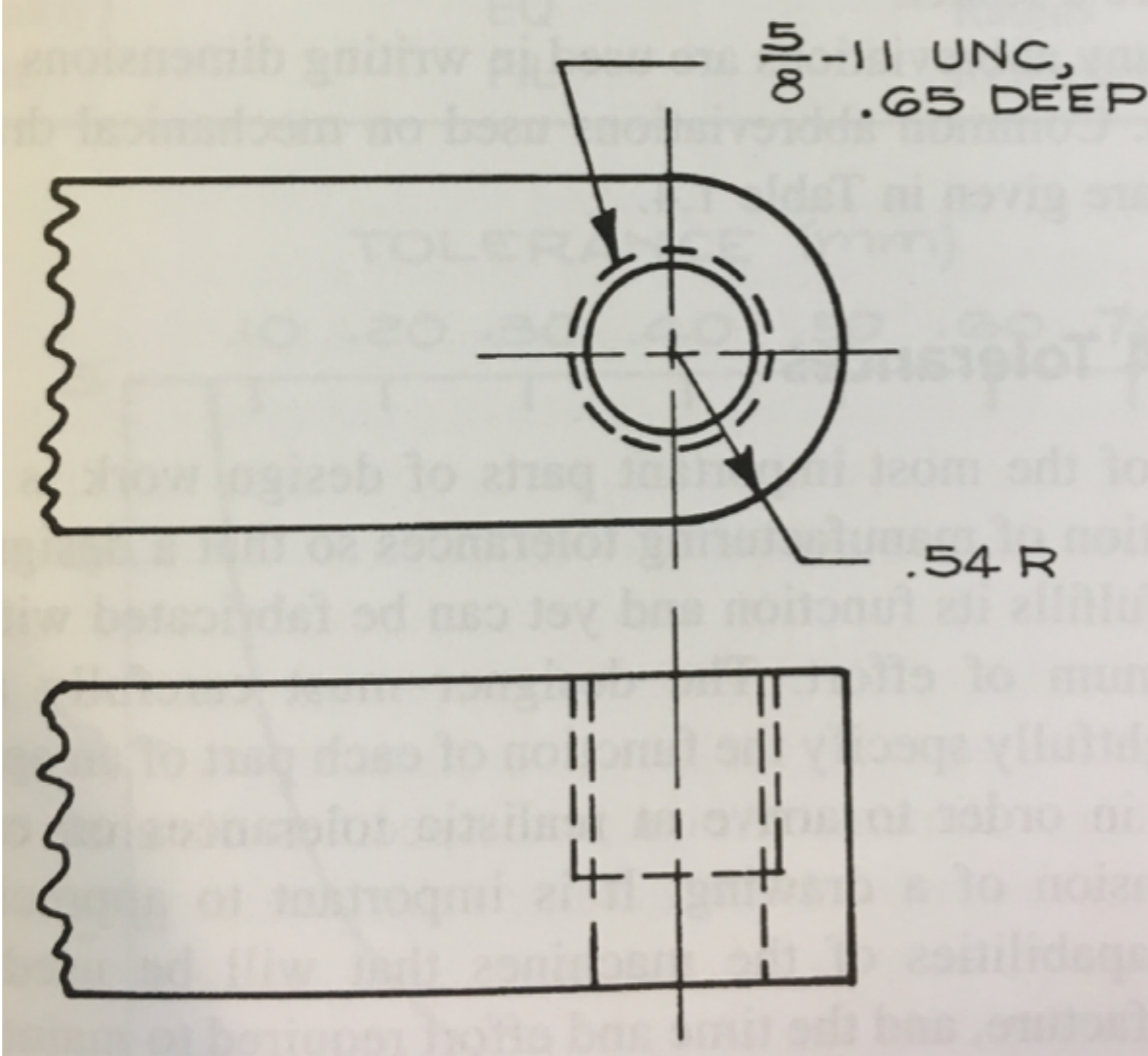
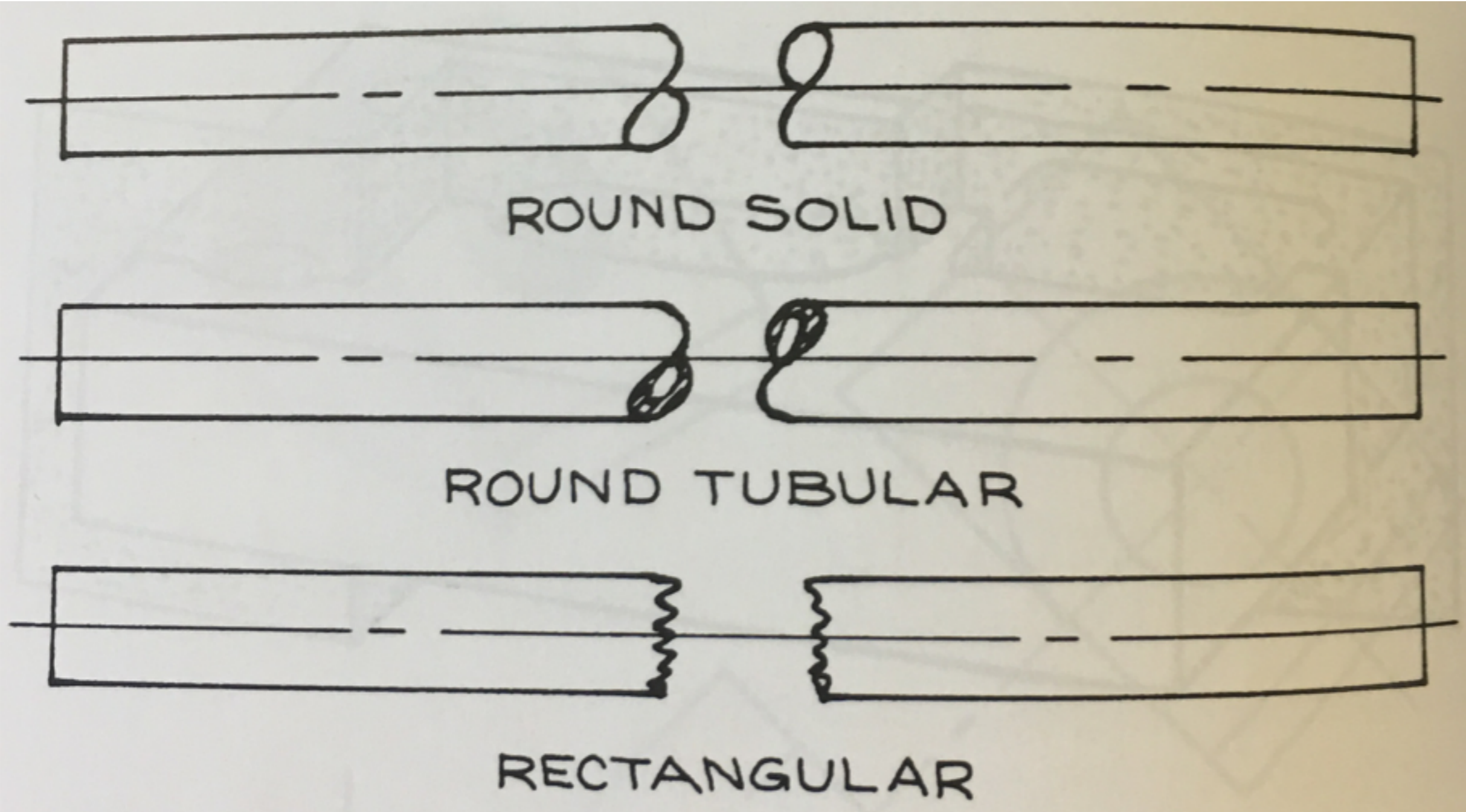
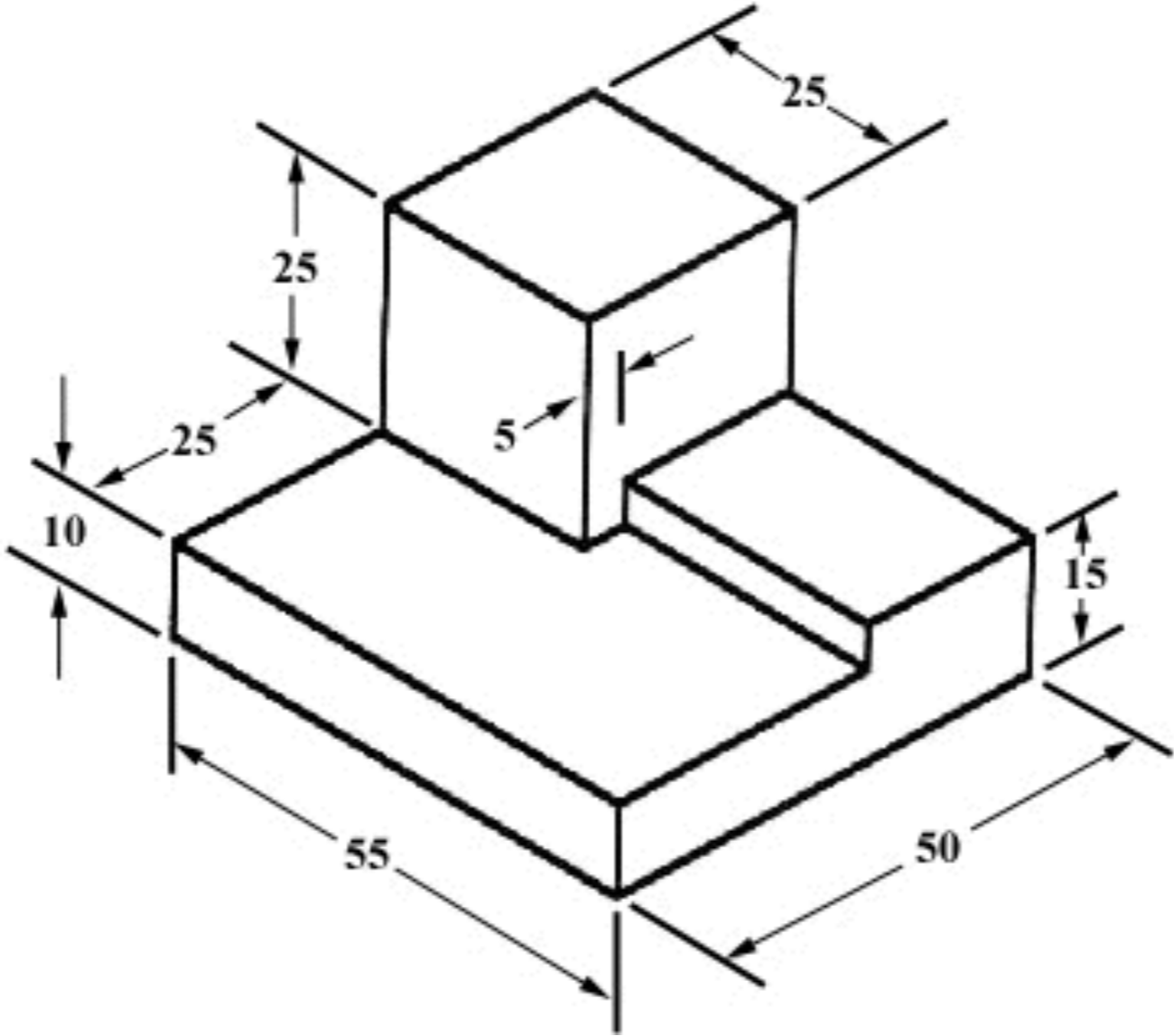


Image: Building Scientific Apparatus

Breaks eliminate large sections of material



Dimensioning is how we show what size features are



Dimensions should completely describe the part

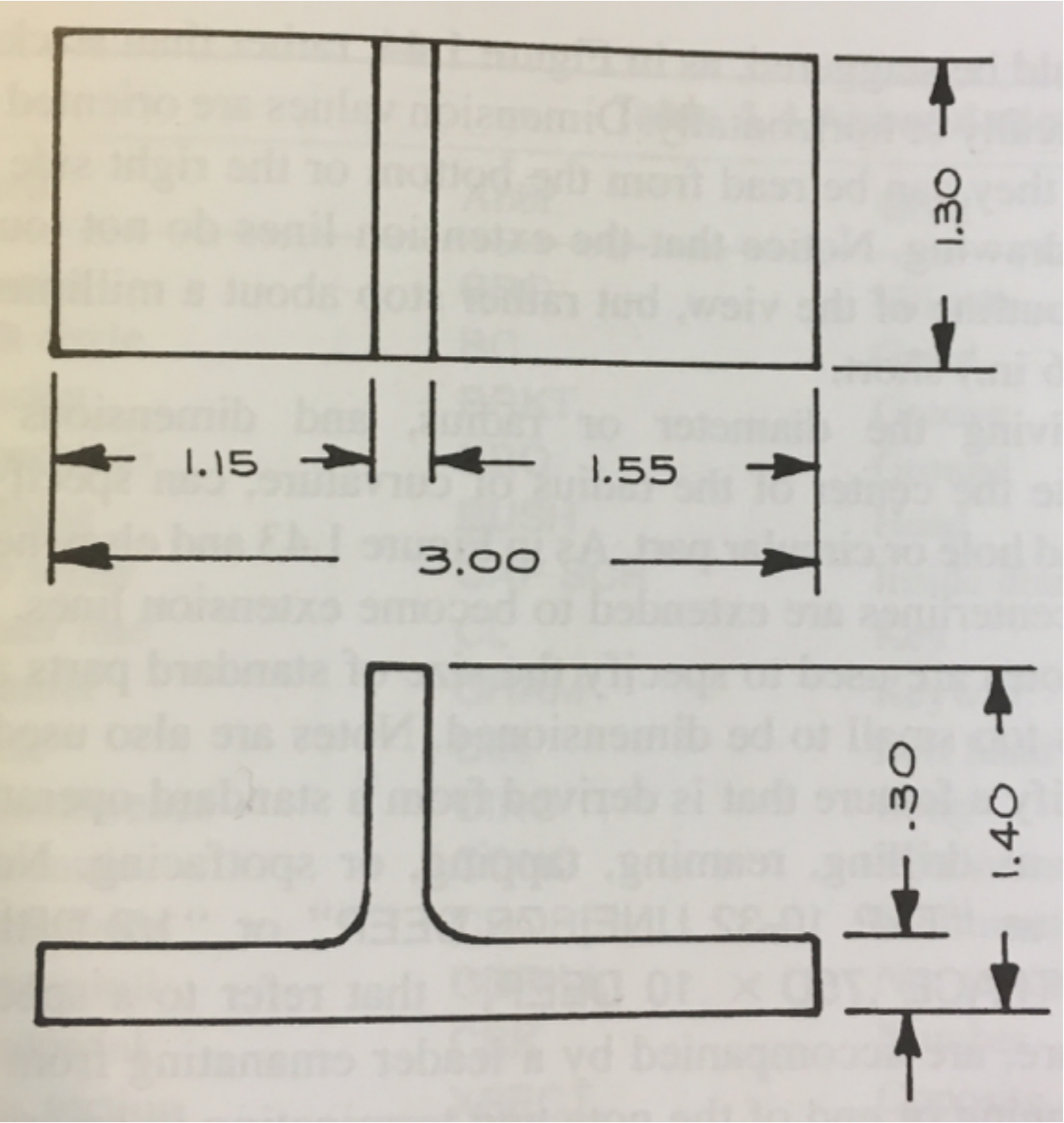
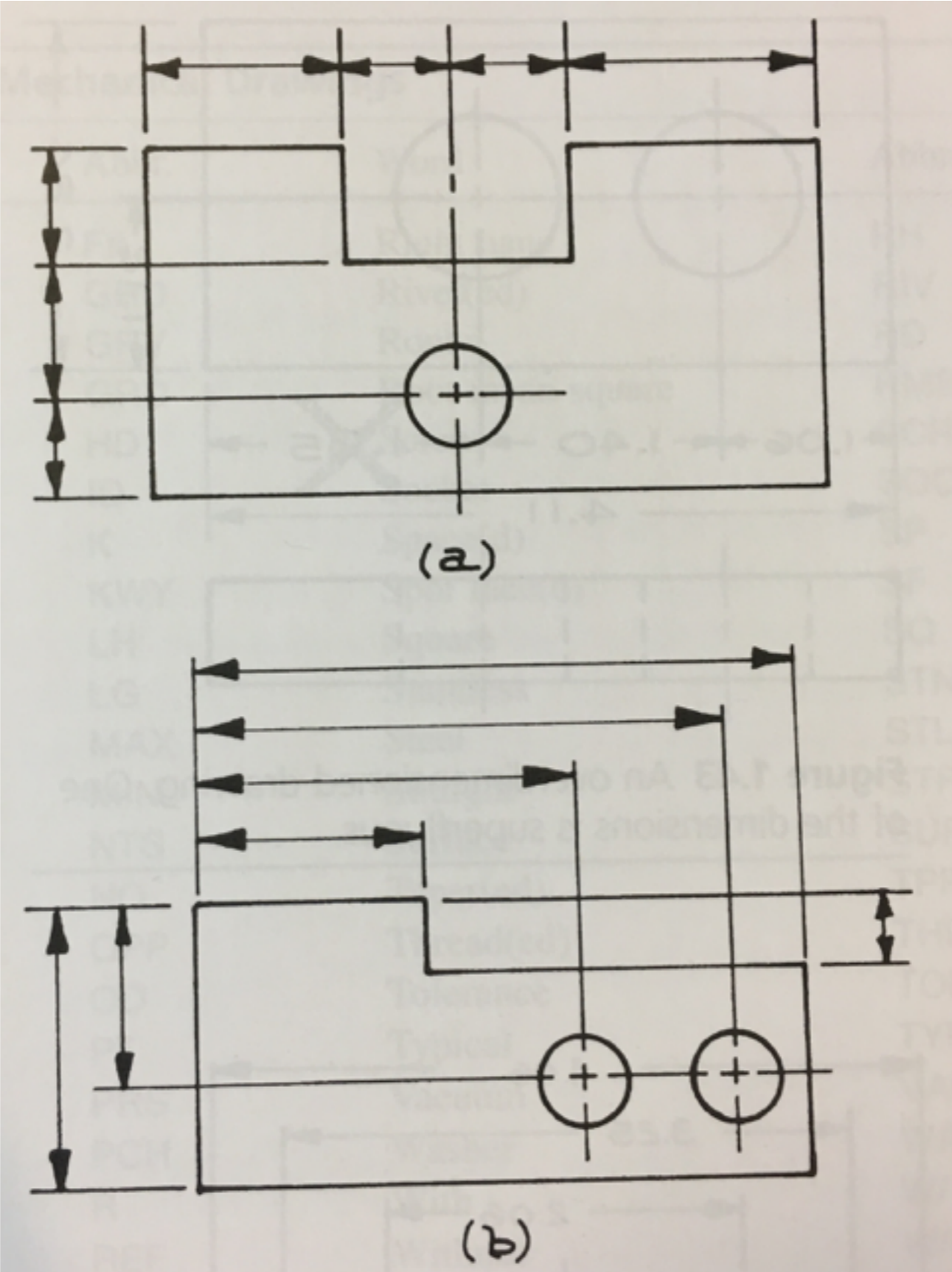
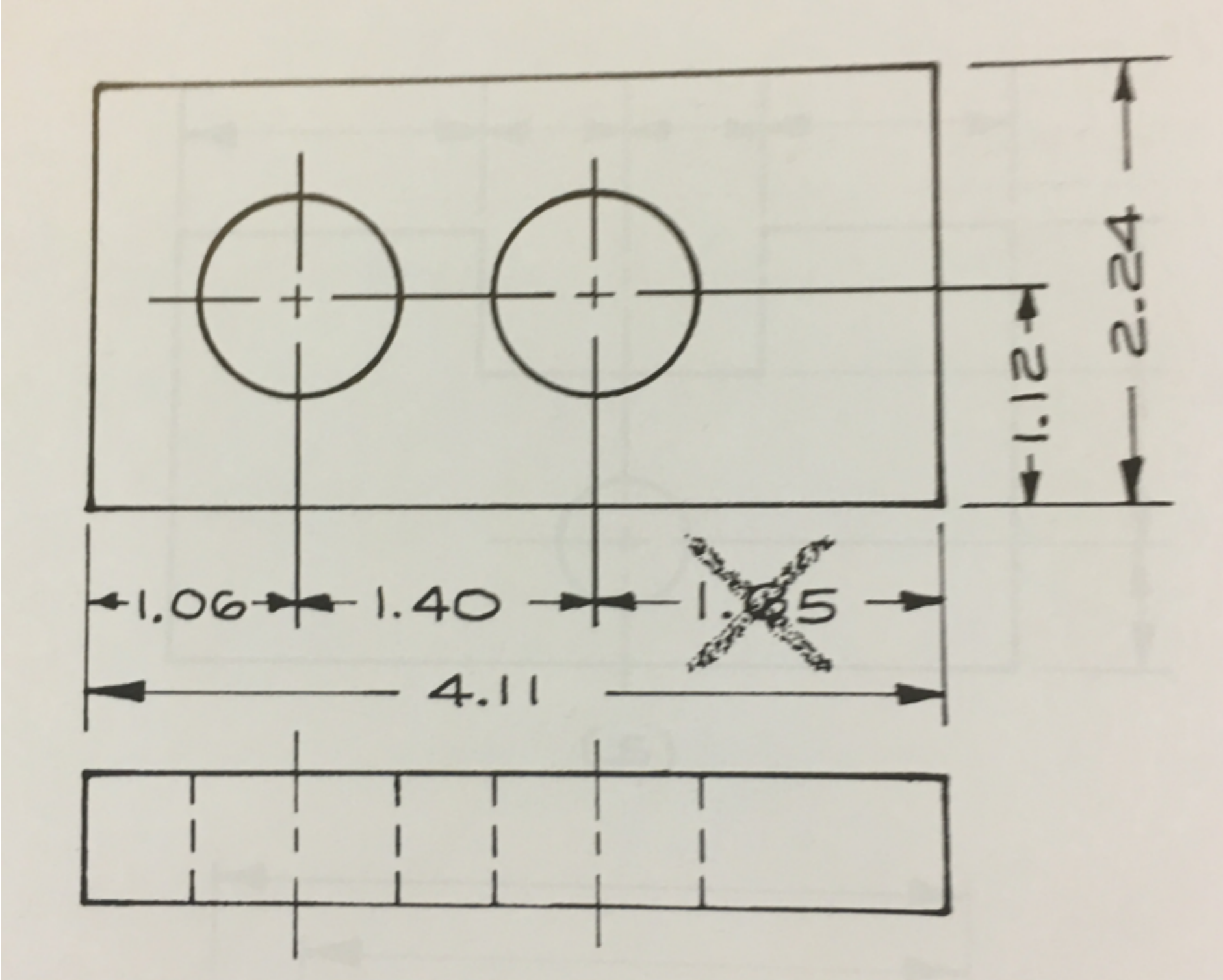


Image: Building Scientific Apparatus

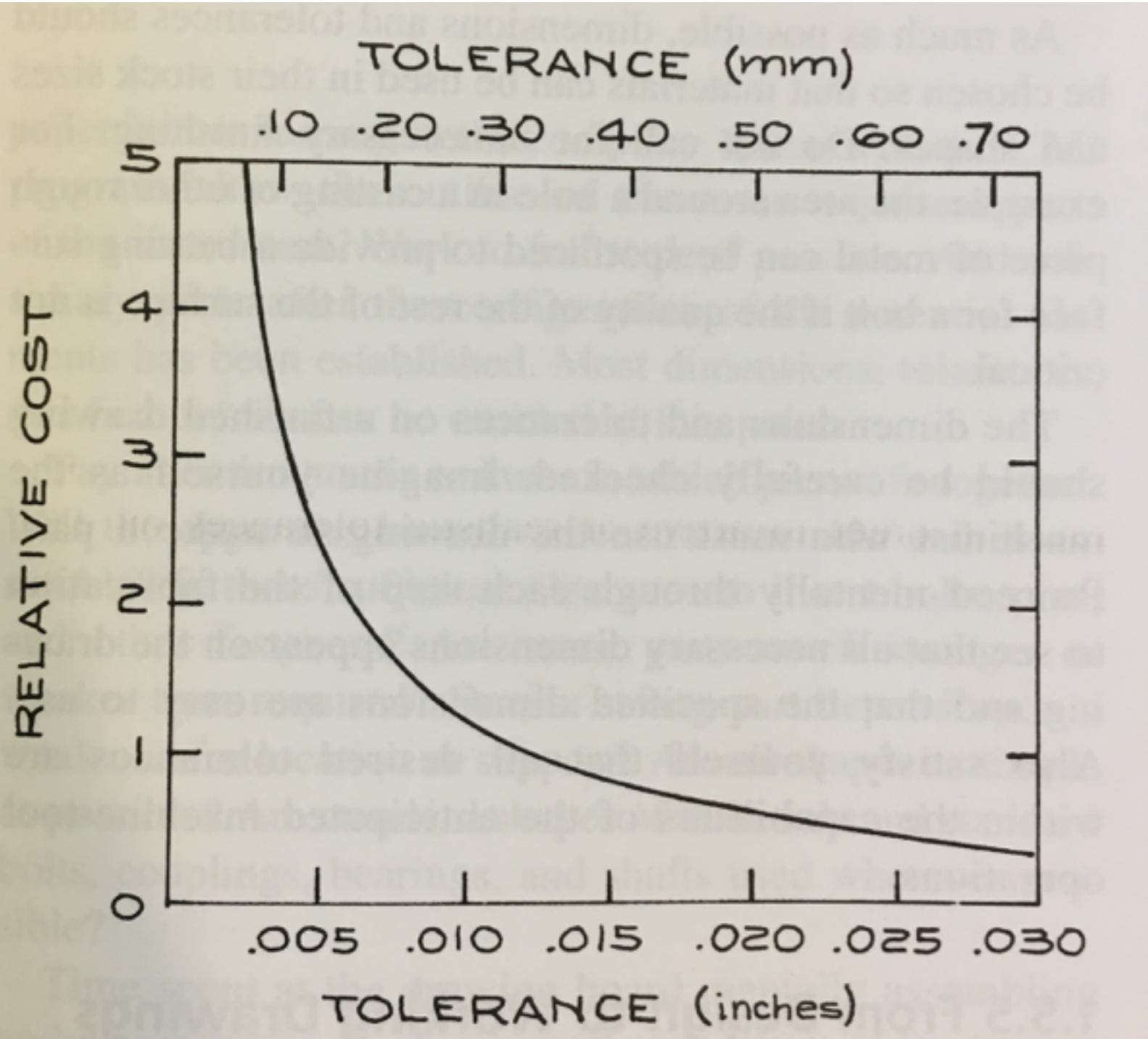
Dimensioning can be series or parallel depending on your needs



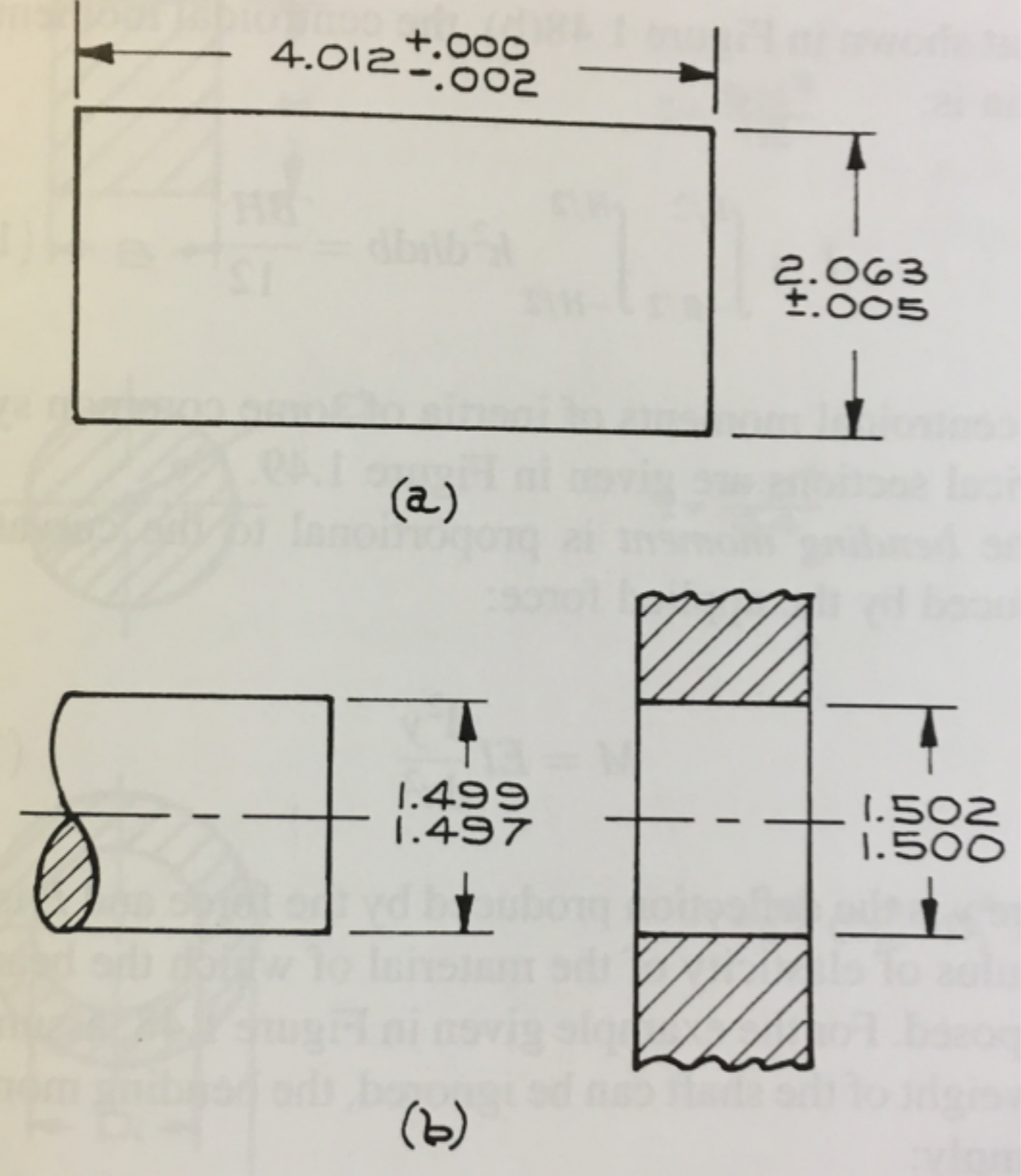
Do not over define parts



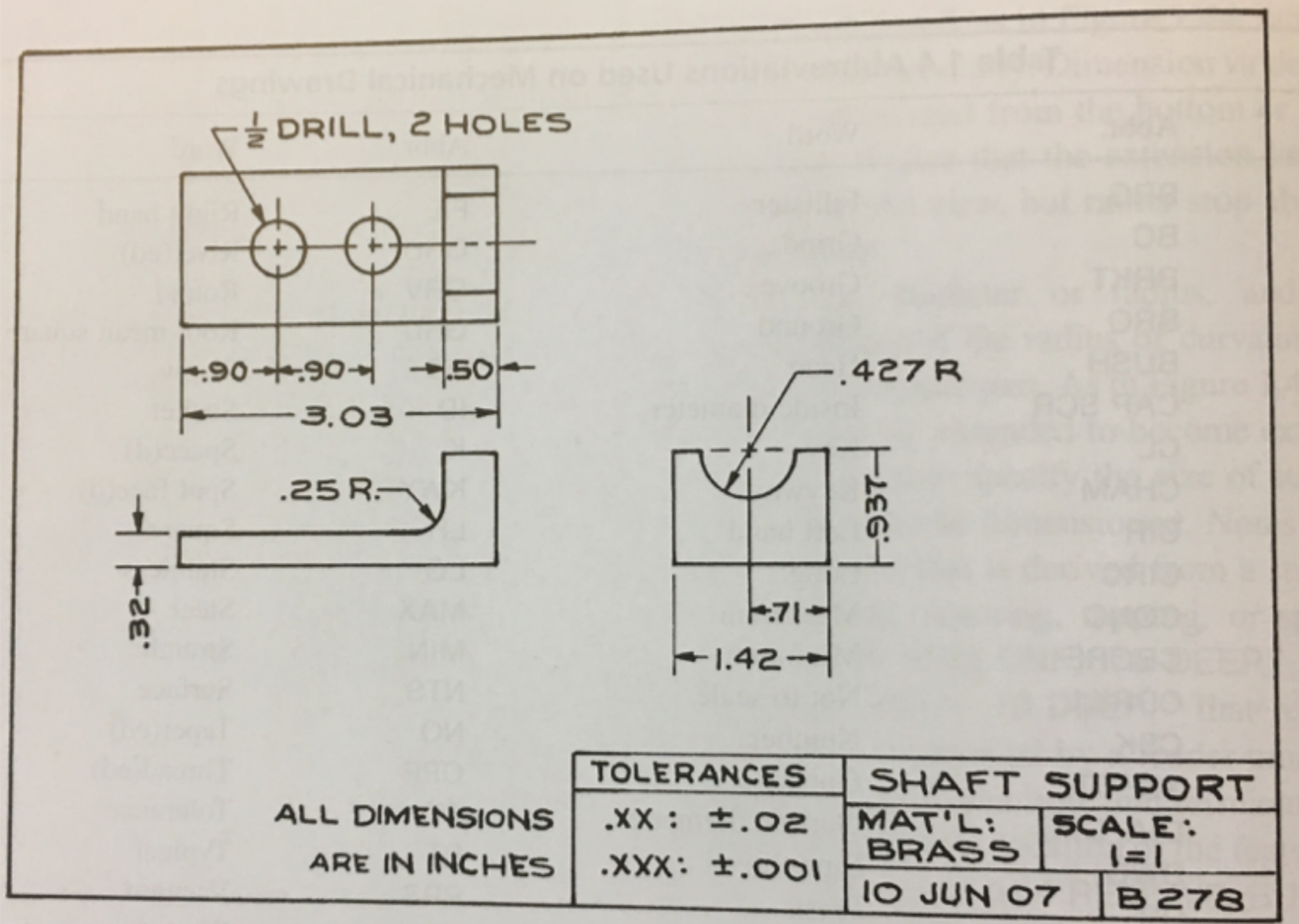
Tolerance can greatly change the price of your part



Tolerance can be specified in three ways



Tolerance can be specified in three ways



Assignment: Sign up for OnShape

The image shows the OnShape website's sign-up page. At the top right, there are buttons for 'CREATE ACCOUNT' and 'SIGN IN'. The OnShape logo is on the left. A navigation menu includes 'CAD', 'LEARN', 'CUSTOMERS', 'PARTNERS', 'COMMUNITY', 'ABOUT', and 'BLOG'. The main heading reads 'THE LEADING CAD PLATFORM FOR AGILE PRODUCT DESIGN'. Below this is a paragraph: 'Onshape is a full-cloud CAD system that's perfect for agile product design. Unlike installed CAD and PDM, Onshape gives everyone on the team instant access to the same CAD system and same CAD data.' A 'LEARN MORE ABOUT FULL-CLOUD CAD' button is located below the paragraph. To the right is a sign-up form with fields for 'FIRST NAME', 'LAST NAME', and 'EMAIL', followed by a yellow 'CREATE ACCOUNT' button and a link: 'Are you an Engineering Executive? Click Here >>'. Below the text is a composite image of a tablet and a smartphone. The tablet displays the OnShape CAD interface for a 'Cylinder Shell - Main' part, showing a feature tree on the left and a dimension input dialog box with a numeric keypad. The smartphone displays a 3D model of a 'Bevel Gear Assembly'.

DUE: 9/27/16

Activity: Make a mechanical drawing



DUE: 9/27/16