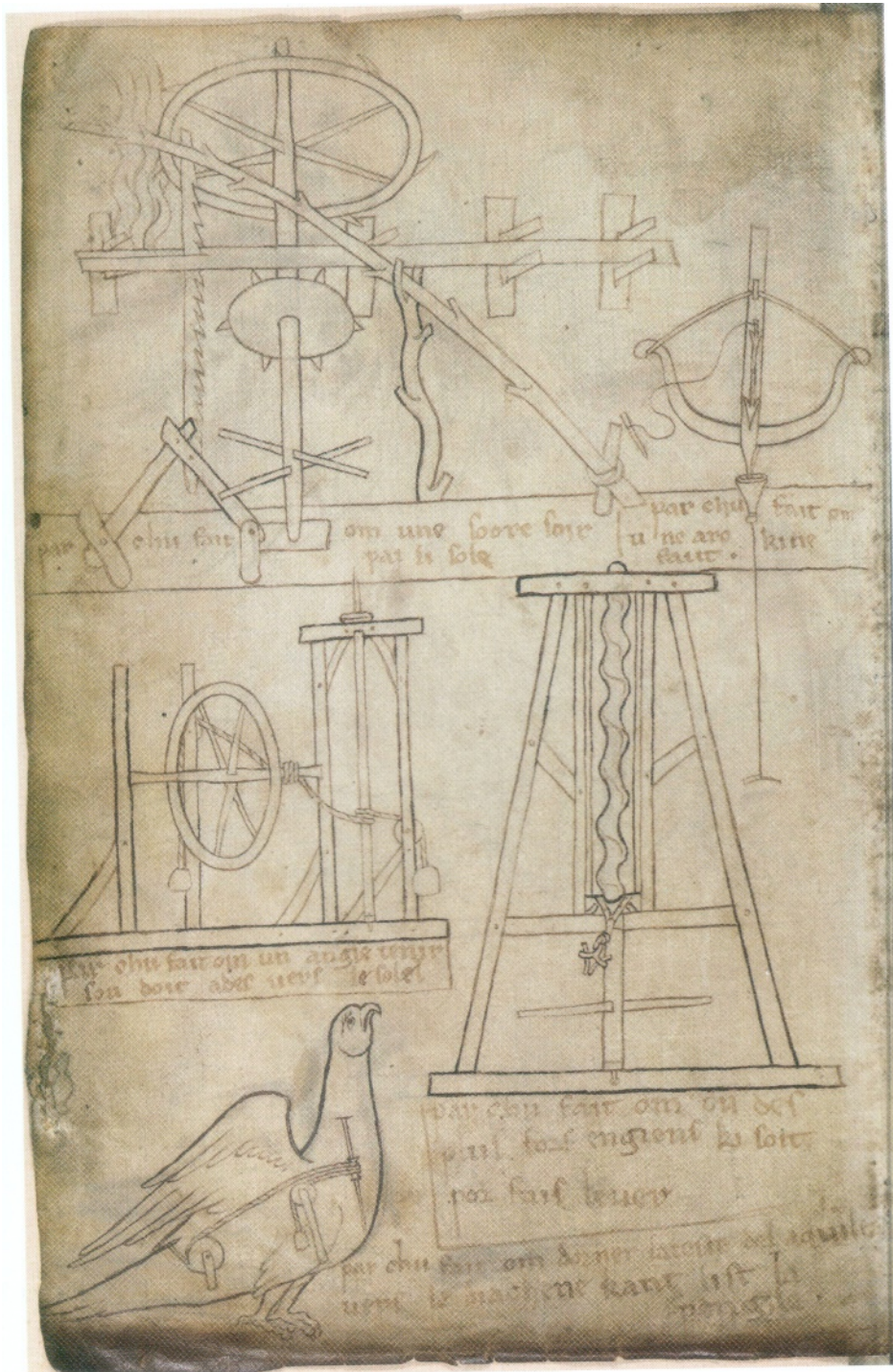


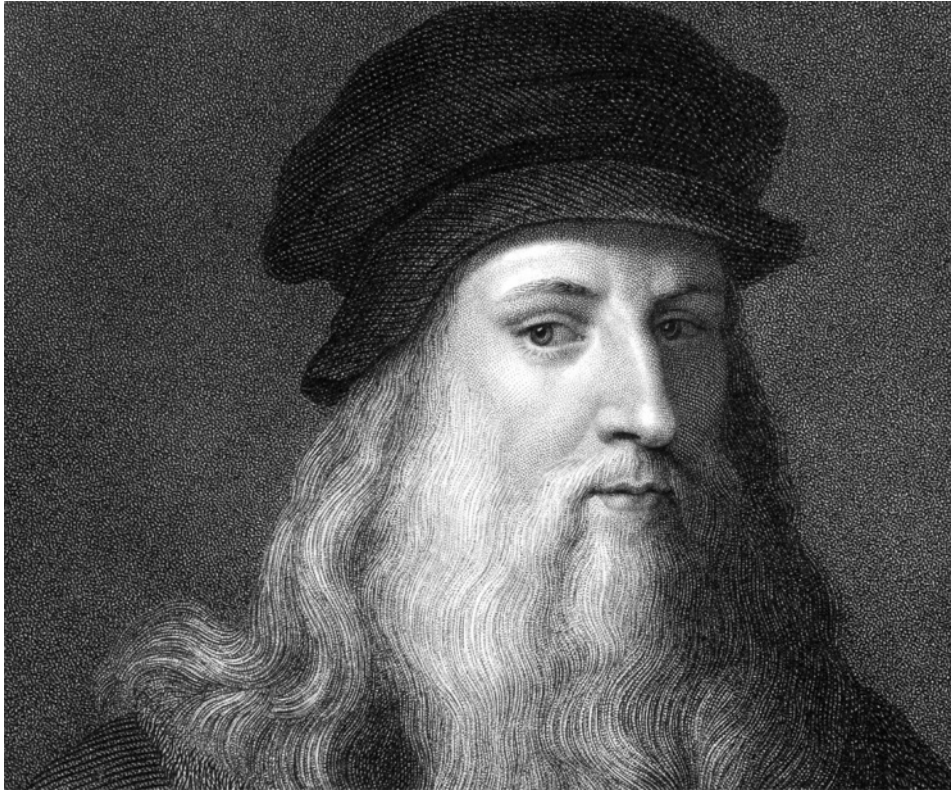
Sistemas de Representação Digital em Arquitetura

Desenho Técnico

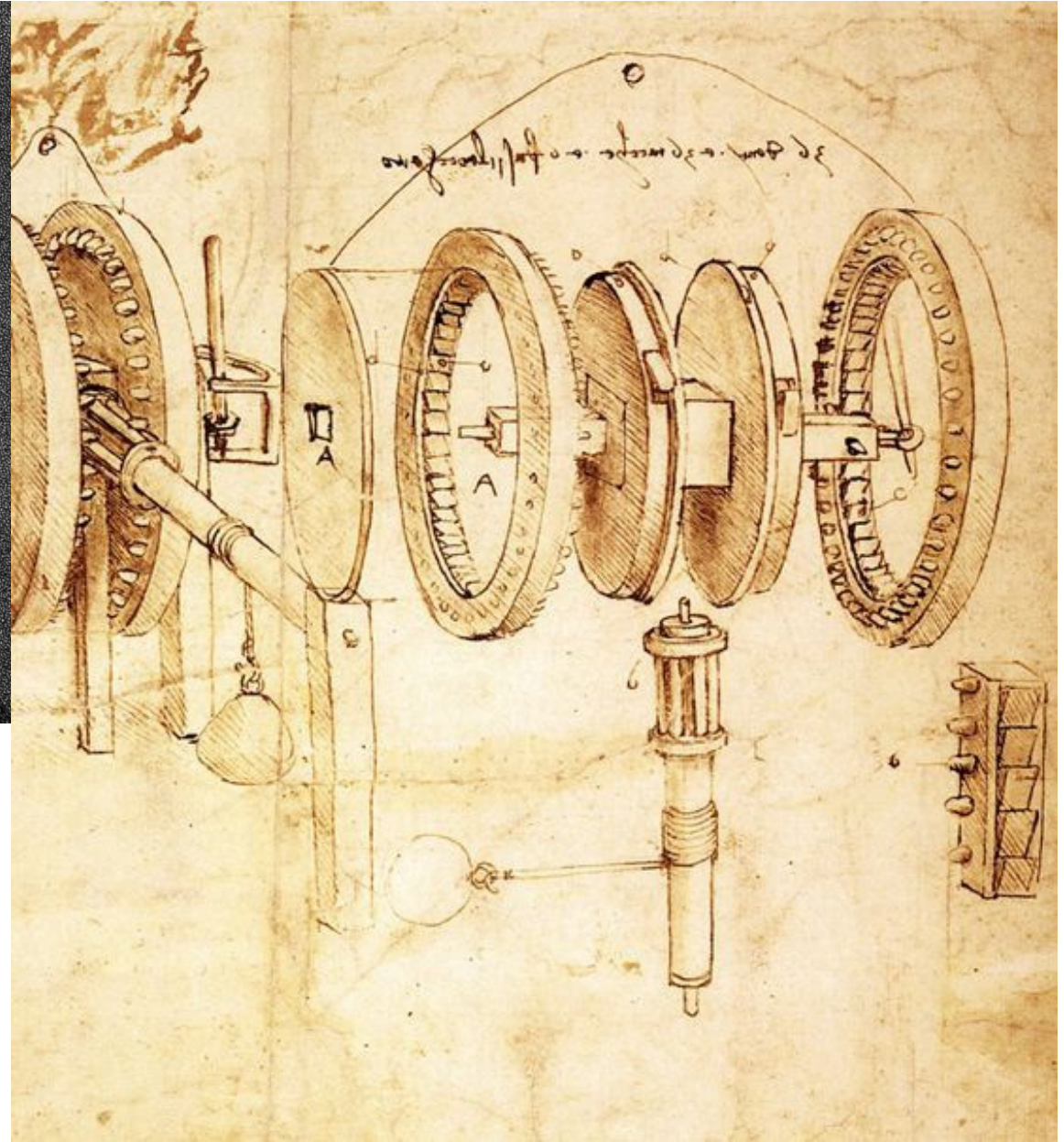
Victor Ferreira
Professor Auxiliar

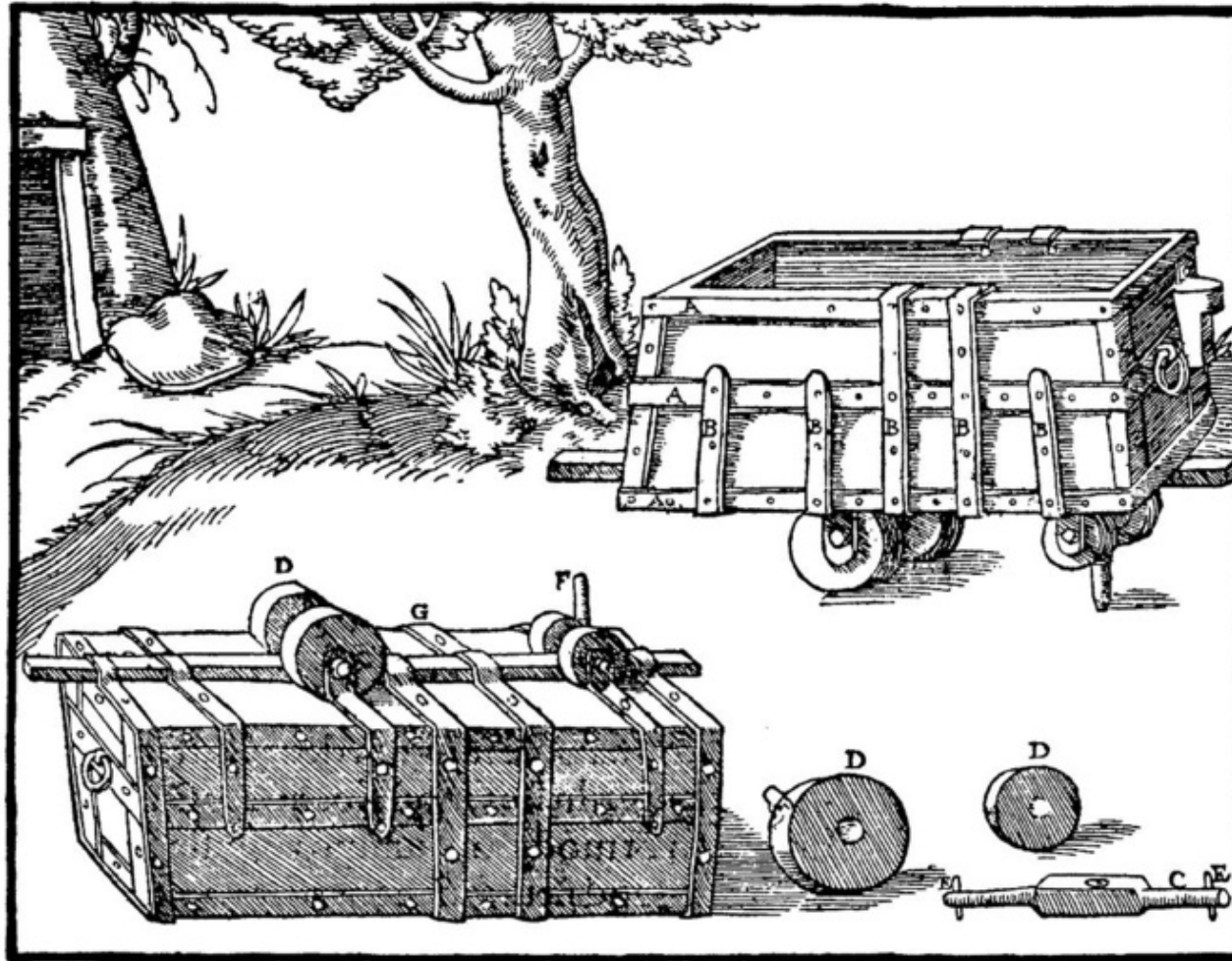


Villard de Hannecourt (pedreiro medieval), *Machines*, c.1220-1235

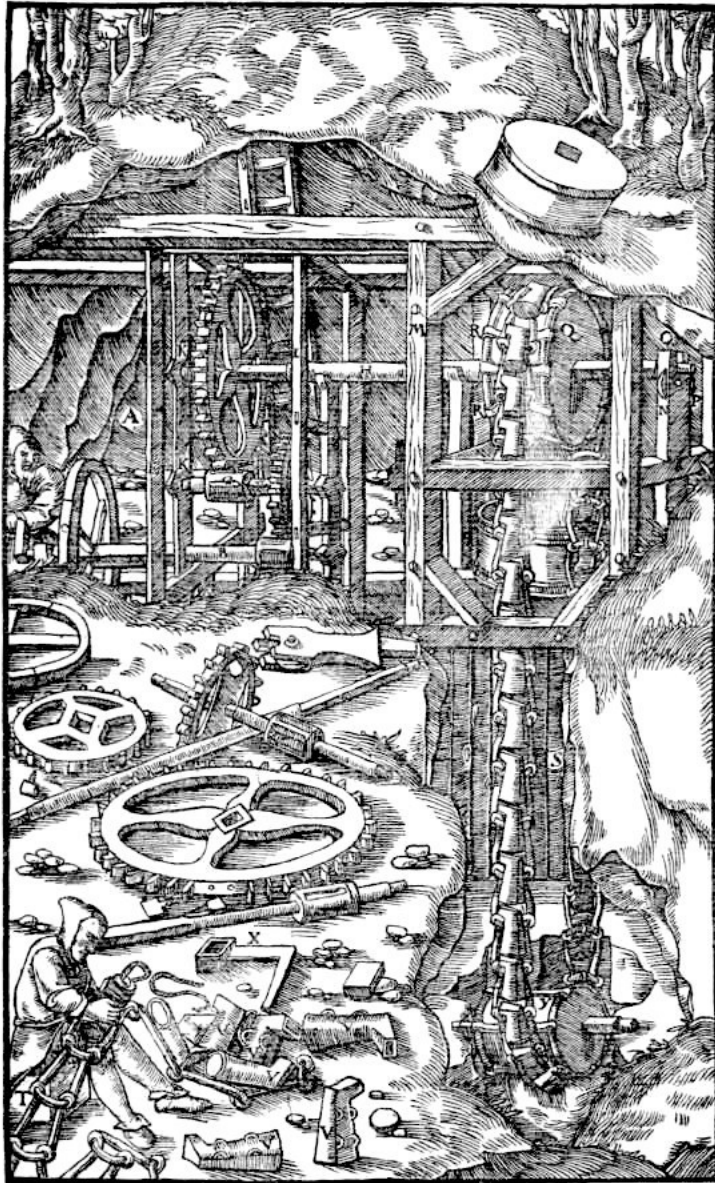


Leonardo DaVinci, 1452-1519





A—RECTANGULAR IRON BANDS ON TRUCK. B—ITS IRON STRAPS. C—IRON AXLE.
D—WOODEN ROLLERS. E—SMALL IRON KEYS. F—LARGE BLUNT IRON PIN.
G—SAME TRUCK UPSIDE DOWN.



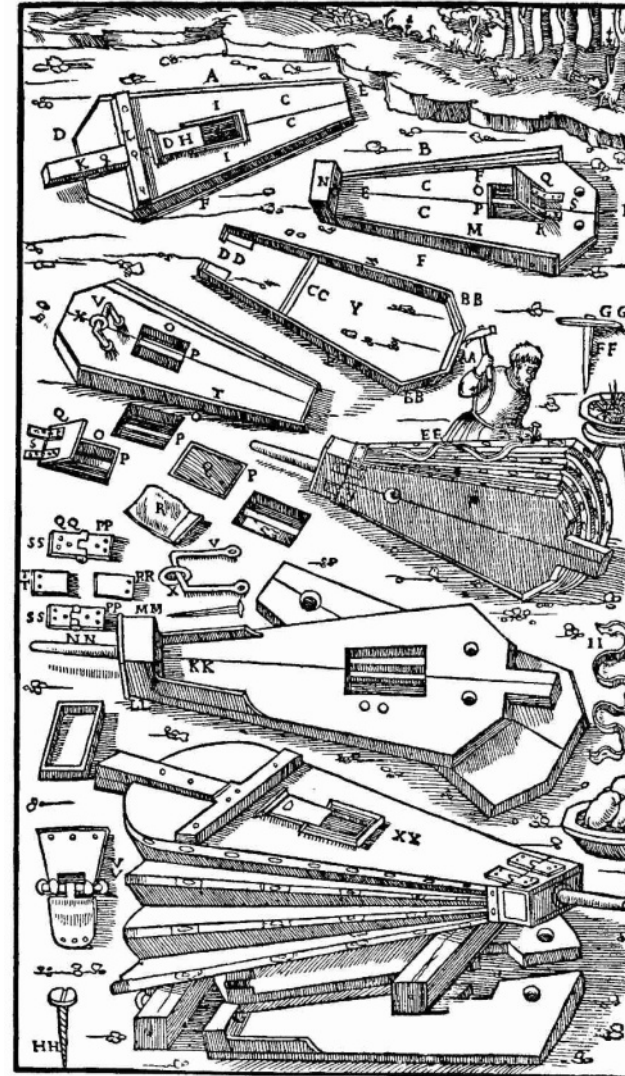
A—IRON FRAME. B—LOWEST AXLE. C—FLY-WHEEL. D—SMALLER DRUM MADE OF RUNDLES. E—SECOND AXLE. F—SMALLER TOOTHED WHEEL. G—LARGER DRUM MADE OF RUNDLES. H—UPPER AXLE. I—LARGER TOOTHED WHEEL. K—BEARINGS. L—PILLOW. M—FRAMEWORK. N—OAK TIMBER O—SUPPORT OF IRON BEARING P—ROLLER. Q—UPPER DRUM. R—CLAMPS. S—CHAIN. T—LINKS. V—DIPPERS X—CRANK. Y—LOWER DRUM OR BALANCE WEIGHT.



A—SUMP. B—PIPES. C—FLOORING. D—TRUNK. E—PERFORATIONS OF TRUNK. F—VALVE. G—SPOUT. H—PISTON-ROD. I—HAND-BAR OF PISTON. K—SHOE. L—DISC WITH ROUND OPENINGS. M—DISC WITH OVAL OPENINGS. N—COVER. O—THIS MAN IS BORING LOGS AND MAKING THEM INTO PIPES. P—BORER WITH AUGER. Q—WIDER BORER.



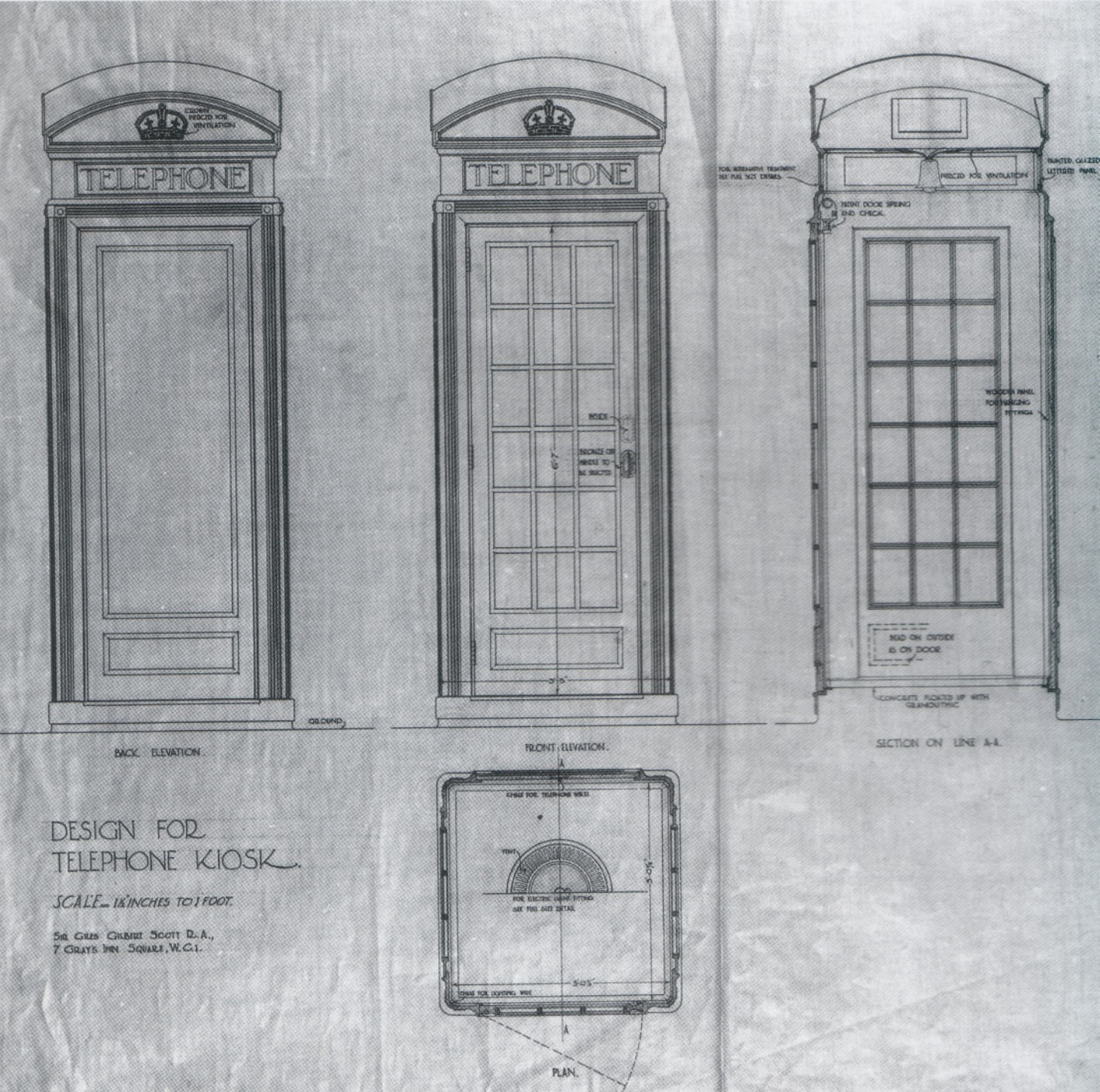
A—Box B—LOWER PART OF BOX. C—UPPER PART OF SAME. D—CLAMPS. E—PIPES BELOW THE BOX. F—COLUMN PIPE FIXED ABOVE THE BOX. G—IRON AXLE. H—PISTON-RODS. I—WASHERS TO PROTECT THE BEARINGS. K—LEATHERS. L—EYES IN THE AXLE. M—RODS WHOSE ENDS ARE WEIGHTED WITH LUMPS OF LEAD. N—CRANK.
(This plate is unlettered in the first edition but corrected in those later.)



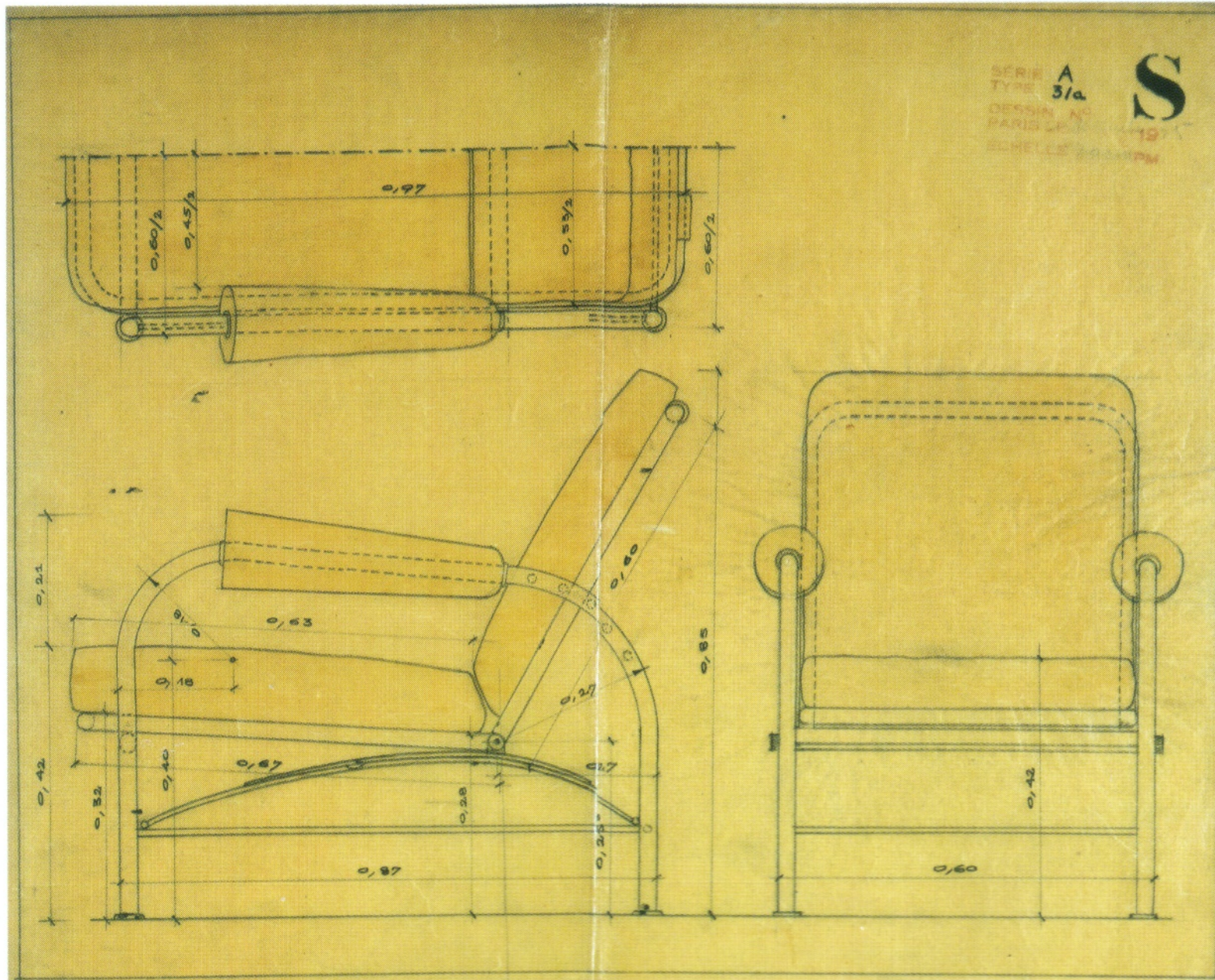
A—UPPER BELLOWS-BOARD. B—LOWER BELLOWS-BOARD. C—THE TWO PIECES OF WOOD OF WHICH EACH CONSISTS. D—POSTERIOR ARCHED PART OF EACH. E—TAPERED FRONT PART OF EACH. F—PIECES OF LINDEN WOOD. G—APERTURE IN THE UPPER BOARD. H—LID. I—LITTLE MOULDINGS OF WOOD. K—HANDLE. L—CLEAT ON THE OUTSIDE. THE CLEAT INSIDE I AM NOT ABLE TO DEPICT. M—INTERIOR OF THE LOWER BELLOWS-BOARD. N—PART OF THE HEAD. O—AIR-HOLE. P—SUPPORTING BAR. Q—FLAP. R—BOW. S—THONG. T—EXTERIOR OF THE LOWER BOARD. V—STAPLE. X—RING. Y—BOW. Z—ITS LONG PIECES. AA—BACK PIECE OF THE BOW. BB—THE BOWED ENDS. CC—CROSSBAR DISTENDING THE BOW. DD—THE TWO LITTLE PIECES. EE—HIDE. FF—NAIL. GG—HORN OF THE NAIL. HH—A SCREW. II—LONG THONG. KK—HEAD. LL—ITS LOWER BOARD. MM—ITS UPPER BOARD. NN—NOZZLE. OO—THE WHOLE OF THE LOWER BELLOWS-BOARD. PP—THE TWO EXTERIOR PLATES OF THE HEAD HINGES. QQ—THEIR CURVED PIECE. RR—MIDDLE PLATE OF THE HEAD. SS—THE TWO OUTER PLATES OF THE UPPER BELLOWS-BOARD. TT—ITS MIDDLE PLATE. VV—LITTLE AXLE. XX—WHOLE BELLOWS.



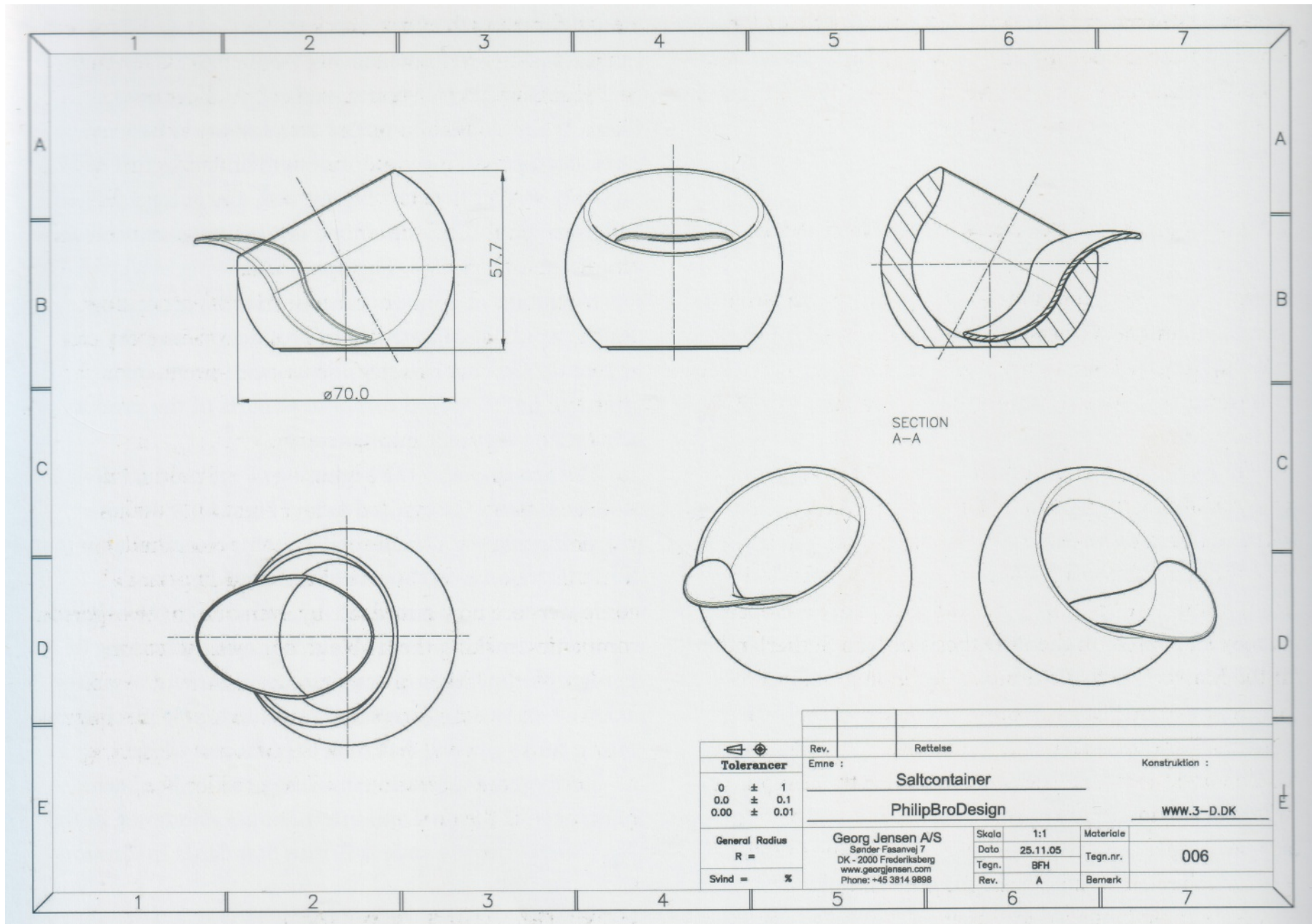
Gaspard Monge - Conde de Péluse (9 Maio 1746 - 28 de Julho 1818). Matemático francês, inventor da Geometria Descritiva (base matemática do Desenho Técnico) e o pai da Geometria Diferencial.



Sir Giles Gilbert Scott (1880-1960). Desenho para o icônico quiosque telefônico GPO nº2, 1924.



Erno Goldfinger, 1925, cadeira de metal com assento de mola.



Philip Bro Ludvigsen, 2005, Desenho CAD de contentor de sal "Twist".

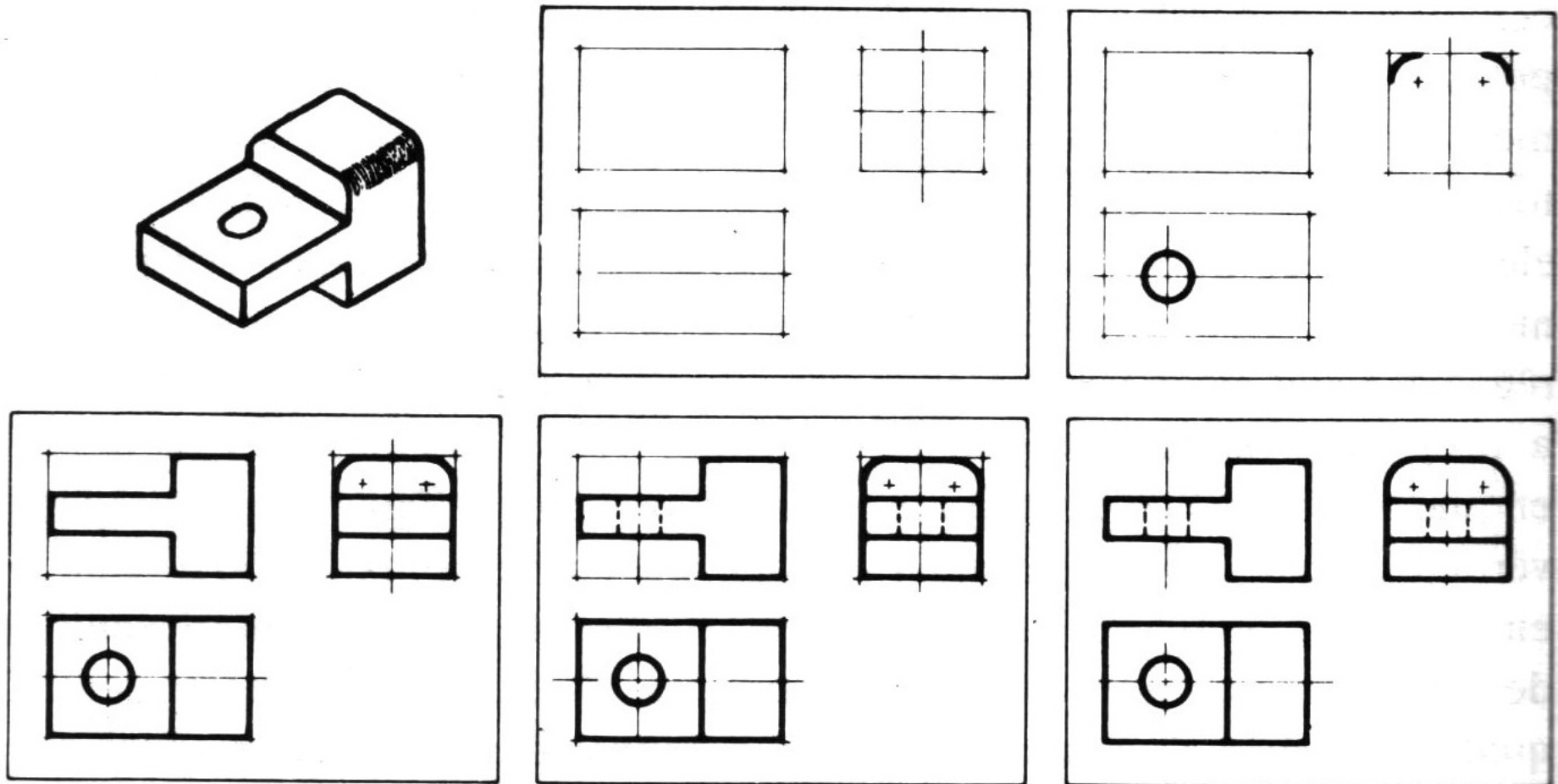


Fig. 7.41 – Fases de execução de um desenho

b) Linhas e sua utilização

A Norma Portuguesa NP-62 (1961) trata das **linhas e sua utilização**.

Nos desenhos técnicos utilizam-se traços de espessuras diferentes: grosso, médio e fino.

No quadro I mostram-se os diversos tipos de linhas.

No quadro II indica-se o grau de dureza das minas: macias, médias e duras.

A figura 27 mostra um exemplo das diversas espessuras utilizadas num desenho.

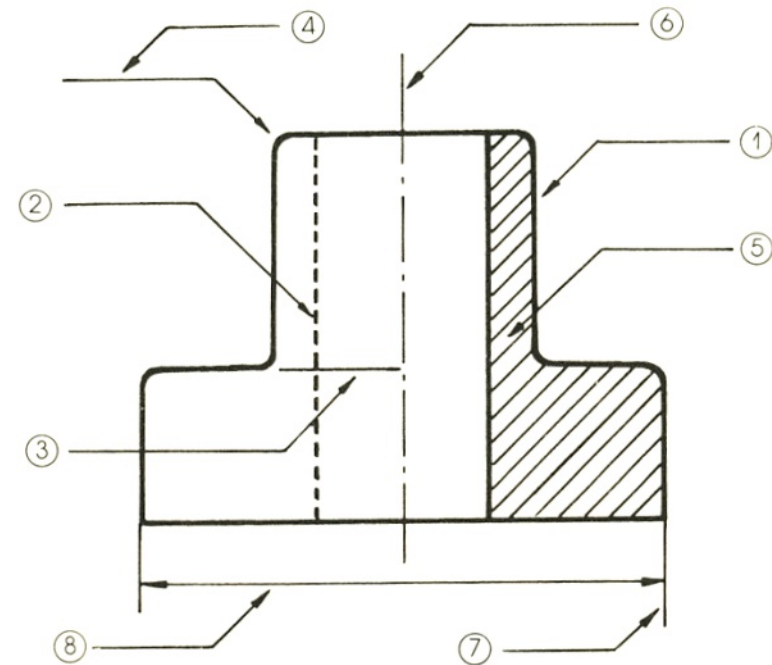
QUADRO I—Grossura de linhas

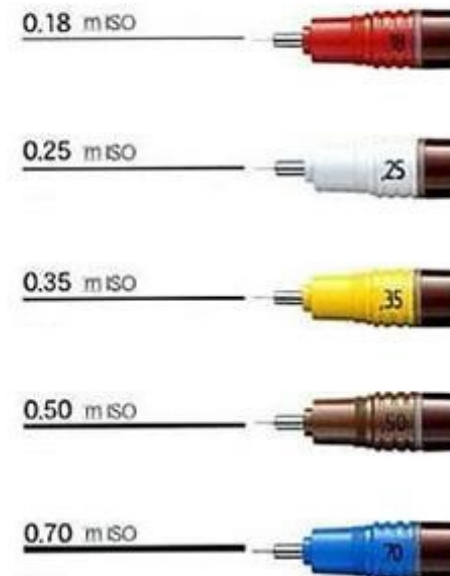
GRUPO DE LINHAS	1,4	1,0	0,7	0,5	0,35	0,25
GROSSO	1,4 ██████████	1,0 ██████████	0,7 ██████████	0,5 ██████████	0,35 ██████████	0,25 ██████████
MÉDIO	1,0 ██████████	0,7 ██████████	0,5 ██████████	0,35 ██████████	0,25 ██████████	0,18 ██████████
FINO	0,7 ██████████	0,5 ██████████	0,35 ██████████	0,25 ██████████	0,18 ██████████	0,13 ██████████

QUADRO II—Grau de dureza das minas

MINAS MACIAS	7B	6B	5B	AB	3B	2B	B		
MINAS MÉDIAS	HB	F							
MINAS DURAS	H	2H	3H	4H	5H	6H	7H	8H	9H

- Grosso ① Aresta ou linha de contorno visível
 Médio ② Aresta ou linha de contorno oculta
 Fino { ③ Aresta fictícia
 ④ Linha de referência
 ⑤ Tracejado de corte
 ⑥ Eixo de simetria
 ⑦ Linha de chamada
 ⑧ Linha de cota





Canetas de desenho técnico Rotring Isograph/Rapidograph e respectivas espessuras.
<https://www.rotring.com/en/technical-pens/50-isograph-pen-4006856151008.html>

Abordámos na página anterior a grossura das linhas utilizadas nos desenhos.

Vamos agora estudar os **tipos de traço** e os **nomes** que tomam.

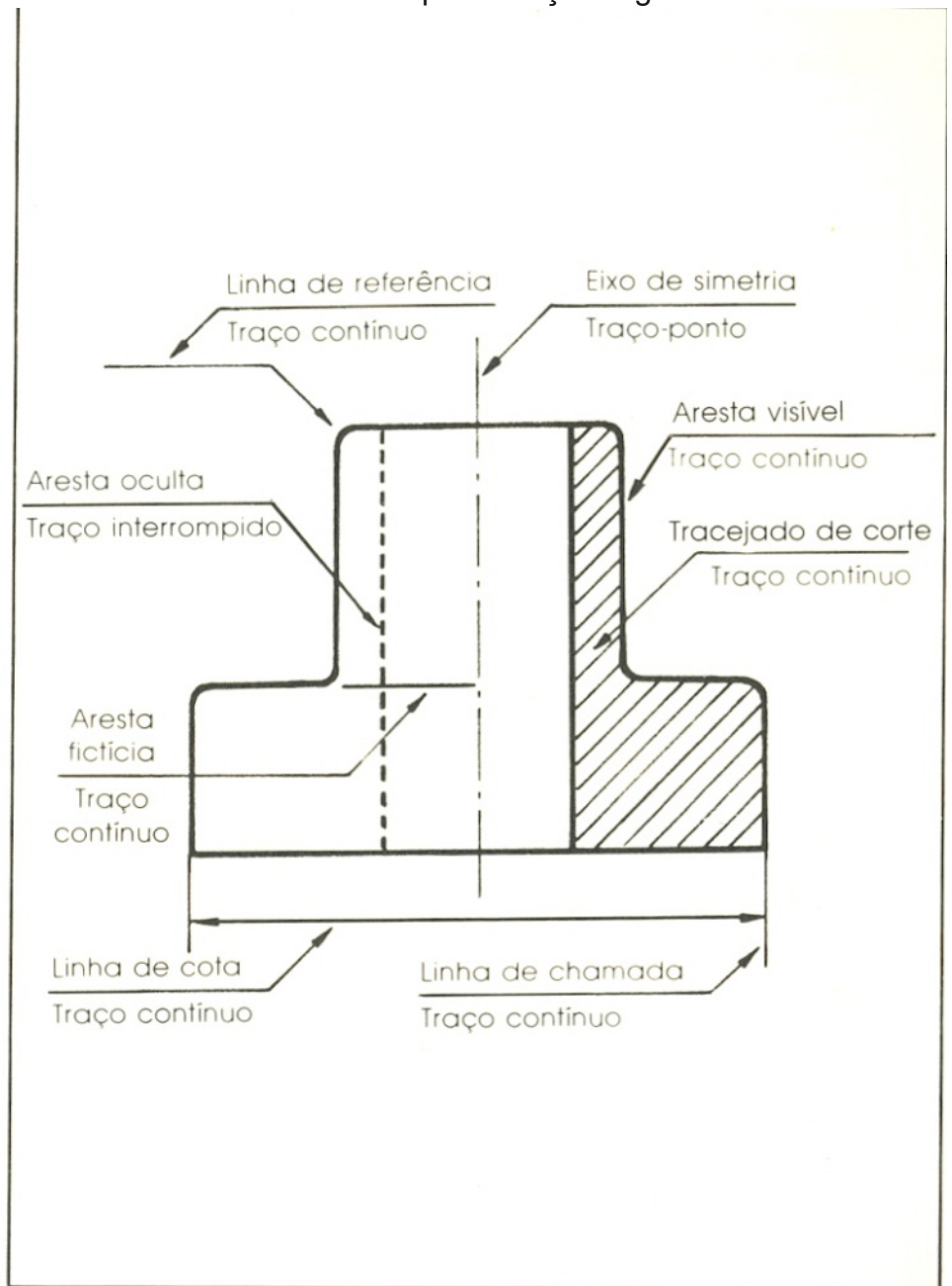
Assim, temos o traço contínuo, o traço interrompido e o traço-ponto.

No quadro III indicam-se esses tipos de traço e o que podem representar.

A figura 28 mostra um exemplo da utilização dessas linhas e sua nomenclatura.

QUADRO III — Utilização das linhas

TRAÇO CONTÍNUO	<ul style="list-style-type: none"> • Arestas e linhas de contorno visíveis • Arestas fictícias • Linhas de cota • Linhas de chamada • Linhas de referência • Contornos de secções rebatidas • Tracejados de cortes
TRAÇO INTERROMPIDO	<ul style="list-style-type: none"> • Arestas e linhas de contorno ocultas
TRAÇO-PONTO	<ul style="list-style-type: none"> • Eixos e traços de planos de simetria • Posições extremas de peças móveis • Zonas situadas à frente de um plano de corte



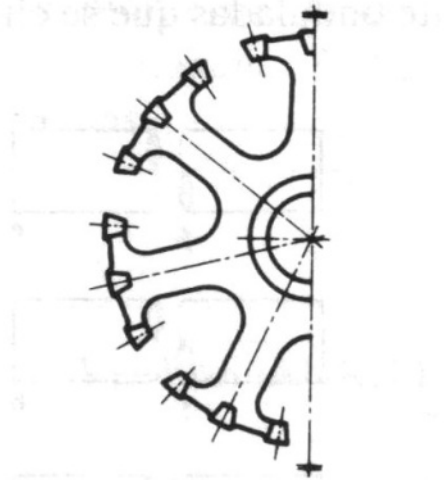


Fig. 7.20 – Meia vista

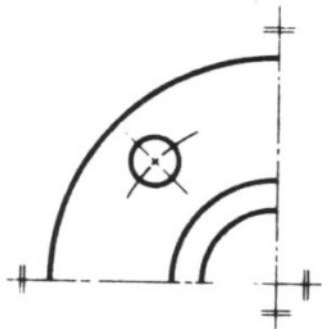


Fig. 7.21 – Vista parcial de uma peça com dois eixos de simetria

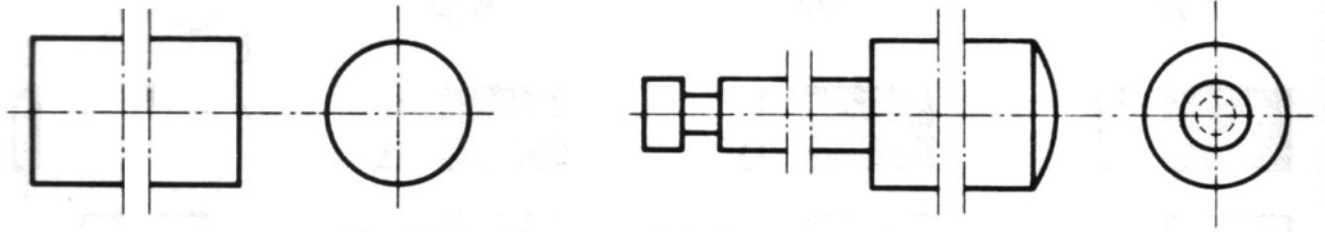


Fig. 7.22 – Vistas parciais de peças compridas

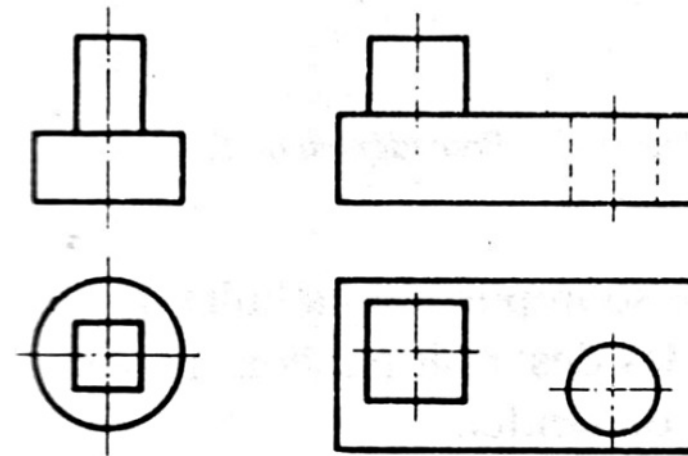


Fig. 7.31 – Representação de linhas de eixo

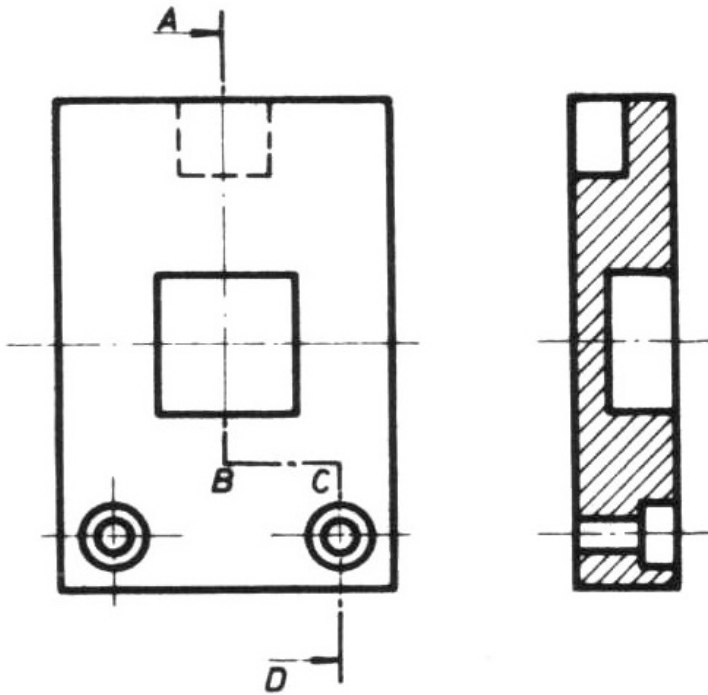


Fig. 8.5— Corte por uma superfície secante de traço poligonal.

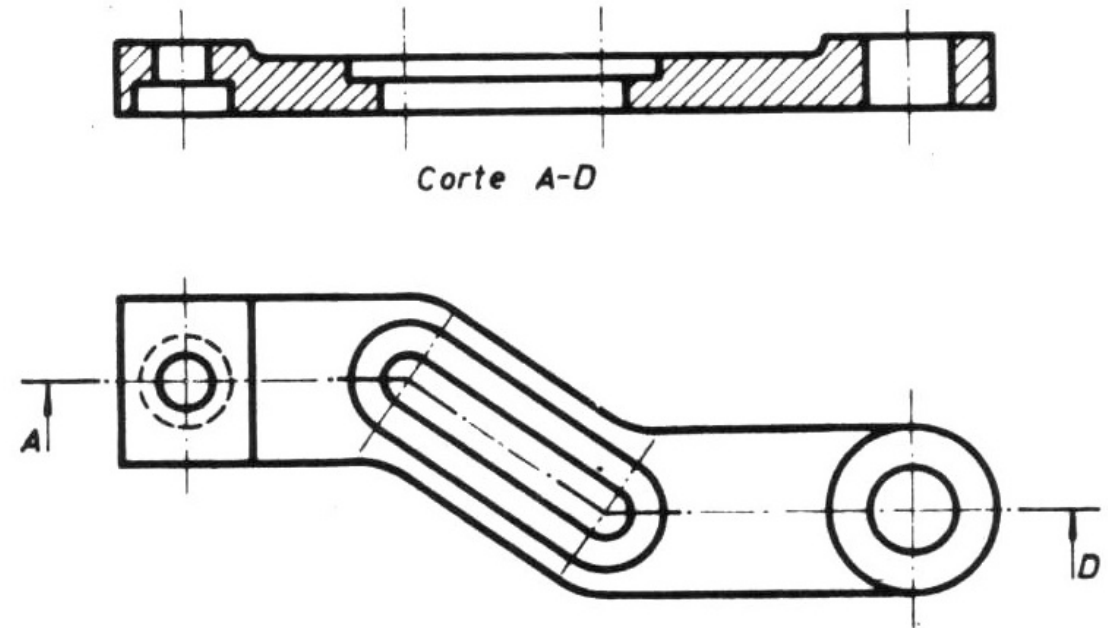


Fig. 8.6— A inscrição de letras junto aos pontos de mudança de direcção prejudicaria a clareza do desenho

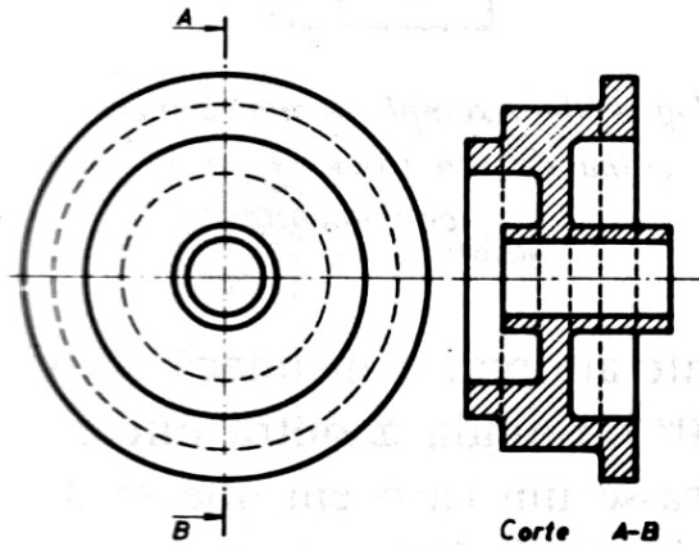


Fig. 8.7— Representação de linhas ocultas em corte (desnecessária)

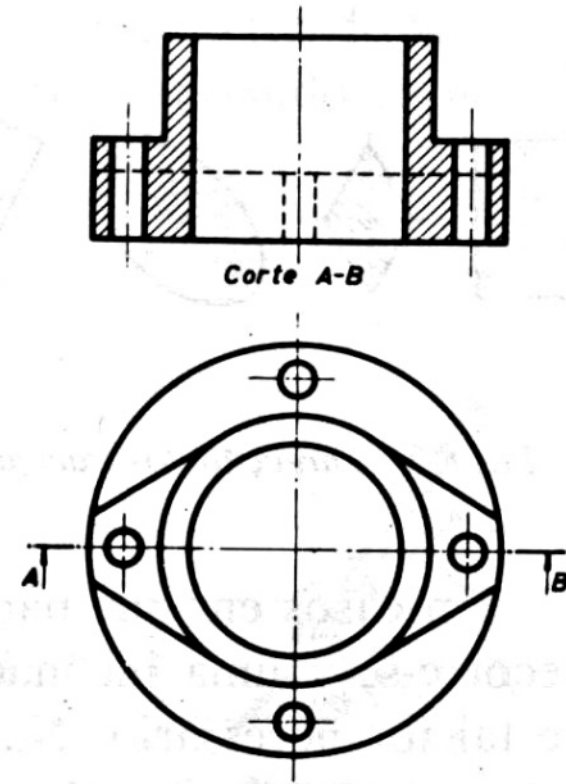


Fig. 8.8— Representação de linhas ocultas em corte (necessária)

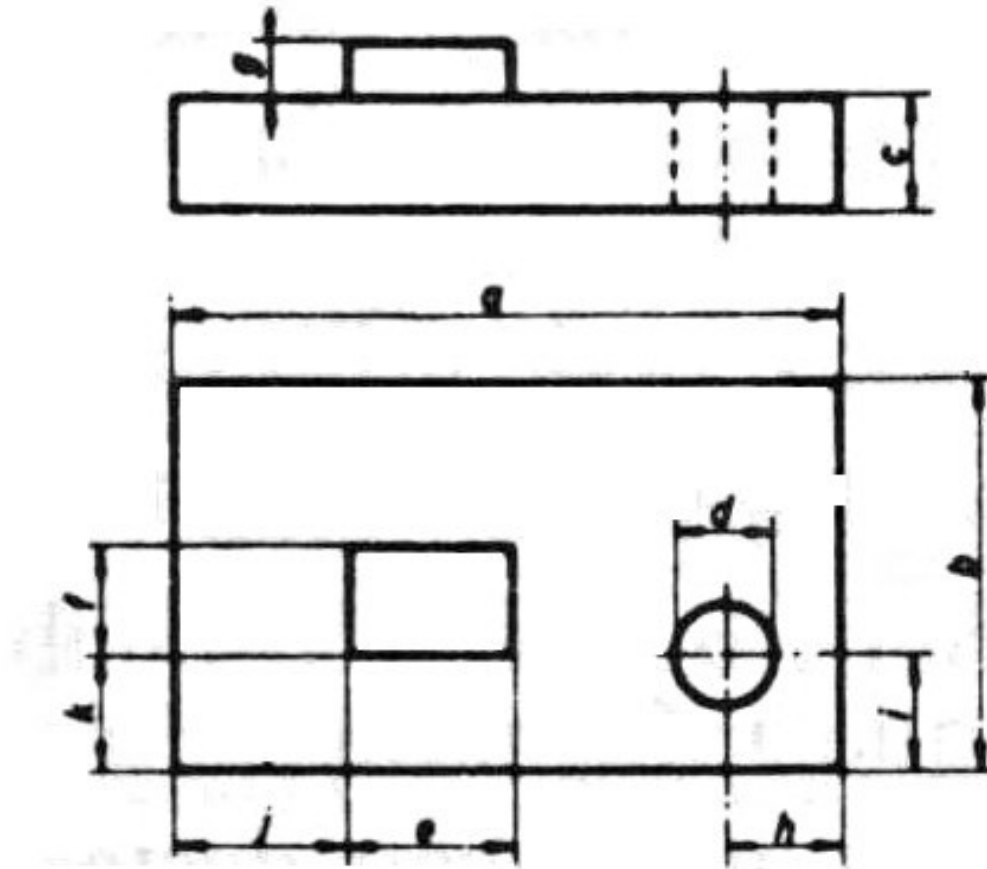


Fig. 12.37 – Escolha de cotas mais convenientes

e) Cotagem

Para, a partir de um desenho técnico, se executar um objecto, é necessário que esse desenho contenha indicações sobre as medidas do objecto.

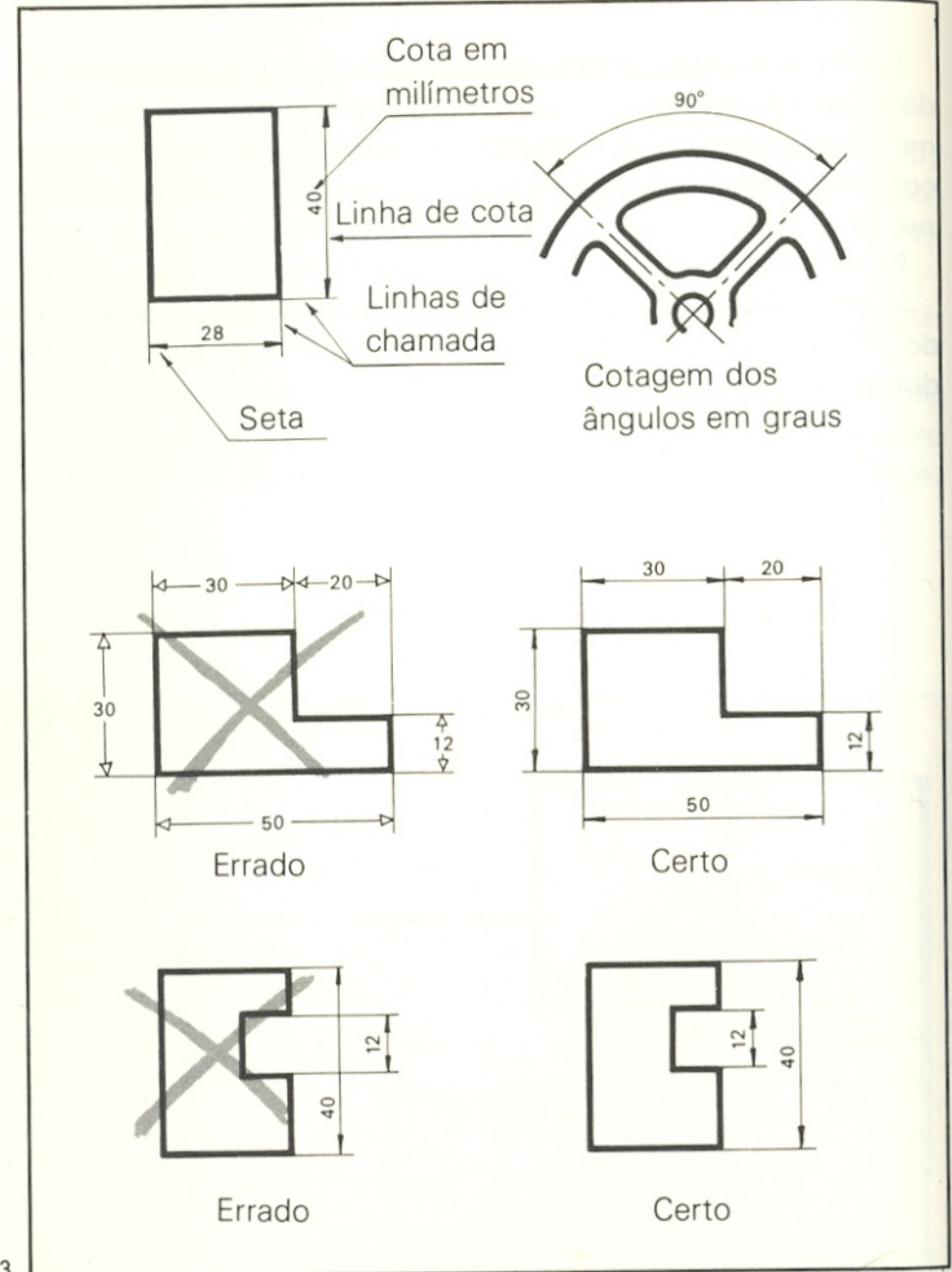
O processo da inscrição dessas medidas no desenho designa-se por **cotagem**.

As normas utilizadas na cotagem dos desenhos estão contidas na Norma Portuguesa NP-297 (1963). Trata-se de normas bastante complexas que requerem uma especialização e saem do âmbito desta disciplina.

No entanto, podemos ficar com noções muito elementares para resolver os casos mais comuns.

Assim:

- As cotas ou medidas referentes a peças de máquinas, são expressas em milímetros e os ângulos em graus.
- As cotas são distribuídas por todas as vistas, evitando-se a sua repetição.
- Tanto quanto possível, são indicadas no espaço exterior envolvente da peça, para uma fácil leitura.
- A linha de cota não deve ser interrompida para colocar a respectiva medida; esta é indicada em números desenhados sempre do lado de cima da linha de cota.
- Deve evitar-se o cruzamento de linhas de cota.



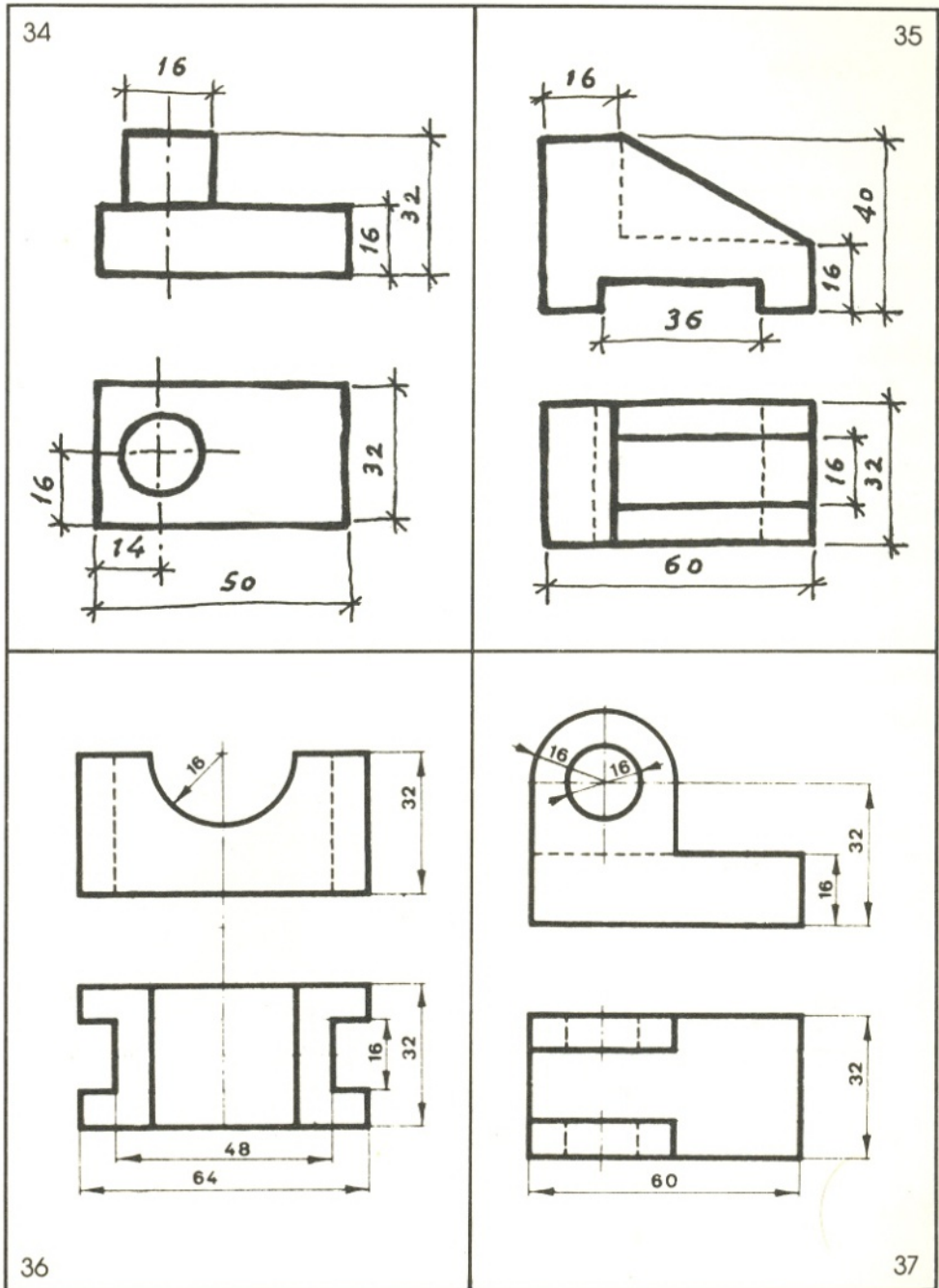
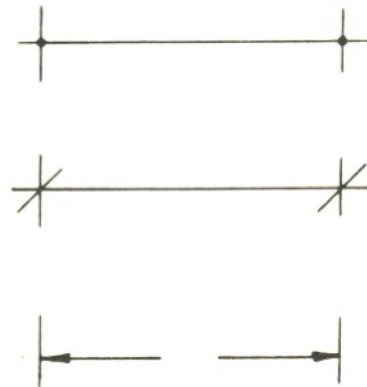
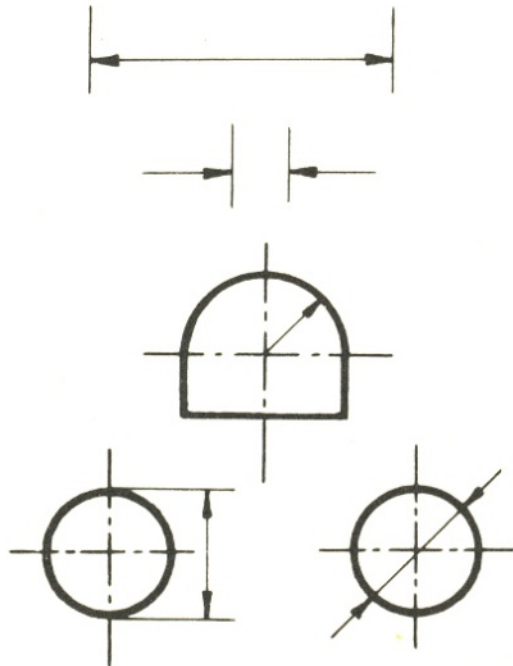
Nas figuras em baixo, exemplifica-se o processo de cotação em casos gerais e em casos particulares.

Nas figuras 34 e 35, mostram-se exemplos de peças cotadas em esboço.

Nas figuras 36 e 37, mostram-se exemplos de peças desenhadas em definitivo.

Casos gerais

Casos particulares



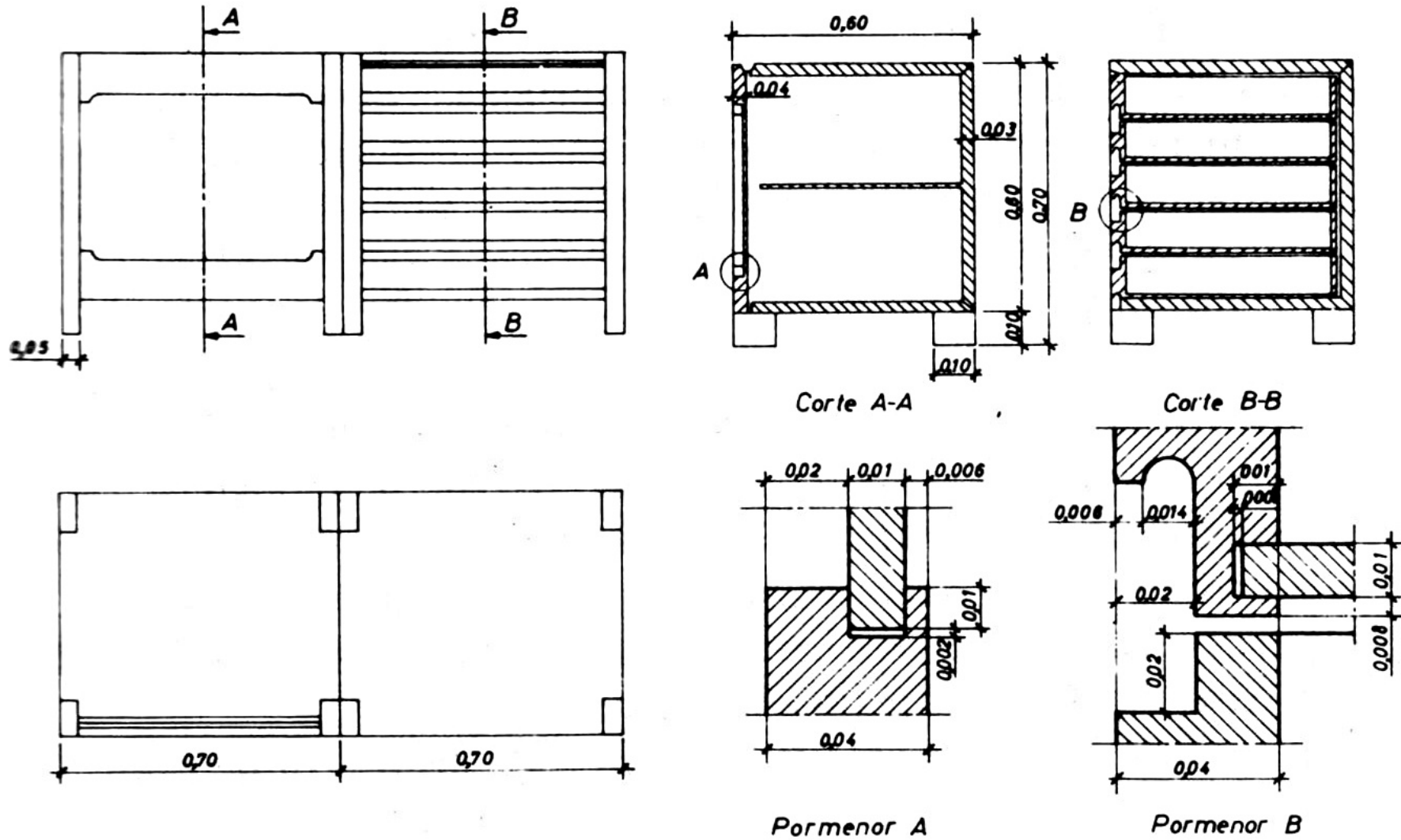


Fig. 19.2— Exemplos de desenho de mobiliário

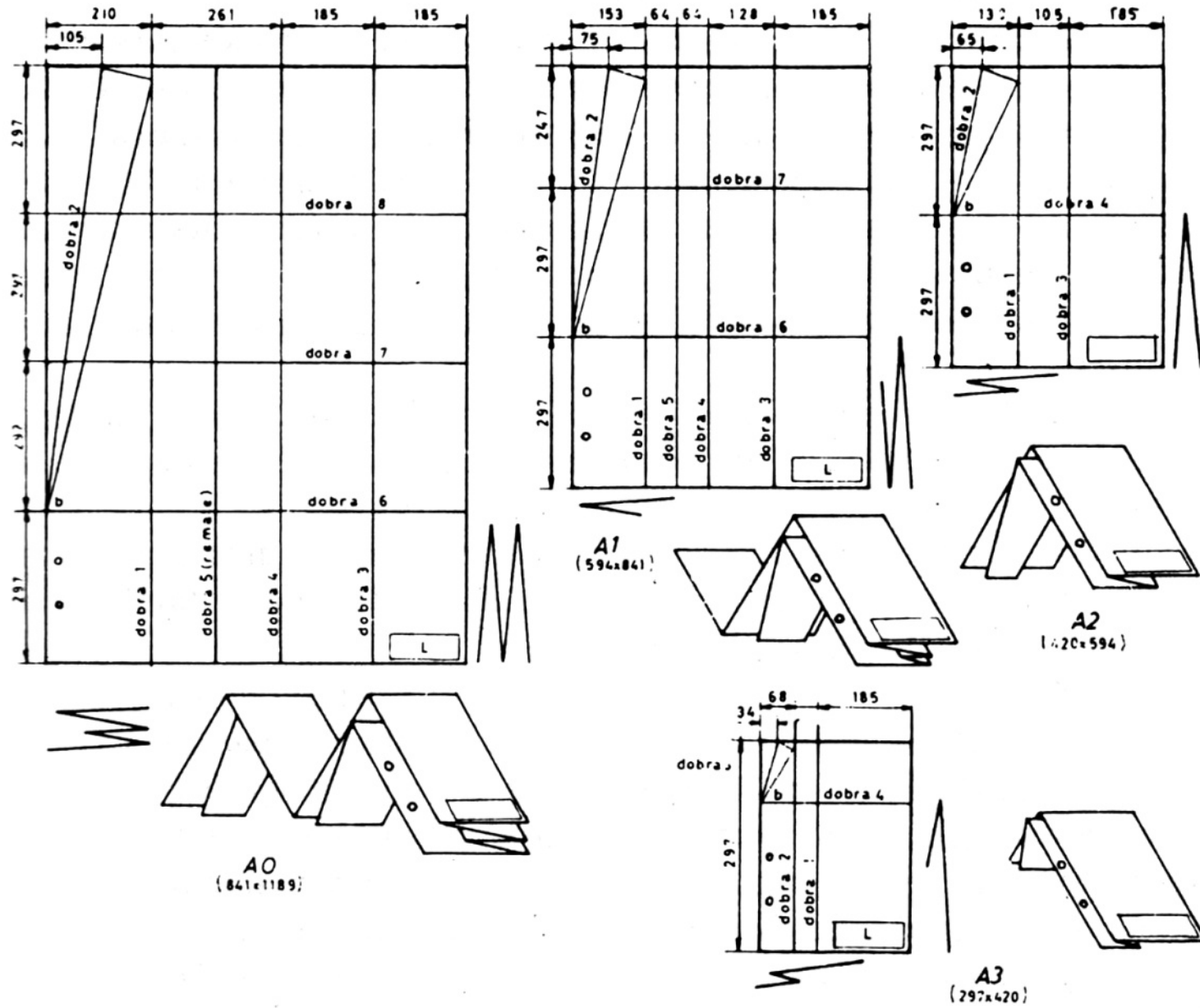


Fig. 3.72— Dobragem de desenhos executados ao alto

Esquema de dobragem de desenhos executados ao alto

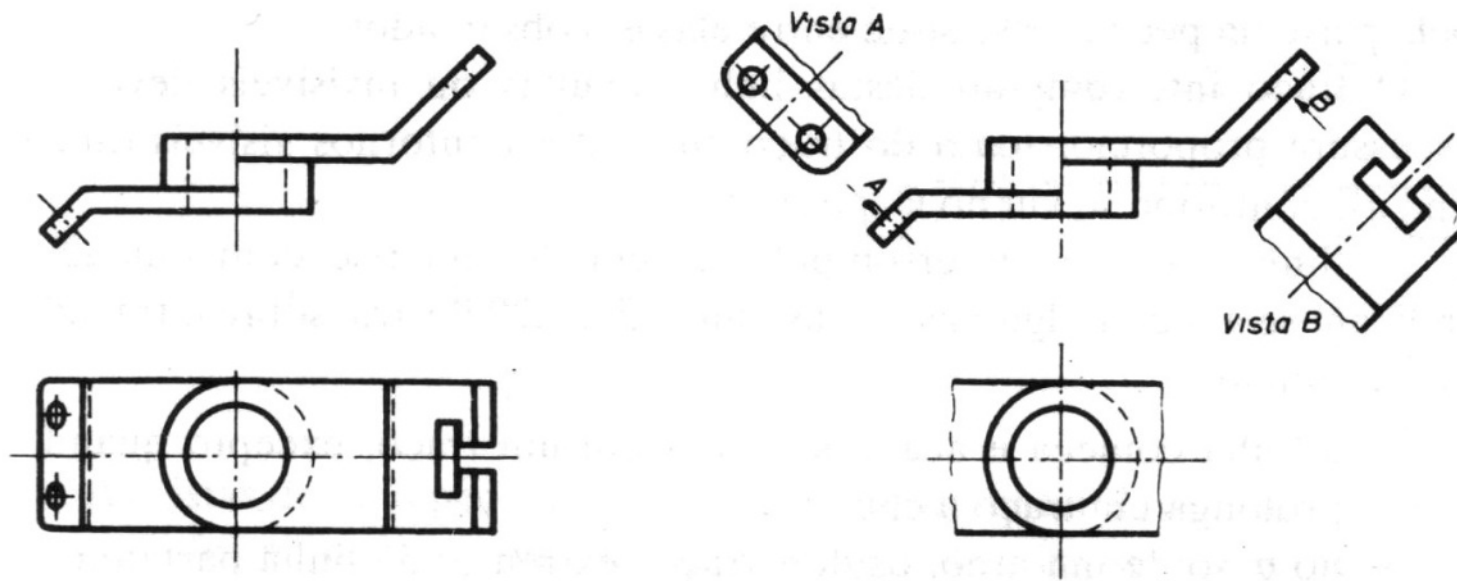


Fig. 7.27 – Comparação da representação com projecções ortogonais correntes e usando vistas auxiliares

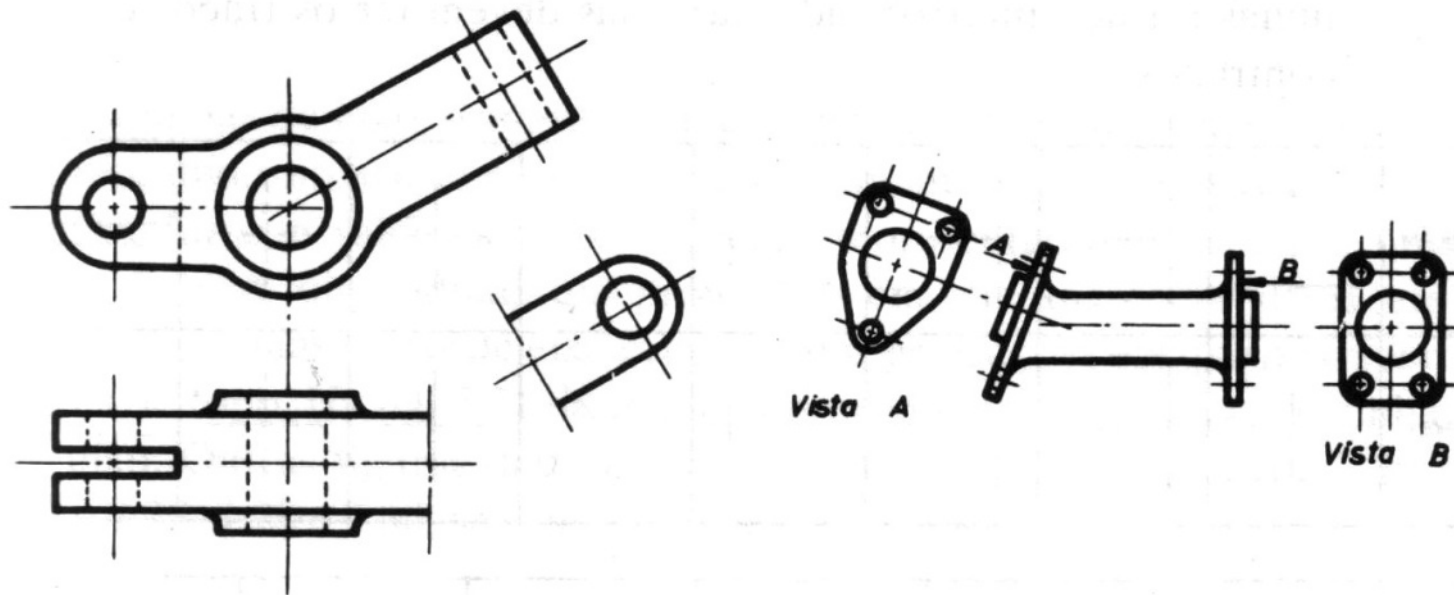
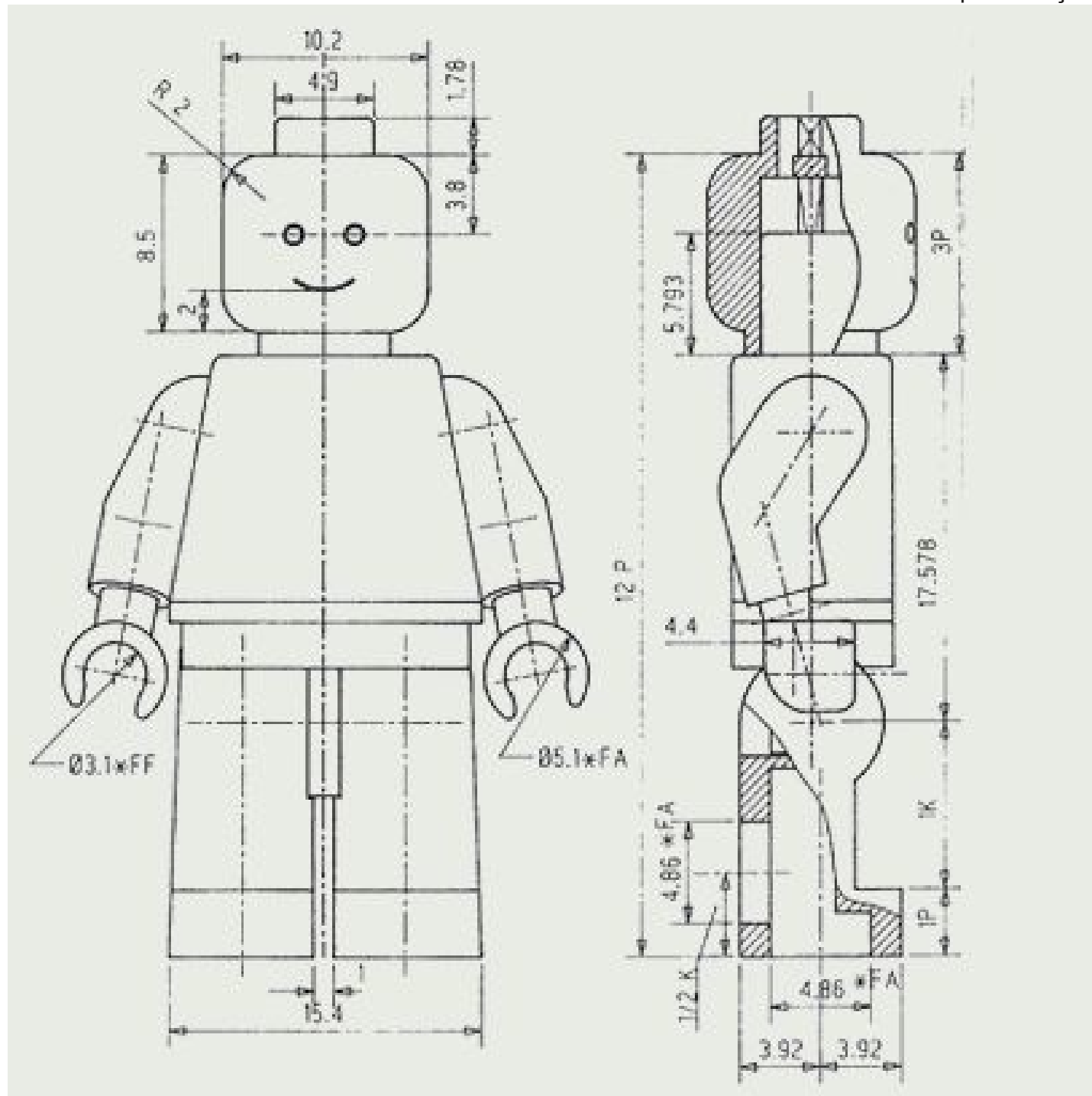
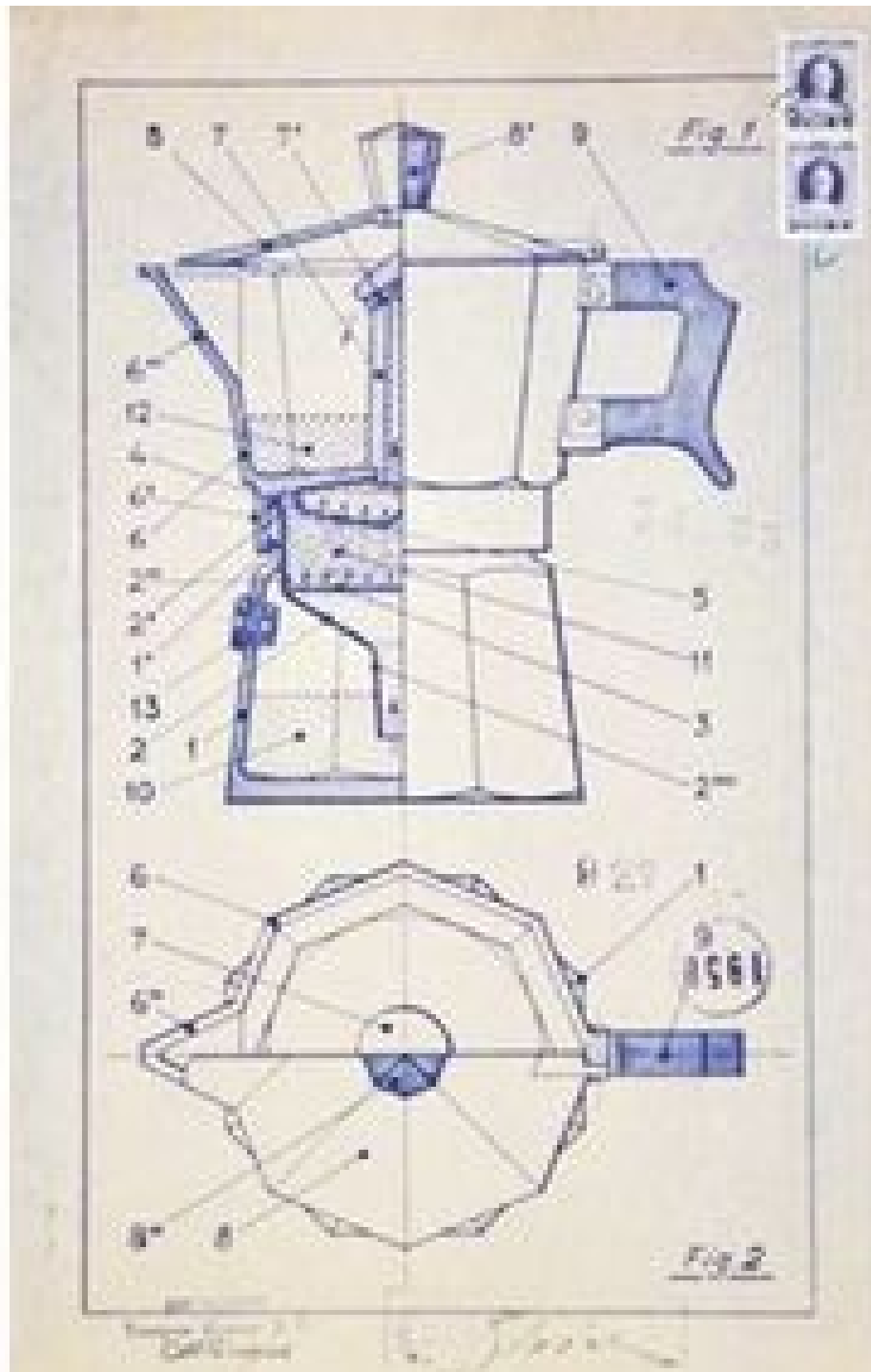
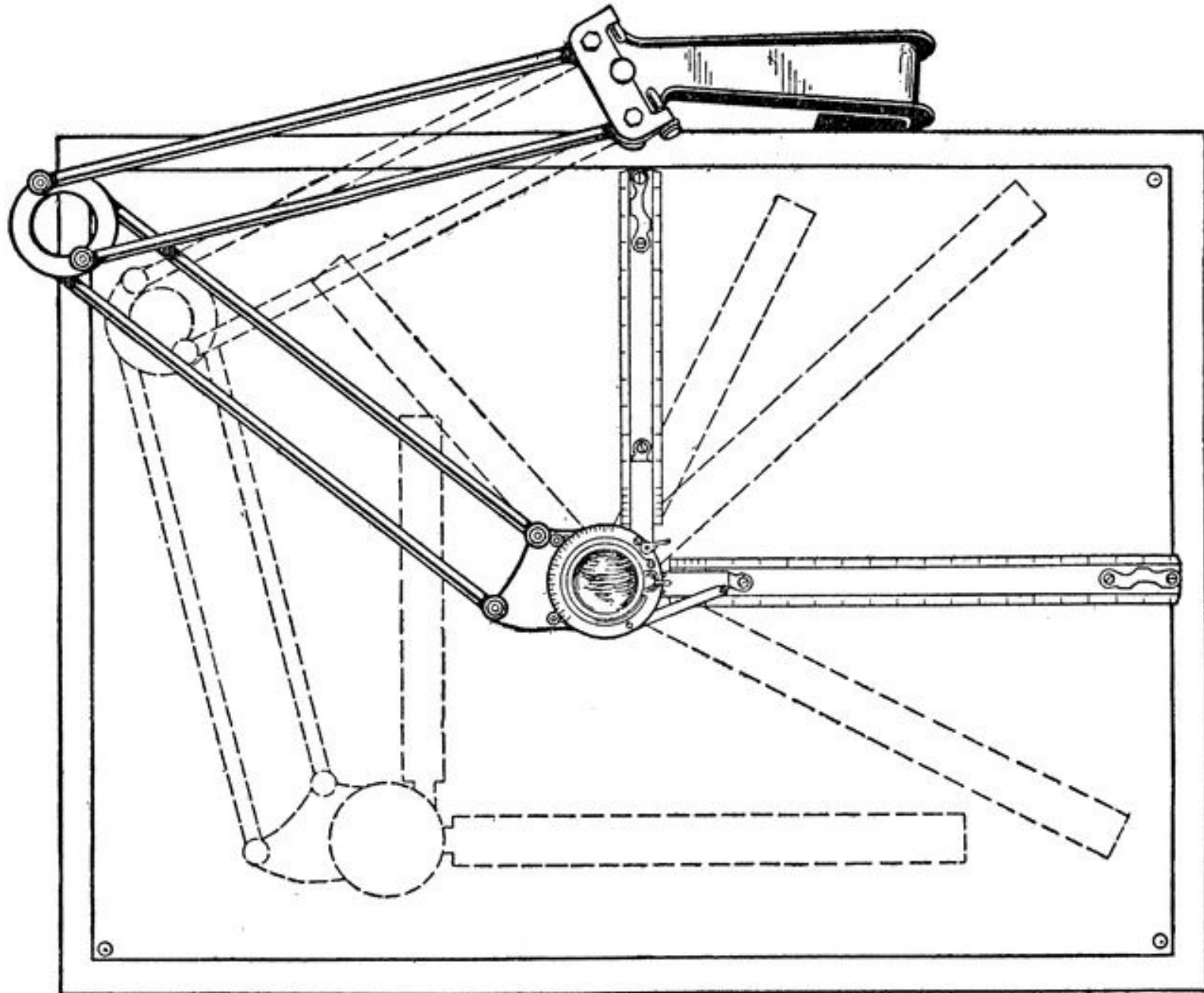
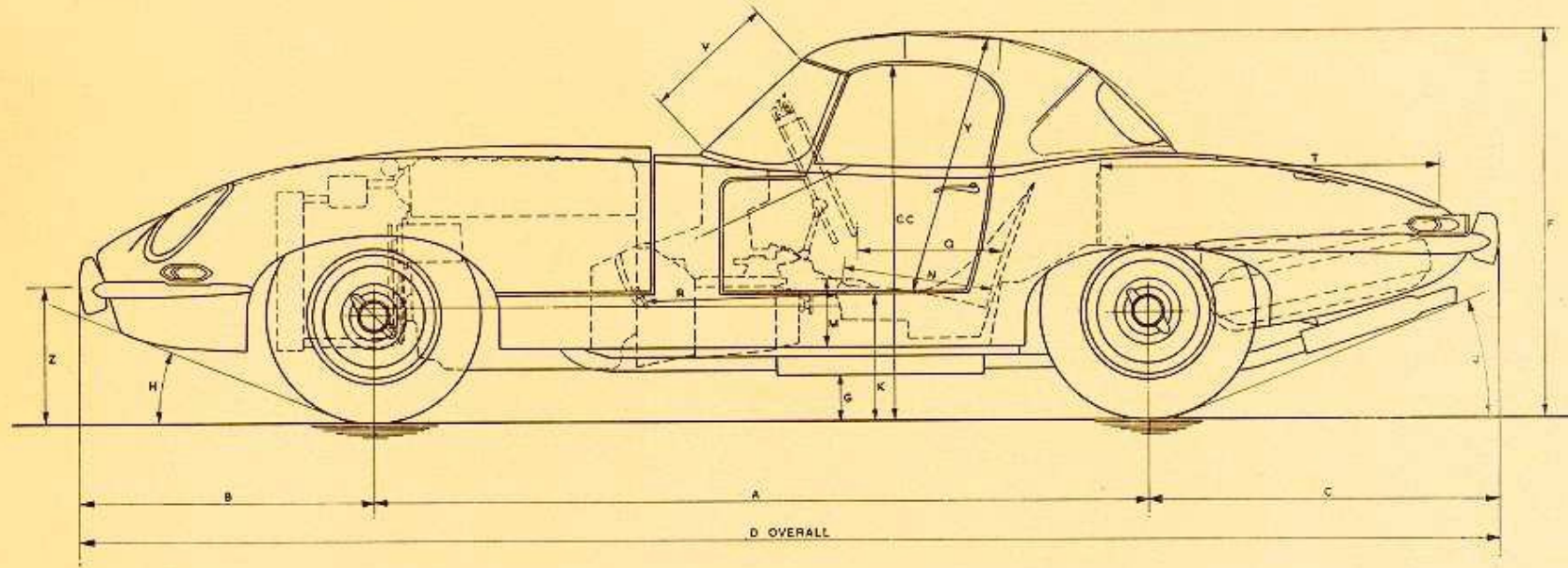


Fig. 7.28 – Exemplos de vistas auxiliares









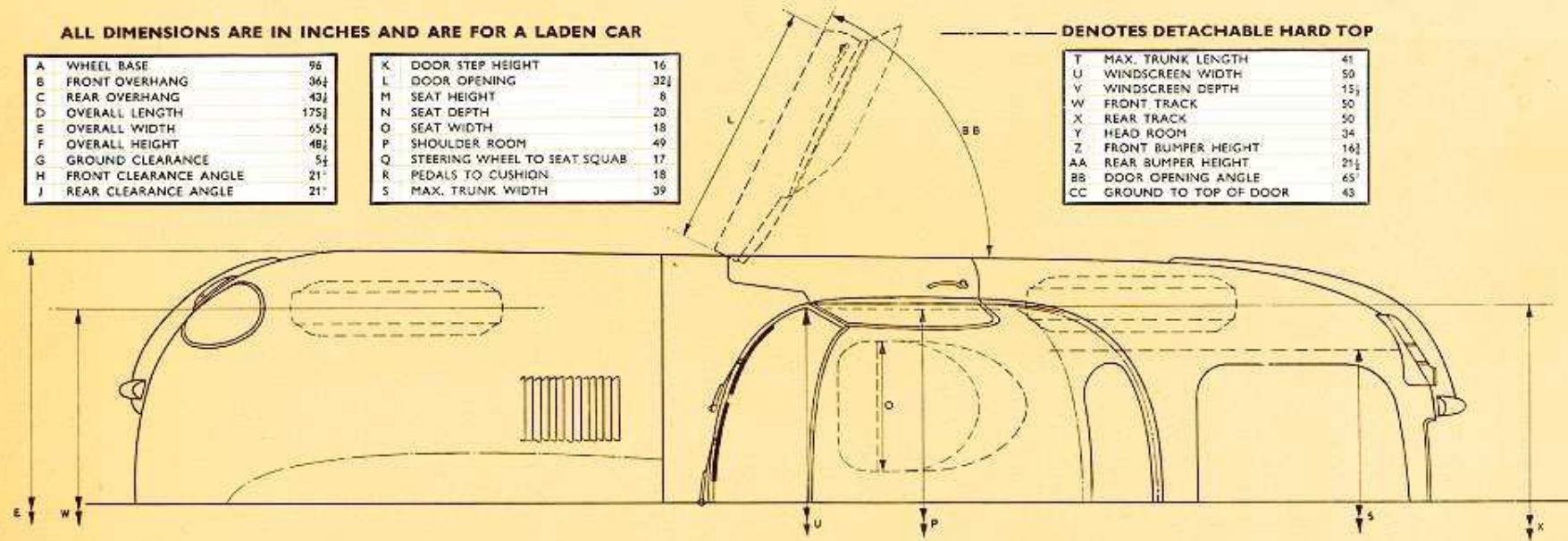
ALL DIMENSIONS ARE IN INCHES AND ARE FOR A LADEN CAR

A	WHEEL BASE	56
B	FRONT OVERHANG	36½
C	REAR OVERHANG	43½
D	OVERALL LENGTH	175½
E	OVERALL WIDTH	65½
F	OVERALL HEIGHT	48½
G	GROUND CLEARANCE	5½
H	FRONT CLEARANCE ANGLE	21°
J	REAR CLEARANCE ANGLE	21°

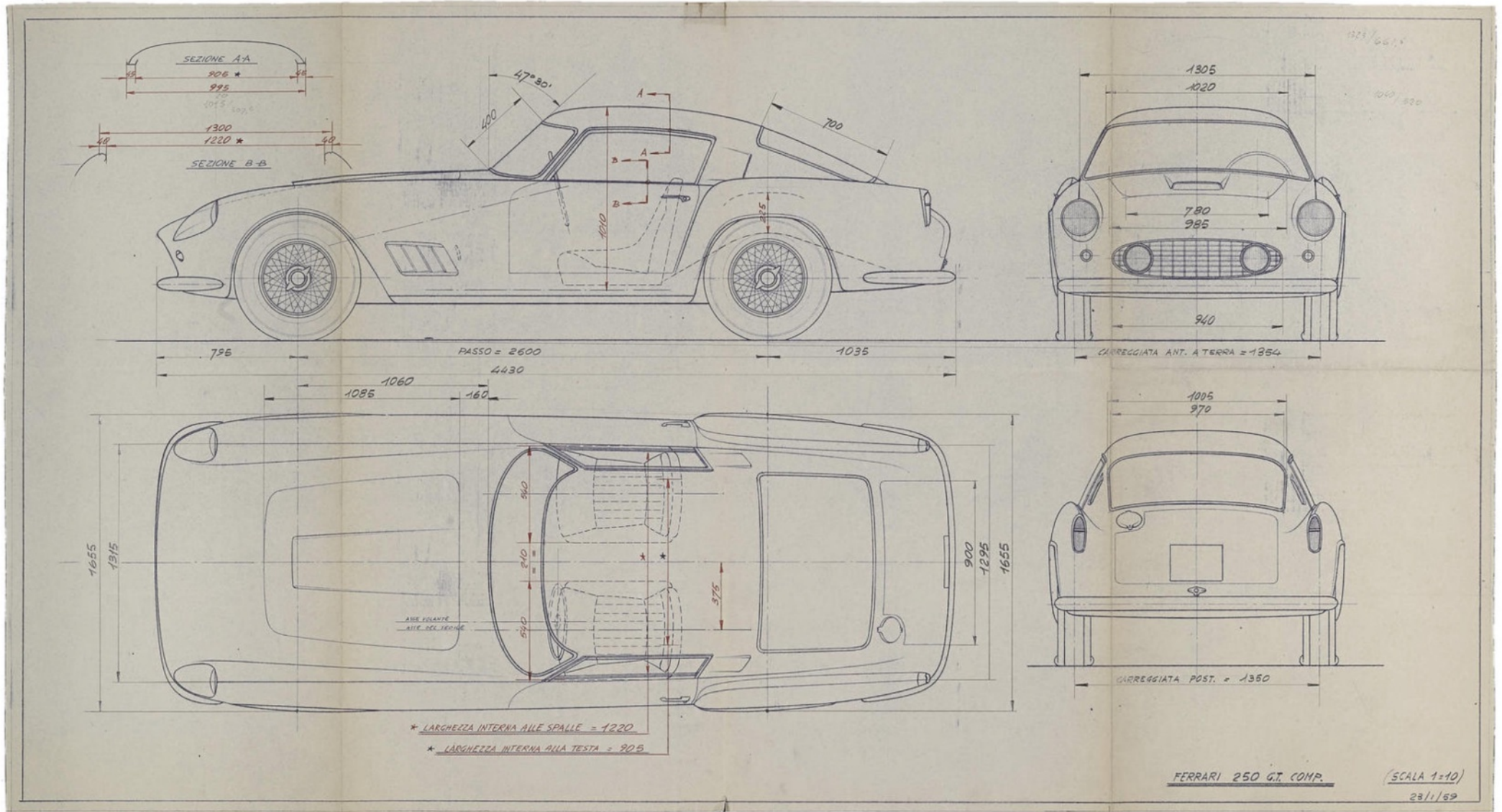
K	DOOR STEP HEIGHT	16
L	DOOR OPENING	32½
M	SEAT HEIGHT	8
N	SEAT DEPTH	20
O	SEAT WIDTH	18
P	SHOULDER ROOM	49
Q	STEERING WHEEL TO SEAT SQUAB	17
R	PEDALS TO CUSHION	18
S	MAX. TRUNK WIDTH	39

--- DENOTES DETACHABLE HARD TOP

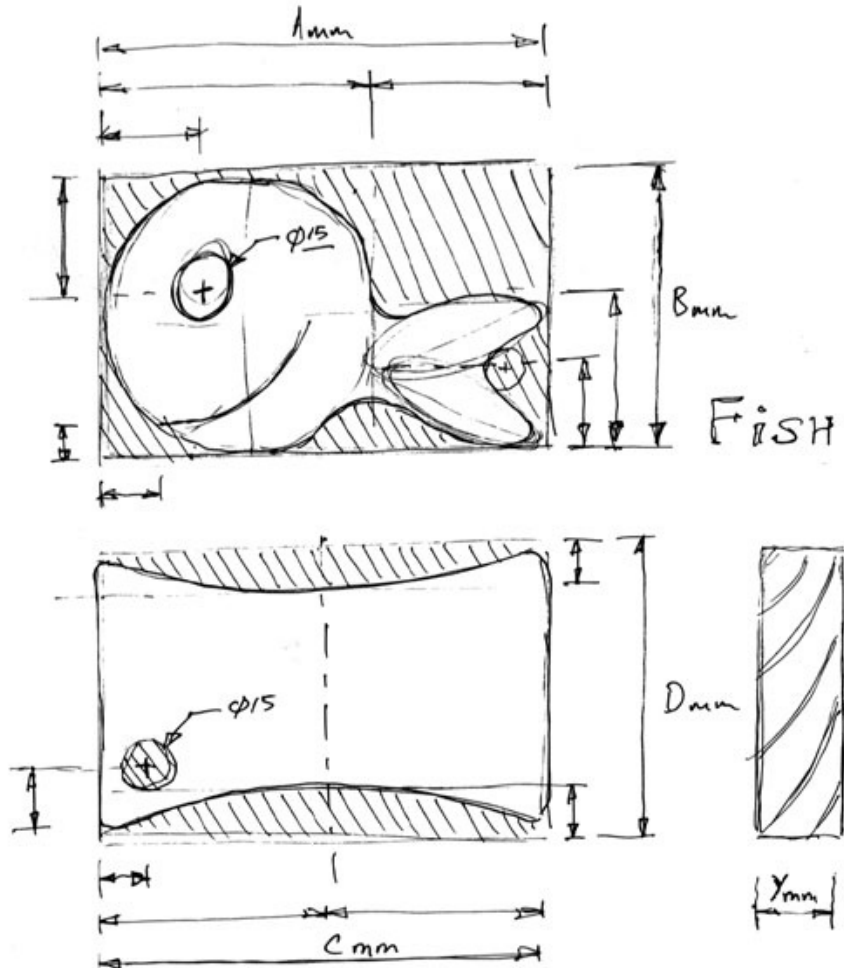
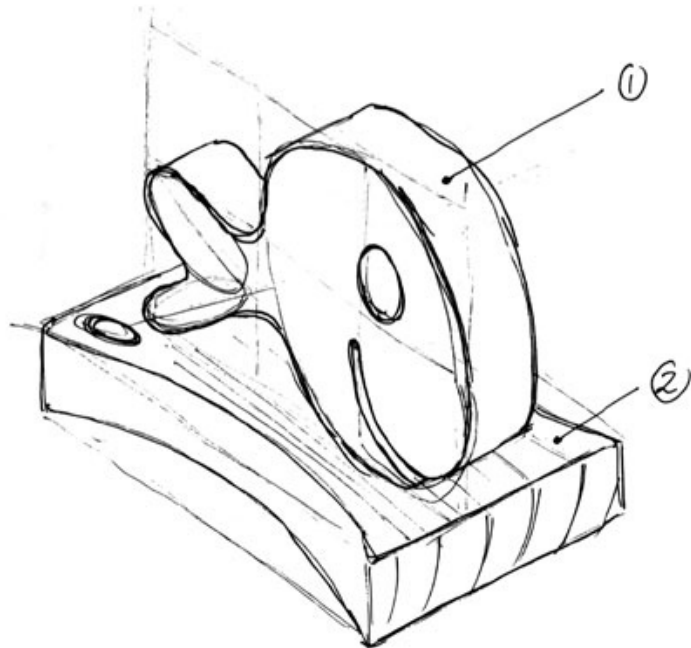
T	MAX. TRUNK LENGTH	41
U	WINDSCREEN WIDTH	50
V	WINDSCREEN DEPTH	15½
W	FRONT TRACK	50
X	REAR TRACK	50
Y	HEAD ROOM	34
Z	FRONT BUMPER HEIGHT	16½
AA	REAR BUMPER HEIGHT	21½
BB	DOOR OPENING ANGLE	65°
CC	GROUND TO TOP OF DOOR	43



OPEN TWO-SEATER MODEL GENERAL DIMENSIONS

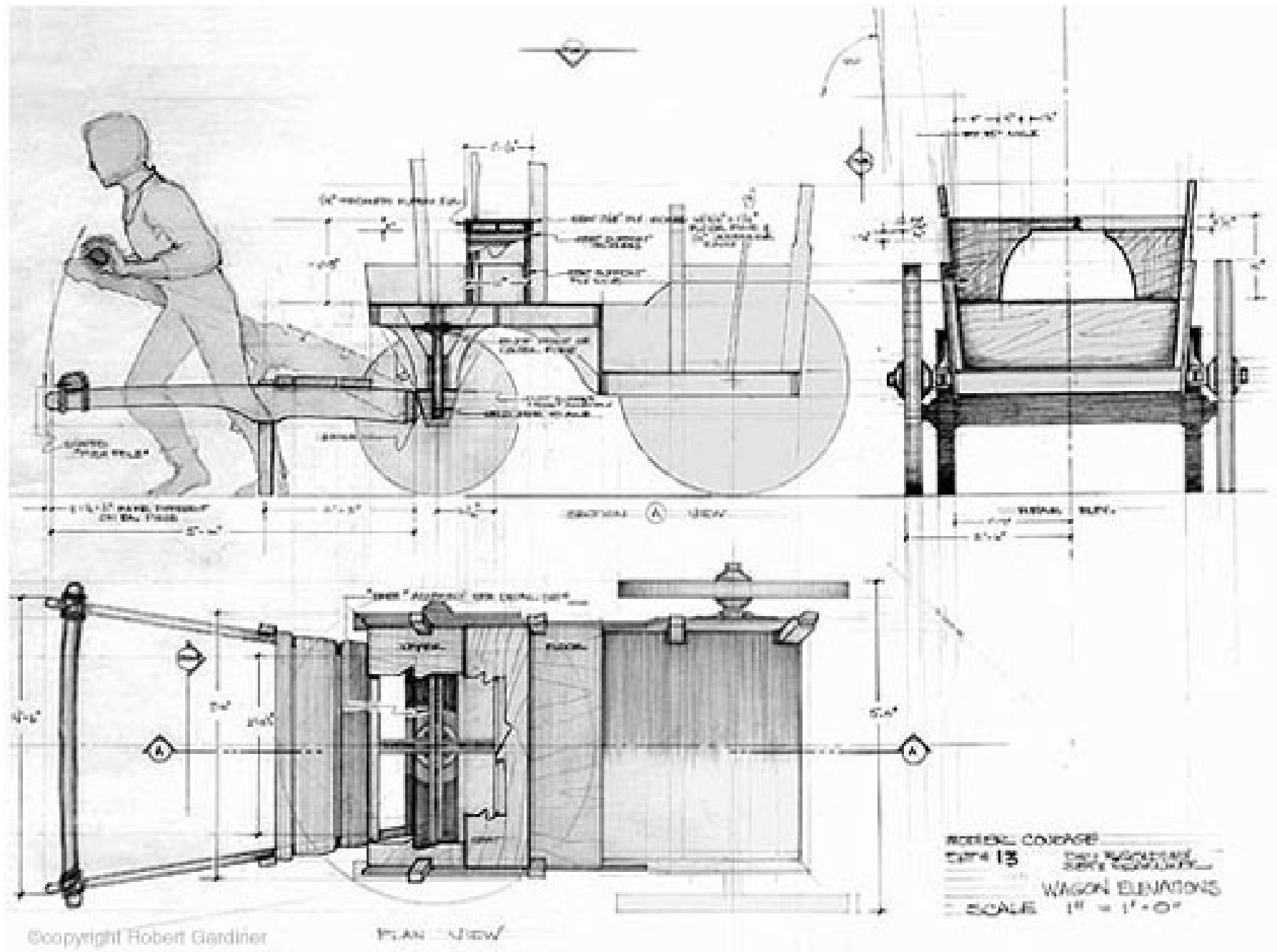


WORKING DRAWING



PARTS	DESCRIPTION	DIMENSION	MATERIAL	QTY
1 & 2	BASE FISH BODY	$A\text{ mm} \times B\text{ mm} \times Y\text{ mm}$	JELUTONG	2
MATERIAL LIST : FISH				

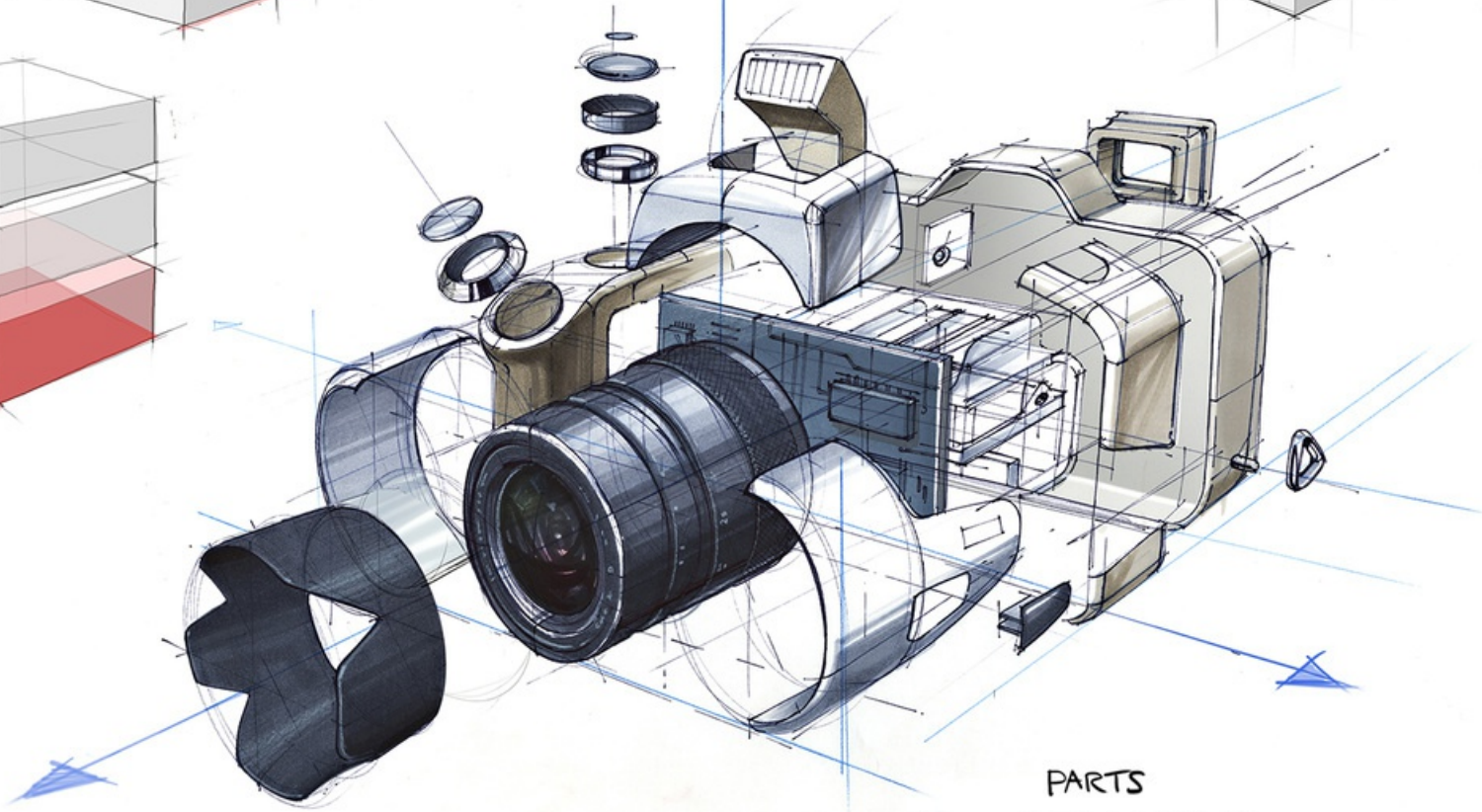
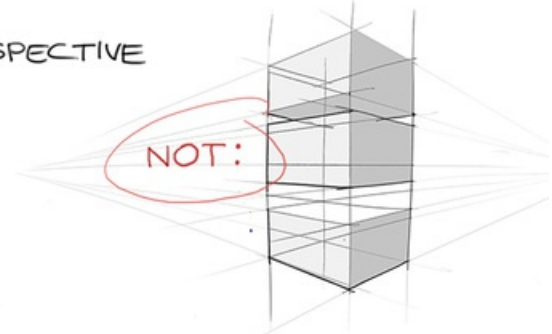
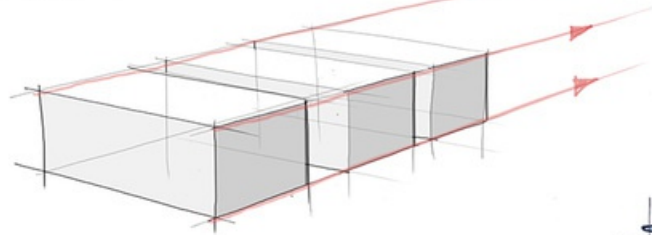
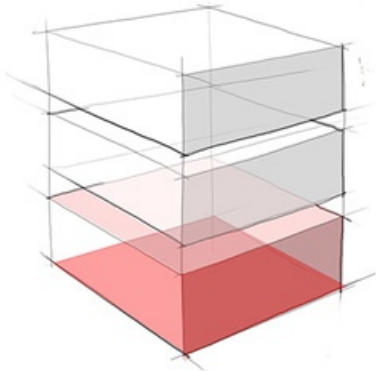
12/4/12
M



VIEWPOINT

MODERATE PERSPECTIVE

NOT:



EXPLODING IN PERSPECTIVE DIRECTIONS

PARTS
OVERLAPPING

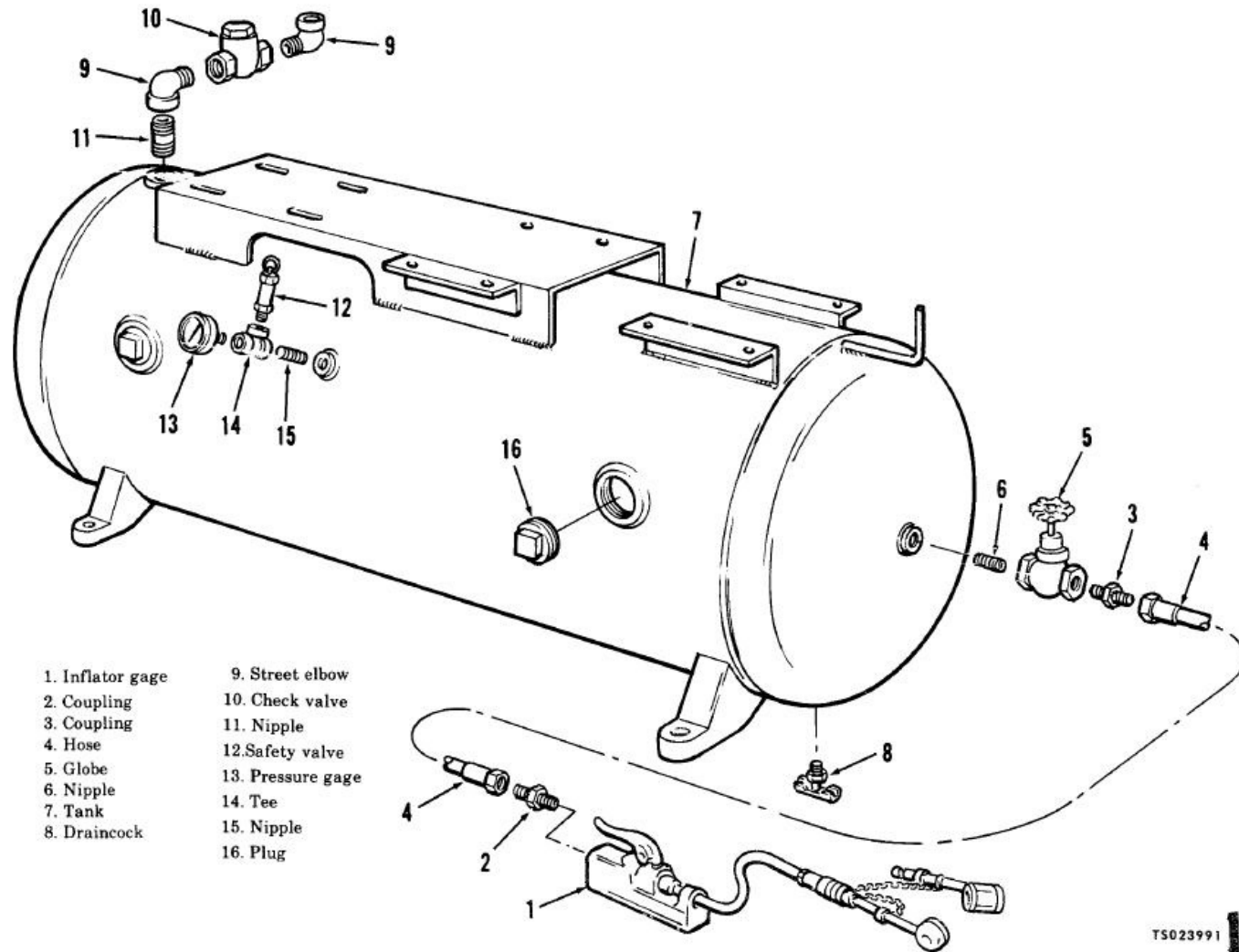


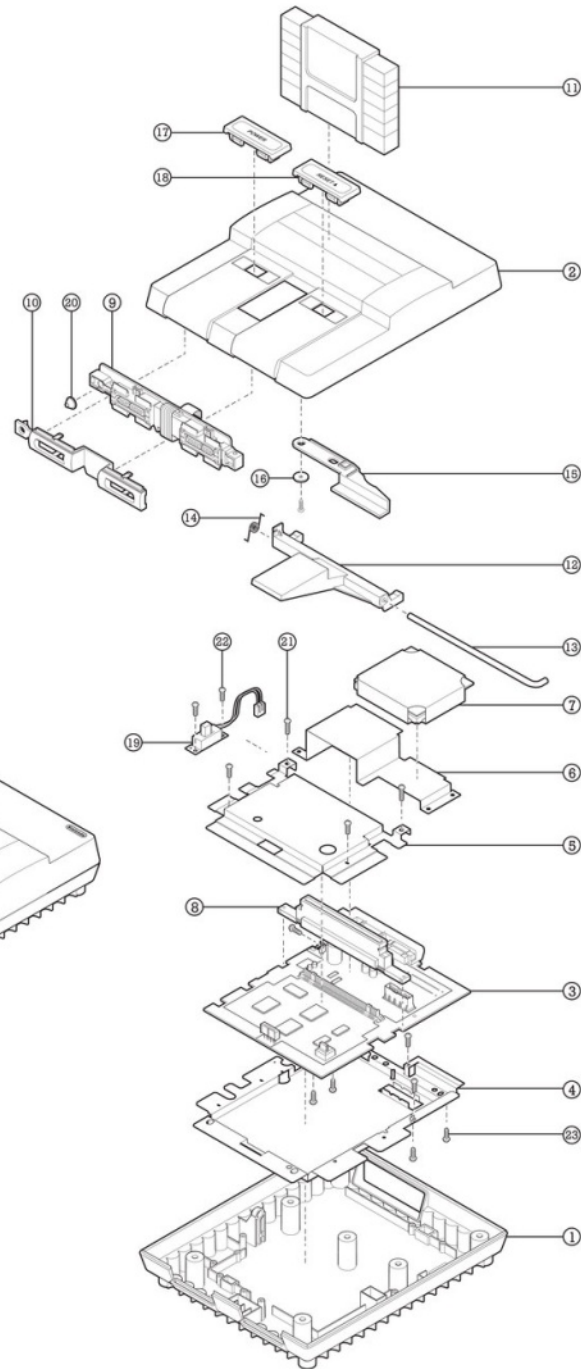
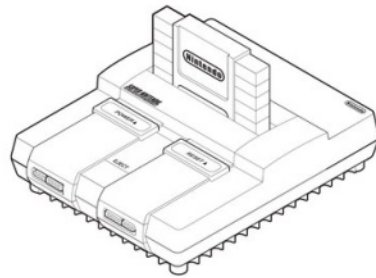
Figure 4-25.1. Compressor controls and instruments, air receiver tank and related parts, model HGR5-8M-6, exploded view.

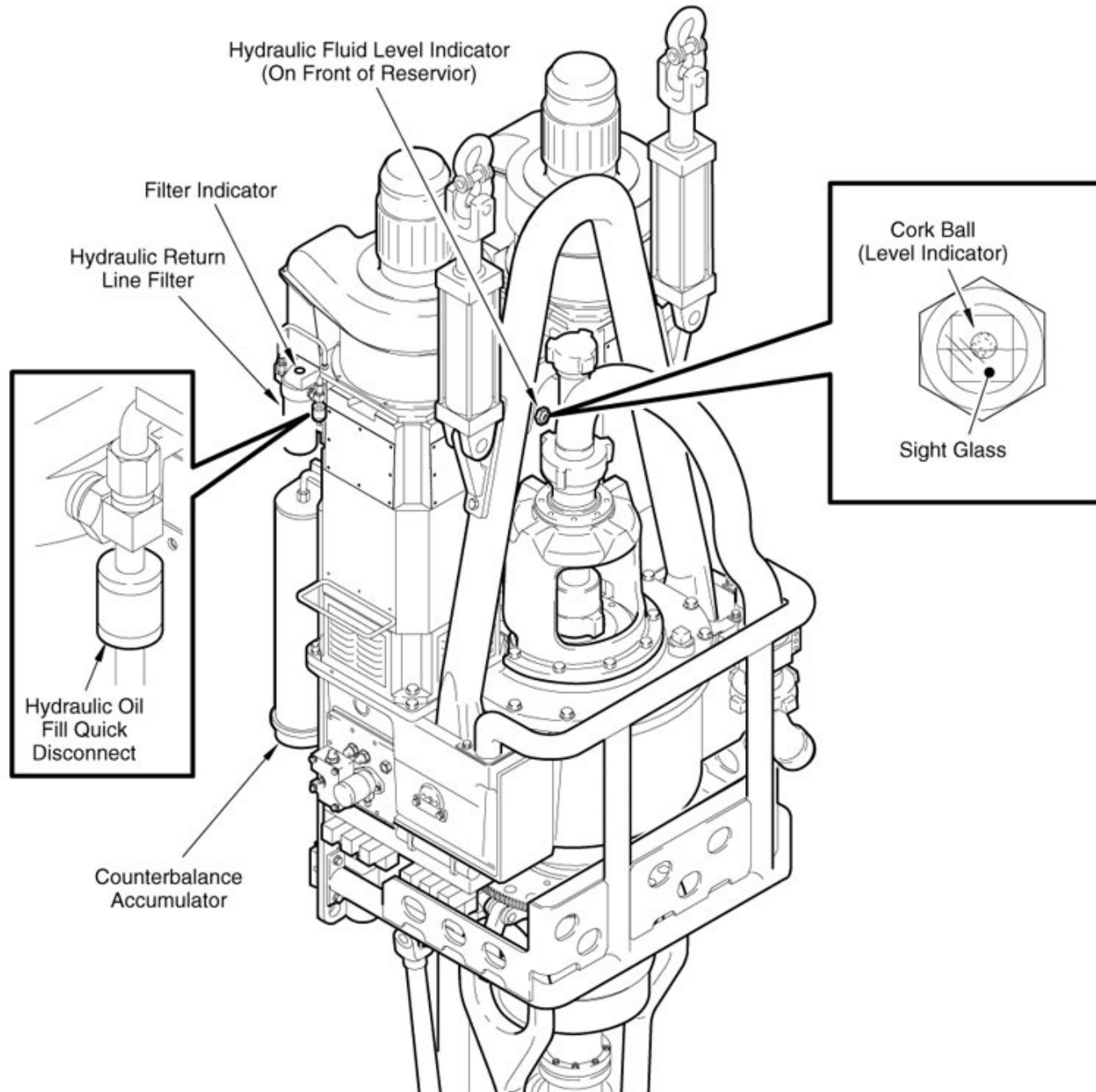
Change 1
 4-44.1/(4-44.2b1ank)

TM 5-4310-277-14

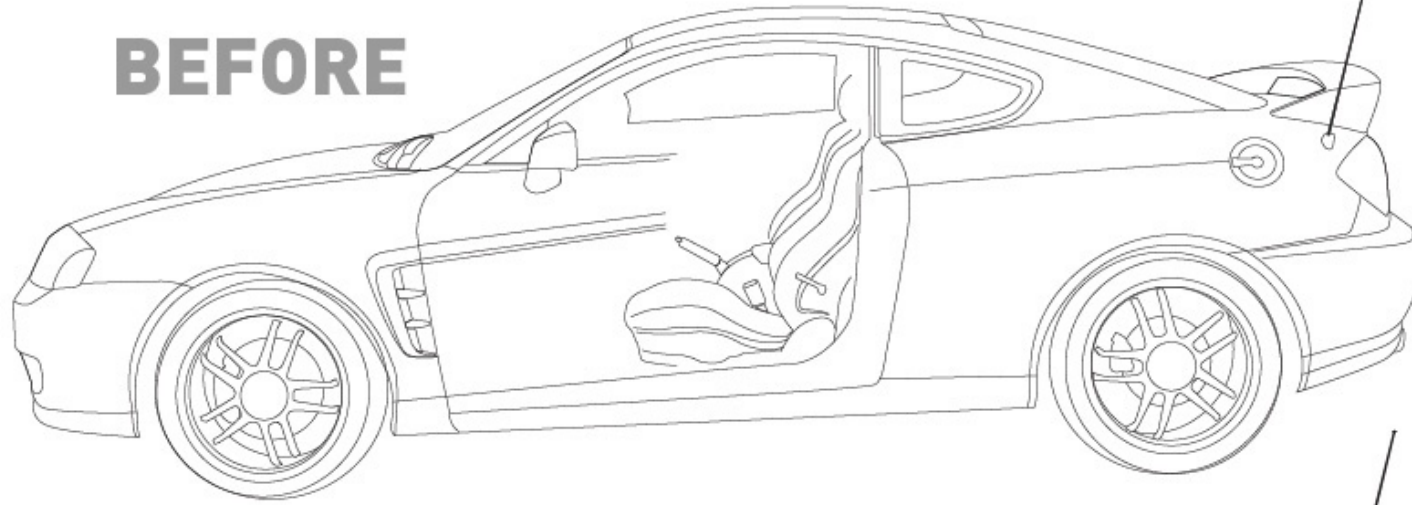
Parts List	Quantity
1 Lower Housing	1
2 Upper Housing	1
3 Motherboard	1
4 Base Plate	1
5 Motherboard Cover Plate	1
6 Heat Sink	1
7 Sound Card	1
8 Cartridge Dock	1
9 Controller Port Circuit Board	1
10 Controller Port Casing	1
11 Game Cartridge	1
12 Eject Lever	1
13 Eject Lever Rod	1
14 Eject Lever Spring	1
15 Power Lock	1
16 Plastic Washer	1
17 Power Button	1
18 Reset Button	1
19 Power Switch	1
20 Power Light	1
21 Large Screw	2
22 Small Screw	7
23 Locking Screw	5

SUPER NINTENDO
ENTERTAINMENT SYSTEM





BEFORE



AFTER

