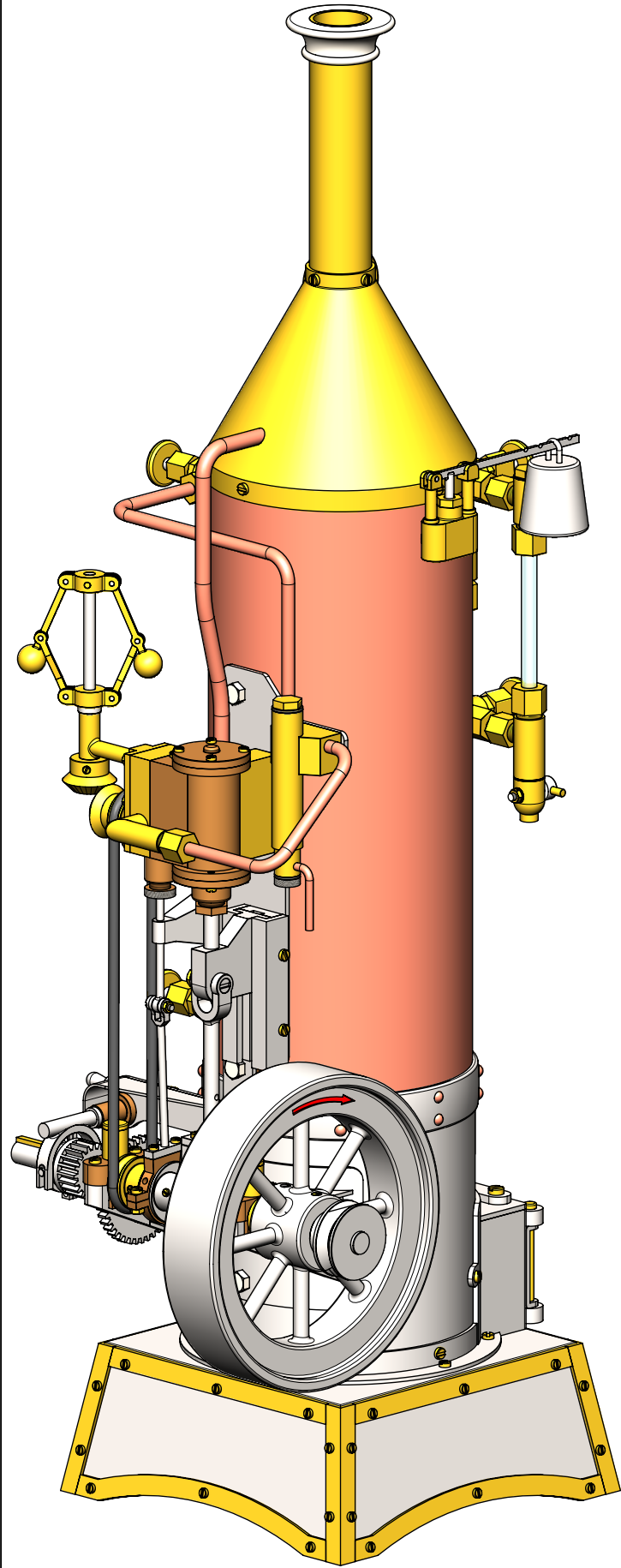
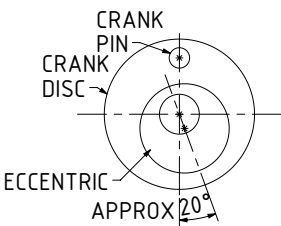




QTY.	PART NUMBER
1	BERNIE-1-01-INTERNAL BASE FRAME PLATE
3	BERNIE-1-02-BASE FRAME STIFFENING PLATE-1
4	BERNIE-1-02-BASE FRAME STIFFENING PLATE-2
2	BERNIE-1-03-BASE FRAME STIFFENING PLATE-3
2	BERNIE-1-04-BASE FRAME STIFFENING PLATE-4.
4	BERNIE-1-05-BASE FRAME CORNER ANGLE
1	BERNIE-1-06-BASE FRAME TOP PLATE
1	BERNIE-1-07-FIRE BOX BASE RING
1	BERNIE-1-08-FIRE BOX SHELL
1	BERNIE-1-09-FIRE BOX DOOR MOUNTING PLATE
1	BERNIE-1-10-FIRE BOX DOOR SURROUND
1	BERNIE-1-11-FIRE BOX DOOR
1	BERNIE-1-12-FIRE DOOR HINGE BRACKET
1	BERNIE-1-13-FIRE DOOR HINGE PIN
1	BERNIE-1-14-FIRE DOOR LOCKING HANDLE
1	BERNIE-1-15-WTR FD PMP HOUSING BRACKET
1	BERNIE-1-16-WTR FD PMP HOUSING
2	BERNIE-1-17-WTR FD PMP BALL VALVE
1	BERNIE-1-18-WTR FD PMP HOUSING OUTLET NIPPLE
1	BERNIE-1-19-WTR FD PMP HOUSING INLET NIPPLE
2	BERNIE-1-20-WTR FD PMP PIPE NUT
1	BERNIE-1-21-WTR FD PMP PLUNGER NUT
1	BERNIE-1-22- BEARING STAND MOUNTING PLATE
1	BERNIE-1-23-BEARING STAND BRACKET-1
1	BERNIE-1-24-BEARING STAND BRACKET-2
2	BERNIE-1-25-CRANK SHAFT BEARING BLOCK
2	BERNIE-1-26-CRANK SHAFT BEARING BLOCK OILER
1	BERNIE-1-27-BOILER SHELL
1	BERNIE-1-28-BOILER BOTTOM COVER
1	BERNIE-1-28-BOILER TOP COVER
9	BERNIE-1-29-BOILER FLAME TUBE
7	BERNIE-1-30-BOILER BUSH M8x11x14
2	BERNIE-1-31-BOILER BUSH M5x9x12
5	BERNIE-1-32-ON-OFF VALVE HOUSING
5	BERNIE-1-33-ON-OFF VALVE SPINDLE SCREW NIPPLE
10	BERNIE-1-34-ON-OFF VALVE SPINDLE-PIPE NUT
5	BERNIE-1-35-ON-OFF VALVE SPINDLE
1	BERNIE-1-36-NON-RETURN VALVE BODY
1	BERNIE-1-37-NON-RETURN VALVE BALL VALVE
1	BERNIE-1-38-NON-RETURN VALVE PIPE NUT
1	BERNIE-1-39-WTR LVL GAUGE BOTTOM HOUSING
2	BERNIE-1-40-WTR LVL GAUGE PIPE NUT
2	BERNIE-1-41-WTR LVL GAUGE GLASS TUBE NUT
1	BERNIE-1-42-WTR LVL GAUGE BOTTOM VALVE
1	BERNIE-1-43-WTR LVL GAUGE TOP HOUSING
1	BERNIE-1-44-WTR LVL GAUGE GLASS TUBE
1	BERNIE-1-45-PRESSURE GAUGE
1	BERNIE-1-46-PRESSURE GAUGE PIPE NUT
1	BERNIE-1-47-BOILER SMOKE BOX
1	BERNIE-1-48- SAFETY VALVE BODY
1	BERNIE-1-49-SAFETY VALVE SUPPORT PILLAR-1
1	BERNIE-1-50-SAFETY VALVE SUPPORT PILLAR-2
1	BERNIE-1-51-SAFETY VALVE VALVE SPINDLE
1	BERNIE-1-52-SAFETY VALVE WEIGHT ARM
1	BERNIE-1-53-SAFETY VALVE WEIGHT
1	BERNIE-1-54-ENGINE BED PLATE
1	BERNIE-1-55-CROSSHEAD GUDE BLOCK
1	BERNIE-1-56-CYLINDER
1	BERNIE-1-57-CYLINDER TOP COVER
1	BERNIE-1-58-CYLINDER BOTTOM COVER
1	BERNIE-1-59-VALVE CHEST
1	BERNIE-1-60-VALVE CHEST COVER
1	BERNIE-1-61-SLIDE VALVE SPINDLE GUIDE
1	BERNIE-1-62-STEAM SUPPLY INLET NIPPLE
1	BERNIE-1-63-STM SUP INLET NIPPLE PIPE NUT
1	BERNIE-1-64-STEAM OILER HOUSING
1	BERNIE-1-65-STEAM SUPPLY PIPE-1
1	BERNIE-1-66-STEAM SUPPLY PIPE-2
1	BERNIE-1-67-BLOW DOWN VALVE PIPE
1	BERNIE-1-68-FEED WATER PIPE
1	BERNIE-1-69-EXHAUST PIPE
1	BERNIE-1-70-FEED WATER INTAKE PIPE
1	BERNIE-2-01-CRANKSHAFT
1	BERNIE-2-02-FLYWHEEL
1	BERNIE-2-03-PULLEY
1	BERNIE-2-04-FLYWHEEL SPACER
1	BERNIE-2-05-ECCENTRIC SHEAVE
1	BERNIE-2-06-CROSSHEAD
1	BERNIE-2-07-PISTON+ROD

QTY.	PART NUMBER
1	BERNIE-2-08-CON-ROD
1	BERNIE-2-09-CON-ROD BIG END
1	BERNIE-2-10-SLIDE VALVE
1	BERNIE-2-11-SLIDE VALVE NUT
1	BERNIE-2-12-SLIDE VALVE SPINDLE
1	BERNIE-2-13-ECCENTRIC STRAP
1	BERNIE-2-14-ECCENTRIC STRAP ROD
1	BERNIE-2-15-GEAR WHEEL MOVING YOKE
1	BERNIE-2-16-GEAR WHEEL MOVING YOKE HANDLE
1	BERNIE-2-17-GEAR WHEEL SLIP RING
1	BERNIE-2-18-CRANKSHAFT GEARWHEEL
1	BERNIE-2-19-WTR FD PMP CRANK GEARWHEEL
1	BERNIE-2-20-WTR FD PMP GEARWHEEL AXLE
1	BERNIE-2-21-WTR FD PMP PLUNGER
1	BERNIE-2-22-WTR FD PMP CON-ROD
1	BERNIE-2-23-CRANKSHAFT GOVERNOR PULLEY
1	BERNIE-2-24-GOVERNOR TOP PULLEY GEARWHEEL
1	BERNIE-2-25-GOVERNOR BELT
1	BERNIE-2-26-GOVERNOR SPINDLE
1	BERNIE-2-27-GOVERNOR SPINDLE GEARWHEEL
1	BERNIE-2-28-GOVERNOR ARM BRACKETS
1	BERNIE-2-28-GOVERNOR ARM BRACKETS
2	BERNIE-2-29-GOVERNOR ARM
2	BERNIE-2-30-GOVERNOR ARM+WEIGHT
7	BERNIE-M2.5 NUT
49	BERNIE-M2.5x4 PAN HEAD SCREW
2	BERNIE-M2.5x5 C-SINK SCREW
12	BERNIE-M2.5x6 PAN HEAD SCREW
6	BERNIE-M2.5x22 STUD
23	BERNIE-M3 NUT
1	BERNIE-M3 WASHER
12	BERNIE-M3x4 GRUB SREW
10	BERNIE-M3x4 PAN HEAD SCREW
2	BERNIE-M3x6 GRUB SREW
24	BERNIE-M3x8 PAN HEAD SCREW
16	BERNIE-M3x8-ROUND HEAD RIVET
3	BERNIE-M3x9 C-SINK SCREW
4	BERNIE-M3x14 PAN HEAD SCREW
2	BERNIE-M3x22 PAN HEAD SCREW
5	BERNIE-M4 NUT
2	BERNIE-M4x8 PAN HEAD SCREW
2	BERNIE-M4x10 GRUB SREW
2	BERNIE-M5 NUT
2	BERNIE-M5x8 HEX BOLT
2	BERNIE-M5x10 HEX BOLT



THE OFF SET ANGLE OF THE ECCENTRIC IN RELATION TO THE CRANK AXIS TO BE EXPERIMENTALLY DETERMINED FOR THE SMOOTH RUNNING OF THE ENGINE AND SATISFACTION OF THE BUILDER

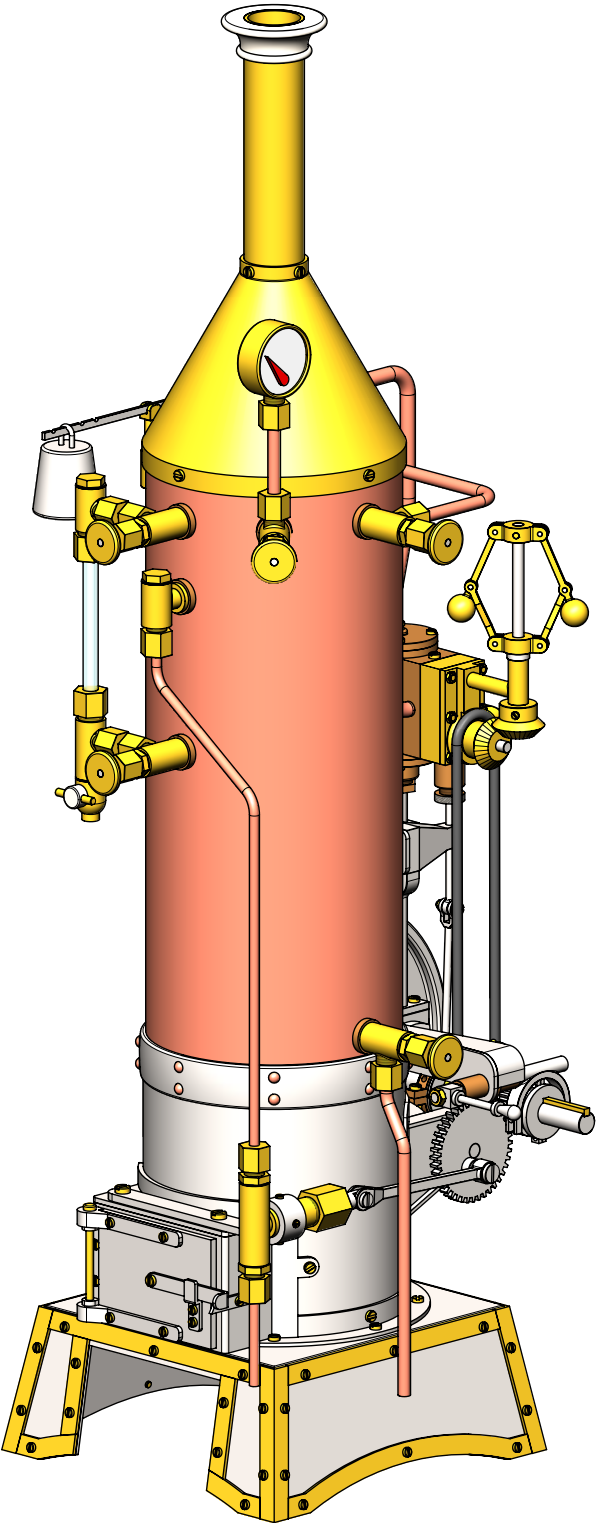
- NOTES:
0. ALL DRAWINGS ARE IN METRIC MEASUREMENTS
 1. ALL ENGINEERING PRACTICES SHALL BE APPLIED WITH REGARDS TO HOLE AND SHAFT TOLERANCES.
 2. WHERE SCREWS OR BOLTS ARE USED THE CLEARANCE HOLES SHALL BE APPROXIMATELY 5% TO 8% LARGER THAN THE MATCHING TAPPED HOLE.
 3. PREFERABLY ALL TAPPED HOLES AND MATCHING SCREWS AND/OR BOLTS TO BE METRIC FINE (FM)
 4. MATERIALS SPECIFIED ON THE DRAWINGS ARE INDICATIVE ONLY. THE BUILDER CAN MAKE HIS/HER OWN MATERIAL CHOICE.
 5. ALL CONNECTIONS/JOINTS WHICH HAVE STEAM PRESSURE APPLIED TO IT SHALL BE SILVER/HARD SOLDERED. FOR SCREWED CONNECTIONS COMPRESSION SEALS TO BE USED.
 6. COMPRESSION SPRINGS ARE DRAWN IN COMPRESSED STATE (CP), UNCOMPRESSED STATE IS APPROX 40% TO 60% LONGER THEN COMPRESSED STATE.
 7. WHERE PREFERRED SCREW OR RIVETED CONNECTIONS CAN BE OMITTED AND PARTS CAN BE BONDED TOGETHER BY USING EITHER HIGH STRENGTH GLUE, EPOXY RESIN, OR SOLDER.
 8. PARTS WHICH ARE DIRECTLY EXPOSED TO STEAM AND/OR WATER SHOULD BE CONSTRUCTED USING NON-FERROUS OR NON CORROSIVE MATERIAL SUCH AS BRASS, BRONZE, GUNMETAL, STAINLESS STEEL, COPPER OR MONEL.
 9. THE ORDER IN WHICH THE PARTS/COMPONENTS ARE MANUFACTURED AND THE MODEL IS ASSEMBLED IS ENTIRELY LEFT TO THE BUILDER/MODEL MAKER.
 10. A COLOUR SCHEME FOR THIS PROJECT IS ENTIRELY LEFT UP TO THE MODEL MAKER.
 11. THE MANNER IN WHICH THE PARTS/COMPONENTS ARE MANUFACTURED IS ENTIRELY LEFT UP TO THE BUILDER.
 12. USE LOCTITE, ON SCREW OR PRESS FIT CONNECTIONS OR SURFACES, WERE DEEMED NECESSARY TO PREVENT PARTS FROM LOOSENING.
 13. WASHER SHALL BE USED WHERE DEEMED NECESSARY.
 14. INQUIRE AT THE APPROPRIATE AUTHORITIES WHETHER OR NOT THIS BOILER REQUIRES A PRESSURE TEST CERTIFICATE
 - XX. ERRORS AND/OR OMISSIONS MAY OCCUR IN THE DRAWINGS, DO NOT HESITATE TO CONTACT ME SO THAT THE ERRORS/OMISSIONS CAN BE RECTIFIED.

OTHER ABBREVIATIONS

DP = DEEP
DAA= DRILL AFTER ASSEMBLY
D&TAA= DRILL AND TAP AFTER ASSEMBLY
CF = CLOSE FIT (SIZE FOR SIZE)
PF = PRESS FIT
PFAA= PRESS FIT AFTER ASSEMBLY
PCD = PITCH CIRCLE DIAMETER
RM = REAM
HEX = HEXACON, 6SIDED
CP = COMPRESSED
KNL = KNURLED
CSK = COUNTERSINK
PL = PLACES
DWL= DOWEL
(TIHESOP=(TAPPED)HOLES EQUALLY SPACED ON PCD
(TIHESOC=(TAPPED)HOLES EQUALLY SPACED ON CIRCUMFERENCE
[SA-xxx]= SUB ASSEMBLY-xxx

MATERIAL ABBREVIATIONS:

ALU = ALUMINIUM
BRS = BRASS
BRZ = BRONZE OR GUNMETAL (BRZ/GM)
CI = CAST IRON
CU = COPPER
GRA = GRAPHITE
MS = MILD STEEL/BRIGHT MILD STEEL
S/S = SILVER STEEL OR STAINLESS STEEL
SPS = SPRING STEEL
PEEK= POLYETHER ETHER KETONE
SYN = SYNTHETIC MATERIAL SUCH AS VETON, NYLON, TEFLON OR RUBBER
IN GENERAL SYNTHETIC MATERIALS SOULD BE ABLE TO WITHSTAND THE HEAT AND PRESSURE(S) APPLIED TO THEM.
nnn/nnn MEANS THAT EITHER MATERIAL CAN BE USED



NOTES: THE PLANS OF THIS ENGINE WERE FIRST PUBLISHED IN THE MODELBOUWER(S) OF APRIL, JUNE, SEPTEMBER 1992 THE AUTHOR OF THE ARTICLE(S) WAS Mr. J. BUGTER, ROTTERDAM

TITLE
1-CYLINDER VERTICAL STEAM ENGINE
COMPLETE WITH BOLIER CALLED 'BERNIE'

DRAWING CONTENTS
ISOMETRIC VIEWS, NOTES AND
BILL OF MATERIALS

PROJECT No 09C-23-00
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PROJECTION
DATE
APRIL-2017
SHEET: 02 OF 07

MODEL SCALE: 1:1
DWG SCALE: 1:1 @A3 OR AS SHOWN
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A3 No: BERNIE-02