

FORMULAE FOR STRENGTHS AT 180# WORKING PRESSURE

	U.S. GOV'T.	LLOYD'S REGISTER
SHELL PLATE	PRESS = $\frac{62720 \times 1.25 \times 1.2}{8 \times 8.7} = 180.23$	PRESS = $\frac{22(20-2) 84.6}{174} = 192.5$
HEADS IN STEAM SPACE	$\frac{175 \times 175^2}{174} = 185.5$	$\frac{175 \times 175^2}{174 \times 15.75} = 199.6$
GRIDERS	$\frac{825 \times 8.625 \times 1.5}{(31.75 - 7.5) 8 \times 2.615} = 184.3$	$\frac{(1060 \times 8.625 \times 1.5)}{(30 - 7.5) 8 \times 30} = 220$
TUBE PLATE (COMPRESSION)	$\frac{(4.25 \times 2.354) 75 \times 27000}{31.75 \times 4.25} = 196.8$	$\frac{(4.25 \times 2.354) 12 \times 1750}{30 \times 4.25} = 213$
(BENDING)		
FRONT HEAD IN WATER WAY		
REAR HEAD BETWEEN COMB. CHAMBS	$\frac{280(10 \times 8.75)^2}{15.5^3} = 215$	$\frac{135(10 \times 8.75)^2}{12.5^3} = 266$
TOP OF COMB. CHAMBS	$\frac{135 \times 10^2}{8^3} = 211$	$\frac{135 \times 10^2}{8^3 \times 1.75} = 22.5$
SIDES 15" BACK OF COMB. CHAMBS	$\frac{120 \times 10^2}{7.4375^3} = 217$	$\frac{100 \times 10^2}{7.4375^3} = 180.8$
ROUNDED BOTTOM OF COMB. CHAMBS	$\frac{900 \times 10^2}{10 \times 4.5^3} = 197.8$	
FURNACES	$\frac{5625 \times 156000}{44} = 199$	$\frac{(9-2) 1259}{45} = 191.6$
MAIN STAYS	$\frac{5.9119 \times 10400}{17 \times 15.75} = 181.9$	$\frac{5.9119 \times 10400}{17 \times 15.75} = 210$
2 3/4"	$\frac{4.4301 \times 9000}{17 \times 12.75} = 184$	$\frac{4.4301 \times 10400}{17 \times 12.75} = 213$
1 1/2" THICK SCREW STAYS IN TOP OF COMB. CHAMBERS	$\frac{1.474 \times 9000}{8 \times 7.5} = 221$	$\frac{1.474 \times 8000}{8 \times 7.5} = 196.5$
1 1/2" THICK SCREW STAYS IN SIDES & BACK OF COMB. CHAMBS	$\frac{1.26 \times 9000}{7.4375^2} = 205$	$\frac{1.26 \times 8000}{7.4375^2} = 182.2$
1 1/2" THICK SCREW STAYS IN BACK AT VERT. EDGE OF COMB. CHAMBS	$\frac{1.474 \times 9000}{12.5 \times 1.75 \times 6.5} = 205$	$\frac{1.474 \times 8000}{12.5 \times 1.75 \times 6.5} = 182$
1 1/2" THICK SCREW STAYS IN BACK AT HORIZONTAL EDGE OF COMB. CHAMBS	$\frac{1.26 \times 9000}{12.5 \times 1.75 \times 6.5} = 215$	$\frac{1.26 \times 8000}{12.5 \times 1.75 \times 6.5} = 190.8$
1 1/2" THICK SCREW STAYS IN CORNERS OF COMB. CHAMBS	$\frac{1.8069 \times 9000}{12.5 \times 1.75 \times 6.5} = 185$	$\frac{1.8069 \times 8000}{12.5 \times 1.75 \times 6.5} = 185$
INSIDE BUTT STRAPS		$\frac{3 \times 1.25(8.5 \times 1.25)}{1.6 \times 1.25 \times 2.5} = 1.1469$
STAYS IN STAY TUBES		$\frac{(12.1 \times 1.25 \times 6.19 \times 2950) 180}{2.8839} = 345.9$

DATA FOR ONE BOILER

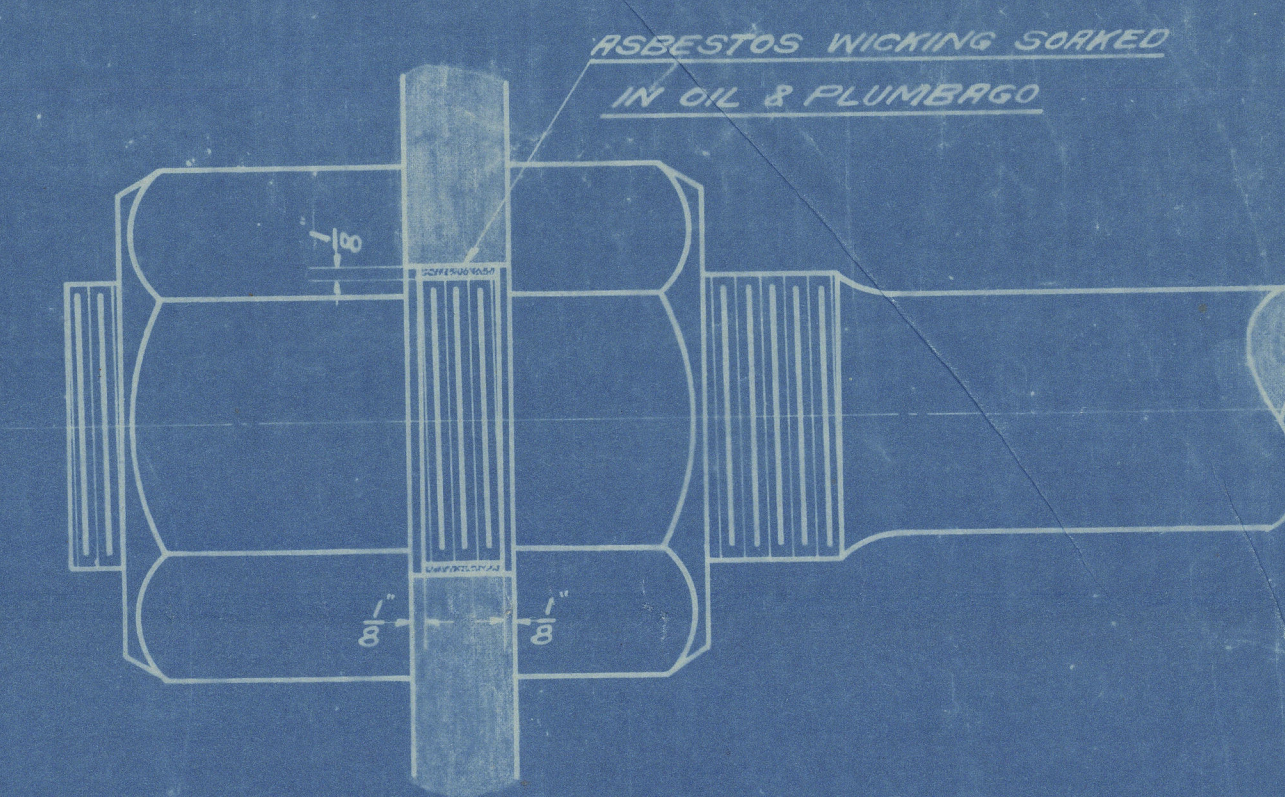
HEATING SURFACE OF TUBES	2234 SQ. FT.
COMB. CHAMBERS	254 "
FURNACES	135 "
TOTAL HEATING SURFACE	2623 "
GRATE SURFACE - 6'-0" GRATE BARS	63 "
RATIO HEATING SURFACE GRATE SURFACE	41.6
EVAPORATION (NATURAL DRAFT) PER SQ. FT. OF GRATE SURFACE PER HOUR	180#
AREA OF SAFETY VALVES REQ'D - 131# & 63# & 12.83 SQ. IN.	
TWO 3" SAFETY VALVES REQ'D. AREA = 14.14 SQ. IN.	

EFFICIENCY OF JOINT

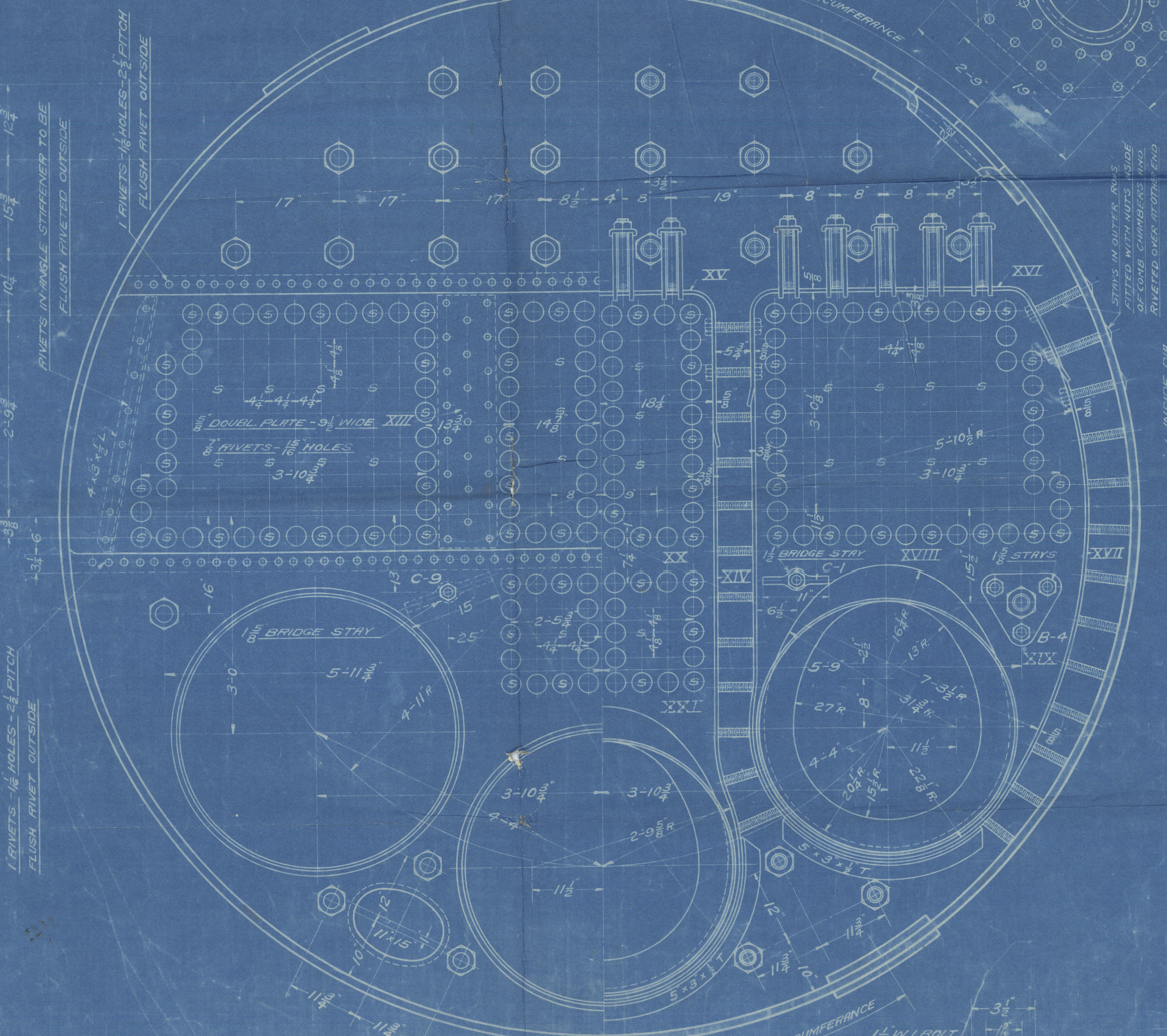
PLATE $\frac{(8.5 - 1.3125) 100}{8.5} = 84.6\%$

RIVETS $\frac{5 \times 1.353 \times 1.75 \times 85}{8.5 \times 1.25} = 94.7\%$

SHELL LONGITUDINAL JOINTS - 1 1/2" RIVETS - 1 1/8" HOLES
CIRCUMFERENTIAL - 1 1/8" - 1 1/8"
INSIDE BUTT STRAPS - 1 1/2" THICK - II
OUTSIDE - I - III

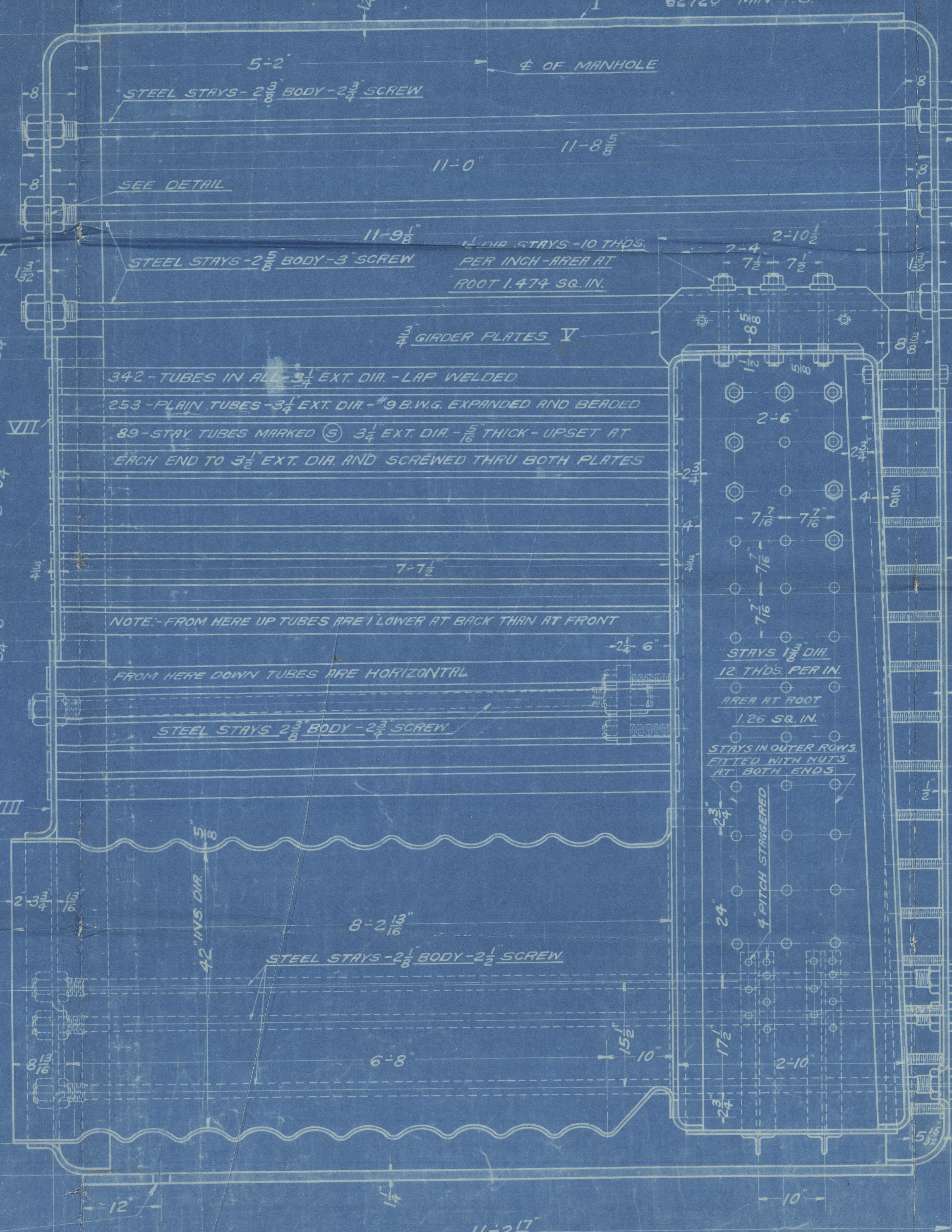


DETAIL OF STRAY



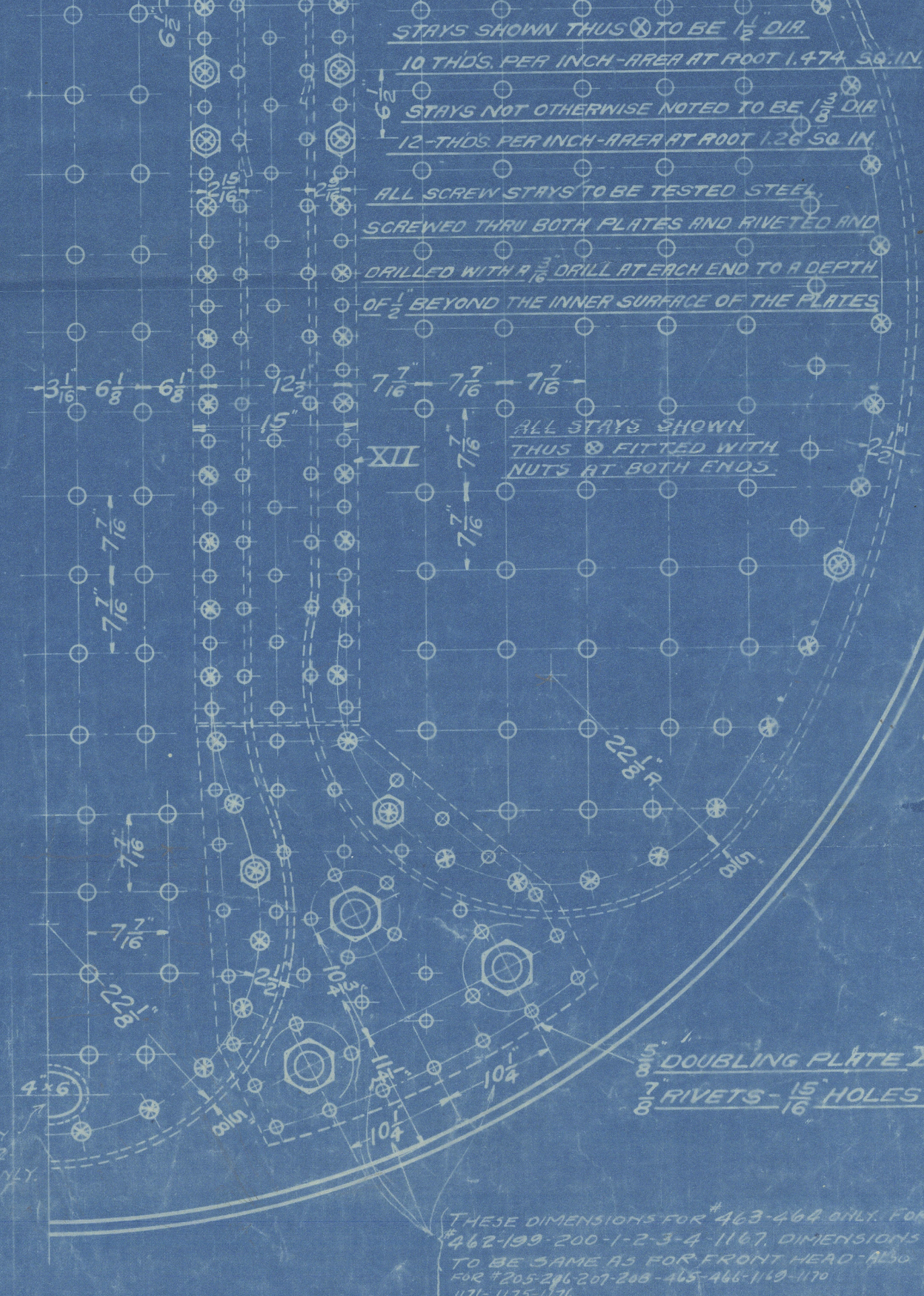
NOTE - ON THE BOILERS LISTED BELOW, NUTS WILL BE OMITTED FROM COMBUSTION CHAMBER STAYS INSIDE AND OUTSIDE OF COMBUSTION CHAMBER WITH EXCEPTION OF CROWN SHEET STAYS, WHICH WILL HAVE NUTS AT BOTH ENDS
1171-1179-1180-1170-1177-1178
463-464-466
205-206-209-210

INSIDE RIVETING AND RIVETING IN FURNACES AT FRONT HEAD TO BE 3/4" DIA. 1 1/2" HOLES - 2 1/2" PITCH
COUNTERSUNK ONE HALF THE THICKNESS OF EACH PLATE



ALL STAYS AND RIVETS TO BE STEEL, TESTED TO COMPLY WITH U.S. GOV'T AND LLOYD'S REGISTER REQUIREMENTS
ALL RIVET HOLES TO BE DRILLED
BOILERS 199-200 TO BE CAULKED INSIDE AND OUT
ALL BOILERS NOW TO BE CAULKED
TO PASS INSPECTION OF U.S. GOV'T AND LLOYD'S REGISTER
FOR A WORKING PRESSURE OF 180 LBS. PER SQ. INCH
TWO BOILERS REQ'D FOR EACH NUMBER
RIGHT AND LEFT IN REGARD TO MANHOLE AND BUTTS

SEE NOTE REGARDING NUTS OMITTED FROM COMBUSTION CHAMBER STAYS FOR CONTRACT NUMBERS SPECIFIED



DETAIL OF STRAY

ORDER No. 151
BOILER
14'-6" INS. DIA. x 11'-0" INS. HEADS x 180#
THE AMERICAN SHIPBUILDING CO.
ENGINEERING DEPARTMENT
SCALE 1" = 1'-0"
DRAWN BY D.C.
CHECKED BY M.W.M.
128182
Lloyd's Register
11112-0279

