

S.S. VEERHAVEN

SCHAAL 1/10 SCALE 1/10

BUITENZICHT. - OUTSIDE VIEW

THICKNESS OF BOILER SHELL 41.3 mm

" " OUTSIDE BUTT 31.8 mm

" " INSIDE BUTT 34.9 mm

DIA. OF BOILER INSIDE 4344

193.7

63.5  
68.6  
63.5

288.9 mm

288.9 mm

65.1  
107.9  
130.2  
177.8  
107.9  
65.1

632

3253

RIVETS  $\phi$  42.9 mm

RIVETS  $\phi$  41.3 mm

WORKING PRESSURE 18.27 Kg. cm<sup>2</sup>

TEST " 30.92 " "

W226-CISE

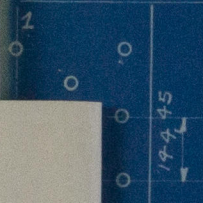
MERCANTILE MARINE ENGINEERING AND GRAVING DOCKS CO. N.M. ANTWERPEN 4/12/3



# Main-boiler Z. Verhaven

## Replacement of riveted buttstraps on the boiler-shell E.W. buttstraps

### 1) Relative resistance of the riveted joint with double buttstraps



We consider a strap of 288,9 mm wide

$R_t$  = Traction stress in shell plate

$R_s$  = Shearing stress of rivets =  $\frac{4}{5} R_t$

Resistance of shell plate =  $288,9 \times 41,3 \times R_t = 11950 R_t \text{ Kg mm}^2$

Resistance along the first line of rivets:

$$(288,9 - 42,9) 41,3 \times R_t = 10160 R_t \text{ Kg mm}^2$$

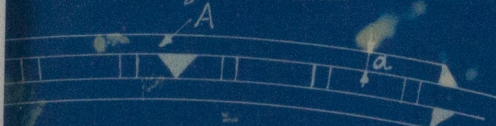
Resistance along the 2<sup>nd</sup> line of rivets:

$$(288,9 - 85,8) 41,3 \times R_t + 1,75 \frac{(288,9 - 42,9)^2}{4} R_s = 10420 R_t$$

Resistance along the 3<sup>rd</sup> row is higher than along the 2<sup>nd</sup> line  
weakest part is along the first row

Relative resistance of riveted joint  $\frac{10160}{11950} = \underline{0,85}$

### Welded joint



Rivet holes remain in shell plates

We consider the traction stress

of the welded material to be only 0,60  $R_t$

Resistance along each of the three rows of rivet holes is

less than the resistance of the weld in A which amounts to:

$$288,9 \times 41,3 \times 0,60 \times R_t = 7170 R_t \text{ Kg mm}^2$$

Buttstraps have only to provide a supplementary resistance

$$11950 - 7170 = 2990 R_t \text{ Kg mm}^2$$

The thickness of the buttstraps is thus:

$$2 \times \frac{a}{\sqrt{2}} 288,9 \times 0,60 R_t = 2990 R_t$$

$$a = 12,2 \text{ mm}$$

Propose to take buttstraps of 25 mm thick which gives a relative resistance of the joint of:

$$2 \frac{25}{\sqrt{2}} 288,9 \times 0,60 R_t + 7170 R_t = 13320 R_t \text{ Kg mm}^2$$

$$\frac{13320}{11950} = 1,10 \text{ or } \underline{10\% \text{ more resistance than with}}$$

the riveted joint