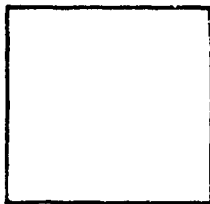


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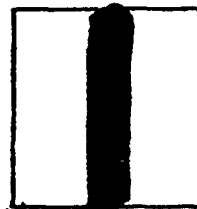
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344/45



REPORT NO. 344/45

HIGH Si MONEL CASTINGS FOR RACES

By

INDEXED

P. R. Kostig  
Chemical Engineer

October 9, 1936  
WATERTOWN ARSENAL  
WATERTOWN, MASS.

Exp 0-749

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<i>Int Nickel Co. - 1</i>	-	-	-	welding and as directed	-
Local Circulation	1	1	1	1	as directed
Available for special circulation.	2	2	3	3	1
Other establishments requesting work.	-	2	-	-	-
Private Parties paying for work	-	-	-	-	2

Report No. 344/45  
Watertown Arsenal

October 9, 1936

HIGH S1 MONEL CASTINGS FOR RACES

Object

To determine suitability of S Monel Metal for Races

References

XO 749A4

Conclusions

Provided that roller bearings and not ball bearings are used and provided that no bending of the races occur during both normal and abnormal service and provided the metal is radiographed to determine uniformity of density (and therefore, absence of soft spots due to porosity) and freedom from other harmful defects, S Monel Metal Castings will be suitable for use as races with K Monel rollers for the intended service.

S Monel Metal Castings may be considered galvanically neutral to Monel and to K Monel.

A minimum average hardness of 365 may be expected from special S Monel Metal Castings.

Bend specimens from special S Monel Castings break when bent 1 1/2 degrees but do not break when bent 1 degree.

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Test Metal

Four annular rings 20 1/8 in. o.d.; 14 3/8 in. i.d.; 1 1/8 in. thick, were submitted by the International Nickel Company on invoice numbers C 7426 (order C 2757 M) and C 7668.

They were numbered as follows:

<u>Ring</u>	<u>Areas</u>	<u>Invoice</u>	<u>Heat</u>	<u>Pig.</u>
1	SM1 to SM6	C7668		
2	SM1 to SM6	C7668		
SM3	1 to 6	C7426	SM367A	2772
SM360A	SM	C7426	SM360A	2772

Results

Hardness Ring 1	BHN	364	
2		387	
SM 3 - 367A		387	
SM - 360A	369 Ave.	150 Rc	39 Ave
	380 Highest		39 1/2
	336 Softest		36

Soft areas were never observed greater than 1/4" dia.

Macro

Porosity at midpoint of 8 out of 10 cross sections was observed. The structure was dendritic. Ring SM 360A was the only one thusly examined.

Bending

A bend specimen 6 in. x 1 in. x 1/2 in. from rings SM-360A

did not break when bent 1° but broke when bent 1 1/2°.

#### Load Carrying Capacity

The load carrying capacity of ring SM-360A is 4700 lbs. per in. length.

#### Radiographs

Ring 1 showed porosity due to piping in 3 areas, more pronounced porosity in localized spots in another area and a surface tear in another area, 6 areas being examined.

Ring 2 showed 4 clear areas and extensive piping in 2 other areas, 6 areas being examined.

Ring SM3 - SM 367A showed porosity in middle section of 4 areas, pipes or tears in another area and extensive tears in another area.

Rings 1 to 3 were examined 100%.

Ring SM-360A was examined only at 1 length of 10 in. and small regions of porosity were found.

#### Analysis

Analysis of ring 4 - heat 360A is given in Table I

#### Corrosion

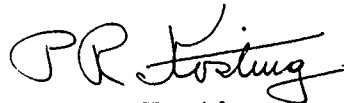
When coupled with K Monel and with Monel negligible currents if immersed in synthetic sea water were observed.

#### Discussion

As expected porosity was observed in these castings. However, this defect is limited to the mid-section and is not detectable on

the surface. There are certain small areas of slight porosity that can be detected on the surface of some casings, but these are few and do not extend over 1/4" in area.

The castings are not as uniform in hardness as engineers are accustomed to using for hard metals. However, if only rollers are used and not ball bearings, and the races are properly supported so that no bending can occur, the metal will be suitable for the service intended. Rings can be obtained free from tears so that casting technique must be carefully checked to insure freedom from tears and freedom from extensive porosity and/or piping. Due to the low ductility of the alloy care must be exercised against unexpected bending in service.

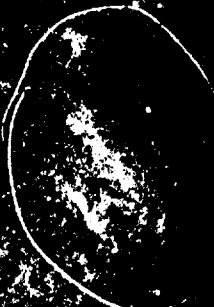


P. R. Kosting,  
Chemical Engineer

Figure I

Figure I (M48) is representative of tears found in ring 1, area SM4. The tear by the letter S extended to the surface and upon etching was readily detected.



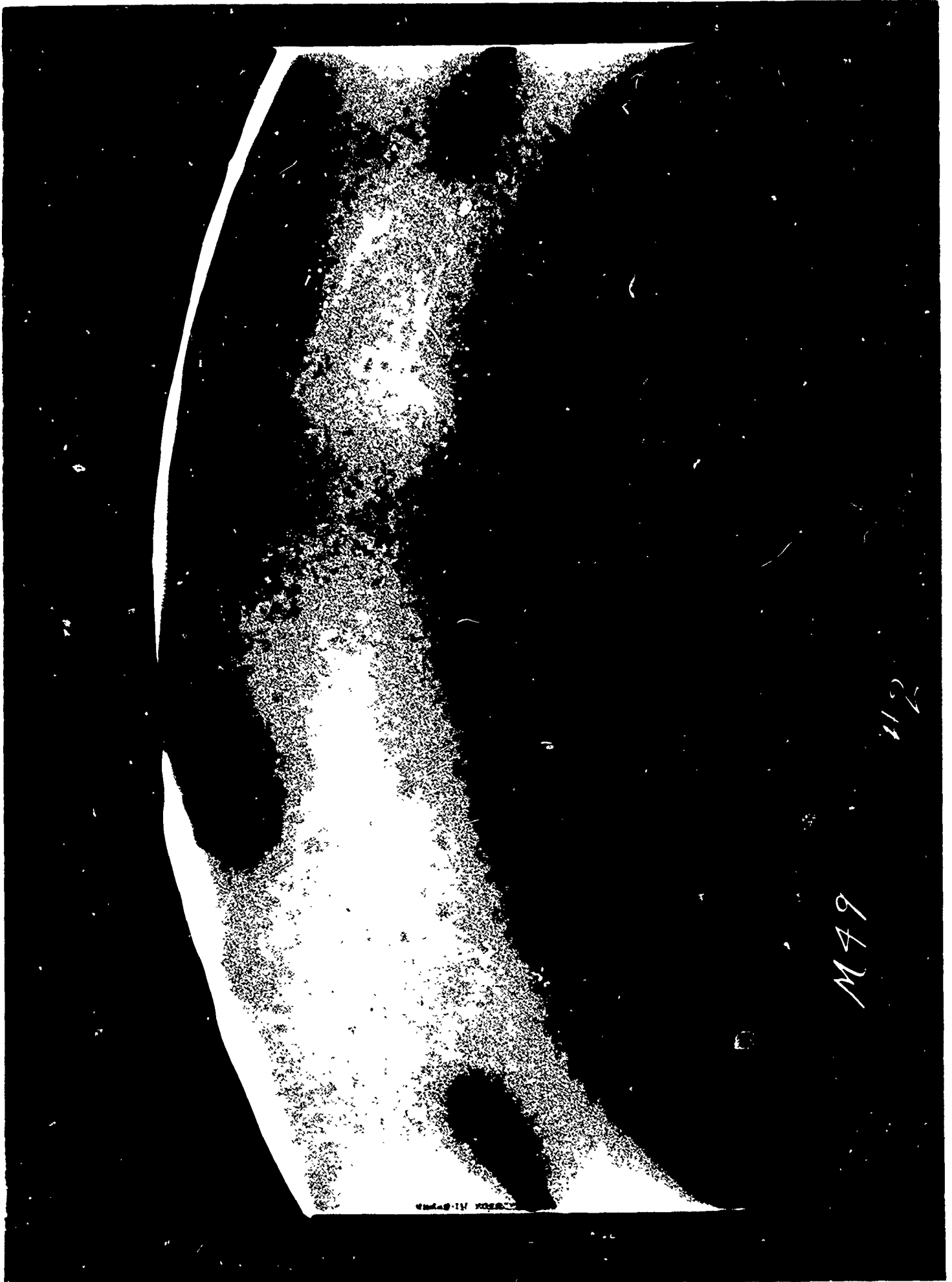


M98

1

Figure II

Figure II (M49) is representative of piping which existed in ring 2. No softness could be detected on the surface.



M49

112

KODAK SAFETY FILM

Figure III

Figure III (M50) is representative of large tears found in ring SM3 area of heat 367A. One tear extended to the surface where it was discernible with difficulty after etching.



FIG. 1 KINGO - SHI 2-7A AREA 6

MBC

Figure IV

Figure IV (M45) is representative of the general appearance of the castings and is from ring 4, SM 360A.

CBW

Still just  
" 29/11/59

Edna's cup

Edna's cup  
Test run 29/11/59

Edna

Table I

Report No. 344/50

September 25, 1936

MONEL

Sample from Dr. Kosting, Si Monel Casting SM360A, Test  
Ring for Race:

Silicon	5.00
Copper	32.20
Iron	2.80
Manganese	.40
Aluminum	.16
Carbon	.11
Nickel	59.33

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A. Sloan  
Chemist