O T T A W A August 5th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1471.

Examination of Defective Brass Rod and Primer Bodies.

(Copy No. 10)

Bureau of Mines
Division of Metallic
Minerals
-
Ore Dressing
and Metallurgical
Laboratories

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
Mines and Geology Branch

O T T A W A August 5th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1471.

Examination of Defective Brass Rod and Primer Bodies.

Origin of Problem:

In a letter dated July 8th, 1943 (File No. 12/4/3), Mr. J.M. Gilmartin, for Inspector General, Inspection Board of United Kingdom and Canada, Ottawa, Ontario, requested an examination of brass components, with the object of determining why cracking had occurred.

One piece of a partly machined brass rod and two finished samples of Primer No. 15 were submitted (Materials Division Analysis Requisition No. O.T. 4016, dated June 22, 1943).

It was stated that the rod was extruded by the Canada Strip Mill, Montreal, from Class A metal. The exact chemical composition was not given, but it was said that the material

(Origin of Problem, cont'd) -

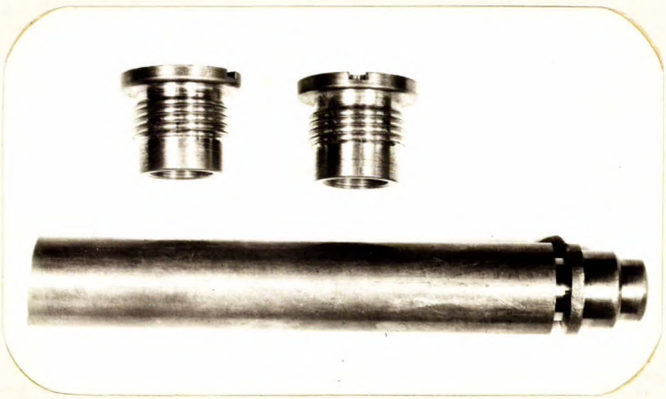
exhibits typical mechanical properties of a yield strength greater than 20 T/sq.in. (44,800 p.s.i.), an ultimate tensile strength averaging 34 T/sq.in. (76,160 p.s.i.), and an average elongation of 25 per cent.

It was also stated that the incidence of the defect is apparently restricted to four or five bars out of the many hundreds supplied. It was felt that a visual inspection alone is not sufficient, and will not guarantee that such defects can be detected. The question was raised as to whether it would be advisable to introduce a mercurous nitrate test at the strip mill. To date this test has been carried out on finished components only.

Description of Samples:

Figure 1 shows the samples as received. The rod and both finished primers show longitudinal cracks.

Figure 1.



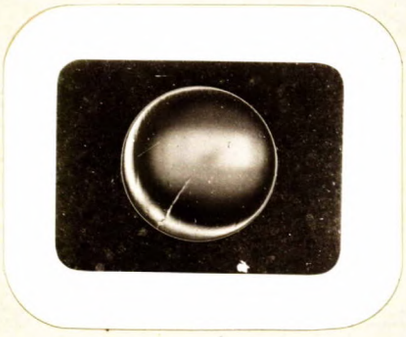
SAMPLES AS RECEIVED.

(Approximately ½ size).

(Continued on next page)

Figure 2 shows the depth of the crack in the brass rod.

Figure 2.



CROSS-SECTION OF CRACKED ROD.

(Approximately actual size).

Hardness Tests:

The hardness was determined by the Rockwell method, using the B-scale.

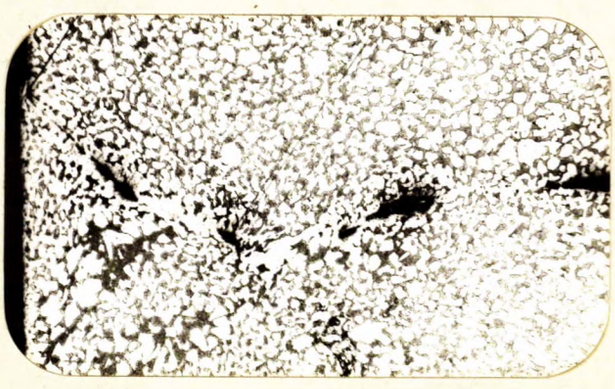
Cross-Section of the Brass Rod (10 readings)

Maximum	-	73.5	(centre of the cross-section)
Minimum	-	80.0	(near edge of the cross-section)
Average	-	77.5	

Microscopic Examination:

Figure 3 shows the microstructure of the material around the crack.

Figure 3.



X100, NH_4OH etch.

DISCUSSION OF RESULTS:

The appearance of the cracks on the submitted samples is typical of "season cracking". This phenomenon is a result of residual stresses in cold-worked material and is always accompanied by corrosion.

It is known that yellow brasses are the most susceptible to this corrosion-cracking, especially brass containing 60 per cent copper, which is the most sensitive composition. Coarse-grained brasses are more liable to fail than fine-grained brasses.

Season cracking is attributed to the attack of certain corrosive media (e.g., ammonia content of the atmosphere, soapy water, mercuric compounds, etc.). Additional stressing, due to too drastic machining operations, etc., may also cause cracking. At the present time, season cracking of brass should not present any serious problem to the producer. Stress relief and other manufacturing methods, such as the proper combination of cold work and annealing, have been developed which can supply brass products free from susceptibility to season cracking.

To avoid unnecessary machining costs of defective material and to ensure better quality of the product, it would be advisable to require an additional mercurous nitrate test on the brass rods before release for primer production.

—

Conclusion and Recommendation:

The cracking of the submitted brass samples occurred as a result of "season cracking".

It seems to be advisable to introduce a mercurous nitrate test in the inspection of brass rods before release for the production of primers and similar machined components.

oooooooooo
ooooo
o

JWM:MC.