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OTTAWA August 16th, 1940.

REPORT

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 886.

Report on Bren Gun Tripod Welded Sections received from the Department of National Defence, Ottawa, Ontario, on August 9th, 1940.

Bureau of Mines
Division of Metallic
Minerals

CANADA

DEPARTMENT
OF
MINES AND RESOURCES

Mines and Geology Branch

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Object of Investigation:

To examine and evaluate three welded Bren Gun tripod pieces.

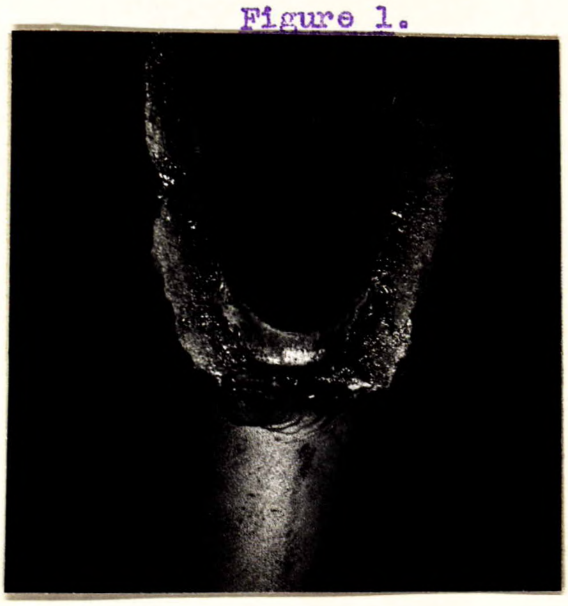
The pieces as received had been subjected to extreme forces in order to break and examine the welds. Each leg was examined separately.

Macro-Examination:

(1) - STEEL WELD.

Figures 1 and 2 show the steel welded pieces as received:

Figure 1.



Weld on tube.

Figure 2.

Weld on plate.

The leg tube was welded to a flat plate at an angle of 25 degrees (approximately). This angle is too acute to allow the weld metal to "fill in". The weld metal parted from the plate under stress.

(2) - BRASS WELD.

The brass welded leg is shown, as received, in Figures 3 and 4.

(Continued on next page)

(Macro-Examination, cont'd) -

Figure 3.

Weld on tube.

Figure 4.

Weld on plate.

Where the weld was torn apart, one side adhered to the plate and the other side broke away.

(3) - BRASS WELD.

The third leg, as received, is shown in Figure 5.

Figure 5.

(NOTE: The tube was welded to a flat plate. The plate was hammered to a 90-degree angle and the weld was still intact.)

This weld was definitely much stronger than either tube or plate.

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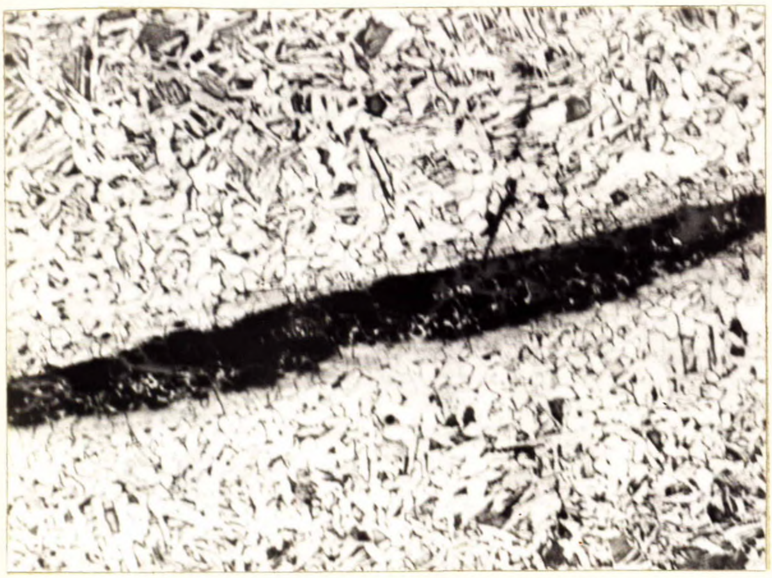
Micro-Examination:

(1) - STEEL WELD.

Figure 6 shows the average condition at the weld joint. A layer of oxide and slag has been entrapped. This weakens the joint. Figure 7 shows a perfect fusion of metals which existed only at the outer edge of the joint.

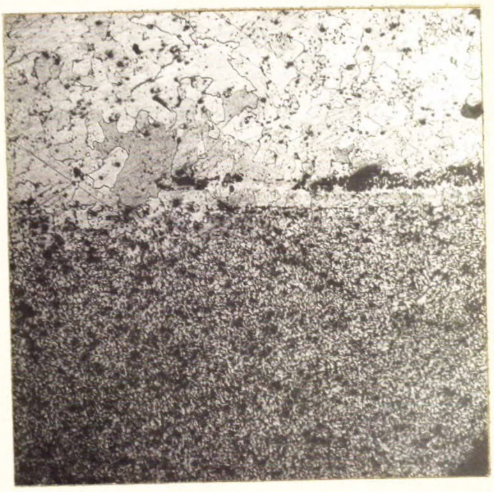
Figure 6.



100X. (Nital)

Weld seam, showing slag inclusions.

Figure 7.



50X. (Nital)

Perfect fusion of metals.

(2) - BRASS WELDS.

In both of the brass welded legs there was a very close adherence between the brass and the steel. Figure 8 shows Leg No. 2 and Figure 9 shows Leg No. 3.

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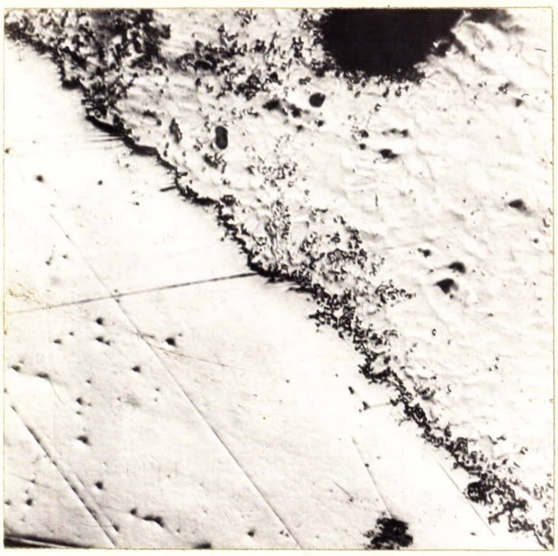
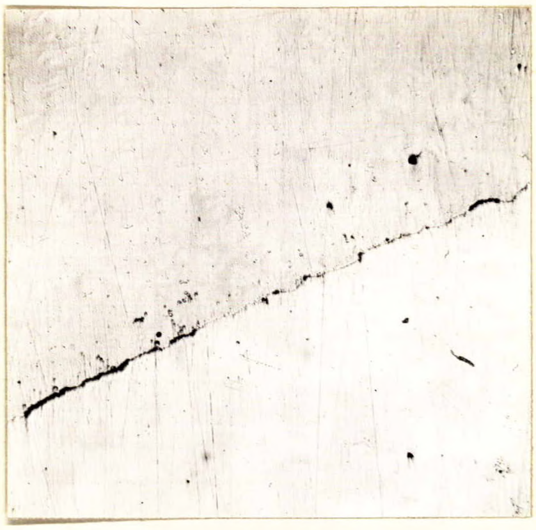
(Micro-Examination, cont'd) -

Figure 8.



100X.
(Leg No. 2)
Weld seam, unetched.

Figure 9.



100X.
(Leg No. 3)
Weld seam, unetched.

-

Chemical Analysis of Weld Materials:

(1) - STEEL.

Carbon	-	0.07	per cent
Manganese	-	0.14	"
Silicon	-	0.07	"

(2) - BRASS.

Copper	-	57.99	per cent
Zinc	-	40.43	"
Iron	-	1.32	"

(3) - Brass.

Copper - 57.10 per cent.

-

Discussion of Results:

Steel Weld -

When complete fusion between weld metal and welded object is obtained, this type of weld is satisfactory. In this case a continuous fused joint was not produced. Either the welding temperature was too low, or the fluxing action was not sufficient to remove the oxides and slag from the welded surface.

Brass Welds -

This material is commonly used for welding and brazing. A very good adhesion was obtained in most areas of the welds examined. The weld was stronger than the metal sections it joined together.

Recommendations:

For this application (welding together tubes and plates of low-carbon steel about 1/16 inch thick), brazing or brass welding with Muntz metal should be more satisfactory than welding with low-carbon steel rod. Brazing can be done at a much lower temperature than welding with low-carbon steel rod. The low temperature means

(a) a quicker job,

(b) less distortion,

(c) fewer strains set up,

(d) less oxidization, and

(e) easier fabrication.

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(Recommendations, cont'd) -

To ensure uniform high quality of brazed joints, test pieces should be fabricated and subjected to physical tests at regular intervals.

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