O T T A W A October 17th, 1941.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1109.

Examination of "Aladdin" Brazing Rods.

BUREAU OF MINES
DIVISION OF METALLIC MINERALS
—
ORE DRESSING AND
METALLURGICAL LABORATORIES

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

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Origin of Problem:

In a letter dated September 23rd, 1941, Mr. K. S. Rawlins, Assistant Chief Inspector (Materials), British Air Commission, Washington, D. C., requested the chemical analysis and simple experimental examination of "Aladdin" brazing rods. Two leaflets were attached.

It was stated that these rods are considered suitable for brazing aluminium and aluminium alloy sheets and castings.

(Origin of Problem, cont'd) -

Nine brazing rods, of various diameters, were received on September 29th, 1941.

Chemical Analysis:

a) Wet Analysis:

		Per cent
Copper	-	2.67
Aluminium	-	2.99
Iron	-	0.35
Manganese	-	0.03
Cadmium	-	None detected.
Zinc	-	Remainder.

b) Spectrographic Analysis (only qualitative):

Essential constituents:

Major - zinc.
Minor - copper, aluminium, manganese.

Traces:

Strong - magnesium.
Medium - iron, silicon.
Faint - silver, cadmium, gallium, lead.

Nil:

As. Au, B, Ba, Be, Bi, C, Ca, Cb, Ce, Co, Cr, Ge, Hg, In, Ir, K, Li, Mo, Ni, Os, P, Pd, Pt, Ti, Tl, V, W, Yb, Yt, Zr.

Experimental Work:

Aluminium Sheet (BSS - 2L16, 0.036 in. thick) -

A test was carried out by a commercial welder who is considered one of the best in this district. He was unable to obtain any results either with or without flux.

A second test was carried out by welders with wide experience in welding aluminium sheet and aluminium alloy castings. They at first experienced difficulty in holding

(Experimental Work, cont'd) -

Aluminium Sheet, cont'd -

the heat in the aluminium sheet, with the result that there was not enough heat to flow the "Aladdin" rod. It was agreed that the metal to be brazed had to be heated up to a temperature high enough to melt the rod. After a number of trials they succeeded in getting the sheet hot enough to flow the brazing metal. The sheet was "tinned" with the molten solder by scrubbing with a wire brush. Once the metal was tinned there was no trouble in brazing the aluminium sheet provided the latter was kept hot.

The operation which gave the best results can be summarized as follows:

1. Bevel the sides of the sheet to be brazed and then clamp them together in the form of a "V" on flat steel plate.
2. Apply the heat to the sheet about a half-inch away from the "V".
3. Scrub the metal with a wire brush to remove any oxide.
4. Flow the brazing metal into the "V" groove and then tin by again scrubbing with a wire brush.
5. Keep the sheet hot as in No. 2 and flow the brazing metal into the "V" groove until filled with the correct amount.
6. Keep the flame off the "Aladdin" rod and the brazed surface all through the above operation.
7. No flux was used in this work.

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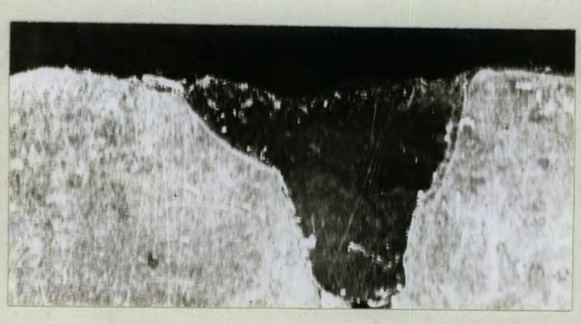
(Experimental Work, cont'd) -

Aluminium Alloy Casting (BSS - L33) -

The same procedure was followed for aluminium alloy castings as for aluminium sheet. It may be remarked that the casting held the heat better than the sheet and therefore was easier to braze.

Figure 1.

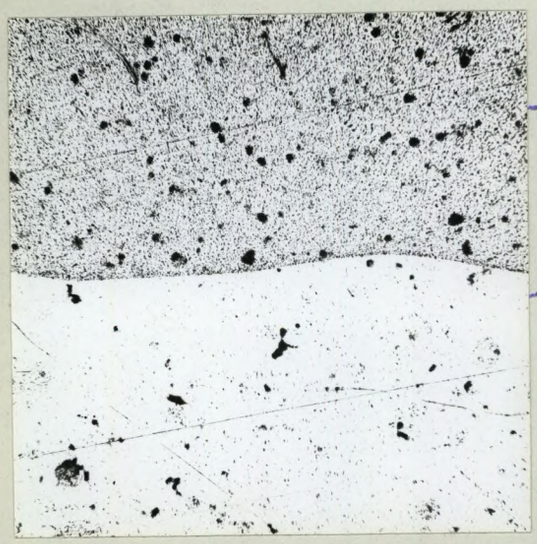


BRAZED JOINT OF ALUMINIUM ALLOY CASTING.

(Magnification, approximately X5)

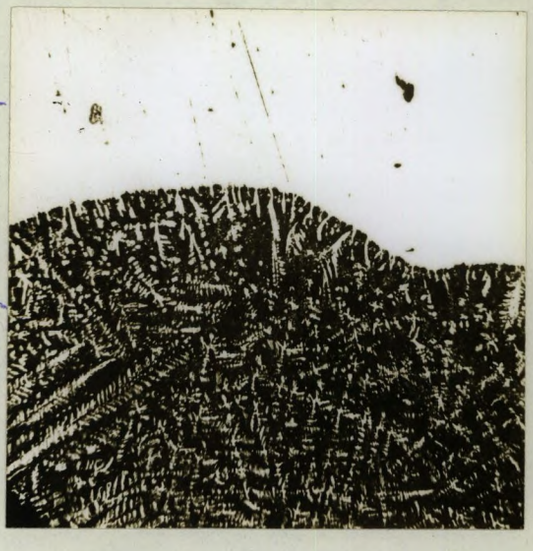
Micro-Examination:

Figure 2.



X100, unetched.

Figure 3.



X100, etched.*

BRAZED JOINT OF AN ALUMINIUM SHEET.

(a - aluminium sheet)
(b - brazing material)

Figure 2 shows also the effect of overheating (burning) of the aluminium sheet near the joint, caused by improper heating of the sheet in brazing.

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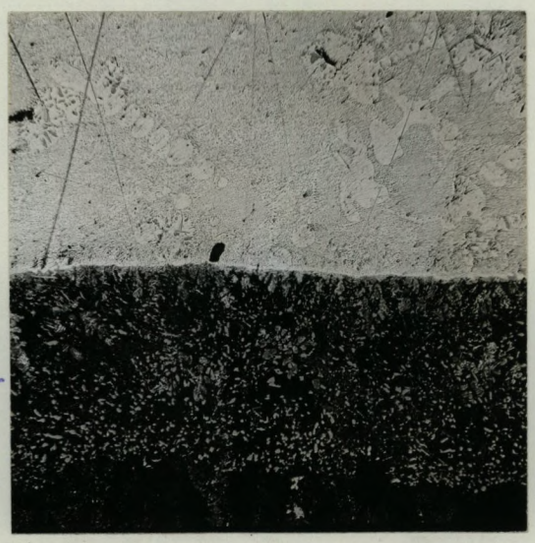
* Etch as given in Metals Handbook, 1939 Edition, pp. 1768-9, (solutions Nos. 4, 5, and 2).
Note: Aluminium is not affected by this etching treatment.

(Micro-Examination, cont'd) -

Figure 4.



X100, etched.*

BRAZED JOINT OF AN ALUMINIUM ALLOY CASTING.

(a - aluminium alloy casting)
(b - brazing material)

-

Discussion of Results:

The "Aladdin" brazing and welding rod is a high-zinc-base alloy material.

The chemical composition of the alloy, together with its relatively high melting point (about 400° C., or 750° F.), makes it fairly difficult to solder thin aluminium sheet. When brazing an aluminium alloy casting of large cross-section one can obtain fairly good joints. In all cases a considerable amount of experience is required, as there is a danger that the aluminium material will be over-heated in the brazing operation. This is not so likely to occur when castings are being brazed, as the thicker

* Etch as given in Metals Handbook, 1939 Edition, pp. 1768-9, (solutions Nos. 4, 5, and 2).
Note: Aluminium is not affected by this etching treatment.

(Discussion of Results, cont'd) -

material has better conductivity.

To be satisfactory, a solder should not only show desirable working characteristics but the soldered joint should be also reasonably durable under service conditions. The difference in electrolytic solution potential between aluminium and zinc promotes corrosion in the presence of moisture, and the joint tends to disintegrate.

By the use of an aluminium base alloy brazing rod,® the difference in electrolytic potential between the joint and the joined material is made relatively small.

Conclusions:

The "Aladdin" brazing rod submitted can be used for soldering aluminium sheet and aluminium alloy castings. Satisfactory soldering with "Aladdin" rod can be obtained only by carefully developing a correct brazing technique, if satisfactory adherence and absence of burning are to be obtained.

The use of this joining material, however, shows no advantage over the brazing with aluminium-alloy-base hard solder or over aluminium welding. Indeed, the rod, when judged in terms of the corrosion resistance of the joint, would appear to have certain disadvantages.

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JWM:PES.

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