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Monthly Progress Reports
5/25/53
10/15/53
9/23/53
5/5/54
3/23/54

Includes mention of
— Tube Reducing Co.
— Harberg Grinding Co.
— Campbell Division of American Chain and Cable

BRIDGEPORT BRASS COMPANY

BRIDGEPORT, CONNECTICUT

BRASS Bridgeport CO.

RESEARCH DEPARTMENT

[redacted]

SPECIAL REREVIEW
FINAL DETERMINATION
UNCLASSIFIED

By: J. Platt
Date: 9/14/84

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MONTHLY PROGRESS REPORT
February 16 - March 15, 1954

Issued: March 23, 1954

Bridgeport Brass Company
Bridgeport, Connecticut

Contract No. AT(30-1)1405

R. M. Treco, Section Head

I. Technical Summary

A) Uranium Rod Drawing

The ten rods of 1.405" average diameter X 20 ft. original length as received from Fernald have been degreased with hydrex and pickled with a solution of 50% concentrated nitric and 50% water. These rods were subsequently cut into lengths of 6'-5" each. Metallographic samples were removed from butt end, center and lead end positions of each 20-ft. rod. These samples together with 6" long sections from three typical rods were submitted to Havens Laboratory for examination. Preliminary results on two samples indicate that the metal has a normal alpha-phase structure with an average grain size of .020 mm. and no evidence of cold work. Surface condition was generally good requiring no special surface preparation for the initial drawing.

All of the above rods were machine pointed in a lathe to a diameter of 1.270" and a point length of 6". Two of the rods were lubricated with a solution of molybdenum disulfide and VMCH lacquer containing 20 wt. % of lacquer and 10 wt. % of molybdenum disulfide in solvent. These rods were drawn with a 1.375" standard brass rod drawing die, with a calculated area reduction of 4.2%. However, springback reduced this to a measured reduction of 3.5%. Plans are to draw ten more rods through standard rod and tube dies (for die angle variation) with reductions of 3.5, 6.9 and 10%. Dies for this purpose have been ordered and will be ready the week of March 22.

A quench tank and hoisting equipment for beta-treating have been installed at the pilot plant salt bath furnace and the operation of the equipment is being checked with dummy loads of steel. Plans have been completed to beta-treat twelve of the 6-foot rods in order to duplicate the drawing schedule of the untreated rods.

B) Zirconium Tube Fabrication

a) Drawing of Tubes

As reported previously, zirconium and zircalloy II had been drawn successfully through two passes, while a third pass failed when the plug would not seat. This is a serious problem since, in addition to failure to reduce tube wall thickness, the tube sunk and could not be drawn further. A tapered nose attachment for the plugs also proved unsuccessful. Since it was possible that the hardness of the tubes was responsible for plug slippage, two tubes were annealed by induction heating to approximately 1450° F. (788° C.) for a 3 minute period. However, these tubes proved to be no better in a subsequent draw.

In view of these drawing difficulties, it appears that considerably more development time is necessary for zirconium drawing. In order not to hold up the job, however, new consideration was given to rocking. A plant visit to Tube Reducing Corp. indicates that it may be feasible to rock to wall thicknesses as small as .042", although previously an .080" wall was considered to be the lower limit. Fortunately, we have rocking dies of 1-1/8" finish diameter and it was only necessary to design two special mandrels for the two sizes of tube required. These mandrels have been designed and will permit rocking of schedule I tubes to a final nominal size of 1.125" O.D. x 0.062" wall. Schedule II tubes will be rocked to 1.125" O.D. x 0.042" wall and finished to a final O.D. of 1.010" by a sinking operation. All of the available stock of drawn tubes have been induction annealed in preparation for rocking. Examination of the microstructure after annealing revealed a recrystallized structure with an 0.015 mm. grain size. Hardness was 85 B Rockwell.

b) Welding

The Dupont welding jig has been completed. The drive motor speed has been properly regulated from [redacted] r.p.m. This has been adjusted through

the pulley system to give from 0 to about 66 RPM of the tube which seems to be satisfactory. The welding torch has been rigidly mounted and a rectangular copper tube has been formed to supply argon gas coverage to the portions of the weld circumference not protected by the argon from the electrode gas supply.

Some successful trial welds have been made using the bronze dummy assemblies. It was found that the A.C. power would be required to avoid overheating of the metal because of the light sections to be welded. The arc stability is poor on the bronze but better on the zirconium.

At the present time the supporting posts for holding the tube have been used for annealing of the tubes.

C) Extrusion Characteristics of Zirconium

In an effort to compare the deformation strength at elevated temperatures of zirconium and zircalloy II with copper base alloys used in cladding, some hot hammer tests have been made. These tests were conducted at various temperatures between 675° C. and 900° C. and consisted of dropping a 50-lb. hammer vertically through a distance of 4 ft. on to a cylindrical specimen .500" diameter x .750" high placed on a heavy anvil. Deformation is measured in terms of per cent reduction in height. The results obtained are shown in Fig. 1 as a function of temperature with comparison curves for deoxidized copper and 85/15 Cu-Zn alloy.

D) Cans for Cladding

Twenty-two extrusion shells of 85/15 brass were finished to the following size: 6.142" O.D. x .050" wall x 16-18" length. The copper shells from the previous experimental .030" wall layout had been drawn to 6.873" O.D. x .036" wall but failed to draw through the 6.142" die and were scrapped.

E) Havens Laboratory

Technical Service: All samples of clad uranium from Metals and Controls have been polished and photographed for information desired [illegible] port on this

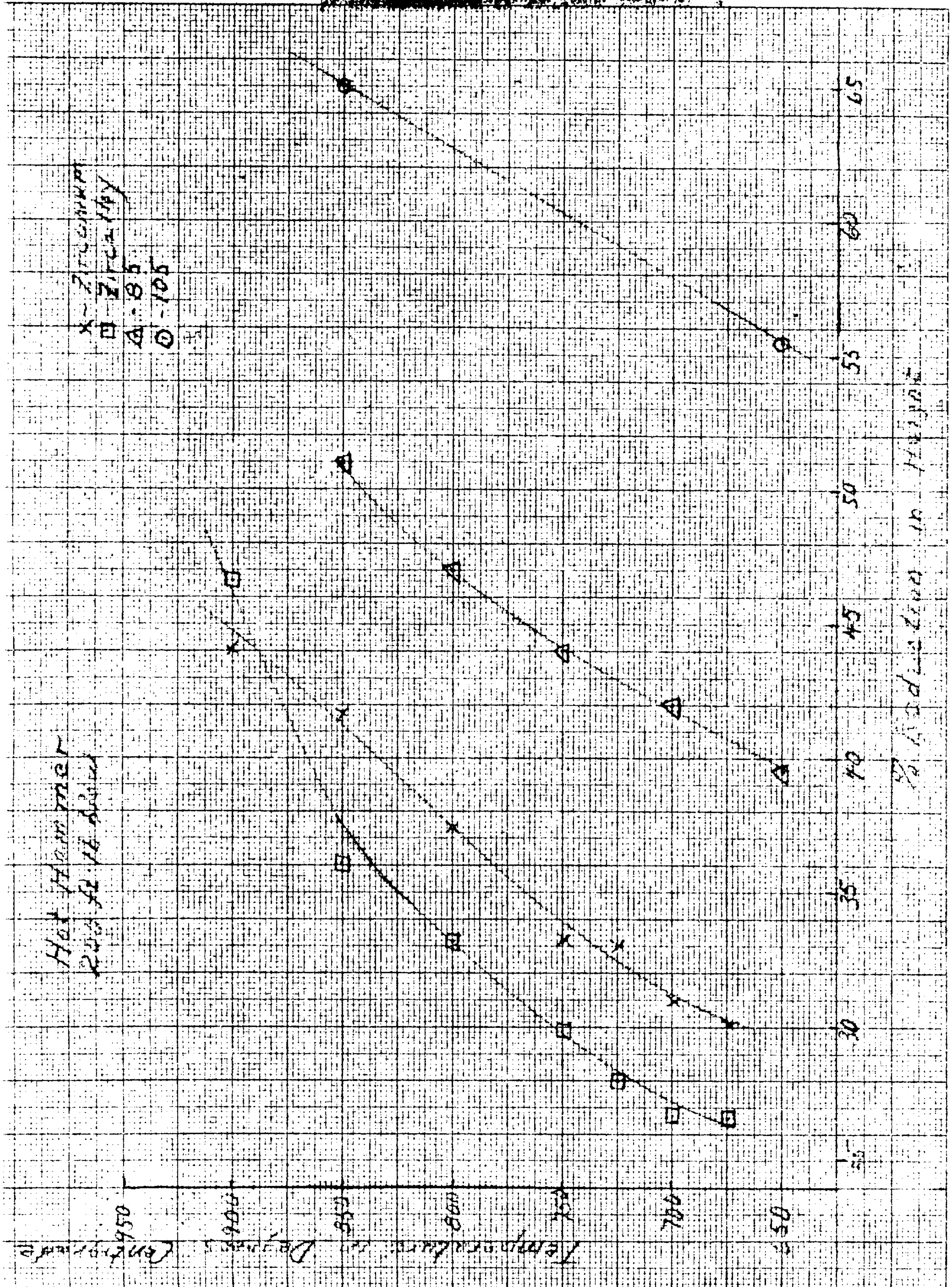
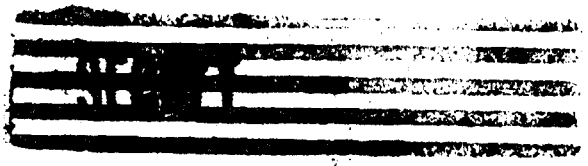

Hot Hammer
△ - 85
⊙ - 105
% Reduction in Height
25
30
35
40
45
50
55
60
65
950
900
850
800
750
700
650

Fig. 1



ten and will be issued within the next report period.

: Samples of "as received" uranium rod from Fernald are allographically before they are drawn and processed for

; lathe has been received. The milling machine is expected

Billet Holes

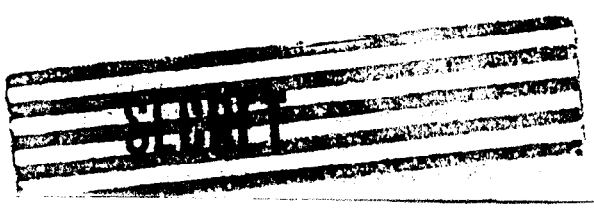
rusion of uranium and zirconium tubes has required the . length longitudinal hole to accomodate the mandrel. This rsome since machining of these metals is difficult and the scrapped. In order to eliminate this scrap, if possible, hole drilling method has been tried. A proprietary electric m as "Method - X" can remove a center hole rapidly while : of the metal in solid core form. This core can be considered In order to test the feasibility of making such holes, a zirconium (1.25" diam. x 1.5" high) was sent out for machining h hole drilled out. The results appear to be satisfactory to test the method further with a full-size billet. Method - X sed successfully on uranium.

Shells

onth marks the start of monthly progress reports on the rogram since our contract AT-36-1-24 with the Pittsburgh a continuation of the Sylvania Electric Products sub-contract tract AT-30-1-GEN-366 terminated on January 30.

s time, a final report on the above contract, entitled "Fabri- um Shells - II", has been written and will be issued during

eriod.



At this time also, we have completed and shipped to Hanford 200 zirconium shells. Average dimensions were 1.447" O.D. x .018" wall. Lengths ied from 10-1/8" to 10-5/8" with most in the longer length. In addition, roup of 33 reject shells were shipped for testing and examination.

Present work is concentrated on the production of flat bottom shells ch involves a striking operation. Tool design for this operation is not satisfactory.

Administrative Summary

A) Pilot Plant

During the past month the monorail system for handling heavy billets he vault, welding laboratory and machining area has been completed. Metal s for material storage have been installed in the vault. The installation ickle and wash tanks, together with the necessary ventilation, blowers fume washer are completed. However, it is now considered desirable to the two ten foot stainless tanks together so that longer lengths can be led.

It now appears that operation of the salt bath furnace will be ired on a day-to-day basis for annealing of zirconium deep-drawn shells ell as uranium annealing. This imposes the requirement of round-the-clock ation. In order to minimize man-power, it is desirable to operate the ace unattended for two shifts which requires a maximum of safety protection. ment is now being installed to shut down the furnace automatically in vent of emergency.

B) Health and Safety

White duck coats and white duck coveralls have been procured for rotection of visitors and workmen respectively while in the pilot plant These will be handled by the usual laboratory facility when soiled. A

small stock of rubbers is on hand for shoe covers for visitors to the pilot plant area and additional rubbers are being procured..

A sink with foot pedal valves has been ordered for the proposed locker room area in the pilot plant and one half the required number of lockers are already on hand.

C) Trips

a) Tube Reducing Corp.

R. M. Treco visited this company for the purpose of discussing tube pocking in general and the 2.4" O.D. ribbed process tube for Hanford in particular. While the length of the Hanford tube poses a problem, a slight modification of their No. 3 machine will permit the conversion of 21 ft. tubes. Special tools will have to be designed, however.

b) American Society for Metals

R. M. Treco attended the mid-winter meeting at Boston, Mass. for the beryllium symposium and discussion.

Respectfully Submitted,

BRIDGEPORT BRASS COMPANY

R. M. Treco

R. M. Treco, Section Head
Atomic Metallurgy Research

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