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NATIONAL ARCHIVES

Date: 7th December, 2021
Reply to
Attn of: Mitch Gundrum, RXC Conservator Technician
Subject: Condition Report and Treatment Proposal for
RG 46: Records of the United States Senate First Congress
SEN 1A-B2 Original Senate Joint and Concurrent Resolutions 1789-1791 Box 2
RXC# 19-019; HMS #WR1-461116701

To: Yoonjoo Strumfels, RXC
Jody Beenk, Supervisor RXC

Description:

Title/Name: SEN. 1A-B2 1791 Mar. 3 Resolve Requesting the President of the United States to Cause an Estimate of the Nature and Situation of the Lands Claimed by the Indians, Etc.
Date/Place: 1791
Support: Laminated Beige 1 antique laid paper, thickness between Thin 2 and Medium 1[1].
- Chain Lines: 26.5mm between lines (average of three readings from various sections across the document: 26.5, 26, 27); single outlier distance of 29.5mm
- Laid Lines: 17 lines per 2 sq. cm (17, 17, 17)
- Thickness: 0.106mm (0.109, 0.108, 0.101)
- Quality: Finer quality with even pulp distribution and little to no inclusions. Slightly thicker pulp distribution along chain lines (appearing darker in transmitted light) suggests use of antique laid-style mould. Tiny lighter points at intersection of chain and laid lines possibly attributable to additional stabilization stitches across mold wires.

Dimensions: The document is originally a folio with two (2) leaves, four (4) pages; is presently laminated as two leaves separated by a small margin.
- Leaf measurements (h x w): 15-1/16″ x 9-5/32″
- Unfolded Laminated Document: 15-¼″ x 18-½″, including ⅛″ margin between leaves and 1/16″ margin extending past document perimeter on all sides

Media: Presumed iron gall ink and pen, graphite
Attachments: None
Citations: None
Watermarks: None

[1] according to *The Print Council of America Paper Sample Book*, Lunning and Perkinson, 1996.

Condition:
The document is laminated with cellulose acetate film with no protective tissue barrier layer present. The document surface is flat and glossy, likely a result of the lamination process flattening any original texture out of the paper. The document includes the two conjugate leaves of the original folio, split along its original main fold and laminated with a ⅛″ margin of film separating the leaves. This film margin is torn ⅓ of the way up from the bottom of the document. In its original folio state, the document shows 1 horizontal and 3 vertical major vertical folding creases, suggesting that the tall folio was previously folded in half, then trifolded. There are tears and losses along these creases, especially at the top edge and along the horizontal crease. Additionally, there is darker discoloration along these creases which suggests oxidation and potential embrittlement of the paper substrate in these areas. The document shows greyish surface grime along folding creases, especially on the endorsement page.

Oxidation discoloration is often visible on paper as a brownish gradient, darkest at the environment-exposed edges of the document and getting lighter toward the interior. This discoloration, along with chipping and losses, is present along the top edge of the document and discernibly lacking from the side and bottom edges. In a document stored as a trifold, one would expect to see a similar degree of exposure-induced oxidation discoloration across the bottom edge and at least one of the side edges (the second, outer flap of the trifold) of the document. In this document, the side and bottom edges lack this typical discoloration, and furthermore these edges and the bottom corners of the document are exceptionally crisp and even, show almost no tears or losses, and the expected chain and laid line pattern is broken sharply and at an angle to the chain lines at this edge. These features suggest that the document was trimmed after an initial period of use and storage, possibly as part of the pre-lamination process.

Manuscript writing is present in at least three (3) unique hands and ink types, discernible by differences in the darkness (brown to dark brown to nearly black) and amount of ink used (thin to bold lettering). The overall condition of the writing support is Fair to Poor[2], with darker strikethrough present at the ends of letterforms. The majority of the manuscript is located on the recto and verso of the first leaf, while the second leaf has only a small section of endorsement text on the verso. There is a moderate degree of ink strikethrough visible through the paper for all of the manuscript (Fig. 1). Several characterial graphite inscriptions are present in the left margin and lower signature section of the first page.

There are small mottled round spots distributed across the document. The spots are dark in normal light but translucent in transmitted light, looking similar to oil stains (Fig. 2). These spots may indicate uneven adhesion of the cellulose acetate film onto the paper substrate. Raking light shows cockling along document edges and creases, as well as some changes in the film adhesion in the top left corner of the second page, in an area of about 1.5 inches square. Closer inspection reveals the acetate film to be delaminating in this area, with some delamination of the paper substrate noted as well. Differences in light reflection which highlight chain and laid

[2] according to *Condition Rating for Paper Objects with Iron-Gall Ink*, Instituut Collectie Nederland, November 2001. https://english.cultureelerfgoed.nl/binaries/cultureelerfgoed-en/documents/publications/2001/01/01/condition-rating-for-paper-object-with-iron-gall-ink/Informatieblad_01_condition_rating_eng.pdf

lines at the edges of the document (Fig. 3) also suggest uneven adhesion of the cellulose acetate film onto the paper substrate. The document fluoresces subtly under long wave (365nm) ultraviolet radiation[3] when compared to an unlaminated document of equitable age and makeup.

Testing:
The physical state of the laminated document was assessed through handling and visual inspection of the document was carried out in normal and raking light. Preliminary spot testing was performed on the document to determine the solubility of the cellulose acetate film and the ink media.

Tiny (2mm x 15mm) strips of cellulose acetate film were extracted from the lamination margin at the bottom edge of the document. Solvent solutions were prepared using several test ratios of acetone and deionized water: 100% acetone, 9:1 acetone to DI water, 8:2 acetone to DI water, and 7:3 acetone to DI water. For each of these solutions, a sample of the film laminate was placed in a petri dish and solution was added until it completely covered the surface of the dish. The dishes were allowed to sit for several minutes while the reactions were observed. After ~15 minutes, the film sample in each of the petri dishes had completely dissolved and the solvent had evaporated, leaving a whitish precipitate (Fig. 4). As all of the solvent solutions were effective in dissolving the cellulose acetate film, we decided to move ahead to spot testing with the 100% acetone and 9:1 solutions. Iron gall and other ink media are reactive and potentially soluble in water, thus these solutions containing the lowest possible amount of water suggested the lowest risk to the ink media during immersion.

Spot testing was conducted under a stereo microscope, using a 00 size soft white synthetic bristle brush to apply the selected solutions to small (3-5mm) areas of the document where ink media is present. Solvent solutions were applied slowly to the document to dissolve and displace the cellulose acetate film, leaving the paper support fibers and ink media exposed (Fig. 5). Because the three sections of the document are written in different hands and ostensibly use different ink media, these spot tests were conducted in two discrete areas in each of the three sections to test solubility of all ink media on the document. This testing showed that all of the ink media used were stable in both the 100% acetone solution and the 9:1 acetone and water solution, establishing the document as eligible for immersion delamination treatment. There was, however, the development of a powdery white precipitate on the surface of the laminated document when tested with the 9:1 solution. The 100% acetate solution only solubilized the cellulose acetate film, which remained transparent after displacement.

Proposed treatment:
1. Using digital imaging, photograph the document before, during, and after treatment.
2. Test laminate material and media for solvent solubility.
    a. If inks are sensitive to solvent, the documents cannot be delaminated, but repairing paper losses with appropriate insert paper will improve the appearance.
    b. If inks are stable in solvent, immerse documents in successive baths of solvent with possible addition of water to remove cellulose acetate.

[3] as examined by in-house Spectroline Model ENF-240C UV Lamp.

3. After drying, surface clean both sides to remove loose soiling with a vinyl eraser/eraser crumbs.
4. Test inks for sensitivity/solubility in de-ionized water and ethanol solutions.
5. If inks are stable, pre-condition the document in ethanol to “stabilize” the inks.
6. Proceed with aqueous washing. Immerse the document in de-ionized water and ethanol bath to remove soluble impurities and degradation from paper. After washing, immerse the document in ethanol to drive out the water from the paper.
7. Examine inks for any changes. Document as needed.
8. Test for the presence of iron(II) ions using non-bleeding Bathophenanthroline indicator paper. Document the observation.
9. Test ink medium for its sensitivity/solubility in calcium bicarbonate solution.
10. If inks are stable, proceed to de-acidify the document in a cold calcium bicarbonate solution.
11. Size the document with a gelatin sizing solution.
12. Dry the sized document between polyester web and blotters under light weight.
13. Repair tears and losses with Asian long-fiber bast paper and wheat starch paste.
14. If necessary, use acrylic paint toned repair paper to fill losses to improve the document’s appearance.

Discussion:
The treatment will stabilize the ink and the paper for long-term preservation by removing the cellulose acetate lamination, acidity, impurities, and by raising the paper’s pH. Delamination will make the paper truer to its original state and enhance contrast between the paper and ink. Therefore the ink strikethrough on the document may also become more visible after treatment. The aqueous treatment may result in some movement of iron gall ink including some minute ink drop out, but the overall benefit to the document outweighs the minor changes in the ink.

Estimated treatment time:
(x hours) Include time spent on examination, testing, preparing proposals and reports, treatment, photo documentation, fabrication of housings, and conducting authorized research relevant to the treatment.

APPROVAL TO TREAT AS DESCRIBED ABOVE:

_____ _____

Custodial branch chief (or designee) Date

Treatment:

Delamination: As described above, treatment began with digital imaging and testing of the laminate and media for solubility. After confirming the solubility of the acetate film and stability of the iron gall ink media, treatment progressed to immersing the document in successive solvent baths. The document was split along the center laminate margin for more stable handling, and each leaf of the folio was supported by a sheet of mylar slightly larger than the leaf on all edges. Treatment commenced first on the endorsement leaf as a final precaution against damage to the primary content of the document; after several minutes in the bath without discernible damage to the ink media, simultaneous treatment began on the main content leaf. The delamination of the Working in a fume hood, each supported leaf was immersed in a solvent bath, allowed to work for several minutes, flipped between sheets of mylar, allowed to rest for several more minutes, then removed to a fresh bath to repeat this process. Three successive baths were used, the first two consisting of 1000ml of 100% acetone, and the third made up of a 9:1 ratio of acetone with deionized water to facilitate deeper saturation and swelling of the paper fibers and evacuation of the embedded cellulose acetate film. Table 1 shows the time each leaf was allowed to sit in the series of solvent baths:

Table 1: Time Spent in Delamination Solvent Bath (minutes)

	Leaf 1 (Endorsement Page)			Leaf 2 (Main Content Page)		
	Side 1	Side 2	Total	Side 1	Side 2	Total
Bath 1 (Acetone)	18	22	40	20	22	42
Bath 2 (Acetone)	16	16.5	32.5	18	19	37
Bath 3 (9:1 Acetone:DI Water)	14	24	38	19	20	39
Total Time Spent:			110.5			118

Acetone evaporates quickly—when the mylar sheets used to flip the documents were removed from the bath and the acetone evaporated, the sheets were covered with a milky white precipitate (dissolved cellulose acetate). This precipitate became less noticeable with successive baths as more cellulose acetate was solubilized and disposed of, until the mylar sheets were free of precipitate after the third solvent bath, suggesting that most of the cellulose acetate had been removed from the document. During the third bath, the supporting mylar sheets were replaced with sheets of spun polyester, and after their final immersion session, the leaves were placed between blotters to dry.

Washing: Treatment proceeded with solubility testing for the iron gall ink media using several test ratios of deionized water and ethyl alcohol: 7:3 water to alcohol, 8:2 water to alcohol, 9:1 water to alcohol, and 100% deionized water. For each of these solutions, a white-bristle brush was used to apply a tiny amount of solution to inconspicuous portions of the manuscript. Under magnification, the wetted ink media was examined for signs of

solubility, bleeding, and displacement, all of which would make the document ineligible for washing. Prolonged exposure to moisture can accelerate the degradation of iron gall ink media. While each of the solutions were applied without causing discernible changes to the ink media, the 7:3 solution was chosen as the preferred washing solvent as it maximizes both washing and evaporation potential.

Each leaf of the folio was supported by a sheet of spun polyester slightly larger than the leaf on all edges. Working in a fume hood, each supported leaf was immersed in a solvent bath, allowed to work for several minutes, then removed to a fresh bath to repeat this process. The washing process included a preconditioning bath of 100% ethyl alcohol; three baths of washing solution made up of ethyl alcohol and deionized water, wherein the pH was raised to ~8.5 with a small amount of saturated, double-filtered calcium hydroxide; and a final ethyl alcohol bath to drive the remaining water from the document to facilitate faster drying. The five successive baths were used as described in Table 2:

Table 2: Time Spent in Washing Solvent Bath (each leaf)	
	Time Spent (minutes)
Bath 1: Preconditioning (Ethyl Alcohol)	5
Bath 2: Washing 1 (5:5 Alkalinized DI Water: Ethyl Alcohol)	5
Bath 3: Washing 2 (7:3 Alkalinized DI Water: Ethyl Alcohol)	15
Bath 4: Washing 3 (7:3 Alkalinized DI Water: Ethyl Alcohol)	15
Bath 5: Water Evacuation (Ethyl Alcohol)	5
Total Time Spent (each leaf):	45

After the final bath, the document leaves were transferred to new spun polyester supports for handling and placed between blotters to dry.

Alkalinization:
After washing, the document was alkalinized as a preventative measure against long-term oxidation deterioration. Theoretically, this treatment provides a buffer surface layer of OH^- ions which destructive, oxidizing H^+ ions can react with over time before continuing their deterioration of the cellulose molecules in the paper support. A ~0.1 M solution of calcium carbonate ($CaCo_3$) was prepared by mixing 0.8g of calcium carbonate powder into 800ml of cold deionized water. Carbon Dioxide (CO2) was injected into this solution via SodaStream to render a calcium bicarbonate ($Ca(HCO_3)_2$) solution. The alkalinization solution was a 1000ml 8:2 ratio of this calcium bicarbonate solution with ethyl alcohol. The document was placed in a wetting solution of 100% ethyl alcohol for five (5) minutes, then moved to the alkalinization solution and allowed to work for 20 minutes.

Resizing:
The document was moved directly from the alkalinization bath to a plexi sheet for resizing. After visible pools of moisture had evaporated, a 1.5% solution of gelatin in warm (~35℃) pH-neutral water was applied to both sides of the document through a sheet of spun polyester using a wide, soft, natural bristle paste brush. The resized document was then rapidly dried between successive blotters, then placed in a blotter/felt stack under light weight to dry for several weeks.

Mending and Fills:

Materials:

- UV Lamp
- acetone
- ethyl alcohol
- calcium hydroxide
- ph indicator
- calcium carbonate
- sodastream (co2)
- gelatin

IDP #1: Cellulose Acetate Film Delamination - Project Timeline		
Date	Hours	Work Completed
12/7	9AM-3PM (6)	Conducted preliminary assessment of document, began writing Condition Report
12/8	9AM-3PM (6)	Measured paper specifications; conducted assessments under magnification and UV radiation; continued writing Condition Report
12/9	9AM-3PM (6)	Conducted spot solubility testing of cellulose acetate film, iron gall ink media; trained on digital image capture process and techniques with Rachel Bartgis; continued writing Condition Report and began Treatment Proposal

12/14	9AM-3PM (6)	Completed delamination; conducted spot solubility testing of iron gall ink media; continued writing Condition Report and Treatment Proposal
12/15	9AM-3PM (6)	Completed washing; continued writing Condition Report and Treatment Proposal; completed preconditioning of two silked document fragments in ethyl alcohol
12/16	9AM-3PM (6)	Completed alkalinization and resizing; continued writing Condition Report and Treatment Proposal; completed desilking, enzyme bath, and washing of two silked document fragments
2/8	9AM-3PM (6)	Began self-mending
2/10	9AM-3PM (6)	Continued self-mending

Fig. 1: Detail of ink strikethrough

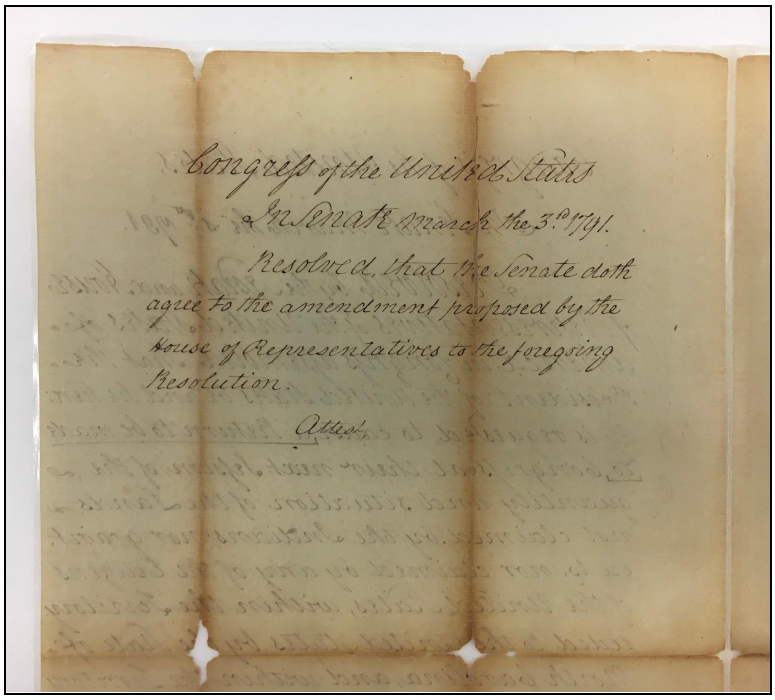

Fig. 2: Detail of mottled discoloration

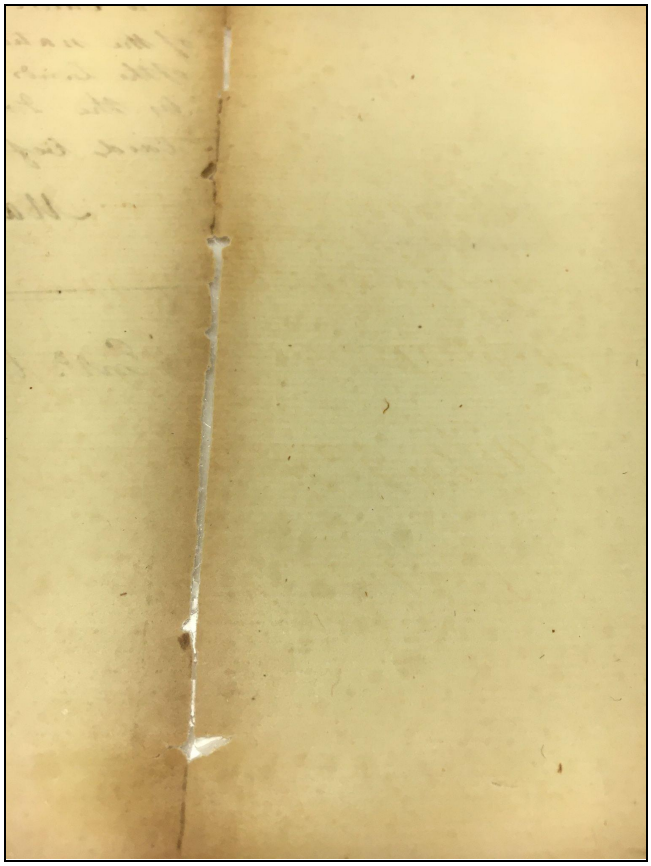

Fig. 3: Detail of chain and laid line reflections