Conservation Report

Bureau Organ by
Abraham Adcock & John Pether

London, ca. 1750-1765
Accession no. 1958-260

John R. Watson and Louis Dolive
Department of Conservation
The Colonial Williamsburg Foundation
2001

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How to read this report

The "Main Report" (pages 7-35) is arranged by component, so the component list (page 6) serves as an index to it. For each component in the main report, information includes technical description, past interventions, condition problems, and decisions or actions taken on each condition issue. Photographs and analysis information is also recorded under the component. The following symbols allow you to read the report in many different ways…

- Past Interventions
- Condition Issues
- Action Records
- Analysis
- Graphic links

If you want to know what was wrong with the organ before treatment, scan for the broken plate. If you want to see what was done to the organ in the past, scan for the hand, or if you want to read just what we did in the present treatment, scan for the A (for "Action"). The camera icon signals a photograph. Note the photo number and find the photo in the photo-documentation section at the end.

Project Report

Project No. 18529

Saturday, December 11, 2004

Object/Title	*Bureau Organ*	Period	1750-1765
Attribution	*Abraham Adcock & John Pether*	Origin	London, England
Owner	*Colonial Williamsburg Foundation*	Object #	**1958-260**
Collection	*Department of Collections*		
Location	*Governor's Palace, Williamsburg*		

Project Description

The organ is used for programs in the Governor's Palace, and is the preferred chamber organ for these programs because of its pitch near A415. The project was to make thorough examination and restorative treatment for musical use and exhibit in the Palace.

This conservation treatment was among those featured in an article by John Watson in _The Tracker: Journal of the Organ Historical Society_, Volume 46, No. 3, July 2002. In this report, the British term "shifting movement" is interchangeably used with the term "machine stop" meaning the foot pedal that turns off the 2' and mixture stops.

Condition (Before Tmt)

The organ had a machine stop pedal which did not function and its purpose was unknown. There were also increasing problems with running of the wind causing several pipes to sound along with their neighbors. There were wind leaks necessitating too much working of the bellows. The pitch had been artificially lowered by the addition of cardboard extensions on some of the bass pipes, and the temperament had been converted to equal temperament.

Project Intent

To restoratively conserve the instrument to be fully functional as a musical instrument; return pitch to a presumed earlier state, and provide a conjectural period temperament.

Project Summary

The treatment was carried out by John Watson with contract technician Louis Dolive whose background was in organ building. Dolive also had more specialized expertise in pipe making. Following treatment, the organ was in good playing condition, and back at a pitch level and temperament appropriate to the period of the instrument. The machine stop was made operable, the running of the wind stopped, and the wind made more efficient. Pitch was set to A422 and the temperament was set to the "English Common Temperament" (see tuning recommendations in the preventive conservation section. Technical data on all digital photographs (prefixed with "D") is embedded in the file's EXIF data.

Project Phases

Examination & Treatment Proposal Completed *7/10/2001* *Phase # 1*

Notes *This phase was separately numbered as CW Conservation Project no. 18071. Objective: To document the organ's condition and propose specific conservation treatments.*

Approvals *Curator Martha Katz-Hyman & Project Conservator John R. Watson*

Staff *John R. Watson, Project Conservator*

Louis Dolive, Conservation Technician

Restorative Treatment Begun *7/10/2001* Completed *11/29/2001* *Phase # 2*

Notes *The organ was cleaned and stabilized. Stray movements of air in the windchest (called running) were stopped, the shifting movement restored to use, the original lead weight returned to the bellows, and the instrument retuned to an unequal temperament.*

Approvals *MKH (9-28-2001)*

Staff *John R. Watson, Project Conservator*
Louis Dolive, Conservation Technician

Caution while using machine stop (foot lever)

The lever applies considerable pressure on the end of the shifting movement slider. The slider extension has broken twice in the past, and one of those times it probably became lodged, prompting the removal and loss of the original trundle. Note the support block connected to the right foot shelf built into the dolly. This was apparently intended to stop the pedal from descending too far and damaging the shifting movement. While playing, be sure to pull the shelf out far enough so the block gives this support.

Environment

Light: Keep organ out of direct sun light to avoid sun-bleaching of the wood.
Humidity: Keep relative humidity within the range 35% - 65% and do not let changes of RH occur faster than 10% in 24 hours.

Special Handling Instructions

Although the organ is designed for easy moving, and has a modern dolly fitted to it, any moving is to be done only if necessary and with great care. Avoid jostling when the pipes are installed, as this causes stress where the pipes bear against the pipe racks. If the organ is to be picked up or moved from building to building, the pipes should be removed. If pipes are removed, note the directions in which their mouths face so they can be returned to their correct orientation. Do not let the pipes strike together during transit.

Tuning

The temperament is the "English Common Temperament" recommended to us by Kenneth Mobbs and Alexander C. N. Mackenzie of Ord, both of Bath, England. The cents deviation from equal temperament are as follows:

c = 0
c-sharp = -7.6
d = -6.8
e-flat = -2.6
e = -13.6
f = +3.4
f-sharp = -9.6
g = -3.4
g-sharp = -5.6
a = -10.2
b-flat = +0.4
b = -11.6

Mixture is tuned as pure octaves and fifths.

Use great caution when cone tuning. Some of the mouths are weakened from past abuse, and unable to withstand pounding with the tuning cone. Consider lifting the pipe to tune while holding, giving sufficient time, of course, for the pipe to cool before judging pitch.

Campaigns

Colonial Williamsburg Foundation, Department of Conservation. Instruments Lab

Noel Mander

Date	*ca. 1957 or 1958*
Personnel	*Noel Mander Ltd.*
Location	*London*
Documentation	*A letter in the object file from Mander to Robert Campbell dated 19th June, 1979*
Summary	*According to Mander: "This instrument was sold to the establishment under false pretenses. Many years ago, it was sold to Mr. Geraint Jones by Mrs. Gerals Finze. Mr. Jones siad that he could not afford a restoration but would I do the minumum work which was needed to make the organ play. I did what I could and charged him about 35 pounds, he then sold it to Williamsburg at a very high price and told the authorities that it has been restored by me -- it certainly had not been."*

Clifford Bennett restoration for CWF

Date	*1959*
Personnel	*Clifford Bennett of Kansas City*
Location	*Williamsburg*
Documentation	*Memo in object file dated 3-16-1959*
Summary	*Organ dismantaled; metal pipes repaired and rounded out; adjusted for speech; wood pipes repaired with screws; chest and table secured with screws; joints repacked; slides graphited and refitted; return spring welded and replaced; pivot points greased; some(?) new leather for bellows; felt cushion for joint between chest and bellows; tuned; wood pipe stoppers greased; weights replaced with springs for 2 1/4" pressure; new cloth hinges on action wires; keys refitted. CB noted the missing parts (trundle) and the possibility of replacing it.*

CWF 1959 (simultaneous with Bennett restoration)

Date	*March 1959*
Personnel	*Unknown*
Location	*Williamsburg*
Documentation	*"Antique Furniture Maintenance Record" in the file.*
Summary	*"Generally overhaul [meaning Bennet's work?] Remove dovetail inserts from both side panels, and fit larger ones. Glue loose veneers. Fit new rollers with brass bushes, and one new board L. end to bottom. Rentokil. Fit new leather hinges to push rods."*

Robert Campbell, 1979

Date	*Spring 1979*
Personnel	*Robert D. Campbell*
Location	*CWF, Williamsburg, VA*
Documentation	*Brief report in object file.*
Summary	*Mostly involved repairs to the bellows. Also some patching of cracks in wooden pipes and removal of five corroding nails in lower lips of 8' flute.*

A. Skutans (simultaneous with Campbell work)

Date	*May, 1979*
Personnel	*Albert Skutans*
Location	*CWF*
Documentation	*See "Maintenance Record" in object file*
Summary	*Various veneer patches, regluing of loose parts, replacement of four screws, cleaning with mineral spirits and waxing with Butcher's beeswax.*

1986 Campbell/Redstone

Date	*1986*
Personnel	*Robert Campbell and Peter Redstone*
Location	*Williamsburg*
Documentation	*Redstone memo to John Davis of September 12, 1986*
Summary	*Pitch lowering using paper collars*

Components List

Colonial Williamsburg Foundation, Department of Conservation. Instruments Lab

Bureau Organ

- *Bureau Organ*
  - *1 - Case*
    - *1.1 - Lower Case*
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    - *5.4 - Sliders*
    - *5.5 - Toe Boards*
  - *6 - Pipework*
    - *6.1 - Stopped Diapason 8'*
    - *6.2 - Flute 4'*
    - *6.3 - Fifteenth 2'*
    - *6.4 - Mixture II*
      - *6.4.1 - Front rank of mixture*
      - *6.4.2 - Back rank of mixture*
  - *7 - Other Photo Documentation*

Component-Level Data: Description; Past Interventions; Condition; Actions

Colonial Williamsburg Foundation, Department of Conservation. Instruments Lab

Bureau Organ

Description *A chamber organ in the form of a Bureau with concealed keyboard and pipes.*
Marks and Inscriptions: "Abraham Adcock and John Pether Londini Fecit" in pen on the name batten.
Compass: C-e'''; 53 keys.
The organ was purchased from Geraint Jones, a London-based organist who toured Europe with the instrument and is said to have made several recordings with it (H,M.V. and Decca recording labels).
4 stops; 5 ranks.
Left hand stops: Mixture (2 rank). Metal; Stopped Diapason (8' wood)
Right hand stops: Fifteenth (2' wood & metal); Flute (4' wood)
Shifting movement for removing the 2' and mixture.
Wind via front pedal and optional side pedal. The pressure is 2 1/4".

Measurements *Width = 1163mm; Depth = 605mm; Height = 1190mm*

D-0103.jpg *The organ overall.*

D-0108.jpg *Detail of the nameboard inscription.*

Past Intervention

Attribution *Clifford Bennett restoration for CWF*
Interpretation *"Organ completely dismanteled, all parts checked over"*
"...The whole cleaned and reassembled, all moveable connections and pivot points greased…"
Evidence *Bennet's report of March 16th, 1959.*

Past Intervention

Attribution *CWF 1959 (simultaneous with Bennett restoration)*
Interpretation *Rentokil pest control treatment*
Evidence *Antique Furniture Maintenance Record in object file.*

1 Case

1.1 Lower Case

D-0080.JPG *A view of the upper case, viewed from below after reinstallation of the stopped diapason toeboard.*

Past Intervention *Wooden wheels*

Attribution *CWF 1959 (simultaneous with Bennett restoration)*
Interpretation *The wheels were replaced, and the original wheels were saved.*
Evidence *Four old wheels were found with the original bellows weights in storage. They remain preserved with the associated parts archive as no. 16. Their replacement was recorded in CWF object record, "Antique Furniture Maintenance Record" dated*

1.1 Lower Case (continued)

March 1959.

Condition *repairs/restoration* *UNSTABLE*

Location *Attachment of machine pedal to case bottom*

Notes *The screw and lower nut extend too far, interfering with the sliding foot rest in the dolly.*

S-0037.JPG Bottom of the lower case. Note large nut that conflicted with footshlf 0037 Bottom of the lower case. Note large nut that conflicted with footshelf

S-0046.JPG Machine stop attachment to bottom, interior view. 0046 Machine stop attachment to bottom, interior view.

S-0051.JPG Bulky nuts from machine pedal attachment. 0051 Bulky nuts from machine pedal attachment.
These nuts were replaced, and stored within the organ.

S-0054.JPG Machine pedal after re-attachment with new nuts. 0054 Machine pedal after re-attachment with new nuts.

Proposed Treatment

Notes *Replace screw and nut so not to descend far below the bottom. Place old parts in archival storage.*

Treated as Proposed

D-0070.JPG Parts removed from the pedal mechanism were lashed inside the bottom of the lower case under the bellows. The two strips of wood were hide-glued to the case.

1.1.1 Front

Condition *losses/missing parts*

Location *half-way up the right corner*

Notes *Veneer is missing*

S-0044.JPG Veneer loss on right front corner. 0044 Veneer loss on right front corner.

Proposed Treatment

Notes *Patch veneer with like material.*

Treated as Proposed

Cons. Materials *Hide glue*

S-0045.JPG 0045 Veneer repair on right front corner.

1.1.2 Ends

Condition *losses/missing parts* *UNSTABLE*

1.1.2 Ends (continued)

Location *left lower-rear corner*

Notes *Veneer is missing; the pieces have been saved*

S-0041.JPG Fallen veneer from bass, rear bottom corner. 0041 Fallen veneer from bass, rear bottom corner.

Proposed Treatment

Cons. Materials *Titebond Liquid Hide Glue*

Notes *Reattach veneer.*

Treated as Proposed

1.1.3 Back

1.2 Main Case

Past Intervention *veneer on right side*

Attribution *1979 - Albert Skutans*

Interpretation *The veneer was repaired*

Evidence *Report in object file.*

Past Intervention *Inside under the lid.*

Interpretation *A shelf (now missing) was provided at the level of the top of the top horizontal pipe. This might have been for storing music.*

Evidence *Only the supporting cleat on the left and a pin at the right remain.*

1.2.1 Keywell

S-0067.JPG Note whitened beeswax(?) fills in right stop jamb panel. 0067 Note whitened beeswax(?) fills in right stop jamb panel.

S-0069.JPG Left stop jamb before treatment. 0069 Left stop jamb before treatment.

S-0070.JPG Right stop jamb after treatment. 0070 Right stop jamb after treatment.

S-0071.JPG Left jamb after treatment. 0071 Left jamb after treatment.

Past Intervention *Stop Jambs (the panels through which the hand stops pass)*

Attribution *Unknown*

Interpretation *Candle sconces were once attached in this area, and were subsequently removed.*

Evidence *A series of holes are the only indication, and this hypothesis is not corroborated by any other observations.*

Condition *past restoration*

Location *Stop jambs*

Notes *The fills for several holes on each stop jamb have turned white, probably because*

1.2.1 Keywell (continued)

they use beeswax, which has that tendency. Old fills were saved as No. 10 in the associated materials archive.

Treatment

Notes *Replace the fills with colored wax.*

1.2.2 Ends

D-0043.JPG *Treble end of case seen from inside.*

S-0073.JPG *Interior of case showing vent. 0073 Interior of case showing vent.*

S-0077.JPG *Detail of vent cloth. 0077 Detail of vent cloth.*

S-0078.JPG *Detail of vent cloth. 0078 Detail of vent cloth.*

Past Intervention *both ends*

Attribution *CWF 1959 (simultaneous with Bennett restoration)*

Interpretation *Remove dovetail inserts and replace with larger dovetails; glue loose veneers*

Evidence *See documentation in object file.*

D-0044.JPG *Inside of treble end of case. Note large "butterfly" dovetails.*

S-0072.JPG *Bennet's bowties holding the split in the side. Bennet's bowties securing the split in the side.*

Condition *structurally unsound* *UNSTABLE*

Location *back edge at bottom*

Notes *an old fill is loose*

Proposed Treatment

Cons. Materials *Hide glue*

Notes *Reglue old patch*

Treated as Proposed

Condition *distorted/bent/dented*

Location *Access door on left end.*

Notes *The door lock is not contacting anything due to shrinkage*

Treatment

Cons. Materials *Hide glue*

Notes *Add a notched slip of wood so the lick locks.*

Completed *8/2/2001*

S-0076.JPG *New notched block added for side door latch. 0076 New notched block added for side door latch.*

1.2.3 Back

1.2.4 Top

1.2.4 Top (continued)

1.3 Black Dolly

S-0059.JPG Dolly without organ. Note built-in foot supports. 0059 Dolly without organ. Note built-in foot supports.

S-0060.JPG Dolly without organ. Note built-in foot supports. 0060 Dolly without organ. Note built-in foot supports.

S-0062.JPG Dolly upside down. 0062 Dolly upside down.

S-0063.JPG The dolly includes two sliding foot-rests under the pedals. The brown patch on the right front top of the pedal is a leather-topped wooden block intended to stop the machine pedal from descending too far.

Past Intervention

Attribution *Pre-CWF, ca. 20th century*

Interpretation *The dolly was added to the case to facilitate moving. Foot rests were supplied in the dolly as well.*

Evidence *Modern workmanship. It seems likely that this was added for Geraint Jones who toured with the organ and would have needed as much portibility as possible.*

2 Wind System

Description *The wind pressure is 2 1/4". There is a feeder bellows and a reservoir with original lead weights. Manual pumping using a detachable foot pedal on the front or one on the side.*

D-0078.JPG The lower section of the case with the upper section removed, showing the bellows viewed from above rear.

D-0079.JPG The top of the reservoir, right end. The original lead weight has been reinstated. Note the two pairs of holes on either side of the valve. These were left by the springs that had been installed in place of the weight. The obvious repair on the upper brace is from an earlier restoration.

D-0089.JPG Running of the wind was tested by blowing air into the windchest, and using a flag of gold leaf to indicate where it was escaping. The leaks were very easy to observe and locate in this way.

S-0093.JPG Detail of bellows leathering. 0093 Detail of bellows leathering. The apparently new leather was from one of the recent restorations, and not from the present work.

S-0094.JPG Detail of bellows leathering. 0094 Detail of bellows leathering.

Condition *split/cracked*

Notes *Some bending joints in the leather were cracked.*

Treatment

Notes *Some new patches were added to the bellows on top of older leather. See photos.*

S-0093.JPG The apparently new leather on the left spine of the feeder bellows is new in this campaign.

S-0096.JPG We think the apparently new patch at the top left was added in the present campaign.

2.1 Foot Levers

S-0055.JPG Interior view of the two bellows foot pedal mechanisms. Interior view of the two bellows foot pedal mechanisms. The front of the organ is on the left of the image.

S-0056.JPG Interior view of the two bellows foot pedal mechanisms. The front of the organ is on the left of the image.

S-0057.JPG Interior view of the two bellows foot pedal mechanisms. Interior view of the two bellows foot pedal mechanisms. The front of the organ is at the top of the image.

2.2 Bellows

S-0089.JPG Overall top of bellows system. 0089 Overall top of bellows system.

S-0091.JPG View of bellows system. 0091 View of bellows system.

S-0092.JPG Side view of feeder and reservoir. 0092 Side view of feeder and reservoir.

Past Intervention *Feeder and reservoir bellows.*

Attribution *Robert Campbell, 1979*

Interpretation *repatched both ... with new naturally tanned pneumatic leather, and thicker gusset leather.*

Past Intervention

Attribution *Clifford Bennett restoration for CWF*

Interpretation *"…bellows checked, and new leather glued to make sound."*
"…the weight on bellows replaced with springs (2), to secure better and more steady wind pressure (2 1/4" w.p.). The reason for the latter is that the rib area varies as bellows fills, the varying tension of the springs compensates for this and keeps the pressure more constant, and also helps to minimise fluctuations due to irregular pumping of pedals....if at any time it is desired to reinstate the weight it is only a matter of removing the springs and screwing back the weight in place as before"

Evidence *Bennet's report of March 16th, 1959.*

Condition *repairs/restoration*

Location *Weights*

Notes *The springs that replaced the bellows weights in 1959 provide a different steadiness of wind supply than the original weights that remain in CWF storage.*

Proposed Treatment

Notes *Remove springs and re-attach original weight. Original screw holes and witness marks show where the weight was placed*

Treatment

Notes *The 1959 springs were removed to storage, and the original weights were re-*

2.2 Bellows (continued)

installed in their original positions using modern round-headed screws in the original holes.

Condition *accretions*

Notes *Dirt and grime on leather*

No Treatment

2.2.1 Feeder Bellows

S-0081.JPG Bearing plates where pedals push on feeder bellows. 0081 Bearing plates where pedals push on feeder bellows.

S-0082.JPG Check valves in feeder bellows. 0082 Check valves in feeder bellows.

S-0083.JPG Overall view of feeder bellows. 0083 Overall view of feeder bellows.

Past Intervention *end leaves*

Attribution *Robert Campbell, 1979*

Interpretation *"...removed and cleaned for repair of wood splita [sic] as leather had water damaged in the past….Inside hinges had fabric inside and very thin leather on the outside. The hinge leather on the bottom bellows (hinge end) was removed in order ot [sic] reglue the wood strip to the bellows. The split leaves in the bottom were reglued with white glue. The bottom boards of the bottom bellows were reglued with white glue at both ends. The reop hinge was reglued with hot hide glue. The main hinge strip of bottom bellows needed regluing - used hot hide glue. … In replacing the end leaves of the lower bellows, existing center hinge was covered with naturally tanned pneumatic leather, leaving as much old leather as possible and still get a good glue joint. In taking off existing lower leaf, we notices [sic] three layers in gussets only to cover small holes in first layer. Cloth hinge material was noticed in top and bottom of end leaf. Bottom layer of gusset was not original, as it covered up a patch in the leaf (end). Wood eating animals have eated [sic] holes in the bottom wind trunk. These holes were filled with hide glue. It can be determined that the gusset on lower bellows is not original, as the first 4mm. On leaves was not cleaned of its first layer of gusset, and can be verified on gusset left in organ under wind trunk side."*

Evidence *Campbell's report in file.*

Condition *split/cracked*

Location *Front side, upper rib*

Notes *The rib is split. An old patch over the split is torn, causing wind loss. Robert Campbell mentioned regluing a split there in his 1979 report. It must have reappeared by 1986 according to mention of the problem in the Redstone memo of 9-12-1986.*

S-0095.JPG Split rib with old leather patch (also split). 0095 Split rib with old leather patch (also split).

Proposed Treatment

Notes *Replace old split leather patch with new one of alum tawed leather.*

2.2.1 Feeder Bellows (continued)

Treated as Proposed

Cons. Materials *Hide glue*

Completed *7/10/2001*

S-0097.JPG New leather patch on split bellows rib. 0097 New leather patch on split bellows rib.

2.2.2 Reservoir

Past Intervention *Leaves*

Attribution *Pre-1979*

Interpretation *Robert Campbell thought the leaves were "recent"*

Evidence *The leaves are spruce which is a different wood (than the leaves of the feeder?) . Also thicker--1cm rather than 2.5mm in the feeder.*

2.3 Wind Lines

S-0084.JPG Gasgeted trunk from bellows. 0084 Gasketed trunk from bellows. The trunk joint was re-leathered by Bennet in the 1959 restoration.

Past Intervention

Attribution *Clifford Bennett restoration for CWF*

Interpretation *New leather for wind trunk joint between bellows and chest.*

Evidence *Bennet report.*

3 Key Action

D-0023.JPG Detail of stickers. Key levers appear in their vertical position (upper right). The rollers are in the foreground, and the trunk to the bellows on the lower left.

D-0033.JPG Part of the key action (right 1/3 of photo) showing wire trackers and rockers.

D-0036.JPG Backfall assembly and tracker wires removed from instrument.

D-0113.JPG Overall interior view of key action. 0113 Overall interior view of key action.

D-0114.JPG Interior detail of key action - bass end. 0114 Interior detail of key action - bass end.

D-0115.JPG Interior detail of key action - treble end. 0115 Interior detail of key action - treble end.

S-0074.JPG Interior view of leather keyboard pivot, stop pad. 0074 Interior view of leather keyboard pivot, stop pad.

S-0104.JPG Key action and rollers. 0104 Key action and rollers.

3.1 Key Levers

3.1 Key Levers (continued)

S-0035.JPG Detail of ivory key arcades. 0035 Detail of ivory key arcades.

S-0036.JPG Detail of ivory key arcades. 0036 Detail of ivory key arcades.

S-0120.JPG Key levers viewed from above. 0120 Key levers viewed from above.

S-0121.JPG Key levers removed from organ. 0121 Key levers removed from organ.

S-0132.JPG A natural and a sharp key lever, side view. 0132 A natural and a sharp key lever, side view.

S-0133.JPG A natural and a sharp key lever. 0133 A natural and a sharp key lever.

S-0134.JPG Underside of a natural and a sharp key. 0134 Underside of a natural and a sharp key.
Note the form of the front pin mortises. This supports the theory that the cut marks in the key frame were taken from the pin slots in the fronts of the keys, probably before the keys were cut apart.

S-0135.JPG Detail of the slotted rear end of the key levers. 0135 Detail of the slotted rear end of the key levers.
The fork at the end of the keys engage with the trackers when the key is lowered into the horizontal position.

Condition *distorted/bent/dented*

Notes *The keys sometimes stick.*

Proposed Treatment

Notes *Diagnose and eliminate friction of key levers against each other.*

Treatment

Notes *Some balance rail pins required slight bending to straighten key levers. This eliminated the sticking problems.*

3.2 Key Frame

S-0131.JPG Key frame with keys removed, before work began. 0131 Key frame with keys removed, before work began.

Condition *past alteration*

Location *Cloth under fronts of keys*

Notes *The keydip is irregular and incorrect*

S-0124.JPG Keyframe cloth from previous restoration. 0124 Keyframe cloth from previous restoration.

S-0125.JPG Keyframe cloth from previous restoration. 0125 Keyframe cloth from previous restoration.

S-0126.JPG Keyframe cloth from previous restoration. 0126 Keyframe cloth from previous restoration.

3.2 Key Frame (continued)

S-0127.JPG Construction evidence on keyframe. Construction evidence on keyframe. Note cut marks flanking each key guide pin. This indicates that the keys were slotted first, and the pins located afterwords based on scribe lines defined by the slots. Similar cuts in key frames of other instruments usually relate to the cloth once used as padding, but not in this instance.

Proposed Treatment

Notes *Remove modern felt (1958?) and replace with more appropriate materials and adjust the key dip by cloth selection.*

Treated as Proposed

Notes *Added four layers of wool blanketing under naturals and five layers under sharps.*

Completed *10/23/2001*

S-0122.JPG Key frame showing new cloth. 0122 Key frame showing new cloth.

S-0123.JPG Key frame showing new cloth. 0123 Key frame showing new cloth.

3.3 Key Frame Support

3.4 Thumper Rail

S-0137.JPG Thumper Rail 0137 Thumper Rail

S-0139.JPG Closeup detail of thumper rail cloth. 0139 Closeup detail of thumper rail cloth.

Condition *distorted/bent/dented*

Notes *The rail is mis-aligned to the nameboard. It may contact the back of the sharps in the center of the keyboard.*

Treatment

Notes *We think we solved the problem by loosening the thumper rail screws and re-aligning.*

3.5 Stickers

S-0106.JPG Stickers in place. 0106 Stickers in place. Note bleed holes in chest before we plugged them.

Past Intervention *leather hinges*

Attribution *CWF 1959 (simultaneous with Bennett restoration)*

Interpretation *The leather was replaced*

Evidence *Antique Furniture Maintenance Record in object file.*

Condition *active corrosion* *UNSTABLE*

3.5 Stickers (continued)

Location *Copper alloy wires on the lower ends of stickers*
Notes *Moderate active corrosion*

Proposed Treatment
Notes *Mechanically clean and coat with Incralac.*

Treatment
Cons. Materials *Microcrystalline wax blend*
Notes *The coating was microcrystaline wax.*

3.6 Rollerboard & Rollers

3.7 Backfalls

S-0116.JPG Close up of backfall assembly and modern pivot caps. 0116 Close up of backfall assembly and modern pivot caps. The newer cleats were added in a previous restoration.

S-0117.JPG Close-up of backfalls showing two modern pivot caps. 0117 Close-up of backfalls showing two modern pivot caps. The new cleats were added in a previous restoration.

Past Intervention *back of backfalls to action wires*
Attribution *Clifford Bennett restoration for CWF*
Interpretation *Detachment was repaired with added leather on sides.*
Evidence *added leather on side of connection; memo of Sidney Madison in file.*

3.8 Trackers

D-0022.JPG Interior of organ with keyboard in the folded up position, showing trackers.

3.9 Regulating Mechanisms

4 Stop Action

Description *Left hand stops: Mixture (2 rank) 22.56. Metal; Stopped Diapason (8' wood)*
Right hand stops: Fifteenth (2' wood & metal); Flute (4' wood)
Shifting movement for removing the 2' and mixture.

S-0049.JPG Interior detail of shifting movement pedal mechanism 0049 Interior detail of shifting movement pedal mechanism

S-0072.JPG Right trundles viewed from inside. 0072 Right trundles viewed from inside.

S-0073.JPG Bass end trundles viewed from inside. 0073 Bass end trundles viewed from inside.

4 Stop Action (continued)

S-0150.JPG Connection of trundle to the 2' 15th slider. 0150 Connection of trundle to the 2' 15th slider.
Note also the new shifting movement trundle in place.

4.1 Knobs & Shafts

4.2 Trundles

S-0143.JPG Connection of mixture slider to trundle. 0143 Connection of mixture slider to trundle.

Past Intervention *Trundle at right end of windchest*

Interpretation *Someone disabled the machine stop action by chiseling off one of the trundle brackets and discarding the trundle and one pivot block. I believe this occurred because the machine stop pedal without a stop at the front can apply too much pressure to the shifting movement slider. On at least two previous occasions, the bearing point crushed. I presume the last time this happened was especially inconvenient, and the trundle was hastily removed.*

Evidence *The trundle is missing, but one of the brackets survives. The position of the missing bracket is indicated by two old screw holes, one of which retains a screw fragment. The non-original end of the slider is in the parts archive and numbered "20."*

D-0120.JPG The treble end of the windchest in the upside-down position. Note the evidence of the missing trundle pivot block, and its forceful removal.

S-0201.JPG The treble end of the windchest in the upside-down position. Note the evidence of the missing trundle pivot block, and its forceful removal.

Condition *distorted/bent/dented*

Location *Stopped Diap. 8'*

Notes *Trundle rubs against wooden frame for cloth screen. This produces binding and squeaking.*

Proposed Treatment

Notes *Plane edge of cloth screen frame to reduce binding and squeaking. Cloth frame may not be original as its presence eliminates the ability to tune certain bass pipes through the access door.*

Treatment

Notes *The frame holding the textile screen in the side access opening was pulled off, the wrought nails pulled out, the textile trimmed where it extends on the rear vertical edge. The frame was re-attached with glue alone to its old position but about 2mm further to the rear. No shaving of old wood was necessary.*

Condition *losses/missing parts*

Location *right end of windchest - missing shifting movement trundle*

Notes *The trundle that completes the machine stop action is missing. One of two end brackets remains. Also two attachment screw holes and one screw fragment remain as evidence of the missing mechanism.*

4.2 Trundles (continued)

D-0041.JPG The right end fo the wind chest showing the location of the missing trundle, and the surviving pivot block (top forground.)

Proposed Treatment

Notes *Make new trundle to restore function to the machine stop. Attach new bracket leaving evidence of earlier attachment exposed if possible. Consider glue attachment without screws to make treatment removable.*

Treatment

Cons. Materials *Hide glue*

Notes *We reconstructed the missing trundle and the missing vertical sticker, and stamped them with the date. The work otherwise followed period style workmanship including use of oak and hand-forged wrought iron arms with clinched tangs.*

D-0061.JPG The new trundle and right trundle pivot block. The block, trundle, and iron arm are stamped with the year. The vertical element on the left is also new. Note the evidence of the original attachment of the lost pivot block. The replacement trundle was made long enough to protect that evidence.

D-0098.JPG The new trundle and vertical sticker in place, before re-attachement of the front pivot block. Note the year stamped into all reproduction components.

Condition *shrinkage*

Location *Left hand upper trundle pivot block screws*

Notes *The screws extend too far to the outside of the case due to shrinkage of the wood around them.*

Treatment

Notes *Added and dated small wooden spacers under screw heads to compensate for block and case shrinkage.*

Completed *10/23/2001*

5 Windchest

D-0032.JPG The windchest shown upside down with pallet box open, stopped diapason slider in center, and stopped diapason toeboard on right.

D-0033.JPG Left to right: Stopped Diapason toeboard; two trundles; 4' toeboard; mixture /2' toeboard; key action.

D-0039.JPG The windchest, shown right-side-up. Note small round sticker holes on left, slider positions for mixture (left) and 2' (right). Note also the split in the table board on the right, and modern screws.

S-0080.JPG Windchest in case, viewed from behind. 0080 Rear of windchest. Note the air passages for horizontal pipes.
Windchest in case, viewed from behind.

S-0087.JPG Wind intake for chest. 0087 Wind intake for chest.

S-0155.JPG Treble half of windchest, top, with mixture, 15th, and 4' sliders. 0155 Treble half of windchest, top, with mixture, 15th, and 4' sliders.

S-0156.JPG Bass half of windchest, top, with mixture, 15th, and 4' sliders. 0156 Bass half of windchest, top, with mixture, 15th, and 4' sliders.

5 Windchest (continued)

S-0165.JPG Treble end of 8' diap. Toeboard showing passages to rear horizontal pipes.

S-0166.JPG Bass end of 8' diap. Toeboard showing passages to rear horizontal pipes.

Past Intervention

Attribution *Clifford Bennett restoration for CWF*

Interpretation *"chest secured by screws where table had warped and the glue had given way, all bars resealed by painting with glue after screws were put in, joints repacked"*

Evidence *Bennet's report of March 16th, 1959.*

Condition *Distortions causing running of the wind*

Notes *Due to uneven shrinkage in the windchest, and to separation of glue joints in the grid, and to splits, wind is free to escape, or to leak into the wrong pipes causing them to speak out of turn.*

D-0089.JPG Running of the wind was tested by blowing air into the windchest, and using a flag of gold leaf to indicate where it was escaping. The leaks were very easy to observe and locate in this way.

D-0114.JPG By flooding light into a note channel, the leakage of light into neighboring channels indicated wind leaks. Note the strong glint of stray light. The fiberscope was used to focus high-intensity light into the channel.

D-0119.JPG End view of the windchest. Note a split in the upper (right) table which could result in wind leakage.

D-0128.JPG Testing for wind leaks. Very-low-pressure wind is blown into a channel (in right of photo) and a flag of gold leaf indicates a leak around the pallet near the hinge.

D-0133.JPG Testing for wind leaks. Very-low-pressure wind is blown into a channel and a flag of gold leaf indicates a leak into the neighboring channel.

S-0088.JPG Looking upward in the wind passage into the windchest. Note the new leather visible in the center of the opening. It was added in this treatment.

S-0202.JPG Treble end of windchest. Note the split in the table and other gaps between sides.

S-0203.JPG Treble end of windchest. Note the split in the table and other gaps between sides. The pallet knife identifies a gap.

S-0205.JPG Bass end of windchest. Note the split in the table and other gaps between sides. The pallet knife identifies a gap.

Treatment

Cons. Materials *Hide glue*

Notes *We sealed the interior corners of the channels using a fiberscope to observe, and a syringe to inject hide glue. The traditional method would have been to flood the chest with hide glue after first removing all pallets, but this would have required removing all the pallets, and probably replacing the leather hinges. We were able to leave the pallets attached throughout the treatment. Other wind leaks were identified and patched with glue or leather as noted elsewhere in the report.*

D-0097.jpg Technician Louis Dolive injects hide glue along the seam between the channel walls and the table of the chest. He used a fiberscope to target the treatment.

5 Windchest (continued)

D-0143.JPG A fiberscope-view

S-0088.JPG Looking up the windway into the chest. Note new leather patch visible in the center of the opening.

S-0183.JPG The loosened leather patch in the foreground was replaced in the present treatment.

5.1 Windchest Grid

Condition *repairs/restoration*

Location *front edge of windchest*

Notes *Seven bleed holes had been drilled in the grid, possibly to solve problems with running. This hasty expedient contributes to the loss of wind.*

S-0106.JPG Bleed holes in front of chest. 0106 Bleed holes in front of chest.

Treatment

Cons. Materials *Hide glue*

Notes *Fitted dowels were glued into the holes with hot hide glue. We leveled the plugs carefully with a chisel so not to sand or slice off any old wood around them.*

Completed *8/8/2001*

D-0088.JPG Bleed holes had been drilled in the windchest. We filled these holes, and trimmed them flush without abrading the surrounding surface. Note also in this photo the additive leveling of the pallet seats.

S-0107.JPG Bleed holes during filling. 0107 Bleed holes during filling. Note also the new trundle in position on the right.

5.2 Table Boards

Condition *detached*

Location *Op. Diap. table near joint with back edge of pallet box.*

Notes *Table board has shrunk, breaking glue bonds with many of the ribs of the windchest. This causes runs - when air leaks to the wrong notes.*

Proposed Treatment

Cons. Materials *Hide glue*

Notes *Reattach. If table board cannot be removed entirely, reglue what is possible and inject glue to form a bead inside affected channels where wind is leaking from one channel to another. Use hide glue.*

D-0048.JPG Injecting hide glue into splits in table. The suction cup helps to force the glue into the split.

Treated as Proposed

Notes *See also treatment described under section 5.0 and photo D-0048.*

5.3 Pallet Box

D-0040.JPG The pallet box with bungboard removed. The spring rail (left edge at top) appears warped when lacking the support of the bottom board of the windchest.

D-0068.JPG Treble end of pallet box.

D-0069.JPG Bass end of pallet box showing air passage to bellows at the end.

Condition *Stripped Screw*

Location *bungboard, lower right screw*

Proposed Treatment

Cons. Materials *Titebond Liquid Hide Glue*

Notes *Fit and glue a dowell to the hole and redrill for the screw.*

Completed *8/19/2001*

Treatment

Notes *The hole was shimmed with velum from an old drum head.*

S-0177.JPG Note shimmed bungboard screw hole in lower center-right of photo.

Condition *distorted/bent/dented*

Location *pallet seats - see notes for precise identification*

Notes *Due to the shrinkage of the pine spacers between the passages, the pallets do not seat properly all around the perimeter of the opening. This allows air so escape past the pallets.*

D-0084.JPG The spacers between the pallet openings were not flush with the pallet box frame, causing loss of wind.

S-0173.JPG Note deposits of black dust on the pallet seats, indicating areas of greatest wind leakage.

S-0175.JPG Note deposits of black dust on the pallet seats, indicating areas of greatest wind leakage.

Treatment

Cons. Materials *Hide glue*

Notes *The affected pallet seats were coated with liquid hide glue and the pallet set against them with a temporary membrane of thin polyester film to protect the pallet leather from the glue. Some pallet seats received as many as 4 treatments before the leaks were sufficiently stopped.*
The affected pallet seats so treated:
C, D, D#, E, F, d#1, f1, c2, c#2, g#2, a2, a#2, b2, c3, d3, d#3
The following notes required removing the pallet completely:
C, D, D#, E, a2, d#3
The following pallet seats had minor gaps between the channel dividers and the end pieces that were filled:
A, A#, c, e, a#1, d#2, f2, f#2

Completed *8/21/2001*

D-0083.JPG The spacers between the pallet openings were not flush with the pallet box frame. The dark areas in the photo are fills added to create a flat

5.3 Pallet Box (continued)

surface for the pallets to seal.

S-0167.JPG *The exposed pallet seat was treated additively to level the surface.*

S-0168.JPG *The exposed pallet seats were treated additively to level the surface.*

S-0170.JPG *Re-attaching pallets that had been temporarily detached.*

5.3.1 Pallets

D-0095.JPG *Detail of the pallet box showing two detached pallets.*

S-0157.JPG *Reattaching some pallets that had been detached. 0157 Reattaching some pallets that had been detached.*

Condition *dirt, grime, surface deposits; dust*

Notes *The pallets have so much build-up of dust and dirt, that some do not seat properly because of it.*

S-0176.JPG *Note black buildup of dust on pallet.*

Treatment

Notes *Clean pallet leather with stiff brush and vacuum. Clean pallet seats with mineral spirits and swabs.*

Completed *8/16/2001*

5.3.2 Pallet Springs

S-0186.JPG *A pallet spring with measuring rule.*

Past Intervention

Attribution *Unknown*

Interpretation *Repair of a pallet spring*

Evidence *See photo.*

S-0185.JPG *Splinted repair of a pallet spring.*

Condition *active corrosion* *UNSTABLE*

Location *On end of the pallet springs where they touch the pallets.*

D-0067.JPG *Pallet springs showing corrosion where the metal meets the acidic wood.*

S-0184.JPG *Detail of pallet spring corrosion.*

Treatment

Cons. Materials *Microcrystalline wax blend*

Notes *Clean off corrosion with steel wool swabs and coat with micrystalline wax.*

Completed *8/1/2001*

Condition *broken/fragmented*

5.3.2 Pallet Springs (continued)

Location *note g2*

Notes *The pallet side of the spring is fractured.*

Proposed Treatment

Notes *Using a brass sleeve, epoxy parts back together.*

Completed *9/5/2001*

Treated as Proposed

Cons. Materials *5-Minute Epoxy*

5.4 Sliders

S-0188.JPG *Detail of a slider. Note remnants of old lateral scribe lines.*

S-0197.JPG *The shifting movement spring in position.*

Past Intervention

Attribution *Clifford Bennett restoration for CWF*

Interpretation *"slides graphite and refitted, one return spring welded and replaced." This presumably refers to the shifting movement slider spring.*

Evidence *Bennett's report of March 16th, 1959.*

D-0051.JPG *Replaced end of shifting movement slider. Note groove formed for the tongue and groove joint.*

Condition *shrinkage*

Notes *The sliders have too much space around them, contributing to the "running of the wind" and causing pipes to sound that should not sound.*

Treatment

Notes *Shim the sliders. Test the gap using a streight edge across the bearers and checking the gap at the slider with a thickness gage. Paper used for the shimming were Arches Ingres Rag Paper (100% Cotton) and Permalife (25% Cotton & 72% wood pulp.)*

D-0111.JPG *Measuring the gap over the sliders. Results of the measurement is recorded on the paper in the background.*

S-0187.JPG *Close-up of slider. The white material in some of the pores is beva remaining from our own rejected trial of a shimming method.*

S-0188.JPG *Close-up of slider. The white material in some of the pores is beva remaining from our own rejected trial of a shimming method.*

Condition *structurally unsound*

Notes *The narrow extension of the slider that bears against the trundle arm has been replaced, and the replacement is also damaged from use. This vulnerability appears to be caused by the lack of a stop for the shifting movement pedal. If the pedal is hit too hard, the trundle arm pushes too hard on this extension and breakes it.*

D-0051.JPG *Damaged, non-original extension of shifting movement slider.*

Treatment

Notes *Replaced the damaged, nonoriginal section of the slider with new wood. The*

5.4 Sliders (continued)

nonoriginal end of the slider is in the parts archive and numbered "20."

D-0098.JPG Note right end of the slider showing new wood replacing a loss where the new trundle bears against the slider.

5.5 Toe Boards

D-0053.JPG Stopped Diapason toeboard, top, after cleaning of the parchment.

D-0054.JPG Stopped Diapason toeboard, bottom.

D-0055.JPG Top of 4' toeboard showing shifting movement slider with the new repair on the right end.

D-0056.JPG 4' Flute toeboard, top view, with shifting movement slider removed.

D-0057.JPG 4' toeboard, underside.

D-0058.JPG Toeboard for Mixture and 2' after cleaning of parchment - Top view.

D-0059.JPG Toeboard for Mixture and 2', bottom.

S-0200.JPG Detail of the bottom of the 4' flute toeboard.

Condition *repairs/restoration*

Location *4' toeboard 1/3 from the right end*

Notes *Damage to the parchment and channeling was poorly repaired and causes runs.*

S-0191.JPG Damage in 4' flute toeboard channeling. The old patch has been removed in preparation for reconstructing the walls of the channels.

S-0192.JPG Damage in 4' flute toeboard channeling. The old patch has been removed in preparation for reconstructing the walls of the channels.

Proposed Treatment

Cons. Materials *Araldite® AV 1253; Titebond Liquid Hide Glue*

Notes *Remove old patch, build channeling back up with Araldite over hide glue; trim flush; glue new parchment patch over the area.*

Completed *8/21/2001*

Treated as Proposed

D-0091.JPG The damaged walls of the channeling were coated with hide glue, and the walls reconstructed with Araldite before being covered with leather.

S-0193.JPG The damaged walls of the channeling coated with hide glue before refining the surfaces of the repair.

S-0194.JPG The channel walls have been reconstructed with Araldite and are leveled prior to gluing of the new leather patch.

S-0195.JPG The repair completed. The polyethelene bag holds the debris removed from the damaged area. The bag is in the archived components collection.

Condition *dirt, grime, surface deposits; dust*

5.5 Toe Boards (continued)

Location *top parchment covering*

Notes *The hygroscopic nature of the dust can hasten mold growth.*

S-0153.JPG Toeboard parchment before cleaning. 0153 Toeboard parchment before cleaning.

Treatment

Cons. Materials *Saliva*

Notes *Cleaned the parchment using saliva and swabs.*

Completed *7/31/2001*

D-0052.JPG Cleaning the toeboard parchment.

Condition *split/cracked; repairs/restoration*

Location *Parchment on top of the Mixture/15th toeboard*

Notes *Some small holes in the parchment allow air leakage. One old patch was also failing.*

Treatment

Notes *New patches were added, and one previous patch was removed and a new smaller patch put in its place. See photos.*

S-0114.JPG The four white patches on the Mixture/15th toeboard are new. The rear-most patch of the center pair of patches is the remnents of an older patch that has been removed and replaced with a smaller new one.

S-0115.JPG Two new white patches on the Mixture/15th toeboard.

S-0160.JPG New white patches on the Mixture/15th toeboard.

6 Pipework

D-0005.JPG Interior of upper case treble view.

D-0006.JPG Interior of upper case treble view.

D-0008.JPG Detail of pipework.

D-0017.JPG Detail of pipework. Note stoppers near top of travel, modern tuning sleeves, and early pipe markings.

D-0029.JPG Detail showing conveyence tubes to the Stopped Diapason pipes, and the makeshift shading devices of metal and cardboard. Note the round customs stamp (red ink) on the top rear pipe.

D-0073.JPG Some of the pipes are fragile, especially in the area of the mouth, due to careless cone tuning.

D-0074.JPG Some of the pipes are fragile, especially in the area of the mouth, due to careless cone tuning.

D-0099.jpg A wooden pipe showing old witness marks for an earlier stopper position.

S-0251.JPG The back wall of the organ showing attached pipes and passages to windchest.

S-0252.JPG The back wall of the organ showing attached pipes.

Analysis *X-Ray Fluorescence (XRF)*

Analyst *Dave Kiefer, Innove-X Systems* Completed *11/9/2004*

6 Pipework (continued)

Objective *To determine lead and tin content of the pipe metal.*

Description *Trimmings from the top of the front mixture pipes (No. 11 in the archived materials list)*

Results *85% Lead and 15% Tin*

Interpretation *The XRF was not calibrated to identify antimony, so it is not known if this or any other metals were present in the alloy. The XRF device automatically adjusted results to total 100%.*

Past Intervention *Metal and wooden pipes*

Attribution *Clifford Bennett restoration for CWF*

Interpretation ** Metal pipes rounded out, adjusted and set for proper speech, soldered where necessary.*
** Wood pipes - joints checked, glued and secured where necessary.*

Evidence *See memo of March 16, 1959*

S-0027.JPG Screw added to pipe, possbily in the Bennet restoration. 0027 Screw added to pipe, possbily in the Bennet restoration.

Past Intervention

Attribution *1986, Redstone*

Interpretation *The pitch was pushed lower to be closer to A-415.*

Evidence *Memo of Sept. 1986 by Redstone. Cardboard collars found on some wooden pipes before the present conservation were presumably added in 1986. Also, wood pipes had the stoppers at the end of their travel, and the tuning flaps of the bass 4' and 2' wood pipes nearly closed.*

S-0028.JPG 4' flute pipes with the tuning flaps nearly closed 0028 4' flute pipes with the tuning flaps nearly closed. The pitch of the organ had been pushed low.

Past Intervention

Attribution *Pre 1958*

Interpretation *The pitch was raised necessitating the cutting down of some pipes.*

D-0134.JPG Cut down pipe with nearly closed tuning flap. 0034 Cut down pipe with nearly closed tuning flap.
This Fifteenth pipe was cut down to raise the pitch (note cut off label) then the tuning flap nearly closed to attemp lowering it again.

D-0171.JPG The pipe in the forground shows evidence of cutting down. Note the splintery edge of the wood along the inside edge, and compare with the appearance of the pipe in the background that had not been cut down. The rear pipe would have been raised in pitch by pushing in the stopper.

D-0174.jpg A stopper removed from a Stopped Diapason pipe. Note the large oak block added to the bottom of the stopper. This would have facilitated the substantial raising of pitch.

Past Intervention *Metal Pipes*

Attribution *Unknown*

Interpretation *The pipes were converted to sleeve tuning. (In the present conservation, the sleeves are being removed, new metal added and the pipes cone tuned.)*

Evidence *The tuning sleeves are not typical of the period. We presume the instrument would*

6 Pipework (continued)

have been cone tuned. The tuning sleeves were archived as no. 13, 14, and 15.

Condition *dust*

Location *Mouth areas of most pipes*

Notes *Dust in mouth areas damages speech of pipes.*

Treatment

Notes *Cleaned using a soft bristle brush and vacuum.*

Condition *Altered pitch level*

Location *Pitch*

Notes *The pitch of the organ has been pushed flat to about A-415. This requires bass pipes to be severely shaded and stoppers to be at the end of their travel. The speech of the pipes suffers for this. Ref. Redstone 1986 memo.*

D-0009.JPG *Pipework showing cardboard stoppers and earlier tuning sliders.*

D-0016.JPG *Pipework showing cardboard stoppers and earlier tuning sliders.*

S-0249.JPG *These two pipes helped to determine the early pitch level for the organ. Note the witness marks on the inside of the pipe indicating the past position of the stoppers.*

S-0250.JPG *These two pipes helped to determine the early pitch level for the organ. Note the witness marks on the inside of the pipe indicating the past position of the stoppers.*

Proposed Treatment

Notes *Tune the organ closer to the pitch for which it was originally adjusted, using a pitch that maximizes the efficiency of the voicing. The pipes will speak better at the pitch they were designed for and voiced at. Also the original bellows weights will insure that the pressure is back to the pressure for which it was designed.*

Treatment

Cons. Materials *Araldite® AV 1253*

Notes *The organ was tuned to A422. We decided that the past conversion to tuning sleeves was not sufficiently preservation worthy, and that the movability of the organ favors the greater stability of cone tuning. By using lead for new extensions, the rims are very responsive to cone tuning. We rolled the lead to an appropriate thickness, and soldered it to the pipe with eutectic solder (sn 63/37 pb). The original pipe tops had already been trimmed off before the instrument had come into the collection. The un-stopped wooden pipes were also lengthened. After coating the old rim with hide glue, new wood was added using Araldite as a gap-filling adhesive. We regret the use of adhesive tape for protecting the old wood during this process, as it pulled off some oxidized fibers of the old wood -- an effect that can be seen on the pipes after treatment. In all pipe soldering, Louis Dolive used "Dextrin" for sizing. Dextrin is a commercial food product. In the historical period, gum arabic was often used as sizing.*

Completed *10/24/2001*

S-0239.JPG *The front row of the mixture after lengthening the pipes.*

S-0240.JPG *The front row of the mixture after lengthening the pipes.*

S-0242.JPG *A woden pipe during lengthening.*

S-0243.JPG *Wooden pipes being lengthened.*

6 Pipework (continued)

Condition *distorted/bent/dented*
Location *Rims of metal pipes*
Notes *Many slide tuners are loose and will slide under vibration.*

Proposed Treatment
Notes *Slightly tighten tuning slides to restore stable function. Do not tighten unless necessary.*

Treatment
Notes *After discussion, we decided to remove the sliders and lengthen the pipes with lead. See documentation for condition "Altered pitch level" (above).*

Condition *past alteration*
Notes *The temperament was A=440cps prior to conservation.*

Treatment
Notes *We set the temperament to "English Common Temperament" recommended to us by Kenneth Mobbs and Alexander C. N. Mackenzie of Ord, both of Bath, England. See the tuning section of Preventive Conservation Recommendations in this report for the cents deviation from equal temperament.*

6.1 Stopped Diapason 8'

Past Intervention *Repairs to "several of the lower octave pipes" (Stopped Diapason?)*
Attribution *Robert Campbell, 1979*
Interpretation *regluing of loostened joints and knot holes.*
Evidence *Campbell's report in object file: "Several of the lower octave pipes needed regluing and knot holes needed patches because of cracks in them. The five square nails were taken out of the 8' flute, tenor A and middle D lower lips because the rust was [causing cracks.]"*

Condition *losses/missing parts*
Location *c'*
Notes *Missing wedge in foot causing pipe to be too loud*

Treatment
Notes *A new wedge was added.*
Completed *10/24/2001*

Condition *Weak tone*
Location *Note G*

Proposed Treatment
Notes *Find wind leak or obstruction and restore function. May be related to chest runs.*

Treatment

6.1 Stopped Diapason 8' (continued)

Notes *We made no specific record of this treatment. The tone may have improved after cleaning.*

Condition *dessicated; friable; losses/missing parts*
Location *Note D#*
Notes *The old leather gasgeting of the tuning stopper is damaged.*
S-0244.JPG Damaged stopper leather.

Treatment
Notes *The leather was replaced.*
S-0246.JPG Replacing damaged stopper leather. We are unsure whether we added the wood shim on the right edge if the stopper, but it is clearly modern.

6.2 Flute 4'

Past Intervention *nails in tenor A and middle D lower lips of "8' [sic] flute"*
Attribution *Robert Campbell, 1979*
Interpretation *Five corroded iron nails removed because they were splitting the wood.*
Evidence *Campbell's report in the object file.*

Condition *Missing wedges*
Location *F', a#2-- wedges inside foot*

Treatment Assignment *LD*
Notes *Slivers of wood were added to the foot to limit wind flow.*
Completed *10/24/2001*

6.3 Fifteenth 2'

Past Intervention *Mouth area -- C; c#1*
Attribution *Unknown*
Interpretation *Repairs were made to correct damage from cone tuning.*

Past Intervention *d#1*
Attribution *Unknown*
Interpretation *Pipe has been replaced*
Evidence *Diameter, mouth form, and foot are all different*

Past Intervention *Foot -- a#1*
Attribution *Unknown*
Interpretation *Broken foot repaird*

Past Intervention *Foot -- f#2*

6.3 Fifteenth 2' (continued)

Attribution *Unknown*
Interpretation *Lower 3/4 of foot was replaced*
Evidence *workmanship, design and material*

Past Intervention *tuning slide -- c3; c#3; d3*
Attribution *Unknown*
Interpretation *This tuning slide has been replaced more recently than the others*
Evidence *Use of Aluminum*

Past Intervention *Tuning Collar -- F#;G*
Attribution *1986 Campbell/Redstone*
Interpretation *The organ was tuned flatter. Paper collars were fitted to these pipes to lower their pitch.*
Evidence *Paper collars.*

Condition *repairs/restoration*
Notes *The pipes have been shortened in past pitch raising.*
S-0216.JPG Note the two pipes with tuning flaps nearly closed. The photo was taken before the pipes were lengthened to the presumed original length.

Treatment
Notes ** Rims of wooden bass pipes (lowest 9): new wood was added to the pipes to recover lower pitch and the wood toned to be less white.*
** Rims of metal pipes were extended with soldered lead extensions.*
Completed *10/24/2001*
S-0213.JPG Two 2' pipes after lengthening in 1980s.
S-0215.JPG Several 2' pipes with new lengthening.

Condition *structurally unsound*
Location *Note C, c#1; sides of mouths*
Notes *Cracks have formed at earlier repairs of cone tuning damage.*
S-0223.JPG Cracked mouth at old repair 2' note C.
S-0224.JPG Cracked mouth at old repair 2' note C.

Treatment
Notes *Straightened and re-soldered cracks.*
S-0233.JPG The split in pipe C during re-soldering.
S-0234.JPG The split in pipe C during re-soldering.

Condition *broken/fragmented*
Location *Note G*
Notes *The stay cleat was broken loose*

Treatment
Cons. Materials *Titebond Liquid Hide Glue*
Notes *The cleat was reglued.*

6.3 Fifteenth 2' (continued)

6.4 Mixture II

6.4.1 Front rank of mixture

Description *Notes 1-17 -- start at 2/3' pitch, so Note 1 (C) plays g*
Notes 18-36 -- break back to the octave pitch -- note #18 is an f and plays an f.
Notes 37-53 -- breaks back an octave, plays octave pitch -- note #37 is a c and plays a c.

Past Intervention *Feet -- # 6, 8, 35, 53*
Attribution *Unknown*
Interpretation *Repairs to feet -- damage probably from cone tuning*

Past Intervention *#6*
Attribution *Unknown*
Interpretation *Repairs to body*

Past Intervention *Body -- #4*
Attribution *Unknown*
Interpretation *Extension to lengthen pipe*
Evidence *Solder seam and apparently newer metal added*

Past Intervention *Tuning slides of #15, 18, 22, 28, 31, 32, 42*
Attribution *Unknown*
Interpretation *Recently replaced tuning slides*
Evidence *Use of aluminum*

Past Intervention *Tuning Slides -- #32-51, 53*
Attribution *Unknown*
Interpretation *Recently replaced tuning slides*
Evidence *Aluminum slides*

Past Intervention *Foot -- #1*
Attribution *Unknown*
Interpretation *Bleed hole drilled in foot.*

Condition *repairs/restoration*
Location *Note 7, 11, 14, 15, 17, 22, 26, 27*
Notes *Gashes have been cut in the feet presumably to bleed off air as a crude expedient in voicing.*
S-0237.JPG Note gash in foot of note 11.

Proposed Treatment
Notes *Round out and seal holes with removeable patches.*
S-0236.JPG Resoldering in progress on note 11.

6.4.1 Front rank of mixture (continued)

Treatment
Notes *The gashes were repaired by soldering.*

Condition *Severely dented feet.*
Location *Feet of notes 2 and 4*

Treatment
Notes *Rounded out to give the pipes structural integrity.*

Condition *distorted/bent/dented*
Location *Notes 7, 8, 9, 15, 29, 34, 38, 39, 40, 41, 45, 46, 47, 49, 52*
Notes *Dents cause structural instability and chance of air leaks.*

Proposed Treatment
Notes *Round out feet so they stand straight and have no wind losses at the toes.*

Treated as Proposed

Condition *broken/fragmented*
Location *Note 8*
S-0221.JPG Damaged foot of note 8.

Treatment
Notes *The break was resoldered.*
S-0235.JPG The break during resoldering.

6.4.2 Back rank of mixture

Description *Notes 1-17 -- are at 1' pitch so note #1 is nominally 1' long.*
Notes 18-34 -- break back to the 5th, so note 17 (an E) plays an e; note #18 is an f and its pipe plays a c; note #19 is an f# and plays a c#.
Notes 35-53 -- break back and octave (still playing the fifth)

Past Intervention *Body -- #6*
Attribution *Unknown*
Interpretation *Extensive repairs to body*
Evidence *Much reworking and solder*

Past Intervention *Mouth area -- #32*
Attribution *Unknown*
Interpretation *Repairs*
Evidence *Resoldering around the mouth area*

Past Intervention *Foot -- #21, 29, 53*
Attribution *Unknown*
Interpretation *repairs*
Evidence *New solder and repairs.*

6.4.2 Back rank of mixture (continued)

Past Intervention *Note 10*

Attribution *Unknown*
Interpretation *The foot was re-soldered to the body*
Evidence *Workmanship and appearance of the solder.*

Condition *distorted/bent/dented*
Location *Notes 4, 8.*
Notes *The feet are crooked as a result of careless cone tuning.*
S-0226.JPG Note crooked foot, Mix II, back, note 8.

Treatment
Notes *Straightened feet by bending.*

Condition *distorted/bent/dented*
Location *Note 1 - body*
Notes *Large dent in body from careless pipe removal.*

Treatment
Notes *Rounded out over mandrel.*

Condition *split/cracked*
Location *Note 1*
S-0218.JPG Split in pipe

Treatment
Notes *We resoldered the crack.*
S-0232.JPG Solder repair of split in pipe.

Condition *Loose Languid*
Location *Note 52 & 49*

Treatment
Notes *We re-soldered the languid.*
S-0229.JPG The languid after resoldering and before cleaning of the sizing.
S-0230.JPG The languid after resoldering and before cleaning of the sizing.

7 Other Photo Documentation

D-0002.JPG Interior of case, treble half, showing arrangement of pipes.
D-0003.JPG Interior of case, bass half, showing arrangement of pipes.
D-0004.JPG Overall interior of case, top view, showing pipes.
D-0007.JPG Interior of upper case treble view.
D-0010.JPG Interior detail, bass end, showing some pipes, stop action, and key ends.

7 Other Photo Documentation (continued)

- *D-0011.JPG Interior detail, treble end, showing some pipes, stop action, and key ends.*
- *D-0019.JPG Rack boards and toe boards before cleaning.*
- *D-0024.JPG Interior of case with pipes removed. Top view, bass end.*
- *D-0025.JPG Interior of case with pipes removed. Top view, treble end.*
- *D-0028.JPG View of the keyboard in the closed position from the inside of the case, showing wire trackers and mixture rackboards.*
- *D-0030.JPG The inscription "Restored by / N.P. Mander & / L.W. Parry / 1952"*
- *D-0031.JPG Chest and key action visible behind front access panel.*
- *D-0034.JPG Left to right, mixture & 2' rackboard; tracker register, part of the key action (see photo 26 for context of this board); and the bungboard.*
- *D-0038.JPG left to right, stickers; mixture & 2' rackboard (note use of parchment to reduce splitting); tracker register, part of the key action (see photo 26 for context of this board); and the bungboard.*
- *D-0098.JPG Several treatments are visible in this photo. A patch on the toeboard covers a reconstructed loss in the channeling; the parchment has been cleaned; the reconstructed trundle and its sticker are visible, as is the re-replaced end of the shifting movement slider, and the filled bleed holes in the front of the windchest.*
- *D-0173.jpg A stopper removed from a Stopped Diapason pipe.*
- *D-0176.jpg Contents of the parts archive.*
- *S-0079.JPG Detail of interior of case, front/bass corner, 0079 Detail of interior of case, front/bass corner,*
- *S-0105.JPG Interior detail: Chest, key action, rollers, trundle pivot block. 0105 Interior detail: Chest, key action, rollers, trundle pivot block.*

Conservation Materials Cited in this Report

Colonial Williamsburg Foundation, Department of Conservation. Instruments Lab

- 5-Minute Epoxy.
- Araldite® AV 1253. A two-part epoxy-based carvable adhesive system. Supplier: Ciba-Geigy Corporation, 4917 East Lansing, MI 48823-5691.
- Hide glue. Supplier: Bjorn Industries, Inc., 551 King Edward Road, Charlotte, NC 28211.
- Microcrystalline wax blend. This blend gives a slightly more durable final surface than Renaissance wax. Supplier: WAO5 microcrystalline wax is available from Conservation Resources International, LLC. 8000-H Forbes Place, Springfield, VA 22151. Polywax 2000 is available from Conservation Support Systems, 924 West Pedregosa St., Santa Barbara, CA 93101.
- Saliva. The unique properties of saliva for conservation come from its inclusion of seven classes of ingredients, according to Wolbers (2000 - Architype Publications p.6-7): water as solvent, pH/buffer(s), surfactant(s), ion or specific ionic effects, chelation, enzymes, and adjuvants.
- Titebond Liquid Hide Glue. Hide glue modified by manufacturer to increase working time. Supplier: Franklin International, Columbus, OH, 43207.

Archived Components

Colonial Williamsburg Foundation, Department of Conservation. Instruments Lab

Item No *01*

Item *Paper strip with markings*

Notes *See section 5.4 and photo D-0111. The markings indicate the thickness of shims for the sliders.*

Item No *02*

Item *Two leaf springs*

Notes *These springs were from the 1958 replacement of the original lead weights. See section 2.2.*

Item No *03*

Item *Modern leather removed from bellows during repair.*

Notes

Item No *04*

Item *Old leather removed from D# Stopped Diapason tuning stopper.*

Notes

Item No *05*

Item *Replaced or surplus tuning flaps from St. Diapason 8' bass pipes.*

Notes *Various periods.*

Item No *06*

Item *Cardboard extensions from 1980s retuning*

Notes *From Fifteenth 2' G and F.*

Item No *07*

Item *A group of fragments found in bottom of case.*

Notes

Item No *08*

Item *Modern stopper extension from St. Diapason G.*

Notes *See photos D-0173, D-0174, and D-0175.*

Item No *09*

Item *Modern cloth from key frame.*

Notes

Item No *10*

Item *Fills from stop jambs*

Notes *These were plugs that filled holes in the panel through which the hand stops pass. They date to an earlier restoration.*

Item No *11*

Item *Pipe metal trimings from Mixture II front row pipes.*

Notes *(See also no. 17)*

Item No *12*

Item *Leather fragments removed in 1979 restoration*

Notes *According to the paper included with the fragments: "these are leather samples taken off April 1979. As can be seen on the gussets on the glued side, they are not original. As indicated with the penciled arrows you will notice remains of earlier leather. The hinges were fabric, as can be seen with samples. Robert D. Campbell 1979. The (5) nails are from ten A & Mid D of the 8' Fl."*

Item No *13*

Item *Tuning sleeves from Mixture, back row.*

Notes

Item No *14*

Item *Tuning sleeves from Mixture, front row.*

Notes

Item No *15*

Item *Tuning sleeves from 2' Fifteenth.*

Notes

Item No *16*

Item *Brads and cloth fragments*

Notes *Brads removed from the inner frame to which the textile screen is glued on the left side of the upper case. The brads held the frame to the case. If they are 18th century, they nevertheless had been out in the 1959 restoration when the mahogany cleats were set into the sides. We cut the fragment of cloth off the rear edge of the screen.*

Item No *17*

Item *Pipe metal trimings from Mixture II back row pipes.*

Notes *(See also no. 11)*

Item No *18*

Item *Fragments of leather nuts from top of stickers.*

Notes

Item No *19*

Item *Parchment fragments removed during repair of 4' toeboard.*

Notes

Item No *20*

Item *Damaged end from shifting movement slider.*

Notes *This fragment is not original, but is from an earlier repair.*

Item No *21*

Item *Original wheels, replaced in 1959 restoration but saved with the instrument.*

Notes *These were found having been stored with the original weights, also removed in 1959.*

Report Attachments

Colonial Williamsburg Foundation, Department of Conservation. Instruments Lab

Item 1 ***Charts of pipe dimensions***

Location *Attached to this report*

Contents *Three sets of figures in which Louis Dolive worked out the needed extensions on pipes to bring them to their presumed earlier state.*

Item 2 ***Diagram of Windchest***

Location *Attached to this report*

Contents *Our CAD drawing on one sheet of paper.*

Item 3 ***A page of notes titled "Evidence Pipes"***

Location *Attached to this report*

Contents *The notes were made by Louis Dolive while collecting evidence for the early pitch of the organ.*

Item 4 ***Graph titled, "Comparison of Temperaments"***

Location *Attached to this report*

Contents *A single sheet with colored lines showing the cents deviation from equal temperament for each note of the scale for six unequal temperaments. The organ was tuned to the one labeled "Common."*

Item 5 ***An annotated diagram showing the layout of pipes in the organ***

Location *Attached to this report*

Contents *The drawing is dated 11-25-97, and has hand-notations about "running of the wind" symptoms.*