Skeleton measurement sheet

Location: Paris, Musee de la Musique
Inv. N°: **E.303**
Measured: Adrian Brown
Date: 22-Jun-26

Pitch @ a=440hz:	Bb
Total length:	720
Speaking length:	654
Windway length:	66

Material: cherry, or possibly plum?
mark: Double trefoil under window and on bell

	FINGERHOLES				
	length		**diameter**		**direction**
	(from top)	(from bl)	east/w	north/s	⇧⇨⇩⇦
X	*262.5*	196.5	5.4	5.7	
1	*272*	206	6.9	7.2	sl up
2	*314*	248	6.8	7.3	
3	*354*	288	7.0	7.6	sl down
4	*418.8*	352.8	7.5	7.8	sl up
5	*462.2*	396.2	6.9	7.1	
6	*501.5*	435.5	6.6	7.5	sl down
7 (under key)	*594.5*	528.5	11.7	11.9	

Step:	damaged	Window width:	17.0	
Edge thickness:	damaged	Cutup	damaged (6.7?)	
Windway exit chamfers:				
up	largish	45 deg	Ramp width north	17.2
down	very small		south	18.3
W/W entrance:				
width	19.7	ww crack	Ramp length: west	23.7
height	1.4-2.5	block cracked	east	23.7
			middle	27.2

NOTES: This recorder is very close in design to the two Rauch bassets in Merano (6852 &6853) which share the same length and pitch.
The wall thickness is very thin, especially around the regions where the bore has been chambered. Also hole 7 has very little depth due to the cut away and thus has very little undercutting. The other holes are undercut with a bias as expected and all the holes seem rather small for an instrument of this size. An endoscope examination suggests a more even undercutting than viewed from the inside.
The window is very neatly cut and symmetrical.
The enormous chambering in the top half of the bore was achieved with no concentric marks that are visible and few lateral scraping marks. It is very difficult to ascertain how this was made.

Cap And Fontanelle

Fontanelle	
Overall length	89.5
internal Ø south	54.0
internal Ø north	50.0
largest external Ø	60
north ring width	16.5
Ø	55-55.5
south ring width	16.3
Ø	58.7-59.5
rose Ø	25.5
holes	2.5
line from top	51.5

	External diameters (east - west)	
	distance from top	**Ø**
	0	47.9
blockline	66	47.2
	180	41.3
	hole X	39.2
	1	39.1
	2	38.7
	3	38.3
	4	37.6
	5	37.3
	6	36.9
above fontanelle	531.5/533	37.3
	7	47.5/38.1
lower fontanelle mount	624	53.4
bead	627	46.4
below bead	629.5	36.9
	653	36.8
	684	39.7
	705	48.9
	end of original sectior	
bell	720	70.0
	replacement rim	

NOTE:
The beak has been reshaped quite roughly around the circumference and a hole has been drilled under the block for what looks to be a fixing point for something (see photos) Some older measurements made when the block could be removed show that the block is cut away on its back side, around the position of this hole. Maybe a drain? The rings and key parts look original, the spring has a recess cut out to give space to the key post. There a signs of old woodworm inside and outside, and the bell rim has been replaced/restored since the museum photos were made.

Tuning

I =	Bb			**Temp.**			
Tuner set to	440	Equal tempered		**Humidity**			
Note	**Cents deflection from 0**	**Pressure mm H_2O**	**Fingering, where different**	**Note**	**Cents deflection from 0**	**Pressure mm H_2O**	**Fingering, where different**
I				**VIII**	+40		
II				**IX**	+40		
III				**X**			
IV				**XI**			
V	+40			**XII**			
VI	+40			**XIII**			
VII	+40			**XIV**			
				XV			

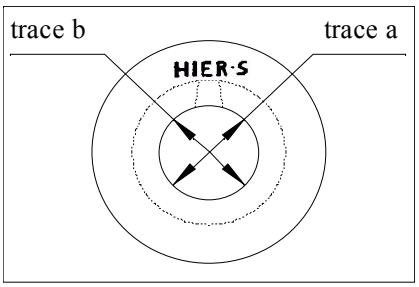
The pitch is around Bb, but there is so little sound, it's very difficult to get much more than a whisper with very little wind pressure from the organ blower.
Only the notes V- IX were worth recording, but they do seem to be more or less in tune.

Paris E 303 basset Rauch revisited.xls, Bore from top

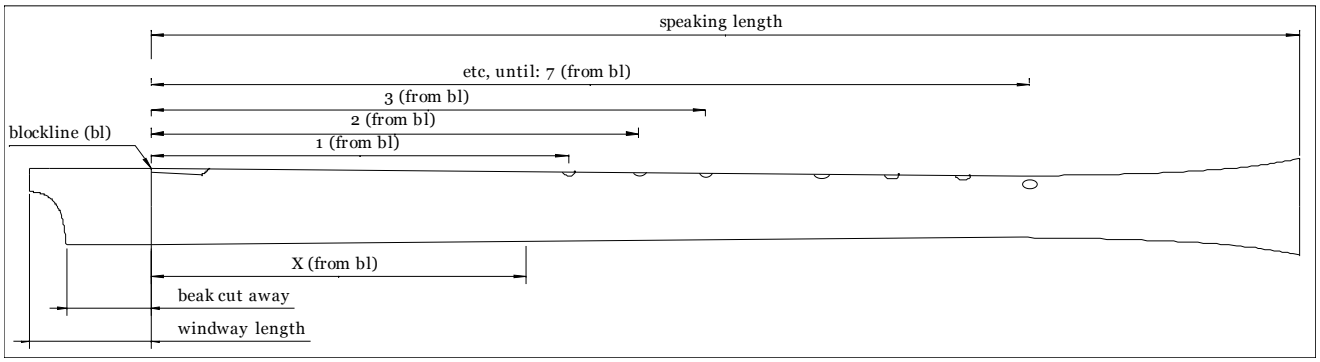
Length	Ø⇦⇨	Ø⇧⇩		Length	Ø⇦⇨	Ø⇧⇩		Length	Ø⇦⇨	Ø⇧⇩		Length	Ø⇦⇨	Ø⇧⇩
68.5	30.36	33.83		233.5	32.45	31.62		398.5	29.07	28.54		563.5	27.16	26.96
73.5	30.32	33.57		238.5	32.27	31.44		403.5	29.00	28.43		568.5	27.05	26.96
78.5	30.36	30.01		243.5	32.08	31.51		408.5	28.96	28.35		573.5	26.94	26.96
83.5	30.50	30.37		248.5	31.94	31.33		413.5	29.00	29.57		578.5	26.79	26.96
88.5	30.39	30.41		253.5	31.94	31.22		418.5	28.89	32.28		583.5	26.76	26.81
93.5	30.39	30.26		258.5	31.68	31.22		423.5	28.70	31.15		588.5	26.68	26.67
98.5	30.54	30.34		263.5	31.50	41.06		428.5	28.59	28.10		593.5	26.50	30.52
103.5	30.65	30.60		268.5	31.27	33.42		433.5	28.41	27.99		598.5	26.50	30.15
108.5	30.83	30.67		273.5	31.31	34.71		438.5	28.37	27.88		603.5	26.50	26.44
113.5	31.02	30.85		278.5	31.16	31.55		443.5	28.34	27.91		608.5	26.35	26.30
118.5	31.35	30.93		283.5	31.20	30.60		448.5	28.19	27.91		613.5	26.17	26.08
123.5	31.57	31.07		288.5	31.09	30.63		453.5	28.08	27.88		618.5	26.06	25.71
128.5	31.50	31.22		293.5	31.02	30.67		458.5	28.04	28.94		623.5	25.91	25.56
133.5	31.75	31.22		298.5	31.05	30.56		463.5	27.86	31.62		628.5	25.73	25.49
138.5	31.75	31.33		303.5	30.98	30.56		468.5	27.86	30.96		633.5	25.58	25.42
143.5	31.83	31.33		308.5	30.83	30.56		473.5	27.71	27.69		638.5	25.69	25.42
148.5	31.86	31.29		313.5	30.87	32.32		478.5	27.86	27.77		643.5	25.65	25.42
153.5	32.12	31.40		318.5	30.80	34.23		483.5	27.90	27.95		648.5	25.65	25.38
158.5	32.27	31.77		323.5	30.72	30.26		488.5	27.86	28.10		653.5	25.54	25.38
163.5	32.27	31.95		328.5	30.61	30.08		493.5	27.75	27.91		658.5	25.51	25.34
168.5	32.30	32.03		333.5	30.61	30.01		498.5	27.49	27.91		663.5	25.47	25.42
173.5	32.45	31.81		338.5	30.65	29.97		503.5	27.42	31.48		668.5	25.47	25.45
178.5	32.52	31.88		343.5	30.58	29.75		508.5	27.38	30.01		673.5	25.54	25.49
183.5	32.52	31.88		348.5	30.50	29.71		513.5	27.49	27.62		678.5	25.40	25.31
188.5	32.49	31.99		353.5	30.36	30.85		518.5	27.31	27.80		683.5	25.25	25.31
193.5	32.49	32.14		358.5	30.21	33.28		523.5	27.05	27.73		688.5	25.18	25.20
198.5	32.60	32.17		363.5	29.92	30.37		528.5	27.09	27.51		693.5	25.03	25.09
203.5	32.60	32.32		368.5	29.84	29.20		533.5	27.09	27.25		698.5	25.03	25.01
208.5	32.71	32.25		373.5	29.70	29.13		538.5	26.98	27.22		703.5	25.10	24.87
213.5	32.93	32.28		378.5	29.51	28.94		543.5	26.90	27.22		708.5	25.10	24.75
218.5	32.89	32.32		383.5	29.40	28.87		548.5	27.01	27.03		713.5	24.99	24.83
223.5	32.74	32.25		388.5	29.33	28.76		553.5	26.90	27.11		718.5	25.25	24.94
228.5	32.63	32.06		393.5	29.18	28.65		558.5	27.01	26.92				

KEY AND NOTES TO MEASUREMENT SHEETS

All attempts at measuring are necessarily subjective and the current survey was undertaken with some finite objectives: To undertake an inclusive study of surviving recorders, using a skeleton format of the most important measurements and minimal intervention. The bores are measured from the bottom, using a strain gauge based digital internal caliper. This has the advantage that bores can be measured with the blocks in situ, thus preventing damage to this sensitive part. Normally, at least two traces are made, at approximately 90° from each other, avoiding the tone holes where possible. Calculations are then made to give internal diameters from the top of the instruments, and to allow bore traces to be plotted.

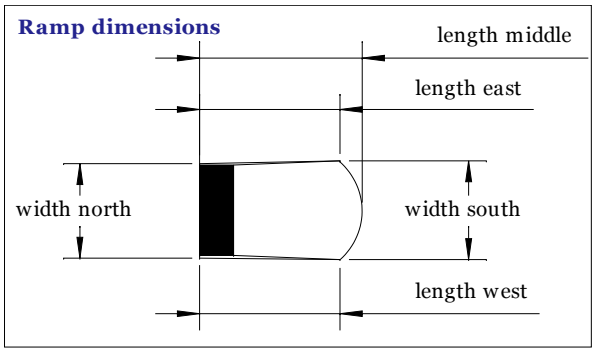


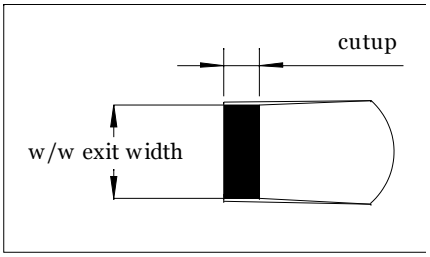
FIELD	TYPICAL VALUE	EXPLANATION
Location:		Town, collection or both, where the instrument is currently located
Inv. N°:		Inventory number of the instrument
Measured:		Name of measurer
Date:		Date of measurements, where known
Pitch @ a=440hz:		Pitch in terms of lowest note, all holes covered, relative to modern pitch (a=440hz). + or - indicates a quarter tone step, relative to modern pitch
Material:		Material from which the instrument is made
mark:		Mark or stamp visible on the instrument, branded or embossed by maker or owner



FINGERHOLES	Tone, or fingerholes of the instrument
length	
(from bl)	(See drawing above)
(from top)	Sum of length from blockline and windway length
diameter	
east/w	Tone hole minimum diameter in an east to west direction
north/s	Tone hole minimum diameter in a north to south direction
direction	
⇧⇨⇩⇦	Indicates if a fingerhole is bored obliquely, or undercut with an unusual bias, and in which direction
Step:	Difference between lower surface of edge (labium) and upper surface of windway ceiling. Typically, this measurment is a visual estimate, given that the blocks would not normally be removed
Edge thickness:	Thickness of edge (labium). Measured by impression made in fine gum and compared using feeler gauges

Windway exit chamfers: up	small, c. 0.6	Chamfer on upper surface of windway exit (on ceiling)
	flat	An estimate of its angle
down	2.0	Chamfer on lower surface of windway exit (on block)
	45°	An estimate of its angle
		(These measurements have either been obtained by the same method as the edge thickness, or are a visual estimate)
W/W entrance: width		Width of windway entrance,
height		Height of windway entrance, distance between windway ceiling and block surface
External diameters		Diameter of the instrument's exterior
(east - west)		Measured at 90 degrees to the longitudinal plane of the tone holes
distance from top		Distance from the north end of the instrument, at which measurement was taken. Note: On basses with fontanelles, the approximate measurements of beads and fontanelle supports were also included.





Cap		Measurements relative to cap
Overall length	99	Total length of the cap
internal Ø	57.6	Approximate internal diameter of cap recess
depth	73	Maximum depth of cap recess
largest external Ø	74.7	Maximum diameter of caps external turning
hole Ø	11.8	Diameter of crook hole, where appropriate
blow hole		Width and height of blowing hole, where appropriate
ring width	21.6	Width of brass strengthening ring
Ø	64	Diameter of brass strengthening ring
Fontanelle		Measurements relative to fontanelle
Overall length	151	Total length of fontanelle
internal Ø south	69.5	Approximate internal diameter of lower end
internal Ø north	64.3	Approximate internal diameter of upper end
largest external Ø	81.2	Maximum exterior diameter, typically scored with a line though the middle of the roses
north ring width	22.5	Width of upper brass strengthening ring
Ø	71.7	Diameter of upper brass strengthening ring
south ring width	22.9	Width of lower brass strengthening ring
Ø	78.5	Diameter of lower brass strengthening ring
rose Ø	28	Diameter of the largest ring of hole arrangement. Typically holes are arranged in three rings, with an extra hole in the centre.
holes	3	Diameter of the rose holes

For the exterior of the instruments, measurements are taken at strategic points, relative to the functionality of the instruments. Some decorative details, particularly with regard to bass instruments, were also recorded to allow a faithful reproduction to be made.
Concerning the voicing of the instruments, only the most basic details such as those concerning the window and ramp, windway width can be recorded with any surety. Many of the blocks are badly damaged, missing or replacements and it is felt that little can be gained by miniscule examination of these areas. With instruments with an undamaged labium or chamfers, estimates are made to give instrument makers an idea of the sort of degree of voicing these recorders might have originally had.
The recorders are mouth blown and measurements taken with a Korg tuner calibrated in equal temperament at a=440hz, Readings are taken as cents deflection from this pitch standard. In some cases, pressure measurements are taken in millimetres of water column, using an Appleby and Ireland pressure gauge with the range 0 to 100 mm/H2O.
Each instrument is blown to find the centre of the sound and the pressure and pitch recorded. Where fingerings other than the standard fingerings given below are used, these too are recorded, as are any variants. Whilst finding the 'centre of the sound' is always a subjective process, using a mechanical method to test pitch and sound does have the advantage of consistency and is generally more objective than having several players try the instruments. It is also considerably less destructive to the recorders and gives a good idea of the relationship between different instruments.
The following standard fingerings are tested.

Note	Fingering
I	1234567
II	0123456-
III	012345--
IV	01234-5-
V	0123----
VI	012-----
VII	01------
VIII	0-2-----
IX	--------
X	0/12345--
XI	Not recorded
XII	0/123----
XIII	0/12-----
XIV	Various
XV	Various