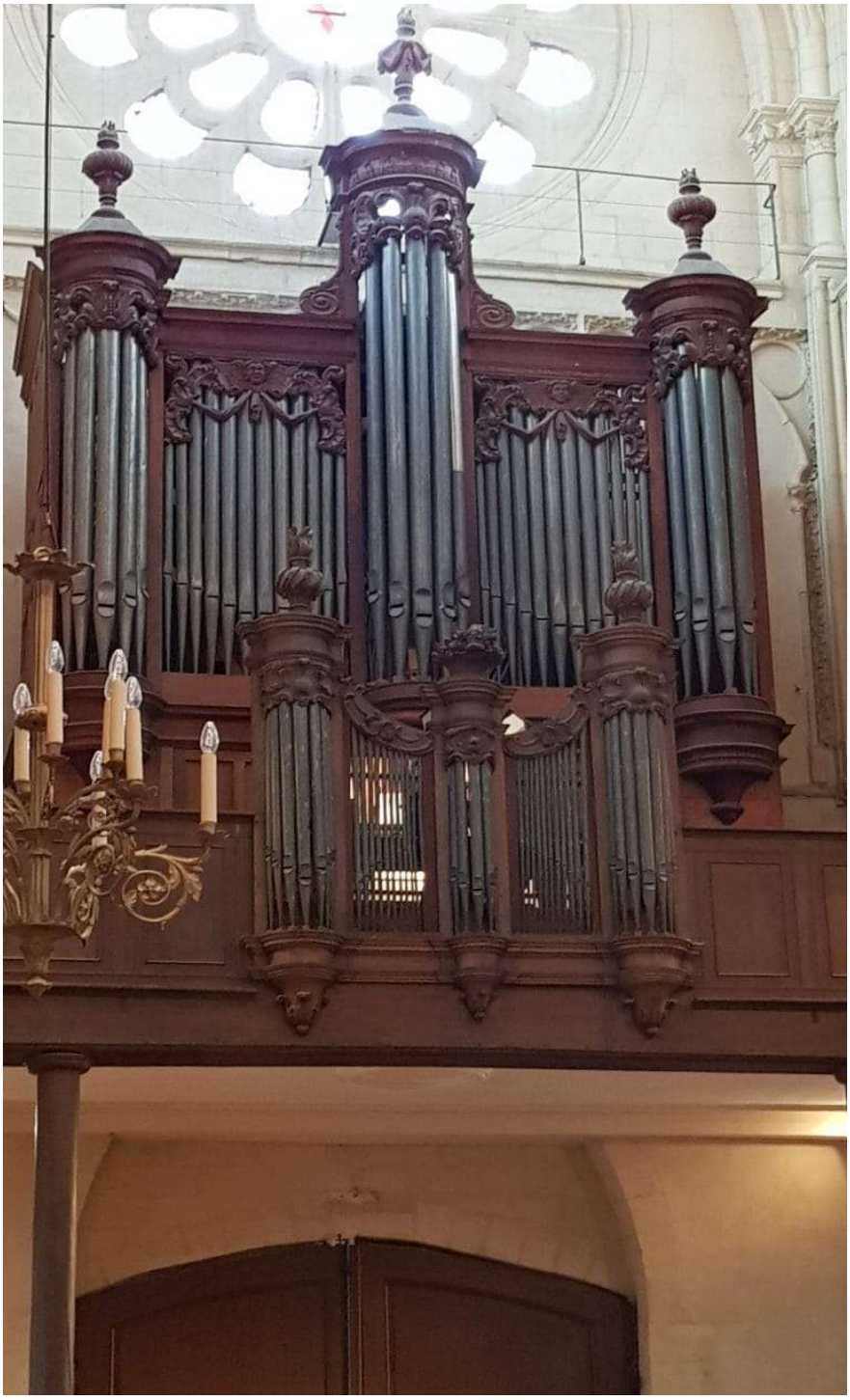

French Organbuilding

By Blair Batty

Forward

I am a retired organbuilder. This PDF is some of my personal notes about French organbuilding, which I gathered over my lifetime. It was intended for my own education and interest; I never intended to publish. As such, I freely plagiarized and copied anything interesting, and often failed to keep track of sources.

It also contains information send to me by friends, as well as information from various books and publications. Much of it I wrote down decades ago.

I've ignored history, which is well covered by others. I've also ignored construction and mechanism, which at the time I felt we were already doing better. Mostly, I was interested in how the stoplist and pipework evolved over the centuries; and how the pipework was constructed and voiced. I've documented pipe measurements, which is interesting to organbuilders.

I've only seen a few Andreas Silberman organs while visiting the Alsace region, and that was four decades ago, so my direct experience of French organs is limited. However, I did spend some time looking at the scaling method of both Dom Bedos and Cavaille-Coll.

I apologise for the messiness of my notes. Many were made decades ago and time and my arthritis preclude redoing it. I'm to blame for the typing and design; Microsoft Word is truly cryptic.

If I've used your photo or material, please contact me and I'll either acknowledge you, or remove it; however you wish. Do contact me, if you have any comments, corrections, sources or questions. I won't be offended…

There are a lot of pipe scales shown here. If scaling is new to you, you could read my Introduction to Pipe Scales, found on my website: BlairBatty.Ca.

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BlairBatty.ca

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French Organbuilding

French organ building can be broken down into the Classical era and the Romantic era. Stephen Bicknell *(Organbuilder #6/1988)* breaks down French organ building as follows:

- Pre-1750 - Pre-Classical period — early Flemish & French
- 1750-1840 - Classical period — Clicquot, Isnard, Bédos, Thierry
- 1840-1880 - Romantic period — Cavaillé-Coll, Daublin, Callinet
- 1880-1930 - Symphonic period — Mutin *(successor to Cavaillé-Coll)*, Merklin
- 1930-now - Modern period — Victor Gonzales

Pre-Classical Period- Before 1750

- 12', 6', and 3' transposing organs.
- 1400s: The earliest organs were probably Brabant style Blockwerks.
- 1500s: Northern France saw the breakup of the blockwerk. Tromps abandoned.
- Narrow Scale Plein Jeu: Principals 16', 8', 4', VIII Fourniture & Cymbal
  (the remains of the blockwerk, when the 16, 8, & 4 were separated)
- Wide Scale: 8' stopped flute, 4' open flute, 2', 1-1/3', 1' plus 1-3/5' which was introduced with the Cornet from the Netherlands in about the 1580s.
- 1500s: Southern France *(Bordeaux)* saw Italian style organs: 8', 4', 2', 1-1/3', flutes 8', 2-2/3', 2', regal reeds.
- Similar to English organs of the period.
- French influence in England through Dallam *(Brittany)* and Harris

Characteristics by 1590

- Consistent use of Trompettes
- Clarion 4' and Cromorne 8' introduced
- Dessus de Cornet V solo and reed treble reinforcer
- Cantus Firmus Pedal Flute 8' and Reed stops
- Compass changed to C
- Positiv developed
- Paris and Rouen became centers of organ development.

Classical period 1650-1790

- L. A. & F.-H. Clicquot, Isnard, Dom Bédos, Thierry
- Main case not subdivided into a werk-princip style. Case carved.
- Case has a relationship to the internal structure.
- The North German Rückpositiv was the equal partner of the Hauptwerk, whereas the French Positiv was the concertino of the French organ. The French had essentially one plenum, the
- Grand Plein Jeu. 3rd & 4th keyboards had short compasses for solo sonorities.

The Classical French organ has only five pipe types

1. A fluty principal chorus 16', 8', 4', 2', Fourniture, and Cymbale that make up the Plein Jeu.
2. Bourdons: stopped flutes 16', 8'.
3. Wide cylindrical open flutes; also combined as cornets.
4. Powerful Reeds (Trompettes and Bombardes).
5. Solo Reeds: Cromorne, Vox Humana, Hautboy.

The Plein jeu

This was the main chorus, similar to the blockwerk, *(from which it descended)*. It is the fluty principal plenum, shown below:

Grand Orgue	**Positiv**
16' Montre	8' Montre
16' Bourdon	8' Bourdon
8' Montre	4' Prestant
8' Bourdon	2' Doublette
4' Prestant	Fourniture
2' Doublette	Cymbale
Fourniture	
Cymbale	

The ancient Blockwerk had doubled ranks. Perhaps the doubled 16' and 8' were cut down to make Bourdons when the blockwerk was rebuilt in the new way, so were always included in the Plein Jeu. More likely, the Bourdons were included to fill out the gentle 16' & 8' Montres. No reeds, narrow or wide tierces, or flutes *(other than the 16' & 8' Bourdons)* were ever included in the Plein Jeu. There is no separate 2-2/3' rank in the Plein Jeu.

Though many ranks were involved and wind pressures relatively high, the chorus sound was not overwhelming, screamy, brilliant, shrill or high pitched; it was very homogeneous. This is the result of wide treble scales, closed toes, and gentle voicing.

The Montres were quite gentle, blending into the Plein Jeu. In contrast, the German Principal 8' was powerful, giving a definite 8' pitch basis, and giving a clear pitch reference for listening to polyphonic music.

Mixtures

Plafond is the pitch limit reached by the highest pitch rank of a repeating mixture, at the points of repetition. The typical upper limits were: Fourniture at 1/6', Cymbal at 1/8', and Plein Jeu at 1/8'. Classical French mixtures never went into the top octave of a 2' rank (notes #50-61). This is an octave below 1/16', the practical limit of audibility. The highest pitch at low C was 1/4'.

The large numbers of ranks filled the spectrum from 16' to 1/8' providing the brilliance needed to fill the large stone buildings and the powerful resultants that supported the gentle Montres. This "filling of the spectrum" precludes the formation of vowel sounds, so common in German organs. The French contrast their clean, vowel-less chorus with the Cornet and its very strong "A" vowel sound.

German organs create the vowel format by using fewer ranks, but are strongly voiced and center around a narrow frequency range *(upper vowel format)*. By having mixtures at different pitch ranges in different divisions, each German division has its own vowel character, so each plenum has a different sound.

Mixture Rules

- The Fourniture and Cymbale were never used apart.
- The Cymbale often broke twice per octave in 4ths and 5ths.
- The Fournitures broke once or less per octave in 8ves, usually at f^0 and f'.
- Mixtures often ran into the 16' and 32' series (5-1/3' and 10-2/3'), and the 2-2/3' entered quite low, often in the bottom or tenor octave.
- The number of ranks depends upon the depth of the pitch of the montres.
- The Cymbale often had more ranks than the Fourniture.
- Fournitures and Cymbales overlapped to a great degree, resulting in doubled ranks.
- Tierces are never part of mixtures.
- There are typically equal numbers of quints and octaves, or one more octave than the quints.

Fourniture Horizontal is the stereotypical classical French mixture where the mixture stays in a strictly delimited acoustical range, by using breaks. Classical Cymbales also keep within a narrow range, using more breaks. Used together, they fill the lower spectrum and fuse with the 8' and 4'.

Fourniture Ascendante is a modern style, where the tonal mass climbs upward from the bass to treble. It is better suited for polyphonic music. German mixtures are designed this way, so the vowel format gradually raises towards the treble, also helping to delineate polyphonic music.

Progression Harmonique is an extremely ascendant mixture, devised by Cavaillé-Coll. It never really caught on, and even Cavaillé-Coll frequently reverted to classical mixtures.

Plein Jeu is a stop name: it is the Fourniture and Cymbale on one draw, though both always keeping separate toeboards. Sometimes the Fourniture is erroneously called a Plein Jeu.

Flutes & Cornet

Besides supporting the Plein Jeu, the Bourdon 8' was the foundation for all flute combination *(plus Bourdon 16' on large organs)*. The flutes where the components of the Cornet: either full compass separate ranks, treble only ranks, or combined as 5-rank Cornets. The Cornet consists of:

8'	Bourdon: can be narrower because it is reinforced by powerful resultants
4'	Prestant: very wide and fluty
3'	Nazard: lead, large scale
2'	Quarte de Nazard: *(a fourth above the Nazard)*, unison mutation to be used with the Nazard and Tierce, lead, large scale.
1-3/5'	Tierce: lead, large scale
1-1/3'	Larigot: not usually a part of the Cornet, but of the same family.

The Cornet was originally from the Netherlands in the mid-1550s. It was frequently progressive, 4 to 6 ranks, including a 1-1/3'. Early references to "Hautboy-Cornet" indicate that it was considered to be imitative of the early Oboe, interchangeably with the organ reed stop.

The main use of the Cornet was to reinforce the treble of the Trompettes, to compensate for the way these loud reeds fall off in treble power. By the 1650s a Cornet was given its own treble keyboard as a solo stop. If the chest was below the G. O. it was called Echo, if above the G. O. it was a Recit.

- Grand Jeu de Tierce was the full flutes chorus without mixtures.

- Early organs had Larigot 1-1/3' and Flageolet 1'; by the mid-17th century the 1' was replaced by Tierces. About 1660 the 3-1/5' *(16'series)* was introduced. The 5-1/3' was not introduced until the18th century. The Flute 4' was usually a chimney flute.
- The Grand Jeu de Tierce was the full flute chorus with mutations, but without mixtures.
- Cornet ranks have a larger scale, with more powerful solo voicing, brilliant and sparkling in tone, than when decomposed as separate ranks.
- Cornets are required only in the treble as solo voices.
- The Grand Orgue has the largest scaled Cornet, starting from c', to support the big reeds.
- The Positiv has a Cornet if it has Trumpets 8' & 4' (needing support).
- The Bombarde division gets a Cornet similar to Grand Orgue, for the same reasons.
- The Cornet de Recit has a solo Cornet starting at tenor f (smaller scale than Grand-Orgue).
- The Echo has a smaller scaled Cornet than the Recit.
- On modern organs Cornet decompose ranks are often Blockflutes (tapered, small mouth width) for a better blend, at the expense of the Cornet flavour *(but Blockflutes are never used in Cornets)*.
- Classic Cornets stop at c49 or d51. In modern organs that go higher, you must narrow the scale in the top octave or the pipes will give up speaking. If a pipe's diameter approaches its body length, it won't speak.
- The Cornet is mounted and voiced with very closed toes to get the characteristic attack/release.
- Cornets have wide (1/4) mouths, low (1/4) cutups.

Reeds

- Grand-Orgue: Trumpet 8', Clairon 4', Vox Humana 8'
- Positiv: Cromorne 8', occasionally Trompette 8'
- Recit: Oboe 8', occasionally a Trompette 8'
- Pedal: Bombarde 16', Trompette 8', Clairon 4'

Trompettes were for audacious melodies in the bass or soprano and were the foundation of the Grand Jeu. The Bombarde 16' didn't appear until the 1690s-1730s. In the 1760s there were sometimes pairs of 8' Trompettes, for a distinct chorus effect.

The Cromorne 8' was used in the ensemble in the Positiv as an echo of the Grand-Orgue Grand Jeu, and in contemplative melodies (bass, tenor, or soprano).

The Vox Humana (always used with the Bourdon 8' and the tremulant) was used for tender airs and chords. By the time of Dom Bédos and Clicquot the organs became associated with very loud Trompettes and many flutes. The Vox Humana was placed on the Grand-Orgue because only the Positiv had flutes soft enough to accompany it.

Grand Jeu: Chorus reeds and the separate mutations, perhaps the Cornet. No mixtures.

Some Notes on the Reeds

Resonators

- French resonators have high tin content: 70-90%.
- Metal thickness is thin at the top, thicker at the block.
- Cut dead to length with no slots, just flat of the fly-off point (with a strong fundamental).
- Beware of copying (large reverberant French buildings moderate the powerful fire).

Shallots

- Parallel shallots, opened full length, and later often with domed ends.
- Cavaillé-Coll had three scales: large, medium and small.
- C-C have 4 face widths: cut to 1/2, 2/3, 3/4 variable shallot heights (but less than 3/4).
- C-C tended towards a narrower face as he approached the symphonic period.

- Romantic and Symphonic had narrower faces to give a rounder sound with less harmonics. Used a higher wind pressure in the treble to maintain treble power.
- Earlier periods have wider scales and faces
- Shallots are forged from one piece of brass, including the domed ends.
- The 16' Basson and Hautbois bass shallot has a slight taper and a soldered plate with a teardrop opening cut into the plate (allowing the use of wider tongues).

Reed Construction

- Double nut blocks for all cylindrical ranks, and 4' and up for oboes and trumpets.
- Blocks must be filed to fit the boot perfectly, or the tone suffers. Round wedges.
- Avoided supports at the top, which may deaden the tone.
- Boots of heavy lead.

Main Sounds of the Classical Organ

- Plein Jeu: full Grand-Orgue (no reeds or open Flutes except for a cantus firmus Pedal).
- Grand Jeu de Tierce: full flutes chorus with mutations, but no mixtures.
- Grand Jeu: Reeds, mutations, and some foundations, perhaps strengthened by Cornet.
- Fond d'Orgue: all flutes and principals at 16', 8', 4', with possibly the Positiv coupled to the Grand-Orgue.
- The Bourdon 8' plus the Prestant 4' formed the "foundation" for the Trompettes.

Characteristics of the Classical Organ

- Principals and reeds have tin bodies, lead feet. Flutes are lead.
- All metal pipes were hammered.
- Pedal basses and manual stopped basses are of wood.
- Organs are described by size of pipe (e.g., 16', 8' organ), a Grand 8' organ had a Bourdon 16', a Petit 8' organ did not.
- The G. O. and Positiv each have a Plein Jeu chorus and a Grand Jeu de Tierce chorus.
- If the G. O. has Trompettes 8' & 4', it needs a mounted Cornet from middle c to strengthen the treble.
- The third keyboard *(recit)* is a treble keyboard for solos, with a Cornet, Trompette or Hautbois.
- By the mid-18th century, the 16' Bombarde division had its own keyboard (plus a few Trompettes).
- The Gross Tierce 3-1/5' provides an excellent bass line in duos and trios as a foil to the other part played on a Cornet.
- Very big, loud reeds from the 18th century (Clicquot).
- Watch the pitch: organs were 1-1/2 to 2 HT flat, strongly affecting the relative scaling.
- Pallets, etc., didn't need to be large, as a full tutti was never played

Gottfried Silberman: The French Connection

It is well known that Gottfried Silbermann was strongly influenced by French ideas when he trained with his brother Andreas Silberman in Alsace. Andreas had worked in Paris and was influenced by Thierry, who built the following Echo *(Brustwerk)* as part of the St Louis-des-Invalides, Paris

8'	Bourdon
4'	Flute
3'	Nazard
2'	Quart
1-3/5'	Tierce
II	Cymbal
8'	Cromorne

THE ORGAN-BUILDER

By FRANÇOIS BÉDOS DE CELLES, Benedictine of the Congregation of Saint-Maur, in the Abbey of Saint-Denis (France), Member of the Royal Academy of Science of Bordeaux.

PREFACE.

SECTION ONE.

Brief history of the organ.

TAKING the word, *organ,* in its earliest meaning, we find that it goes back to the original invention of the arts. In the remotest times, the name, *organ,* was given to any tool or instrument whatever. Later, its use was limited to musical instruments in general. In more recent times, the term indicated wind instruments; and finally, it designated only a set of pipes bound together, whose more or less diverse combinations produced a more or less pleasing concert of sounds, according to the artist's ability.

A few authors have used the term, *organ,* to designate a group of persons singing together, and others, to indicate a consort of flute-players. The commentators of Holy Scripture limit the term to wind instruments. When it is written in Genesis that Jubal, one of the sons of Lamech, was "father of all such as handle the harp and organ", the commentators believe that *harp* represents all stringed instruments and *organ,* all wind instruments.[1] The Hebrew word rendered in the Vulgate by *organum* corresponds to the Chaldaean *abuba*[2], and his term bears an obvious resemblance to the "ambubaiarum collegia" by which Horace designates flute- or organ-players from Syria.

The Latin word, *organum,* is very often encountered in Holy Scripture. Saintly Job, describing the prosperity of the wicked, says that they "take the timbrel and harp, and rejoice at the sound of the organ."[3] Then describing his misfortunes, he says that "my organ [is turned] into the voice of them that weep."[4] The organ is also mentioned in Psalm CL, among the instruments used to praise the Lord,[5] but these were different instruments from our organs. The expression used by the author of Psalm CXXXVII to portray the sadness of the children of Israel during the Babylonian captivity, proves that theirs were very light, portable instruments: "we hanged our instruments upon the willows."[6]

Dom Calmet, in his monograph on this topic, thinks that the organ mentioned in Scripture was a set of pipes, stopped at their lower ends and joined together, played by sliding over the lower lip. This is the instrument which Lucretius suggests when he says, *unco saepe labro calamus percurrit hiantis:* "he slides open pipes back and forth at his lip".[7] The organ in this sense was well known to secular writers, especially poets. Virgil attributes this invention to the god Pan; and others, to another origin. These diverse opinions, says Dom Calmet, arise only from the ignorance of these authors concerning the true history and antiquity of these instruments, which the Greeks seem to have borrowed from peoples farther East. This organ-like in-

1 *Critical Commentary to Genesis,* 4:21.

2 Dom Calmet, "Dissertation on Musical Instruments", in *Literary Commentary to the Psalms,* vol. II, p. 87.

3 Job, 21:12.

4 Job, 30:31.

5 Psalms, 150:4.

6 Psalms, 137:2.

7 Lucretius, Bk. IV.

Dom Bédos

François-Lamathe Dom Bédos de Celles de Salelles (*1709-1779)* was a Benedictine monk, organbuilder and author of the treatise *L'art du facteur d'orgues*, 1766-78. This book gives a wealth of information about every detail of building the French organ of the eighteenth century and is a necessary reference for any serious organbuilder. The best edition is Charles Ferguson's translation *The Organ-Builder (Raleigh, North Carolina, Sunbury Press, 1977)*. It is a huge book, because all the plates and drawings were reproduced full size. Bédos showed his pipe measurements as full-size graphs, so reproduction accuracy was important.

He provides useful information about every detail of organbuilding: Casework design, stoplists, pipemaking, bellows and windchest making, pipe scale layout, gluing. As a recognized organbuilder, he was called upon to carry out repairs and appraise and advise other organbuilders across France.

Bedos Scales

The following scales are from the Mahrenholz book, who copied it from Bédos' book. Bédos organs were one semitone flat, A=415 Hz, but no corrections have been applied here. All are inside diameters, in millimeters.

	C1	C13	C25	C37	C49
Principal 32'	503.8	261.6	140.3	79.9	49.6
Principal 16'	306.8	159.6	86	49.3	30.8
Principal 8'	155.7	84.1	48.3	30.4	21.4
Oktave 4'	94.7	50.2	28	16.9	11.3
Oktave 2'	57.3	31.4	18.3	11.7	8.5
Plein Jeu 4'	79.7	45.9	25	14.6	9.4, c61-6.8
Plein Jeu 4'	40.6	22	12.6	8	5.6

(Flute de Pedal) wood	C1	C13	C25	C37	C49
Offenbass 32'	498.9	267.2	151.4	93.5	64.5
Offenbass 16'	323.3	176.5	103.1	66.5	57.3
Offenbass 8'	190.9	108.7	67.6	57.3	
Offenbass 4'	108.3	85.7	66.3	37.2	22.7

Wood	C1	C13	C25	C37	C49
Gedackt 32'	437.8	232.7	130.2	78.9	
Gedackt 16'	224	128.1	80.2		
Gedackt 8'	140	81.5			

Metal pipes	C1	C13	C25	C37	C49
Gedackt 4' *(wide)*		84.6	48.8	30.9	22
Rohrflote 4' *(wide)*		84.6	48.8	30.9	22
Gedackt 4' *(narrow)*		73.3	42.7	27.4	19.7
Rohrflote 4' *(narrow)*		73.3	42.7	27.4	19.7
Flote 4' (Basse de Viole)	94.7	50.2	28	16.9	11.3

Cylindrical	C1	C13	C25	C37	C49
Terz 3-1/5	94.7	50.2	28	16.9	11.3
Nasat 2-2/3'' *(wide)*	85.7	46.9	27.6	17.9	13
Nasat 2-2/3' *(narrow)*	71.6	39.7	23.8	15.8	11.8

Tapered	C1	C13	C25	C37	C49
Nasat 3' (wide)	93.6	50.9	29.6	18.9	13.5
Top of pipe	62.5	32.9	18.1	10.6	6.9
Nasat 3' (narrow)	71.6	39.4	23.4	15.3	11.3
Top of pipe	48.1	25.3	13.9	8.2	5.4

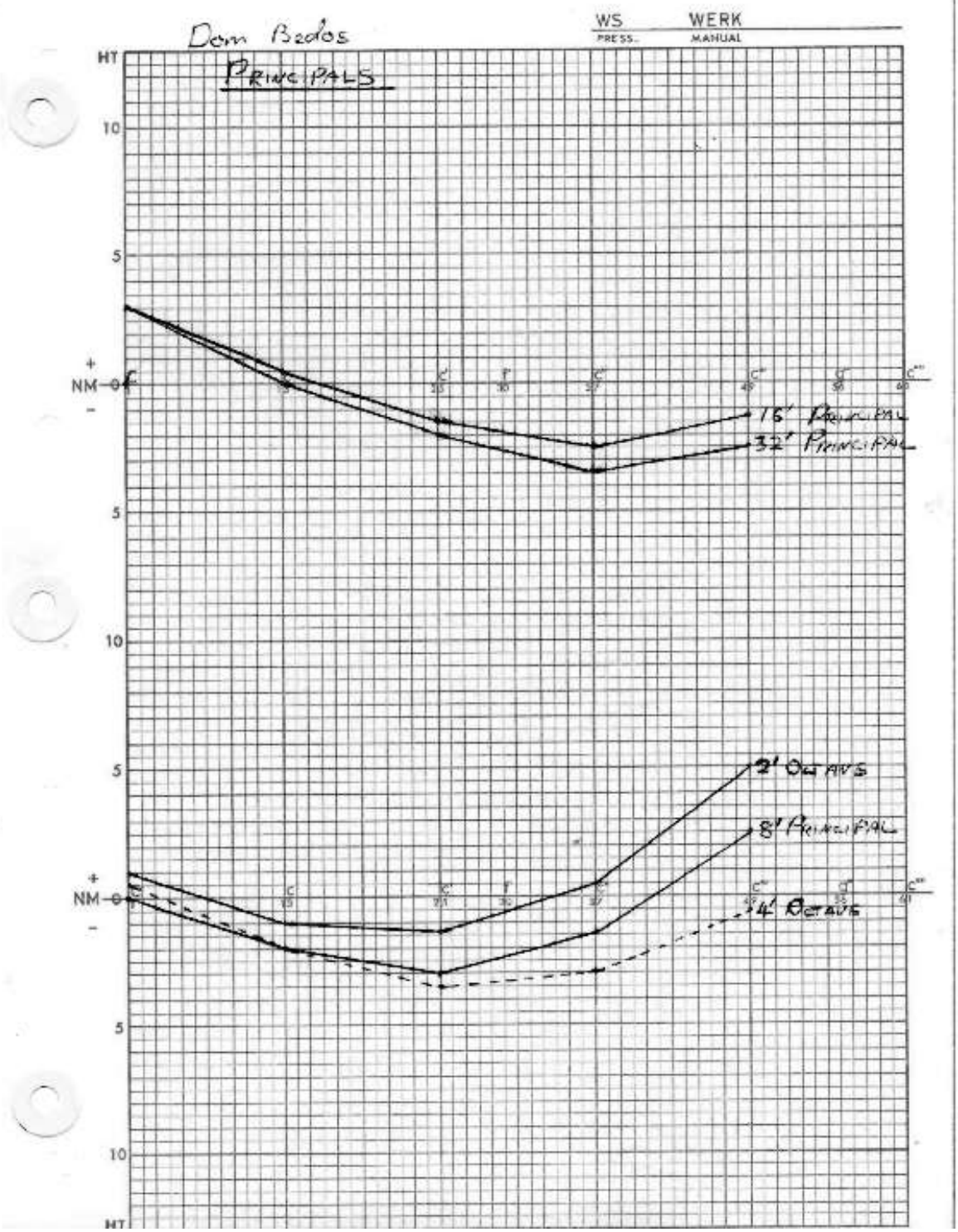
	C1	C13	C25	C37	C49
Quarte 2' Wide	72.2	39.6	23.5	15.3	11.3
Quarte 2' Narrow	66.2	38.1	24.1	17	13.5

	C1	C13	C25	C37	C49
Terz 1-3/5' (wide)	59.2	33.1	20	13.4	10.2
Terz 1-3.5' (narrow)	54.1	29.8	17.6	11.5	8.5
Larigot 1-1/3'	47.3	27.2	17.1	12.1	9.6

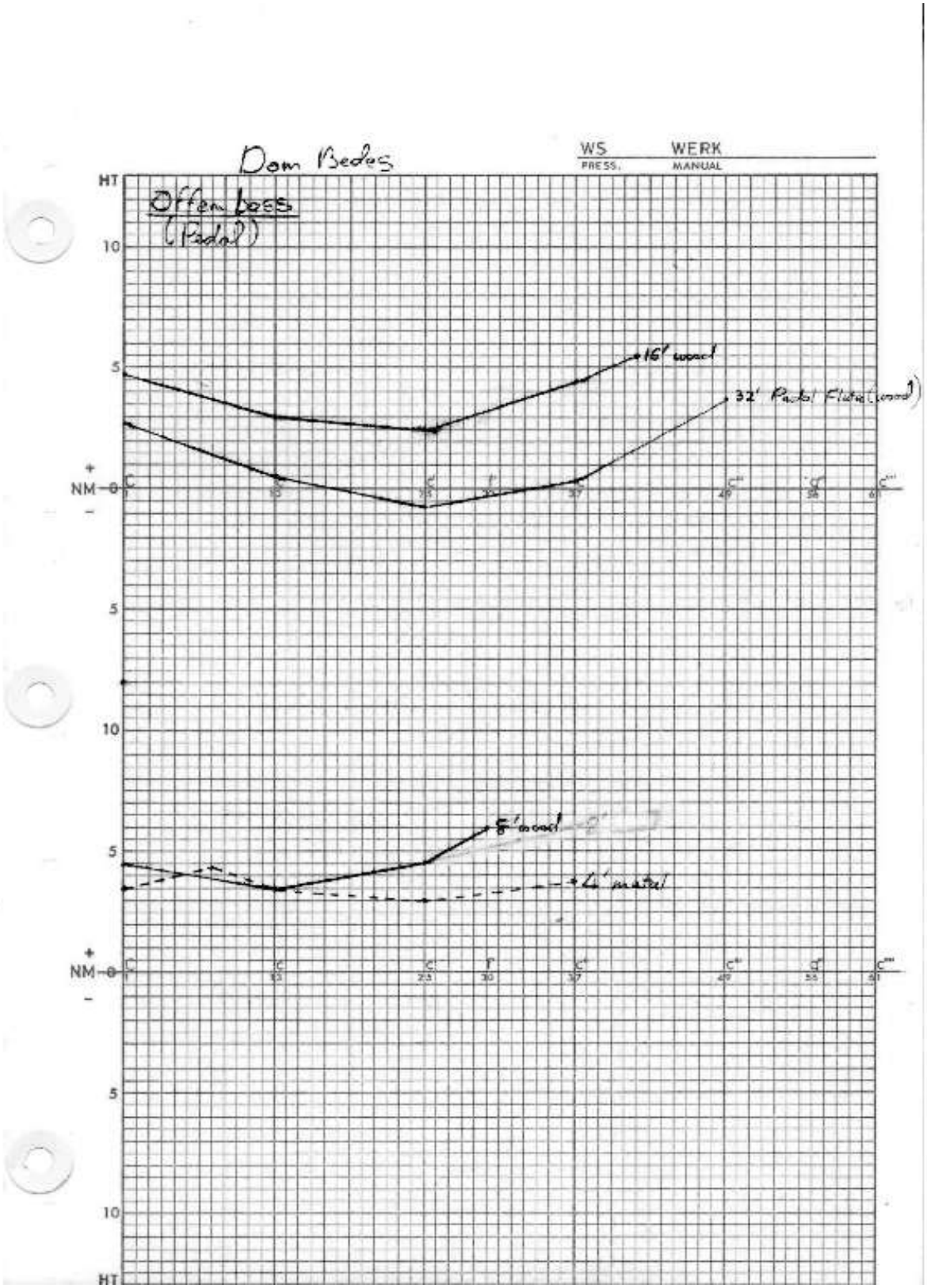
Grand Cornet			C25	C37	C49
8'			46.8	29.9	21.4
4'			39.5	25.2	18.1
2-2/3'			33.8	22.9	17.5
2'			28.8	19.4	14.7
1-3/5'			24.3	16	11.8

Cornet de Recit	C1	F18	C25	C37	C49
8’		68.2	49.3	30.3	20.9
4’		58.7	42	25.3	16.9
2-2/3’		48.5	35.4	22.3	15.8
2’		42.9	31.1	19.4	13.5
1-3/5’		37.2	26.8	16.5	11,3

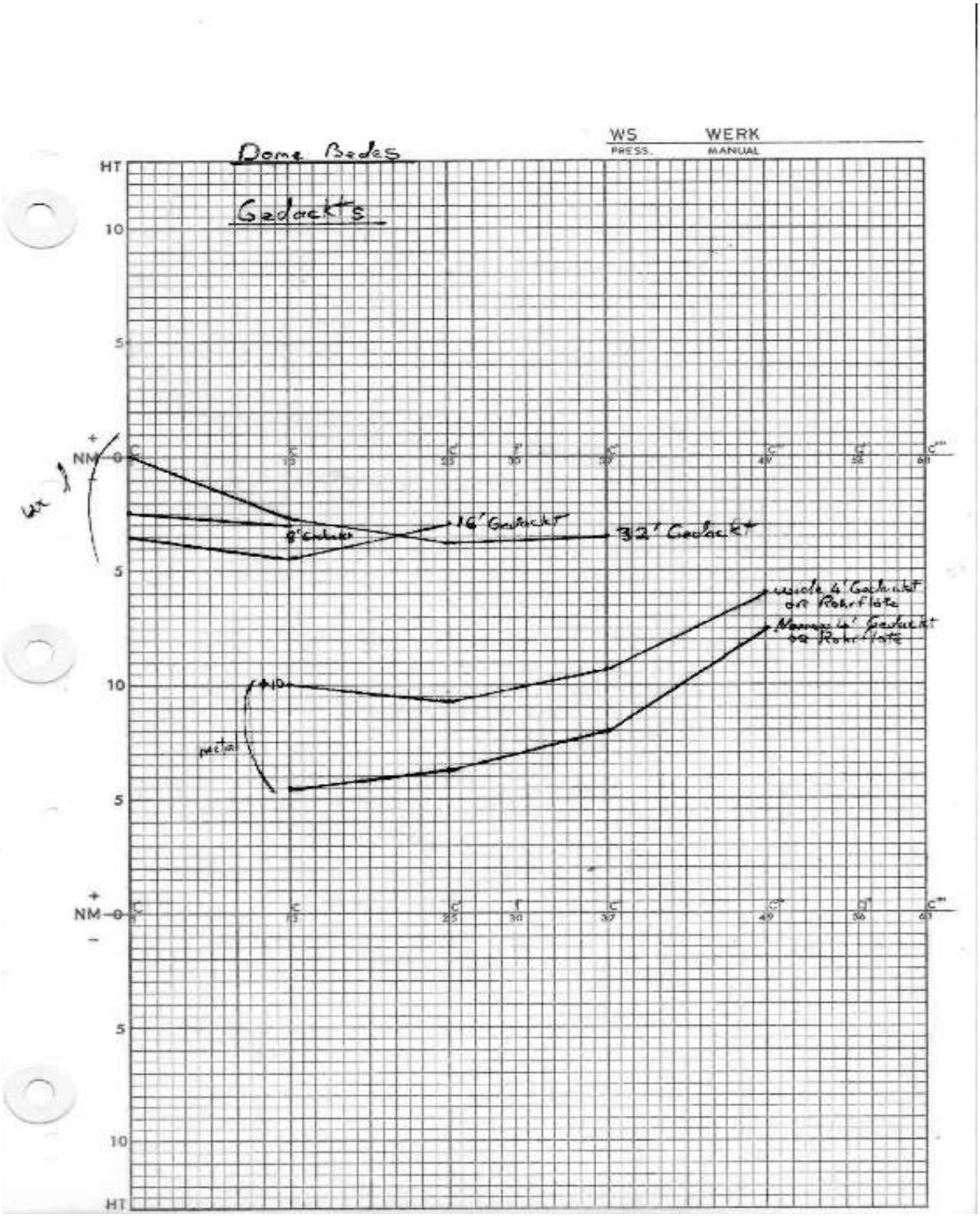
Montre

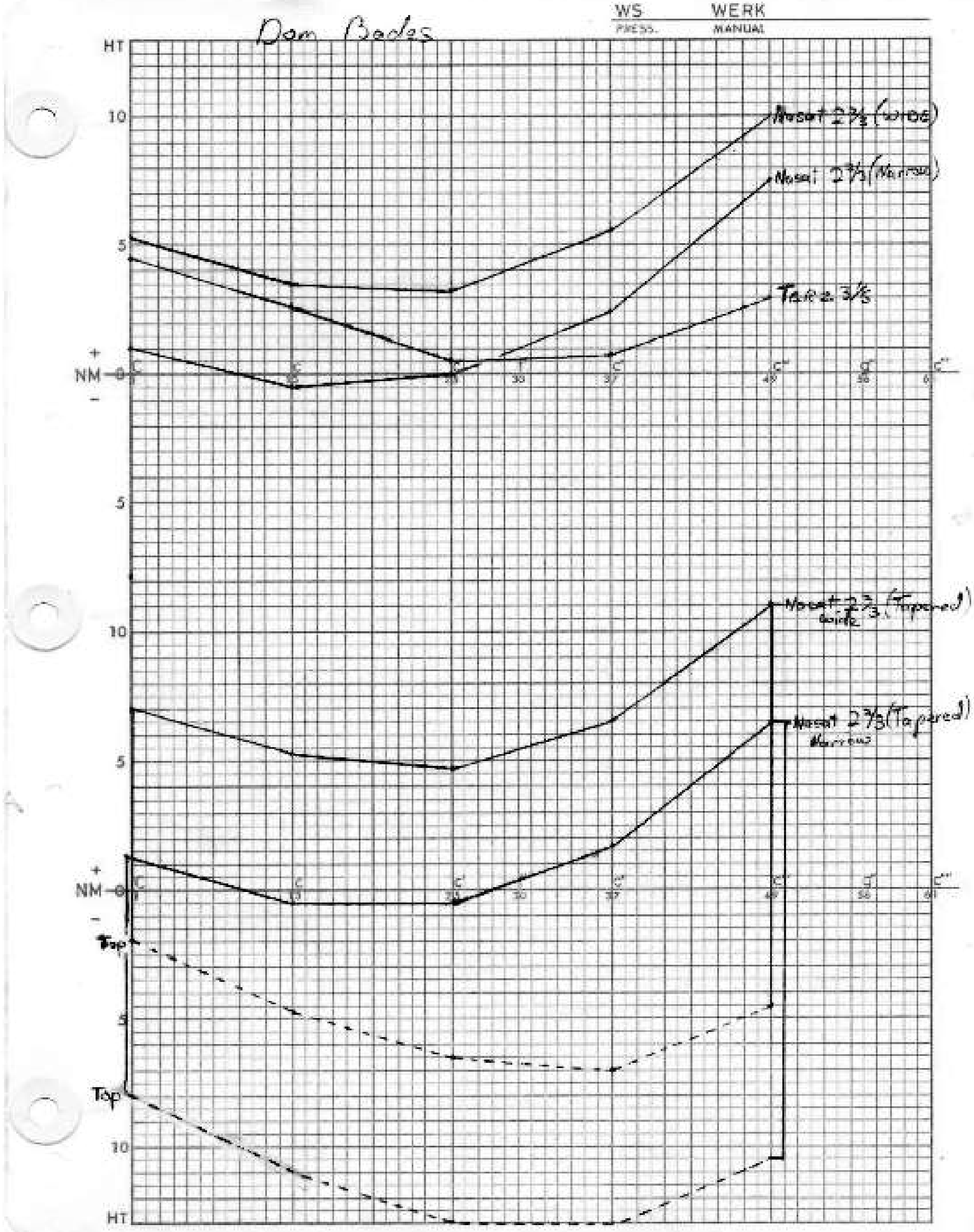

Dom Bedos
WS WERK
PRESS. MANUAL
PRINCIPALS
HT
10
5
+
NM 0
-
16' PRINCIPAL
32' PRINCIPAL
2' OCTAVES
8' PRINCIPAL
4' OCTAVES

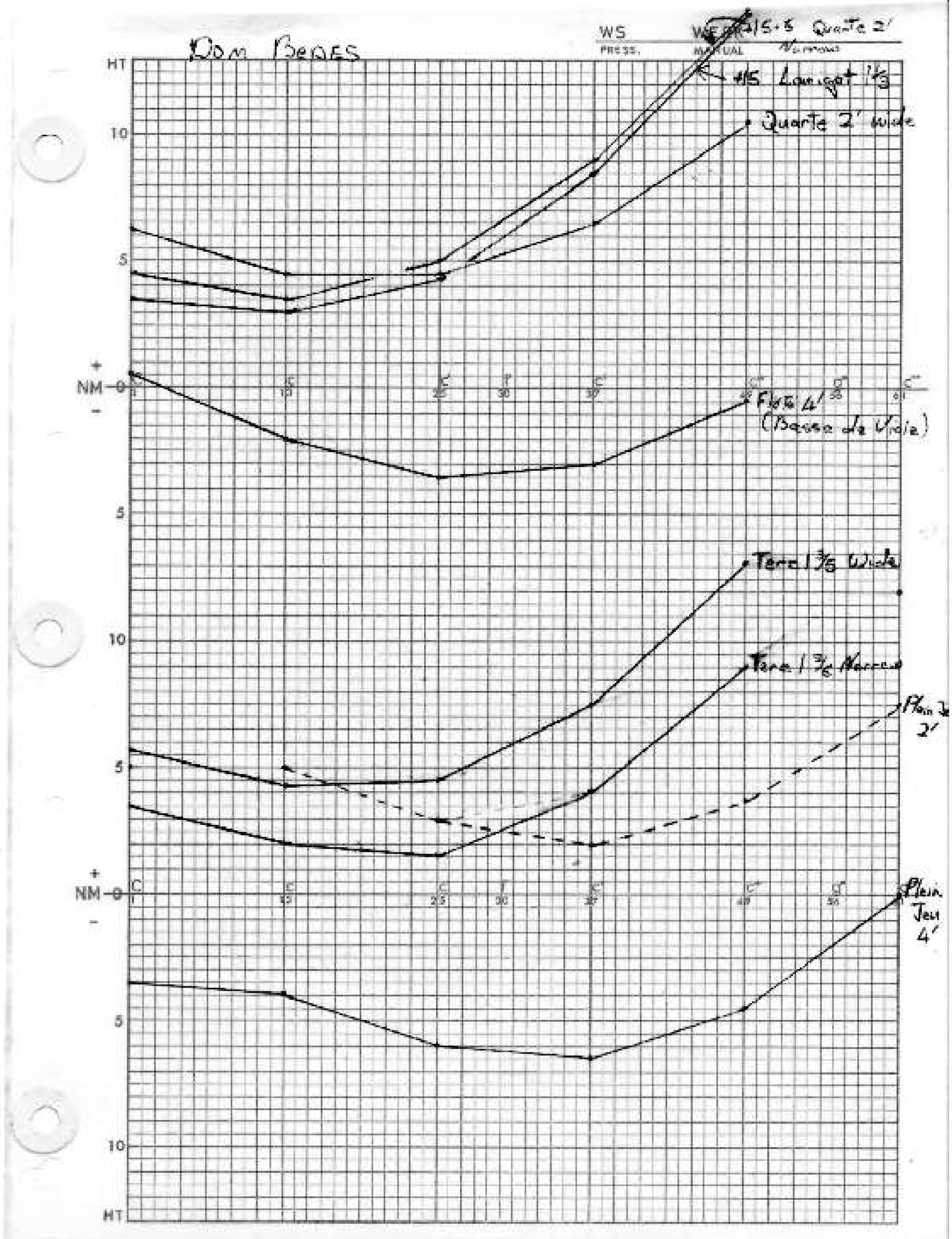
Offen Bass


Dom Bedes
WS
PRESS.
WERK
MANUAL
Offen bass
(Pedal)
HT
10
5
16' wood
32' Pedal Flute (wood)
+
NM
0
-
5
10
5
8' wood
4' metal
+
NM
0
-
5
10
HT

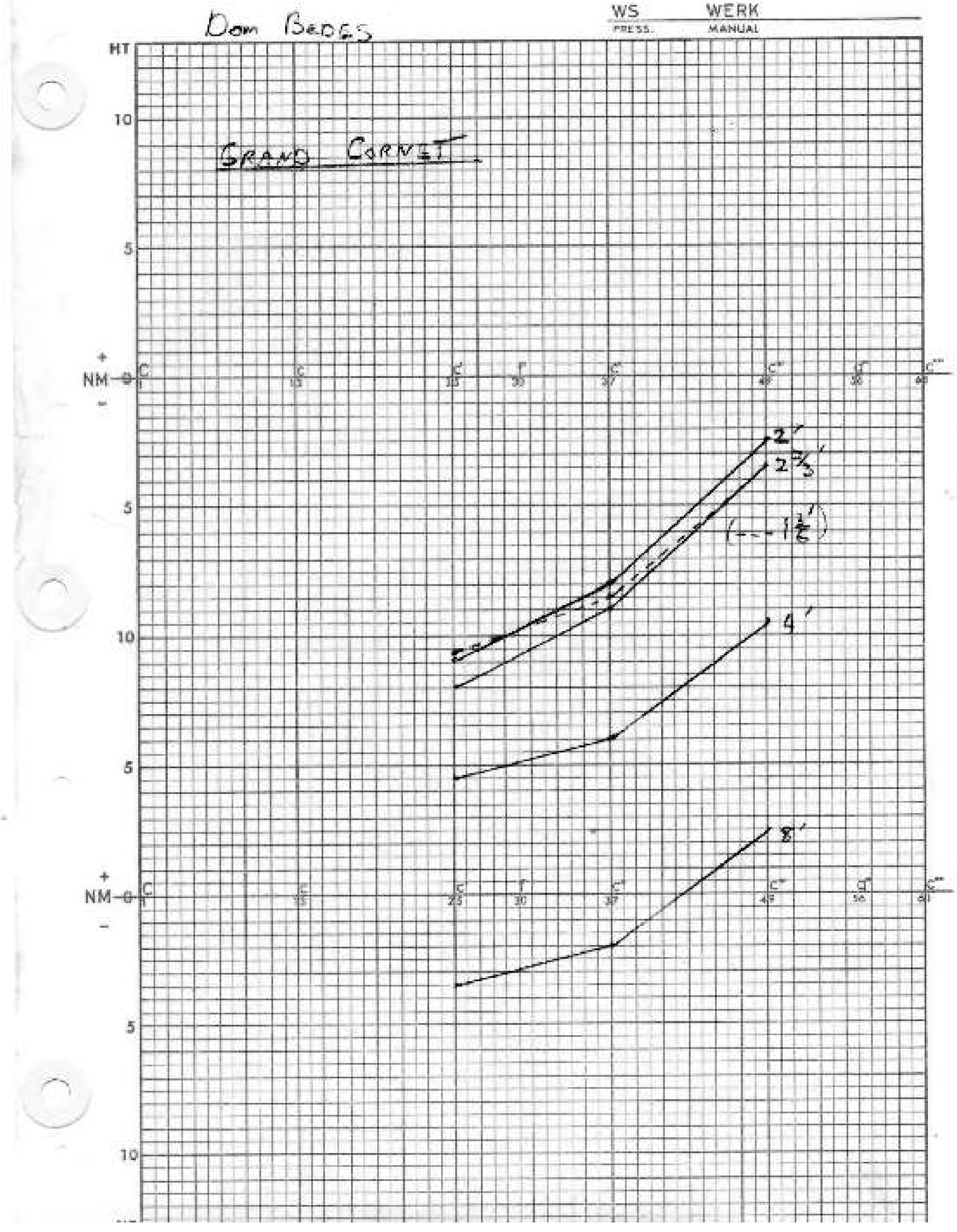
Bourdon

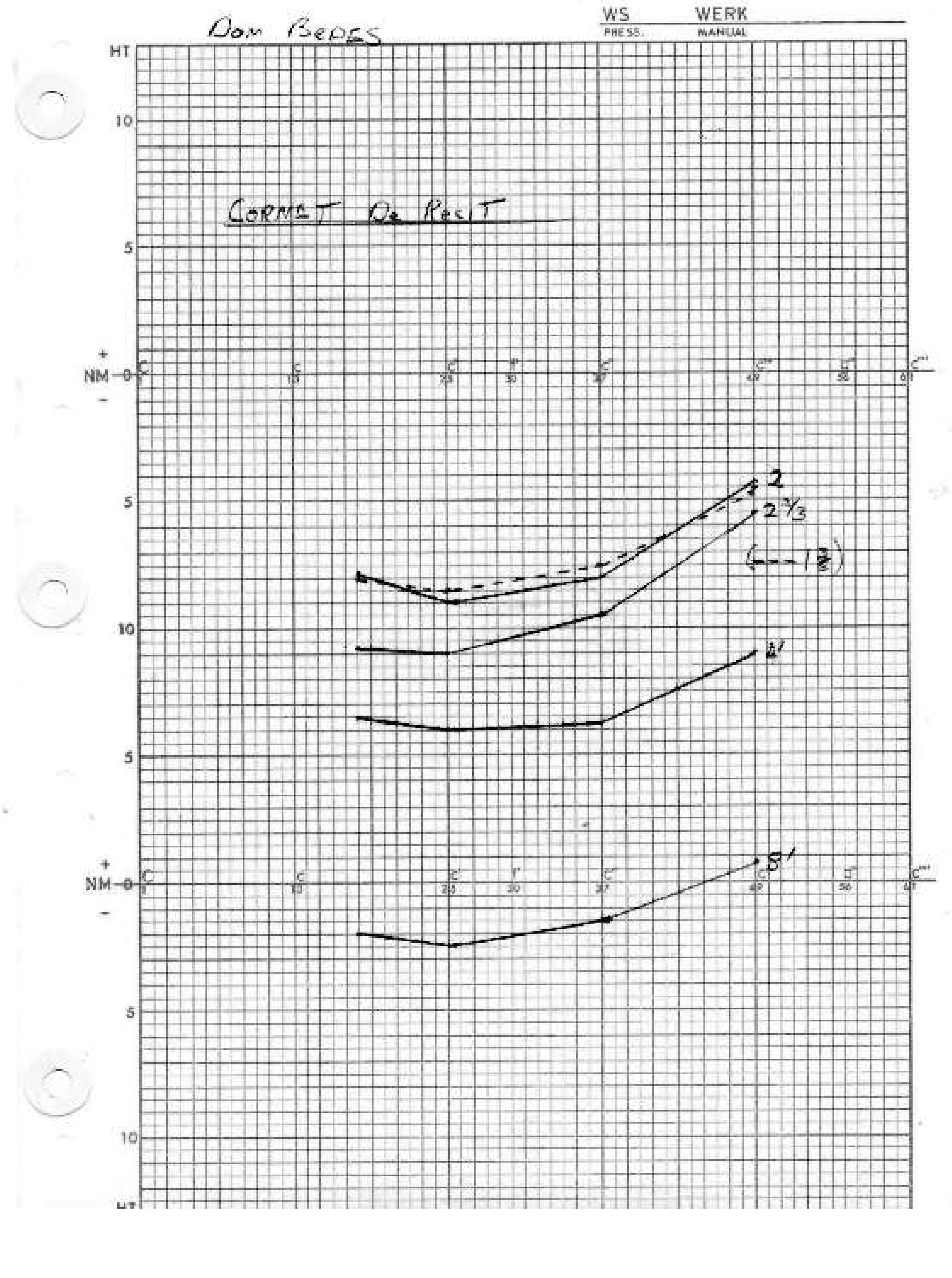

WS
PRESS.
WERK
MANUAL
Dome Bedes
Gedackt 8
HT
10
5
+
NM
0
16' Gedackt
32' Gedackt
10
5
+
NM
0
−
5
10
HT


Dom Bedos
WS
PRESS.
WERK
MANUAL
HT
NM
Nasat 2 2/3 (wide)
Nasat 2 2/3 (Narrow)
Tierce 3/5
Nasat 2 2/3 (Tapered) wide
Nasat 2 2/3 (Tapered) Narrow
Top
Top



Dom Bedos
WS
PRESS.
MANUAL
Quarte 2'
#15 Larigot 1 1/3
Quarte 2' wide
HT
10
5
NM-0
Flute 4'
(Basse de Viole)
Tierce 1 3/5 Wide
Tierce 1 3/5 Narrow
Plein Jeu 2'
Plein Jeu 4'


Dom Bedes
WS
PRESS.
WERK
MANUAL
GRAND CORNET
2'
2 2/3'
(--- 1 3/5')
4'
8'
NM
C
13
25
30
37
49
56
61


Dom Bedes
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8'

Aristide Cavaille-Coll

Cavaille-Coll

By 1800, French organ building had been stagnating for over a century. Rigid organ building traditions mandated how a French organ must sound and be built. The only change in a century, was that reeds got louder. The typical French organ had gentle Principals with a mild bass and fluty treble. It had good Bourdons, wonderful mutations and Cornets, powerful reeds and almost no pedal. Composition for the instrument was also stagnated.

The French Revolution *(1790-1800)* resulted in the suppression of the church and destruction of many baroque and classical French organs. By the time organ building revived, France had missed the beginning of the romantic organ building period. Very few organs were built during the early 1800s.

Cavaillé-Coll *(1811-1899)* descended from a family of organ builders and was a talented protégé of his father Dominique, a well-known builder of Languedoc. Languedoc was near Spain, where an organbuilder could survive, away from the Paris chaos of the revolution. When organ building started to recover in France, the Cavaillé-Colls moved to Paris in 1833 to take advantage of the rebuilding. But organbuilding tradition had been broken. Cavaillé-Coll transformed French organ building by creating a new style of organ, his French symphonic organ.

Aristide Cavaillé-Coll had the reputation of being the most distinguished organ builder of the 19th century. He pioneered innovations in the art and science of organ building that permeated the profession and influenced the course of organ building, composing and improvising through the early 20th century.

He wrote scientific journal articles about the organ construction details, and published the results of his research and experiments. His most famous organs were built in Paris:

- Saint-Denis Basilica (1841)
- Église de la Madeleine
- Sainte-Clotilde Basilica (1859)
- Saint-Sulpice church (his largest instrument; behind the classical façade)
- Notre-Dame Cathedral *(behind the classical façade, while preserving Clicquot's reeds)*
- Baron Albert de L'Espée's residence in Biarritz *(moved finally to the Sacré-Cœur Basilica)*.

A Brief History of the Organ

The early organ was a blockwerk; a big mixture of principal pipes: 8', 4', 3', 2', 1-1/3', 1'. 2/3'… that all spoke together. This chorus of harmonics gave the organ a big organo pleno sound. The next innovation was to give each rank of the blockwerk an on-off switch *(a way to Stop it)*, so the power of the chorus could be adjusted by adding or stopping various harmonics.

Bourdons were added to strengthen the fundamental, and some solo voices, like trumpets were added. Finally, the Flemish invented a chorus of fat principals, which was found to be very useful in making solo sounds. This became the Cornet and Cornet-decompose family.

So, the Classic organ was basically principal choruses on several manuals, which could be varied in loudness or tone by adding harmonically related principals, Bourdons at 8' and 4', some solo reeds, and in French speaking areas, Cornet stuff.

By the Romantic music period, organists and organbuilders were looking to the orchestra for inspiration. Just as the orchestra was made up of a variety of disparate instruments, with different tones and effect, organists similarly wanted organs with a variety of 8' stops of varying power, tone and effect. They might have a few 4' stops, or even a 2', but they were just for reinforcing the 8' ranks, not for building a Classical chorus. No need for mixtures or mutations. And, of course, there were lots of solo reeds.

The Romantic Organ

The Romantic period in music, roughly spanning from 1825 to 1900, is characterized by a focus on emotional expression, individualistic styles, and a departure from the strict forms of the Classical period. Composers during this era aimed to evoke strong feelings in their music, often through dramatic harmonies, soaring melodies, and programmatic works inspired by literature, art, and nature.

The Romantic organ is almost any instrument built in, and inspired by the Romantic period.

Music in the church changed, influenced by changes in the secular musical world. The organ also changed, to accommodate those interests. Louder unison tone became available to better accompany massed singers *(hymn singing had become popular)*. There became a focus on foundational tone, solo voices, and substantial string choruses and celestes. There was a new interest in playing orchestral transcriptions. There was a development of imitative stops and a move to equal temperament.

The organ was also going through technological improvements. Récit Expressif *(Swell)* became an important division, and swell boxes improved their dynamic range. Seamless dynamic expression by adding and subtracting stops with or without the swell pedal. Better wind supply, regulation and storage provided more wind, allowing larger organs. These organs could support bigger, wind-hogging pipes, and more of them simultaneously.

English, French and German organs of the period, each had their own characteristics and repertoire, but they were still Romantic organs. There are a couple of sub-groups of romantic organs:

The Orchestral Organ, as championed by E. M. Skinner, built to play orchestral transcriptions with special stops invented to imitate orchestral instruments.

The Theatre *(Wurlitzer)* Organ was an extreme instrument, not intended for the church. It was installed in theaters to perform popular music concerts, dances and accompany silent movies. It used extreme wind pressures, scales and voicing, loud imitative stops and accessories such as piano, chimes, drums, bells and whistles.

The Symphonic Organ, as created by Cavaillé-Coll, had its own unique sound, was played with a symphonic performance style, and had its own native repertoire *(Charles-Marie Widor, Louis Vierne, Marcel Dupré, Maurice Duruflé, Jehan Alain, Charles Tournemire, Jeanne Demessieux, César Franck, Félix-Alexandre Guilmant, Olivier Messiaen, Jehan Alain)*.

When talking about organs, you shouldn't apply much meaning to the terms "symphonic" and "orchestral"; they are just labels applied by the builders, themselves. But when symphonic is applied to a real orchestra, it has a technical meaning defining size, instrumentation and repertoire.

The Symphonic Organ

The Cavaillé-Coll Symphonic Organ had all the same attributes as the other Romantic organs. But it also had a number of unique design elements that set it apart from other Romantic organs, and profoundly affected how and what it wanted to play.

It was a wonderful organ for doing what it was designed for. But like any specialist, those same symphonic characteristics meant it functioned poorly playing other styles, like Bach. *(Just as a Lamborghini is a terrible car, if you have a lot of luggage)*. Yes, you can play Bach on a Cavaillé-Coll, you can also play Bach on bagpipes. But why would you, when you've got Franck?

Cavaillé-Coll's symphonic organ was a new type of organ, where everything blended with everything, and was able to follow both smooth and immediate dynamic changes like a symphonic orchestra. The French repertoire contains innumerable organ symphonies *(rather than orchestral transcriptions)*, for which the C-C organ is perfectly suited. He did this by several innovations:

- Unique Principals - by adapting specialized scales with huge treble scales.
- Strings - voicing innovations so strings became prompt, bold and effective.
- Harmonic Flutes - he invented them!
- Barker lever - which allowed much bigger organs.
- Use of ventils to preregister sudden dynamic changes.
- More 8' stops and fewer upperwork stops.
- C-C organs inspired new repertoire exploiting the symphonic organ's resources.
- Scales, voicing and specification so you can balance a full orchestra, or fill a cathedral, without sounding overblown or raucous.
- Dynamic swell box

Principals

By adapting German logarithmic scaling methods, he was able to get an even tone and regulation across the compass of each stop, that the classic French Montre couldn't do. This allowed him to build choruses that were much more powerful and balanced, but with a strong treble ascendancy. He often used scales that grew in size, into the treble, giving his unique loud, fluty *(almost cornet)* treble.

Strings

Strings had been around for a long time. But they tended to be weak, slow, stringy Dulciana-like stops. By applying new voicing techniques and mouth appliances like open windways and higher cutups, freins harmoniques, beards and rollers, and by slotting the pipe tops, Cavaillé-Coll was able to obtain bold, prompt speech from string pipes.

Harmonic Flutes

Harmonic Trumpets had been around for a long time. Cavaillé-Coll knew that if you attached an 8' resonator onto a 4' trumpet, you got a 4' trumpet that was powerful and richer sounding. That was because the 4' Harmonic Pipe had the harmonic series of overtones of an 8' pipe *(but without the 8' fundamental)*.

Cavaillé-Coll reasoned he could get more power out of a Principal pipe if he could make it harmonic. So, he took a principal pipe and drilled a hole in the center of the resonator. That put a leak at the node of the fundamental harmonic, destroying it. That gave him a pipe with an 8' diameter, 8' cutup, 8' toe hole and wind, and an 8' harmonic series. It had a bold, powerful ascendant 4' tone, if somewhat breathy and fluty; almost cornet-like. It was perfect for filling huge, reverberant stone churches.

Please understand, Cavaillé-Coll wasn't trying to invent an Orchestral Flute. He was trying to make a super-principal *(to be clear they sound fluty, not like diapasons!)* that could fill those huge, stone French churches. And he got it. For practical reasons of cost and space, only the treble was harmonic. He developed a special scale that was normal principal scale at bottom C, but rapidly grew to an octave larger by the time it became harmonic, then kept growing to the top of the keyboard. Indeed, it was actually a compound scale which grew faster in the bass, and slower in the harmonic section.

Barker Levers

Cavaillé-Coll was building larger organs with more 8' stops. That demanded more wind and bigger key valves, which made the key touch uncomfortably heavy. An Englishman, Charles Barker had invented a servo-motor machine that used the organ's wind to inflate little bellows to pull on the trackers. This lightened the touch of the keys and made big organs possible.

The Ventil System

The ventils allowed the player to bring in various sections of the organ *en masse*, rather like a conductor cueing, for example, the brass section of the orchestra.

More 8’ Stops

Cavaillé-Coll built a new type of organ. He wasn’t interested in building choruses and polyphony. He was interested in colourful solo stops playing melodies over varied layers of 8’ tonal masses.

Classical organists used “economy of registration”. They would only use one 8' stop. If they needed it louder, they would substitute a louder 8' stop, or perhaps add a 4' stop *(This was partly because of a shortage of wind, partly so not to obscure the polyphony)*. But the Romantist organist used handfuls of 8' stops.

The Classical organ got louder by adding harmonics: 4', 2-2/3', 2', Mixtures, and there was bump every time something was added *(terraced dynamics)*. The Romantic organ varied its power by adding louder unison stops to softer ones, and by using the new Swell box, giving the sought-for smooth buildup of dynamics.

The Romantic organ used unison stops of different loudnesses: Dulciana, Melodia, Open, respectively: soft medium, and loud. But the Cavallé-Coll unisons were different. His Montre 8', Flûte harmonique 8', Bourdon 8', Gamba 8', and even Oboe were all scaled and voiced to work seamlessly together.

Stops could be mixed and matched together and the union blended, while colouring each other. They were all of similar dynamics and character, and played well together *(just like the disparate instruments of the orchestra)*. Many romantic pipe organs have a problem of blend between the various stops, and yet orchestras, with their wildly different shapes and sounds of instruments, don’t seem to have a problem with blend. C-C doesn’t have a problem with blend either…

Of course, many organs were and are hybrids of Classical and Romantic ideas.

Dynamic swell box

The Récit *(swell)* in a Cavaillé-Coll organ was a large division encased in a large swell box. The box had thick walls and shutters, and had a large dynamic *(soft-loud)* range, particularly big Récit reeds.

Treble Ascendency

Cavaillé-Coll organs grow dramatically in loudness towards the treble. This is partly to compensate for Classical French Mixtures, which stay at one tessitura throughout the keyboard, so you lack a sense of rising from the Mixtures as you play into the treble. Cavaillé-Coll’s Progressive Harmonics mixture may have been an attempt to improve treble ascendancy by eliminating breaks. Also, huge reverberant churches required a loud treble to fill them.

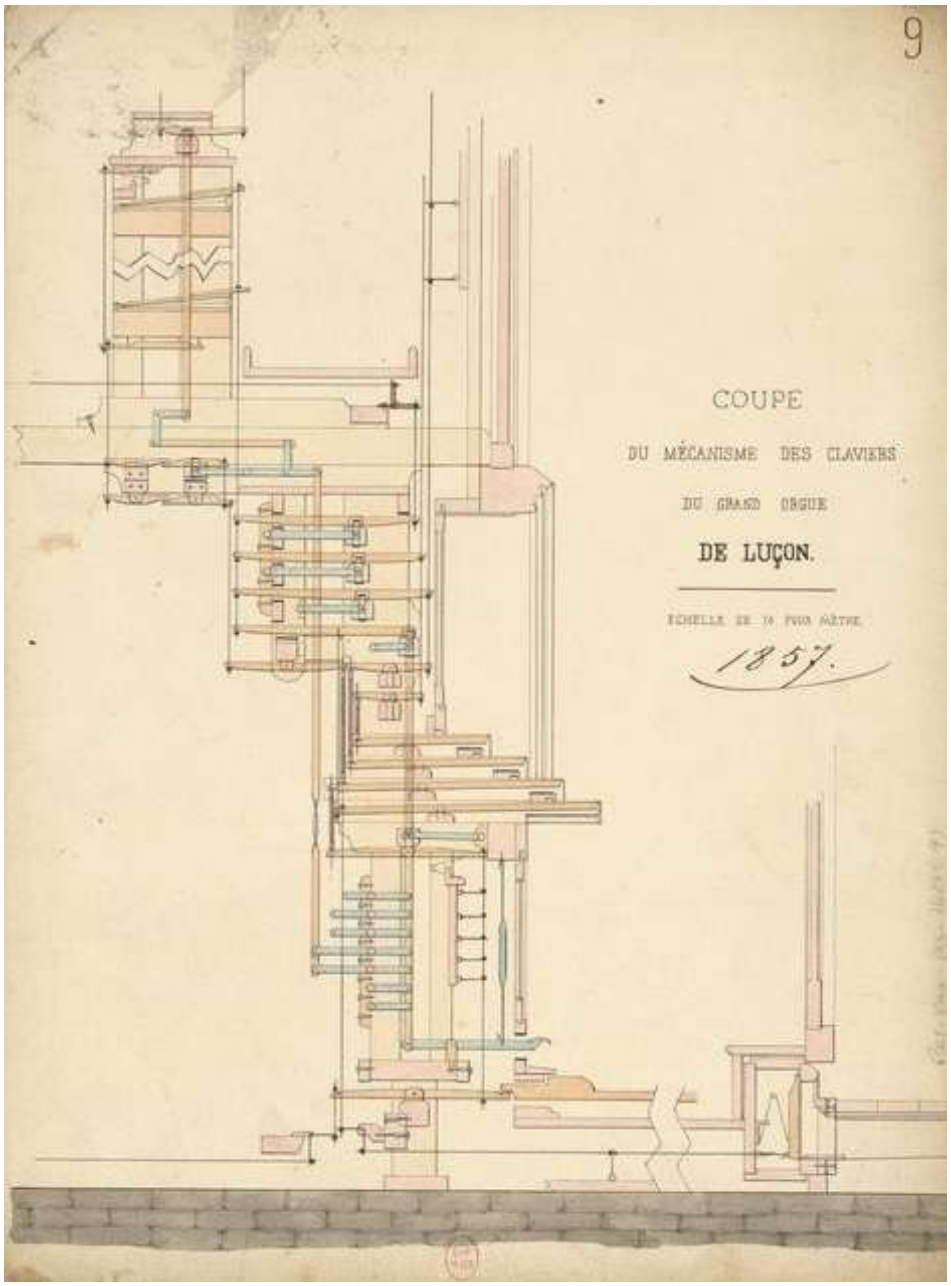
French and English organs are very different- Jérémy Gauthier

In English organs sounds are based on diapasons pushed at maximum sound, delicate and very straight strings -reeds also very delicate and blends very well with the almost pipes -all pipes blends in great unity -there are more mixtures and acute sounds -the sound is more directed -the sound is never very colored compared to French organ, but it is more solemn -English pipes are very straight.

In French organs: - sound based on “principaux” (one or two “montre” (front of the organ an one diapason at swell) also, but we have like 2 or 3 times les of theses pipes compared to English organs, and more flutes -We don’t have open pipe of flutes, only stopped or harmonic -when we activate reeds we heard it a lot, it is very loud -romantic organ is near symphonic, and these organs imitate orchestras. We search a unified sound also, but more rich and diversified -the French style is maybe less solemn and the sounds are more near like the harmonium, but no less impressive and beautiful -pipes are larger.

There are different systems of wind in the organ, for different pressures. Acute pipe and reeds need more pressure to sound with the right power -The great majority of French organs are in tracker action, even big organs. French organists didn't like the pneumatic action very much in the past and even today -the system of harmonisation of pipes is different, here we have the "entaille de timbre." To see what I say, see the tour of the sounds of the:

- C-C organ of Saint Sernin: https://www.youtube.com/watch?v=vlvWqZgdtyU
- Willis organ of Lincoln: https://www.youtube.com/watch?v=dSucBIqDlq8



Cavaillé-Coll's Four Fonds - by Stephen Bicknell

I have had several requests for some kind of description of how the four typical flue foundation stops of a Cavaillé-Coll organ actually work in practice. Here goes!

First, I would like to affirm that the effect is quite unlike four stops of similar type on organs made in other styles. Very few English or American romantic organs have the necessary qualities. To take an extreme example, in a vintage Harrison & Harrison one diapason might be audible when added to the Open II, but as the latter is likely to be of geigen *(moderately keen)* quality and slow in speech, and the Stopped diapason quick and dull, the blend will not be perfect. The Claribel will be very full and pure and will swamp the Open II or Stopped diapason; the Open I will be large and foundational with a strong bass, and will swamp the lot. It's oil and water - no wonder George Dixon, the leading exponent of the 'Imperial' style of organ design, recommended that diapasons and flutes should never be drawn together.

Cavaillé-Coll never built an organ of soft stops and loud stops, but maintained his own personal version of classical balance between the ranks throughout his career. However, there are several aspects of his style which make his recipe peculiarly effective and interesting.

The Montre 8', Flûte harmonique 8', and Bourdon 8' are the invariable components of the sauce; variety, from instrument to instrument, comes from different scalings and progressions and the addition to the trio of a Viole de Gambe, Violoncelle, or Salicional.

Firstly, there is a uniformity in the style of voicing between these various ranks. This stems partly from the fact that Cavaillé-Coll stuck to rather 'quick' speech (a voicer's term referring to the fact that the languid is set low). This is inclined to make the pipes slightly dull in tone, allowing the nicking to be light and on the face of the languid only. Good articulation is preserved in all ranks. Though this articulation hardly amounts to an audible chiff, the Montre will speak with a trace of the octave (the basses are often made without ears, a fact which forces the speech to be set quick), the Flûte harmonique will speak with a trace of the sub-octave, and the Bourdon will speak with a trace of the octave quint (2 2/3'). The string rank will start with a characteristic 'dzzzh' consonant (if you know Russian you will know what I mean!).

Notice that we are already encountering effects of great variety and complexity. This is accentuated by the fact that each rank embodies trace elements which are related to its neighbours. The Montre will be fluty on account of generous scale, quick speech, and the unfocussed effect of having no ears, but an element of string tone may be present if the pipes are slotted. The Flûte harmonique is not an orchestral flute (although it passes well as such in the correct register); it is actually a harmonic partner to the Montre, a principal stop of large scale and double length. It has an open wooden bass of full but horny tone (modest scale, slotted, the flue cut in the block not the cap), with the harmonic section starting around middle f. The harmonic pipes have the virtue of speaking with the harmonic build-up of a true 16' register, adding the faintest trace of 'sub' tone to the entire mix (there are 5 1/3' and 3 1/5' components which only a harmonic stop can provide). Cavaillé-Coll was obsessed with melodic strength: Montre and Flûte harmonique together are designed to provide this. The bass of the Montre is likely to be gentle in power, the treble harder, brighter and louder. The Flûte harmonique fills out the bass, adds power to the treble, and gives a distinct colour to both the speech and continuation tone.

The remaining two stops are the lesser partners to this major pair. Bourdon and string together give the 'Fonds Doux' (doux = soft, sweet), in gentle imitation of their senior brethren. The combination of the two usually sounds so like a lesser principal rank as to make the provision of a small open diapason completely unnecessary (just as the combination of Montre and Flûte harmonique makes the provision of a large open diapason completely unnecessary). Indeed in some Cavaillé-Coll recit divisions the 4' ranks are Viole 4' and Flûte octaviante 4', together sounding uncannily like a single rank of 4' principals.

The string rank will add a trace of colour to either the Montre or the Flûte harmonique, but normally neither it nor the Bourdon are quite strong enough on their own to add appreciably to the Montre and Flûte harmonique (though the Bourdon thickens the sauce very slightly). But, together, the string and Bourdon are strong enough to balance either of the senior ranks on their own or to make a significant background colour in the four-rank ensemble.

The bass to treble balance of all four is that familiar from an English or American string stop, but contrasting with romantic techniques in the English-speaking world, there is no attempt whatever to make the basses of the principals or flutes loud enough to be heard in major combinations. The bass of the Montre will support the treble of the Montre, but the bass of the chorus with mixtures is held up by the bass of the upperwork as much as by the bass of the Montre itself, and in full organ the necessary underpinning is provided by the reeds and by the independent (but mild) pedal fluework. In the *fonds* the abiding impression is of a gentle, unfocussed but full bass with a very strong melodic impetus in the treble. The bass-treble crescendo is often carried to lengths that the English speaking world would believe impossible: the montres are to varied scales but sometimes the halving is as slow as the nineteenth or twentieth note.

Finally, a lot of the success of the recipe is related to the precise nature of the voicing and the speed of speech. These are characterful, articulate voices, but without any trace of neo-classical huskiness, breathiness, windiness, or chiff. Please note that is a style of voicing which cannot easily be imitated on elecro-pneumatic actions where the pallet opens much faster and the speech of the pipes has to be set slow.

Another school of organ building which can show something like this is that practiced in the Netherlands in the late eighteenth and early nineteenth centuries, where a similar effect is obtained from the three typical foundation ranks of Prestant (narrow bass but cut up high), Baarpijp (stringy spitz flute) and Holpijp (fat chimney flute). It is perhaps no coincidence that Cavaillé-Coll admired the organs of Bätz, where the mélange also includes a full organ with mixtures, cornets and batteries of reeds 16', 8' and 4' (fine examples survive at Utrecht Cathedral, at the Lutheran Church in the Hague, and elsewhere).

As you can see the picture is complex and fascinating: there is more detail in these four typical Cavaillé-Coll stops than you will find in an entire organ by a less inspired builder. References to cooking have peppered this description: to extend the likeness further it would be no exaggeration to say that the Cavaillé-Coll *jeux de fon*ds make the *roux* on which every registrational dish is based.

The End - Bicknell

Voicing and Tonal finishing on site

The pipework was extensively prevoiced to standard cutup charts; cutups were not normally changed during finishing. On-site finishing was indeed given pride of place in Cavaillé-Coll's scheme of things, but it was not always done by the man himself. Indeed, in the second half of his career the finishers became well-known artists in their own right *(the brothers Felix and Gabriel Reinburg and Frederic Prince among them)*.

Some French connoisseurs claim to be able to distinguish the styles of these individuals, and the variety of tone and balance between one Cavaillé-Coll and another is slightly greater than with other 19th century factory builders. The vital thing is that it was the site finishing that determined the exact balance between each rank and between bass and treble, where in most contemporary firms these aspects were a matter of policy handed down from on high.

Récit (Swell Organ)

- The swell box was kept as small as possible:
- open basses *(flutes, sometimes Gambas)* were located outside box
- Bourdon Basses inside, but very narrow.
- rarely a 16' Récit Bombarde.
- Harmonic Flutes 8', 4', 2'
- Bourdon á cheminee 8'
- solo stops: Vox Humana, Trompette, Basson/Hautbois
- Gamba & Voix Celeste introduced later

Essential Recit

8' Flûte Traversiere
8' Bourdon
8' Viole de Gambe
8' Voix Celeste
4' Flûte Octaviante
2' Octavin
8' Trompette
8' Basson-Hautbois
8' Voix Humaine

Other Details

- Always on slider chests, multiple pallets in the bass.
- Reed ventils provided less pluck when off
- Cor de nuit: small scale, mildly quinty-sounding Gedackt w/o chimney
- Large bass pipes were often offset, sometimes with motors providing fresh direct wind
- Mixtures could be Classical French or Cavaillé-Coll “Harmonics”
- Lowest wind pressures were for the pedal
- Sometimes multiple pressures for the windchests, with higher pressure from g32.

Trumpets

The big trumpets 16', 8', 4' were on the Great, not the Swell. The Grand Orgue 2-2/3' Quinte and 2' Doublette are principal tone, placed on the reeds pallet box. Cavaillé-Coll Mixtures are sometimes the Classical Plein-Jeu and sometimes the Cavaille-Coll progressive “Harmonics.”

Werner Lamm - One of the main differences is the trumpet 8' in the Swell organ. (Trompette harmonique). It’s the backbone with coupled manuals (*Jeux de fonds* in Great and Positive). German late 19th Organs often only have an oboe but not a trumpet on the 3rd Manual.

Tableau Synoptique des diamètres des tuyaux de divers dimensions.

Designation.	N° du Diapason	Progression	C 8p.	F 5 1/3	C 4p	F 2 2/3	C 2p	F 1 1/3	C 1	F 2/3	C 1/2
Montre gr. t.	1	8	152	121	90	71	53	45	32	27	
Montre my. t	2	8	133	106	78	62	47	44	28	23	
Montre men. t.	3	8	115	92	68	55	40	34	24	20	
Salicional grt.	id.	8	115	92	68	55	40	34	24	20	
Salicional grt	4	7 1/2	115	94	70	57	42	34	26	21	
Salicional my. t	5	7 1/2	102	83	62	50	37	30	23	18	
Salicional men. t.	6	7 1/2	90	73	55	44	33	27	20	16	
Gambe gr. t.	id.	7 1/2	90	73	55	44	33	27	20	16	
Gambe gr. t.	7	7	90	74	56	45	34	28	21	17	
Gambe my. t.	8	7	80	65	50	40	31	25	19	15	
Gambe men. t	9	7	71	57	44	35	27	22	17	13	
Viole d'amour gr. t	10	6 1/2	71	59	45	36	28	23	18	14	
Viole d'amour my. t	11	6 1/2	63	52	40	33	24	20	15	13	
Viole d'amour me. t	12	6 1/2	57	47	35	29	22	18	13	11	
Gambe gr. t	13	6	"	"	57	48	36	31	23	20?	
Gambe my. t	14	6	"	"	51	42	32	27	20	14?	
Gambe me. t	15	6	"	"	46	38	29	25	18	16	
Voix céleste Réc. or.	16	6 1/2	81	6x7	51	41	32	26	19	16	
Viole Recit moy. t.	17 #10	6 1/2	"	"	45	38	28	23	18	14	
Viole me. t	18 #11	6 1/2	"	"	40	33	25	20	15	12	
Flûte gr. t. pédale	Z	7	"	"	107	87	60	54	41	33	
Prestant gr t	A	7	"	"	91	74	56	46	35	28	
Prestant my. t	B	7	"	"	80	65	50	40	31	25	
Prestant me. t	C	7	"	"	71	58	44	35	27	22	
Dulciane gr. t	D	6 1/2	"	"	71	59	45	36	28	23	
Dulciane my. t	E	6 1/2	"	"	63	52	40	33	24	20	
Dulciane men. t	F	6 1/2	"	"	57	47	35	29	22	18	

This is implicit in the "progression" 12.86

?? or 4' stops!

These dittos mean that the bass is the same for the corresponding stop above, not the Viole d'Amour.

C.B →

This must be just the "house designation" for the scale stick.

Cavaillé Coll Scales

Cavaillé-Coll was proud to show off the beautifully engineered blueprints of his organs. He also published essays about things like calculating organ pipe lengths to have the correct speaking length, and computing bellows size and winding requirements. However, his scaling was kept secret.

Coincidentally(?), Cavaille-Coll's Montre #1 standard scale is almost identical to Topfer's "Ideal Open Diapason"…

Fortunately, his *Shop Notes* still exist and can be downloaded as a PDF from the Oberlin College Library. Also, photocopies of his *Shop Notes (1850-1878)* have been floating around for decades. It contains summaries of organ prices, pipe scales, mixture compositions, pitch/vibration calculations, and notes on bellows. An example of it is shown on my previous page, and you can download the PDF of it from my website. By examining it we can figure out a number of things:

1 – Standard House Scale Numbers (*No. du Diapason*)

Almost every Stop was available in three sizes. The stops and sizes were individually assigned their own number from #1-18, or a letter from A to F, which probably referred to a pipe shop scale stick. These were referred to as "*No. du Diapason*" for identification purposes.

Some families of stops were assigned their own *No. du Diapason* series. For example, the Harmonic Flutes have their own series of #1-6.

2- Designation

This was the name of the stop, *(i.e. Gambe, Flûte)*. So a stop would be identified by its Designation and No. du Diapason, (e.g. Montre #2).

3 – Three Sizes (gr., moy, me)

Each stop was available in three sizes: gr., moy, me *(greatest, middle, small)*. Each size was 3 pipes, or halftones, smaller than the next.

4 – Halving Ratio (Progression)

The French traditionally described their scales by giving the size of the first (C1) and last pipe (c49), four octaves. Cavaillé-Coll did it similarly, but with a couple of differences:

1) He still specified the size of the biggest pipe by its diameter in millimeters. But he expressed the size of the smallest pipe c49, as a fraction of the bottom C. In other words, *Progression* is the ratio of size between the first and last pipe. It's a different way of expressing the halving ratio. Progression #8 is the same as Töpfer's 17th Halving. An example:

- Progression 7, C1 dia of 77 mm, so 77 mm/7 prg = 11 mm for top c49

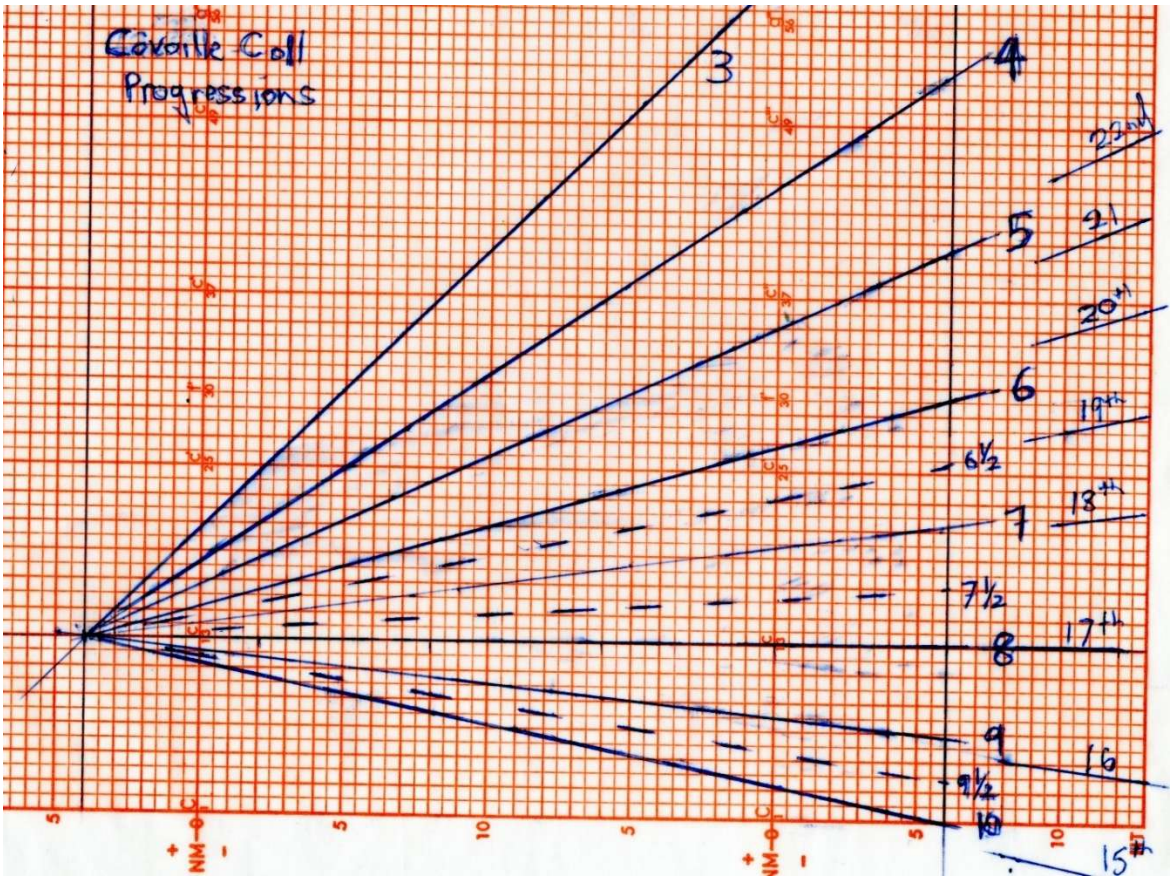
2) His second innovation was how he found the remaining notes #2-48. Traditionally it would have been laid out on a graph derived from a pipemaker's pipe length stick. But, Cavaillé-Coll hired a mathematician to calculate all his intervening pipes logarithmically, providing Töpfer-like scales. This was his big secret.

But why 49 notes? Didn't he build 56, 58, or 61 note keyboards? Perhaps, but don't forget that Cavaillé-Coll was born in 1811, and he took over his father's shop. Scales had been calculated on a four-octave keyboard for centuries, and his new system was just a refinement of that tradition. His mathematician could easily calculate the missing top notes.

Note: I made no adjustments to the scales to account for C-Coll's pitch at A-870.

Progressions

Cavaillé-Coll progressions are shown in the following Töpfer Normalmensur chart, starting with progression #3 at the top and #10 at the bottom. On the right side of the graph, I've shown Töpfer halving ratios. You can see how C-C progression #8 is the same as Töpfer's halving on the 17th pipe.



Some Notes about C-C Scales

- Montres A, B, C are probably a newer revision of Montres 1, 2, 3.
- Bourdon H, Y, X are probably a newer revision of A, B, C, and "bis" means a revised scale.
- Quinte 2-2/3', Doublette 2', and Mixtures have the same scale and progression.
- Mouth width is typically ¼, of the circumference, but others are possible.
- Cutups are strictly done in the factory to standard charts, and seldom revised in the church.
- The most common cutup Progression was 7.5.
- Harmonic Flute *1bis, 2 bis, 3 bis* are newer revisions of H-Flute 1, 2, 3.
- He rarely changed his scale for Octavin 2' #6.
- Harmonic Flute 8' pipes #1-12 were made of wood.
- Harmonic Flutes were his big secret, and I've found misinformation published.
- The Cornet 2' and 1-3/5' scales were derived from Bourdon *H bis*, but as open pipes.
- The 4' Flute Douce was 1-12 stopped, 13-24 chimney flute, and open from c25.
- A number of these scales were not in the 1868 version of the *Shop Notes*.
- A stop named "Flûte" means it is an open pipe, not that it is necessarily fluty toned. The wooden bass of a string might be named Flûte.

Cavaille-Coll Standard Scales

Stop	Prog	Scale	Mouth	C	c^0	c^1	c^2	c^3	c^4
MONTRE 8'									
Montre gr	8	1	1/4	154.2	91.7	54.5	32.4	19.3	11.5
my		2	1/4	135.4	80.5	47.9	28.5	16.9	10.5
men		3	1/4	118.9	70.7	42	25	14.9	9.2
SALICIONAL 8'									
Salicional gr	7-1/2	4	1/4, 2/9	118.3	71.5	43.2	26.1	15.8	9.5
my		5		104.3	63	38.1	23	13.9	8.4
men		6		91.9	55.6	33.6	20.3	12.3	7.1
VIOLA de GAMBE									
Viole de Gambe gr	7	7	1/4, 2/9	92.2	56.7	34.9	21.4	13.2	8.1
my		8		81.7	50.2	30.9	19	11.7	7.2
men		9		72.3	44.5	27.3	16.8	10.3	6.4
VIOLE d'AMOUR									
Viole d'amour gr	6-1/2	10		73.2	45.8	28.7	18	11.3	7.1
my		11		65.1	40.8	25.5	16	10	6.3
men		12		57.9	36.3	22.7	14.2	8.9	5.6
GAMBE									
Gambe gr	6	13		89.4	57.1	36.5	23.3	14.9	9.5
my		14		79.9	51.1	32.6	20.9	13.3	8.5
men		15		71.5	45.7	29.2	18.6	11.9	7.6
Voix Cel rec ord gr	6-1/2	16		82.3	51.5	32.3	21.2	12.7	7.8
Viole (recit) my		17			45.8	28.7	18	11.3	7.1
Viole men		18			40.8	25.5	16	10	6.3
GAMBE (Mutin)									
Gambe 8' gr	11-1/2	13 bis		82	44	28	18	11.5	7.3
men	: 6	14 bis		71	39.3	25.1	16.1	10.3	6.6
MONTRE 8' & DULCIANE 8'									
Montre gr	6	A	1/4	145.3	92.8	59.3	37.9	24.2	15.5
my		B	1/4	129.9	83	53	33.4	21.6	13.8
men		C	1/4	116.1	74.2	47.4	30.3	19.4	12.4
Dulcane gr	6-1/2	D		116.9	73.2	45.8	28.7	18	11.3
my		E		104	65	40.8	25.5	16	10
men		F		92.5	59.9	36.3	22.7	14.2	8.9
FLUTE CREUSE									
Flute Creuse gr	6	1 bis		150.8	96.3	61.6	39.3	25.1	16.1
men		1		139.9	89.4	57.1	36.5	23.3	14.9

Stop	Prog	Scale	Mouth	C	c^0	c^1	c^2	c^3	c^4
PRESTANT 4'									
Prestant 4' gr	7	A	1/4	92.2	56.7	34.9	21.4	13.2	8.1
my		B	1/4	81.7	50.2	30.9	19	11.7	7.2
men		C	1/4	72.3	44.5	27.3	16.8	10.3	6.4
QUINTE 2-2/3'									
Quinte 2-2/3 gr	6	A	1/4	61.6	42.4	27.1	17.3	11.1	7.1
my		B	1/4	55	37.9	24.2	15.5	9.9	6.3
men		C	1/4	49.2	31.4	20.1	12.8	8.2	5.2
DOUBLETTE 2'									
Doublette 2' Ord gr	6	A	1/4	51.1	32.6	20.9	13.3	8.5	5.4
P.J. H. my		B	1/4	45.7	29.2	18.6	11.9	7.6	4.9
P.J. Ord men		C	1/4	40.8	26.1	16.7	10.7	6.8	4.4
The Doublette and Quinte have the same dimensions. They are used for mixtures.									

Stop	Prog	Scale	Mouth	C 4'	C 2'	F	$F^{\#}$	C 1'	c	c	c
HARMONIC FLUTES											
Flute Harm 8' gr	3:4	1 bis	1/4	85.2	64.7	57.7	57.8	48.6	34.4	24.3	17.2
my		2 bis	1/4	76	58	51.5	53	44.5	31.5	22.3	15.8
men		3 bis	1/4	72.6	55.2	49.2	48.6	40.9	28.9	20.4	14.4
Flute Harm 8' gr	3:5	1	1/4	85.2	64.7	57.7	56.5	46.3	30.9	20.7	13.8
men		2	1/4	76	58	51.5	51.1	41.8	28	18.7	12.5
Flute Octav 4' gr		3	1/4	72.6	55.2	49.2	51.1	41.8	28	18.7	12.5
my		4	1/4	67	51		46.3	37.8	25.3	16.8	11.3
men		5	1/4	61	46		37.8	34.2	22.9	15.3	10.2
Flute Octaviante 4	3:6	6	1/4	60.4	46.1			37.9	24.2	15.5	9.9
Octavin 2' Ordinaire	4:6	6	1/4		51.5			37.9	24.2	15.5	9.9
Harmonic split at 2' f/f#, except last two scales (3:6, 4:6) which are harmonic at 1' C.											

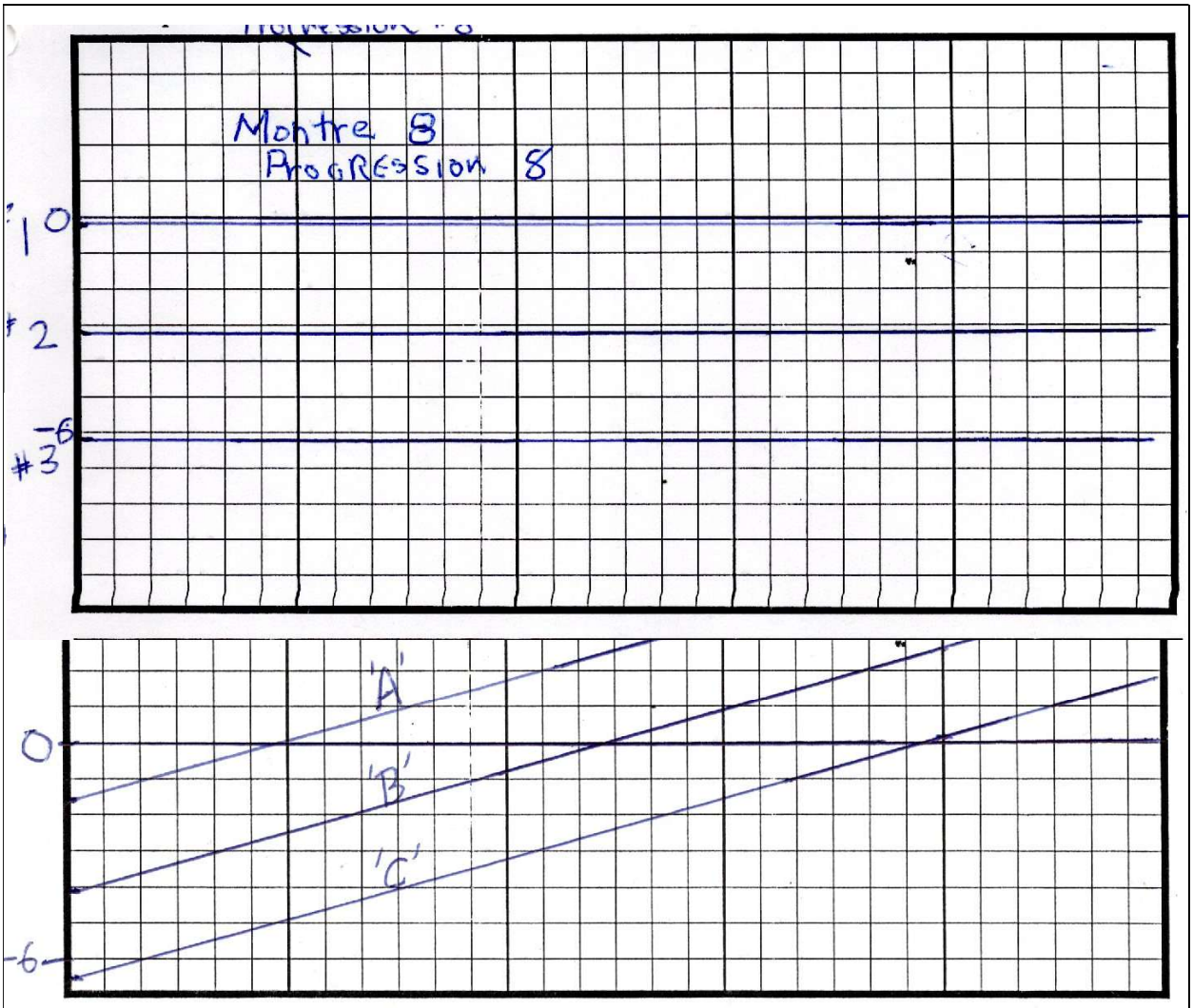
STOPPED PIPES									
Stop	Prog	Scale	Mouth	C 4'	c 2'	c 1'	c 1/2'	c 1/4'	c 1/8'
Bourdon +gr	5	H bis	1/4	84.6	56.5	37.8	25.3	16.9	
gr		H	1/4	76.5	51.1	34.2	22.9	15.3	
my		Y	1/4	69.2	46.3	30.1	20.7	13.8	
men		X	1/4	62.5	41.9	28	18.7	12.5	
Bourdon gr	6	A	1/4	79.9	51.1	32.6	20.9	13.3	8.5
my		B	1/4	71.5	45.7	29.2	18.6	11.9	7.6
min		C	1/4	63.9	40.8	26.1	16.7	10.7	6.8
Quintaton gr		D	1/4	57.1	36.5	23.3	14.9	9.5	6.1
my		E	1/4	51.1	32.6	20.9	13.2	8.5	5.4
men		F	1/4	45.7	29.2	18.6	11.9	7.6	4.9
Chimneys	(diameter x length)				15x135	9.6x62	5.7x27	4.8x20	

CORNET RANKS									
Stop	Prog	Scale	Mouth	C	c^0	c^1	c^2	c^3	c^4
Nasard 2-2/3'	4:7			63	44.5	31.5	21.4	13	8.1
Quarte 2'	5	H		51.1	34.2	22.9	15.3	10.2	
Tierce 1-3/5'	5	H bis		49.5	33.1	22.1	14.8	9.8	

MISC RANKS									
Stop	Prog	Scale	Mouth	C 16	C 8'	C 4'	C 2'	C 1'	C 1/2'
Flute 4' (Pedal)	7	Z		-		108.5	66.7	41	

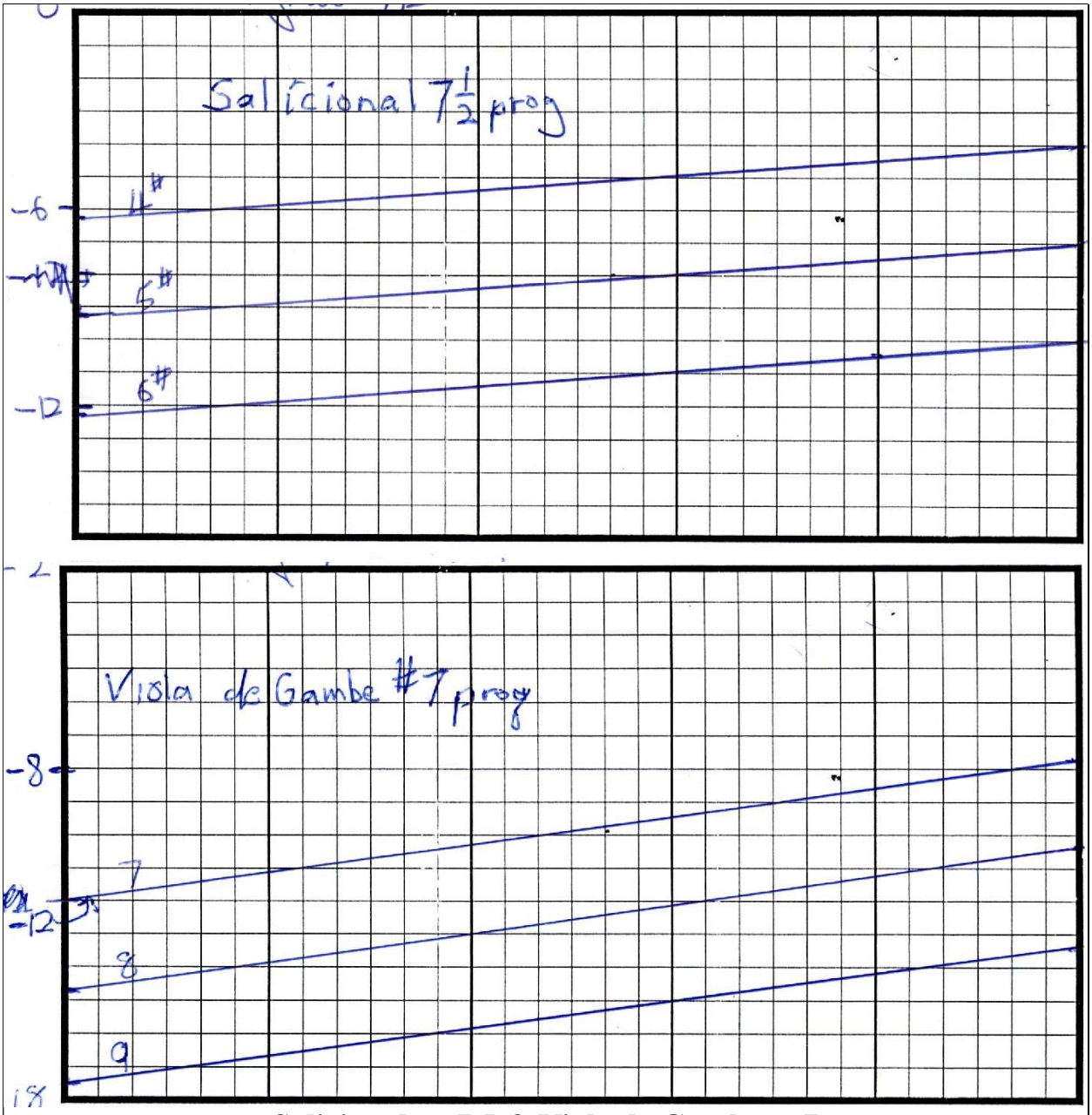
OPEN WOOD BASSES 8' (inside depths)									
Stop	Prog	Scale	Mouth	C 32	C 16'	C 8'	C 4'	C 2'	C 1'
Flutes 16' (Ped) gr	8	AA		500	300	179.5	106.5		
my		CC			275	165	98		
men		DD			253	~~105.5~~	90		
Flute 8' (Ped)		mo8				200	120	71	
Flute 8'		FA			150.5	180	107	64	
		FB				150	89	53	
	8	F0				164	98	58	
		F1				150	89	53	
		F2				132	79	47	
		F3				115	86.5	41.5	
		F4				103	63.5	39.5	
	7	F5				91	56.5	35	
		F6				81	50	31	
Flute 16' Gross scale		BB/1bis			332	204	125	77	

STOPPED WOOD FLUTES 16' (inside depths)								
Stop	Prog	Scale	Mouth	C 32'	C 16'	C 8'	C 4'	C 2'
Soubasse 32' (Ped)	7	BB		340,360?	220	135	83	
Bourdon 8' (Ped)		BBO				149	95	60.5
Bourdon 16' gr		A			200	128	81	70
my		B			179	115	73	63
men	6	C			160	102	65	56
Quintaton 16' gr		D			150	96	61	53
my		E			140	89	57	49
men		F			129	82	53	45



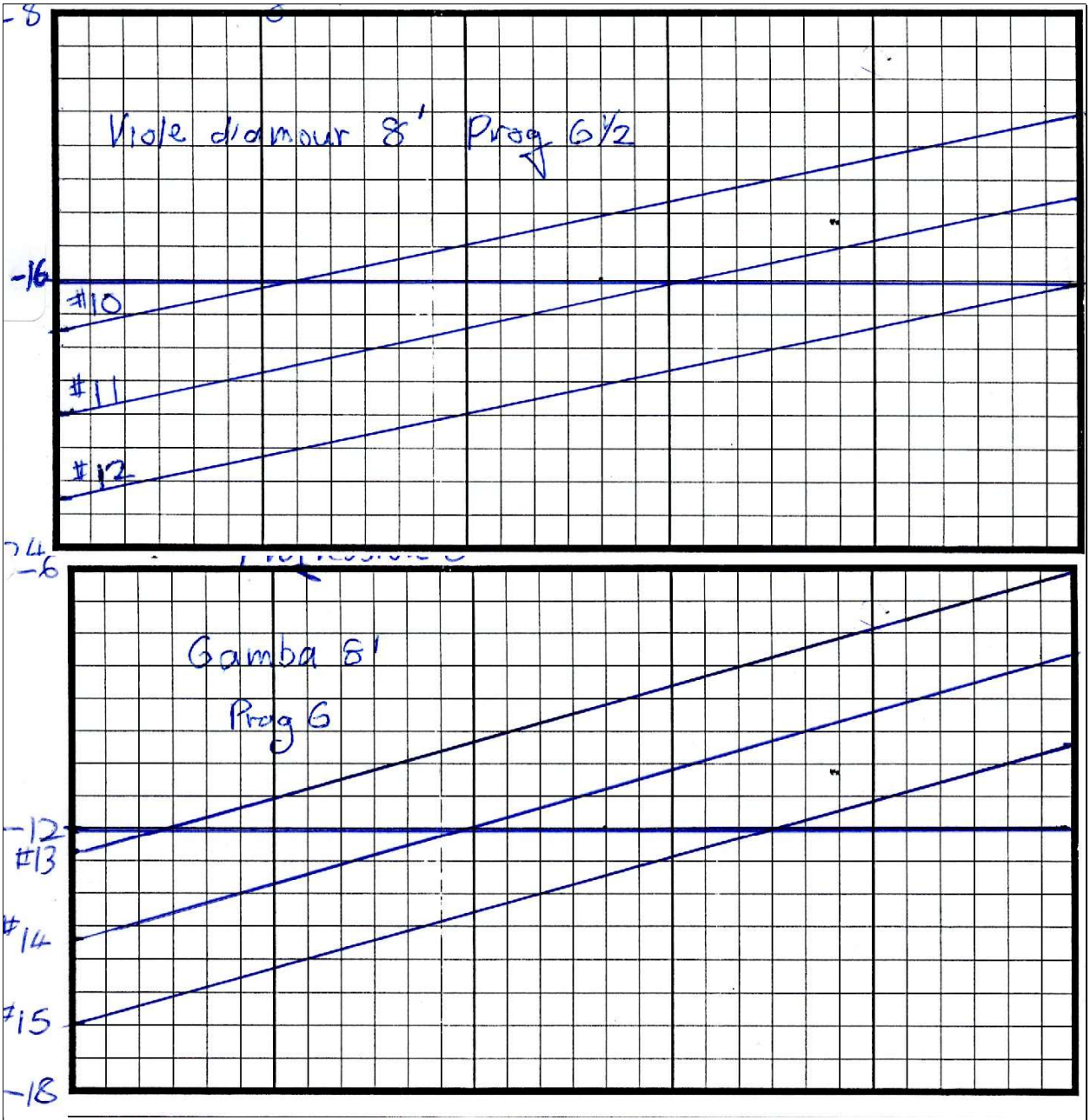
Montre

	Prog	Scale	Mouth	C1	C13	C25	C37	C49	C61
Gr	1	8	¼	154.2	91.7	54.5	32.4	19.3	11.5
My	2	8	¼	135.4	80.5	47.9	28.5	16.9	10.5
Men	3	8	¼	118.9	70.7	42	25	14.9	9.2
Gr	A	6	¼	145.5	92.8	59.3	37.9	24.2	15.5
My	B	6	¼	129.9	83	53	33.4	21.6	13.8
Men	C	6	¼	116.1	74.2	47.4	30.3	19.4	12.4



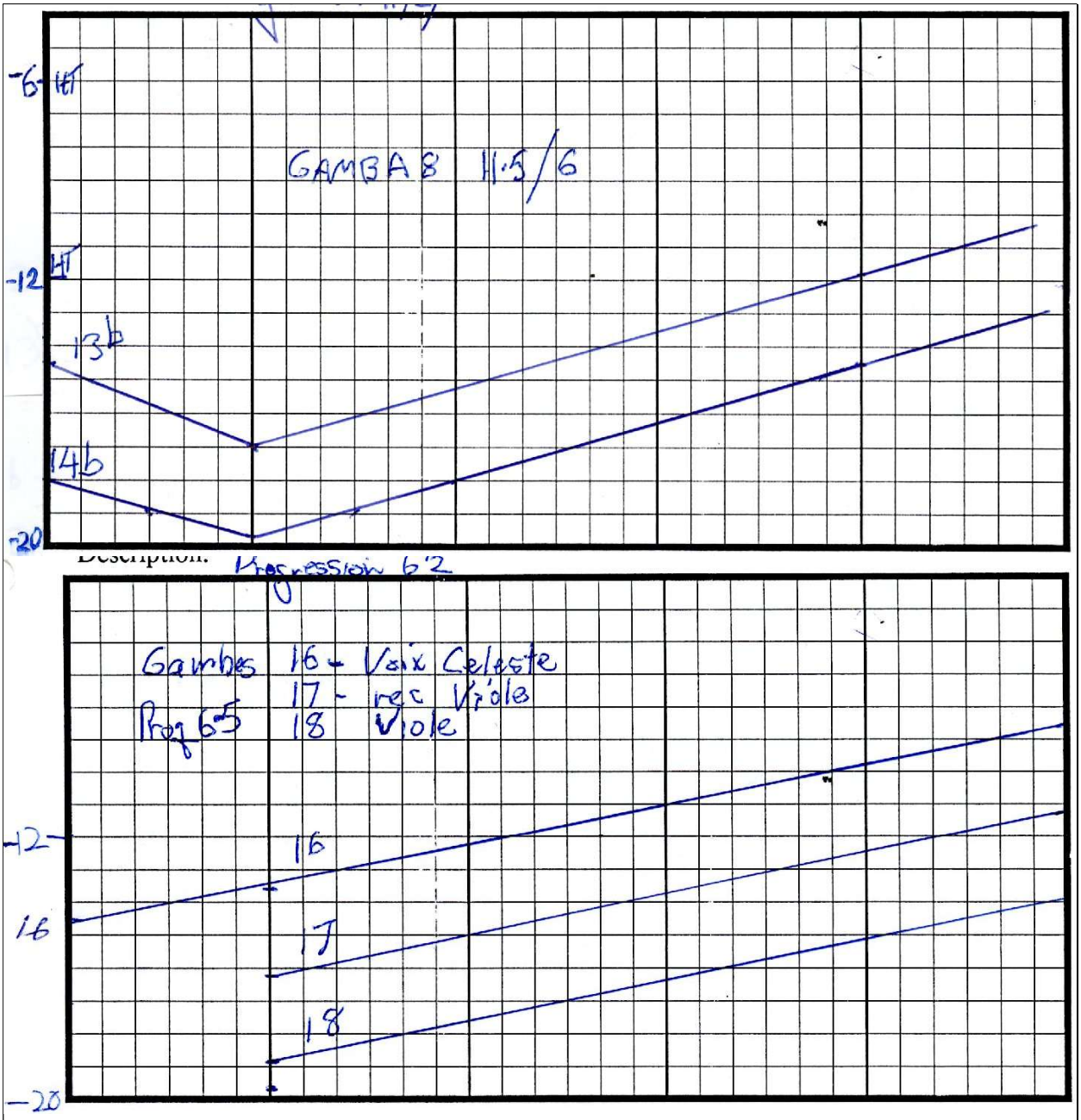
Salicional pr 7.5 & Viola de Gambe pr7

	Prog	Scale	Mouth	C1	C13	C25	C37	C49	C61
Gr	4	7 ½	1/4, 2/9	118.3	71.5	43.2	26.1	15.8	9.5
My	5	7 ½	1/4, 2/9	104.3	63	38.1	23	13.9	8.4
Men	6	7 ½	1/4, 2/9	91.9	55.6	33.6	20.3	12.3	7.1
Gr	7	7	1/4, 2/9	92.2	56.7	34.9	21.4	13.2	8.1
My	8	7	1/4, 2/9	81.7.1	50.2	30.9	19	11.7	7.2
Men	9	7	1/4, 2/9	72.3	44.5	27.3	16.8	10.3	6.4



Viole d'Amour pr6.5, Gamba pr6

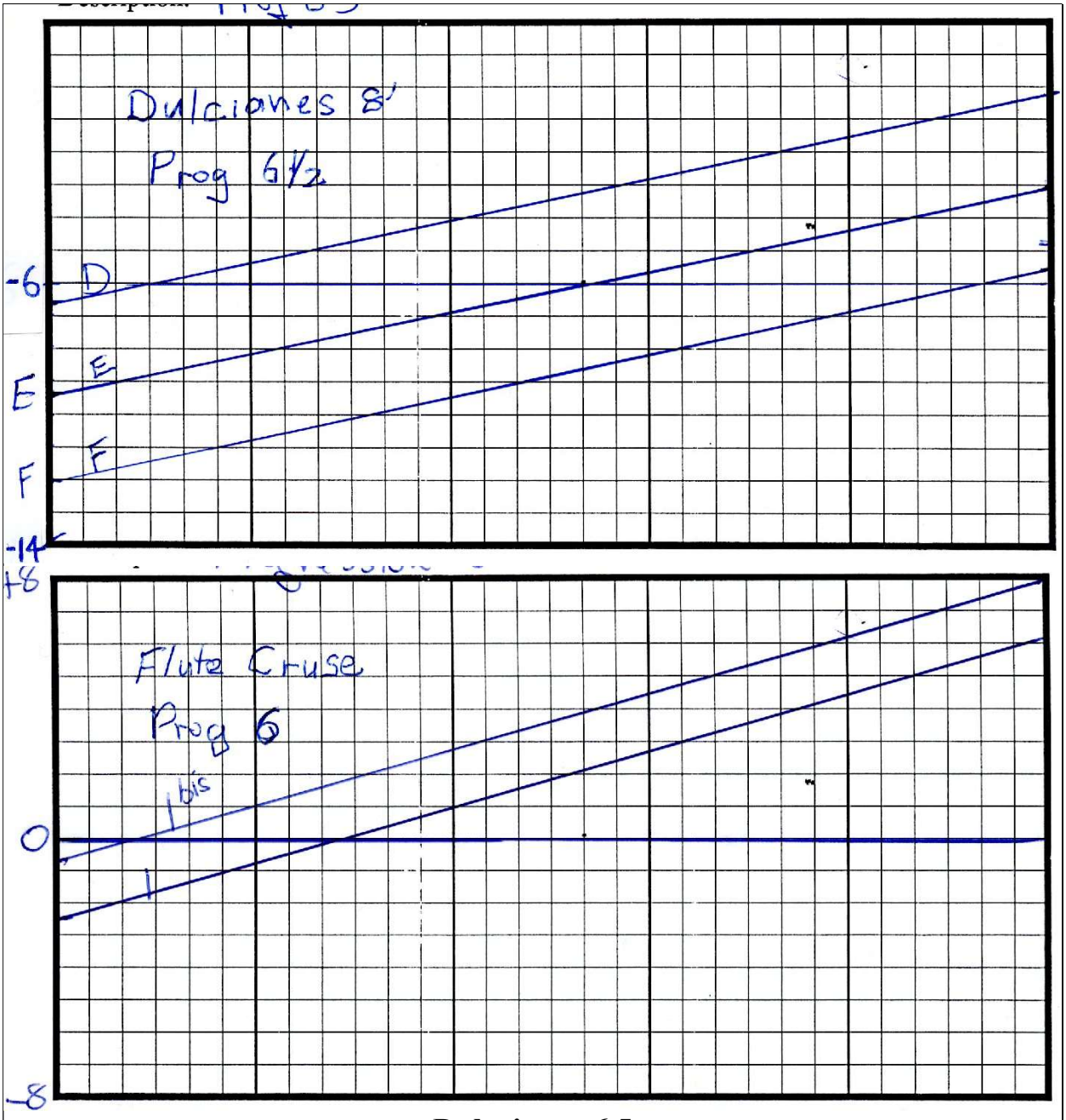
	Prog	Scale	Mouth	C1	C13	C25	C37	C49	C61
Gr	6 ½	10		73.2	45.8	28.7	18	11.3	7.1
My	6 ½	11		65.1	40.8	25.5	16	10	6.3
Men	6 ½	12		57.9	36.3	22.7	14.2	8.9	5.6
Gr	6	13		89.4	57.1	36.5	23.3	14.9	9.5
My	6	14		79.9	51.1	32.6	20.9	13.3	8.5
Men	6	15		71.5	45.7	29.2	18,6	11.9	7.6



Gamba (Mutin) pr11.5/6, Gambs pr6.5

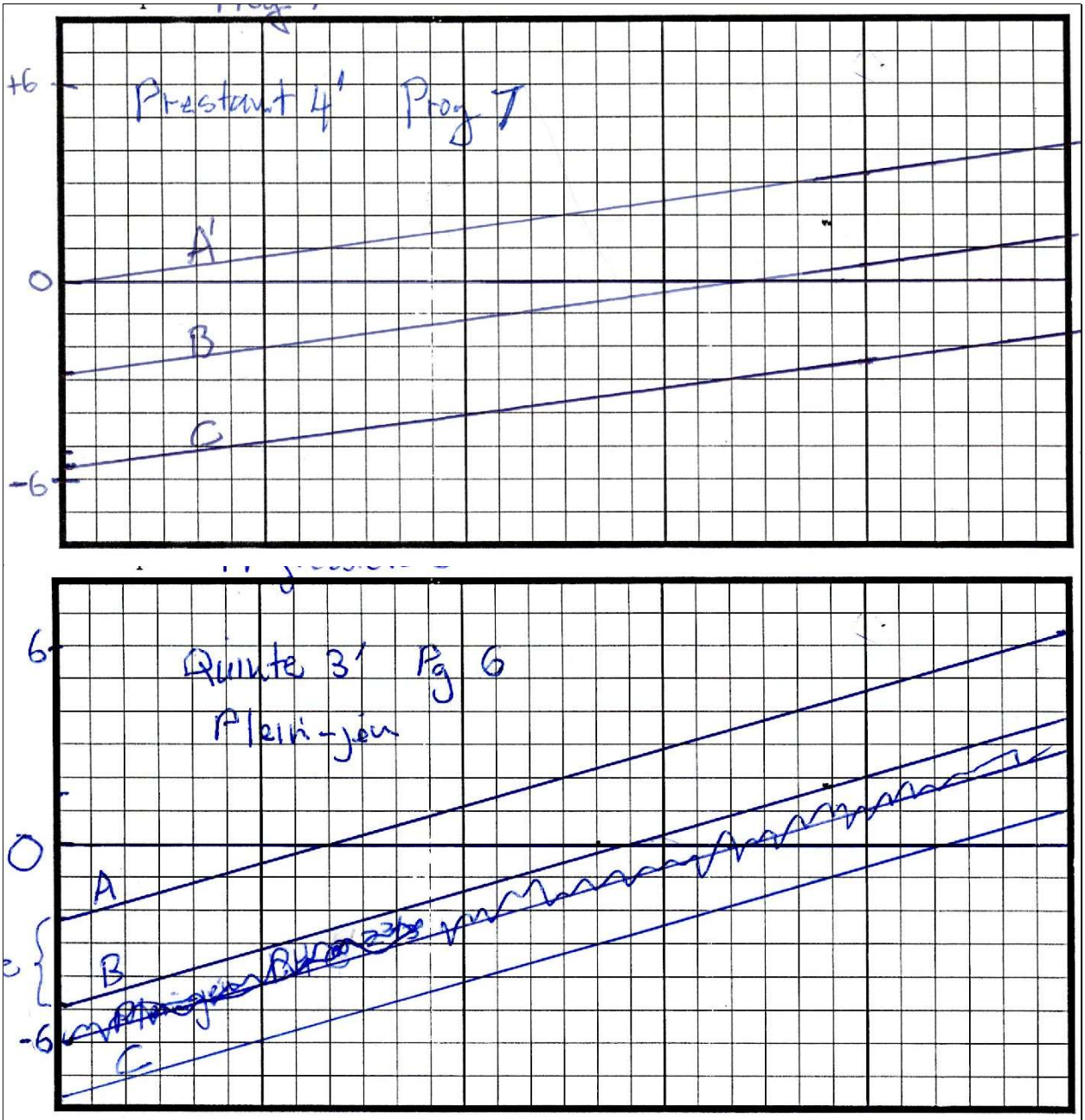
	Prog	Scale	Mouth	C1	C13	C25	C37	C49	C61
Gr	13bis	11.5-6		82	44	28	18	11.5	7.3
Men	14 bis	11.5-6		71	39.3	25.1	16.1	10.3	6.6
Gr	6.5	6.5		82.3	51.5	32.3	21.2	12.7	7.8
My	6.5	6.5			45.8	28.7	18	11.3	7.1
Men	6.5	6.5			40.8	25.5	16	10	6.3

Scales 13 bis, 14 bis not on 1865 list.



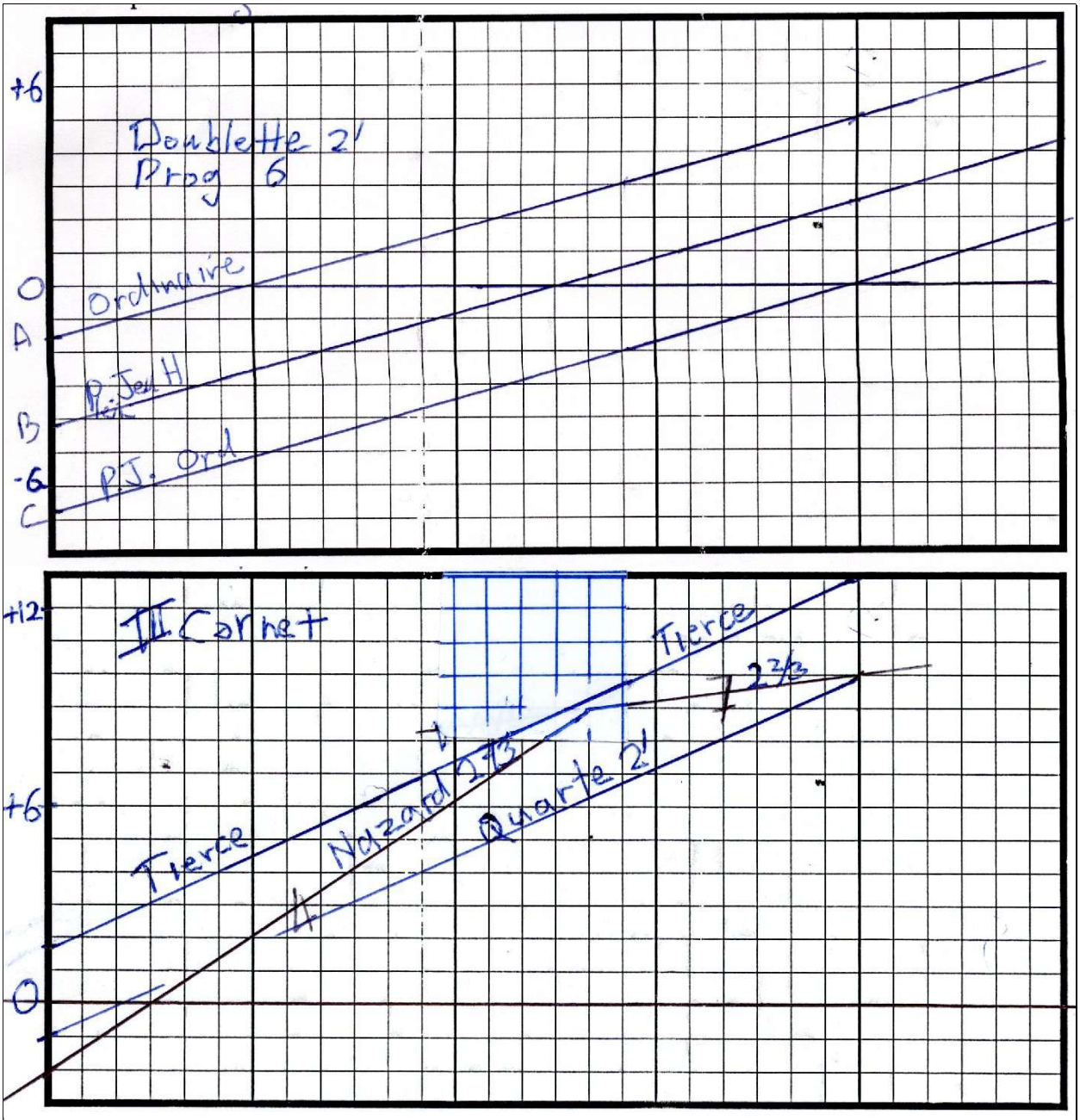
Dulcaine pr6.5

	Prog	Scale	Mouth	C1	C13	C25	C37	C49	C61
Gr	6 ½	D		116.9	73.2	45.8	28.7	18	11.3
My	6 ½	E		104	65	40.8	25.5	16	10
Men	6 ½	F		92.5	59.9	36.3	22.7	14.2	8.9
Flute Cruse pr6									
Gr	6	1 bis		150.8	96.3	61.6	39.3	25.1	16.1
My	6	1		139.9	89.4	57.1	36.5	23.3	14.9



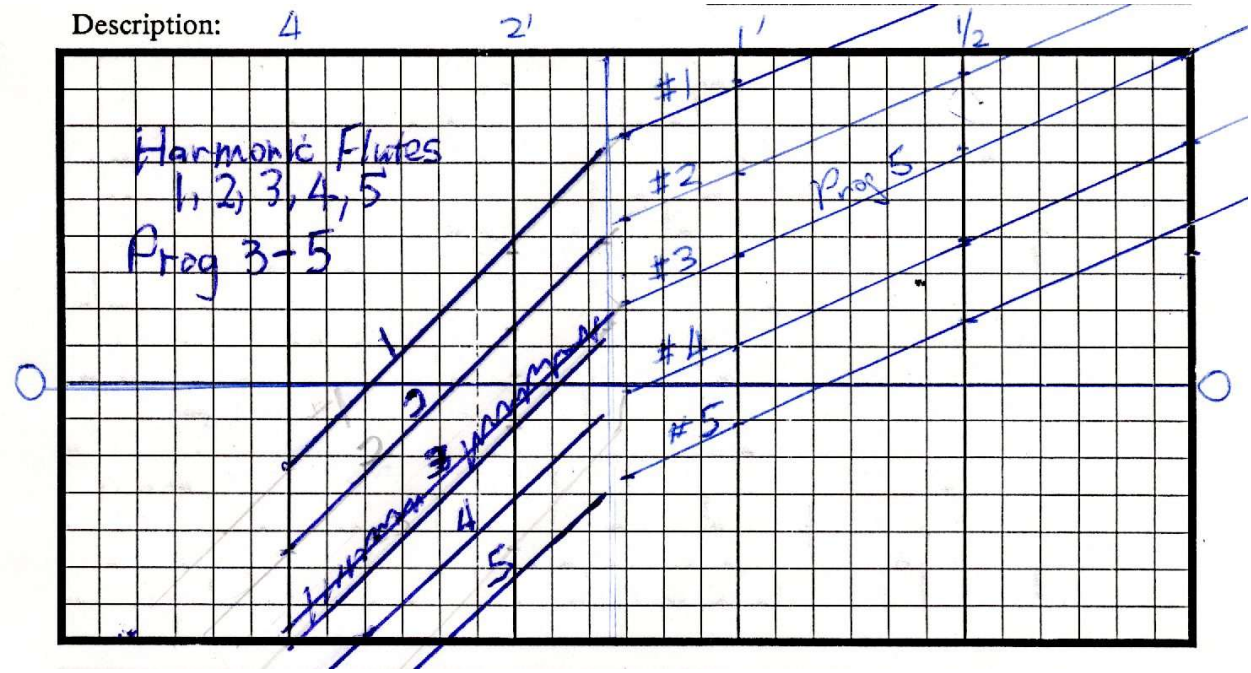
Prestant 4' pr 7, Quinte 2-2/3' pr6

	Prog	Scale	Mouth	C1	C13	C25	C37	C49	C61
Gr	7	A	¼	92.2	56.7	34.9	21.4	13.2	8.1
My	7	B	¼	81.7	50.2	30.9	19	11.7	7.2
Men	7	C	¼	72.3	44.5	27.3	16.8	10.3	6.4
Gr	6	A	¼	61.6	42.4	27.1	17.3	11.1	7.1
My	6	B	¼	55	37.9	24.2	15.5	9.9	6.3
Men	6	C	¼	49.2	31.4	20.1	12.8	8.2	5.2



Doublette 2' pr6, Cornet III

	Prog	Scale	Mouth	C1	C13	C25	C37	C49	C61
Gr	6	A	¼	51.1	32.6	20.9	13.3	8.5	5.8
My	6	B	¼	45.7	29.2	18.6	11.9	7.6	4.9
Men	6	C	¼	40.8	26.1	16.7	10.7	6.8	4.5
2-2/3'	4/7			63	44.5	31.5	21.4	13	8.1
2'	5	H		51.1	34.2	22.9	15.3	10.2	
1-3/5'	5	H bis		49.5	33.1	22.1	14.8	9.8	



Harmonic Flute 8' – 1, 2, 3, 4, 5											
	Prog	Scale	Mouth	C 4'	C 2'	F	F#	C 1'	C ½'	C ¼'	C 1/8'
Gr	3-5	1	¼	85.2	64.7	57.7	56.5	46.3	30.9	20.7	13.8
My	3-5	2	¼	76	58	51.5	51.1	41.8	28	18.7	12.5
Men	3-5	3	¼	72.6	55.2	49.2	51.1	41.8	28	18.7	12.5
	3-5	4	¼	67	51		466.3	37.8	25.3	16.8	11.3
	3-5	5	¼	61	46		37.8	34.2	22.9	15.3	10.2

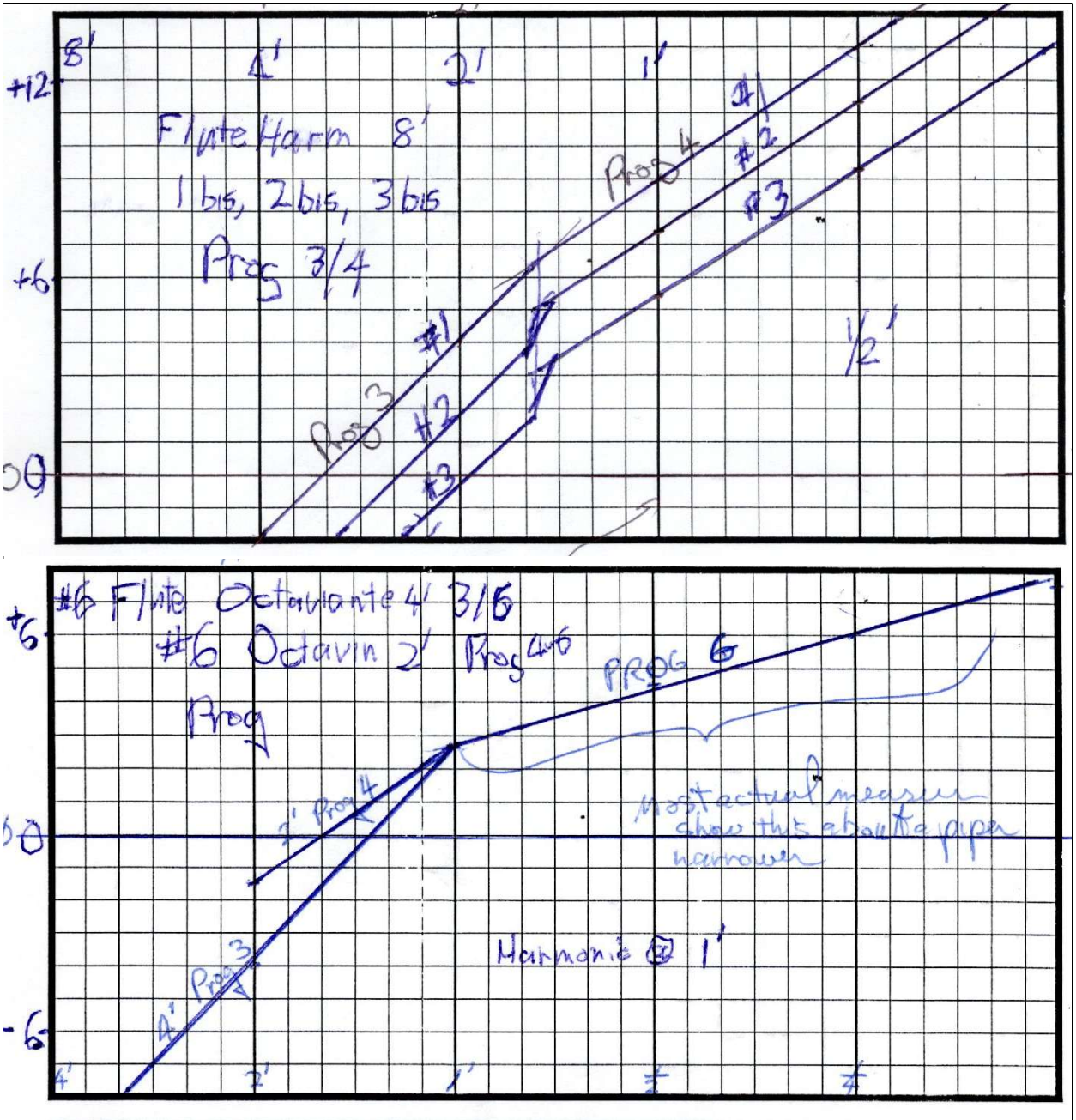
Notes on Harmonic Flutes

- Measured pipes sometimes show scales varying from what is shown.
- Flute Harmonique #1, 2, 3 were used in early years,
- Flute Harmonique 1bis, 2bis, 3bis, were preferred.
- Flute Harmonique was sometimes used at 4'
- Flute Harmonique #4, 5 don't know if they were ever used.
- Harmonic split at 2' f/f# except for Octaviante 4 and Octavin at 1'C

Old French stops weren't labeled with foot markings *(8')*; the pitch was implied in the name. Montre, Prestant and Doublette: 8', 4' and 2' respectively, was implied for principals. Similarly, for the new Harmonic Flutes: Flute Traversiere, Flute Octaviante and Octavin. 8', 4' and 2'was implied.

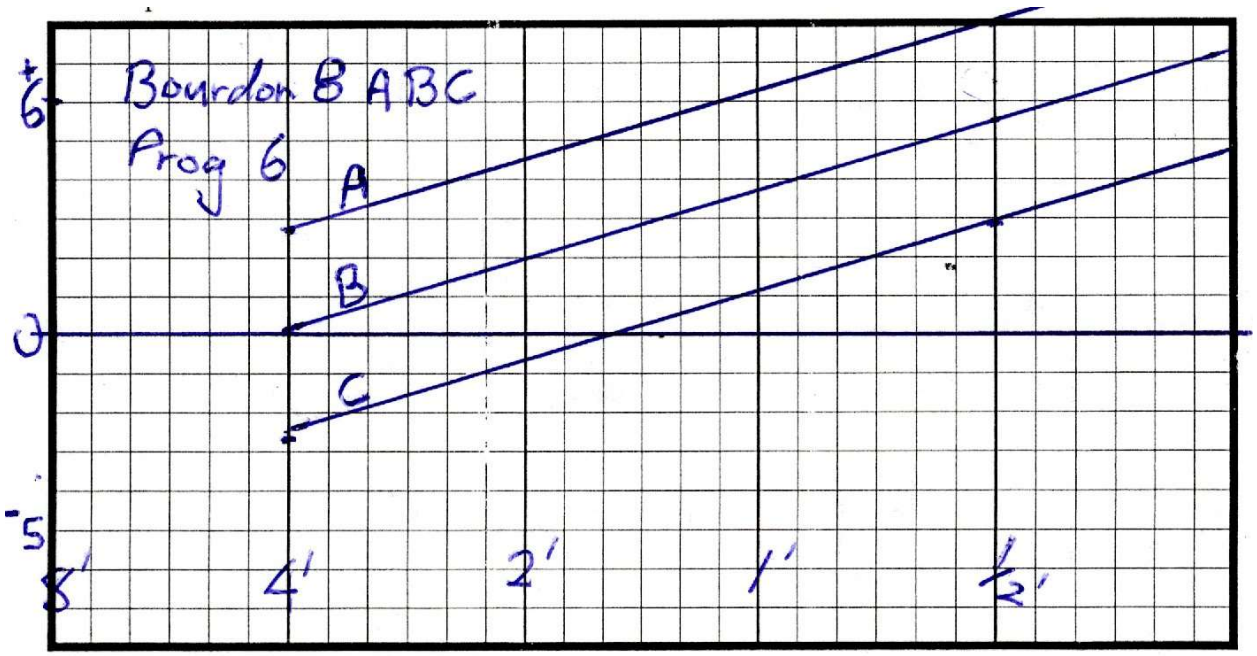
'Harmonique' was added to the name, so everyone would be aware: Flute Traversiere Harmonique, Flute Octaviante Harmonique and Octavin Harmonique. Later C-C simplified them to Flute Octavinate and Octavin, because everybody knew they were harmonic. The Flute Traversiere 8' in the Swell was renamed Flute Harmonique, when put in the Grand-Orgue or Positif.

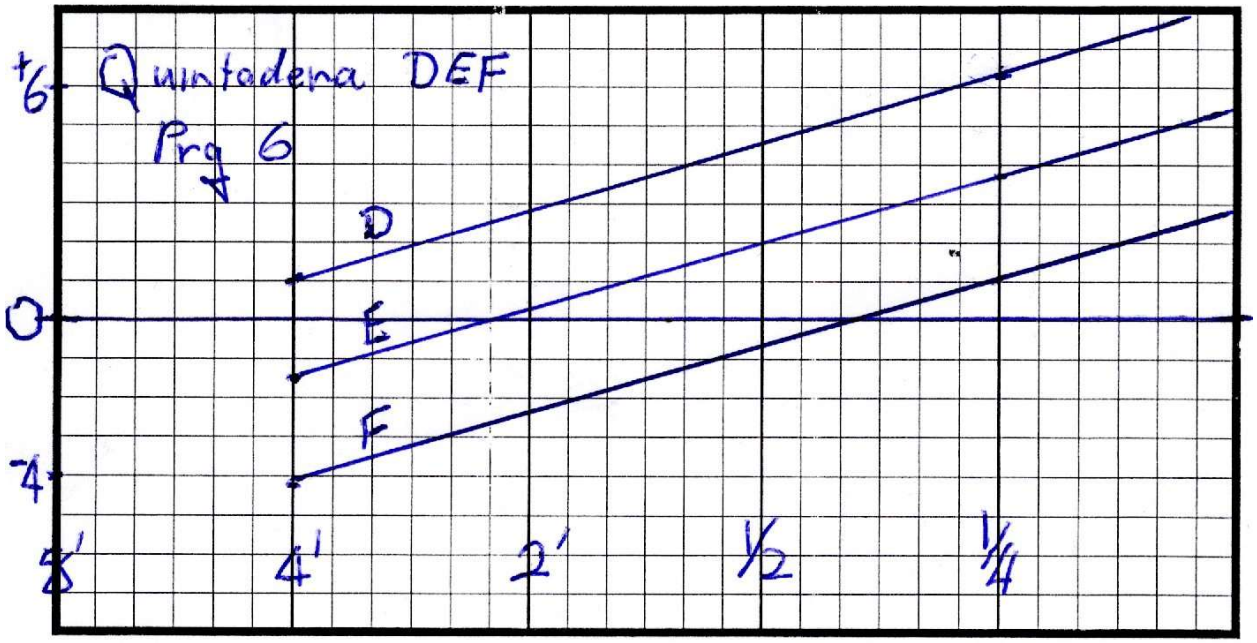
The slotted open wood bass of the Harmonic Flute is highly characteristic and very important in fleshing out the bass of the Montre. On the Swell, these wood pipes were often put outside the box.



Harmonic Flute 8' 1bis, 2bis, 3bis, Flute Octaviante 4', Octavin 2'

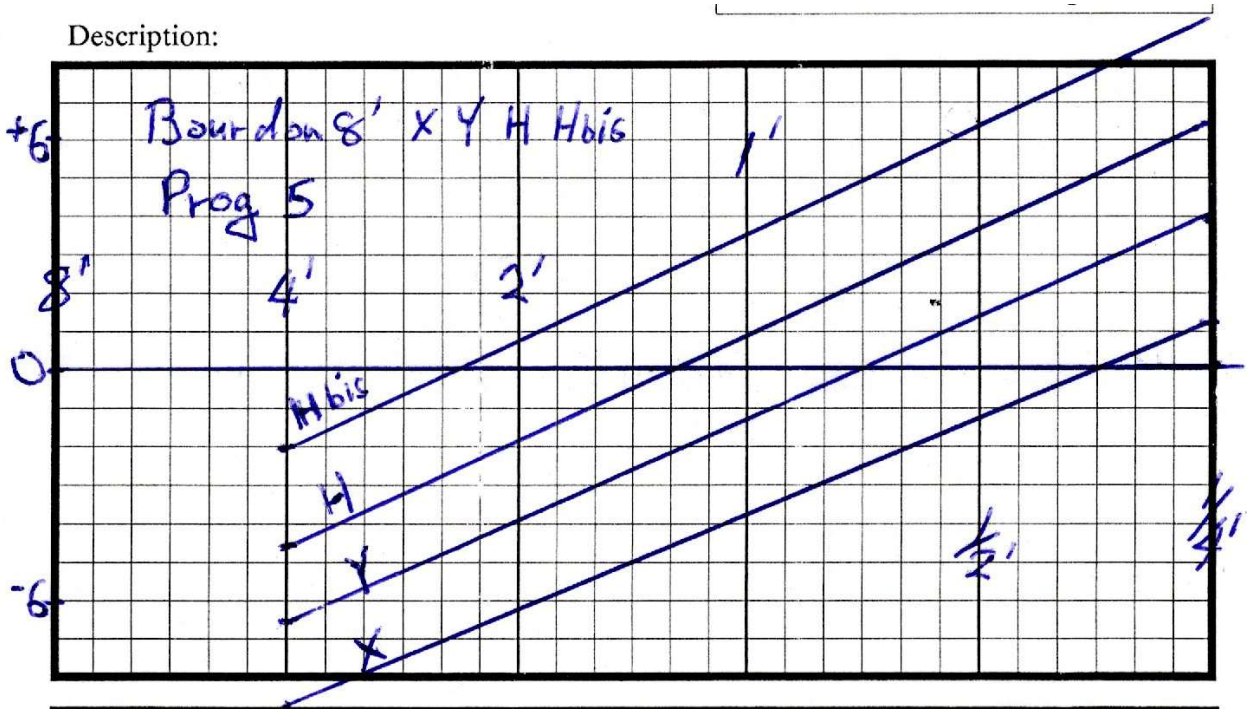
	Prog	Scale	Mouth	C 4'	C 2'	F	F#	C 1'	C ½'	C ¼'	C 1/8'
Gr	3-4	1bis	1/4	85.2	64.7	57.7	57.8	48.6	34.4	24.4	17.2
My	3-4	2bis	1/4	76	58	51.5	53	44.5	31.5	22.3	15.8
Men	3-4	3bis	1/4	72.6	55.2	49.2	48.6	40.9	28.9	20.4	14.4
				C 4'	C 2'	C 1'	B	C ½'	C ½	C ¼'	C 1/8'
Oct 4'	3-6	6	1/4	60.4	46.1		37.5	37.9	24.2	15.5	9.9
Oct 2'	4-6	6	1/4		51.5		37.9	37.9	24.2	15.5	9.9



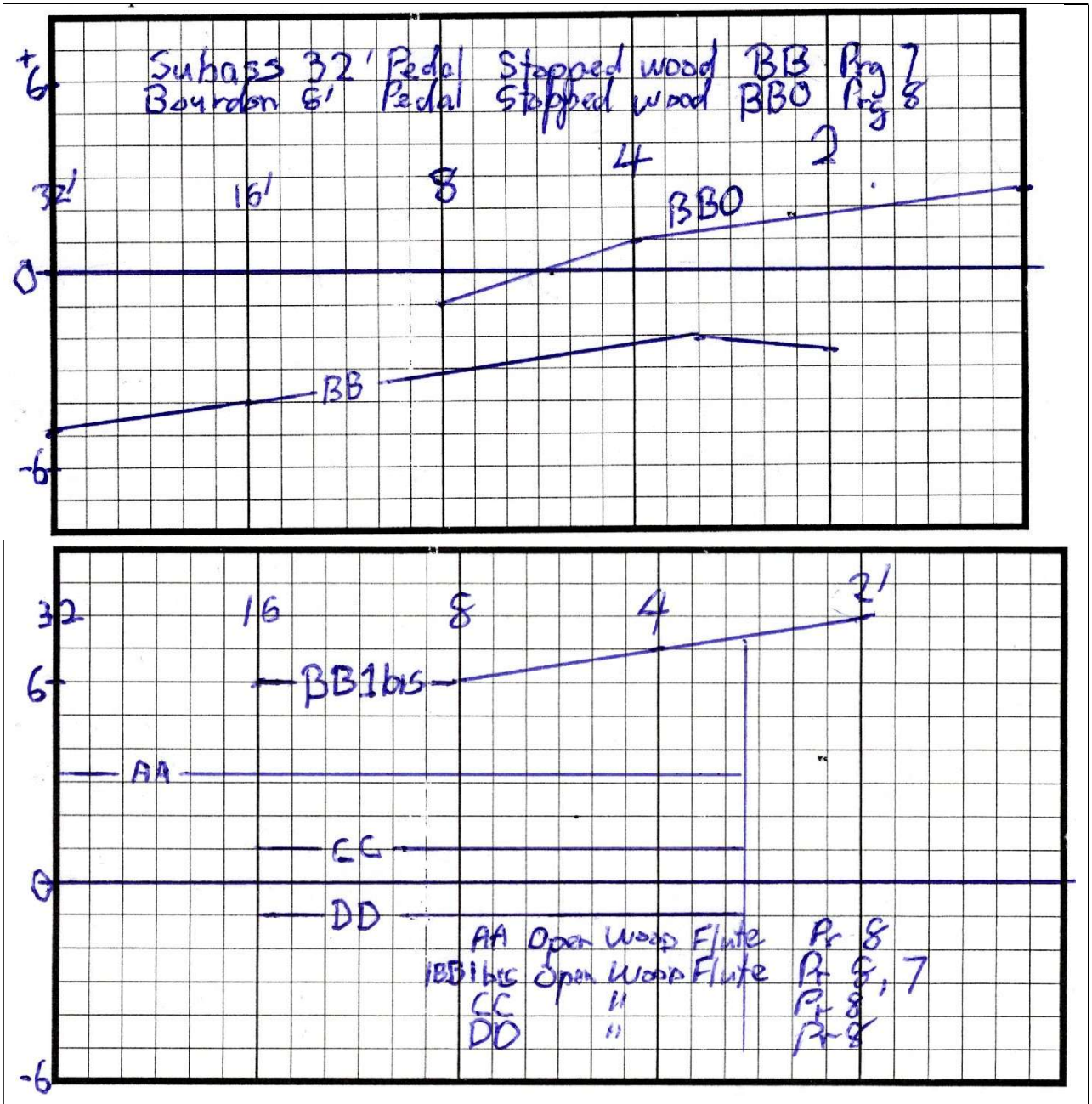


Bourdon 8' A,B,C Quintadena D,E,F									
	Prog	Scale	Mouth	4met	2'	1'	½'	¼'	1/8'
Gr	6	A	¼	79.9	51.1	32.6	20.9	13.3	8.5
My	6	B	¼	71.5	45.7	29.2	18.6	11.9	7.6
Men	6	C	¼	63.9	40.8	26.1	16.7	10.7	6.8
Gr	6	D	¼	57.1	36.5	23.3	14.9	9.5	6.1
My	6	E	¼	51.1	32.6	20.9	13.2	8.5	5.4
Men	6	F	¼	45.7	29.2	18.6	11.9	7.6	4.9

Description:



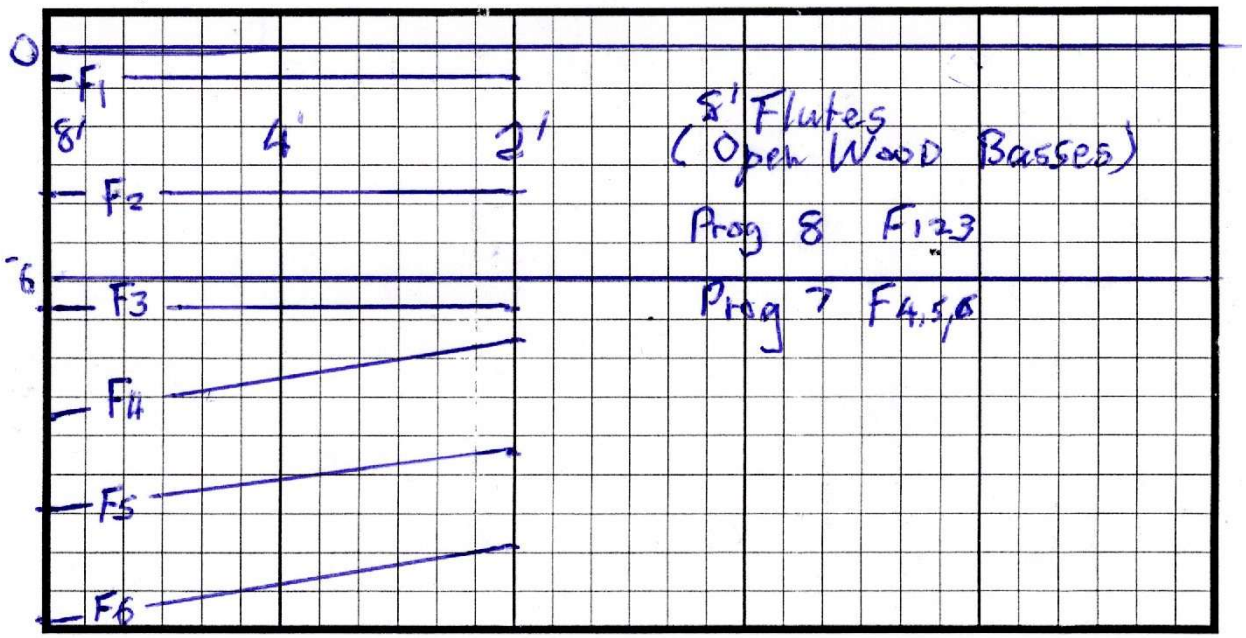
Bourdon 8', X, Y, H, Hbis, Prog 5								
	Prog	Scale	Mouth	4'	2'	1'	½'	¼'
	5	Hbis	¼	84.6	56.5	37.8	25.3	16.9
	5	H	¼	76.5	51.1	34.2	22.9	15.3
	5	Y	¼	69.2	46.3	30.9	20.7	13.8
	5	X	¼	62.5	41.9	28	18.7	12.5
Chimneys (dia x length)								
					15x135	9.6x62	5.7x27	4.8x20



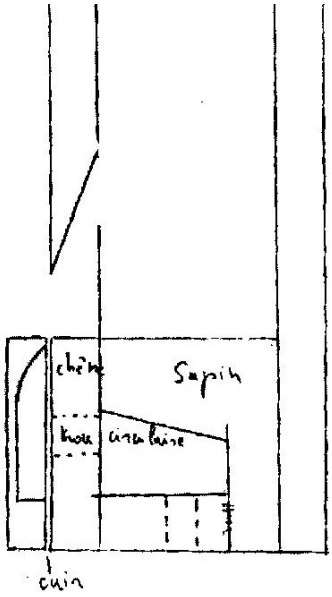
32', 16' Open Wood AA, CC, DD

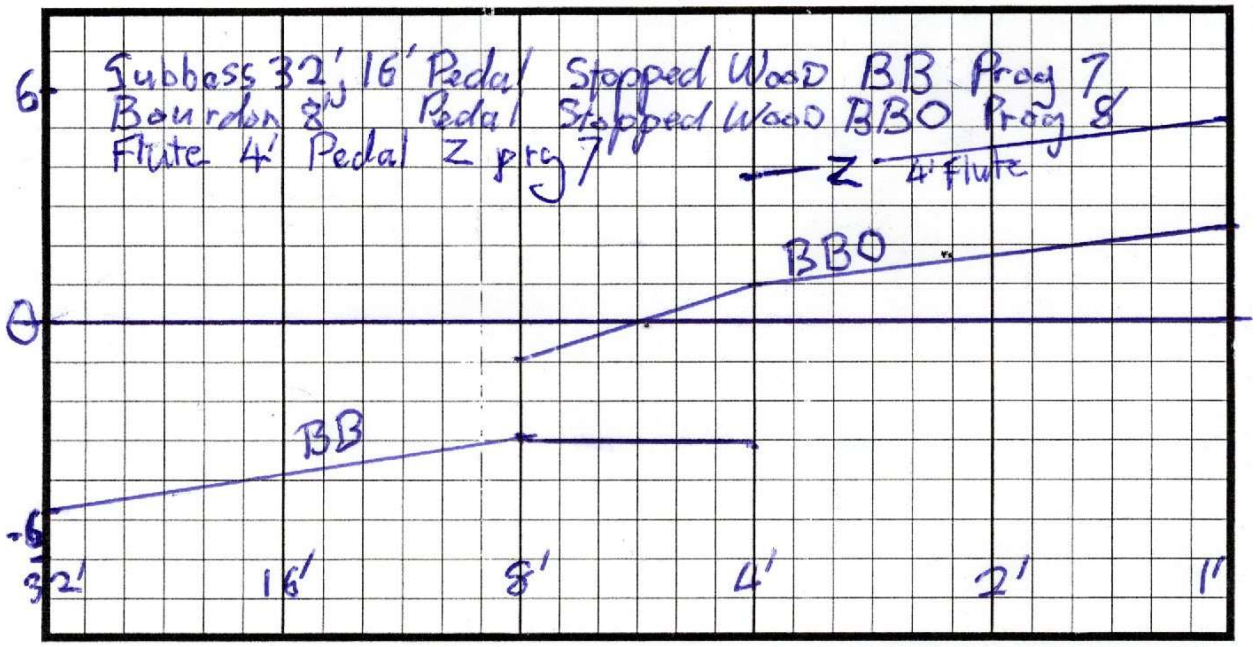
	Prog	Scale	Mouth	32'	16	8'	4'		
	8	AA		500	300	179.5	106.5		
	8. 7	BB1bis			332	204	125	77	
	8	CC			275	165	98		
	8	DD			253	150.5	90		

Description:



8' Flute F1-F6(Open wood bass)									
	Prog	Scale	Mouth	C1	C13	C25			
	8	F1		150	89	53			
	8	F2		132	79	47			
	8	F3		115	86.6	41.5			
	7	F4		103	63.5	39.5			
	7	F5		91	56.5	35			
	7	F6		81	50	31			





Pedal Subbass 32', Bourdon 8', Flute 4', Z									
	Prog	Scale	Mouth	32'	16'	8'	4'	2'	
Subbass 32', 16'	7	BB		360	220	135	83		
Bourdon 8'	8	BB0				149	95	60.5	
Flute 4' *(Pedal)*	7	Z					108.5	66.7	41

Reeds

Cavaille-Coll's reeds are powerful and refined. I've included the next couple of pages of Cavaille-Coll scale that M. Cheron sent me back in 1997. To make good reeds requires many measurements and exacting workmanship. On my website you will find several stops with measured drawings.

There is also a chart of reed block sizes and shallot sizes.

Diamètres des Tuyaux (anches)

exprimés en millimètres

Désignations des jeux	Prog	C 32	F 24	Diapason	C 16	F 12	C 8	F 6	C 4	F 3	C 2	F 1½	C 1	F 3/4
Bombarde Pédale	5	353	298	A 1	236	199	157	133						
"	-	318	269	A 2	213	180	142	120						
"	-	288	244	A 3	193	163	129	109						
"	-	260	220	A 4	174	147	116	98						
Bombarde G.O.	4			B 1	250	216	177	153	125	108				
"	-			B 2	329	198	162	140	114	99				
"	-			B 3	210	182	148	128	104	91				
"	-			B 4	193	167	136	118	96	83				
"	-			B 5	177	152	125	108	88	76				
Trompette et Clairon	Pédale			C 1			160	143	122	109	93	83	70	63
"	3			C 2			150	133	114	102	86	77	66	58
"	-			C 3			140	125	106	95	81	72	61	55
"	-			C 4			130	116	99	88	75	67	57	51
"	-			C 5			122	109	93	83	70	63	53	47
Bombarde G.O.				D 1	200	178	152	135	115	103	87	78	66	59
"	3			D 2	187	166	142	126	107	96	82	73	62	55
"	-			D 3	174	155	132	118	101	90	76	68	58	51
"	-			D 4	162	145	123	110	94	84	71	63	54	48
"	-			D 5	152	135	115	103	88	78	66	59	50	45
"	-			D 6	142	126	108	96	82	73	62	55	47	42
Trompette et Clairon	2½			E 1			140	127	112	101	89	80	70	64
	-			E 2										

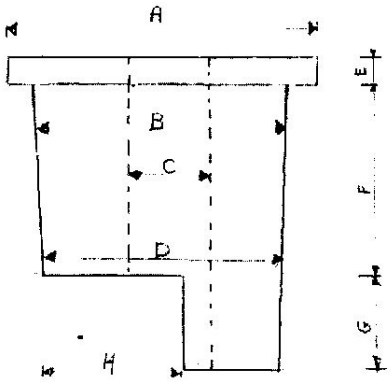
Diamètres des Tuyaux (anches)

exprimés en millimètres

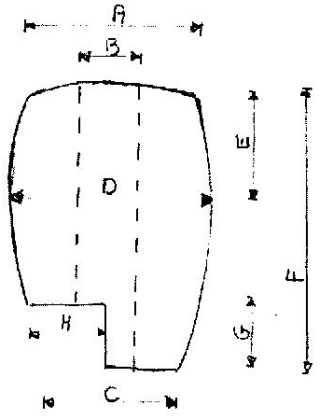
	"		E 3			125	113	99	90	79	72	62	57
	"		E 4			118	107	94	85	74	68	59	54
	"		E 5			111	101	88	80	70	64	56	51
Trompette et Clairon	2		F 1			119	110	100	93	84	78	71	66
	"		F 2			114	106	95	89	81	75	68	63
	"		F 3			109	101	91	85	77	72	65	60
	"		F 4			104	97	88	82	74	69	62	58
	"		F 5			100	93	84	78	71	66	59	55
Musette		2 1/2				74	67	59	53	46	42	36	33
Basson	3		G 1			80	72	61	55				
	"		G 2			75	67	57	51				
	"		G 3			70	62	53	47				
	"		G 4			65	58	49	44				
	"		G 5			61	54	46	41				
Basson	2,67		H 1	173	155	135	122	105	95	83	75	65	58
	"		H 2	162	147	127	115	99	90	77	70	61	55
	"		H 3	153	138	119	108	93	84	73	66	57	52
	"		H 4	143	129	112	101	88	79	69	62	54	49
	"		H 5	135	122	105	95	83	74	65	58	51	46
	"		H 6	127	115	99	90	77	70	61	55	48	43
Basson	2,267		K 1	161	148	131	121	107	98	87	80	71	65
	"		K 2	153	140	125	114	102	93	83	76	68	62
	"		K 3	145	133	119	109	97	89	79	72	64	59
	"		K 4	138	127	112	103	92	84	75	69	61	56
	"		K 5	131	121	107	98	87	80	71	65	58	53
	"		K 6	125	114	102	93	83	76	68	62	55	51
	"		K 7	118	109	96	89	79	72	64	59	52	48
	"		K 8	112	103	92	84	74	69	61	56	50	45
	"		K 9	107	98	87	80	71	65	58	53	47	43

Dimensions des noyaux Cavaillé - Coll

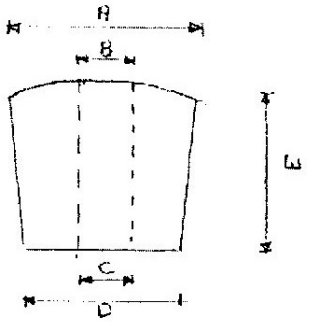
N°	12	11	10	9	8
A		46	43	41	39,5
B		39	36	34	32
C		12,5	11,5	10	9,5
D	39	36	34	31,5	30
E		5	5	4,5	4
F		28	27	26	24
G		12	12	11	11
H		23	21	20	18



N°	7	6	5	4	3	2	1
A	29	27	25	24	23	21	19
B	9	8	7,5	6,5	6,5	6	5
C	18	16	15	14	14	11	11
D	31	28	27	26	24	23	21
E	21	18	17	16	15	14	13
F	40	37	34	32	30	28	26
G	9,5	9,5	9	9	8	8	7
H	13,5	12	11	10	9,5	9	9



A	35	32	31	28	27
B	19	20	22	22	24
C	16	18	19	19	20
D	33	30	29	27	26
E	27	24	20	17	15



Measurements from the report of the rebuilding of 1989 St Jean Baptiste de Long, Somme, C-C,1877 by Laurent Plet Organbuilder. Report found on my webpage.

Why Scaling Matters

Scaling refers to the dimensions of the pipes; principally the inside diameter of the pipe, but also things like the mouth width, cutup, windway and toehole. Those measures determine the loudness and tone of the pipe. Let's say you only wanted to make a pipe louder. If you only increased the diameter of the pipe, you would make it flutier, not louder. If you only opened the toehole and flue, giving it more wind, you would make it louder, but also much brighter. Raising only the cutup would make the pipe duller.

To make the pipe louder, but keeping a similar tone, requires changing everything. You need a bigger scale, plus more wind from a larger toehole/flue and a higher cutup. That's why we must know all the variables, to understand what the voicer was doing.

Cavaille-Coll

We know the diameters that Cavaille-Coll used, and have graphed them in Topfer NM. Cavaille-Coll typically had three sizes of each stop: small, medium and large. He would choose the pipe size, depending upon the stoplist, auditorium and loudness required.

We can't ask M. Cavaille-Coll to ask about his choices, but we do have three of his organs, complete with scales which we can examine and try to figure out what he was doing. What follows in the next chapters are two smaller organs with complete scales, plus a larger organ with just the pipe diameters.

Cavaille-Coll mostly used ¼ mouths. His cutups were often about ¼ of the mouth. I'm told that his voicers did not use fractional cutups of the mouth. They strictly followed graphs that often followed the 7-1/2 progression (halving on the 17-1/2 pipe). I have a photocopy of that chart and when I find it I'll compare it to actual pipes and revise this book. Voicing and cutups were determined in the factory voicing room and seldom changed during tonal finishing in the church. Tonal finishing was carefully done, at the rate of about 1 stop per day (which is slow, compared to other builders).

Église Notre-Dame, Ardennes, GIVET, 1868

Organ by d'Aristide CAVAILLÉ-COLL in 1868. 12 Stops, two keyboards and Pedal. Organ was rebuilt in 1991 by Laurent Plet, facteur d'orgues

Grand-Orgue- 54 notes C1-F5

16’ Bourdon' #21-54 on Gt chest, 1-20 from pedal
8’ Montre
8’ Flûte harmonique
4’ Prestant
1'1/3 Plein Jeu harmonique II-IV

Récit expressif- 54 notes C1-F5

8’ Viole de Gambe
8’ Voix Céleste
4’ Flûte Octaviante'
8’ Basson Hautbois'
8’ Trompette

Pédale- 20 notes C1-G2

16’ Soubasse'
8’ Basse

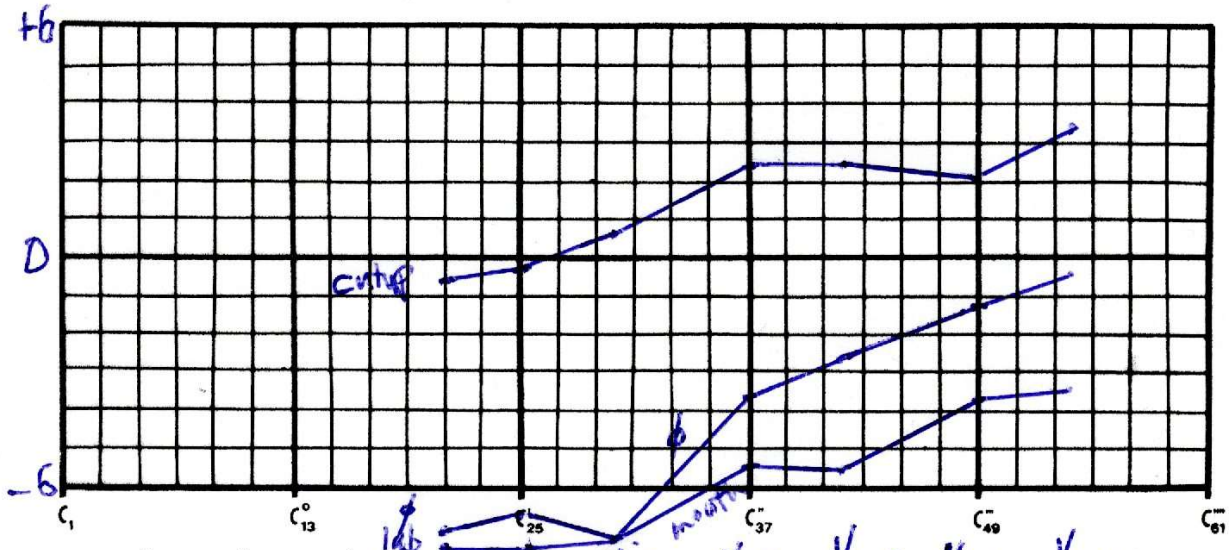
- Pédales des combinaisons
- Tirasse Grand Orgue
- Tirasse Récit
- Accouplement Récit / Grand OrgueI
- Trémolo, Expression, Tonnerre

Original report of organ and restoration on my website.

Stop: Bourdon 16 Div.: Ped/GO Builder: C-C Date: 1868

Windpressure: Pitch: Church: Notre Dame Givet

Description of site & organ:



Mouthwidth:			1/4·1	1/4·2	1/3.8	1/4·3	1/4·5	1/4·4	1/4·5
Cutup:			1/2·9	1/2·9	1/2·9	1/2·8	1/2·8	1/3·1	1/3

ACTUAL MEASURE ← Ped → 21g# f f

Top Diameter:			8						26
Diameter at Mouth:			80	70	53	47	39	31	24
Mouthwidth:			61	52	44	34	27	22	18
Cutup:			21	18	15	12	9·5	7	6
Metal Thickness:									
Windway:									
Languid:									
Body Length:									
Toe Hole ø:			7·2	7	6	5·8	5·8	3·8	3·6
		X17	6·8	0.85	0.8	0.85	0.9	0.6	0.7

Prog 6 - 2ars all

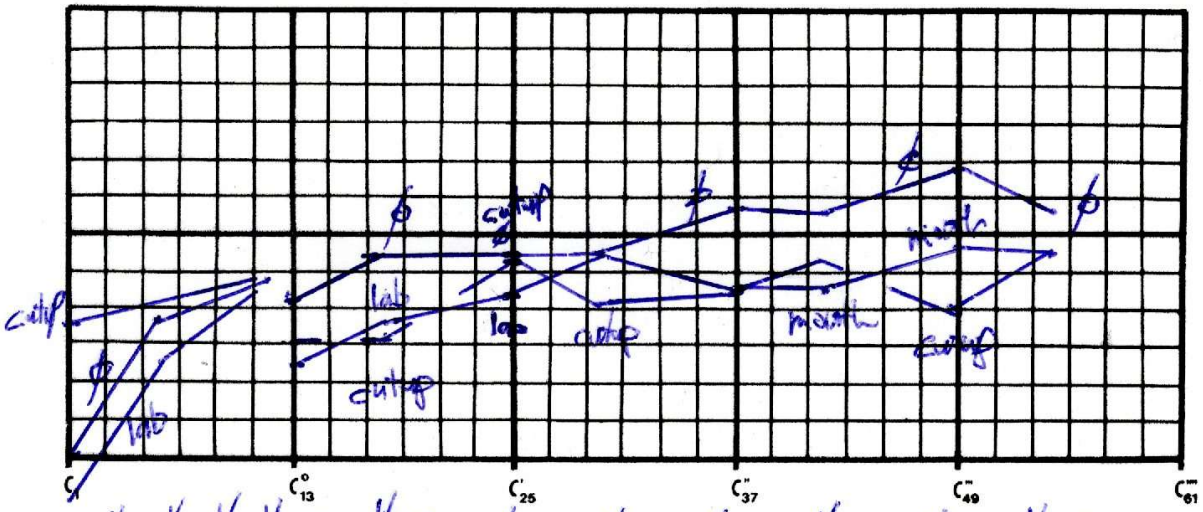
Stop: Principal 8 Div.: GO

Builder: C-C Date:

Windpressure: Pitch:

Church: Notre Dame Givet

Description of site & organ:



Mouthwidth:	1/4.1	1/4.1	1/4	1/4.3	1/4.3	1/4.2	1/4	1/4.5	1/4.3	1/4.4	1/4.2
Cutup:	1/3.3	1/3.9	1/4.4	1/3.9	1/4.1	1/3.8	1/4.3	1/4	1/3.9	1/4.5	1/4

← wood →

ACTUAL MEASURE	f	b		f							
Top Diameter:	118.2	114	105								
Diameter at Mouth:	122	114	108	85	73	57	43	34	27	21	16
Mouthwidth:	90	85	80	62	53	40	34	24	19.5	13	12
Cutup:	27.5	22	18	16	13	10.5	8	6	5	3.5	3
Metal Thickness:											
Windway:											
Languid:											
Body Length:											
Toe Hole*:				8	10.5	6.5	5.3	4.3	4	3.2	2.8
1oe X √3				.9	1.2	.9	.8	.7	.8	.7	.7

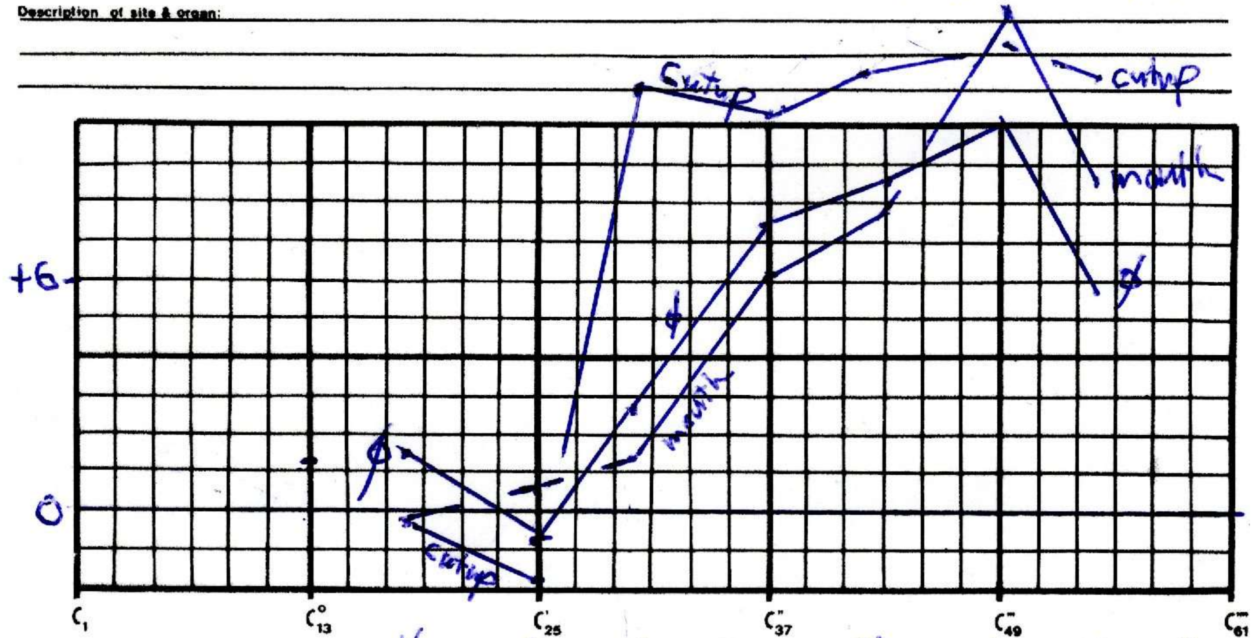
1-36 ears

Scale seems to be #1 Montre 8' with ¼ cutup and ¼ mouth.

Stop: Flute Har 8' **Div.:** GO **Builder:** C-C **Date:** 1868

Windpressure: **Pitch:** **Church:** Notre Dame Givet

Description of site & organ:



Mouthwidth:			1/4.2	1/4.2	1/4.3	1/4.2	1/4.1	1/3.5	1/3.5	[illegible]
Cutup:			1/4	1/3.6	1/2.6	1/3.3	1/3.4	1/4.2	1/3.6	[illegible]

ACTUAL MEASURE ~~[illegible] Pedal~~

f18 f f f54

Top Diameter:									
Diameter at Mouth:			78	53	50	45	38	30	28
Mouthwidth:			58	40	36.5	33.5	29	27	18
Cutup:			14.5	11	14	10	8.5	6.5	5
Metal Thickness:									
Windway:									
Languid:									
Body Length:									
Toe Hole ø:			7.8	6.3	6.5	5.7	5	4.6	4.3
	[illegible]		0.9	0.9	0.9	0.8	0.8	0.8	0.9

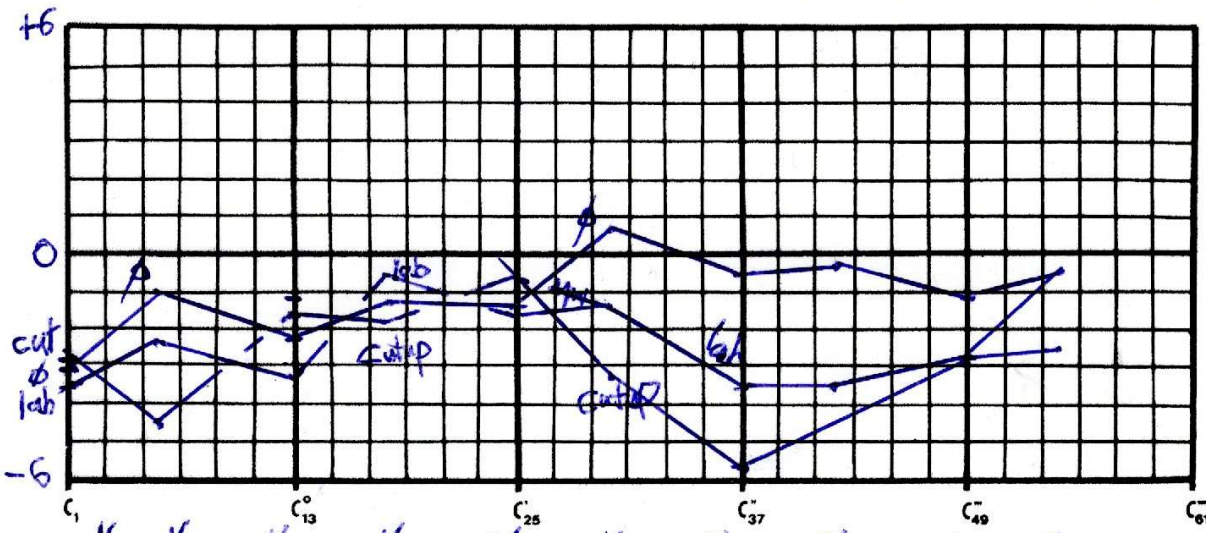
ears all

Source of Data:

Stop: Prestant 4' Div.: GO Builder: C-C Date: 1868

Windpressure: Pitch: Church: Notre Dame Givet

Description of site & organ:



Mouthwidth:	1/4.1	1/4.2	1/4.2	1/4.1	1/3.9	1/4.3	1/4.6	1/4.6	1/4.3	1/4.3
Cutup:	1/3.9	1/4.4	1/3.7	1/3.8	1/4.2	1/5.6	1/4.3		1/4	1/3.6

ACTUAL MEASURE f♮ f♮ 4 f

Top Diameter:									
Diameter at Mouth:	71	50	42	30.8	27	19	15.5	11	9
Mouthwidth: 62	53	37.3	32	25	19.6	13	10.5	8	6.5
Cutup: 16	12	10	8.5	6	~~3.5~~ 4.5	3	8(1)	2	1.8
Metal Thickness:									
Windway:									
Languid:									
Body Length:									
Toe Hole ø: 7.8	6.7	5.6	4.2	3.4	3.5	3	2.7	2	1.5
Toe 1/4 .9	.8	.8	.7	.7	.7	.7	.7	.7	.6

Source of Data: Material:

NOTES (ears, bearus, slots, tuners, voicing, etc) ears 1-24

Scale seems to be #B Prestant 4'' with ¼ cutup and ¼ mouth. Toe holes are relatively closed, suggesting gentler tone.

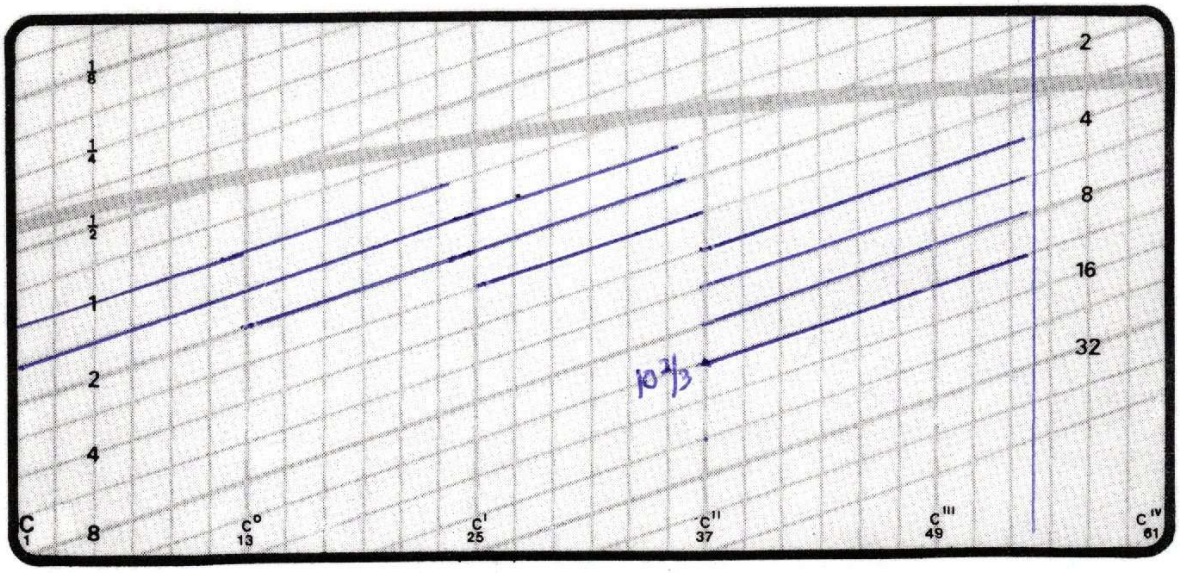
Mixture

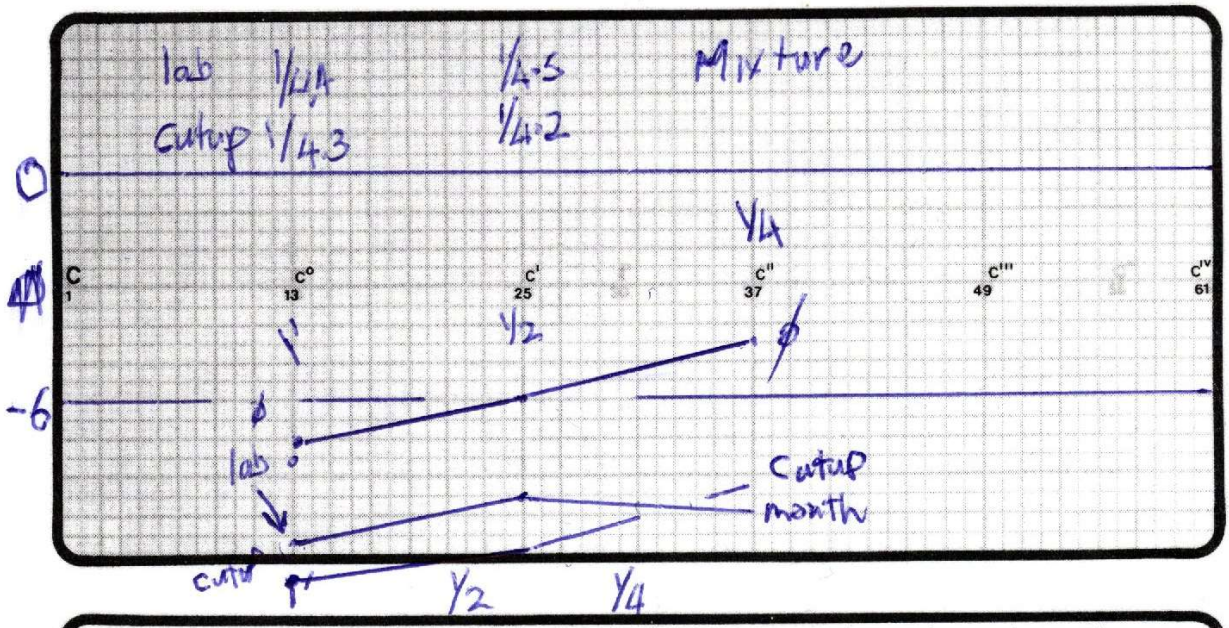
Stop 1⅓ Mixture II-IV Div Church Notre Dame Givat 1868

Builder C-C Opus Year Scale Wind Pa. Seating Area m^2

Vol. m^3 Rev. 500/1000 s -dB Room Pitch hz. Seats Vol./Seats

Misc.





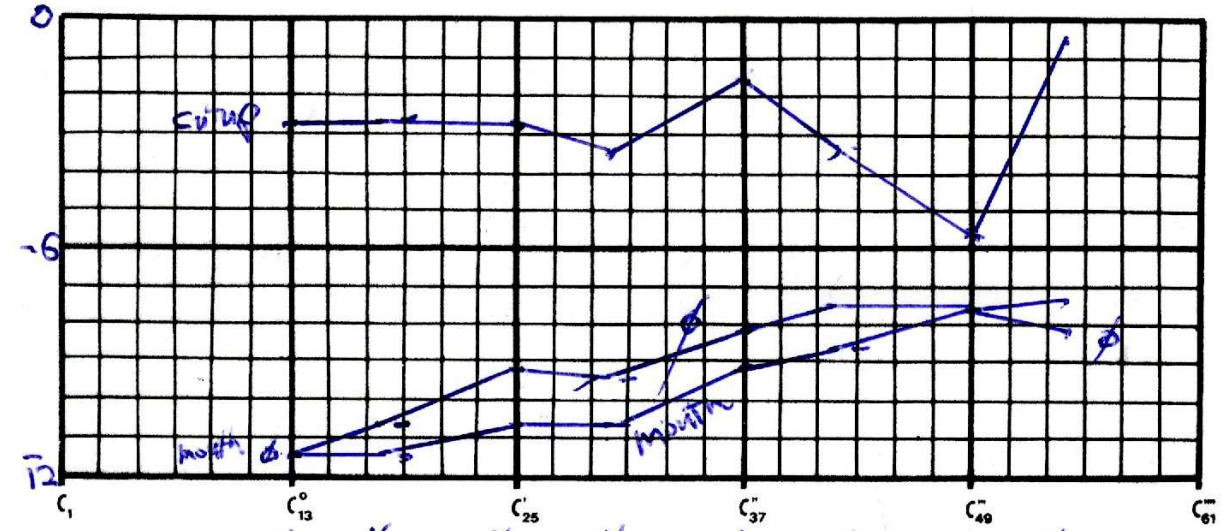
Note			
Diameter	24	15	9.5
Mouthwidth	17	10.5	7
Cutup	4	2.5	1.8
Flue			
Toe	2.6	2	1.6

Mixture breaks seem dubious to me…

Stop: Gamba 8' Div.: Récit Builder: C-C Date: 1868

Windpressure: Pitch: Church: Notre Dame Givet

Description of site & organ:



Mouthwidth:		1/4	1/3.8	1/3.8	1/3.8	1/3.8	1/3.8	1/4	1/3.8
Cutup:		1/2.8	1/2.8	1/3.1	1/3.1	1/3	1/3.3	1/3.7	1/3

← 1-12 wood →

ACTUAL MEASURE

		f		f		f		f	
Top Diameter:									
Diameter at Mouth:		56	45	35	28	22	18	14	11
Mouthwidth:		44	37	29	23	18	15	11	9
Cutup:		16	13	9.5	7.5	6	4.5	3	3
Metal Thickness:									
Windway:									
Languid:									
Body Length:									
Toe Hole ø:		7.5	6.3	5.2	4.3	3.6	3	2	1.5
	$\times\sqrt{\phi}$	1	.9.5	0.9	0.8	0.8	0.7	—	—

1-12 wood ears 1-37

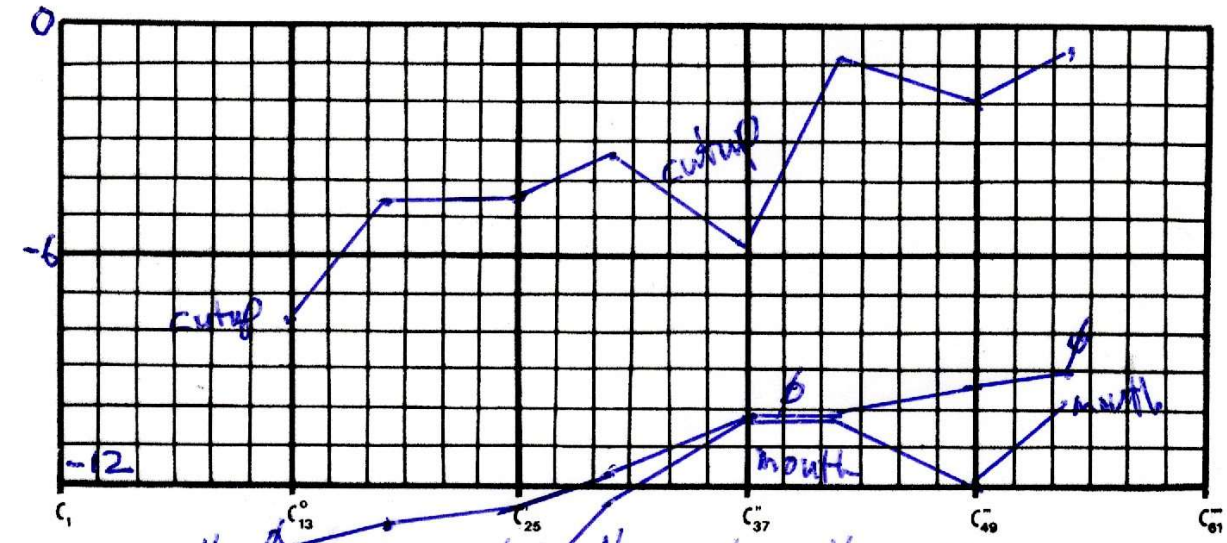
Stop: Voix Celeste 8' Div.: Récit

Builder: C-C Date: 1868

Windpressure: Pitch:

Church: Notre Dame Givet

Description of site & organ:



Mouthwidth:		¼·2	¼·4	¼·5	¼·2	¼·1	¼·1	¼·5	
Cutup:		1/3	1/25	½·5	½·7	1/3·2	½·6	½·6	

ACTUAL MEASURE

		f		f		f		f	
Top Diameter:		5f							
Diameter at Mouth:		51	42	32	26.5	21	17	13	11
Mouthwidth:		38·4	30	23·3	20	16	13	9	8
Cutup:		13	12	8·8	7·5	5	5	3·5	3
Metal Thickness:									
Windway:									
Lenguid:									
Body Length:									
Toe Hole ø:		6	6	3·8	3·8	2·8	3	3·2	2
Toe×√		0·8	0·9	0·7	0·8	0·6	0·7	0·8	0·6

A. B. Batty

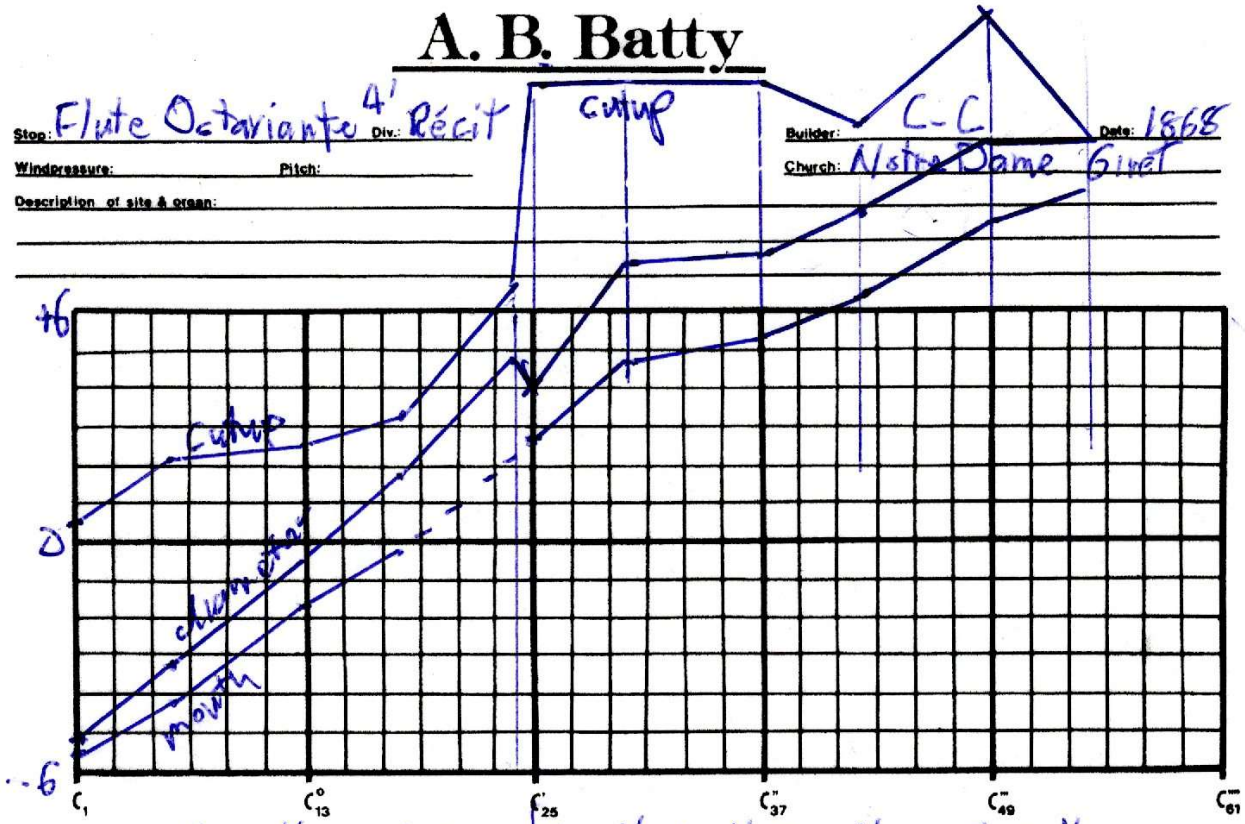
Stop: Flute Octaviante 4' Div.: Récit

Windpressure: Pitch:

Description of site & organ:

Builder: C-C Date: 1868

Church: Notre Dame Girat



Mouthwidth:	1/4	1/4.2	1/4.4	1/4.4		1/4.2	1/4.5	1/4.5	1/4.5	1/4.5	1/4.3
Cutup:	1/3.1	1/3.1	1/3.3	1/3.5	1/29	1/2.6	1/2.8	1/2.9	1/3.2	1/2.9	1/3.7

ACTUAL MEASURE — f — f — Harmonic → f — f

Top Diameter:										
Diameter at Mouth:	65	56	48	42	39	36	27	23	18.5	15
Mouthwidth:	49	40	34.5		29	25	19	16	13	11
Cutup:	16	12	10	9	11	9	6.5	5	4.5	3
Metal Thickness:										
Windway:										
Lenguid:										
Body Length:										
Toe Hole:	6.3	6.3	6		6	5.5	4.5	4	3.5	2.5
To/√p	0.85	0.85	.8		.9	.9	.9	.8	.8	.7

St Jean Baptiste de Long, Somme, 1877

Orgue Aristide CAVAILLÉ-COLL 1877 *(opus 374)*, 90mm wind pressure

Grand Orgue- 56 notes (C1-G5)

16’	Violoncelle, C-F, 8' + 5'1/3, resultant
16’	Bourdon
8’	Montre
8’	Flûte Harmonique
8’	Bourdon
4’	Prestant
4’	Flûte Douce
2'2/3	Quinte
2’	Doublette
III	Fourniture

Récit- 56 notes (C1-G5)

8’	Cor de Nuit
8’	Viole de Gambe
8’	Voix Céleste'
4’	Flûte Octaviante
8’	Trompette
8’	Basson-Hautbois
4’	Clairon

Pédale- 30 notes (C1-F3)

16’	Soubasse (**) 24 pipes fir(?)wood
8’	Basse (**)
8’	Trompette (**)

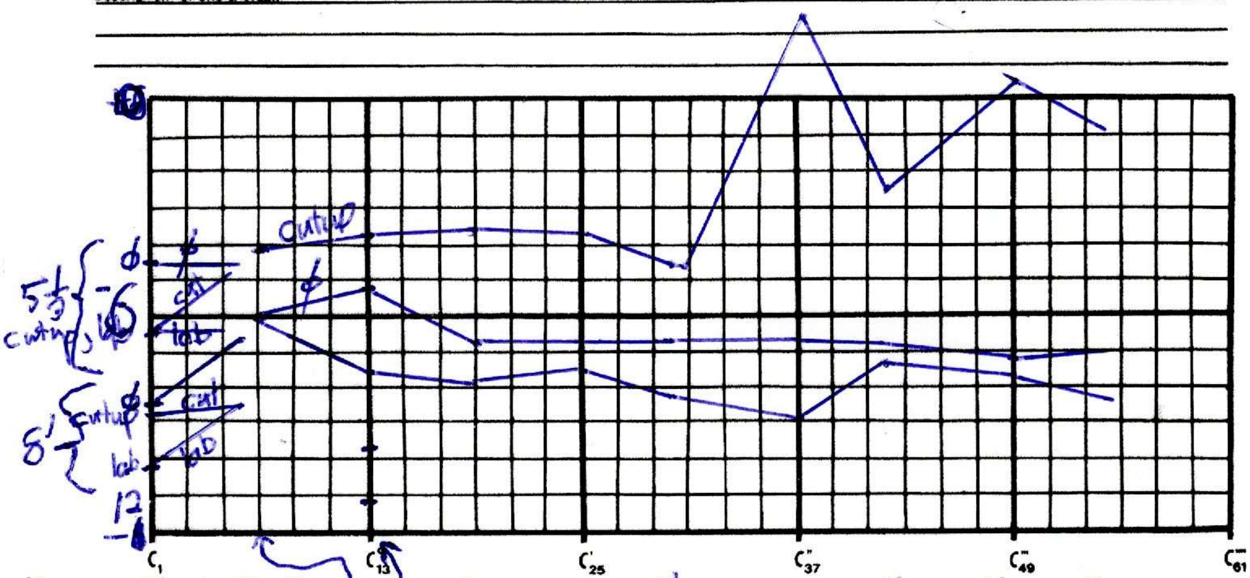
- ** Borrows from Grand Orgue
- Pédales des combinaisons
- Tirasse Grand Orgue, Tirasse Récit
- Accouplement Récit / Grand Orgue
- Trémolo, Expression Récit, Orage

Original report of organ and restoration on my website.

Stop: Violoncelle 16' **Div.:** GO **Builder:** C-C **Date:**

Windpressure: 90mm **Pitch:** **Church:** St Jean Baptiste Long

Description of site & organ:



Mouthwidth:	1/4.3	1/4.5	1/4.4	1/4.4	1/4	1/4.4	1/4.2	1/4.1	1/4.3	1/4.2	1/4.1	1/4.1	1/4.1
Cutup:	1/3.8	1/3.7	1/4	1/3.7	1/3.7	1/3.4	1/3.3	1/3.4	1/3.4	1/2.5	1/3.3	1/2.8	1/3
ACTUAL MEASURE	8' C	5 1/3 C	8 F	5 1/3 F	F#	C	f		f		f		f
Top Diameter:													
Diameter at Mouth:	140	122	122	98	155	120	93	69	56	41	33	24	19.5
Mouthwidth:	102	86	88	70	122	88	69.5	52.5	41.2	30.5	25.5	18.3	15
Cutup:	27	23	22	19	33	26	21	15.5	12	9.5	7.8	6.5	5
Metal Thickness:													
Windway:													
Languid:													
Body Length:													
Toe Hole Ø:							10.5	8	6.3	5.3	4.5	3.7	3.5
				toe x √6			1.1	.95	.85	.8	.8	.75	.8

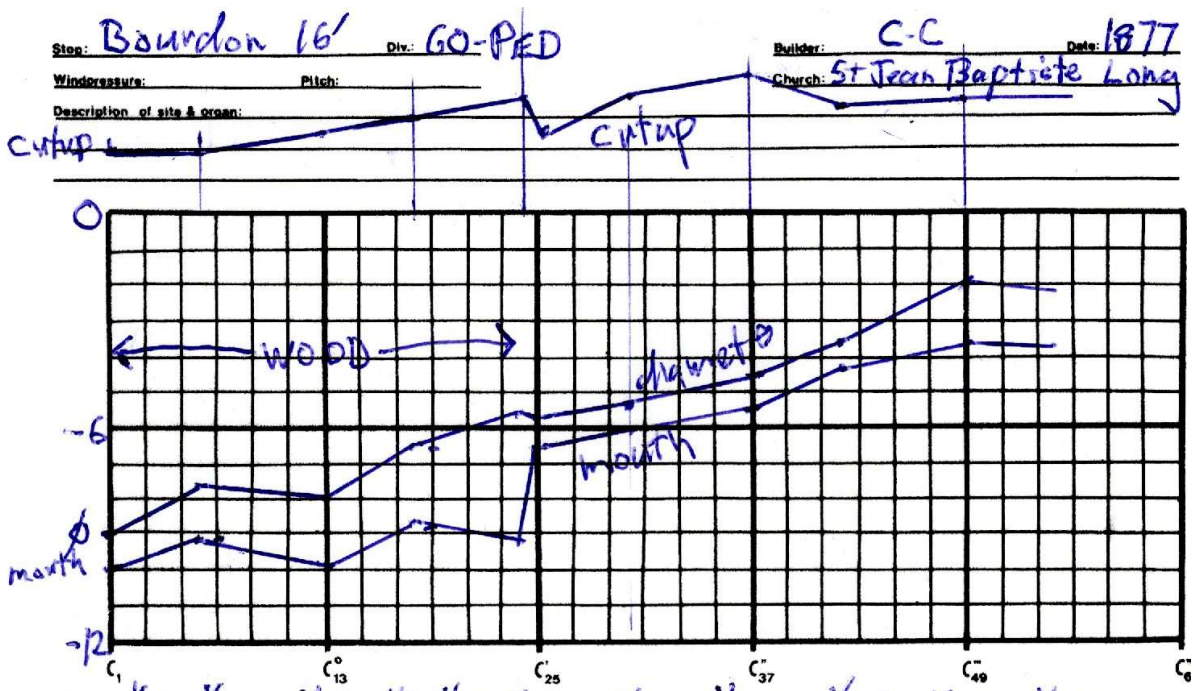
Source of Data: **Material:**

NOTES (ears, beards, slots, tuners, voicing, etc) 1-6 résultant 8'+5 1/3'

Stop: Bourdon 16' Div.: GO-PED Builder: C.C Date: 1877

Windpressure: Pitch:

Description of site & organ: Church: St Jean Baptiste Long



Mouthwidth:	1/4·1	1/4·2	1/4·4	1/4·4	1/4·6	1/4·1	1/4·1	1/4·2	1/4·1	1/4·3	1/4·3
Cutup:	1/2·4	1/2·5	1/2·3	1/2·4	1/2·3	1/2·7	1/2·6	1/2·6	1/2·9	1/2·9	1/2·9

ACTUAL MEASURE

	f	c	f	b		f					
Top Diameter:	177										
Diameter at Mouth:	178	153	113	95	78	72	59	45	38	30	24
Mouthwidth:	138	115	84	74	57	55	45	34	29	22	17.6
Cutup:	134	111	79	67	51	20.5	17	13	10	7.5	6
Metal Thickness:	56	45	34	28	22						
Windway:											
Languid:											
Body Length:											
Toe Hole ø:						8.2	7.3	6.5	5.4	4.8	3.8

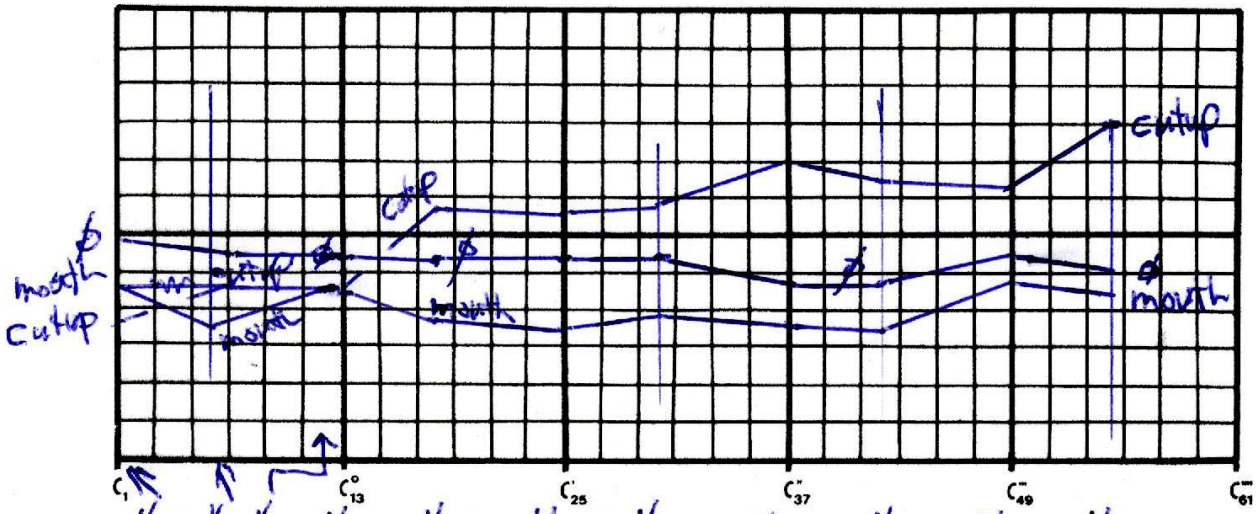
6 depth width mouth cutup

← 1-24 wood →

Stop: Montre 8 Div.: GO Builder: C-C Date: 1877

Windpressure: Pitch: Church: St Jean Baptiste de Long

Description of site & organ:



Mouthwidth:	1/4.2	1/4.1	1/4.2	1/4.2	1/4.3	1/4.3	1/4.2	1/4.2	1/4.2	1/4.1	1/4.1
Cutup:	1/4.1	1/3.9	1/3.9	1/4	1/3.5	1/3.5	1/3.5	1/3.3	1/3.4	1/3.6	1/3.3

← wood →

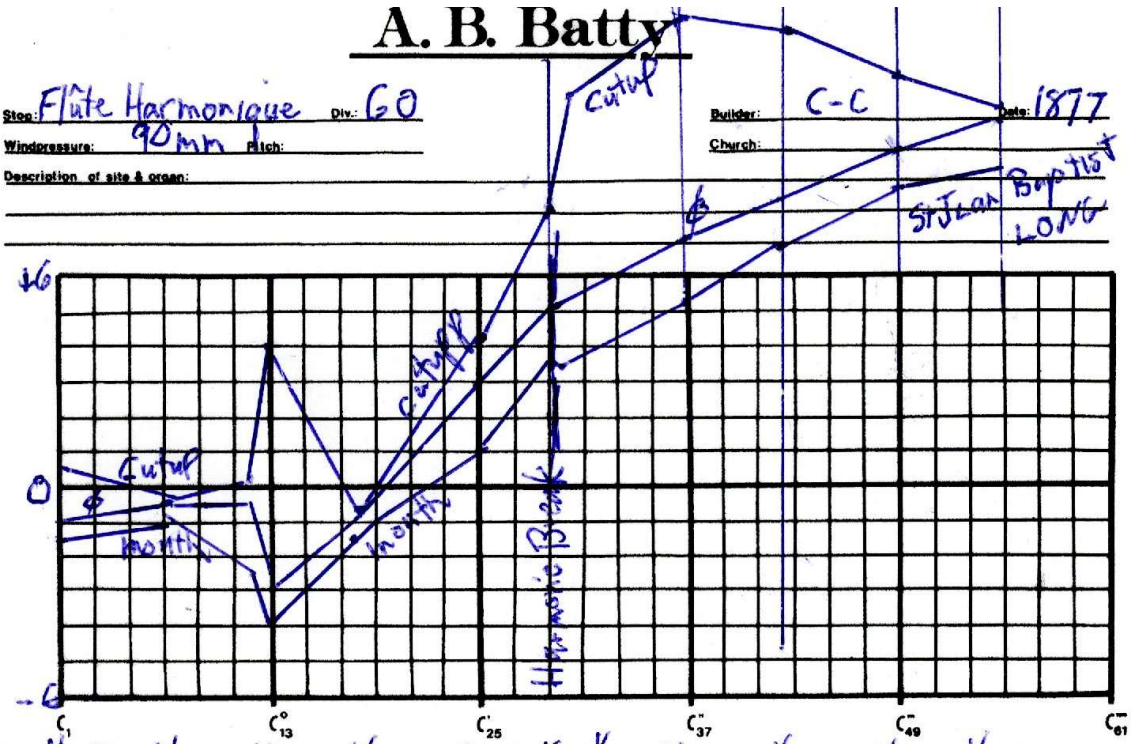
ACTUAL MEASURE

	f#	b		f#	f		f		f	
Top Diameter:										
Diameter at Mouth: 155	118	95	90	72	53	43	31	25	19	15
Mouthwidth: 115	85	71	67.8	53	38.7	31.8	23	18.5	14.5	11.5
Cutup: 28	22	18	17	15	11	9	7	5.5	4	3.5
Metal Thickness:										
Windway:										
Languid:										
Body Length:										
Toe Hole:			8.5	8.5	7.5	6.5	5.3	4.8	4	3.8
			0.9	1	1	1	0.95	0.9	0.9	1

A. B. Batty

Stop: Flute Harmonique Div.: 60
Windpressure: 90mm Pitch:
Description of site & organ:

Builder: C-C
Church:
Date: 1877



1/4.1	Mouthwidth: 1/4.2	1/4.4	1/4.2	1/4.2	1/4.3	1/4.3	1/4.4	1/4.3	1/4.3	1/4.2	1/4.3
1/3.7	Cutup: 1/4	1/3.6	1/2.9	1/3.9	1/3.5	1/3.2	1/2.6	1/2.8	1/3.1	1/3.4	1/3.6

← wood →

C ACTUAL MEASURE B C f e f → Harmonic

F 23.6

ø 148	Top Diameter:										
depth 48	Diameter at Mouth: 135	97	82	72	62	57.5	56	44	38	30	25
width 18	Mouthwidth: 96	72	61	54	45	42	32	32	28	22.3	18.2
mouth 14	Cutup: 93	68	21	14	12	13	11.5	11.5	9	6.5	5
cutup 31	Metal Thickness: 33	21									
	Windway:										
	Languid:										
	Body Length:										
	Toe Hole ø:		9.2	7.8	7.2	7.2	8	8	6.5	6.5	5.8
			1	.95	.9	.9	1.1	1.2	1	1.1	1.2

← 1.12 wood →

Stop: Bourdon 8 Div.: GO

Windpressure: 90mm Pitch:

Builder: C-C Date: 1877

Church: St Jean Baptiste Long

Description of site & organ:

Mouthwidth:	1/4.3	1/4.4	1/4.5	1/4.2	1/4.2	1/4.3	1/4.3	1/4	1/4.2	1/4.3	1/4.3
Cutup:	1/2.3	1/2.4	1/2.3	1/2.6	1/2.6	1/2.7	1/2.8	1/3	1/3	1/3.2	1/3.1

← wood →

ACTUAL MEASURE

	C	f	b				f		f		f
Top Diameter:											
Diameter at Mouth:	113	97	77	73	60	46	39	29	24	18	15
Mouthwidth:	83	71	54	53	44.6	33.5	28.2	22.5	18	13.3	11
Cutup:	80	67	51	21	17	12.5	10	7.5	6	4.2	3.5
Metal Thickness:	35	28	22								
Windway:											
Languid:					chimneys	123x13	98x11	68x9.5	50x8	29x6	21x4
Body Length:											
Toe Hole ø:				7.7	6.8	5.5	5.3	3.8	3.7	3.6	3
		toe x.15		.9	.9	.8	.8	.7	.8	.8	.8

A. B. Batty

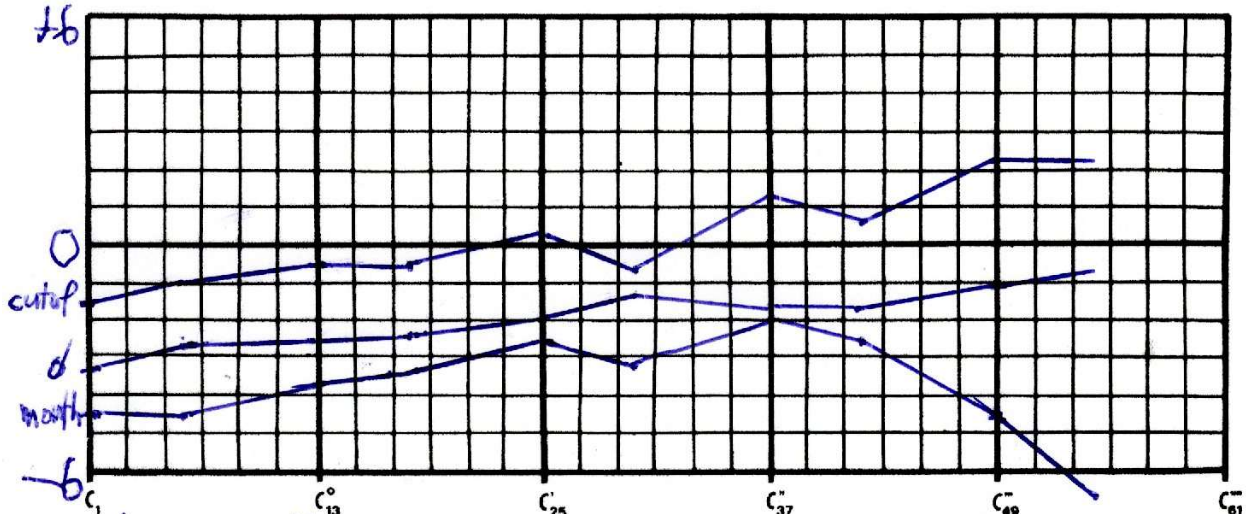
Stop: Prestant 4 Div.: 60

Windpressure: 90mm Pitch:

Builder: C-C Date: 1877

Church: St Jean Baptiste Long

Description of site & organ:



Mouthwidth: 1/4.2	1/4.3	1/4.2	1/4.2	1/4.1	1/4.4	1/4	1/4.1	1/4.6		
Cutup: 1/3.5	1/3.4	1/3.3	1/3.5	1/3.5	1/3.6	1/3.5	1/3.7	1/3		

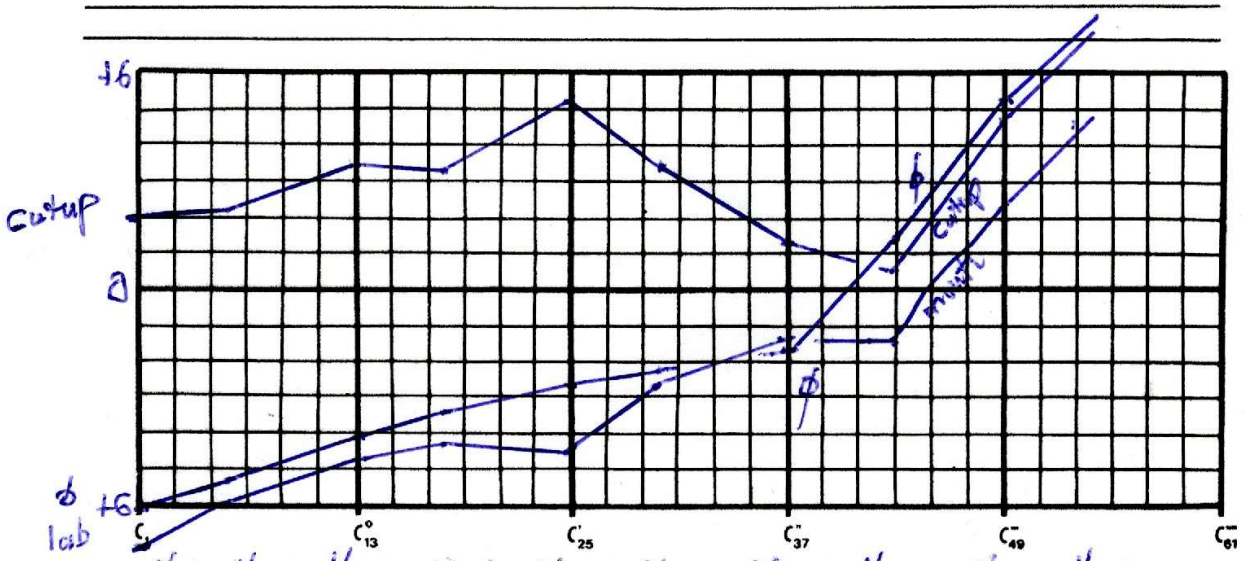
ACTUAL MEASURE

	f		f		f					
Top Diameter:										
Diameter at Mouth: 80	66	49	40	30	25	18	14.5	11	9	
Mouthwidth: 60	48	36.5	30	23	18	14	11	7.5	5.5	
Cutup: 17	14	11	8.5	6.5	5	4	3	2.5	2	
Metal Thickness:										
Windway:										
Languid:										
Body Length:										
Toe Hole ø: 8.8	8.8	6.8	5.9	4.8	4.3	3.8	3.5	2.8	2	
foot x √p − 1	1.1	.95	.85	.85	.8	.85	.9	.8	.9	

Stop: Flûte Douce 4' Div: GO (chimney Flute) Builder: C-C Date: 1877

Windpressure: 90 mm Pitch: Church: St Jean Baptiste Long

Description of site & organ:



Mouthwidth:	1/4.1	1/4.1	1/4.1	1/4.1	1/4.3	1/4.1	1/3.9	1/4.6	1/4.6	1/4.5	
Cutup:	1/2.7	1/2.8	1/2.8	1/2.9	1/2.6	1/3.1	1/3.6	1/3.7	1/3.6	1/3.6	

ACTUAL MEASURE

								f	f#		
Top Diameter:								5	5	5	
Diameter at Mouth:	71	59	46	38	29	24	18	15	16	14.5	13
Mouthwidth:	54	45	35	29	21	18.5	14.5	11.5	11	10	9
Cutup:	28	16	12.5	10	8	6	4	3	3	2.8	2.5
Metal Thickness:											
Windway:		5 ø	13	11	10	8.5	6	5ø			
Languid:	chimney	length	125	100	69	51	30	20			
Body Length:											
Toe Hole ø:	8	6.8	6.3	5.2	3.6	3.8	3	3	3	2.8	3
	.9	.9	.95	.9	.7	.8	.7	.8	.8	.75	.8

k chimneys → 1 Body 1/3 taper

Source of Data:

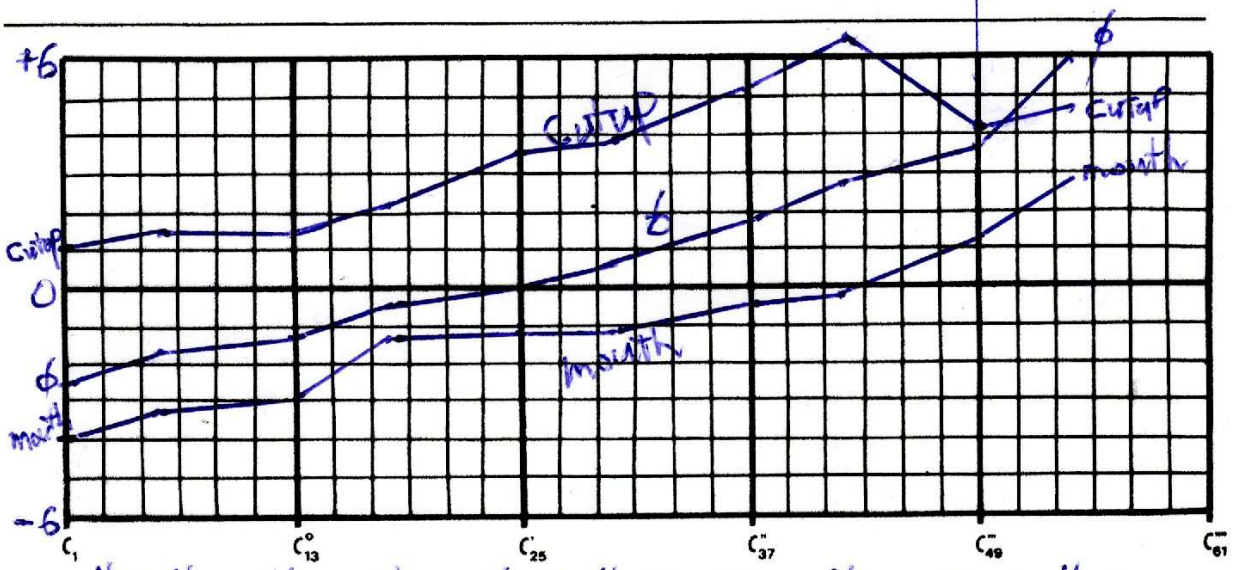
Stop: Quinte 2 2/3 Div.: GO

Builder: C-C Date: 1877

Windpressure: 90 mm Pitch:

Church: ST Jean Baptiste LONG

Description of site & organ:



Mouthwidth:	1/4.3	1/4.3	1/4.3	1/4.1	1/4.2	1/4.3	1/4.4	1/4.5	1/4.5	1/4.6
Cutup:	1/3.2	1/3.3	1/3.3	1/3.5	1/3.3	1/3.2	1/3.1	1/3	1/3.5	1/3.7

ACTUAL MEASURE f f f f f

Top Diameter:									
Diameter at Mouth: 61	51	38.5	32	24	20	15.5	13	10	8
Mouthwidth: 45	37.5	28	24.3	18	14.5	11	9	7	5.5
Cutup: 14	11.5	8.5	7	5.5	4.5	3.5	3	2	1.5
Metal Thickness:									
Windway:									
Languid:									
Body Length:									
Toe Hole ϕ: 6.5	6.4	4.6	4.7	4	3.5	3	2.6	2.4	2.2
toe x √5 .85	.9	.8	.8	.8	.8	.8	.7	.8	.8

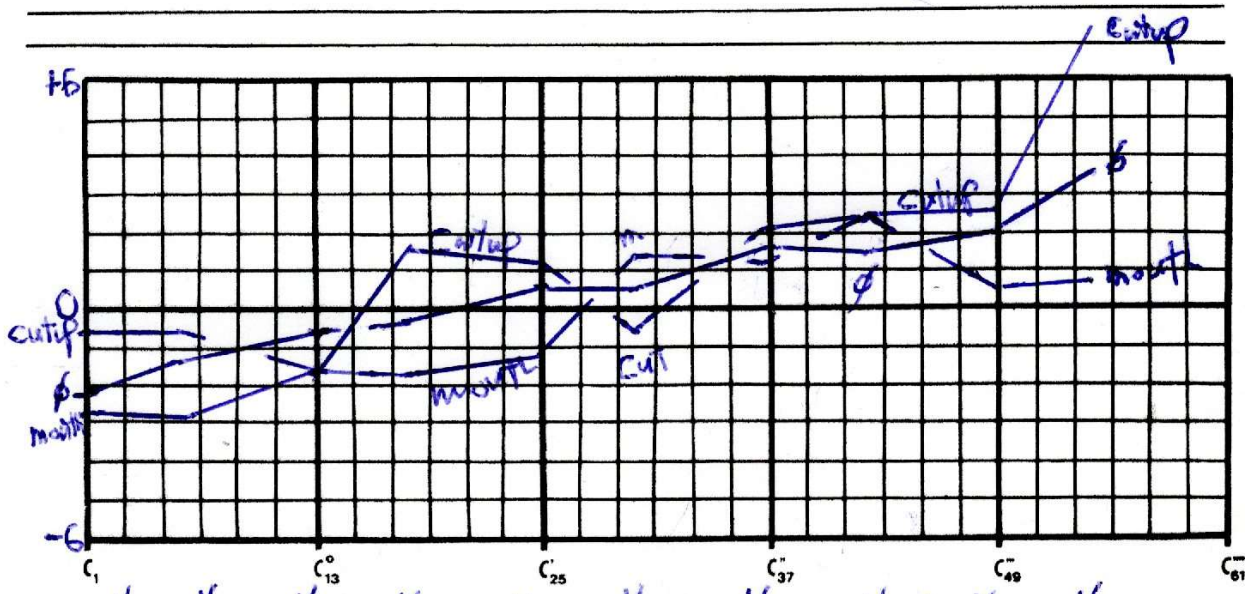
Stop: Doublette 2' Div.: GO

Builder: C-C Date: 1877

Windpressure: 90mm Pitch:

Church: St Jean Baptiste Lowe

Description of site & organ:



Mouthwidth:	1/4.1	1/4.3	1/4.2	1/4.3	1/4.3	1/3.9	1/4.1	1/3.9	1/4.3	1/4.5
Cutup:	1/3.6	1/3.6	1/4	1/3.5	1/3.6	1/4.3	1/3.8	1/4	1/3.7	1/3

ACTUAL MEASURE f

Top Diameter:										
Diameter at Mouth:	50	42	32	26	20	16	12.5	10	7.5	6.5
Mouthwidth:	38	30.6	24	19	14.5	13	9.5	8	5.5	4.5
Cutup:	10.5	8.5	6	5.5	4	3	2.5	2	1.5	1.5
Metal Thickness:										
Windway:										
Languid:										
Body Length:										
Toe Hole ø:	6.2	5.5	4.8	4.1	3.5	3.5	3	2		
	.9	.9	.8	.8	.8	.9	.9	.6	toe ø	

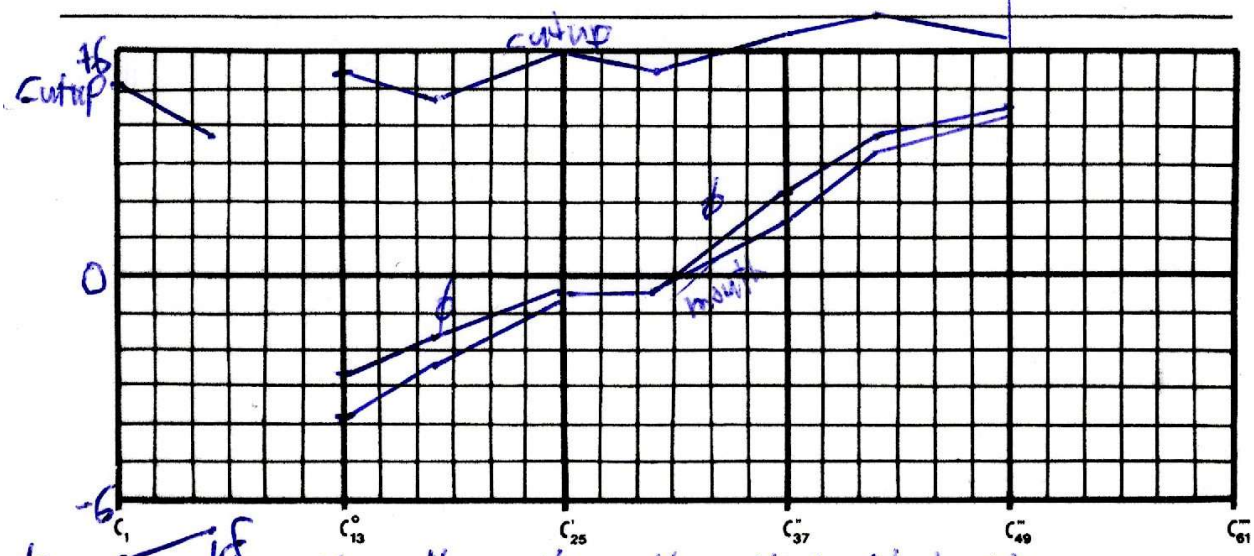
Stop: Cor de Nuit 8' Div.: Récit

Builder: C-C Date: 1877

Windpressure: 96 mm Pitch:

Church: ST Jean Baptiste LONG

Description of site & organ:



Mouthwidth:	1/2.4	1/4.2	1/4.1	1/4	1/4	1/4.1	1/4.1	1/4	
Cutup:	1/2.2	1/2.3	1/2.7	1/2.9	1/3	1/3.2	1/3.2	1/3.4	1/3.7

← WOOD →

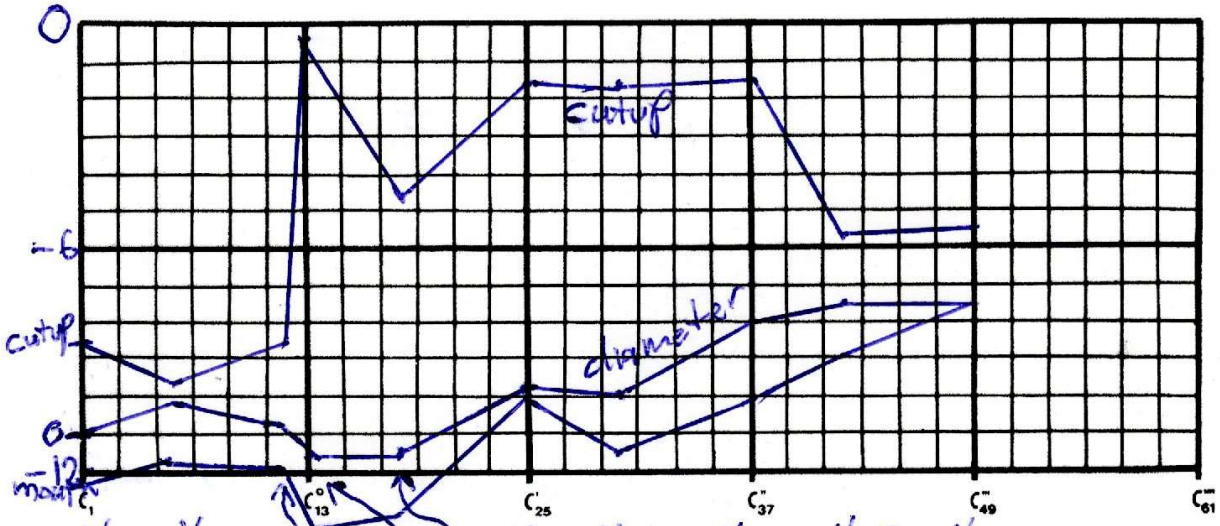
ACTUAL MEASURE

	C	F	C	f		f			f
Top Diameter:									
Diameter at Mouth:	113	97		69	54	46	36	31	23.5
Mouthwidth:	83	71	82	53	42	35.7	27.3	24	18.3
Cutup:	82	67	61.4	18	14	11	8.5	7	5
Metal Thickness:	38	29	23						
Windway:									
Lenquid:									
Body Length:									
Toe Hole ø:			9	8	7.3	6.4	6	4.8	4.8

Stop: Viole de Gamba 8 Div.: Recit Builder: C-C Date: 1877

Windpressure: 90mm Pitch: Church: Jean Baptiste

Description of site & organ:



Mouthwidth:	1/4-2	1/4-3	1/4-2	1/4-4	1/4-3	1/4	1/4-3	1/4-4	1/4-3	1/4		
Cutup:	1/3-4	1/3-7	1/3-5	1/22	1/2-8	1/2-8	1/2-6	1/2-8	1/3-5	1/3-7		

ACTUAL MEASURE C F b c f c f f

Top Diameter:	97											
Diameter at Mouth:	103	85	67	56	45	36	29	23	19	14		
Mouthwidth:	72	59	43	40	33	28	21	16-5	14	11		
Cutup:	72	59	45	18	12	10	8	6	4	3		
Languid Thickness:	21	16	13									
Windway:												
Languid:												
Body Length:												
Toe Hole ø:				6-5	6-8	5	4-5	3-5	3-5	3-5		
				·9	1	·9	·8	·7	·8	·9		

depth 103
width
Mouth
cutup 21

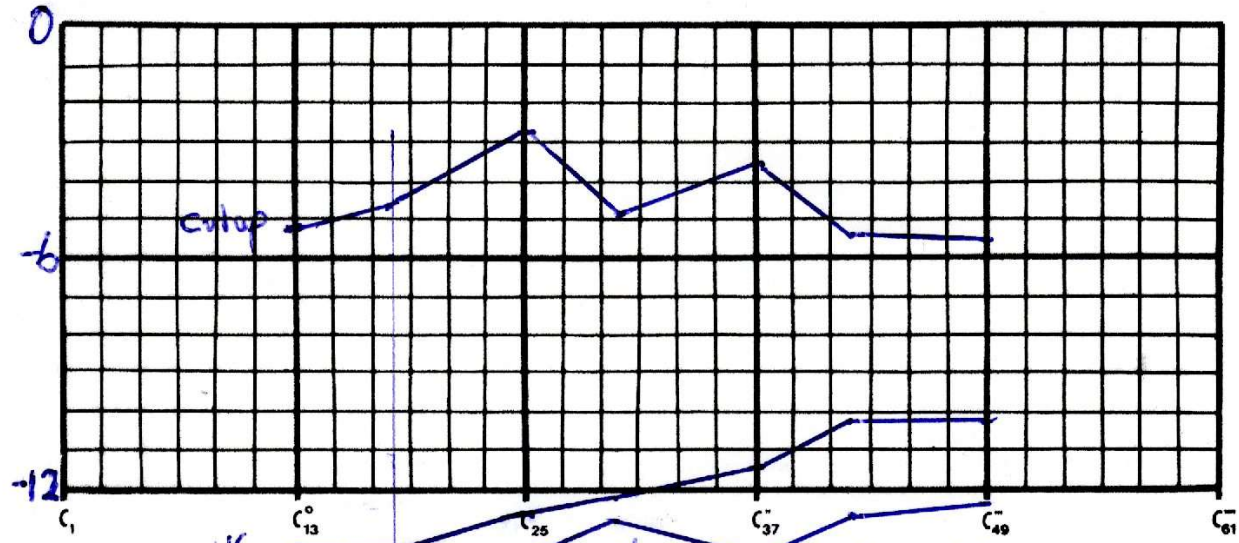
Stop: Voix Celeste 8 Div.: Recit

Builder: C-C Date: 1877

Windpressure: 90 Pitch:

Church: Jean Baptiste Long

Description of site & organ:



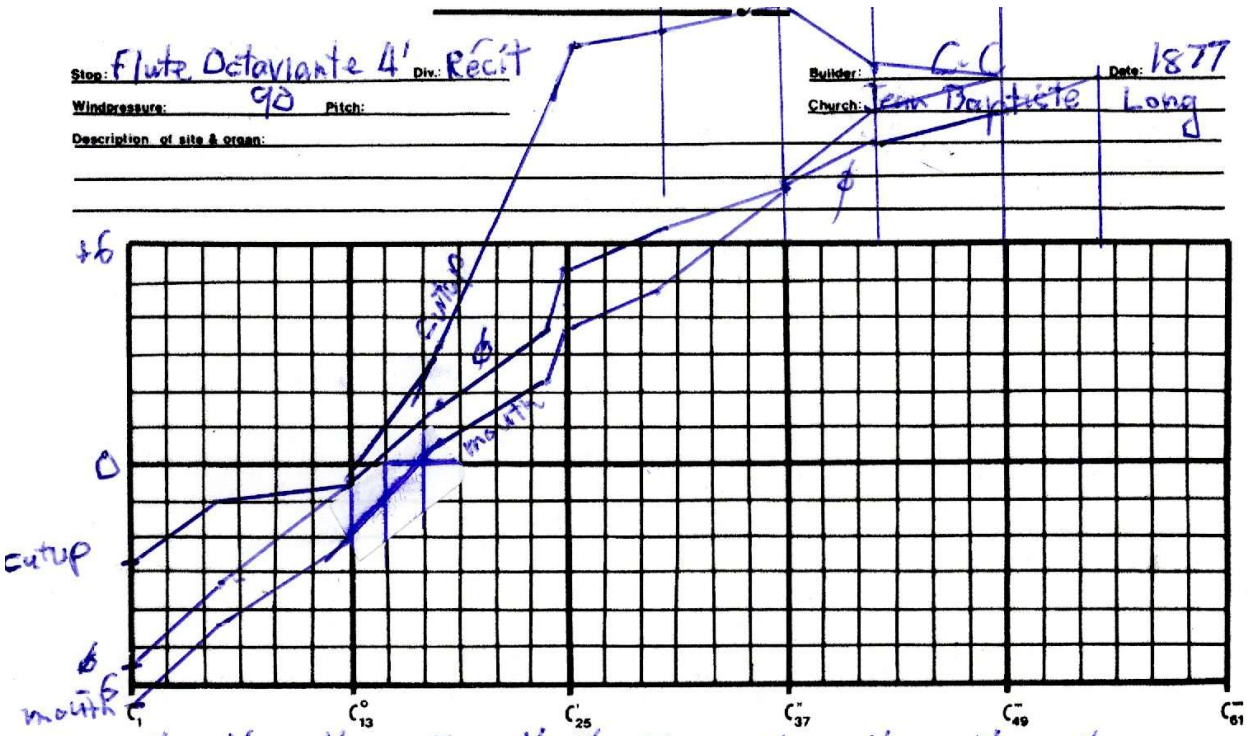
Mouthwidth:	1/4.5	1/2.4	1/4.3	1/4.1	1/4.5	1/4.5	1/4.4		
Cutup:	1/2.5	1/2.4	1/2.5	1/2.9	1/2.5	1/3	1/3		

ACTUAL MEASURE

Top Diameter:									
Diameter at Mouth:	51	41	32	26	20	17	12.5		
Mouthwidth:	36	29	23.5	20	14	12	9		
Cutup:	14.5	11.2	9.5	7	5.5	4	3		
Metal Thickness:									
Windway:									
Languid:									
Body Length:									
Toe Hole ø:	6.2	6	6.8	4.2	3.3	2.8	2.7		
toe X/6	.9	.9	1.2	.8	.75	.7	.8		

Stop: Flute Octaviante 4' Div.: Récit
Windpressure: 90 Pitch:
Description of site & organ:

Builder: C.C
Church: Jean Baptiste
Date: 1877 Long



Mouthwidth:	1/4.2	1/4.2	1/4.3	1/4.2	1/4.3	1/4.3	1/4.3	1/4	1/3.9	1/3.8	1/3.9
Cutup:	1/3.4	1/3.5	1/3.8	1/3.5	1/4	1/2.7	1/2.8	1/3	1/3.7	1/3.9	1/4

ACTUAL MEASURE

← Harmonic

Top Diameter:											
Diameter at Mouth:	73	65	54	48	40	41	34.5	27	23	18	15
Mouthwidth:	54.5	49	39.5	35.5	29.5	30	25.5	21	18.5	15	12
Cutup:	16	14	10.5	10	11	11	9	7	5	3.8	3
Metal Thickness:											
Windway:											
Languid:											
Body Length:											
Toe Hole:	8.2	7.2	6.2	6.1	6.4	6.1	6.2	5.8	5.5	5	4.8
toe x .8	1	.9	.85	.85	1	1	1.1	1.2	1.2	1.2	1.2

St Etienne Abbey, Caen

St Etienne Abbey, Caen Organ by CAVAILLÉ-COLL in 1883

The previous organ was built in 1745 by the Lefevre brothers of Rouen, featuring a monumental oak case crafted by master carpenter Gouy, adorned with Herculean statues. This organ had over 4,000 pipes, 60 registers, and 5 keyboards but fell into disrepair by the mid-19th century. Cavaillé-Coll build a completely new instrument which cost 70,000 francs and retained the magnificent Gouy case, as well as some of the Lefevre pipework.

At first, the organ was criticized for being “weak and indistinct", compared to the previous Baroque instrument. However, it was later realized that the abbey's acoustics changed significantly when filled with people, and listeners needed to get used to the new Romantic sound. Over time, the instrument gained acceptance and acclaim.

The scaling information of this magnificent Cavaille-Coll organ of 1883 was taken from the excellent book “The Organ of St. Etienne Abbey in Caen, written by Robert Davy in 1985. This book is filled with an excellent description, history, drawings and measurements of the organ, and should be in your library. There are excellent descriptions of the pipework, except that only the diameter measurements of the pipes are provided. I include those measurements here and include some graphs to help illustrate the scales.

Stoplist

First Manual, Grand Orgue - 56 notes, C1-g’’’

16’	Montre	
16’	Bourdon	X
8’	Montre	
8’	Flûte harmonique	
8’	Bourdon	
8’	Gambe	Prog 6-1/2, ‘E’ Dulciane, +1ht
4’	Prestant	A
4’	Flûte Octaviante	#2

Tirasse Grand Orgue

3’	Quinte	A
2’	Doublette	Prog 8
	Plein Jeu VII	B
16’	Bombarde	D3
8’	Trompette	E2
4’	Clairon	E3

Pédale - 30 notes, C1-g’’’

32’	Bourdon	BB
16’	Contrebasse *(wide scale)*	
16’	Bourdon	BB
8’	Flute *(wide scale)*	
8’	Bourdon	Hbis
8’	Violoncello	Montre 2
4’	Flute	Z

Tirasse Pedale Orgue

16’	Bombarde	
89’	Trompette	
4’	Clairon	

Second Manual, Positif - 56 notes, C1-g’’’

16’	Bourdon	B
8’	Salicional	Prog 6-1/2, E Dulciane +1ht
8’	Principal	B
8’	Cor de nuit	B
8’	Uda maris	
4’	Prestant	
4’	Flûte douce	B
	Carillon I-III	

Tirasse Positif

16’	Basson	K3
8’	Trompette	E4
8’	Cor Anglais	

Third Manual, Recit-Expressif - 56 notes, C1-g’’’

16’	Quintaton	D
8’	Diapason	A
8’	Flute traversiere	
8’	Viole de Gambe	7
8’	Voix Celeste	16
4’	Flute octaviante	
8’	Basson-hautbois	
8’	Clarinette *(closed shallot)*	
8’	Voix humaine	

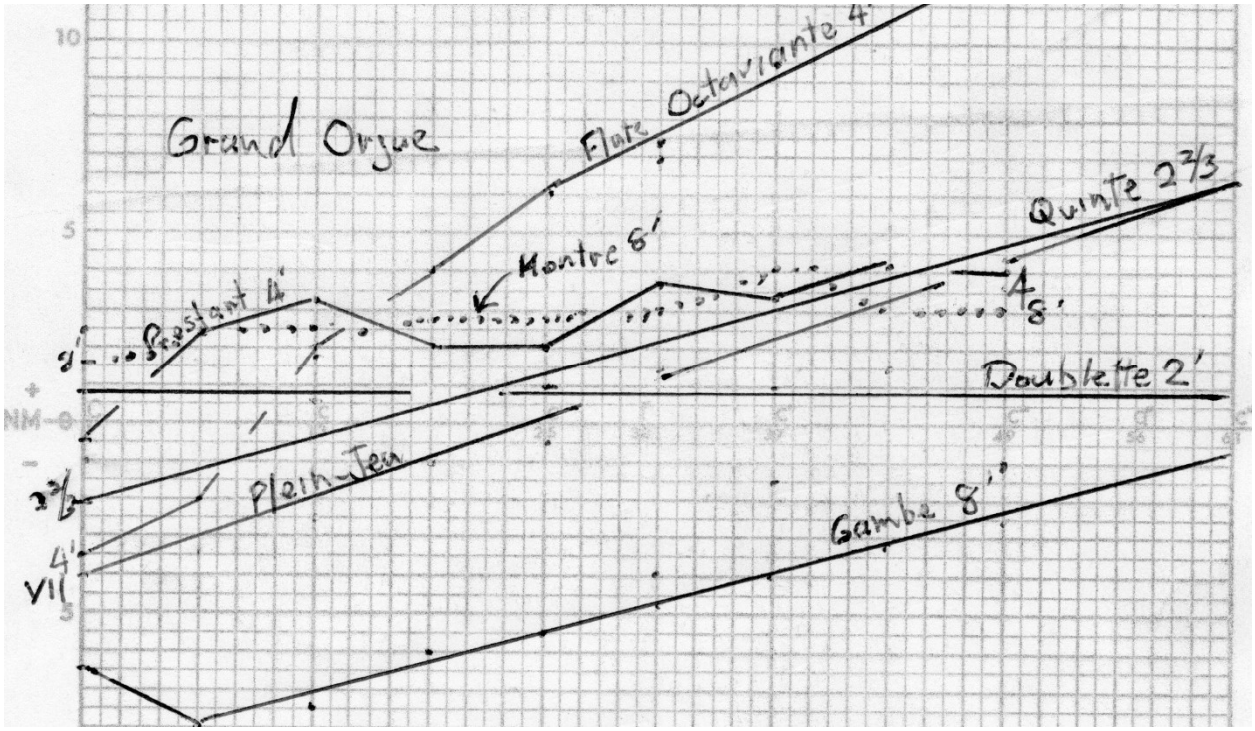
Tirasse Recit-Expressif

2’	Octavin	Prog 3-1/2 /6, 1
	Cornet II-V	8’ – Hbis, rest prog 5
16’	Bombarde	
8’	Trompette	
4’	Clairon harmonique	

Tirasse

- Thunder
- Grande – pedal coupler
- Positif – pedal coupler
- Recit – pedal coupler
- Grande – suboktave
- Recit – suboktave
- Grande – pneumatic manual
- Positiv – Grande copula
- Recit – Grande copula
- Recit – Positiv
- Recit – Tremolo
- Swell pedal

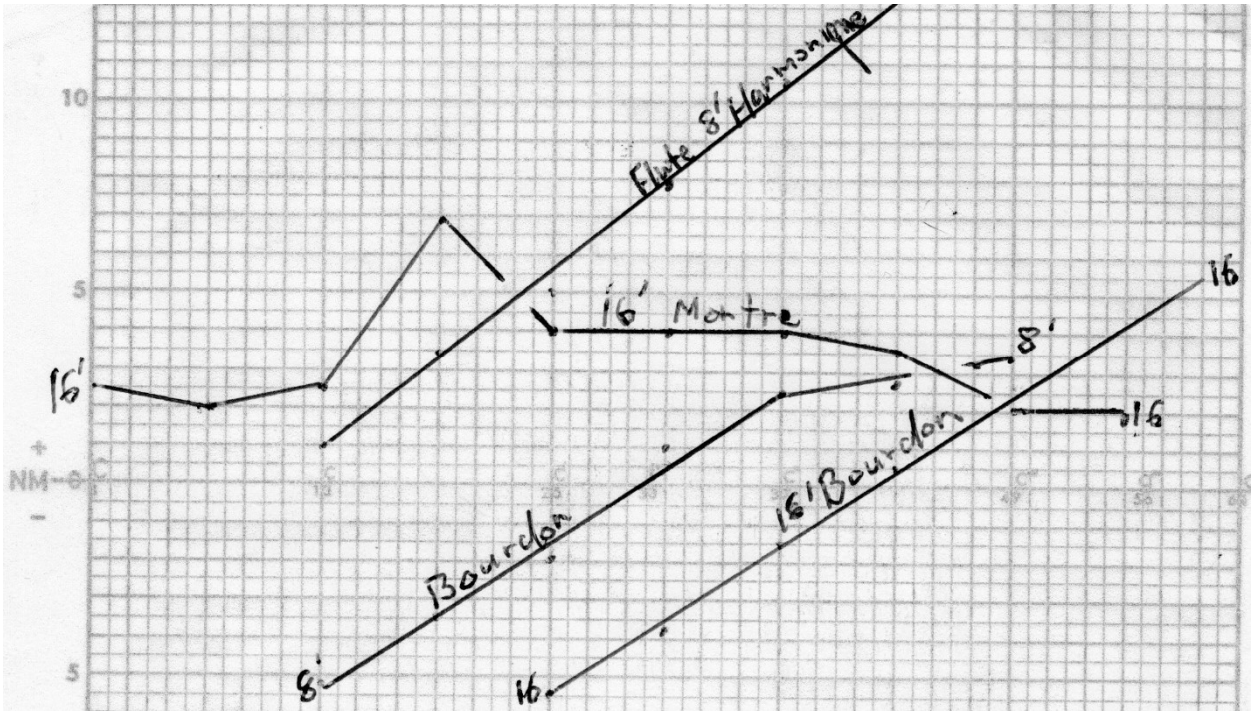
Grand Orgue Scales



Grand Orgue	C1	C13	C25	C37	C49	C61
Montre 16’	290	180	110	57.3	33.5	
Bourdon 16’	166x167	112x112	73	51	36	
Montre 8’	160	95.4	59.5	37	21	
Bourdon 8’	110x112	73	50.3	35.2	22.3	
Flute Harmonique 8’	163x123	96.5	68	51.5	38.5	
Gambe 8’	116.5	67	43.4	27	17.2	
Prestant 4’	88	63.6	34.5	21	13	
Flute Octaviante 4’	80	57	42.4	29	19.2	
Quinte 2-2/3’	51.4	33.5	29	14		
Doublette 2’	80	57	42.4 29	19.2		
Plein-Jeu VII	45 @2’	39.2	19	13		
Cornet V	Old pipes					

The scales, especially on the Grande Orgue, are irregular for several reasons. The Montre basses are from the 1745 Lefevre brother’s façade. Also, several Lefevre stops, especially wooden basses were reused with new C-C trebles. Finally, after the organ was installed, there were complaints that the new organ wasn’t loud enough and there is evidence that several stops were rescaled to make them louder.

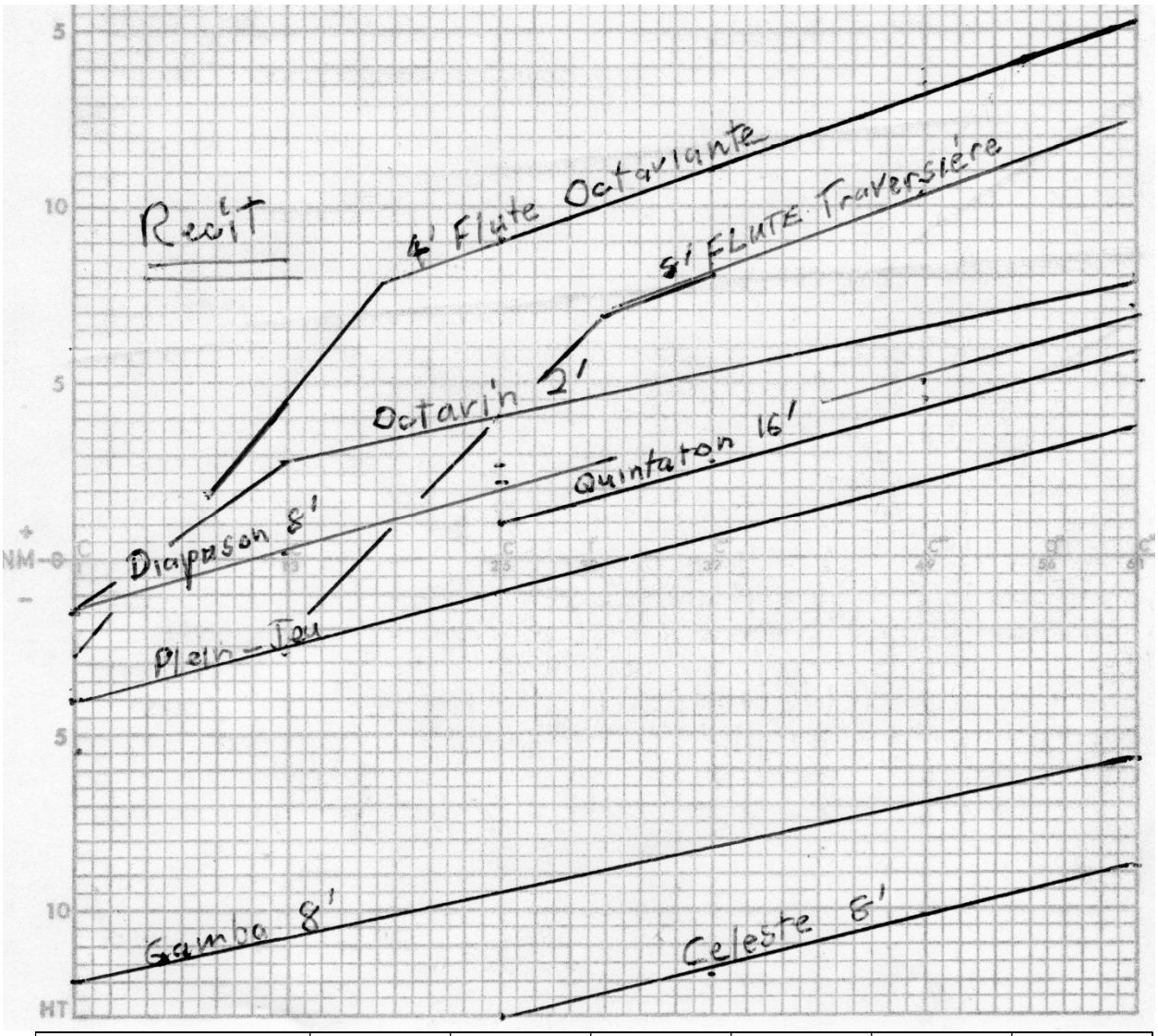
Grande Orgue



Pedal Scales

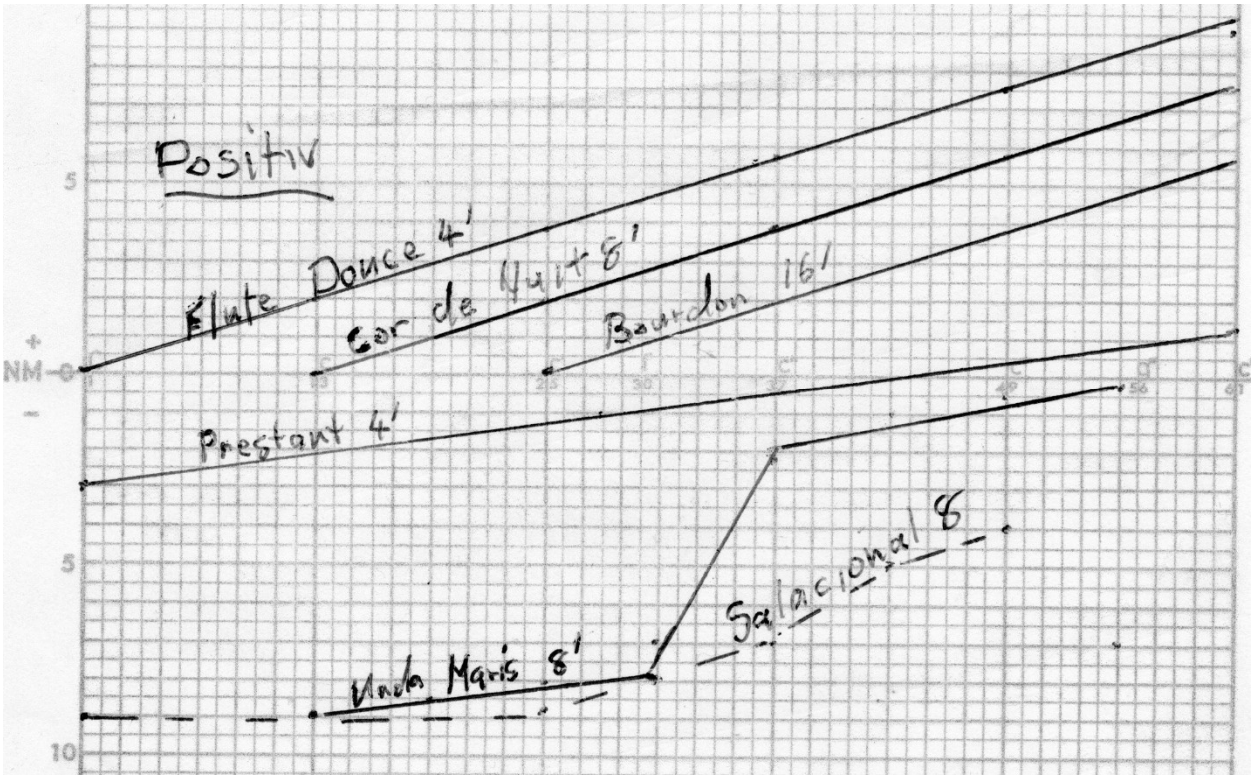
Pedal Orgue, BB	C1	C13	C25
Bourdon 32’	340x290	220x180	135x110
Contrebasse 16’	By Vers-	chneider	
Bourdon 16’ BB	218x180	130x102	83x60
Grosse Flute 8’	160x160	107x107	60x60
Violoncelle 8’ montre2	131	80	48.5
Bourdon 8’ Hbis	128x112	85	57
Flute 4’ Z	107	67	41.5

Recit Scales



Recit	C1	C13	C25	C37	C49	C61
Quintation 16’	170x170	108x108	58.8	38	24.3	
Diapason 8’	150	91	58.8	38	24.2	
Flute Traversiere 8’	145x112	83.5	63.4	44.7	30	
Gambe 8’	93	56.5	36	22.6	13.8	
Voix Celeste 8’		51.2	33	20.6	14	
Flute Octaviante 4’	82	66.5	48.2	34.5	25	
Octavin 2’	52.5	38.2	28	18		
Plein-Jeu IV’	45.8 @ 2’	29	18.2	13		
Cornet V (open ranks)	66.2@4’	43.8	29.5	19.9		

Positiv Scales



Positiv	C1	C13	C25	C37	C49	C61
Bourdon 16’	155x190	100x130	73	48	30	
Principal 8’	Lefevre					
Cor de Nuit 8’	110x122	73.5	47.2	29.7	22.6	
Salicional 8’	105	59	42.5	27	17	
Unda Maris 8’		62	39	29.8	18	
Prestant 4’	81.5	50	30.5	18.8	11	
Flute Douce 4’	73.2	47.3	29.8	19	12.1	
Carillon I-III	51.5 @2’	33.8	25.3	16		