

DOCUMENTATION OF THE CAVAILLE-COLL GRAND ORGUE
IN THE CHURCH OF SAINT-SULPICE, PARIS, FRANCE

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TABLE OF CONTENTS

Chapter	Page
I. HISTORY OF THE CAVAILLE-COLL GRAND ORGUE AT SAINT-SULPICE . . .	3
II. DETAILS OF THE CAVAILLE-COLL PIPEWORK AT SAINT-SULPICE . . .	11
Construction and Voicing of Selected Flue Pipes	11
Construction and Voicing of Selected Chorus Reeds	32
Analysis of the Positif and Récit Mixtures	44
III. A DESCRIPTION OF THE MECHANICAL ACCESSORIES ON THE SAINT-SULPICE CONSOLE	46
BIBLIOGRAPHY	50
APPENDIX	52
Appendix A: Present Specifications of the Cavaillé-Coll Grand Orgue at Saint-Sulpice	53
Appendix B: Photographs with Commentary on the Grand Orgue at Saint-Sulpice	56
Appendix C: Titular Organists of the Cavaillé-Coll Grand Orgue at Saint-Sulpice	73
Appendix D: Dedicatory and Centennial Celebrations at Saint-Sulpice	74

INTRODUCTION

This study is chiefly concerned with voicing techniques employed by Aristide Cavaillé-Coll in his organ in the church of Saint-Sulpice. In the past, the nominal amounts of literature dealing with the Cavaillé-Coll organ have been both vague and poorly documented, rarely dealing with specific details of his work.

The reader should remember that the Saint-Sulpice organ represents an anomaly in Cavaillé-Coll's career. Due to the colossal size of the instrument, room existed for stops such as the Kéraulophone and Baryton of the Bombarde and the Ophicléide of the Pédale, stops indigenous only to Saint-Sulpice. However, the most important consideration in understanding this instrument is the unusual size and awkward shape of the case¹ housing the pipework. "The architect of the organ case was named Chalgrin and his work was a chagrin for me."² Obviously, Cavaillé-Coll realized from the beginning that the case seriously impeded the speech of the pipes. In all likelihood, some voicing techniques were modified in order to compensate for the accoustical hurdles imposed by Chalgrin.

This paper by no means represents an exhaustive documentation of the Saint-Sulpice Grand Orgue or of voicing techniques generally pursued by Cavaillé-Coll. Certain bass pipes, located on off-set chests, would have required inordinate amounts of time and effort in order to reach. Time was extremely limited, necessitating a study of only those ranks

¹The organ case was finished in 1776 by Chalgrin.

²Hinton, J.W., Organ Construction, p. 108. (In French, the name of the builder also means chagrin.)

most important to the ensemble sound of Cavaill6-Coll's building.

Nevertheless, the details provided in this paper concerning Cavaill6-

Coll's work are without precedent in the English language and will hopefully aid both the American organ builder and organist in a better understanding of the craft of a most important figure in the history of organ construction.

CHAPTER I

HISTORY OF THE CAVAILLE-COLL GRAND ORGUE AT SAINT-SULPICE

Specifications of the Grand Orgue in 1862³Pédale

Jeux de Fond		Jeux de Combinaison	
Principal-basse	32'	Clairon	4'
Contra-basse	16'	Ophicléside	8'
Soubasse	16'	Trompette	8'
Flûte	8'	Basson	16'
Violoncelle	8'	Bombarde	16'
Flûte	4'	Contra-Bombarde	32'

Grand-Orgue
(Second Manual)

Principal Harmonique	16'
Montre	16'
Bourdon	16'
Flûte Conique	16'
Flûte Harmonique	8'
Flûte Traversière	8'
Montre	8'
Bourdon	8'
Diapason	8'
Flûte à Pavillon	8'
Prostant	4'
Grosse Quinte	5 1/3'
Doublette	2'

Grand-Chœur
(First or Second Manual)

Salicional	8'
Octave	4'
Grosse Fourniture	IV
Grosse Cymbale	VI
Plein Jeu	IV
Cornet	V
1 ^{re} Trompette	8'
2 ^e Trompette	8'
Clairon	4'
Clairon Doublette	2'
Basson	8'
Basson	16'
Bombarde	16'

Bombarde
(Third Manual)

Jeux de Fond		Jeux de Combinaison	
Soubasse	16'	Grosse Quinte	5 1/3'
Flûte Conique	16'	Grosse Tierce	3 1/5'
Principal	8'	Quinte	2 2/3'

³Source: The plaque containing the original specifications signed by Cavaille-Coll now hangs in the titular's quarters at the rear of the organ.

Flûte Harmonique	8'	Octavo	4'
Bourdon	8'	Octavin	2'
Gambe	8'	Cornet	V
Violoncelle	8'	Trompette	8'
Kéraulophone	8'	Clairon	4'
Flûte Octavante	4'	Baryton	8'
Prestant	4'	Bombarde	16'

Positif
(Fourth Manual)

Violon Basse	16'	Quinte	2 2/3'
Quintaton	16'	Doublette	2'
Quintaton	8'	Plein Jeu Harmonique III-VI	
Flûte Traversière	8'	Tierce	1 3/5'
Salicional	8'	Larigot	1 1/3'
Viole de Gambe	8'	Piccolo	1'
Unda Maris	8'	Trompette	8'
Flûte Octavante	4'	Clarinette	8'
Flûte Douce	4'	Clairon	4'
Dulciana	4'	Euphone	16'

Récit-Expressif
(Fifth Manual)

Quintaton	16'	Flûte Harmonique	8'
Bourdon	8'	Flûte Octavante	4'
Violoncelle	8'	Dulciana	4'
Prestant	4'	Quinte	2 2/3'
Doublette	2'	Octavin	2'
Fourniture	III	Cornet	V
Cymbale	IV	Trompette	8'
Basson et Hautbois	8'	Trompette Harmonique	8'
Cromorne	8'	Bombarde	16'
Cor Anglais	8'	Clairon	4'
Voix Céleste	8'		

VOIX HUMAINE 8'

Régistres de Combinaison:
(Located on both sides of the manuals)
Récit
Positif
Bombarde
Grand-Orgue et Grand-Chœur
Pédale

Pédales de Combinaison
(In order from left to right)
Effet d'Orgue
Tirasse Grand-Chœur
Tirasse Grand-Orgue
Anches Pédale
Octaves Graves des Claviers
Récit
Positif
Bombarde
Grand-Orgue
Grand-Chœur

Appels des Joux de Combinaison
 Récit
 Positif
 Bombarde
 Grand-Orgue
 Accouplements au Premier Clavier
 Récit
 Positif
 Bombarde
 Grand-Orgue
 Grand-Chœur
 Tremblant du Récit
 Expression du Récit

Cavaillé-Coll's monumental Grand Orgue in Saint-Sulpice has changed little since its dedication on April 29, 1862. Some minor alterations in solo stops and mechanical accessories have transpired, but the most important ensemble voices have remained untouched.

Four dates are engraved on the back of the positif façade which faces the console: 1776, 1862, 1882, and 1903. The significance of the first two has been established. Undoubtedly, most of the changes which have occurred since 1862 fall into one of the other two years. Unfortunately, company records maintained by Cavaillé-Coll and his successor, Charles Mutin, have been sold to a private citizen, Monsieur Claude Noisset de Crauzat of Paris. These records are known to include vital information which would clarify several of the mysteries which shall be exposed in this chapter. Repeated attempts were made to secure access to these documents, but Monsieur Crauzat was always inaccessible.

A comparison of the 1862 specification with the present one (provided in Appendix A of this paper) indicates the following changes:

A. Mechanical

1. Exclusion of the "Effet d'Orage" pedal.
2. Exclusion of the "Tremblant du Récit" pedal.
3. Addition of a "Tirasse Récit."
4. Addition of a "Copula Récit-Positif."

5. Addition of a chamade ventil.
6. Changes in the order of the manuals.
7. Change in nomenclature: The Bombarde is renamed Solo.
8. Salicional 8' of the Grand-Choeur moved to the Grand-Orgue; Doublette 2' of the Grand-Orgue moved to the Grand-Choeur.
9. Flutes Harmonique 8' and Octaviano 4' of the Récit Joux de Combinaison exchange places with the Fourniture III and the Cymbale IV of the Récit Joux de Fond.

B. Tonal

1. Addition of separate Principals 16' and 8' to the Pédale.
2. Septième 2-2/7' replaces Baryton 8' of the Bombarde.
3. Positif Clarinotte 8' removed and replaced by Bombarde Baryton 8'.
4. Positif Euphone 16' removed and replaced by new Basson 16'.
5. Récit Cor Anglais 8' removed and replaced by a new Diapason 8'.
6. Récit Trompette Harmonique 8' seems to disappear and a Trompette-en-Chamade added in its place.

Initially, the specification gives the impression of five separate manual divisions: Grand-Choeur, Grand-Orgue, Bombarde, Positif, and Récit-Expressif. Functionally, however, there are four divisions. The Grand-Choeur stops really function as the Joux de Combinaison stops for the Grand-Orgue. The Grand-Choeur manual itself functions solely as a coupling manual. Any division or combination thereof is playable from the first manual by first depressing the appropriate pedal(s) under "Accouplements au Premier Clavier." The stops which appear to be assigned to that keyboard are floating and are playable either from the second keyboard by activating the Grand-Orgue ventil under the "Appels des Joux de Combinaison" or from the first keyboard by activating the appropriate coupler. In any case, the Grand-Choeur stops do not automatically sound from the first manual.

Another unusual feature of the instrument is the fact that only two of the five manuals could be coupled directly to the pedal. If the organist desired the Récit, Positif, or Bombarde divisions coupled to

the pedal, it was first necessary to activate the appropriate "copula" to the first manual and then couple the Grand-Choeur to the pedal. This procedure, of course, completely prevented the Grand-Choeur stops from being used on the first keyboard unless its stops were meant to sound in the pedal as well. Later, the "Tirasse-Récit" was added at the expense of the "Effet d'Orgue" pedal.

Inter-manual coupling could be achieved only by coupling the divisions in question to the first keyboard. The important "Récit à Positif" coupling which eventually became so important in French literature of the late 19th and early 20th centuries was impossible without first coupling both divisions to the first manual. Eventually, the "Tremblant du Récit" was moved to a vacant drawknob, providing room on the "Pédales de Combinaison" for a Récit-Positif coupler.

The order in which the manual divisions were assigned to their respective keyboards was most logical, although in actual practice, the scheme proved to be highly impractical. The Récit-Expressif, containing the softest voices of the organ, was placed on the fifth manual. The Positif and Bombarde occupied the fourth and third manuals respectively, representing a gradual intensification of the dynamic level. Finally, the Grand-Orgue--Grand-Choeur complex occupied the second manual. The most powerful reed battery was situated in this division. Thus, the position of the manuals within the console graphically illustrated the relative dynamic level of each division: higher manuals were softer, lower manuals were louder. Unfortunately, the fifth manual is extremely impractical to use for any length of time. The organist's arms must be extended to their full length, and in the case of a small or medium

built person, the back is uncomfortably bent over the other four manuals. As French literature developed, the *récit* grew in importance, necessitating a relocation of the manuals in the following scheme: Bombarde, *Récit-Expressif*, *Positif*, *Grand-Orgue*, *Grand-Chœur*.⁴ The name of the Bombarde division was undoubtedly altered at this time, assuming the English name Solo. This was an unfortunate change since this division has few similarities with English solo divisions. Nevertheless, the division still occupies a dynamic intermediary between the *Grand-Orgue-Grand-Chœur* complex and the *Positif*.

Further comparison between the 1862 specification and the present console suggests that the *chamade* stop was added at a later date. However, Monsieur Crauzat maintains that the rank labeled *Trompette-en-Chamade* has always been in the organ. Apparently the *Trompette Harmonique* 8' on the *Récit* was later renamed *Trompette-en-Chamade* and equipped with its own ventill pedal. It should be noted, however, that *chamade* is a misnomer in this instance. The resonators are of the hooded variety, placed at the very top of the case and voiced on 6 inches of wind, the highest pressure in the instrument. This stop is the most powerful reed in the organ and is much more versatile on a separate ventill⁵ rather than within a portion of the *Récit* ventill system as Cavallé-Coll had left it in 1862.

The minor tonal changes outlined earlier are self-explanatory. Without access to the Cavallé-Coll documents owned by Monsieur Crauzat,

⁴Vierne requested a similar redistribution at Notre Dame in the 1930's.

⁵Unlike the other ventill stops at Saint-Sulpice, the "chamade" drawknob is not prepared (drawn). The pedal automatically engages the pipes regardless of the position of the drawknob.

one can not definitively name the builder of the Septième 2-2/7' of the Bombarde or of the Basson 16' of the Positif. The Principals 16' and 8' of the Pédale (1934) and the Diapason 8' of the Récit (1903) were documented by an engraving left by Charles Mutin. No mention is made of the Septième or Basson. However, a comparison of the Septième and Diapason pipes yields important similarities: both are constructed from an alloy containing significantly less tin than the remaining ranks of the instrument, and both exhibit heavy nicking throughout the compass, an extreme which is atypical of other known Cavaillé-Coll stops. It is the opinion of this author that the Septième 2-2/7' is also the work of Charles Mutin. Why he neglected to mention this addition in his engraving remains a mystery.

The Basson 16' of the Positif exhibits certain clues which also suggest the work of a different builder. The pipes of this rank are not as carefully installed as are similar 16' reeds known to be the work of Cavaillé-Coll. The bass octaves on all 16' reeds are carefully supported by additional wooden racks which completely surround the resonator at the upper end. The bass pipes of the Basson 16' are tied with pieces of cloth, a practice which is found neither in Saint-Sulpice nor any other organ constructed by Cavaillé-Coll.

Although knowledge of Cavaillé-Coll's voicing techniques and procedures in organ building may suggest probable dates for the new pipework, significant problems arise in dating the mechanical changes outlined earlier. In his article appearing in The Organ,⁶ William Sumner

⁶Sumner, W.L., "The Organ in the Church of Saint-Sulpice, Paris," The Organ, XLVIII (January, 1969), p. 103.

asserts that the chamade ventril and manual changes were accomplished by Mutin in 1903. Sumner acknowledges his friendship with Wider and was probably provided with this information by Wider himself. No documentation appears in the article. However, Sumner's statement that the chamade was added by Mutin in 1903 is false. Records indicate that the stop existed in the instrument under another name and was controlled by another ventril system. In addition, Sumner also implies that the Baryton 8' of the Positif was also a new Mutin stop. Again, the 1862 specification completely refutes this. Further mistakes appear in his specifications of the present organ and in his discussion of the former order of the manuals. Mistakes such as these may well cast doubt on other statements made by Sumner relative to the Saint-Sulpice organ.

Until further research is accomplished, one can not authoritatively assign the various mechanical alterations to either 1882 or 1903. By 1862, Wider had presided at Saint-Sulpice for twelve years, giving him ample ^{time} to discover the weaknesses of his instrument. Certainly the need for additional tirasces and inter-manual couplers had become obvious to him. His earliest symphonies required the traditional coupling of the Récit-Positif, Récit-Positif-Grand-Orgue, a scheme which was impossible at Saint-Sulpice. It is likely, therefore, that Wider indicated these deficiencies to Cavaillé-Coll, who agreed to add the "Tirasce Récit" and the "Copula Récit-Positif."

Items 8 and 9 listed under mechanical changes are somewhat more awkward to date. Their original locations are illogical in relation to the rest of the instrument, a fact which Wider no doubt recognized early in his association with the organ. Their subsequent relocations would have logically transpired in 1882.

CHAPTER II

Details of the Cavaillé-Coll Pipework at Saint-Sulpice

The following pages contain information on significant aspects of the Cavaillé-Coll pipework at Saint-Sulpice. Flues, excluding mixtures, are presented in section A, chorus reeds in section B, and mixture analysis in section C.

Unfortunately, several basses of the flue ranks were located on off-set chests, buried at the back of the particular division. As important as these pipes are in determining scaling, it was necessary to omit them from the analysis. In section B, only the 8', 4', and 2' reeds of the Grand-Chœur division are treated in detail. Chorus reeds in other divisions exhibited identical properties in their construction. Only their scaling and wind pressures are reported.

Section A: Construction and Voicing of Selected Flue Pipes

All measurements are reported to the nearest $1/64$ of an inch.

"EX" (excluded) is recorded when pipes were omitted from the analysis due to their location or when certain facets of the analysis did not apply to the particular pipe.

Standard octave designations are employed throughout this chapter. Upper-case letters indicate the great octave, small letters the tenor octave, small letters followed by "1" the middle c octave, etc.

Grand-Orgue
Division

Flûte Harmonique 8'
Stop

General Remarks:

Harmonic pipes begin on f^1 . At c^2 , the harmonic boros are located at $9 \frac{3}{4}$ " above the lip of the pipe. All harmonic pipes contain double boros, placed on opposite sides.

Harmonic pipes in this organ are never slotted.

Materials:

Unspotted metal containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

$3 \frac{7}{8}$ "

Sealing:

Diameter of - C: $6 \frac{7}{8}$ "

Halves on - stop 20, then step 16

Width and Cut-up of the Mouth:

	c	c	$c^1 = 58mm$	$c^2 = 35mm$
	$5 \frac{7}{16}$ "	EX _____	$2 \frac{9}{32}$ "	$1 \frac{3}{8}$ "
cut: $\frac{1}{4}$ Width of		EX _____	$\frac{1}{2}$ Width of	$1 \frac{5}{32}$ "
the mouth			the mouth	

Treatment of the Languid:

	C	c	c^1	c^2
Thickness	$1/4$ "	EX	$5/32$ "	$3/32$ "
Angle of the Bevel	45°	EX	55°	40°
presence of Skiving	none	EX	none	none

Characteristics of the Nicking:

Consistently shallow throughout the compass. 18 nicks at C, diminishing consistently. All nicking is on the languid.

Accessories:

EARS:	$3 \frac{1}{4}$ "	EX	$1 \frac{1}{32}$ "	$3/4$ "
(widths are reported)				

Miscellaneous:

	C	c	c^1	c^2
Thickness of the Pipe Metal	$3/64$ "	EX	$1/32$ "	$1/32$ "
Size of the Toe Bore	EX	EX	$9/32$ "	$1/4$ "
Length of the Foot	$18 \frac{1}{2}$ "	EX	$9 \frac{3}{4}$ "	$9 \frac{15}{16}$ "
Dimensions of the Slot	$2 \frac{3}{16}$ "	EX	EX	none
	$x 3 \frac{7}{8}$ "			

Grand-Organ-
Division

Salicional 8'
Stop

General Remarks:

Material:

Unspotted metal containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

3 3/4"

Sealing:

Diameter of - C: 4"

Halves on - step 23, then step 17

Width and Cut-up of the Mouth:

	^c 85.7	^c	^{c¹}	^{c²}
	3 3/8"	2 3/32"	1 5/16"	5 1/8"
cut: 15/16"		11/16"	1/2 Width of the mouth	1/2 Width of the mouth

Treatment of the Languid:

	^c	^c	^{c¹}	^{c²}
Thickness	1/8"	1/8"	3/32"	3/32"
Angle of the Bevel	50°	50°	50°	50°
Presence of Skiving	none	none	none	none

Characteristics of the Nicking:

Shallow and infrequent during the first two octaves. In upper registers, somewhat bolder. All nicking is on the languid.

Accessories:

EARS: (through g²) 1 1/16" EX 25/32" 1/2"
(widths are reported)

ROLLER BEARDS PLACED LOW IN THE MOUTH (through B): C: 5/8" diameter

Miscellaneous:

	^c	^c	^{c¹}	^{c²}
Thickness of the Pipe Metal	3/64"	1/32"	1/32"	1/32"
Size of the Too Bore	1/2"	9/32"	7/32"	5/32"
Length of the Foot	8 7/8"	8 7/8"	8 1/16"	8"
Dimensions of the Slot	1 9/32"	15/16"	9/16"	11/32"
	x 2 3/4"	x 3"	x 2 1/4"	x 19/32"

Grand-Organ
Division

Prestant 4'
Stop

General Remarks:

Material:

Unspotted metal containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

3 3/4"

Sealing:

Diameter of - C: 3 1/2" ⁸⁹
Halves on - step 16 until g¹. Halves next on g³.

Width and Cut-up of the Mouth:

	C	c	c ¹	c ²
	2.25/32" ^{70.6 1/4}	1.9/16"	15/16"	19/32"
cut: 1/2 Width of the mouth		1/2 Width of the mouth	1/2 Width of the mouth	1/2 Width of the mouth
Treatment of the Languid:	C	c	c ¹	c ²
Thickness	3/32"	3/32"	1/16"	1/16"
Angle of the Bevel	55°	55°	45°	45°
Presence of Skiving	Skiving on all pipes -----			

Characteristics of the Nicking:

Consistently shallow. 32 nicks at C. More nicking in the middle registers, tapering off in higher registers.

Accessories:

EARS: (through a) 1 25/32" 29/32" EX EX
(widths are reported)

Miscellaneous:

	C	c	c ¹	c ²
Thickness of the Pipe Metal	1/32"	1/32"	1/32"	1/32"
Size of the Toe Bore	11/32"	7/32"	3/8"	1/8"
Length of the Foot	11 1/8"	8 3/16"	8 5/16"	8 3/16"
Dimensions of the Slot	1 5/32"	21/32"	7/16"	1/4"
	x 2"	x 1"	x 15/16"	x 1/2"

Grand-Choeur.
Division

Octavo 41
Stop

General Remarks:

Material:

Unspotted metal containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

3 3/4"

Scaling:

Diameter of - C: 2 3/4"

Halves on - step 18 (consistently)

Width and Cut-up of the Mouth:

	C	c	c ¹	c ²
	2 3/16"	1 5/16"	7/8"	1/2"
cut:	2 1/32"	3/8"	1/4"	1/2 Width of the mouth

Treatment of the Languid:

	C	c	c ¹	c ²
Thickness	1/8"	3/32"	1/16"	3/64"
Angle of the Bevel	45°	45°	40°	40°
presence of Skiving	Skiving on all pipes -----			

Characterization of the Nicking:

Very shallow. 18 nicks at C. Almost non-existent after c². All nicking is on the languid.

Accessories:

EARS: (through b) 11/16" EX
(widths are reported)

Miscellaneous:

	C	c	c ¹	c ²
Thickness of the Pipe Metal	1/32"	1/32"	1/32"	less than 1/32"
Size of the Too Bore	11/32"	1/4"	3/8"	1/8"
Length of the Foot	8 3/4"	8 1/2"	8 3/8"	8 3/8"
Dimensions of the Slot	Unslotted pipes -----			

Grand-Chocour
Division

Doublette 2'
Stop

General Remarks:

c¹ is the last pipe having slots.

Material:

Unspotted metal containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

3 3/4"

Sealing:

Diameter of - C: 2 1/16" 52.4

Halves on - No precise half diameter. Nearest is step 12, then step 20, then step 23.

Width and Cut-up of the Mouth:

	C ^{1/4}	c	c ¹	c ²
	1 21/32" 42	7/8"	1/2"	5/16"
cut: 1/4 Width of the mouth		1/4 Width of the mouth	1/4 Width of the mouth	1/4 Width of the mouth
Treatment of the Languid:	C	c	c ¹	c ²
Thickness	1/8"	1/16"	3/64"	1/32"
Angle of the Bevel	55°	45°	45°	45°
Presence of Skiving	Skiving on all pipes -----			

Characteristics of the Nicking:

Shallow throughout the compass. 22 nicks at C, diminishing consistently.

Accessories:

None

Miscellaneous:	C	c	c ¹	c ²
Thickness of the Pipe Metal	1/32"	1/32"	1/64"	EX
Size of the Tee Bore	1/4"	3/32"	1/8"	7/64"
Length of the Foot	8"	8 3/16"	8 1/4"	8 1/4"
Dimensions of the Slot	5/8"	3/8"	7/32"	no slot
	x 2 1/2"	x 5/8"	x 3/8"	

Solo
Division

Flûte Harmonique 8'
Stop

General Remarks:

Harmonic pipes begin on g^{#1}. At c², the harmonic bores are located at 10 7/16" above the upper lip of the pipe. All harmonic pipes contain double bores, placed on opposite sides.

Harmonic pipes in this organ are never slotted.

Materials:

C-B Open wood pipes.

c-g³ Unspotted metal containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

4 1/2"

Sealing:

Diameter of - C: ^{147.6} 5 13/16" x ¹¹⁴ 4 1/2"; Diameter of c: ⁸⁹ 3 1/2"
Halves on - step 24, then on step 19

Width and Cut-up of the Mouth:

C	c	c ¹	c ²
5 1/2"	3 3/4"	1 7/8"	1 3/16"
cut: 1 3/16"	3/4"	1/2 Width of the mouth	31/32"

Treatment of the Languid:

	C	c	c ¹	c ²
Thickness	EX	5/32"	1/8"	1/8"
Angle of the Bevel	EX	45°	45°	45°
Presence of Skiving	EX	none	none	none

Characteristics of the Nicking:

Shallow throughout the compass. 11 nicks at C. In tenor octave, fairly frequent. Light, infrequent nicking in upper registers.

Accessories:

EARS:	EX	1 1/16"	1 1/32"	3/4"
(widths are reported)				

Miscellaneous:

	C	c	c ¹	c ²
Thickness of the Pipe Metal	EX	1/32"	less than 1/32"	1/8"
Size of the Tenor Bore	EX	3/8"	9/32"	1/4"
Length of the Foot	EX	8 13/16"	8 9/16"	8 7/16"
Dimensions of the Slot	EX	EX	none	none

Solo
Division

Prestant 41
Stop

General Remarks:

Material:

Unspotted metal containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

4 1/2"

Sealing:

Diameter of - c: 2"; c¹: 1 7/16"; c²: 1 3/16"
Halves on -

Width and Cut-up of the Mouth:

	C	c	c ¹	c ²
EX		1 7/16"	1"	2 1/32"
cut: EX		1 3/32"	1/2 Width of the Mouth	1/2 Width of the Mouth

Treatment of the Languid:	C	c	c ¹	c ²
Thickness	EX	3/16"	3/32"	1/16"
Angle of the Bevel	EX	45°	45°	45°
presence of Skiving	EX	none	none	none

Characteristics of the Nicking:

Frequent nicking. Moderate—deep at tenor octave. Progressively more shallow and less frequent in upper registers. All nicking on the languid.

Accessories:

EARS: (through c ¹)	EX	5/8"	9/16"
(widths are reported)			

Miscellaneous:

	C	c	c ¹	c ²
Thickness of the Pipe Metal	EX	less than		less than
Size of the Ten Bore	EX	1/32"	1/8"	1/32"
Length of the Foot	EX	3/16"	3/16"	5/32"
Dimensions of the Slot	EX	8 3/8"	8 1/4"	8 5/16"
		5/8"	3/8"	9/32"
		x 1 1/2"	x 3/4"	x 7/16"

Solo _____
Division

Octavin 2' _____
Stop

General Remarks:

Harmonic pipes begin on c. Placement of harmonic bores: c 10 1/8" above upper lip of the pipe; c¹ 4 3/4" ; c² 2 11/32". All Harmonic pipes contain double bores, placed on opposite sides.

Harmonic pipes in this organ are never slotted.

Material:

Unspotted metal containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

4"

Sealing:

Diameter of - C: 1 29/32" 48mm
Halves on - step 22, then step 20.

Width and Cut-up of the Mouth:

C	c	c ¹	c ²
1 17/32"	1 1/8"	3/4"	15/32"
cut: 15/32"	13/32"	2/32"	5/32"

Treatment of the Languid:

	C	c	c ¹	c ²
Thickness	1/8"	3/32"	3/64"	1/16"
Angle of the Bore	45°	45°	45°	45°
Presence of Skiving	none	none	none	none

Characteristics of the Nicking:

Shallow throughout the compass. At C, 16 nicks. Almost nonexistent after c². All nicking is on the languid.

Accessories:

EARS (through d#1) 3/4" 17/32" 3/8"
(widths are reported)

Miscellaneous:

	C	c	c ¹	c ²
Thickness of the Pipe Metal	less than 1/32"	less than 1/32"	1/64"	EX
Size of the Toe Bore	7/32"	7/32"	5/32"	1/8"
Length of the Foot	8 1/2"	8 1/2"	8 7/16"	8 7/16"
Dimensions of the Slot	none	none	none	none

Solo
Division

Principal 8'
Stop

General Remarks:

Material:

C-B Open wood pipes

c-g³ Unspotted metal containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

4 1/2"

Sealing:

Diameter of - C: 5 15/16" x 4 1/2"; c: 3 7/8"; c¹: 2"; c²: 1 3/8"
Halves on -

Width and Cut-up of the Mouth:

C	c	c ¹	c ²
EX _____	2 21/32"	1 5/8"	1 1/16"
cut: EX _____	3/4"	1/4 Width of the mouth	1/4 Width of the mouth

Treatment of the Languid:	C	c	c ¹	c ²
Thickness	EX	3/16"	3/32"	1/16"
Angle of the Bevel	EX	40°	45°	50°
Presence of Skiving	EX	none	none	none

Characteristics of the Nicking:

Moderate nicking throughout the compass. All nicks placed on the languid.

Accessories:

EARS:

(widths are reported)

EX 1 5/16" 7/8" 5/8"

Miscellaneous:

	C	c	c ¹	c ²
		less than		
Thickness of the Pipe Metal	EX	1/32"	1/32"	1/32"
Size of the Too Bore	EX	13/32"	1/4"	7/32"
Length of the Foot	EX	9 1/16"	9"	9 1/4"
Dimensions of the Slot	EX	1 3/16"	21/32"	13/32"
		x 1 3/8"	x 13/16"	x 1/2"

Solo
Division

Violoncelle 8'
Stop

General Remarks:

Incomplete stop. Begins on c.

Materials:

Unspotted metal containing approximately 90% tin.. Pipe feet are of lesser quality.

Wind Pressure:

4 1/2"

Sealing:

Diameter of - c: 2 7/16"
Halves on - always on 16th step.

Width and Cut-up of the Mouth:

	c	c	c ¹	c ²
EX		1 7/8"	1 1/16"	1 1/16"
cut: EX		23/32"	9/32"	3/16"

Treatment of the Languid:	C	c	c ¹	c ²
Thickness	EX	1/8"	3/32"	5/32"
Angle of the Bevel	EX	35°	45°	45°
Presence of Skiving	EX	none	none	none

Characteristics of the Nicking:

Deep nicking in lower registers of the stop. 30 nicks at c.

Accessories:

EARS: (through b¹) EX 1" 29/32"

(widths are reported)

HARMONIC BRIDGE: (through d#1)

c: Placed 1/4" into cut-up of mouth. 15/16" in width; c¹: Even with languid.

Miscellaneous:

	C	c	c ¹	c ²
Thickness of the Pipe Metal	EX	less than 1/32"	less than 1/32"	1/64"
Size of the Toe Bore	EX	11/32"	3/16"	1/8"
Length of the Foot	EX	8 9/16"	8 9/16"	8 1/2"
Dimensions of the Slot	EX	25/32"	15/32"	9/32"
		x 1 5/16"	x 15/16"	x 1/2"

Solo
Division

Bourdon B1
Stop

Clickquot stop
"Stag"

General Remarks:

Mouths on all wooden pipes are of the English variety.

Mat 11:

- C-d# - Stopped wooden pipes
- c-b - Covered metal pipes
- c1-g3 - Chimney pipes

little
Lower tin content in comparison with other ranks. This is undoubtedly a Clickquot stop.

Wind Pressure:

4 1/2"

Sealing:

Diameter of - C: 5 5/16" x 4 3/4" (no half diameter) c: 2 7/8" x 3 5/16";
Halves on - step 20 (metal pipes) e: 2 9/16"

Width and Cut-up of the Mouth:

C	c	c ¹	c ²
EX	2 7/8"	2 17/32"	3 1/32"
cut: EX	22/32"	17/32"	9/32"

Treatment of the Languid:	C	c	c ¹	c ²
Thickness	EX	EX	1/8"	1/16"
Angle of the Bevel	EX	EX	40°	40°
Presence of Skiving	EX	EX	none	none

Characteristics of the Nicking:

In wooden pipes, very light nicking. Moderate nicking on lower languid in metal pipes.

Accessories:

EARS: (metal pipes) 1/2" 5/16"
(widths are reported)

Miscellaneous:	C	c	c ¹	c ²
Thickness of the Pipe Metal	EX	EX	1/32"	1/32"
Size of the Toe Bore	EX	3/8"	7/32"	3/8"
Length of the Foot	EX	EX	8 1/2"	8 9/16"
Dimensions of the Slot	none	none	none	none

Positif
Division

Quintaton 81
Stop

General Remarks:

C bears the inscription "Monsieur Daublaine." The full extent of Daublaine's work at Saint-Sulpice has not yet been determined.

Mouths on all wooden pipes are of the English variety.

Material:

C-B₃ - Stopped wooden pipes

c-g³ - Covered metal pipes

Tin content is considerably lower in these metal pipes.

Wind Pressure:

4 1/2"

Scaling:

95.3 x 76.2
Diameter of - C: 3 3/4" x 3"; c: 2 5/8" *66.7*
Halves on - step 19; then step 21. (metal pipes)

Width and Cut-up of the Mouth:

	C	c <i>1/4 lab</i>	c ¹	c ²
	<u>2 3/4</u>	<u>2 5/32" 54.8</u>	<u>1 3/8"</u>	<u>7/8"</u>
cut: 1"	<u>1"</u>	<u>23/32"</u>	<u>7/16"</u>	<u>5/16"</u>

Treatment of the Languid:

	C	c	c ¹	c ²
Thickness	EX	9/64"	3/32"	1/16"
Angle of the Bevel	EX	45°	45°	45°
Presence of Skiving	EX	none	none	none

Characteristics of the Nicking:

Moderate in lower and higher registers. Nicking is more frequent in upper tenor and c¹ octave.

Accessories:

BARS: (metal pipes) 1 3/32" 13/16" 5/8"
(widths are reported)

Miscellaneous:

	C	c	c ¹	c ²
Thickness of the Pipe Metal	EX	1/32"	less than 1/32"	less than 1/32"
Size of the Tee Bore	3/8"	1/4"	3/16"	3/16"
Length of the Foot	EX	8 3/4"	8 1/2"	8 9/16"
Dimensions of the Slot	none	none	none	none

Positif.....
Division

Dulciana 41
Stop

General Remarks:

Material:

Metal pipes containing approximately 90% tin. Pipe feet are of lesser quality.
Tapered pipes.

Wind Pressure:

4 3/4"

Sealing:

Diameter of - C: Top 1 1/32" — Bottom 3 7/16"
Valves on - step 16; then step 20.

Width and Cut-up of the Mouth:

	C	c	c ¹	c ²
	2 19/32"	1 19/32"	3 1/32"	2 1/32"
cut: 3/4"		7/16"	9/32"	1/2 Width of the Mouth
Treatment of the Languid:	C	c	c ¹	c ²
			Cut-ups become one-fourth the width of the mouth at c ² .	
Thickness	5/32"	1/8"	5/64"	1/16"
Angle of the Bevel	40°	40°	50°	50°
Presence of Skiving	none	none	none	skived

Characteristics of the Nicking:

Very fine nicking throughout the compass. Frequent in all octaves except c¹.

Accessories:

EARS: 5/8" 13/32" 17/32" 1/2"
(widths are reported)

Miscellaneous:

	C	c	c ¹	c ²
Thickness of the Pipe Metal	3/64"	1/32"	less than 1/32"	less than 1/32"
Size of the Too Bore	3/8"	1/4"	5/32"	5/32"
Length of the Foot	8 1/8"	8 1/8"	7 3/4"	7 1/2"
Dimensions of the Slot	none	none	none	none

Positif
Division

Doublette 2'
Stop

General Remarks:

b is the last pipe with slots.

Material:

Metal pipes containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

4"

Sealing:

Diameter of - C: 1 29/32"

Halves on - step 17 consistently.

Width and Cut-up of the Mouth:

	C	c	c ¹	c ²
	1 15/32"	29/32"	19/32"	3/8"
cut: 1/4 Width of the mouth		1/4 Width of the mouth	3/16"	1/4 Width of the mouth
Treatment of the Languid:	C	c	c ¹	c ²
Thickness	1/8"	5/64"	1/16"	1/32"
Angle of the Bevel	40°	45°	50°	40°
Presence of Skiving	none	none	none	none

Characteristics of the Nicking:

Light nicking. At C, 14 nicks. Almost nonexistent after c.

Accessories:

EARS (through c): 5/8" 11/32"
(Widths are reported)

Miscellaneous:	C	c	c ¹	c ²
Thickness of the Pipe Metal	1/32"	1/32"	EX	1/64"
Size of the Toe Bore	7/32"	5/32"	1/8"	3/32"
Length of the Foot	8 3/8"	8 1/2"	8 1/2"	8 1/2"
Dimensions of the Slot	5/8"	3/8"	none	none
	x 1 5/8"	x 1 1/16"		

Positif
Division

Larigot 1 1/3'
Stop

General Remarks:

Quiet

Material:

Metal pipes containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

4"

Scaling:

Diameter of - C: 1 3/4"
Halves on - step 20; then step 28.

Width and Cut-up of the Mouth:

	C	c	c ¹	c ²
	1 7/16"	1 3/32"	5/8"	13/32"
cut: 1/4 Width of the mouth		1/4 Width of the mouth	1/4 Width of the mouth	5/64"
Treatment of the Languid:	C	c	c ¹	c ²
Thickness	1/16"	1/16"	3/64"	3/64"
Angle of the Bevel	55°	55°	55°	EX
Presence of Skiving	none	skived	skived	skived

Characteristics of the Wickings:

Moderate in the lower registers. Very light beginning in the tenor octave and throughout the remainder of the rank.

Accessories:

EMRS: (through b) 11/16" 21/32"
(Widths are reported)

Miscellaneous:

	C	c	c ¹	c ²
Thickness of the Pipe Metal	1/32"	loss than	1/64"	EX
Size of the Tee Bore	3/64"	7/32"	1/8"	3/32"
Length of the Foot	8 3/16"	8 1/4"	8 3/16"	8"
Dimensions of the Slot	none	none	none	none

Positif.....
Division

Piccolo. 1'
Stop

General Remarks:

Pipes are slightly tapered.

Material:

Metal pipes with lesser tin content.

Wind Pressure:

4"

Scaling:

Diameter of - C: Top 1 3/16 — Bottom 1 23/32"
Halves on - step 20; then step 21.

Width and Cut-up of the Mouth:

C	c	c ¹	c ²
1 3/8"	3/4"	9/16"	7/16"
cut: 1/4 Width of the the mouth	1/4 Width of the mouth	1/4 Width of the mouth	1/16"

Treatment of the Languid:

C	c	c ¹	c ²
Thickness	1/8"	1/8"	1/16"
Angle of the Bevel	45°	55°	45°
Presence of Skiving	none	none	none

Characteristics of the Nicking:

Moderate in great and c¹ octaves. Light in tenor and treble octaves.
15 nicks at C.

Accessories:

EARS (through f) 9/16" 7/16"
(widths are reported)

Miscellaneous:

C	c	c ¹	c ²
Thickness of the Pipe Metal	less than 1/32"	less than 1/32"	EX
Size of the Tee Bore	3/16"	5/32"	5/32"
Length of the Foot	8 3/16"	8 1/8"	8 3/16"
Width of the Slot	none	none	none

— Récit —
 Division

Flûte Harmonique 8!
 Step

General Remarks:

Harmonic pipes begin on f^1 . At c^2 , the harmonic bores are located at $10\frac{1}{4}"$ above the upper lip of the pipe. All harmonic pipes contain double bores, placed on opposite sides.

Harmonic pipes in this organ are never slotted.

Material:

C-B - Open wooden pipes.

c-g³ - Metal pipes containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

4 1/2"

Scaling:

Diameter of - c: 2 7/8"

Helves on - step 27.

Width and Cut-up of the Mouth:

C	c	c^1	c^2
EX _____	2 1/4"	1 23/32"	1 1/4"
cut: EX _____	21/32"	Width of the mouth	3/8"

Treatment of the Languid:	C	c	c^1	c^2
Thickness	EX	1/8"	5/64"	5/64"
Angle of the Bevel	EX	35°	45°	45°
Presence of Skiving	EX	none	none	none

Characteristics of the Nicking:

Moderate nicking in the tenor octave. 15 nicks at c. Lighter in c^1 octave, then bolder beginning on c^2 .

Accessories:

EARS:	EX	7/8"	27/32"	19/32"
(Widths are reported)				

Miscellaneous:

	C	c	c^1	c^2
Thickness of the Pipe Metal	EX	1/32"	1/32"	1/32"
Size of the Toe Bore	EX	9/32"	7/32"	3/16"
Length of the Foot	EX	8 11/16"	8 11/16"	8 3/8"
Dimensions of the Slot	EX	none	none	none

Récit
Division

Flûte Octayante 4'
Stop

General Remarks:

Harmonic pipes begin on f. At c^1 , the harmonic bores are placed $10\frac{1}{4}"$ from the upper lip of the pipe. At c^2 , bores are located $4\frac{5}{8}"$ from the lip of the pipe. All Harmonic pipes contain double bores. Harmonic pipes in this organ are never slotted.

Material:

Metal pipes containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

$4\frac{1}{2}"$

Sealing:

Diameter of - C: $2\frac{7}{8}"$

Halves on - step 27; then step 21.

Width and Cut-up of the Mouth:

	C	c	c^1	c^2
	$2\frac{7}{32}"$	$1\frac{21}{32}"$	$1\frac{7}{32}"$	$2\frac{7}{32}"$
cut: $5/8"$		$1\frac{5}{32}"$	$1\frac{3}{24}"$	$1\frac{1}{4}"$

Treatment of the Languid:

	C	c	c^1	c^2
Thickness	$1/8"$	$3/32"$	$5/64"$	$3/64"$
Angle of the Bevel	35°	45°	45°	45°
Presence of Skiving	none	none	none	none

Characteristics of the Nicking:

Moderate nicking throughout the compass. All nicking is on the languid.

Accessories:

EARS:	1"	$2\frac{5}{32}"$	$2\frac{1}{32}"$	$1\frac{7}{32}"$
(Widths are reported)				

Miscellaneous:

	C	c	c^1	c^2
Thickness of the Pipe Metal	$1/32"$	$1/32"$	$1/32"$	$1/64"$
Size of the Tee Bore	$1/4"$	$1/4"$	$3/16"$	$3/16"$
Length of the Foot	$8\frac{5}{8}"$	$8\frac{5}{8}"$	$8\frac{7}{16}"$	$8\frac{7}{16}"$
Dimensions of the Slot	none	none	none	none

---R6cit---
Division

---Octavin.2!---
Stop

General Remarks:

Location of harmonic bores above the upper lip:

c 11 1/16"; c¹ 5 1/4"; c² 3 9/16"

Harmonic pipes begin on c.

Material:

Metal pipes containing approximately 90% tin. Pipe feet are of lesser quality.

Wind Pressure:

4 1/2"

Sealing:

Diameter of - C: 1 7/8"

Valves on - step 22; then step 20.

Width and Cut-up of the Mouth:

C	c	c ¹	c ²
1 17/32"	1 1/8"	3/4"	15/32"
cut: 7/16"	3/8"	7/32"	1/8"

Treatment of the Languid:

	C	c	c ¹	c ²
Thickness	3/32"	1/16"	1/16"	1/32"
Angle of the Bevel	45°	45°	35°	35°
Presence of Skiving	none	none	none	none

Characteristics of the Nicking:

Frequent nicking until harmonic pipes begin (c). Nicks are fine, never bold.

Accessories:

EARS: 11/16" 19/32"
(Widths are reported:

Miscellaneous:

	C	c	c ¹	c ²
Thickness of the Pipe Metal	1/32"	1/32"	less than 1/32"	EX
Size of the Tee Bore	7/32"	3/8"	5/32"	5/32"
Length of the Foot	8 1/2"	8 1/2"	8 7/16"	8 7/16"
Dimensions of the Slot	none	none	none	none

Grand-Cheour
Division

1st Trompette 8'
Stop

General Remarks:

All Trompette resonators are unslotted.

Both great and tenor octaves employ overhanging tongues.

c and c¹ octaves contain double blocks. Dimensions: From higher block to end of shallot: c 7 1/4" c¹ 5 3/4" . From lower block to end of shallot: c 3 9/16" c¹ 2 5/8".

Tongues in all Cavaill6-Coll chorus reeds are never weighted.

Materials:

Metal boots and resonators. Metal contains approximately 90% tin.

Flared resonators.

Wind Pressure:

3 3/4" until b.

4 1/2" from c¹ to g³.

Scaling:

Diameter of - C: 5 7/16"

Halving on - step 31. No further half diameter.

Length of the Resonator:	C	c	c ¹	c ²
	88 3/4"	39 7/8"	17 3/8"	10"*

Harmonic Pipes Begin:

no harmonic breaks.

Dimensions of the Shallot:

	C	c	c ¹	c ²
Length	3 27/32"	2 9/16"	1 5/8"	13/16"
Diameter	17/32"	5/8"	3/8"	7/32"
Length of the Shallot opening	3 13/16"	2 5/8"	1 23/32"	29/32"
Width (low end) of the Shallot opening	13/32"	5/16"	7/32"	9/64"
If closed, distance between lower end of the Shallot and beginning of the opening	---	---	---	---
Type of Shallot closing at the lower end	slightly rounded for all shallots.			
Amount of tongue overhanging at the end of the shallot, if present	3/8"	1/8"	---	---
Thickness of the Shallot Wall	1/16"	3/64"	less than 1/16"	1/32"

Dimensions of the Tongue:

Width at end nearer the Block	13/32"	3/8"	19/64"	7/32"
Width at end nearer the Shallot end	17/32"	7/8"	11/32"	7/32"

Size of the Toe Bore:	1/2"	13/32"	1/4"	5/16"
-----------------------	------	--------	------	-------

Length of the Boot:	10 5/8"	10 9/16"	10 1/4"	10 7/8"
---------------------	---------	----------	---------	---------

* On these pipes, the resonator extends down into the boot before reaching the block. The measurement reads from the block to the end of the resonator, and not from the upper end of the boot to the resonator. The asterisk will be used to denote this feature in all reed analyses.

Grand-Choeur
Division

2^e Trompette 8'
Stop

General Remarks:

c and c¹ octaves contain double blocks. Dimensions: From higher block to end of shallot: c 7 3/32" c¹ 5 15/16". From lower block to end of shallot: c 3 3/4" c¹ 2 3/4" .

Material:

Metal boots and resonators. Metal contains approximately 90% tin. Flared resonators.

Wind Pressure:

3 3/4" until b.

4 1/2" from c¹ to g³.

Sealing:

Diameter of - C: 5 9/16" (c: 4 1/8"; c¹: 3 3/32")

Halving on - no half diameter; new diameter on c¹: 3 25/32"

No further half diameter.

Length of the Resonator:	C	c	c ¹	c ²
	91 1/4"	40 1/4"	15 7/8"	20 3/4" *

Harmonic Pipes Begin:

	c ¹	c	c ¹	c ²
Dimensions of the Shallot:				
Length	3 11/16"	2 23/32"	1 13/16"	1 1/8"
Diameter	1/2"	13/32"	3/8"	5/16"
Length of the Shallot opening	3 21/32"	2 3/4"	1 29/32"	1 1/8"
Width (low end) of the Shallot opening	11/32"	5/8"	1/4"	3/16"
If closed, distance between lower end of the Shallot and beginning of the opening	---	---	---	---
Type of Shallot closing at the lower end	slightly rounded for all shallots			
Amount of tongue overhang at the end of the shallot, if present	---	---	---	---
Thickness of the Shallot Wall	3/64"	less than 1/16"	1/32"	3/64"

Dimensions of the Tongue:

Width at end nearer the Block	25/64"	5/8"	5/16"	9/32"
Width at end nearer the Shallot end	31/64"	13/32"	11/32"	25/64"
Size of the Toe Bore:	7/16"	15/32"	7/16"	3/8"
Length of the Boot:	10 1/2"	9 7/8"	9 1/16"	8 7/8"

Grand-Choquer
Division

Basson 8'
Step

General Remarks:

	C	c	c ¹	c ²
Diameters for the shallots: Ends nearer the block are reported below.				
At lower ends:	5/8"	1/2"	13/32"	11/32"
Widths for the shallot openings: Top ends are reported below.				
At lower ends:	5/16"	1/4"	3/16"	3/16"
All Basson pipes are slotted. Widths of slots:	7/8"	5/8"	7/16"	7/16"

Material:

Metal boots and resonators. Metal contains approximately 90% tin.
Flared resonators.

Wind Pressure:

3 3/4" until b.
4 1/2" from c² to g³.

Scaling:

Diameter of - C: 3 1/8"
Halving on - step 46.

Length of the Resonator:	C	c	c ¹	c ²
	85"	41 3/16"	20"	9 7/16"

Harmonic Pipes Begin:
no harmonic breaks.

Dimensions of the Shallot:

	C	c	c ¹	c ²
Length	3 19/32"	2 11/32"	1 7/16"	31/32"
Diameter (tapered. See above)	17/32"	7/16"	3/8"	5/16"
Length of the Shallot opening	3 1/16"	1 7/32"	27/32"	19/32"
Width (apex end) of the Shallot top	1/16"	1/16"	1/16"	1/32" (Tapered. See above)
If closed, distance between lower end of the Shallot and beginning of the opening	3/16"	5/32"	1/8"	3/64"
Type of Shallot closing at the lower end	All shallot closings are flat.			
Amount of tongue overhang at the end of the shallot, if present	---	---	---	---
Thickness of the Shallot Wall	EX	EX	EX	EX

Dimensions of the Tongue:

	C	c	c ¹	c ²
Width at end nearer the Block	3/8"	9/32"	7/32"	7/32"
Width at end nearer the Shallot end	17/32"	7/8"	11/32"	9/32"

Size of the Toe Bore:

7/8"	3/8"	3/8"	5/16"
8 13/16"	8 5/8"	8 11/16"	8 1/2"

Length of the Boot:

Grand-Chopur
Division

Clairon 4'
Stop

General Remarks:

All Clairon resonators are unslotted.

The great octave of this stop employs tongues which overhang the end of the shallot. The amount of overhang diminishes as the compass rises, disappearing on c.

C and c octaves contain double blocks. Dimensions: From higher block to end of shallot: C 7 1/4" c 5 1/2" . From lower block to end of shallot: C 3 3/8" c 2 3/16" .

Material:

Metal boots and resonators. Metal contains approximately 90% tin.

Wind Pressure:

3 3/4" until p.

4 1/2" from c¹ to g³.

Scaling:

Diameter of - C: 5 1/8"

Halving on - step 20; new diameter on c¹ 2 1/2- no further half diameter.
new diameter on c² 2 1/2- no further half diameter.

Length of the Resonator: C 39 7/8" c 17 13/16" c¹ 9 3/4" * c² 9 1/2" *

Harmonic Pipes Begin:

c¹ and c²

Dimensions of the Shallot:

	C	c	c ¹	c ²
Length	2 17/32"	1 21/32"	1 3/32"	19/32"
Diameter	25/64"	5/16"	9/32"	9/32"
Length of the Shallot opening	2 3/8"	1 21/32"	1 1/8"	21/32"
Width (low end) of the Shallot opening	9/32"	1/4"	7/32"	1/8"
If closed, distance between lower end of the Shallot and beginning of the opening	---	---	---	---
Type of Shallot closing at the lower end	slightly rounded for all shallots			
Amount of tongue overhanging at the end of the shallot, if present	---	---	---	---
Thickness of the Shallot Wall	1/32"	1/32"	less than 1/32"	3/64"

Dimensions of the Tongue:

Width at end nearer the Block	9/32"	7/32"	7/32"	3/16"
Width at end nearer the Shallot end	13/32"	5/16"	1/4"	7/32"

Size of the Toe Bore:

13/32"	5/16"	5/8"	5/8"
--------	-------	------	------

Length of the Boot:

10 1/4"	9 1/4"	9 1/8"	9 1/2"
---------	--------	--------	--------

Grand-Choeur
Division

Clairon-Doublette 2'
Stop

General Remarks:

The great octave contains double blocks. Dimensions: From higher block to end of the shallot: C $5 \frac{3}{4}$ From lower block to end of the shallot: C $2 \frac{5}{8}$.

Material:

Metal boots and resonators. Metal contains approximately 90% tin.

Wind Pressure:

$3 \frac{3}{4}$ " until b.

$4 \frac{1}{4}$ " from c¹ to g³.

Scaling:

Diameter of - C: $4 \frac{1}{8}$ "

Halving on - step 20; new diameter on c¹: $2 \frac{7}{16}$ "- no further half diameter.
new diameter on c²: $2 \frac{7}{16}$ "- no further half diameter.

Length of the Resonator: C

$17 \frac{3}{4}$ " $9 \frac{3}{4}$ "* $9 \frac{7}{8}$ "* $9 \frac{11}{16}$ "*

Harmonic Pipes Begin:

c¹ and c²

Dimensions of the Shallot:

	C	c	c ¹	c ²
Length	$1 \frac{5}{8}$ "	$1 \frac{3}{32}$ "	$1 \frac{5}{32}$ "	$1 \frac{5}{64}$ "
Diameter	$\frac{5}{16}$ "	$\frac{1}{4}$ "	$\frac{1}{4}$ "	$\frac{1}{4}$ "
Length of the Shallot opening	$1 \frac{9}{16}$ "	$1 \frac{3}{32}$ "	$1 \frac{1}{8}$ "	$1 \frac{1}{32}$ "
Width (low end) of the Shallot opening	$\frac{5}{32}$ "	$\frac{1}{8}$ "	$\frac{7}{64}$ "	EX
If closed, distance between lower end of the Shallot and beginning of the opening	---	---	---	---
Type of Shallot closing at the lower end	slightly rounded for all shallots			
Amount of tongue overhang at the end of the shallot, if present	---	---	---	---
Thickness of the Shallot Wall	$\frac{3}{64}$ "	$\frac{1}{32}$ "	$\frac{1}{32}$ "	$\frac{1}{32}$ "

Dimensions of the Tongue:

Width at end nearer the Block	$\frac{7}{32}$ "	$\frac{5}{32}$ "	$\frac{5}{32}$ "	EX
Width at end nearer the Shallot end	$\frac{1}{4}$ "	$\frac{7}{32}$ "	$\frac{7}{32}$ "	$\frac{7}{32}$ "

Size of the Too Bore:

$\frac{11}{32}$ " $\frac{1}{4}$ " $\frac{11}{32}$ " $\frac{5}{16}$ "

Length of the Boot:

$8 \frac{5}{8}$ " $8 \frac{5}{8}$ " $8 \frac{5}{8}$ " $8 \frac{11}{16}$ "

Solo
Division

Trompette 8'
Stop

General Remarks:

Material:

Same remarks as Grand-Choeur reeds.

Wind Pressure:

4" until p

5" from c¹ to g³.

Scaling:

Diameter of - C: 5 1/2"

Halving on - step 29. No further half diameter.

Length of the Resonator: C c c¹ c²

Harmonic Pipes Begin:

no harmonic breaks.

Dimensions of the Shallot: C c c¹ c²

Length

Diameter

Length of the Shallot opening

Width (low end) of the Shallot
opening

If closed, distance between lower
end of the Shallot and
beginning of the opening

Type of Shallot closing at the
lower end

Amount of tongue overhang at the
end of the shallot, if present

Thickness of the Shallot Wall

Dimensions of the Tongue:

width at end nearer the Block

width at end nearer the Shallot end

Size of the Toe Bore:

Length of the Boot:

Positif
Division

Thompotte 8'
Stop

General Remarks:

Material:

Same remarks as Grand-Chocour reads.

Wind Pressure:

4" until b.

4 3/4" from c¹ to g³.

Sealing:

Diameter of - C: 5 1/8"

Halving on - stop 33. No further half diameter

Length of the Resonator: C c c¹ c²

Harmonic Pipes Begin:

none

Dimensions of the Shallot: C c c¹ c²

Length

Diameter

Length of the Shallot opening

Width (low end) of the Shallot
opening

If closed, distance between lower
end of the Shallot and
beginning of the opening

Type of Shallot closing at the
lower end

Amount of tongue overhanging at the
end of the shallot, if present

Thickness of the Shallot Wall

Dimensions of the Tongue:

Width at end nearer the Block

Width at end nearer the Shallot end

Size of the Toe Bore:

Length of the Boot:

Positif
Division

Clairon 41
Stop

General Remarks:

Material:

Same remarks as Grand-Choeur reeds.

Wind Pressure:

4" until b.

4 3/4" from c¹ to g³.

Scaling:

Diameter of - C: 4 3/8"
Halving on - step 17.

Length of the Resonator: C

c¹

c²

Harmonic Pipes Begin:

c²

Dimensions of the Shallot:

C

c

c¹

c²

Length

Diameter

Length of the Shallot opening

Width (low end) of the Shallot

opening

If closed, distance between lower
end of the Shallot and

beginning of the opening

Type of Shallot closing at the
lower end

Amount of tongue overhang at the
end of the shallot, if present

Thickness of the Shallot Wall

Dimensions of the Tongue:

Width at end nearer the Block

Width at end nearer the Shallot end

Size of the Toe Bore:

Length of the Boot:

Récit
Division

Trompette 8'
Step

General Remarks:

Material:

Same remarks as Grand-Choeur reeds.

Wind Pressure:

4" until b.

4 1/4" until b¹; 4 1/2" until g³.

Scaling:

Diameter of - c: 3 1/2" (C EX)

Halving on -

Length of the Resonator: C c c¹ c²

Harmonic Pipes Begin:

Dimensions of the Shallot: C c c¹ c²

Length

Diameter

Length of the Shallot opening

Width (low end) of the Shallot
opening

If closed, distance between lower
end of the Shallot and
beginning of the opening

Type of Shallot closing at the
lower end

Amount of tongue overhang at the
end of the shallot, if present

Thickness of the Shallot Wall

Dimensions of the Tongue:

Width at end nearer the Block

Width at end nearer the Shallot end

Size of the Toe Bore: .

Length of the Boot:

Récit
Division

Clairon 41
Stop

1. Flue Pipes:

f^2 - g^3 are flue pipes.

2. Reeds:

Reeds as Grand-Chocour reeds.

3. Shallot:

4" until b^1 .

4 1/4" until b^1 ; 4 1/2" until g^3 .

4. Shallot:

Shallot of - C: 3"

Shaving on - stop 40. No further half diameter

Location of the Resonator: C c c^1 c^2

5. Shallot:

Shallot breaks.

Location of the Shallot: C c c^1 c^2

6. Shallot:

Shallot

Location of the Shallot opening

Location (low end) of the Shallot

opening

If closed, distance between lower

end of the Shallot and

beginning of the opening

Type of Shallot closing at the

lower end

Amount of tongue overhanging at the

end of the shallot, if present

Thickness of the Shallot Wall

7. Dimensions of the Tongue:

Location of end nearer the Block

Location of end nearer the Shallot end

8. Location of the Top Bore:

9. Location of the Foot:

Section C: Analysis of the Positif and Récit Mixtures

PositifPlein Jeu Harmonique III-VI¹

1-12	12 15 19
13-24	8 12 15 19
25-36	5 8 12 15 19
37-56	1 5 8 12 15 19

Récit

Fourniture III

1-7	19 22 26
8-12	15 19 22
13-24	12 15 19
25-29	8 12 15
30-36	5 8 12
37-56	1 5 8

Cymbale IV

1-7	29 29 33 36
8-12	26 26 29 33
13-19	22 22 26 29
20-24	19 22 26 26
25-27	19 19 22 26
28-29	15 19 22 22
30-36	15 15 19 22
37-41	12 12 15 19
42-56	8 12 15 15

¹In this context, the term "harmonique" denotes a mixture without traditional breaks as this example shows. At each octave, the next lowest partial is added which continues throughout the compass of the stop without breaking back. While these mixtures are effective in bolstering the treble register in homophonic passages, they are inappropriate for contrapuntal textures.

With the exception of the Positif Plein-Jeu, all mixtures appear to be the work of Clicquot, although Cavaillé-Coll undoubtedly redesigned the breaks and, in some instances, the compositions. This pipework shows more signs of aging and contains lesser amounts of tin than known Cavaillé-Coll pipes. The pipes of the Positif Plein-Jeu are the only unslotted ones among the mixture ranks. The remaining mixtures were undoubtedly slotted during the construction of the new organ in 1862 in order to bring them up to standard pitch as fixed by the French government in 1859. The fact that Cavaillé-Coll's mixture is unslotted spurs interesting speculation about his philosophy concerning the use of slotted pipes. If this procedure had been an integral part of his aesthetic as many historians insist, surely his own work would not have escaped slotting. "Tous les jeux tant anciens que nouveaux étaient alors déjà préparés pour le diapason convenu; on a dû les modifier pour les mettre au nouveau ton normal, ce qui a motivé un surcroît de travail de de dépense."² It appears, then, that much slotting was carried out in order to raise the pitch of older pipework to the "nouveau diapason" of 1859.

²Lamazou, Pierre. Etude sur l'Orgue Monumental à Saint-Sulpice, p. 35.

CHAPTER III

A DESCRIPTION OF THE MECHANICAL ACCESSORIES
ON THE SAINT-SULPICE CONSOLE

Cavaillé-Coll's gigantic console at Saint-Sulpice initially presents a confusing array of drawknobs and hook-down pedals. By 20th century standards, the various accessories designed to aid the organist in controlling his stops appear primitive. No combination piston action as we understand it was used. Large amounts of time are needed to set registrations, and in spite of the "Registres de Combinaison" and the ventril system, one or two registrants are generally present to provide more subtle shadings in the registration.

In perspective, however, the Cavaillé-Coll console represents a bold step in the evolution of the French organ. Few precedents were available in either the literature or in other organs for guiding Cavaillé-Coll in his decisions dealing with mechanical accessories. As awkward as the ventril and coupling systems appear to us, they opened new possibilities for creativity which were fully explored by succeeding generations of French organists.

Mechanically, the most important departure from the German, English, and American traditions in organ building lies in the ventril system. On the Cavaillé-Coll organ, the stops on all divisions are divided into two classes: Jeux de Fond (Foundation stops) and Jeux de Combinaison¹ (Combination stops). Generally, 16', 8', and 4' flues plus solo reeds comprise the first category. On the majority of Cavaillé-Coll organs, these pipes

¹The drawknob is always engraved in red when it belongs to the Jeux de Combinaison category.

speak as soon as the drawknob is pulled.² However, the upperwork and reeds, situated in the Jeux de Combinaison group, will not sound until a hook-down pedal is pressed for the desired division. While registering, the organist draws the desired stops from the Jeux de Combinaison (referred to as "preparing" the stops in French) which will sound when their ventils pedal is activated. Similarly, the stops are silenced by releasing the pedal.

Effective crescendos and decrescendos at Saint-Sulpice are the result of the organist's smooth operation of the hook-down pedals (referred to generically in French as "Pédales de Combinaison") for both the ventils and the couplers. Ordinarily, all 16', 8', and 4' foundation stops are coupled to the first keyboard and the pedal with most if not all of the Jeux de Combinaison prepared. At the appropriate points in the music, the ventils pedals are engaged in the following order: Récit, Positif, Bombarde (Solo), Grand-Chœur, "Chamado", and Pédale. The decrescendo is achieved by removing the pedals in the reverse order. It would seem that the sudden additions and subtractions of the large masses of reeds and mixtures would produce a somewhat brusque, uneven effect, but this has been successfully avoided by scrupulous voicing.³

Crescendos and decrescendos may be limited to the foundation stops. The appropriate stops on all divisions are drawn and the Récit is coupled

²In Cavaillé-Coll's two largest instruments, Saint-Sulpice and Notre-Dame, one further stop was required which is explained later in this chapter.

³One may judge for himself the effectiveness of the crescendos and decrescendos at Saint-Sulpice by listening to the recording of the organ at Saint-Sulpice, Paris, by the French Broadcasting Corporation, 1954.

to the first keyboard upon which the organist plays. He gradually introduces the Positif, Bombarde (Solo), and Grand-Orgue foundations by depressing their respective pedals under "Accouplements au Premier Clavier." Once again, a smooth, unified crescendo is produced. The reader should bear in mind that the first (lowest) manual functions as a coupling keyboard. The stops appearing to be assigned to the Grand-Choeur division function as the Jeux de Combinaison for the Grand-Orgue and will not sound until their ventii pedal or coupler to the first manual is engaged.

A vital principle in understanding the registrations of 19th and 20th century French organ composers is clarified at Saint-Sulpice as well as at other unaltered Cavallé-Coll consoles: Whatever division is coupled to the first manual will automatically sound in the pedal if the manual-to-pedal coupler for the first manual is engaged. The same principle applies to inter-manual coupling and the use of the "Octaves Graves": When the Récit-Positif coupler and the Positif-first manual coupler are pressed, the Récit stops will sound from the first keyboard. Similarly, "Octaves Graves" for any division will couple through to the first keyboard (or to the Positif in the case of the Récit-Positif coupler). The "coupling through" feature partially explains why Cavallé-Coll equipped his console with only two tirasses in 1862. During crescendo passages, all manuals automatically sounded in the pedal as soon as their respective coupler to the first keyboard was activated. This avoided further pedal manipulation which would have been necessary had every manual required its own tirasse.

The "Régistres de Combinaison" (Combination registers), located

on the drawknobs, were first introduced by Cavaillé-Coll on the Saint-Sulpice console and later used by him at Notre Dame and by Mutin at Sacré-Coeur. This device permits the organist to set beginning registrations on the drawknobs and then "lock" their sliders into position *temporarily* by moving the combination drawknob from "on" to "off." Another combination can then be set on the drawknobs which will not sound until the combination knob is redrawn to the "on" position. When practical, the combination knobs may be left open which permits the organist to add or subtract the stops gradually without activating the combination system each time. There are five combination knobs, one for each division: Récit, Positif, Bombarde (Solo), Grand-Orgue et Grand-Choeur, and Pédale.

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APPENDIX A

Present Specifications of the Cavaillé-Coll Grand Orgue at Saint-Sulpice

56 Note Manual Compass
 30 Note Pedal Compass
 Barker Lever Machines on all Manuals
 Tracker Action in the Pedal

Pédales de Combinaison

Tirasse Grand-Chœur
 Tirasse Grand-Orgue
 Tirasse Récit
 Anches Pédale
 Octaves Graves des Claviers
 Grand-Chœur
 Grand-Orgue
 Solo
 Positif
 Récit
 Appels des Jeux de Combinaison
 Grand-Orgue
 Solo
 Positif
 Récit
 Accouplements au 1^{er} Clavier
 Grand-Chœur
 Grand-Orgue
 Solo
 Positif
 Récit
 Récit à Positif
 Expression du Récit
 (unbalanced, three settings)

Chamade
 (centered above the Jeux de
 Combinaison Ventils)

Five Tiers of Drawknobs Arranged
 on both sides of the Manuals

1. Pédale
2. Grand Chœur
 plus Pedal Principals 16' and 8'
3. Grand Orgue
 plus Registres de Combinaison
4. Positif (Jeux de Combinaison)
 Solo
5. Positif (Jeux de Fond)
 Récit-Expressif

Stops are arranged in the order of their locations within the console. Space indicates where manual divides horizontal row of knobs. Jeux de Combinaison stops appear in red.

Pédale

Principal	16'
Sonnette du Haut ¹	
X Bombarde	16'
X Bombarde	32'
X Trompette	8'
Flûte	4'
Soubasse	16'
Principal	32'
Violoncelle	8'
Flûte	8'
Contre Basse	16'
X Basson	16'
X Ophicléide	8'
X Clairon	4'
Sonnette du Haut	
Principal	8'

Grand-Orgue
Second Manual

Combinaisons -	
Pédale	
Récit	
Positif	
Solo	
Gd. Orgue et Gd. Chœur	
Flûte à Pavillon	8'
Diapason	8'
Prestant	4'
Bourdon	16'
Montre	16'
Flûte Cœnique	16'
Principal	16'
Flûte Traversière	8'
Flûte Harmonique	8'
Montre	8'
Bourdon	8'
Quinte	5 1/3'
Salicional	8'
Combinaisons -	
Gd. Orgue et Gd. Chœur	
Solo	
Positif	
Récit	
Pédale	

Grand-Chœur
First Manual
Second Manual

X Clairon Doublette	2'
X Clairon	4'
X Basson	16'
X Bombarde	16'
X Plein Jeu	IV
X Fourniture	IV
X Doublette	2'
X Octave	4'
X Cymbale	VI
X Cornet	V
X 1 ^{er} Trompette	8'
X 2 ^e Trompette	8'
X Basson	8'

Positif
Third Manual

X Baryton	8'
X Basson	16'
X Picolo	1'
X Tierce	1 3/5'
<i>clavier</i>	
X Plein Jeu	III-VI
X Larigot	1 1/3'
X Trompette	8'
X Clairon	4'
X Quinte	2 2/3'
Dulciane	4'
Flûte Octaviante	4'
Quintaton	8'
Quintaton	16'
Violone Basse	16'
<i>clavier</i> ↓	
Flûte Traversière	8'
Salicional	8'
Gambe	8'
Unda Maris	8'
Flûte Douce	4'
X Doublette	2'

Récit-Expressif
Fourth Manual

*Clairon	4'
*Bombarde	16'
*Dulciane	4'
*Cornet	V
*Octavin	2'
Violoncelle	8'
Prestant	4'
Flûte Octaviante	4'
Bourdon	8'
Basson-Hautbois	8'
	Voix Humaine 8'
Cromorne	8'
Diapason	8'
Quintaton	16'
Flûte Harmonique	8'
Doublette	2'
Voix Céleste	8'
*Fourniture	III
*Cymbale	IV
*Nasard	2 2/3'
*Trompette	8'
Tremolo Récit	
Chamade:	
*Trompette Harmonique	8'

Solo
Fifth Manual

*Clairon	4'
*Septième	2 2/7'
*Cornet	V
*Octavin	2'
*Octave	4'
Prestant	4'
Gambe	8'
Bourdon	8'
Flûte Harmonique	8'
Principal	8'
Bourdon	16'
Flûte Cônica	16'
Violoncelle	8'
Kéraulophone	8'
Flûte Octaviante	4'
*Quinte	5 1/3'
*Tierce	3 1/5'
*Quinte	2 2/3'
*Bombarde	16'
*Trompette	8'

¹The Sonnette du Haut knobs connect with a bell at the pumping treadles in the interior of the organ. Before the electric blower was installed (1922), the organist could signal when it was time to begin supplying the organ with wind.

APPENDIX C

Titular Organists of the Cavaillé-Coll Grand Orgue at Saint-Sulpice

Georges Schmitt	1849-1863
Louis James Alfred Lefebvre-Wély	1863-1869
Charles-Marie Widor	1870-1934
Marcel Dupré	1934-1971
Jean-Jacques Grunenwald	1973-

Mademoiselle Françoise Renet, instructor of organ at the Conservatoire de Meudon, currently serves as assistant organist. She also served as interim titular organist between Dupré and Grunenwald.

APPENDIX D

Dedicatory and Centennial Celebrations at Saint-Sulpice

The Cavaillé-Coll Grand Orgue at Saint-Sulpice was dedicated on April 29, 1862 by the following organists: Saint-Saens, Franck, Bazille, Guilmant, and Schmitt.¹

Marcel Dupré observed the centennial of the instrument by playing the following recital on May 3, 1962:²

Kyrie du Saint-Esprit	J. S. Bach
Fantasie in C Major	Franck
Marche Funèbre et Chant Séraphique	Guilmant
Bénédiction Nuptiale	Saint-Saens
Variations from <u>Symphonie Gothique</u>	Widor
Symphonie-Passion	Dupré
Improvisation sur un thème liturgique	

Although no program from the dedicatory recital is extant, tradition maintains that Franck played his Fantasie in C and Guilmant his Marche Funèbre et Chant Séraphique for the opening of the Saint-Sulpice organ.

¹Source: Tableau in titular's quarters behind the organ at Saint-Sulpice.

²Swanton, F.C.J., "Anniversary at Saint-Sulpice," The Diapason, No. 8 (July 1962), p. 26.