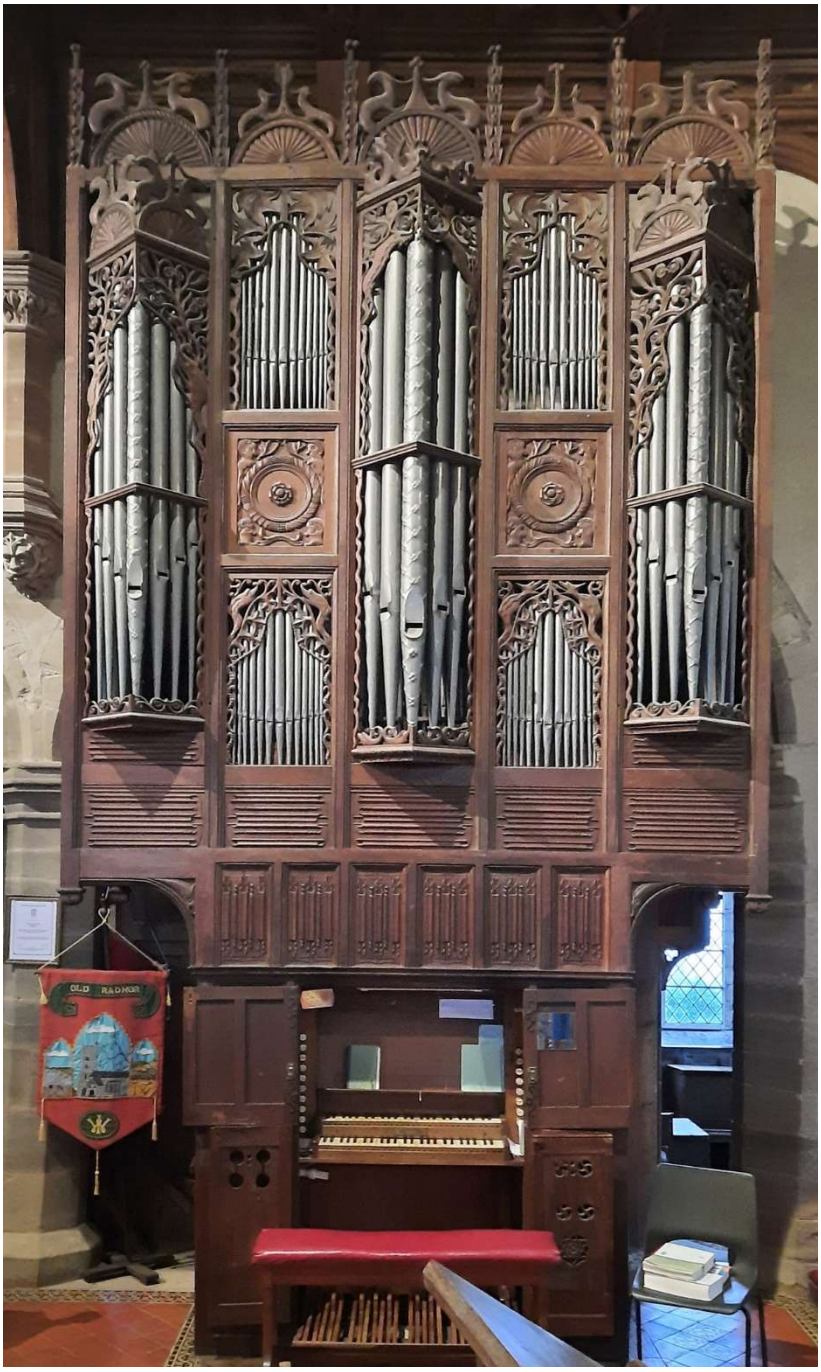

English Organbuilding

By Blair Batty

Forward

I am a retired organbuilder. This PDF is some of my personal notes about English 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. It's been three decades since I've heard the organs, so I've refrained from discussing what they sound like. Anyways, there are lots of excellent recordings of English organs, with appropriate repertoire played authentically.

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, and difficult to obtain.

I made several organ crawls to England in about 1996. I found many of the organs to be conservative, heavy, inarticulate and uninteresting. My favourites were the 1880's Hill Organs; for example, the Hill at St Johns, Hyde Park, London, which I studied and made some measurements.

I also loved the Father Willis reeds. A favourite was Lewis, I studied the 1882 Lewis in John the Evangelist, Upper Norwood. It was bold and exciting; very Germanic.

I apologise for the messiness of my notes. They were made "in the field" and time and my arthritis preclude redoing it. I am 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; how ever you wish. Some of the organ builders discussed are still in business. If you feel I am exposing your proprietary or trade secrets, let me know if you wish it adjusted or removed. Do contact me, should you have any comments, corrections, sources or questions. I won't be offended…

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Cover photo is of the preRestoration
~1515 organ in St. Stephen, Old Radnor, Wales

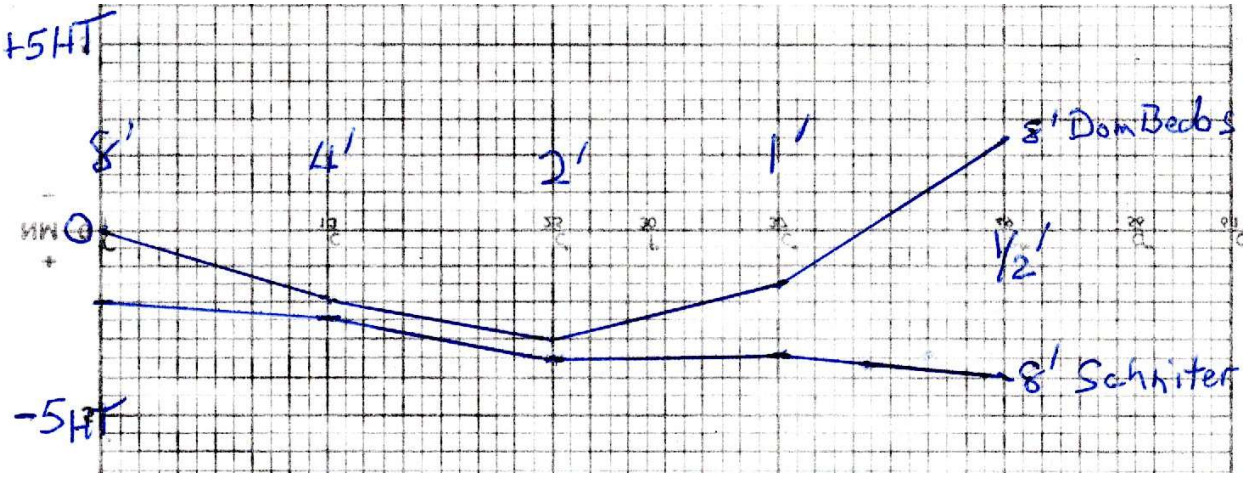
Notes on Pipe Scales

On my website <BlairBatty.Ca> I have a booklet "Introduction to Pipe Scales" that gives a brief history of scales and what they are, how I graph them and how you can understand them. As this book is mostly about English scales and pipe voicing, I recommend you have a look at it as it will help you read this book.

English Pipe Scales

After the Restoration, there were two influential organ builders: a German, Father Smith and a Frenchman, Harris. This resulted in two traditions of organ building in England; one speaking in a Germanic accent, the other in French accent. Though they borrowed from each other, one of the differences between the French and German organ building schools was their basic scale systems.

The vertical axis of the Normalmensur chart below is in Halftones; one halftone is one pipe. The horizontal axis is the progression of the rank from bass to treble *(i.e. it corresponds to the keys of the keyboard)*. The Germanic Schnitger Open is a relatively straight line. I'm not suggesting Schnitger worked with Log tables. He may have empirically found these pipe sizes, or simply copied someone.



You will note the strong curve in the French Dom Bedos scale line; characteristic of classic French scales. This is due to the layout method of the French which is documented in Bedos' book. There is also a method of scaling, which uses an additive factor each octave, which results in a similar curve.

Because of this difference, we get a curve when we plot French scales on a Normalmensur chart. This difference between French and German scales is not a bad thing.

German scales are great for choruses, polyphonic Bach and smaller dry churches. French scales make wonderful mutations and Cornets, but tend toward Diapasons with muddy bass, thin midrange, and bold, ascending cornetty trebles *(that help fill large reverberant rooms)*. Bedoes admitted French scaling had some problems and he gave work-arounds in his book.

But the French scales gave the French what they wanted and it suited the French repertoire. Neither the French nor German system is wrong; they're just different. And each give their builders what they wanted. Otherwise, they wouldn't each use their respective scaling systems for centuries.

Modern builders tend to use German scales for their choruses, and French scales for their mutations and cornets, even if they don't know where they originated. And most English organbuilders follow

either the Germanic Smith, or French Harris pipe traditions, even if they don't know the origins and just copied their master…

Periods of English Organbuilding

- Before 1650
- 1640 Destruction of the organs during the Commonwealth.
- 1660 Restoration, up to Smith & Harris
- Father Smith vs. Renatus Harris
- 1700 Eighteenth Century
- 1780's Samuel Green
- 1800-1830 Transition towards the Victorian organ
- 1830-1850 Hill-Gauntlett
- 1851-1900 Willis, Schulze, Hope Jones
- 1900-1940 Arthur Harrison

Up until the time of Hill, the organ was a Great or main organ, a Chaire or Choir *(Positiv)* secondary organ, with possibly other subsidiary manuals of short compass, like an echo or swell. Unfortunately, information about the early instruments consists mostly of stoplists. Not much else survives…

Compass

Chamber organs always started at C8'.

Church organs started lower, 16'G was usual in the 17th and 18th century. This was because the organs lacked pedals. Secondary manuals, such as Swells, were considered as treble solo manuals so had a short compass in the bass. Cases were 14' high above the impost, to accommodate the 11 foot long body, plus the foot, of 16'G. Three pipe towers suited these long pipes, and made for graceful cases.

Before The Commonwealth of 1650

Description

An organ before 1600 would have been no more than a single manual, large scaled positiv of half a dozen stops, probably sliderchest, perhaps with a long compass.

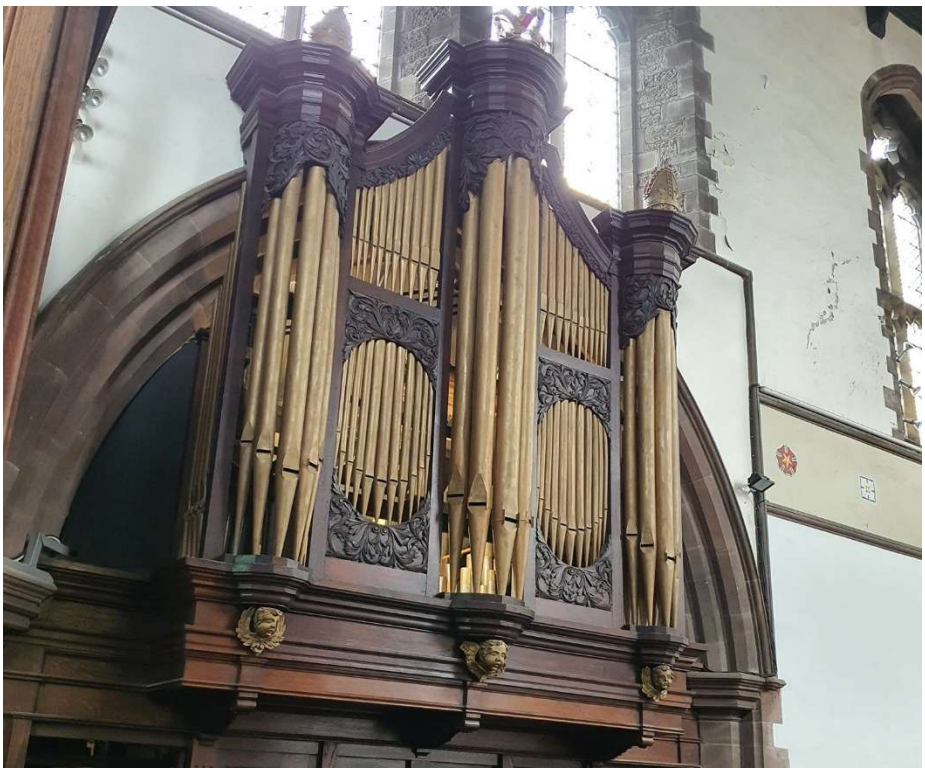
- Old Dutch and Italian influences
- the 22th, long compasses, and lack of pedals, suggest Italian influence
- The 22nd may, or may not have broken back to 1-1/3 or 2-2/3 @ c1, on the evidence of one organ
- Little known, no surviving instruments, no scales, only stoplists and the Old Radnor case.
- We can assume they were like the contemporary continental organs.
- Lots of wood pipes
- Duplicated stops, perhaps of differing power and scales
- very few stop types, no reeds or mixtures
- no pedals
- Small vs Large usually referred to an octave higher, not to scale.

Composers

- Byrd, Gibbons, Bull

Builders

- Thomas Dallam
- John Howe
- John Burward, London



St Cuthbert's Church, Darwen, UK, Father Smith case of 1702

Eton College, Thomas Dallam, 1613

10'?	Diapason	tynn	Stopped (10' tone?)
5'	Principal	tynn	
5'	Flute	tynn	unison to the principal
	Octave	tynn	Octave to the principal
	Fifteenth	tynn	
	Tremulant		

Worchester Cathedral, 1613, Thomas Dallam

Great

Qty.	Stop	Notes
2	Open Diapasons	of metal, CC fa ut 10'
2	Principals	of metal
2	Fifteenths	of metal
1	Twelfth	of metal
1	Recorder	of metal, Stopped

Chaire

	Principal	metal
	Diapason	wood
	Flute	Wood
	Small principal or Fifteenth, of metal	
	Twenty-second	metal

Chirk Castle, John Burward, 1631

Upper

	Stopt Diapason	metal
	Open Diapason	from gamut upwards
	Principal	large
	Principal	small
	Recorder	
	Fifteenth	
	Twenty-second	

Lower

	Diapason	
	Principal	large
	Principal	Small

(Large and small may refer to scale, or the small one may be an octave higher.)

Magdalen College, Oxford, approx. 1615/37

Great

Qty.	Stop
	Open Diapason
	Stopt Diapason
2	Principals
2	Fifteenths
2	Twenty-seconds (1')

Chair

	Stopped Diapason
2 qty	Principals
	Recorder
	Fifteenth

House Organ, Christianus Smith, 1643, (Noel Mander's)

8'	Stopped Diapason	bass
8'	Stopped Diapason	treble
8'	Large Open Diapason	from c
8'	Small Open Diapason	from c'
4'	Principal	
2'	Fifteenth Bass	
2'	Fifteenth treble	
1'	Twenty-second	*@ c' breaks to 2-2/3 (may not be typical)*

York Minster, Robert Dallum

Great

Qty.	Pitch	Stop	Notes
2	8'	Diapasons	tynn, many chased, in the facade
1	8'	Diapason Stopp	wood (Stopped diapason?)
2	4'	Principals	tynn
1	2-2/3’	twelfth	to the diapason
1	2'	Small Principal	tynn
1	2'	Recorder	unison to principal
1	1'	Twenty-second	

Chaire

1		Diapason	Wood (Stopped?)
1		Principal	tynn in facade
1		Flute	wood
		Small Principal	tynn
1		Recorder	tynn, 8’ or 2'?, perhaps from c1

Compass 51 notes: perhaps C, D-d”, e”, or GG, AA, BB<flat>, BB, C, D, E,...c”’

Bordeaux, St-Michel, 1510, L. Gaudet

1.	16’	Prestant	(F-compass)
2.	8’	Octave	
3.	4’	Fifteenth	
4.	2 2/3’	Ninteenth	(Twenty-second)
5.	1 1/3’	Twenty-sixth	
6.	1’	Twenty-ninth	
7.	8’	Flute	
8.	4’	Flute	

Sample registrations

grand jeu:	all stops but the first
jeu de papegay:	1,2
les cornes:	1,5,6
jeu de grans cornaiez:	1,5,6,9
La Fleuste:	1
les cymbales:	1,2,6,9
les chantres	1,8 or 1,2,8
les fleutes d’alement	3,8
la petite cimbale	1,6
les gros cornetz	1,2,8,9
le grand jeu doulx	1,2,3,8,9

1. Subtle graduation between single stops & full organ
2. Combinations were given descriptive, fanciful names
3. Economy of registration

The Restoration

Description

The period of Cromwell's Commonwealth, 1630-60 resulted in the destruction of virtually all the organs. The builders went into other trades, or fled to the continent. When they returned, they built in the old way, but with European, especially French influences (Brittany & perhaps Normandy, not Île-de-France).

Composers

I don't know...

Builders

- Robert, Ralph, George and Thomas Dallam, London
- Thomas Harris, New Sarum
- Edward Darby
- William Hathaway
- Robert Hayward, Bath
- John Hingeston
- John Loosemore, Exeter
- Thomas Thamar, Peterborough
- Lancelot Pease
- Preston, York

Canterbury Cathedral, Lancelot Pease, 1662

Great Organ

Qty	Stop	Material	Comments
1	Diapason	metal	
1	Diapason Stopp	wood	
2	Principals	metal	
2	fifteenths	metal	
	A small & great twelfth	metal	(2-2/3 and 1-1/3, i.e. big & small?)
2	Twenty-seconds	metal	
	Flute	metal	
	Recorder	metal	
	Tierce	metal	

Chaire Organ

2	Stop't Diapasons	wood	
	Principal	metal	façade
	Fifteenth	metal	
	fifteenth	wood	
	flute	wood	

Adlington Hall, ~1660

Great Organ

8'	Open Diapason
8'	St Diapason
4'	Principal
2-2/3'	Twelfth
2'	Fifteenth
2'	Flute bass
2'	Flute treble
1-3/5'	Ters
1-1/3'	Small Twelfth
1'	2 & twenty
8'	Vox Humana
8'	Trumpet

Choir Organ

8'	St Diapason
4'	St Flute
8'	Bassoon

Gt & Chair common chest. Stopped Diapason common thru transmission. Wind pressure 2-5/8”

Song School, Exeter, John Loosemore

8'	Open Diapason
8'	Stopped Diapason
4'	Principal
4'	Flute
2-2/3'	Twelfth
2'	Fifteenth

New College, Oxford, Robert Dallam, 1661

A complete French organ of 2 manuals and 24 stops, with French mixtures: a Fourniture breaking each octave, and a simbale breaking twice an octave.

Gisors, St Gervais & St-Protais, 1580. N. Barbier

Great, CD-c’’’

16'	Montre	tin
8'	Montre	lead
8'	Bourdon	lead
4'	Prestant	tin
4'	Flute	lead
2-2/3'	II Nasard	lead, (Sesquialtera?)
2'	Doublette	tin
1-1/3'	Quinte-flute	lead, chimney flute, or 2-2/3?
	(*Probably 2-2/3. If 1-1/3, the pipes would be very small to make a rohrflute.)*	
1'	Sifflet	lead
IV	Fourniture	tin
	III Cymbale	tin
	V Cornet	from c’
8'	Trompette	
4'	Clairon	
8'	Voix Humaine	

Positiv, CD-c’’’

8'	Bourdon	1-12 of wood
4'	Prestant?	lead
2'	Doublette?	lead
1-1/3'	Petite Quinte	tin
II	Cymbale	tin
8'	Cromorne	tin

Pedale

8'	Jeu de pedale	wood, from C?
8'	Sacqueboutes	tin, from FF, or perhaps 16’?

Positiv in main case, Pos/GO, all with lead feet

Bernard Smith's Durham Cathedral organ

Father Smith

Father Smith may have been a German, or perhaps English. He must have training in the Netherlands, perhaps born there. He introduced Germanic names into his organs: Prestard, Holflute, Sesquialtera, Gedakt, Mixture, Spitts flute, Violl, Super octavo, Quinta dena, Diapason.

- Liked wooden pipes, Stop Diapasons were quinty.
- Introduced sesquilateras, mounted French cornets, *(scales not so fat)*.
- no duplicated stops, except Opens on big organs; perhaps required by two facades due to the location on the screen
- Choir just a positiv organ
- long compass, no pedals.
- Sesquialtera was a breaking mixture, principal scale
- Mixtures contained tierces, so had a reedy tone, *(meantone had pure thirds, so would sound better, than if equal temperament which has strongly tempered thirds.)*
- Introduced Echos, permanently enclosed, sometimes in the Brust position w/o enclosure.
- Principals were strong and ringing
- H&R say 4, 2-2/3 & 2' were 1ht narrow of Open, Mixture -2ht.

Smith's pipework re:BIOS #2, Thistlewaite

- ears to 1'
- 20% common metal, 70 degree languids
- Windways not narrow
- Toes not open, but bigger than 18th century
- Few nixs perhaps 2 or 3 irregularly spaced firm nixs
- Principals: Gt & Ch Principals, twelfth, Fifteenths & mixture the same scale
- Open 1 pipe bigger

Temple Church, 1683

Great

Prestand	
Hohlflute	metal
Principal	wood & metal
Quinta	metal
Super Octavo	
Cornett II	metal
Sesquilatera III	metal
Gedackt	Wainscott
Mixture IV	metal
Trumpet	

Chair

Gedackt	Wainscott
Hohlflute	m
Sadt	m
Spittsflute	m
Violl & violin	metal
Voice Humane	metal

Ecchos

	Gedackt	wood	Full compass
	Super Octavo	metal	full compass
	Gedackt	wood	29 notes
	Flute	metal	29 notes
	Cornet III	metal	87 notes
	Sesquailtera		105 notes
	Trumpet		29 note

St Paul's Cathedral, 1695

Great

8'	Open Diapason
8'	Open Diapason
8'	Stop Diapason
4'	Principal
	Hol Fleut
2-2/3	Great Twelfth
2'	Fifteenth
1-1/3	Small Twelfth
	Cornet
	Mixture
	Sesquailtera
	Trumpet

Chayre

	Quinta Dena Diapason
	Stop Diapason
4'	Principal
	Hol Fleut
2-2/3	Great Twelfth
2'	Fifteenth
	Cimbal
	Voice Humaine
	Crumhorne

Echo

8'	Diapason
4'	Principal
	Nason
2'	Fifteenth
	Cornet
8'	Trumpet

London, Chapel Royal (Banqueting Hall), B Smith, 1699

Great, GG,AA-c’’’

6'	Open Diapason	
8'	Stopped Diapason	
4'	Principal	
4'?	Flute	wood
2'?	Blockflute	metal, c#1
2-2/3'	Twelfth	
2'	Fifteenth	
III	Mixture	
III	Sesquialtera	*(It’s a Cornet, c#1)*
8'	Trumpet	

Choir, GG, AA-c’’’

8'	Stopped Diapason	
4'	Principal	
2'	Flute	wood c#1
8'	Vox Humana	
8'	Cremona	

Echo, g-c’’’

8'	Open Diapason	
4'	Principal	
III	Cornet	(12, 17)
8'	Trumpet	

Echo was placed behind the music rack, without a box, like a burstwerk.

University Church, Cambridge, 1698

Great, GG,AA-c’’’

8'	Open Diapason	
8'	Stopped Diapason	
4'	Principal	
4'	Flute	wood
2-2/3'	Twelfth	
2'	Fifteenth	
	Sesquialtera	
	Cornet	
8'	Trumpet	

Choir, GG, AA-cIII

8'	Stopped Diapason	
4'	Principal	
4'	Nason	wooden Flute
2'	Fifteenth	

Grote Kerk, Edam, Barent Smit 1663
aka Father Smith

Renatus Harris

Harris was the rival of Father Smith. He spent his childhood in France, hence the fuller toned principals and better Reeds. On rebuilds, he recommended removing the duplicate ranks (*hard to tune, but gave little increase in loudness)*; he wanted to replace them with French mixtures and mutations and reeds. Did mechanical borrowing of stops from one keyboard to another, so shared chests.

- He avoided tierces in mixtures
- Used separate 17th and 19th *(1-3/5', 1-1/3')*
- Sesquialtera was just a mixture, usually w/o tierce
- few wood pipes, fine metal chimney flutes

Rebuilding of Magdalen College, Oxford

Thomas Dallam 1615/37 Rebuild by Renatus Harris, 1690 *(grandson)*

Great

Open Diapason	Open Diapason	old	metal
Stopt Diapason	Stopped Diapason	old	wood
Principal	Principal	old	metal
Principal	Twelfth	new	metal
Fifteenth	Fifteenth	old	metal
Fifteenth	Fourniture III	new	metal
Twenty-second	Cymbal II	new	metal
Twenty-second	Cedrine	new	metal

Chair

Stopped Diapason	Stopped Diapason	old	
Principal	Principal	old	
Principal	Flute	new	metal
Recorder	Nason	new	metal
Fifteenth	Fifteenth	old	

St Patricks Cathedral, Dublin, 1695

Great Organ

Open Diapason	metal
Stop Diapason	wood
Principal	metal
Nason	wood
Great Twelfth	metal
Fifteenth	metal
Cornet	metal

Little Organ

Principal	metal
Stop Diapason	wood
Fifteenth	metal
Nason	wood

St Bride, 1696

Great

8'	Open Diapason	Facade
8'	Stop't Diapason	1-12 wood, rest metal
4'	Principal	metal
V	Cornet	metal
2-2/3'	Gt Twelfth	metal
2'	Cart	metal, *(from quarte de Nazard, fluty*)
2'	Fifteenth	metal
1-3/5'	Tierce	metal
V	Sesquialtera	metal
III	Fourniture	
8'	Trumpet	metal

Choir

8'	Stop't Diapason	1-12 wood, rest metal
4'	Principal	metal
4'	Flute	metal
2-2/3	Stop't Twelfth	metal
2'	Fifteenth	metal
1-3/5	Tierce	metal
8'	Vox Humane	

Echo (treble only)

8'	Open Diapason	
8'	Stop't Diapason	
4'	Principal	(or Flute?)
2-2/3'	Gt Twelfth	
2'	Cart	(or Fifteenth?)
1-3/5	Tierce	
8'	Trumpet	

Father Smith vs. Renatus Harris

Contrasts

Father Smith	Renatus Harris
High pitch?	low pitch?
Trained in Dutch-German	trained in France
Poor actions	Better Actions
Seldom used separate 17th or 19ths	Used separate 17th and 19th
usually used tierce in mixtures	seldom used tierce in mixtures
Patronized by the Crown	no Patron
Narrower Diapasons	Broader Diapasons
Germanic	French
Lots of Wood pipes	only a few bass wood pipes
	Good reeds

Similarities

- Both had foreign experience
- by 1680's Smith was making frenchified schemes
- both ignored pedals, though pulldowns, tremulants, and couplers may have simply not mentioned in contracts
- Both preferred *(in leu of Pedals)* long compasses: 16' GG in most organs, FF at Temple, 16' CC planned at St Paul's
- Two and a half manuals, was common
- No organ larger than 30 stops

from Sir John Sutton: "A Short Account of Organs"- 1847

About Father Smith:

The chorus is very fine and very brilliant in effect, though not quite so as the Chorus afterwards introduced by Snetzler in his organs which, though extremely brilliant, is almost too shrill, and when heard in a small building rings unpleasantly in the ears. The great beauty of Schmit's organs consists in the sweetness and brilliance of the wooden pipes.

About Harris:

His Diapasons are both sweet and rich and his chorus vivacious and ringing, even more so than Schmid's, and his reed stops, though far inferior to those made at the present *(1847)*, are also superior to Smith.

18th Century Organbuilders

Description

Father Smith and Renatus Harris set the style for the next 150 years. Indeed, the eighteenth century organbuilders almost all descended from Smith and Harris. This was a Frenchified organ, capable of tierce dialogues, Cornet recits, various basse de Trompette, basse de cromorne possible.

In 1712, at St Magnus, London Bridge, Jordon Introduced the Swell from Spain, and claimed to invent it. Hence the conversion of Echos into Swells, and the gradually increasing compass of Swells. By 1730, every new organ had a Swell. By 1812, the Swell ousted the choir as the chief secondary manual.

Musicians of the period felt pedals, reeds and mixtures were unnecessary. They had very limited ideas of organ tone, refusing new stops other than the Dulciana, but welcoming the Swell box. In the 17th and early 18th century, they used the short octave bass. By mid 18th century, they used the long octave bass, from GG, (omitting GG#).

- No pedals.
- Father Smith & Renatus Harris both used Echos.
- Snetzler introduced the Dulciana, Green refined it
- Doubling of Opens still carried out.
- 16’ manual stops very rare.

Composers

Blow, Purcell, Jerimah Clarke

Pipework

Between 1680 and 1820, there were only three basic types of pipes: Open Diapasons, Stopped Diapasons and reeds. Moderate scales, low cutups and low wind pressures gave bright organs, but they lacked the massiveness of power that the Germans had, and 19th century English wanted. English organ builders typically had two sets of scales:

- Small scales for Chamber organs
- Larger scales for Church organs

Green used a 1:2 octave ratio w/additive constant. Usually bass line 1” additive constant to 2’ or 1’. Usually treble line of 1/2” additive constant above 2’ or 1’. This seems to be the practice of Snetzler, Ohrmann & Nutt, Gray & Elliot. So was using the French curved scales. Renatus Harris, Bridge and Byfield appear to use 3:5, so used German logarithmic-like scales.

Open Diapasons

The principals were often all the same scale. 2-2/3 & 1-3/5 often got wide in the treble. Choir pipes were sometimes narrower than the Great. Typically 1/4 mouth, 1/4 cutup. Mixtures usually had 1-3/5 in it for much of it (meantone). Cornets were wide, Dulciana narrow.

- open cylindrical metal, moderate scale
- 1/4 mouths, 1/4 cutups,
- thin, steep languids

Stopped Diapasons

Stopped Diapasons *(often wood)* were essential and sometimes had drilled stoppers *(Rohrs)* and English Blocks. Open Flutes were rare, except in the pedal. Metal Flutes sometimes had wood basses.

- wood; 1/4 mouths, low cutups, english mouths
- metal; moderately wide scales, 2/9 mouths, 1/4 cutups
- sometimes with chimneys

Reeds:

Reeds had open shallots, tapered, sometimes with beveled ends. Cut to dead length.

- trumpets: moderate scales, beaked schallots
- Bassoon: Trumpet with narrow scaled conical resonator
- Cremona: cylindrical 1/2 length resonator
- Vox Humana: cylindrical 1/4 length resonator

Before 1820, the scale of the different ranks (i.e. open, octave, fifteenths) didn't vary much. A few builders *(e.g. Green)* made the 8' Open bigger, Upperwork narrower.

New Stops Introduced

Only Two new stops were introduced in the entire period. They were the Dulciana and the oboe.

Hautboy (Oboe)

- From France, 1730's
- treble stop
- the stop went into the Swell
- Normal bell & stem
- No top flap, no slots
- later, was paired with Bassoon bass

Dulciana

The Dulciana was imported by Snetzler in 1760's, but it came into common use with the regular use by Samuel Green 1780's.

Snetzler, 1777 Menerale,

Dulciana: 2/9 mouth, less than 1/4 cutup, box beard. Scale:

- 2-2/3' 40.7mm dia
- 2' 31.4mm
- 1' 17.4mm
- 1/2' 10.6mm

Green 1787,

Dulciana 8', 1/5 mouth, 2/7 >>1/4 cutups, no beard

- 2-2/3' 45.3mm dia
- 2' 35mm
- 1' 19.6
- 1/2' 11.9

Smith Lineage

- **Father Smith** d.1708 perhaps emigrated from NW Germany
- Christopher Schrider, d.1754 F. Smith's foreman and son-in-law.
- Christian & Gerard Smith nephews of F. Smith

Harris Lineage

- Thomas Dallam, 1575-1630
- Thomas Harris, d.1684 T. Dallam's son-in-law
- **Renatus Harris**,1652-1724 London
- Thomas Schwarbrook Employee of Renatus Harris
- John Harris, d.1743 Son of Renatus Harris
- John Byfield Partner and son-in-law of John Harris
- John Byfield Jr, d. 1774 Son of John Byfield
- Richard Bridge May have trained under John Harris
- George England Son-in-law of Richard Bridge
- George Pike England d.1815 Son of George England
- Joseph William Walker, 1802-70 Trained by George Pike England, briefly
- Samuel Green, 1740-1796 Partner of Byfield Jr., perhaps worked with Bridge or Snetzler.

Independents

- Glyn & Parker, Salford Manchester
- Jordons, Father & Son apparently self taught
- John Avary, d.1808 good builder, when he wasn't drunk...
- John Snetzler, b.1710 London, Swiss immigrant
- Byfield, Jordon & Bridge were partners, in 1733

Chapter of Worcester, 1666, Thomas Harris

Great

2 qty	Open Diapasons	metal
2	Principals	metal
2	Fifteenths	metal
	Twelfth	metal
	Recorder	metal
	prepared for	

Chaire

	Principal	metal, facade
	Stopped Diapason	wood
	Opn Diapason	wood
	Fifteenth	
	Two & Twenty	

Bristol, St Mary Redcliffe, Harris & Byfield, 1726

Great Organ, CC-d’’’, 63 notes

8'	Open Diapason	
8'	Open Diapason	
8'	Stopped Diapason	
4'	Principal	
2-2/3'	Twelfth	from GG
2'	Fifteenth	from GG
1-3/5'	Teirce	from G
V	Sesquialtera	
V	Cornet	from c1
8'	Trumpet	
4'	Clarion	

Chair Organ, GG-d’’’, 56 notes

8'	Stopped Diapason	
4'	Principal	
4'	Flute Almain	or perhaps 8’, treble only?
2'?	Flute	
III	Sesquialtera	
8'	Bassoon	

Swell, G-d’’’, 44 notes

8'	Open Diapason	
8'	Stopped Diapason	
4'	Principal	
4'	Flute	
III	Cornet	full compass
8'	Trumpet	
8'	Hautboy	
8'	Cremona	
8'	French Horn	

PEDAL

One Octave of Pulldowns

Doncaster Parish, 1740, John Harris

Great, GG-d, 52 notes

8'	Open Diapason	Facade, metal
8'	Open Diapason	inside
	Stopped Diapason	
	Principal	metal
	Twelfth	
	Fifteenth	
	Tierce	
	V Sesquailtera	
	Two Trumpets	
	Clarion	

Choir, 52 notes

	Stop't Diapason
	Flute
	Fifteenth
	Bassoon

Eccho (Swells)

Open Diapason	27 pipes
Stop't Diapason	27 pipes
Principal	27 pipes
Cornet III	3x27 pipes
Trumpet	
Hautboy	

John Snetzler

John Snetzler trained at the Passau firm of Egedacher. He liked the over-refined tone common in Hapsburg, central Europe. He tried to introduce many new stops, but the only one the English would accept was the Dulciana. The Dulciana first appeared in St Margaret's King's Lynn, 1754. Originally a Dulcan, inverted conical stop, it was modified by Green to a narrow principal.

Beverley Minster, 1769, John Snetzler

Great, GG to e'''

8'	Open Diapason	
8'	Open Diapason	
8'	Open Diapason	
8'	Stopt Diapason	
4 '	Principal	
2-2/3'	Twelfth	
2'	Fifteenth	
1-3/5'	Tierce	
III	Sesquialtera	
IV	Fourniture	
8'	Trumpet	
4 '	Clarion	
V	Cornet	from middle c1

Choir

8'	Open Diapason
8 '	Stop't Diapason
4'	Principal
4'	Flute
2'	Fifteenth
III	Sesquialtera
8'	Bassoon
8'	Vox Humana

Swell

8 '	Open Diapason
8'	Stop't Diapason
4'	Principal
III	Cornet
8'	Hautbois
8'	Trumpet

St Martin, Leicester, Snetzler, 1774

Great, GG-e''' (no GG#)

8'	Open Diapason	large
8 '	Open Diapason	small
8'	Stopped Diapason	
4'	Principal	
2-2/3	Twelfth	
2'	Fifteenth	
IV	Sesquialtera	
V	Cornet	from c'
8'	Trumpet	
4'	Clarion	

Choir GG to e'''

8'	Open Diapason	GG to BB stopped
8'	Stopped Diapason	
4'	Principal	
4'	Flute	
2'	Fifteenth	
8'	Bassoon	

Swell Organ, f0 to e''', 36 notes

8'	Open Diapason
8'	Stopped Diapason
4'	Principal
II	Cornet
8'	Hautboy
8'	Trumpet

The scales on the next page is of the Snetzler organ of 1762, that was imported to Congregational Church, South Dennis, Massachusetts. Charlie Fisk gave them to me when I worked in Gloucester, Ma. They were measured when the organ was restored about 1970's.

No. 34

South Dennis — Snetzler 1762

Stop	GGG	CC FFs	c fs	c' fs'	c'' fs''	c''' fs'''
Open Diap. 8' from GG		(GG) 85,8	81 60,3	45,1 34	26,1 20,6	15,9 14,2
Dulciana 8' from f			(f) 44,3	31 23	17,6 13,7	10,3 9,7
Principal 4'	95,2	c 77,1 f# 58,7	42,9 33,3	27 20,8	15,8 12	9,6 7,9
Twelfth 2 2/3	69,3	c 55,6 f# 43,9	31,8 25,4	19,9 15,8	12,7 10,3	8,6 6,3
Fifteenth 2'	57,2	c 44,6 f# 33,5	25,4 19,1	15,8 13,6	11,1 8	only to B''
Cornet II 2'rank from c' 1 3/5' rank from c'-d''				14,2 11,2 12 9,7	8,8 7,1 7,9 7,1	5,7 4,8
Flute 4' from ~~GGG~~ G	75	75/55# 53/37 45/32	43 33,7	25 18	14,5 12,7	10,3 8,6
Flute 4' Länge ab Kern		60 # 42,5	28,2 19,5	14,2 10	7 5	
ø Rohr			11 8,5	6,7 5	5 4	
Rohrlänge			80 72	52 37	23 23	
Stop. Diap. 8' from G	110/135	89/108 71/85	64/80	33/40	25/32	18/20
Material	13	11 10	HH = 59x72, WS ø 10			
Cut-up	25,7	21 14,5				
Chimney ø lg				7/80		4,5/52

Bellows 3'/6'
Conducter to chest 3''/6''8 i.D.
Pallet box B 13''/2''42
Range G, A to e''', 57 notes, Pedal G to Gs ,13 notes.

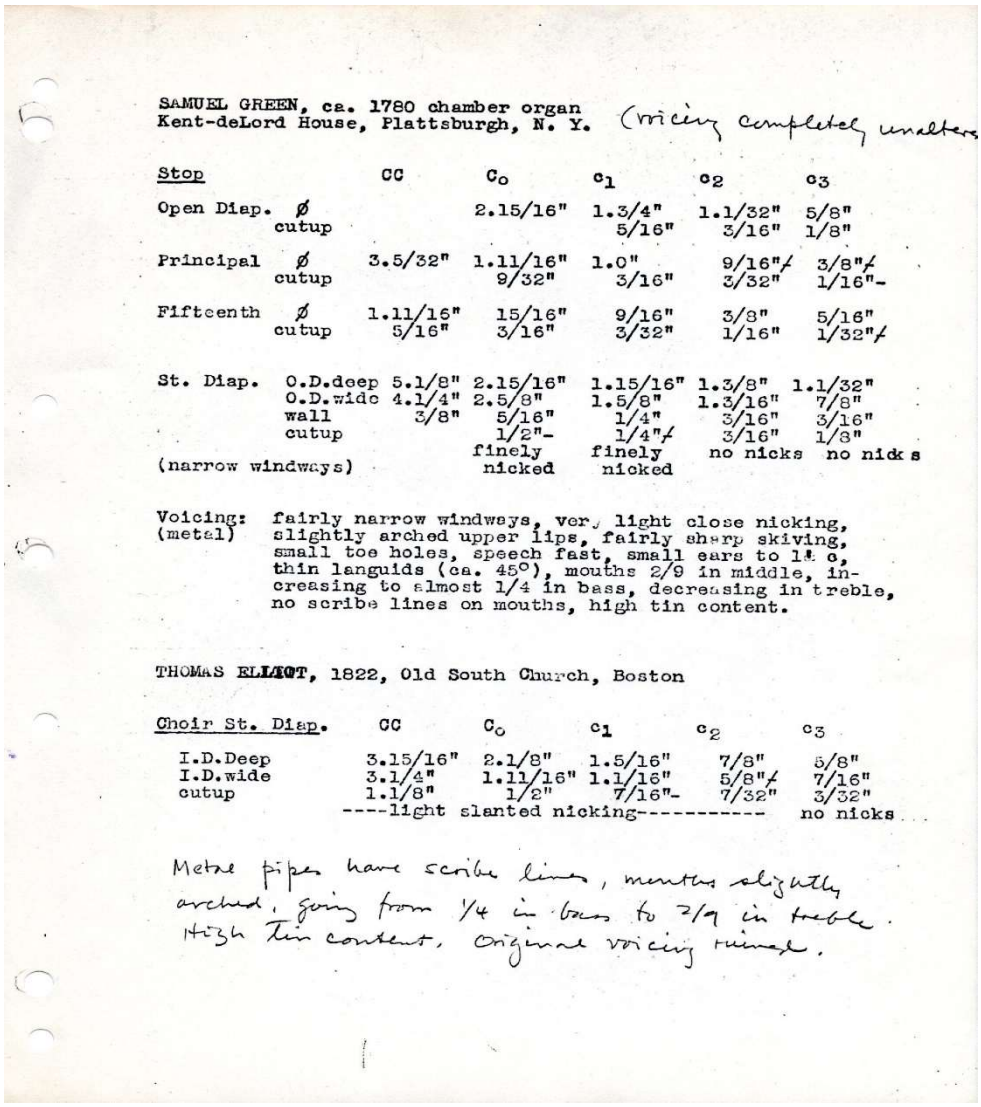
Samuel Green

Though of the Harris school, he departed from it entirely. Soft sweet voicing, but lacking in nobility, and he used excessively large bass scales in his Diapasons. He increased the stature of the Swell organ, by increasing it's compass and introducing venetian type swell shutters.

- Perhaps apprenticed Byfield, Bridge & Jordon, Snetzler?
- Used a very refined, delicate, sweet voicing.
- Partonized by King George III
- Reeds finer than contemporaries
- Created dulciana cornets.
- Cremona; cylindrical 1/2 length resonator
- Vox Humana: cylindrical 1/4 length resonator

Difference Notes

To provide a suitable bass, where the case was too small for full length Open, both Snetzler and Green used Difference notes. These were a quinty 8' Stopped Diapason to provide a fundamental and prominent third harmonic, plus a 4' helper pipe, relatively pure toned, to provide the second harmonic. *(Chart below also CB Fisk, I don't remember it's provenance.)*



SAMUEL GREEN, ca. 1780 chamber organ
Kent-deLord House, Plattsburgh, N. Y. (voicing completely unaltered)

Stop		CC	C_0	c_1	c_2	c_3
Open Diap.	ø		2.15/16"	1.3/4"	1.1/32"	5/8"
	cutup			5/16"	3/16"	1/8"
Principal	ø	3.5/32"	1.11/16"	1.0"	9/16"/	3/8"/
	cutup		9/32"	3/16"	3/32"	1/16"-
Fifteenth	ø	1.11/16"	15/16"	9/16"	3/8"	5/16"
	cutup	5/16"	3/16"	3/32"	1/16"	1/32"/
St. Diap.	O.D.deep	5.1/8"	2.15/16"	1.15/16"	1.3/8"	1.1/32"
	O.D.wide	4.1/4"	2.5/8"	1.5/8"	1.3/16"	7/8"
	wall	3/8"	5/16"	1/4"	3/16"	3/16"
	cutup		1/2"-	1/4"/	3/16"	1/8"
(narrow windways)			finely nicked	finely nicked	no nicks	no nicks

Voicing: (metal) fairly narrow windways, very light close nicking, slightly arched upper lips, fairly sharp skiving, small toe holes, speech fast, small ears to 1st c, thin languids (ca. 45°), mouths 2/9 in middle, increasing to almost 1/4 in bass, decreasing in treble, no scribe lines on mouths, high tin content.

THOMAS ELLIOT, 1822, Old South Church, Boston

Choir St. Diap.	CC	C_0	c_1	c_2	c_3
I.D.Deep	3.15/16"	2.1/8"	1.5/16"	7/8"	5/8"
I.D.wide	3.1/4"	1.11/16"	1.1/16"	5/8"/	7/16"
cutup	1.1/8"	1/2"	7/16"-	7/32"	3/32"
	----light slanted nicking----------				no nicks

Metal pipes have scribe lines, mouths slightly arched, going from 1/4 in bass to 2/9 in treble. High Tin content. Original voicing ruined.

The British Organ from 1850 - Stephen Bicknell

This chapter is a lecture from July/96 by my late friend Stephen Bicknell. He presented it at the ISO (International Society of Organbuilders) conference at Cambridge on July, 1996. I include it here (without permission) because he presents this subject perfectly. Visit his website for all his writings: https://www.stephenbicknell.org/ and buy his book, its really good.

By a quirk of fate that has amused us both, Nicholas Thistlethwaite and I are appearing at this congress disguised as each other. Dr. Thistlethwaite has spoken about the early English organ, an area of particular interest to me, and I am talking, amongst other things, about the Victorian Organ, a subject

on which the good Doctor is regarded as the great expert. I don't think either of us are at all disturbed by this apparent reversal of roles. Apart from the private pleasure of trying to be versatile and generally well-informed, I believe that both of us would wish to demonstrate that we are part of a community of many individuals within the British organ scene. This community places great emphasis on openness and co-operation, and aims to raise standards through the mutual benefits brought by exploration and learning.

For example, the fact that my book on the History of the English Organ is appearing this week is not an indication of a personal achievement or an individual view, but rather of an attempt to collect together the results of recent research by dozens of individuals and to present it in a way that should be acceptable or at least stimulating to all those who have taken part.

Forty years ago, this glasnost did not exist; English organ building was isolated and arguably backward, with much of its surviving qualities hidden by a kind of Spotted Metal Curtain. Thanks to the example and enthusiasm of a new generation of players, historians and organ builders that wall now lies dismantled and its rubble is being cleared away. When the ISO visited this country on previous occasions the experience will have been interesting, but I very much doubt if any visitors from abroad would have felt that they had learned anything that would be useful to them in the future.

The theme of this talk is based on my conviction that now is the time to take the British organ seriously. From Dr. Thistlethwaite you will have learned something of the complex and rather peculiar history of the English classical organ, and at the end of his lecture you will have been left in suspense at the start of the great organ-building revolution of the 1840s. What emerges after 1850 is one of the greatest organ schools of all time: practical, assured, artistic, refined, and astonishing for its combination of quality with high volume production. The sheer number of organs and organ builders from the period 1850-1900 is an immediate indication that we are not dealing with an insular or isolated school. From 1850 the British organ stands alongside its foreign relatives as a major force in the world at large, and I invite you to consider it alongside other schools, such as the French romantic organ, the North German organ of the late seventeenth century or the Iberian organ. For those who know North American organ building much of the territory will be vaguely familiar - after all we share a language and many common roots. For those who do not come from the English-speaking world I respectfully offer the suggestion that there is an important voyage of discovery to be made by those who wish to learn how the craft may evolve in the near future.

With such a great deal of material to cover, I have applied a system of compression to this lecture. The mere facts, the nuts and bolts of the case, have been listed on two sheets of paper identifying crucial names and dates. These lists are not remotely complete: I have given only sign posts and your individual interests will allow you to explore further using these notes or my book as a guide. Nor on this occasion have I used slides as illustrations, for the organs you see on this visit will be the ideal visual and listening guide.

A mere glance at the list of builders will immediately reveal to you that there are as many great names from the industrial era of British history as from the organ-building schools of half a dozen smaller nations, and I ask you to understand at once that the romantic organ in this country is not one school of thought, but many, and they are all different from each other. My next request is that you consider the question of quantity. In Germany the Sauer firm took fifty years to reach its opus 1000; In Britain such targets were passed quickly by even the provincial firms. Harrison and Harrison of Durham built 1000 organs in about thirty years; Norman & Beard of Norwich could build a thousand organs in only seventeen years. In France the workshop of Cavaille-Coll employed 52 men in 1860; In Britain this would have been a modest workshop - at one time Norman & Beard employed 300.

Finally, there is the question of quality. Could production at such a volume be combined with high standards? The answer is yes. Though the British organ is not associated with some of the neo-classical

virtues - the design and layout are often peculiar, the cases are usually poor or non-existent, the key-actions are not always responsive - there are other areas in which the quality and attention to detail exceeds that of any other school. I ask you to consider the standards achieved by the craftsmen in the organ factory: the soundboard makers, sticking loyally to the slider chest in all but a few cases; the action makers, developing some truly remarkable versions, for example, of tubular pneumatic action - versions which completely contradict the reputation for sloppiness and unreliability which these actions have in other parts of the world; the pipe makers, turning out wood and metal pipes to incredible precision - and sometimes to very unusual designs; and finally, the voicers, who raised the art of refined and stable tone to a pitch of perfection that we can only dream of emulating. All these qualities were maintained in this country through wars and depression, and only began to fade as a result of the very uneven application of neo-classical principles and the general shrinkage in organ building in the period after the Second World War.

What makes the story of the British organ still more interesting is the remarkable achievement in finding a completely new voice and forging a completely new tradition from the very insular and eccentric attempts made in the early nineteenth century. The revolutionary change to the German System of C compass manuals and complete Pedal Organ was accomplished in a matter of ten years or so, and by the time the Great Exhibition opened in the Crystal Palace in London's Hyde Park in 1851 the new school was already showing signs of maturity.

The Crystal Palace is itself a model for the speed and efficiency of Victorian Britain. This building, large enough to enclose fully-grown trees, large enough to have its own weather - it used to rain from time to time - was designed, built and opened to millions of visitors in six months, using one third of the entire glass production of Britain for that year. Beneath its humid and bird-infested arcades stood several organs. That by Gray & Davison was a three manual instrument that would have been recognised and admired by any European builder; that by Willis had seventy stops, Barker action, and pneumatic stop action with pistons. However, two of the foreign visitors had a great impact on account of their quality of materials and their gutsy tonal schemes - they were much louder than the English equivalents. Charles Spackman Barker was responsible for the Ducroquet exhibit, which cemented the idea in the English mind that the French builders knew all there was to know about quality *(it cost twice as much as an equivalent British organ of the same size)*. And then there was the Schulze... But of Schulze we must talk on another occasion.

Driven to undertake yet further reforms in standards of materials, design, layout and voicing, there emerged in the 1850s and 1860s several alternative voices, each very much part of the mainstream of European romantic style. Amongst them it is easy to identify German influence on Hill and even more on Lewis, and French influence on Gray & Davison. French influence has also been claimed for Willis; I disagree entirely, and believe that the appearance of certain French ideas in Willis organs is simply his expression of the need to make new organs conform to general continental standards; Henry Willis's artistic vision is quite individual and influenced by no-one. Then there were traditionalists, Bishop, Walker and Holdich who preserved more ideas and influences from the old school, but using the latest layouts, stop-lists and mechanisms.

Nevertheless, there are features that link all British organs from 1850 until the Second World War, and it will be useful to identify some of them.

First, and most important, the obsession with the sound of the 8' Principal or Diapason. For some reason that I cannot fully understand the Diapasons were always the outstanding tonal feature of the British organ, and I suspect that even in the eighteenth century an organ was judged by the tone of its diapasons first, and everything else second. In the nineteenth century the development of this 8' tone was carried to every possible limit, and an appreciation of this national mania is at the root of our story.

Once Schulze had shown the English a principal with a wide mouth and open foot there was no stopping them. Hill made the scales large and the mouths high, producing a bold but somewhat fluffy tone. Willis made the mouths narrow but blew the pipes very hard and sometimes slotted them; the result was bright and sometimes stringy. Walker made giant versions of the old English type, keeping the mouths wide and low, but increasing the scale sometimes to a monstrous 8 inches or 200 millimetres at 8' C. Only Lewis stood away from this frenzied activity, maintaining his allegiance to the German chorus where all ranks are essentially equal.

With the Diapason making such a commanding statement it is no surprise to find that the whole attitude to the flue chorus is different to that found elsewhere. We should remember that there is no Plein-jeu or Grand-jeu in the English tradition. In the eighteenth century it was understood that mixtures were not usually heard without Trumpets drawn as well. And, apart from the possibilities encountered in the more German-influenced organs of the nineteenth century, this remains true until the classical revival. The chorus is modified considerably in the organs of Willis, and this is typical of the extreme version of English thinking. The English have always stated that Willis's voicing is strong in the treble. This is true for the soft stops and for the reeds, but the balance of the entire instrument is totally dominated by the bass. Firstly, the colossal Diapasons and matching open wood 16' stops on the pedal make a louder noise than any other fluework in the organ. Secondly, though the reeds are controlled by heavy weights in the bass, the resulting tone is so smooth as to blend with the flue basses and drive them still further forward. Meanwhile, in the treble the common practice of making the upperwork small in scale and bright in tone is at its most remarkable in the instruments of Father Willis; thus the upper reaches of the keyboard are notable not for the melody as much as for sparkle and reedy intensity - especially with a tierce in the mixture.

This Willis ideal will be familiar to many, and it is often stated to be entirely typical of the British scene. This is not quite the case. Willis did not become famous as quickly as used to be thought, and was not regarded by his contemporaries in a favourable light until after 1870. Few aspects of his style were actually imitated until after his death in 1901. The other builders used voicing and balance more like their neighbours in France or Germany, and yet a slight tendency to bass-heaviness was common to them all.

Still more interesting to us today, perhaps, is the fact that all of them had enjoyed the successful results of an attempt to marry German and French elements. And this was a true marriage, not mere eclecticism. A really good Hill organ of the 1860s would have had a flue chorus that would have been admired by any German musician or builder, and yet it would have had a tutti dominated by batteries of high-pressure reeds, just like a French organ. With its enormous Swell organ and sophisticated console arrangements, it was arguably more expressive and more colourful than either. And yet its voice would have been quite identifiably British in every detail.

Our attention must now turn to the Swell - the most important part of any British organ! Well, I exaggerate, for it was only in the later romantic period from 1900 on that the Swell organ really came to dominate the whole instrument *(and sometimes to house the only mixture on even three manual organs)*, but it is still true to say that the Swell division is very nearly as important as the Great - it is usually, in fact, a second Great organ in a box. This is indeed exactly how it is used. Throughout the period of this lecture the Swell to Great Coupler is more often on than off. The Swell extends the possibilities of the Great organ and allows that extraordinary British phenomenon - the 'build-up' - a seamless crescendo from soft enclosed string tone at the start, to full organ at the end, an effect whose popularity still completely exceeds that of any other registrational effect. It also, at its most extreme, allows the Great organ to become so loud that parts of it can only be used for special effects - but that, you may judge for yourselves.

With these various methods at work, it is not surprising to find that conventional upperwork has a limited role to play. Hill, Lewis, Walker and some others always knew how to make good quint-and-unison mixtures and continued to do so up to 1900; in the Willis organ the mixtures have become narrow scaled Cornets, designed to bridge the gap in tone between the flues and the reeds, not to be heard in their own right. It is not surprising to find that once the development of ultra-smooth tone started around 1900 those few mixtures that survived were reduced until they were only producing colour, and that of a rather acid kind.

And finally, there is the reed tone, and again a variety of styles to consider. High pressures came very early - 12 inches (300 millimetres) in the Hill at Birmingham Town Hall in 1837. The Cavaille-Coll method of using high pressures for chorus reeds in general was widely adopted in the 1850s. By 1867 Willis had developed his own high-pressure system, devising a unique and brilliantly engineered family of Trumpet voices, on pressures from 7 inches *(178 millimetres)* in organs of 3 manuals and thirty stops or so up to an occasional 25 inches *(635 millimetres)* for the most frightening of his Tubas - and, incidentally, to colossal effect in the bass of Pedal reeds, where even the heaviest of brass weights on the tongue could not obscure the almost unmanageable power of the result.

Let us not forget the console and its accessories, for here of course the British excel. It is true to say that some of that excellence is owed to Willis, who seems to have been aware of the science of ergonomics long before the first ergonomist, and who introduced angled stop-jambs, thumb pistons, and the radiating and concave pedalboard. But the British were already used to engraved ivory stop-knobs grouped tidily by department according to a system common to many builders. They were already used to combination actions, to couplers operated by stop-knobs, to swell pedals, and to the highest cabinet-making standards in the fitting of veneers and the polishing of surfaces. They were also already used to silent, reliable, and easily maintained key actions, having adopted bushing and tapped wires with adjustable collars at the end of the eighteenth century.

This early maturity of the new style was achieved thanks to massive expansion in the craft of organ building. It is difficult to know where to turn. In the Cathedrals and Colleges, the English choral tradition was being revised and expanded. The High-Church movement stimulated revival, debate, and growth on all sides. The wealthy industrial classes ploughed their profits not back into industry - to the lasting disadvantage of the nation - but into good works such as the building of churches.

Music-making was an industry in Britain, already independent of Kings, Lords and patrons for the last century and a half. The public ate new organs for breakfast, lunch and tea - they were the great public entertainment of the nineteenth century, and their makers were household names. The growth was astonishing. Where Hill had struggled ineffectually with his giant organs of the 1830s, he and his many rivals built larger organs still by the hundred within a few decades. No estimate has been made of how many organs were built in this country between, say, 1850 and 1900. My guess is that the figure would approach 100,000. Most of them were good, a few were extraordinary. Towards the end of the life of the Hill firm, they turned again to the giant organ, building in 1890 the celebrated monster at Sydney Town Hall in Australia with its five manuals, its 64' reed, its magnificent case, and a responsive tubular pneumatic action which lasted for over eighty years before its first complete restoration. This is widely regarded as one of the world's finest organs.

With this background in mind, let us turn back to the chronological narrative. Much of it follows predictable lines. I need not outline the tendency towards smoother and ultimately more orchestral tone. I need not dispute with you the question of decadence towards the end of the 19th century - you will all have your own views on this and other subjects - and the general tendencies in 19th century art are familiar to all of us.

In the 1850s and 1860s Hill and Gray & Davison divided the spoils and prestige between them. These two firms and their allies were largely responsible for advocating the German System and for

sweeping away as many GG compass organs as money would allow. Willis wanted to join them, even perhaps to exceed them and become one of those great Victorian figures like the engineer Brunel. For the time being he had to suffer the reputation of being an impudent upstart. The fact that his first big public organ after the Great Exhibition *(the 1855 organ at St. George's Hall Liverpool)* was regarded as a failure did not help. This instrument had long-compass keyboards, unequal temperament, a very peculiar tonal scheme (all of these the responsibility of the consultant, S. S. Wesley) and some of its tonal experiments were unsuccessful. All these faults were rectified in a rebuild in 1867, but in the meantime Willis had to wait for the recognition that his technical genius deserved.

His chance came, for what was already clear was that his organs worked better than those of his rivals. When a new organ was wanted for the Royal Albert Hall in London in the 1860s, Willis suddenly sprang to the fore. Some slight evidence and a good deal of instinct and imagination leads me to believe that Cavaille-Coll was originally intended to build this organ. It is possible that a banking crisis and ensuing depression made it impossible to carry out this intention.

I guess that Willis was already admired for his efficient production, his low prices, and his mechanical perfection. Any tonal matters could be settled by asking him to use Cavaille-Coll's scheme as a starting point and as a bench mark for quality - hence the tin 32' front and the apparent French influence.

I emphasise that these are guesses only. The facts of the matter are that Willis was suddenly asked to build the largest organ in Great Britain without, as far as we know, his rivals being seriously considered. The organ was still criticized by some - the organist W. T. Best asked Willis to demonstrate the Diapasons. Willis's first chords were interrupted by Best roaring from his seat on the other side of the vast hall 'I said your Diapasons, Willis, not your damned Gambas!' Yet the success was his, and when, shortly *(and perhaps significantly)* after the death of William Hill in 1870, he offered a divided organ with tubular pneumatic action to the Dean and Chapter of St. Paul's Cathedral, fame was at last his.

Initially it was this technical achievement which made his name: a conventional Barker-lever action organ was split into two: those parts remote from the keyboards were played via a simple pneumatic relay under the floor. The remaining links and the entire coupling action were mechanical as usual. Similar organs were immediately commissioned for the Cathedrals at Salisbury and Durham, and these instruments and their immediate contemporaries were followed by an unbroken line of commercial success that lasted until Willis's death in 1901.

Though Willis was only one amongst many great names, and was still alone in his pursuit of an eccentric though eminently successful tonal ideal, he so dominated the field as to produce some resentment. Lewis's Schulze inspired Germanic style was in direct opposition - Lewis is reputed to have said: 'if I thought Willis was right, I would shut up shop tomorrow'. Later in life Willis was also resistant to change, and his tonal schemes were always followed predictable lines and were usually repetitive. At their worst they were simply unimaginative, but Willis's detailed control of every aspect of production and voicing meant that there never was a bad Willis organ. Younger men wanted to experiment more; they were not welcome in the established firms and they had to try and make their name as independents.

Hence, the appearance in the 1880s of some radical ideas. The most musically fascinating example is the one surviving organ by Michell & Thynne, now at Tewkesbury Abbey; this is one of the most remarkable, versatile, and dynamic romantic organs ever made, and an obvious source for any serious student of the 19th century. However, the most influential is undoubtedly Hope-Jones.

I do not share the opinion that Hope-Jones was in some way a 'bad' organ builder, however much his beliefs represented the extreme opposite of the classical revival that we enjoy today. He was an extremist, and his organs are as full of artistic instabilities as the man was unstable himself. These are the organs of a man perpetually on the edge of a nervous breakdown. He rose, became manic, stumbled and fell on several occasions, moved to America to avoid scandal, set Wurlitzer on the road to success, and killed himself.

He did, however, invent the modern electro-pneumatic action. In 1887 he could demonstrate an organ with integrated armature and valve in the chest magnets, in which the current consumption was kept down within the range of battery supply, and combined with a radical design of console and fully electro-mechanical switchgear and coupling.

The established builders were at this time completely convinced by their own latest plaything, the all-pneumatic action with pneumatic combinations and couplers - and it has to be said that the best British pneumatic actions are nearly as satisfactory to play as a good Barker action and have proved reliable and well worth restoring. As a body they rose up in outspoken and personal invective against Hope-Jones; that and his inability to stay abreast of any real commercial considerations ultimately destroyed him.

In practice the various subjects raised by Hope-Jones work were indeed appropriate to the age, and he was by no means alone in his technical and tonal experiments. More to the point, he was profoundly influential in both Britain and America, and for two generations every English speaking organ builder knew what the name Hope-Jones stood for, even if he claimed to find his extremes rather distasteful.

Queen Victoria died in 1901 and in the same year Henry Willis (or 'Father' Willis as he had been known publicly since 1898) also breathed his last. I do not know enough about English history to say what the effects of the end of the Victorian age really were, but in the Willis family there was a desperate crisis. The succession struggle between the two sons, Vincent Willis and Henry Willis 2 lasted for six years, and the after-effects of this sad period were to make it impossible for the firm to move anywhere except towards decline, and the last moments of glory are to be found at the beginning of the career of Henry Willis 3.

A word here about Henry 3 - an extraordinary man whom some of you will remember personally. I cannot emphasise enough how difficult were the circumstances in which he succeeded to the Willis tradition, early in life when his education in the craft was complete but his experience of the wider world of organ building hopelessly small.

By sheer force of personality he made a success of his early great projects at Liverpool and Westminster Cathedrals. But in the 1920s he made what must be one of the worst decisions in the history of organ building - he said goodbye to G. Donald Harrison, the great tonal genius of the twentieth century, and adopted a whole set of ideas from E. M. Skinner, none of which increased his popularity or success and some of which - like the French Horn and the Erzhaler, reinvented as the Willis Sylvestrina - left him firmly wedded with the worst excesses of the much criticized orchestral style.

The position of the Willis firm declined. At the time of Father Willis's death the obvious competitors were J. W. Walker, newly raised to special status thanks to their organ of 1897 at St. Margaret's Westminster, built for the famous recitalist E. H. Lemare in his last church appointment, and Norman & Beard of Norwich. By the time these two firms had built the first notable organs of the twentieth century it had already become clear that there was a third challenger in Harrison and Harrison of Durham. In 1904 they built, to the designs of George Dixon, a remarkable three manual organ in a new symphonic/orchestral style in the remote north-western town of Whitehaven. Despite its isolation this organ immediately became famous, and secured Harrison's the equally important contract for the complete rebuilding, rearrangement and revoicing of the Hill at Ely Cathedral, completed in 1908, also in collaboration with Dixon.

Arthur and Harry Harrison had suffered in their early careers from the less than perfect reputation enjoyed by their Father Thomas. They set about correcting matters with considerable determination. Harry Harrison perfected new tubular pneumatic and electro pneumatic actions of indestructible quality. Workmanship and materials in the rest of the work never fell below the excellent. Arthur Harrison committed his life to the tonal work of the company, and everything he touched added to his success.

The custom in Britain from a very early period seems to have been to voice the pipes in the factory. We have evidence from the nineteenth century that voicing jacks or machines were in widespread use, and indeed that voicing in the church *(as practised by Schulze and by his imitator Charles Brindley)* was very unusual. On site the British builder only needed to regulate the pipes for loudness and softness, hence the need for very careful attention to pre-determined detail in the factory stage of the voicing to make sure that every instrument carried the tonal stamp of the firm that made it. The use of a small organ as a voicing aid in the factory may even originate as early as Snetzler in the 1750s.

Whatever the actual history of this practice may be, Arthur Harrison attracted attention not just because of his charming personality and his polite deference to his clients *(an attitude which convinced every customer that they had contributed in some way to the Harrison image)*, but also because of his obsessive attention to detail in the final regulation or balancing in the church, a task which he raised to an art in its own right.

Harrisons were so successful as to eclipse all their rivals and to force other organ builders into imitation of their style. Meanwhile the Willis company was in the middle of upheaval, ultimately to merge with the ailing Lewis, and Norman & Beard ran out of money and had to move in with the by now ultra-conservative Hill firm in London. These marriages were not happy in every detail.

The truth is that the death of Queen Victoria was followed by the decline of the nation and Empire. By 1910 the first depression of the century was eating in to the organ-building trade, as was the fact that the market had been flooded with hundreds of good quality instruments that were even then quite new and shiny *(exactly the problem faced in Northern Europe today)*. All the factors that had made the Victorian age special for organ builders declined too - church attendance dwindled, congregations began to drop in numbers, music making changed, public entertainment moved on to new and more exciting toys like the cinema and ultimately the radio and television.

In this atmosphere of change and even of decline, Harrison and Harrison made their name by reason of quality. Despite the effects of the depression, they applied their rigorously high standards to all their new organs and also, as far as they could in the circumstances, to the many rebuilds of famous Cathedral organs carried out up to Arthur Harrison's death in 1936. By that time, they controlled every aspect of music-making in the major buildings of the Anglican church, and the Harrison sound was and still is indelibly associated with the further great flowering of the English choral tradition in the first half of the twentieth century.

The only distinctively different voice between them was that of John Compton. The fact that the Compton firm made cinema organs in large quantities and used extension in their most famous new organs - the Compton masterpiece at Downside Abbey has over eighty stops derived from thirty ranks - should not lead one to imagine that the Compton organ was in any way cheap or nasty. Compton was the only brilliant exponent of the unit organ - extension was used selectively and ingeniously to produce something that very closely resembled its 'straight' counterpart. The engineering, particularly in the field of electric actions and console accessories, was quite brilliant and well up to the standards achieved by the best American builders. The tonal schemes were remarkable. Compton used many techniques derived from Hope-Jones, and assumed the use of very high pressures - typically 4 or 5 inches (100-125 millimetres) for even normal fluework. He also made a speciality of organs sited in difficult chambers. However, he understood the need for real upperwork, which he again handled in an ingenious way.

Harrison and Harrison had already made widespread use of the flat 21st or septieme in their mixtures from 1904 onwards, and the acid tone generated by this rank is characteristic of their larger organs. Compton went much further, exploring ninths, elevenths and even more remote harmonics and using them with practical result in the 1930s. He also introduced the British public to a whole range of mixture stops they had never heard before - Plein Jeu, Cymbale, Acuta and so on.

But these were not classical organs. With such a strong late romantic school in full flight, it is not surprising that the classical revival on the continent was at first reported as a peculiar foreign disease. The American classic movement was perhaps better known, but every time it was mentioned in the musical press Henry Willis 3 would reply in writing, using a tone that made it clear a) that G. Donald Harrison was merely his protege and b) that his approach was interesting to study but quite unsuited to the British situation. A classical organ arrived in this country in 1936. Designed by Johann Nepomuk David for the home of Susi Jeans, made with mechanical action by Hill Norman and Beard and with pipework made and voiced by the German firm of Eule, it was and still is virtually unnoticed.

After the Second World War the economy was crippled; as we now know, the devastation to the industrial and economic base in this country was far-reaching, even if the actual destruction did not equal that endured in Germany or Japan. When, in 1950, J. W. Walker built a new three manual organ in Oxford, it was the first substantial all-new organ to be built since the war.

However, thanks to the vision of one man, Ralph Downes, classical revival was to be attempted on the grand scale. By 1954 two radical examples of new thinking could be heard: the Walker built for Downes at the Brompton Oratory in London and the larger Harrison and Harrison at the Royal Festival Hall.

The path taken by the classical revival in Britain is a fairly straightforward one, its own local colour derived from the fact that it arrived late, in the face of considerable conservative opposition, and that it coincided with a long period of economic difficulties in which every British industry suffered from extreme problems of production and quality.

This is all very recent history, and I am going to pass very briefly over the final arrival of the first significant all mechanical organ in this country, the Frobenius at Queens College Oxford installed in 1965, over its various imitators, both successful and, unfortunately, unsuccessful, and the various moves made by companies both old and new to adapt to the change in taste and techniques. The people who engineered these changes surround you today and they can tell you in their own words how they have achieved their results.

I should however mention the emergence of the Mander firm after the second world war. I do so partly on account of the loyalty I owe to the company that used to employ me, but also because this is a company not quite like others and in a way it illustrates well what makes the British organ building scene unusual today and of interest to the world at large. In the work of Noel Mander and more recently John Mander one can see a combination of wide and cosmopolitan interests with genuine respect for the nation's past, and an atmosphere in which all influences, both classical and romantic, are regarded as legitimate areas of study and interest. For a company like Mander, or, for that matter, Harrison and Harrison under Mark Venning, new mechanical actions are considered normal and built to a high standard, yet exist happily alongside the restoration of other mechanisms, including the most devious of the tubular pneumatic systems, and the use of high-quality electro pneumatic actions and slider chests in certain large projects.

With questions of classical revival now largely settled, these companies are now turning back to the traditional British obsession with quality, though the scope of their brief is now wider than before. You will see in this country the old love of quality finish at the bench - you will never see invisible components so beautifully polished.

You will see that the art of console making is still carried out to the highest standards, and to those of you who are struggling to find a way of making really good consoles for eclectic organs I seriously suggest that you study what is going on here - examples by Mander, Harrisons and Walker are all of above average standard, some of them are the last word in luxury, beauty, comfort and ease of control.

Thanks to the work of David Graebe for Walkers, the art of case design has been revived in all its pre-modern-movement glory and, in a country where modern design was never universally admired, it is almost certain that the organ case with no mouldings and no carving is dead or at least terminally ill. Finally, there is a spirited revival in the great English art of voicing.

Seventy years ago, your forebears in organ building might have attended the conference in Freiburg at which the principles of the emerging classical revival were first publicly stated. Today things are not so clear. Some are building modern classical organs, some are building in historic styles. Some, through the pressures of the world market, are building their first big eclectic organs and are finding the change hard to make. Some are pursuing a revival of the Cavaille-Coll tradition or of other romantic styles. There seems to be no thread here to grasp, nor any clear path to future success. I feel I can offer some guidance. Standing back for a moment from the varied activity that makes up organ building today I feel quite certain that we are entering a period of artistic revival, in which the individual statement and the creative brilliance of particular tonal architects will again be discussed.

The reasons are very complex, and I do not wish to pre-empt your discussion by revealing them all at once. However, I ask you to consider the fact that, in a world dominated by factory production and high-tech solutions, where the electronic organ substitute has made such headway, the building of real pipe organs is now one of the last and most splendid areas of traditional hand craft to survive in the west. With high art on sale only at the most outrageously inflated prices, it is becoming one of the most remarkable and cost-effective ways that the public can indulge its taste for and its love of the individually designed and hand-made creation - and on what a glorious scale.

The only route to survival in the twentieth century is to accentuate the palpable difference between the luxury of organ building and the thousands of cheap throw-away items that litter the planet. The organs of the future must of course be a mass of carving and decoration, just as they were in the eighteenth century and before. Their musical beauties must again astonish the listener and cause both awe and delight - this must surely bring the arts of tonal invention and voicing back into fashion. Each builder must establish their artistic position - and they may be building in a tradition derived from any past century or area or even in a style which is entirely their own invention. And yet the result must carry a creative conviction far beyond that of other modern products, whether they are cars, computers, or electronic organs. For this task an artistic revival is essential.

Faced with a potential decline in the organ building industry - a subject which those of you in Northern Europe will understand all too well - the importance of the English experience is vital. Our depression came early; for the whole of this century, we have experienced decline in our beloved craft and have adapted as best we can. The results are complex, even confusing, and the thread of the story may only have begun to emerge with the latest and best works of Harrisons, Walker and Mander, and in the work of their various smaller colleagues.

But what is clear, and here lies the message that is the substance of my discourse, is that the only route to survival in organ building is by unswerving dedication to quality. In the worst of times, those whose standards remain high are in a position to survive. Those who make economies in matters of substance are less well favoured. Our experience is the proof. The lesson of the British organ is a mixed one, yet within it lie many secrets. I hope you will give the subject the serious attention it has deserved for so long.

The great London firms of the mid 19th century

William Hill

- the great proponent of the 'German System' from c1840 on *(in collaboration with H. J. Gauntlett)*
- descended from the Snetzler line

- c1856 Hill & Son
- 1860s new version of German style, bolder and more heavily constructed
- 1870 William Hill dies, Thomas Hill and later Arthur G. Hill *(famous case designer and draughtsman)* follow conservatively in William Hill's footsteps
- 1916 amalgamated with Norman & Beard *(see below)*

Gray & Davison

- Frederick Davison, Hill's former partner and later rival
- from 1838 in partnership with the remains of the Gray family
- French influence through the enthusiasm of Henry Smart
- Gradually fades out of the picture after 1860 (closed 1965)

Henry Willis

- Henry Willis, the great individualist and mechanical pioneer of the 19th century
- from 1878 in partnership with Vincent Willis and Henry Willis 2
- 1895 Vincent Willis leaves
- 1901 'Father' Willis dies
- c1911 Henry 2 succeeded by Henry 3
- 1919 merges with Lewis (see below)
- 1924 visit from Skinner, leading to the arrival of G. Donald Harrison in America and the use of Skinner innovations in England
- In business under Henry 4 at Petersfield, Hampshire
- Now run by David Wyld

Lewis

- Thomas C. Lewis, disciple of Schulze
- moved to start building organs by the arrival of the Schulze at Doncaster in 1862
- supported by the Courage brewing family
- 1901 Lewis & Company (Lewis himself forced to retire)
- 1919 merges with Willis

Walker

- Joseph William Walker working from the 1830s on, descended from the longest unbroken tradition in British organ building (Dallam-Harris-Bridge-England)
- Organs solid and conservative
- late 19th century (under J. J. Walker) emerges as a quality alternative to the conservative organs of Hill
- 1950s pioneers of tonal revival <MI>(with Ralph Downes)
- 1978 reformed at Brandon, Suffolk under Robert Pennells (now under Andrew Pennells) as the first large firm to build mechanical action organs as a matter of principle
- 1980s Successful export policy

Other notable London firms in the mid 19th century include Bishop, Bevington, Bryceson, Robson and many others. The list of ALL builders at work in London in the nineteenth century would be very long.

Some provincial firms of the mid 19th century

Forster & Andrews (north east England)

- from the 1840s the first provincial firm to challenge the London builders for quantity of output
- Influenced by Topfer, and slightly by Schulze
- Became conservative and Hill-like at end of 19th century
- Survived until 1950s

Brindley (north east England)

- Charles Brindley, disciple of Schulze
- organs more German than those of any other English builder
- Later Brindley & Foster
- from 1880s again German influenced
- specialising in efficient production and low prices
- Survived until 1960s

Kirtland & Jardine (north west England)

- the pioneers of the German System
- in cosmopolitan Manchester
- Influential on USA through Jardines of New York
- survived (mirabile dictu) until 1970s

Nicholson (central and mid-western England)

- a large family of organ builders emerging in the 1840s and operating in Rochdale, Walsall and Worcester
- maintained standards through 20th century wars and depression
- Still Survives!

Wilkinson (North west England)

- Small local firm
- still able to build a four-manual organ with Barker action and a 32' front
- survived until modern times Telford (Ireland)
- Dublin's answer to William Hill
- survived until modern times

Influential 'Progressive' builders, late 19th century

Casson (North Wales, later London)

- Eccentric visionary and ex-banker
- Extension on pneumatic action in 1880s!
- organs not reliable!

Michell & Thynne (London)

- Michell eccentric visionary and ex-brewer
- Thynne ex-Lewis voicer
- Brilliant proto-symphonic organ 1885 (sic, only one)!
- went bankrupt!

Hope-Jones (Liverpool, later London)

- Eccentric visionary and ex-telephone engineer
- All-electric action and switchgear in 1887!
- Unique tonal style!
- Completely mad! (Organs not reliable, went bankrupt, caused scandal, emigrated, invented cinema organ with Wurlitzer, turned USA on its head, committed suicide)

The main Builders working in the 'Imperial' style

Harrison & Harrison (Durham)

- No connection with G. Donald Harrison!
- A nineteenth century foundation emerging to prominence round 1900 in the second generation
- Arthur (tonal) & Harry (mechanical) Harrison develop new high-quality symphonic/orchestral style in collaboration with George Dixon from 1904 on
- Astonishing quality of workmanship maintained through the depression
- 1950s pioneers of tonal revival under Cuthbert Harrison (with Ralph Downes)
- Survives

Norman & Beard (Norwich & London)

- A high-quality provincial company growing to huge commercial success under the Norman family in the 1880s
- flirtations with Hope-Jones and the progressive school leads to individual symphonic/orchestral style under Herbert Norman from 1904
- Norwich factory employs 300
- 1916 amalgamated with Hill & Son in London
- Norwich factory closes
- Hill, Norman & Beard survive depression on vast maintenance business and eclectic work
- 1950s pioneers of tonal revival under Herbert Norman (jnr) and later under John Norman
- Hill, Norman & Beard survives, now moved to works of former small provincial builder Cedric Arnold in Thaxted, Essex.

2nd rank high-quality builders in the 'Imperial' style

- Taylor (Leicester)
- Binns (Leeds, influence of Schulze claimed)
- Hunter (London)
- Hele(Plymouth) - All now closed

Early twentieth century modernism:

Compton (London)

- John Compton started in Nottingham 1906 as the true successor to Hope-Jones
- later moved to London
- from 1920s with increasing influence from his friend and colleague Jimmy Taylor, unique tonal and technical style
- brilliant engineering, especially in electric actions
- committment to very high quality with every possible technical advance
- specialised in cinema organs (the only European rival to Wurlitzer)
- built many large instruments in which extension was used to artistic effect
- pioneered the very small, very cheap extension organ of which thousands were made by many firms (some are still being made today)
- pioneering electronic organs
- Closed 1960s after death of Compton and Taylor

New traditionalism and early revival:

Mander (London)

- small independent started 1936
- 1950s & 60s the only company to grow
- pioneering concern for old organs and techniques of restoration
- pioneering tonal revival in 1960s and artistic revival in 1980s and 90s
- first new firm to be appointed to several English cathedrals since Harrisons, arguably at the expense of the Willis company
- new wave of high-profile successes under John Mander
- closed

The classical revival:

Collins

- Peter Collins, working North of London from the late 1960s, and influenced by Rieger.
- Recently moved to Melton Mowbray and style becoming more eclectic
- first new company devoted entirely to the building of new organs, all of which have mechanical action.

Grant Degens and Bradbeer (London, later Northampton)

- formed from ex Compton staff c1962
- under Maurice Forsyth-Grant suddenly moved to excellent English version of German neo-classical modernism (new materials, schwimmers, aluminium actions and pallets, extreme 'classical' revival, 'aliquot' mutations, plexiglass swell shutters, daring modern casework by Frank Bradbeer.)
- closed.

Tickell (Northampton)

Ken Tickell, ex Grant, Degens & Bradbeer, pursuing a more civilised version of the classical revival

- The fastest growth of the last decade

Jones (Dublin, Ireland)

- Kenneth Jones, ex engineer, with a personal and successful version of neo-classical style

New traditionalism

Goetze & Gwynn (started Northampton, now near Nottingham)

- Martin Goetze & Dominic Gwynn, from 1982,
- working in English historic styles

Drake

William Drake, trained in Germany, at at first pure classical revival - now reviving personal but academically correct version of pre-1850 English tradition

Some important dates

1851 - Great Exhibition (Crystal Palace) London - organs by Gray & Davison (3m), Hill (2m), Ducroquet (Paris, 2m), Schulze (Paulinzelle, 2m) and others, large 4m Barker organ by Willis with pneumatic stop action and pistons

1853 - Royal Panopticon - 4m Hill with Barker action, equal temperament, continental tonal scheme, varied pressures, chamades

1855 - St. George's Hall Liverpool - 4m Willis with GG compass, unequal temperament, archaic tonal scheme (S. S. Wesley)

1855 - 'The Organ' by Hopkins & Rimbault - first edition

1859 - Leeds Town Hall - 4m Gray & Davison designed by Smart with Barker action, crescendo, varied pressures, reeds and flues en chamade and enclosed (!) - their greatest triumph

1862 - International Exhibition London - organs by Willis (4m), Gray & Davison (3m), Walker (4m) and others

1862 - St. George Doncaster - 5m Schulze, Barker action, chromatic soundboards, 32' manual chorus, voiced on site, diagonal bellows

1870 - death of William Hill

1871 - Royal Albert Hall, London - 4m Willis, 111 stops, 32' tin front

1872 - St. Paul's Cathedral, London - 4m Willis, divided, pneumatic link under floor. Began his fame.

1875 - Alexandra Palace, London - 4m Willis - his secular masterpiece, replacing an organ of 1873 destroyed by fire

1877 - Salisbury Cathedral - 4m Willis - his sacred masterpiece

1877 - St. Andrew's Hall Glasgow - 4m Lewis with three swell boxes (influenced by Cavaille-Coll at Sheffield) - admired by Hans von Bulow

1885 - Inventions Exhibition, London - organs by Willis (4m), Michell & Thynne (4m, their masterpiece and only large organ, now at Tewkesbury) and others. Tubular pneumatic action, electro pneumatic action, and extension all on show somewhere

1885 - Canterbury Cathedral - 4m Willis with electro pneumatic action (but mechanical coupling)

1887 - St. John's Birkenhead - 3m rebuilt by Hope Jones with electro-pneumatic key, stop and combination action, and couplers. Licences issued to various builders.

1889 - final version of Willis all-pneumatic action, patented by Vincent Willis

1890 - Sydney Town Hall (Australia) - 5m Hill with Arthur Hill case and full-length 64' reed, key action tubular pneumatic, couplers mechanical with Barker assistance.

1894 - Hope-Jones starts building new organs

1896 - Worcester Cathedral - 4m Hope-Jones with electro-pneumatic action and switchgear

1897

- Southwark Cathedral, London
- 4m Lewis, electro pneumatic action, the masterpiece of his Germanic style and the inspiration for the work of G. Donald Harrison.

1897

- St. Margaret's Westminster, London
- large 3m Walker built for E. H. Lemare, establishes Walker's new reputation in the front rank of builders.

1901 - Death of Henry ('Father') Willis - family plunged into crisis

1901 - Thomas Lewis retires, company struggles on.

1903 - York Minster - 4m Walker rebuild (Walker's first prestige Cathedral organ)

1904 - St. Nicholas, Whitehaven: 3m Harrison & Harrison (to scheme by George Dixon), establishes Harrisons in the front rank.

1905 - Liverpool Cathedral - negotiations for 5m organ start with Henry Willis 2

1908 - Ely Cathedral - 4m Harrison & Harrison rebuild, establishes Harrisons as the country's most fashionable builders, in preference to Willis.

1908 - Willis forced out of 'Rotunda' works in Camden Town, London

1911 - St. Mary Redcliffe, Bristol - 4m Harrison & Harrison, the most admired Harrison organ (there was more than one masterpiece!)

1912

- Liverpool Cathedral - 5m Willis - construction begins under Henry Willis 2
- Henry Willis 2 gradually replaced by Henry Willis 3

1914-18 - First World War

1916 - Johannesburg Town Hall - 5m Norman & Beard - the last and greatest organ built at Norwich

1919 - Willis merges with Lewis

1922 - Westminster Cathedral - 4m Willis/Lewis started

1923 - Pavilion Theatre Shepherd's Bush, London - large Compton, part extended - establishes Compton in the front rank

1926 - Liverpool Cathedral - 5m Willis 148 stops opened (23 further stops never installed)

1931 - Downside Abbey - large Compton derived from 30 ranks - his masterpiece

1932 - Westminster Cathedral - 4m Willis completed

1934

- King's College Cambridge - 4m Harrison & Harrison rebuild
- the archetypal English accompanimental organ

1936 - Death of Arthur Harrison and end of the Harrison 'era'

1937 - Downside Abbey - large Compton derived from 30 ranks, his masterpiece

1939-45 - Second World War

1952 – 'The Organ' by W. L. Sumner - first edition

1953 - Bromton Oratory, London - 3m Walker with Ralph Downes (the finest Downes organ)

1954

- Royal Festival Hall - 4m Harrison & Harrison with Ralph Downes
- Britain's first large neo-classical organ (electro pneumatic action, no case)

1959 - Adlington Hall - Mander restoration of 17th century organ

1962

- Coventry Cathedral - 4m Harrison & Harrison, electro-pneumatic action, no case
- Cuthbert Harrison's masterpiece

1963 - The British Organ by Clutton & Niland - first edition

1965 - Queen's College Oxford - 2m Frobenius - Britain's most notable 'strict' neo-classical organ

1967 - Liverpool Metropolitan Cathedral, 4m Walker, electro-pneumatic action, no case

1967 - St. Albans - first International Organ Festival

1969

- New College Oxford
- 3m Grant, Degens & Bradbeer, mechanical action, encased
- the first important 'strict' neoclassical organ by a British builder

1972-7 - St. Paul's Cathedral, London, 5m Mander rebuild, establishes Mander in the front rank

1976 - foundation of the British Institute of Organ Studies at Cambridge

1978 - Walker moves out of London under Robert Pennells

1985

- Our Lady of the Angels, Worcester MA
- 3m Walker, mechanical action, divided in three cases, trapezoidal soundboards

1986

- Lancing College - 4m Walker with some old Walker pipework, mixed action
- magnificent case by David Graebe

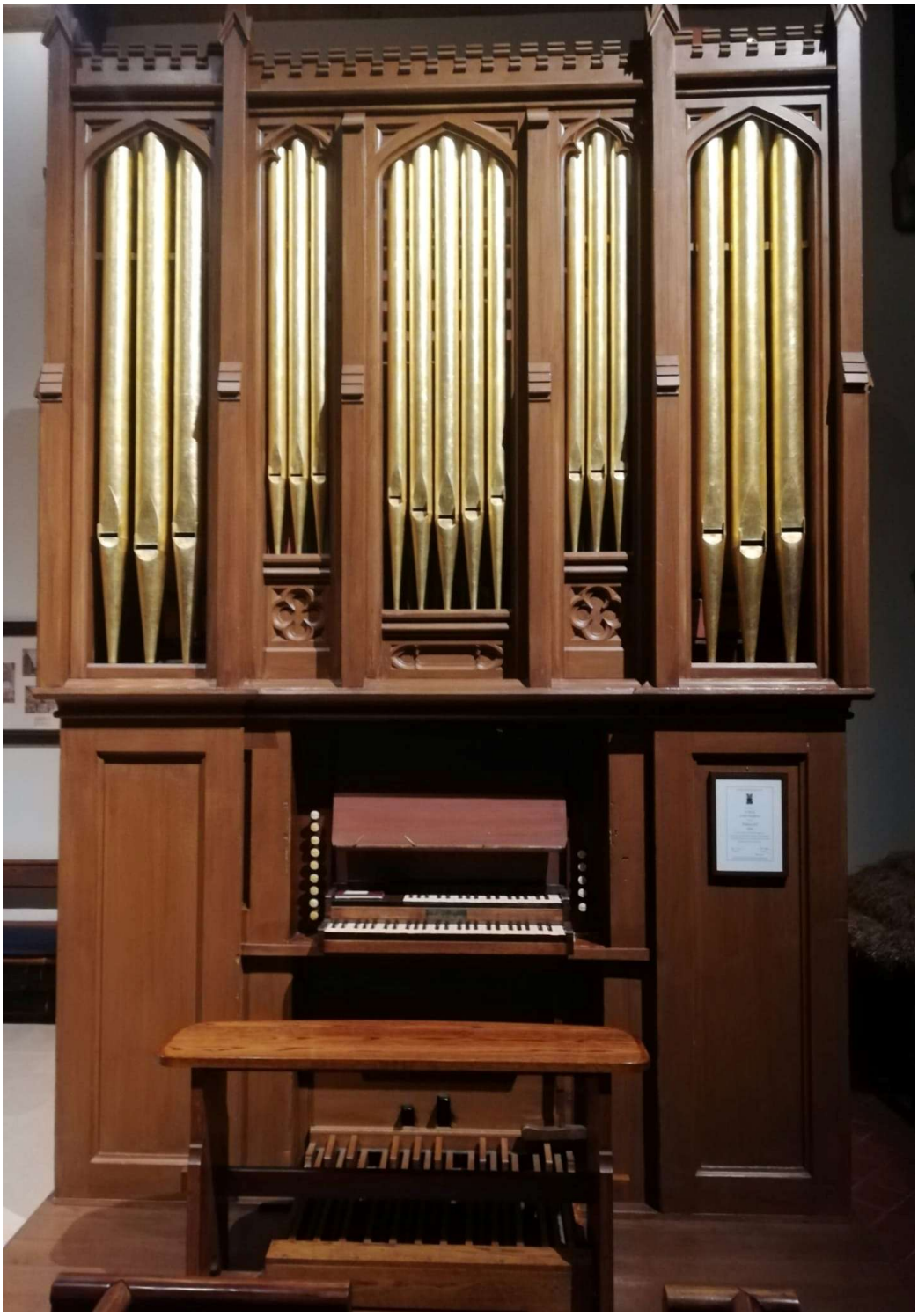
1989

- St. Andrew, Holborn, London
- 2m Mander in strict 19th century style with Michael Gillingham

1991

- Grosvenor Chapel, Mayfair, London
- 2m Drake in 18th century English style
- the first neo-classical organ in Britain to be liked by most listeners!

1992 - St. Ignatius Loyola, New York City - 4m Mander with French symphonic leanings, case by Didier Grassin and Stephen Bicknell - the largest mechanical action organ ever built in Britain (Shown below)



Little Houghton - 1847 William Hill

19th Century Organbuilders

Description

The mellowness & delicacy of voicing of flutes and smooth regulation of reeds suggest a degree of refinement appropriate to small organs, but out of taste by the 1830's which wanted massiveness and variety of effect. There was a move to larger churches, fostering a need for louder organs.

- Bishop introduced Claribella, inverted folds, concussion bellows, pedal bellows.
- Long Compass Great *(at first w/ short octave)*.
- Swell Box, short compass, tenor e or f,
- Narrow scales Dulciana
- Mixtures, reeds, Cornets *(stoplist like century earlier)*
- Bigger organs simply duplicated ranks *(they knew no other ranks)* often 8' Open Diapason.
- Cornet *(and Cornet Voluntaries)* fell out of favor by 1810
- Swell became expressive collection of solo voices and imitative voices.
- Mild orchestral voices being added. There were good for melodic lines of vocal transcription and orchestral textures of the contemporary composers. Additional 8' registers.

After 1800, it was usual in 3m organs to provide a second 8' Open, often scaled and voiced identical. The extra Unison may be to provide more unison tone for large groups of singers.

Winding

By 1800's, organs had horizontal, double rise *(no inverted ribs)* bellows, plus feeders. Diagonal bellows were abandoned. This provided more wind, stabler, encouraging larger chests, bigger scales, pedal pipes, more powerful reeds. Inverted ribs added stability.

The Leading Builders of 1820/40 were:

- J C Bishop
- John Gray
- H C Lincoln
- Elliot & Hill
- William Allen
- Timothy Russell

Pedals

Pedals were rare before 1790's. Pedals were considered an aid to the left hand. After 1790's you had 1 to 1-1/2 octaves of pedal pulldowns in the form of "Toe pedals". Pipes were often just an 8' wooden Diapason. Couplers were still rare in 1820's.

The Anglican Service in the 1830's

Cathedral:

- to accompany the choir
- little call for congregational accompanying
- solo use of organ curtailed

Parochial

- accompany psalms, canticles
- play voluntaries: middle and concluding
- starting towards use of hymns

Main Periods of the 19th Century

- The Insular Movement
- Bristol Reformation
- German system
- Hill
- Schulze *(Lewis)*
- Willis
- Harrison

New Stops before 1850

These new stops were home grown, perhaps with European inspiration. They were open wood pipes, Tuba and some strings.

Open Wood Stops

There was a long tradition of open wood stops, especially for delicate chamber organs: Smith, Snetzler. In the early 19th century, it was discovered that wood pipes could also be used as louder, attractive, colourful, "fancy" solo stops. The Clarabella 8', invented by Bishop in 1819, was built as an early English stopped diapason without a stopper.

Renn made his open flute 4' the same scale as his 8' stopped diapason *(removed the stoppers!)*.

Two sample Renn Stops, 1838, Hyde organ Stop't Diap 8': 1/4 mouth, cutup over 2/7
Bishop, 1845, Willows, 1/4 mouth, cutup 2/7 > 1/4

	2'	1'	1/2'
Width x depth	41x51	28x36	
Theoretical dia	51.6	35.8	23.4

Renn made his open flute 4' the same scale as his 8' stopped diapason *(i.e. he just removed the stoppers!)*.

Two sample Renn Stops, 1838, Hyde organ

Stop't Diap 8': 1/4 mouth, cutup over 2/7

	2'	1'	1/2'
Width x depth	29x34	18x21.5	14x16.5
Theoretical dia	35.4	22.2	17.1

Flute 4' (open), 1/4 mouth, cutup 2/7

	2'	1'	1/2'
Width x depth	28x34	17x21.5	13.5x17
Theoretical dia	34.8	21.6	17.1

William Hill and Inverted Woodpipe Mouths

About 1838 William Hill introduced three open wood stops with inverted mouths. The inverted mouths make the pipes slower, favouring the second harmonic *(octave of the fundamental)* giving a purer sound, which was good for solo use, bad for blend. They had the usual metal tuning flaps.

Big: Waldflute 4’

Hill called this Claribel if it was an 8’ stop. *(Hill’s Clarabella stop was quite different)*. It had pipe bodies and oak blocks and cap. The block was slightly sunk and there was a sharp edge on the upper lip. 1/2 plugged toes. This sample: 1/4 mouth, cutup 2/7, Hill, 1840, St Peter-on-the-Hill

		2’	1’	1/2’	1/4’
Width x depth		35x44.5	23.3x28.7	16x19	10.5x14
Theoretical dia	4	4.5	29.2	19.7	13.7

Medium: Saube Flute

This had a mahogany front, block considerably sunk and foot well plugged. 1/4 mouth narrower in treble, cutup 2/7, 840, example from St Peter-on-the-Hill

	2’	1’	1/2’	1/4’
Width x depth	29.6x37.5	18.5x28	11x19	.2 7x14
Theoretical dia	37.5	25.7	16.4	11.2

Narrow: Oboe Flute

This stop soon disappeared. It had a mahogany front, and was build as a narrow Saube flute with low cutups. It was also used as a 2’ Flageolet & 2’ Piccolo. 1/4 mouth, cutup 1/5 or less, Sample from 1840, St Peter-on-the-Hill

	2’	1’	1/2’	1/4’
Width x depth	28x36	17.5x23.5	12x17	6.5x11
Theoretical dia	35.8	22.9	16.1	9.3

Narrow and Tapered Stops

Salicional: In 1843, Hill started making a small scaled Dulciana which he called a Salicional. It had a 1/5 mouth, cutup 1/5-2/9. In 1853 it was first paired up with a Voix Celestes. The Lewis Salicional in the 1870’s was a very small diapason (N.S. -9), about three pipes bigger than his dulciana. 1/5 mouth, 1/3 cutup. Cavaille-Coll’s Salicional was large (N.S. -4) with a 1/4 mouth and 2/9th cutup

Viol di Gamba & Gemshorn: Hill’s was a Bell Gamba, with a 1/3 taper to the resonator, 2/9 mouth and 1/3 cutup. He later simplified it to omit the bell, calling it a Cone Gamba if 8’, Gemshorn if at 4’. It had 1/2 taper, 1/6 mouth, 1/3 cutup

The Organ After 1850

The Great Exhibition of 1851 was very important because it introduced three new influences to English organ building: Ducroquet, Schulze and Willis.

Ducroquet

The French firm of Ducroquet introduced Cavaille-Coll's Harmonic flutes and also the Flute a Pavillon.

Harmonic Flutes

These harmonic open cylindrical (or wood) stops were eagerly adapted by English builders as a loud, colourful stop. There was a wide variety of scales and treatments. Narrow scales tried to imitate the orchestral flute, wider scales make a solo flute with a strength and purity unknown in other flutes.

Schultz Orchestral Harmonic Flute @ 1' was 28.6mm dia, 1/6 lab, 1/2 cutup

Flute a Pavillon

Was a Bell-diapason, which fell out of favour by the end of the 19th century.

Gray And Davison 1859, Leeds Town Hall. 2/7 lab, 1/3 cutup, halved on 18th note.

	4'	2'	1'
Diameter	78.2	48	29.2
Bell Diameter	127	76	44
Bell length	114	44	25

Schulze

Schulze's organ of the 1851 Great Exhibition was a tonal revelation, however the effect of his influence did not come until later:

- loud voicing, open toes
- Lieblich Gedackts, Geigen principals, German strings, wood pipes, conical pipes, Hohl flotes
- standardized Topfer scales, 2/7 mouths
- Lieblich Gedackts were not copied until 1860's
- 1859 Schulze supplied some pipes for the Temple organ
- 1862 Doncaster Parish Church
- 1864 St Mary, Tyne Dock

Diapasons

The English had been trying to make organs loud enough to support massed voices in large buildings, by adapting huge scales and duplicate ranks, but it didn't work. Schultze showed the way to do it, was not large scales, but with open toes, flues and wide mouths and high cutups. He held the German romantic view the the Great was loud, Swell softer, and Choir softest. You see it in the scales, were the diapason and flute scales are 2 or 3 pipes smaller in each division. Note that the scales given here are for big organs in big rooms.

Schulze used a standardized series of scales, each 2 notes apart, Based on Topfer's 'Mesur A', halving on the 17th.

Schultz	VIII	VII	VI	V	IV	III	II	I	0
Topfer NM	-1 ht	3	-5	-7	-9	-11	-13	-15	-17

Schultz Diapasons were moderately scaled, but had open toes, on moderate (3-1/2") windpressure, open flues, wide mouths, and high cutups, so were quite loud.

	Armley				Hindley		
		Schulz	Topfer	Mouth	Schulz	Topfer	Mouth
Gt	16'	VII	-3 ht	1/4			
	8'	VII	-3 ht	2/7	VII	-3 ht	2/7
	8'				V	-7 ht	2/7
	5-1/3'				VII	-3 ht	1/4
	4'	VII	-3 ht	2/7	VII	-3 ht	2/7
	2-2/3'	VII	-3 ht	2/7			
	2'	VII	-3 ht	2/7			
	Mix	VI	-5 ht	2/7	VI	-5 ht	
Sw	8'	V	-7 ht		VI	-5 ht	
	4'	V	-7 ht		V	-7 ht	
	Mix	V	-7 ht		V	-7 ht	
Ch	8'	IV	-9 ht				
	4'	IV	-9 ht				
	Mix	IV	-9 ht				

Geigen Principal 8'

This is a narrow scaled, stringy Diapason, which Schultz liked to use in the Swell. They used 2/7 or 1/4 mouths. Beards *(fenders)* are used below the mouth, to 2-2/3'. These are sometimes Slotted, and should then be called Horn Diapasons.

Example: 2' pipes of Armley Geigen Principal diameter 41.7 (V) -6.4 ht, mouth 38 (2/7), cutup 9.8 (1/4), Foot 10, Flue 1.2, windpressure 88mm, Ising 3.9, 83.4 dBs.

Gedacts

Schultz gedacts had narrow scales and 1/4 mouths. They were very different to English Stopped Diapasons, but much admired by the English. It had wood pipes to 4' or 2'. Ears on all pipes.

Example: 2' pipe of Armley Gt 8' Gedact: 34.8mm dia, 30mm (1/4) mouth, 14.5mm (1/2) straight cutup, 0.8 flue, 6.5 toe, 82.6 mm wp.

Schultz Gedacts	English Stopped Diapasons
Cap set level to block	Cap below block
Flue in Block	Flue in Cap
Sloping block	square top block
High cutups	Low cutups
Favours higher wind pressures	Favours low wind pressure
Favours strong tones	Favours delicate tones

		Tyne Dock		Armley		Hindley	
		NS	Schulz	NS	Schulz	NS	Schulz
Gt	16’	-9 ht	IV	-11 ht	III	-11 ht	III
	8’			-11 ht	III		
Sw	16’	-11 ht	III	-13 ht	II	-13 ht	II
	8’	-11 ht	III			-13 ht	II
Ch	16’	-15 ht	I	-15 ht	I	-15 ht	I
	8’	-15 ht	I	-15 ht	I	-15 ht	I
	4’	-15 ht	I	-15 ht	I		
Echo	16’			-17 ht	0		
	8’			-17 ht	0		
	4’			-17 ht	0		

Hohlflotes

Another Schultz Stop; a wide mouths open wooden flute. The were either rectangular with the mouth on the wide side, or triangular. They had an ordinary German mouth with a sloping block and soft metal tuning flap. Halved on the 17th note, it was stopped wood to 4’, from 1/2’ & up they are open metal.

Sample: Armley 4’ Hohlflote @ 1’, internal width 25.8, internal sides 35.5, equilivant diameter 23.3mm, mouth 25.8 (1/3), cutup arched 9-11.5 (+2/5), flue 1, toe 9, wp 88, -8 ht, (@ 9 cutup: Ising 2, 87 dB) (@ 11.5 cutup: Ising 1.5, 88.6 dB).

	Armley			Hindley		
	2’	1’	1/2’	2’	1’	1/2’
width	41.7	26		43.8	25	
Sides	61	35.5		61.8	35	
Equival dia	39	23.4		40	23	14.6
Mouth	1/3	1/3		1/3	1/3	1/3
Cutups		2/5-4/9 arched for all pipes				

String Stops

Gambas *(called German Gambas to distinguish from Hills Tapered Gambas)*. They are unstable and needed bars *(flat metal plate across the mouth*) to stabilize.

Example:

- Armley Swell Gamba @ 2’ Dia 31.2 (II), mouth 27 (2/7), cutup 9 (1/3)
- Armley Swell Salicional @ 2’ Dia 31.2(II), mouth24 (2/9),cutup 7.5 (1/3)
- Hinley Great 16 Sub V de Gambe, same scale but 2/9 mouth
- Tyne Dock, Swell Gamba scale III, 2/7 mouth.

Wood Pipework

- Schultz is celebrated for the tone of his wood pipes. Basses of principals,
- Harmonica, and 16’ pedal Violoncello (see BIOS #15, pg 43).

The Great Exhibition 1851

This exhibition was very important because it introduced three new important influences to English organbuilding: Ducroquet, Schulze and Willis. The French firm of Ducroquet introduced Cavaille-Coll's Harmonic flutes and also the Flute a Pavillon. These harmonic open cylindrical (or wood) stops were eagerly adapted by English builders as a loud, colourful stop. There was a wind variety of scales and treatments. Narrow scales tried to imitate the orchestral flute, wider scales make a solo flute with a strength and purity unknown in other flutes. Schultz Orchestral Harmonic Flute @ 1' was 28.6mm dia, 1/6 lab, 1/2 cutup

Wind Pressures

Birmingham: Davison 1856

	Bass	Treble
• Great Flues:	2-2/3"	3-3/4"
• Gt Reeds & Harmonic Fl	3-3/4"	3-3/4"
• Swell	2-2/3"	3-3/4"
• Choir	2-2/3"	2-2/3"
• Pedal Flues	2-3/4"	
• Pedal Reeds	3-3/4"	

Hill Wind Pressures

• St Peter, Cornhill	1840	3"
• Holy Trinity	1845	3"
• St Mary-at-Hill	1848	2-3/4"
• Arundell Cathedral	1850	2-7/8"
• Kiddermunster Town hall	1855	3"
• St Mary Hulme	1858	2-3/4

The Pedal may be slightly more. Tuba could be 10-12"

Schultz at Armley

- Great 82.6 mm
- Swell 88.9 mm
- Choir 63.5 mm
- Echo 47.6 mm
- Pedal 89 and 102 mm

Willis Wind Pressures

- Preston 1860's 3-1/4" (typical)

• St Pauls	Flues	Reeds	
• Great	3-1/2(old)	6"	5" (new)
• Swell	3-1/2	6"	
• Choir	2-1/2"	3-1/2"	
• Solo	4"	3-1/2 (light reeds)	14 and 17-1/2 (heavy reeds)
• Pedal	3-1/2 for 32'		

F.E Robertson, 1897

Robertson wrote a book "A Practical Treatise on Organ Building". He was a Civil engineer by training, and perhaps a practicing organbuilder. Besides practical experience and contemporary observation, he draws heavily on Topfer and Schultze for scaling and voicing.

Scales

He likes to describe scales as the size of the bottom 'C' and perhaps a scale ratio. He mentions Topfers:

- 1:2.83 1/2 on 17th pipe, Topfer's standard
- 1:2.66 1/2 on 18th pipe, Topfer's most used
- 1:2.5 1/2 on 19th pipe, for Bourdons, flutes

Robertson suggests that some good scales are irregular and empirical *(I agree)*.

Wind pressures

- 3" Medium sized church organ
- 2-1/2" Maximum for chamber organs
- 6-10" Reeds

Schultze at Armley

- 3-1/4" Great, Swell and Pedal
- 1-1/2 Choir
- 1-1/2 Echo

Open Diapason 8'

This scale relates to the size of the organ and the room. Full sound, melodious. All the other scales are related to this, except the strings and Flutes.

• 6-3/4"	1/2 on 17th	Typical English	171.5 mm	+2.3 ht
• 6"	1/2 on 17th	Biggest scale	152.4 mm	-0.5 ht
• 5-1/2"	1/2 on 17th	Big church, 30 stops	140 mm	-2.4ht
• 5-1/8"	1/2 on 18th	Smaller organs	130 mm	-4 ht
• 4-1/4"	1/2 on 18th	Chamber organs	108mm,	-8.5 ht

The Gamba

Use a small scale, with a strong pungent tone. Make as loud as it can take, without being harsh. Don't slot. Slotting destroys true Gamba tone, imparting a peculiar hard or horny quality of tone.

- Topfer used 3.4" halving on 18th
- Schultze used 3 7/8" halving on the 17th

Viol da Gamba

Softer than the Gamba, with the tone and scale midway between the Gamba and Salicional. to 3-1/2", 1/4 to 1/5 lab, larger the scale, smaller the mouth

Salicional, Dulciana and Vox Angelica

These are all similar, and very delicate. There are never slotted, which would destroy the velvety quality of the tone. Tend towards larger scales, but smaller mouths, and you will get beautiful tone with less hassles voicing. 3 to 3-1/2" *(75 to 90mm, -17 ht to -12 ht)*

Salicional

Soft and stringy, Topfer used 3.13” halving on 18th, 1/5 lab Dulciana: quiet, less reedy, same scale as Salicional Vox Angelica: Thinnest, 2 pipes narrower scale.

Pedal Bourdon 16’

Topfer would halve bourdons on the 19th pipe, though Schultze used the 17th.

Hayne’s Tubs	13x11-1/2		+6.7 ht,	1/3.8 lab
Typical English	9”x7-1/4		-2.8 ht,	1/4 lab
Very Sufficient	8x5-1/2”	3 3/4” cutup	-7.3 ht,	1/4.3 lab, 1/1.5 cutup
Or powerful stop	8x8	2.6” cutup	-3 ht,	1/3.5 lab, 1/3 cutup
Ordinary organs	6x6	2.11” cutup	-9.7 ht,	1/3.5 lab, 1/2.8 cutup

Bourdon 16’, Manual

Bourdon	6-3/8x3-7/8	3-1/8 lab	-14ht	1/4.5 lab, 1/1.2 cutup
Lieblich Bourdon	5x3-3/8		-18ht	1/4.3

Open Diapason 16’ Pedal

Tone should be full but stringy, with open toes, lots of wind.

Large Scale	11.5x9”	17th pipe	+2.5 ht,	1/4 lab, 1/4 cutup
Better Scale	10.5x8 1/4”	18th pipe	+0.5 ht,	1/4 lab, 1/3.7 cutup
Small Scale	7-3/8x6”		-7.3 ht,	1/4 lab, 1/3 cutup

Open Diapason 32’

Use a big scale, bigger than the 16’ Open, which is bigger than the Great stop. Extra low mouth, lowest in the bass. This works best on it’s own chest. If a manual stop, use same scale as 8’.

Maximum size	24”x20”		+8ht,	1/4 lab, 1/3.9 cutup
Moderate size	19”<179>	17th pipe	+2.2ht	
Minimum size	15-1/4”x12	18th pipe	-3 ht,	1/4 lab

Other Stops

2nd Open is 3 pipes narrower, different tone, not just softer

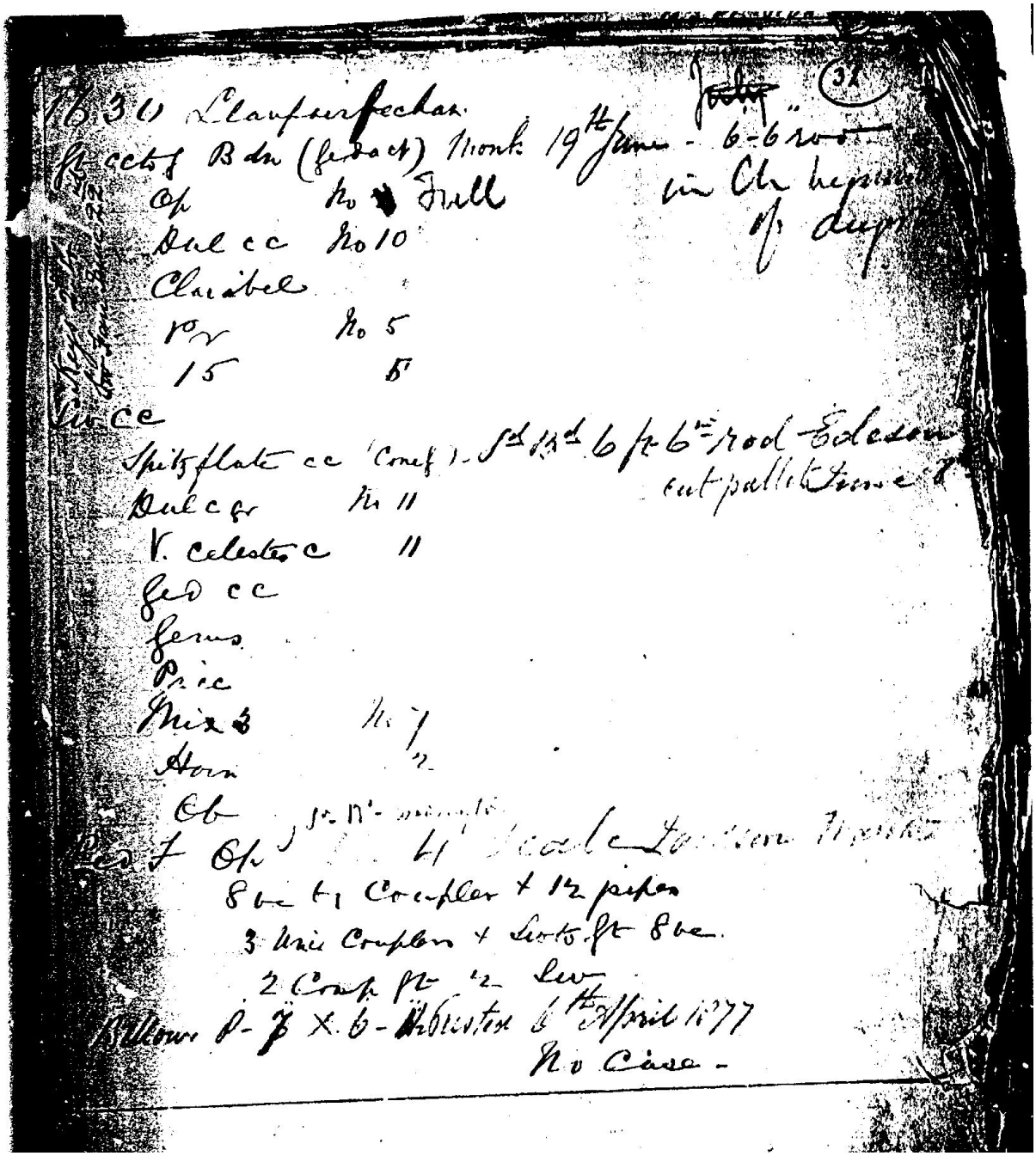
Geigen 5 pipes narrower

Pedal Open 3 pipes bigger

Principal 4’ This should be bright and clear, same as open, or one pipe smaller.

Twelfth 2 2/3 Make the bass soft and fluty by voicing, don’t shrink the scale. Use scale of the open. The treble can be keener.

Fifteenth 2’ Can be a pipe or two narrower than the Open. Use a low mouth, keep keen and bright. Don’t be loud and fluty, or you will scream.



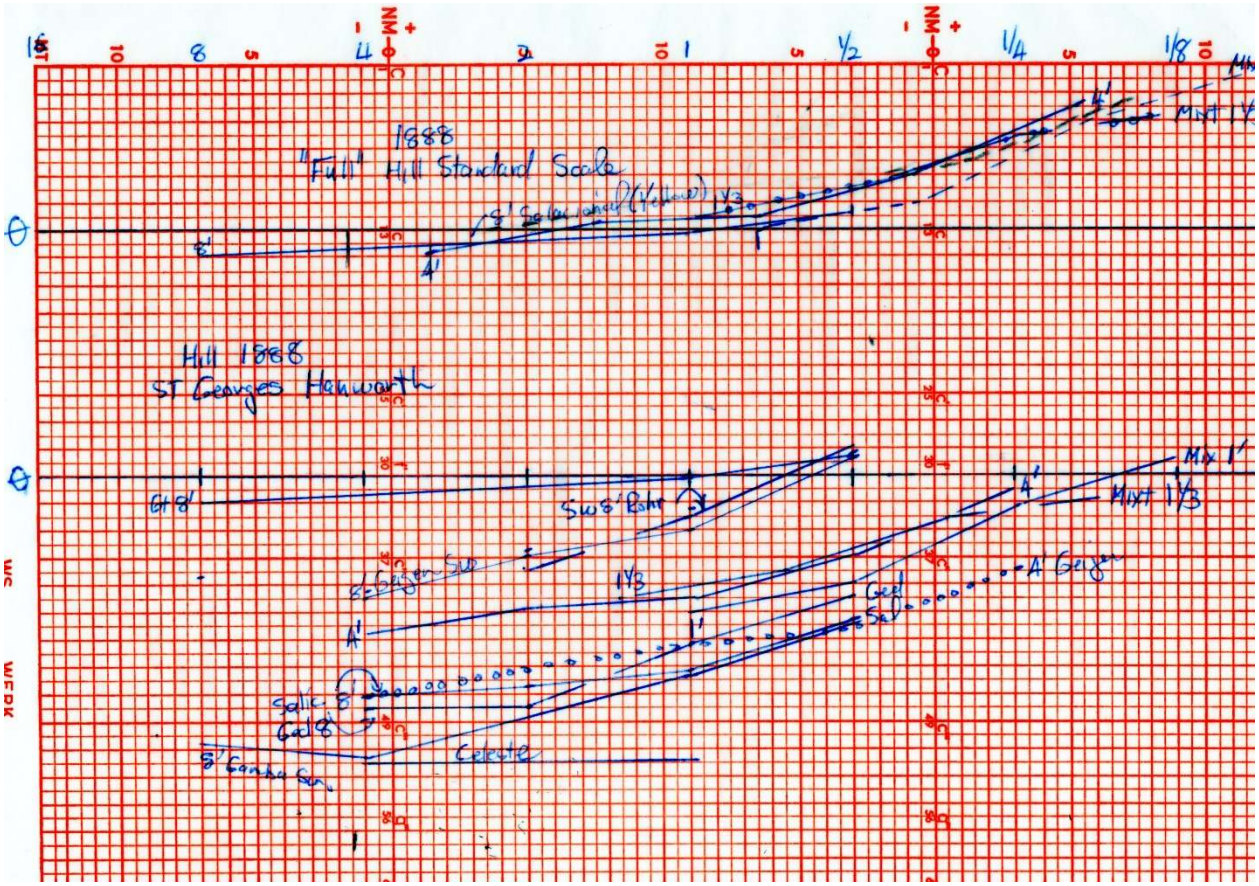
Llanfairfechan Church North Wales
From Hill Shop Book 4,

William Hill

From: The Organs of Britain: Norman

The Hill Swell is as powerful as the Great, but the Swell box makes it sound more distant. Many reeds distinguish the Swell. Generous scales, with low cutups give a sweet and restful sound, devoid of extremes. Higher pressure was used for reeds.

Hill used a standard scale for chorus stops, and transposed it by halftones to get the scale of various ranks. It halved on Topfer until 1', then grew. Other ranks had special scales.



Topfer normmeasure graph of typical Hill scales. They halve at about the 17th until 1', then they half faster for the treble.

In 1998, David C Wickens, former Archivist of the BOA graciously send me his analysis of Hill Scaling, after he reviewed the Hill Factory notes of dozens of organs. Please see the next three pages. Full scale (F) was the standard house scale. Scale 3, 5, 7 were 3, 5, or 7 pipes smaller *(respectively)* of "F".

Appendix 9

RELATIVE SCALING TABLES

1. William Hill & Son
taken from the Hill Shop Books, now in the British Organ Archive

	Shop Book	Gt Dbl	Gt Op1	Gt Op2	Gt Pr	Gt 12	Gt 15	Gt Mix	Sw Op	Sw Pr	Sw 15	Sw Mix
1872												
Belfast, St. James	1.1a		F		3	3	3		3	5		
Balham	1.1a		F		3	3	3		3	5		
Anerley, St. Paul	1.2		F		3	3	3		3	5		
Rochdale, St. Edmund	1.2		F		3	3	3		3	5	5	
1873												
Witley, Mr Foster	1.13		4		7							
Torquay	1.19		6''						5½			
Lady Crawford	1.23		F		5		5	5	3	5		
Gipsy Hill, Christ Church	1.26		F		3	3	3		3	5	5	
Mrs Perkins	1.31		5		9							
Miss Hope	1.39		5		7							
Coodham House	1.49		F						3			
1874												
Worcester Cath. Nave[1]	1.61	3	F +½	2					2	5	5	
Mr Hunter	1.66		3		6							
1875												
Strathfieldsaye	1.79		3		7			7	5	7		
Barbados, St. John	1.88		F						3			
Adelaide Town Hall	2.1		F	3								
1876												
Manchester, New Jerusalem Church	2.16		F									
Criccieth	2.17		2									
Alconbury	2.21			4	7							
Barsham Church	2.23			2								
Bishopston	2.23			2								
Little Harrowden	2.24			3								
Killarney P.C.	2.24		F									
East Byrom 'chamber' "scaled by Mr.Hill"	2.30			3								
1877												
Long Sutton	2.31			2	5							
Llanfairfechan	2.32		F		5		5					7
Brickhill Church	2.35		F		5		5		3	5		
Banstead Lunatic Asylum	2.36		F		5		5		3	5		

1877 continued												
Benton C. Chapel, Rawdon	2.37			2	5				3			
Brasenose College, Oxford	2.38		F		5				3	5		
Archway Chapel	2.39		F		5		5		3	5		
St. Saviour, Aberdeen Park	2.42		F +½		5	5	5		9[a]	5		5
St. Stephen, Carlisle	2.43		F		5		5		3			
and many similar patterns in Shop Bk 2			F		5		5		3			
Darwen Independent Church	2.46		F	2	5	5	5	5[b]	3	5		
Chapel Royal, Whitehall	2.48		F		5	5	5	5				
Dalton Holme	2.49				5				3	6		
Milverton	2.50	3	F	2	5	5	5	5	2	5	5	5
Church of the Martyrs, Preston	2.51	3	F		5	5	5	5	old	old	5	5
Northenden Church	2.54		F		5		5		3	6		
St. Thomas, Ferryside	2.56		5½/ 3¼		5	6	6					
St. Mary Magdalene, Bradford	2.58	3	F		5	5	5	5	3	5	5	5
1878												
Presbyterian Church, Sefton Park	2.73		F		5	5	5	5	3			
Earlstown	2.75		F		5	5	5		3	5		
Leigh	2.76			2	5				3			
1879												
Leamington P.C.	2.81	2	6½		3	5	5	5	2	5	5	5
Christ Church, Ware	2.102		F	2	5		5	5	3	5		
Christchurch Cathedral New Zealand	2.110	2	F		5	5			5[c]	5	5	
1881												
Cheadle	2.115		F		5		5		5	5[d]	5[e]	7
Guildhall, Cambridge	2.122	2	F +½		4	4	4	4	3	5	5	5
1882												
St. Andrew, Bradford	2.142	3	F	2	3	5	3	3	3	5	5	5
St. Mary Boltons	2.145	3	F		5	5	5	5	3	5	5	5
St. James, Paddington	2.149		F	2	4	5	5	5	3	[d]	5	5
1883												
Sion Jubilee Chapel, Bradford	2.162	2	F		4		5	5	2	5	5	5
St. Elizabeth, Reddish	2.168	3	F	2	3	5	5		3	5		
Brownswood Park	2.170	3	F	2	3	5	5		3	5	5	5
1884												
Hampton-in-Arden	2.187		F		5		5		4	3[d]	7[e]	
St.Matthias, Torquay	3.22		F		4	4	4	4	3	5	5	5

1884 continued												
Old Meeting, Birmingham	3.23		6¼	2	4	5	4	4	3	5	5	5
Wesley College, Richmond	3.27			2	5	5	5		4	6		
1885												
'electric' organ	3.34		F		5	5	5		3	5		
St. German, Cardiff	3.38	3	F	2	3	5	5		3	5	5	
All Saints, Eastbourne	3.42		F	2	3	3	3	3	3	5	5	5
1886												
Brecon Priory	3.50		F		3	3	3	3	3	5	5	5
St. Paul, Dorking	3.55		F		5		5		3	5		
Liversedge Church	3.62		F	2	3	3[f]	3		3	5	5	
1887												
All Saints, Cheltenham	3.74		6½		3	3	3	5	3	5	5	5
Dutch Church, Columbo	3.77			2	5		5					
Godalming P.C.	3.82	3	F	2	3	3	3		3	5	5	
1889												
Chigwell Church	3.110		F		3	5	5		3	5		
1890												
Christ Church, Dover	3.128	3	F	3	5	5	5		3	5	5	

[a] Geigen Principal
[b] also Sharp Mixture
[c] Violin Diapason
[d] Gemshorn
[e] Flautina
[f] Nazard

[1] additional figures: Sw 12th - 5; Ch Op - 5; Ch Pr - 7; Ch Dul Mix - 9 [Worcester Cathedral Nave Organ, 1874]

Typical Hill Scales of 1870/80's (Bios #18, pg42)

Great

Double	3	*(i.e. three pipes smaller than "full" or 0*
Open 1	Full (0)	
Open 2	2	
Principal	5	or perhaps 3
Twelfth	5	or perhaps 3
Fifteenth	5	or perhaps 3
Mixture	5	or perhaps 3
Swell		
Open	3	
Principal	5	
15th	5	
Mixture	5	

With a scale of 5 ht narrower than "Full", the upper work seems narrow. But remember that the Hill standard scale grows quite a bit into the treble.

Hill SHALLOTS

Hill/MANDER Posaune
1999/ Williams
#12 (Bloor St SW 8')

Fr Willis Reed Scale Sheet

Stop:			Church:							Wind:	
General	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$	c3	$f\#^3$	c^4
Tongue											
Lift at free end											
Tuned length											
Total tongue length											
Width (small end)											
Width (big end)											
Thickness											
Weights											
Weight Description:											
Resonator											
~~Top Diameter inside~~											
Bottom Dia (in/outside)	12		11.3		8.8		7.3		O.D	Small end	
~~Resonator Length~~	14.3		12.8		9.8		8		OD	big end	
~~Mitre "A"~~ slot ~~out~~	6.5		5		3		2.8		Slot	small end	
~~Mitre "B"~~ Slot small	8.9		6.2		4.8		3.5		Slot	big end	
Resonator Wall Thick											
Tune slot Width											
Tune slot start from top											
Tune slot length open											
Actual Measure Shallot										g	
Total length	113	93.5	80.8	66	54	44.5	37.5	32.5	27.5	23.3	
Inside Dia (small end)	9.5	8.9	8.8	7.7	7	6	5.4	5.3	5	5	
Outside Dia (small end)	11.9	11.3	11.1	9.6	9	7.7	7.2	6.8	6.3	6.4	
Inside Dia (big end)											
Outside Dia (big end)	14	13.1	12.7	10.9	10	8.8	8	7.5	6.8	6.7	
Shallot wall thickness	1	1.1	1.1	.9	1	.8	.8	.7	.6	.6	
Slot Width (small end)	6.3	5.2	4.7	4.4	3.6	2.8	2.4	2.4	2.4	2.2	
Slot Width (big end)	8.2	6.5	6.1	5.4	4.4	3.9	3.2	3.2	2.6	2.3	
~~Slot Length~~	1.2	1.1	1.2	.9	.9	.8	.7	.7	.7	.7	
Flat Width (small end)	8.7	7.3	7.2	6.8	5.9	5	4.6	4.2	4.2	3.7	
Flat width (big end)	10.7	9.2	8.5	7.7	6.7	6.3	5.4	5	4.4	4.3	
Outside Depth (small)	10	9.9	9.9	8.4	7.7	6.7	6.3	6	5.6	5.6	
Outside Depth (big)	11.7	11.2	11	9.2	8.5	7.7	7.1	6.5	6	6	
Shallot Project Length											
Misc Data											
Boot Toe Hole											
Boot length											
Block Dia											
Total Length											

16'
Measure from Mandrel
14.5
17.5
7
10.5
Cap thick

Williams made these shallots for me for Trumpets I revoiced. They were developed for Mander using Hill measurements.

St John, Brownswood Park, London, 1883

GREAT

Double Diapason	16'	#3
Open Diapason	8'	Full
Open Diapason	8'	2
Stopped Diapason	8'	
Principal	4'	3
Wald Flute	4'	
Twelfth	2-2/3'	5
Fifteenth	2'	5
Mixture III		
Posaune	8	Full

SWELL

Bourdon	16'	Gedact
Open Diapason	8'	3
Salicional	8'	11
Vox Angelica	8'	13
Hohl Flute	8'	
Principal	4'	5
Gamba	4'	10
Fifteenth	2'	5
Mixture II		5
Cornopean	8'	
Oboe	8'	

CHOIR

Dulciana	8'	12/bass11
Gedact	8'	
Gemshorn	4'	5
Suabe Flute	4'	
Flautina	2'	7
Clarinet	8'	
PEDAL		
Open Diapason	16'	Full
Bourdon	16'	Edin(burgh)
Cello	8'	
Trombone	16'	metal

(from Hill Shop Book 2, pp 170-171, 19 November 1883, located in the British Organ Archive.)

St Georges Church, Hanworth, Hill 1888 (BIOS #17 pg 80)

GREAT

Open Diapason	8'	full
Gedact	8'	1-12 stop't wood, treble metal #8
Salicional	8'	#8
Octave	4'	#5
Harmonic Flute	4'	harmonic from f, special scale

SWELL

Geigen Principal	8'	Special scale
Geigen Principal	4'	#8
Viole di Gamba	8'	#10
Voix Celeste tc	8'	#12
Rohr Flute		1-12 stopped wood
Mixture II		#5
Oboe	8'	
Horn	8'	

PEDAL

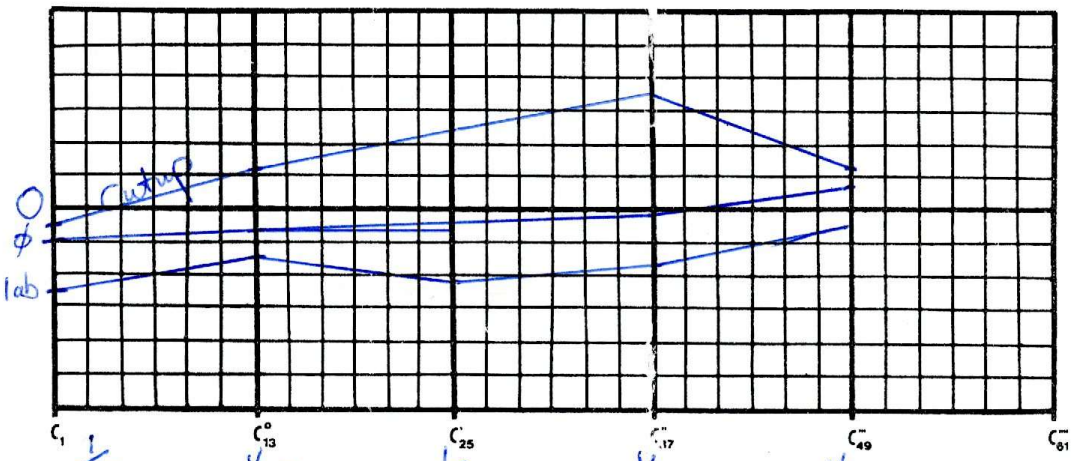
Sub-Bass	16'	full
Violoncello	8'	

I don’t know where I got the Hanworth scales from; perhaps the BIOS book? Since it also has outside diameters, which I never measure, this likely isn’t my measure. See the scale sheets on the next few pages.

A. B. Batty

Stop: Open Diap 8' Div.: Gt
Windpressure: 75mm Pitch: Scale "full"
Description of site & organ:

Builder: Hill & Sons Date: op 2007 1888
Church: ST Georges, Hanworth



	C1	C13	C25	C37	C49	C61
Mouthwidth:	1/4·3	1/4·2	1/4·3	1/4·3	1/4·2	
Cutup	1/2·8	1/3·6	1/3·3	1/3·2	1/3·8	

ACTUAL MEASURE

	C1	C13	C25	C37	C49	C61
Top Diameter: (outside)	152·1	92·3	55·7	34·1	21	
Diameter at Mouth:	119	90	54	33	20	
Mouthwidth:	110	68	39	24	15	
Cutup:	30	19	12	7·5	4	
Metal Thickness:						
Windway:						
Languid:						
Body Length:						
Top Hole ø:						

Source of Data: Material:

NOTES (ears, bearus, slots, tuners, voicing, etc)

A. B. Batty

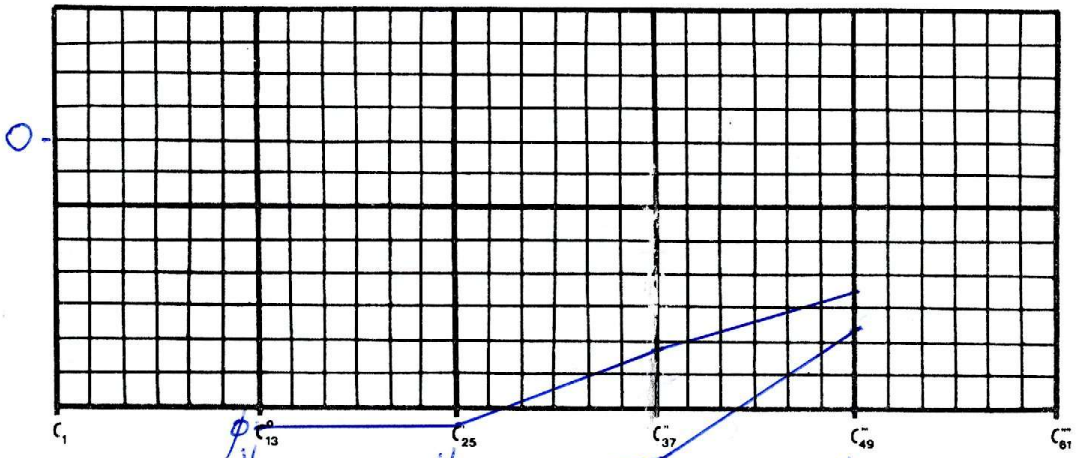
Stop: Gedact 8' cutup Div.: 1st

Windpressure: 75 mm Pitch:

Description of site & organ:

Builder: Hill & Son Date: 1888

Church: St George's Hanwant L



Mouthwidth:		1/4.3		1/4.3		1/4.6		1/4.2	
Cutup:		1/1.7		1/1.8		1/1.9		1/2.4	

ACTUAL MEASURE

OD Toe Diameter:		65.6		39.5		26.1		17.2	
Inside Diameter at Mouth:		64		38		25		16	
Mouthwidth:		47		28		17		12	
Cutup:		27		16		9		5	
Metal Thickness:									
Windway:									
Languid:									
Body Length:									
Toe Hole ø:									

Source of Data: Material:

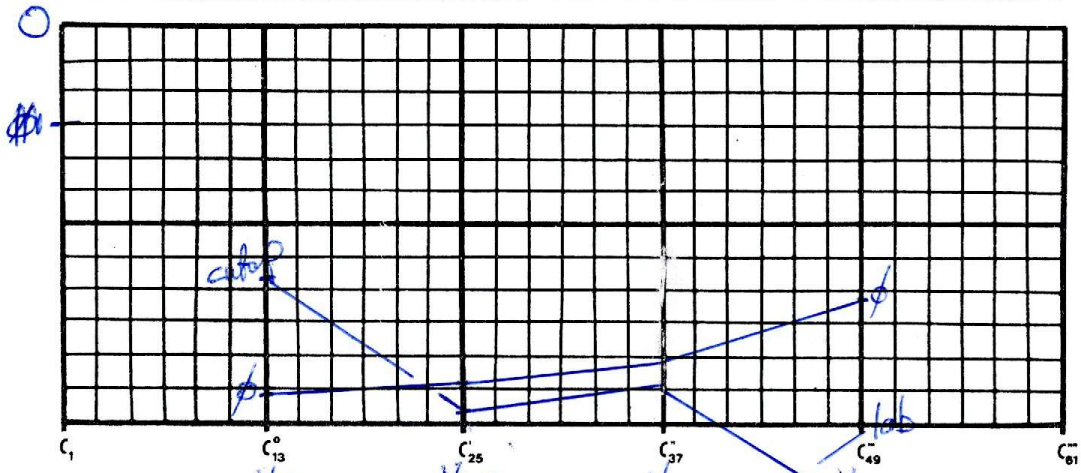
NOTES (ears, beards, slots, tuners, voicing, etc)

1-12 Stopped Wood

A. B. Batty

Stop: Salicional 8' Div.: GT
Windpressure: 75mm Pitch:
Description of site & organ: 1-12 wood.

Builder: Hill & Son Date: 1888
Church: St Georges Haworth



Mouthwidth:		1/5	1/4.9	1/5.5	1/4.7
Cutup:		1/2.8	1/3.4	1/3	1/4.5

ACTUAL MEASURE

Top Diameter:		58.6	36	22	14.6
Diameter at Mouth:		57.2	34.5	21	13.6
Mouthwidth:		36	22	12	9
Cutup:		13	6.5	4	2
Metal Thickness:					
Windway:					
Languid:					
Body Length:					
Toe Hole ø:					

outside
inside

Source of Data: Material:

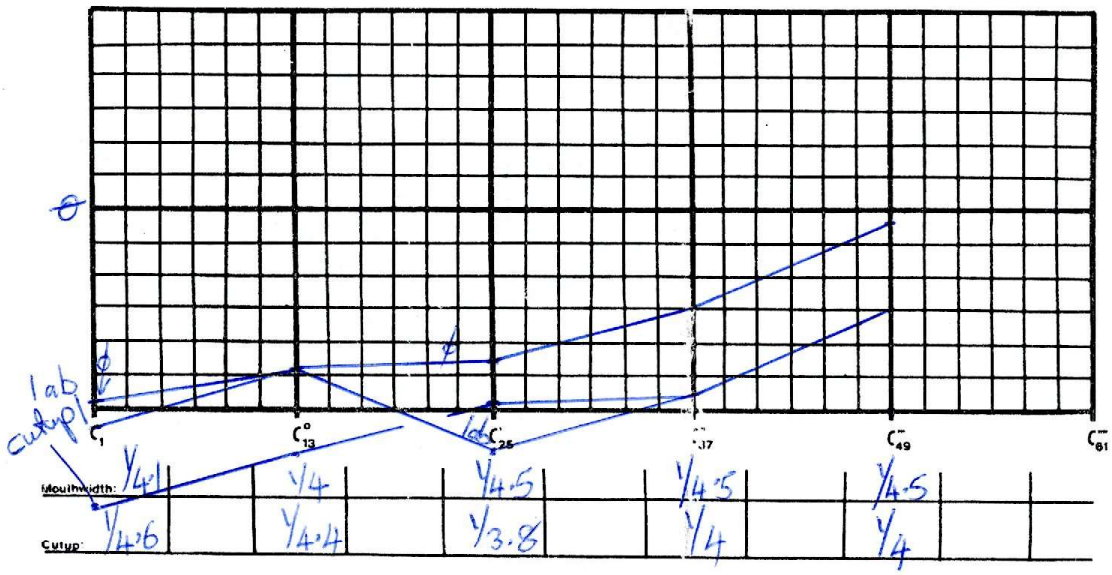
NOTES (ears, bearus, slots, tuners, voicing etc)

A. B. Batty

Stop: Octave 4' Div.: 6t Builder: Hill Date: 1688

Windpressure: 75 mm Pitch: Church: St Georges Hanworth

Description of site & organ:



Mouthwidth:	1/4.1		1/4		1/4.5		1/4.5		1/4.5	
Cutup:	1/4.6		1/4.4		1/3.8		1/4		1/4	

ACTUAL MEASURE

outside Top Diameter:	74.2		45.8		28.3		17.8		12.4	
Inside Diameter at Mouth:	72		44.5		27		17		11.4	
Mouthwidth:	55		35		19		12		8	
Cutup:	12		8		5		3		2	
Metal Thickness:										
Windway:										
Languid:										
Body Length:										
Toe Hole #:										

Source of Data: Material:

NOTES (ears, bearus, slots, tuners, voicing, etc)

A. B. Batty

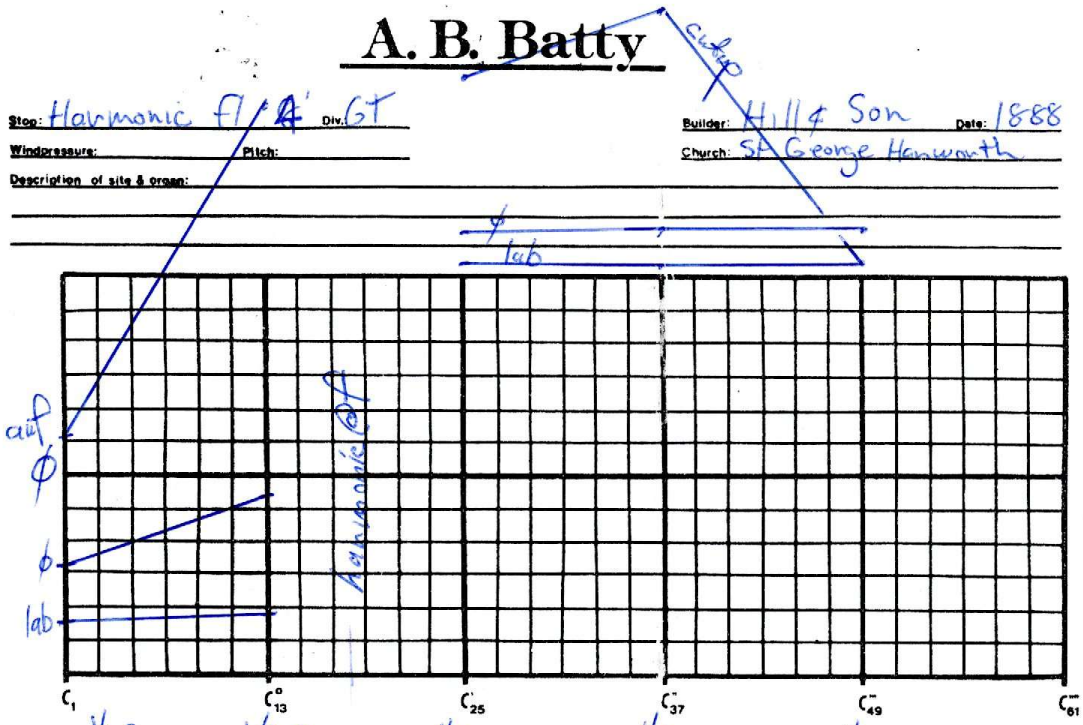
Stop: Harmonic fl/~~A~~ Div. GT

Windpressure: Pitch:

Description of site & organ:

Builder: Hill & Son Date: 1888

Church: St George Hanworth



	C1	C13	C25	C37	C49	C61
Mouthwidth:	1/4.3	1/4.7	1/4.1	1/4.2	1/4.2	
Cutup:	1/3.2	1/2	1/3.1	1/2.9	1/4	

ACTUAL MEASURE

	C1	C13	C25	C37	C49	C61
Top Diameter:	Out 63.4	55.1	46.2	28	17	
Diameter at Mouth:	Inside 62	53.5	44.8	27	16	
Mouthwidth:	60	36	34	20	12	
Cutup:	19	18	11	7	3	
Metal Thickness:						
Windway:						
Lanquid:						
Body Length:						
Toe Hole ø:						

Source of Data: Material:

NOTES (ears, bearus, slots, tuners, voicing, etc)

A. B. Batty

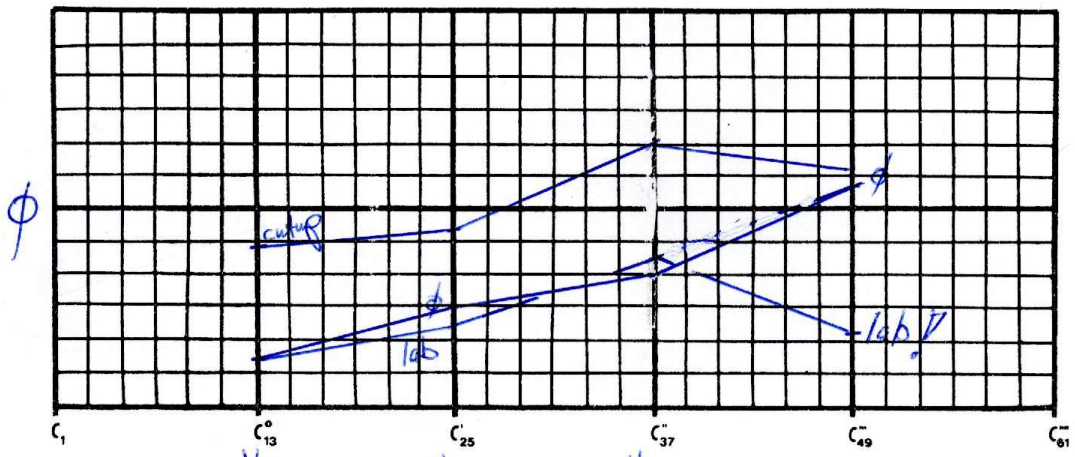
Stop: Geigen Princ 8 Div.: SW

Windpressure: Pitch:

Description of site & organ: Geigen Not Standard scale, it grows faster

Builder: Hill & Son Date: 1888

Church: St George Hanwuth



Mouthwidth:			1/4		1/4.1		1/3.9			
Cutup:			1/3.2		1/3.5		1/3.4			

ACTUAL MEASURE

Top Diameter:			78.3		49.7		31.5		21	
Diameter at Mouth:			76.5		48.2		30		20	
Mouthwidth:			60		37		24		13	
Cutup:			19		10.5		7		4	
Metal Thickness:										
Windway:										
Languid:										
Body Length:										
Toe Hole ⌀:										

Source of Data: Material:

NOTES (ears, beards, slots, tuners voicing etc) from bottom G

A. B. ~~lab~~ Batty

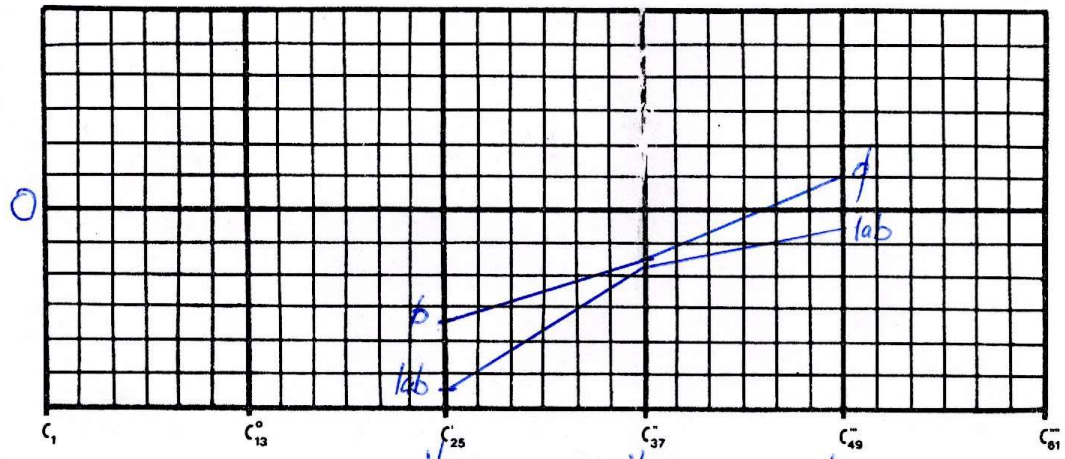
Stop: Rohr flute 8' Div.: SW

Windpressure: 75 Pitch:

Description of site & organ: 1-12 Stopped Wood.

Builder: ~~A~~ H & Son Date: 1888

Church: St George Hanworth



Mouthwidth:					1/4 1/4			1/4			1/4 0.3	
Cutup:					1/1.8			1/2.2			1/25	

ACTUAL MEASURE

Top Diameter:					49			32.1			21.3	
Diameter at Mouth:					47.4			30.8			20.3	
Mouthwidth:					34			24			15	
Cutup:					19			11			6	
Metal Thickness:												
Windway:												
Languid:												
Body Length:												
Toe Hole ø:												

Source of Data: Material:

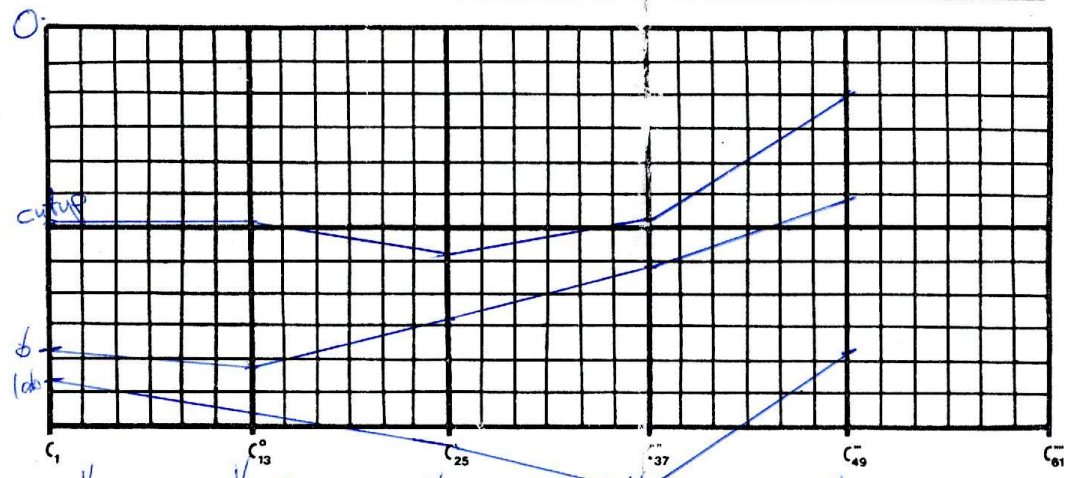
NOTES (ears, bearus, slots, tuners voicing etc)

A. B. Batty

Stop: Viole di Gamba Div.: SW Builder: Hill & Son Date: 1888

Windpressure: Pitch: Church: St George Hanworth

Description of site & organ: 10 - Standard Scale



Mouthwidth:	1/4.2		1/4.02		1/4.7		1/5.4		1/4.9	
Cutup:	1/3.3		1/3.1		1/3.1		1/2.8		1/2.9	

ACTUAL MEASURE

Top Diameter: (outside)	104.4		61.1		39.2		25.5		16.6	
Diameter at Mouth: (inside)	102		59.3		37.5		24.8		15.6	
Mouthwidth:	77		44		25		14		10	
Cutup:	23.5		14		8		5		3.5	
Metal Thickness:										
Windway:										
Languid:										
Body Length:										
Toe Hole ø:										

Source of Data: Material:

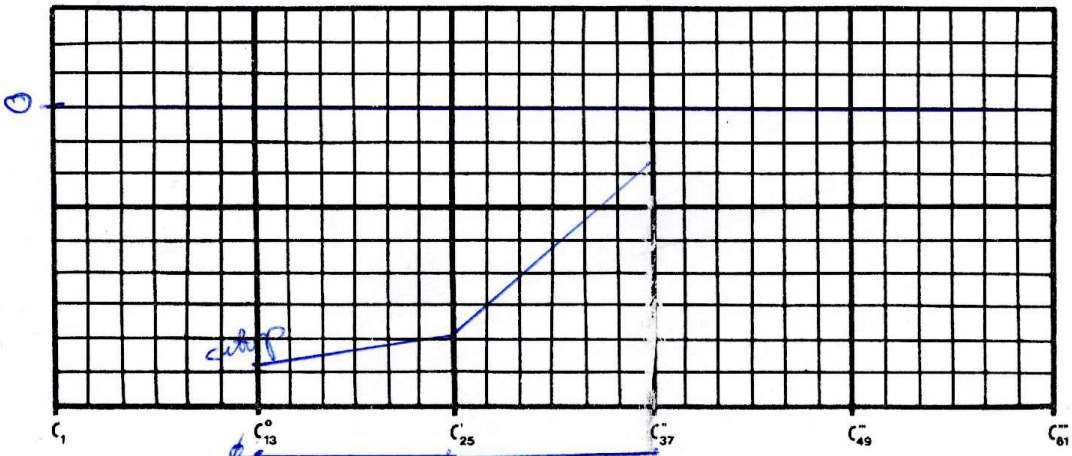
NOTES (ears, bearus, slots, tuners voicing etc)

A. B. Batty

Stop: Voix Celeste TC Div.: Sw & Builder: Hill & Son Date: 1888

Windpressure: 75mm Pitch: Church: St George Hanworth

Description of site & organ:



Mouthwidth:			4.8			4.7			5.1		
Cutup:			2.9			2.9			2.2		

ACTUAL MEASURE

Top Diameter: (outside / inside)			60.2			36			22		
Diameter at Mouth:			58.4			34.5			21		
Mouthwidth:			38			23			13		
Cutup:			13			8			6		
Metal Thickness:											
Windway:											
Languid:											
Body Length:											
Toe Hole ø:											

Source of Data: Material:

NOTES (ears, bearus, slots, tuners, voicing, etc)

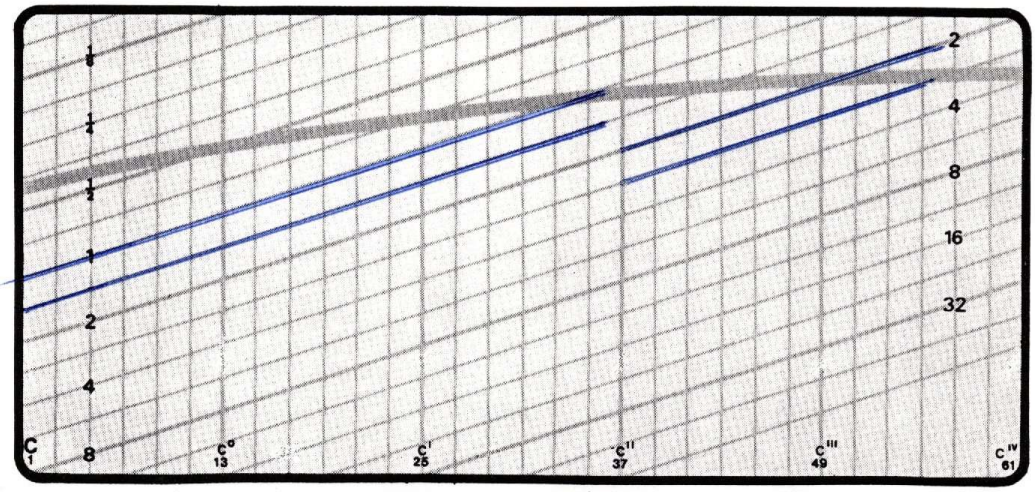
Mixture

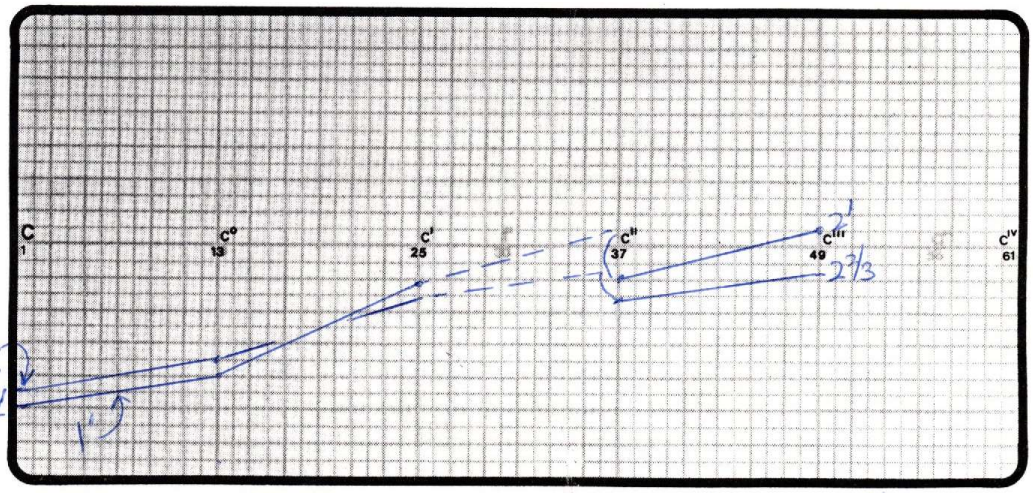
Stop Mixture Div GII Church ST Georges, Haywoorth

Builder Hill Opus 2007 Year 1868 Scale Wind 750 Pa. Seating Area m^2

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

Misc.





	C		c		c'		c''		c'''	
Note	1'	1 1/3	1'	1 1/3	1'	1 1/3	2	3	2	3
O. Diameter	27.7	34.4	18.1	21.6	11.8	14.3	11.8	14.3	8	9.2
→ Mouthwidth	26.7	33.4	17.1	20.6	11.	13.3	11	13.3	7	8.2
Cutup										
Flue										
Toe										
Foot Pa.										
Foot % Cheat Pa.										
Flue % Mouth										
dB										
Ising										

Inside ∅ (allow for metal thick.)

A. B. Batty

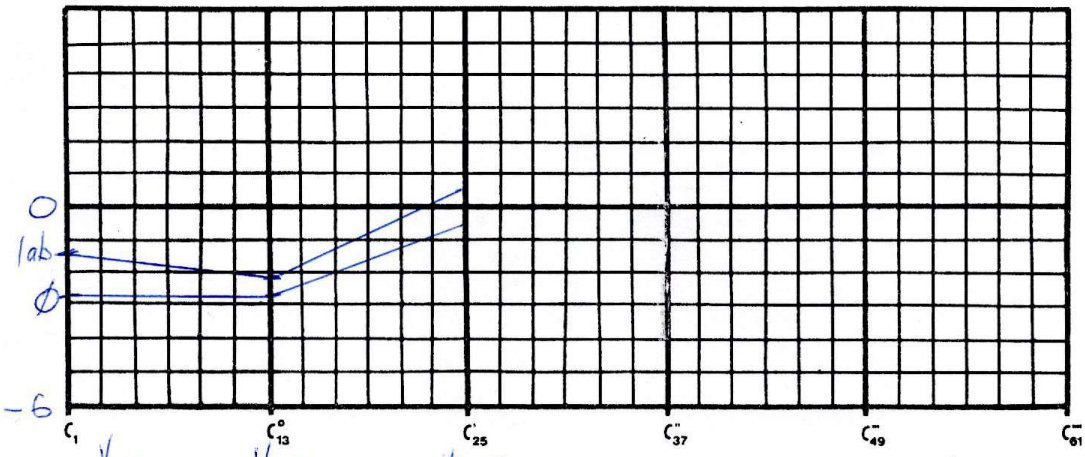
Stop: Violoncello 8 Div.: Ped

Windpressure: 75 Pitch:

Builder: Hill & Son Date: 1888

Church: St George Hanworth

Description of site & organ:



Mouthwidth:	1/38		1/3.9		1/3.9					
Cutup:										

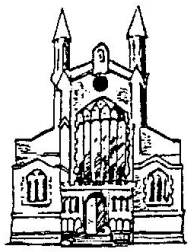
ACTUAL MEASURE

Top Diameter:										
Diameter at Mouth:	130		80		52					
Mouthwidth:	115		66		44					
Cutup:										
Metal Thickness:										
Windway:										
Languid:										
Body Length:										
Top Hole ⌀:										

Source of Data: Material:

NOTES (ears, bearus, slots, tuners, voicing, etc) Open Wood, rollered

St Johns Church
Hyde Park Cresc, London
William Hill 1865



THE CHURCH OF ST JOHN THE EVANGELIST WITH ST MICHAELS AND ALL ANGELS
Hyde Park Crescent, London W2 2PN

THE ORGAN OF ST. JOHN'S CHURCH

Organ built by William Hill in 1865

Moved from west end gallery to north side of the chancel in 1880

Rebuilt by Rushworth and Dreaper in 1925 - pneumatic action added

Restored by Bishop and Son in 1978

Great		Swell	
Dougle open diapason	16	Bourdon	16
Open diapason	8	Open diapason	8
Cone gamba	8	Stopped diapason	8
Stopped diapason	8	Echo gamba	8
Principal	4	Voix celeste (Ten.C)	8
Wald flute (Ten.C)	4	Principal	4
Twelfth	2 2/3	Fifteenth	2
Fifteenth	2	Mixture	11
Mixture	IV	Cornopean	8
Posaune	8	Oboe	8
		Tremulant	

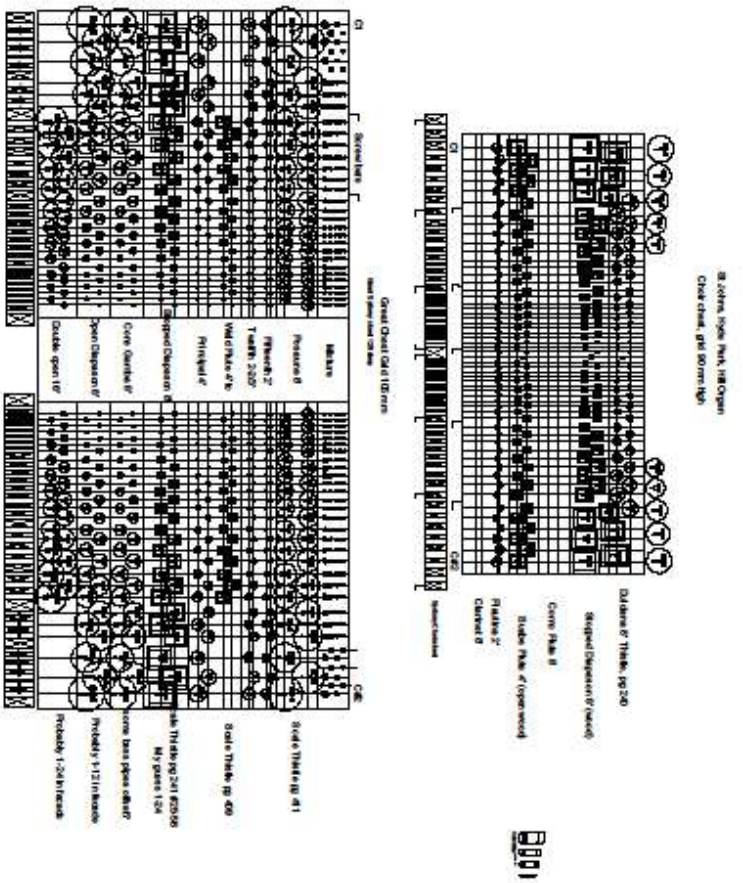
Choir		Pedal	
Dulciana	8	Open Wood	16
Stopped diapason	8	Violone	16
Corno flute (Not Hill)	8	Bourdon	16
Suabe flute	4	Principal	8
Flautina	2	Flute	8
Clarinet	8	Trombone	16 (added 1880 replacing Octave 4)
Tremulant			

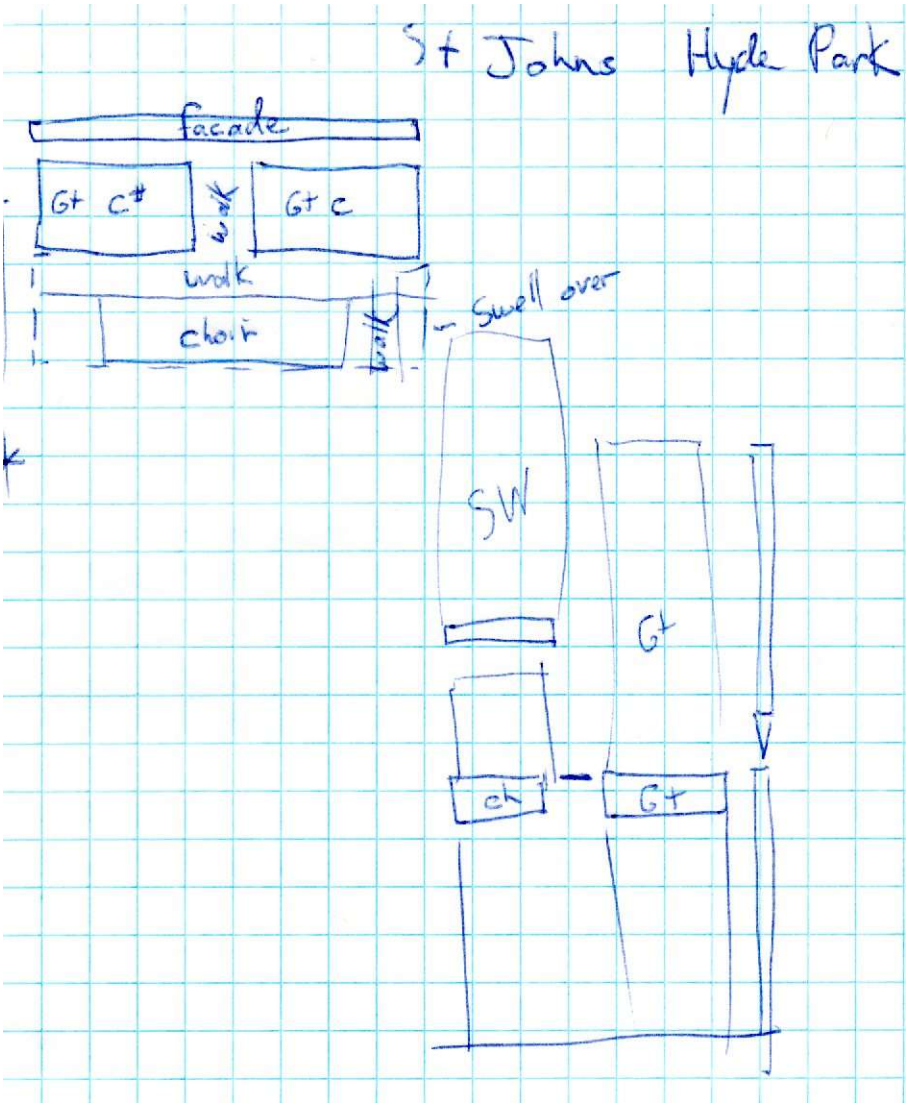
Couplers

Swell to Pedal, Great to Pedal, Choir to Pedal
Swell to Great, Choir to Great, Swell to Choir
Swell octave, Swell suboctave

4 combination pedals to Great, 3 combination pedals to Swell
Reversible pedal for Great to Pedal
Balanced swell pedal

Shown below are the windchest pipe layouts for the great and choir windchests of the Hill organ at St Johns Hyde Park. Notice that the great has double valves and grid channels for the bottom octave. Not all pipes are shown. This is available as a to-scale Autocad drawing, on my webpage.





I visited this wonderful organ about 1996 and scaled the Great division and some of the Choir. Because of poor accessibility and time limits we couldn't measure anything else, but the Pedal 16' Trombone. I also tested the pipe metal composition, a shockingly poor alloy!

The building has a volume of 9,825 m3.

TELEPHONE 519-621-6191
FAX 519-621-7700

The Galt Testing Laboratories Limited

ESTABLISHED 1929

Chemical Analysis of Malleable, Meehanite, Ductile and Cast Irons; Plain, Alloyed and Stainless Steels; Zinc and Aluminum Alloys; Brass and Bronze; Coal, Coke, Limestone Slags, Etc.

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Blair Batty and Associates, Inc.
P.O. Box 740
Simcoe, Ontario
N3Y 4T2
Attention: Blair Batty

Laboratory Sample I.D. #: 90856 Report Date: September 20, 1993

Sample Marked "HILL", Organ Pipe Metal

ST John Hyde Park
~~Islington~~ 1865

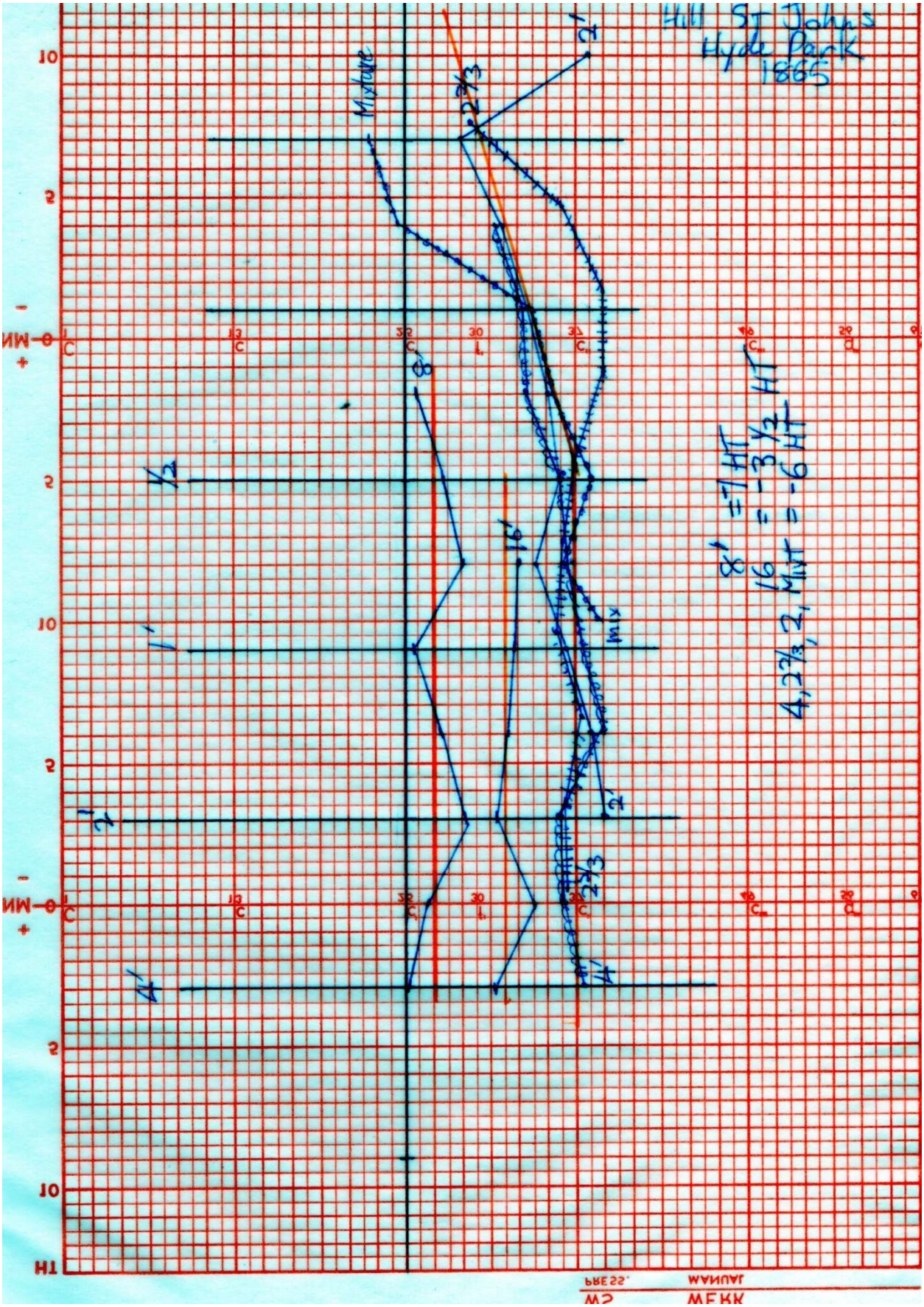
Tin:	16.1	%	(a)
Lead:	82.4	%	(a)
Copper:	0.14	%	(a)
Antimony:	1.2	%	(a)
Iron:	0.021	%	(a)
Bismuth:	0.029	%	(a)
Tellurium:	<0.001	%	(i)

Samples returned at customer's request and expense; otherwise samples retained one year from date of test.

The Galt Testing Laboratories

Per _____ Steven Huynh
Chemical Eng.

Per _____ Lethuy Hoang
Chemist


Hill St Johns
Hyde Park
1865
Mixture
8' = +1 HT
16' = -3½ HT
4, 2⅔, 2, Mixt = -6 HT

A. B. Batty

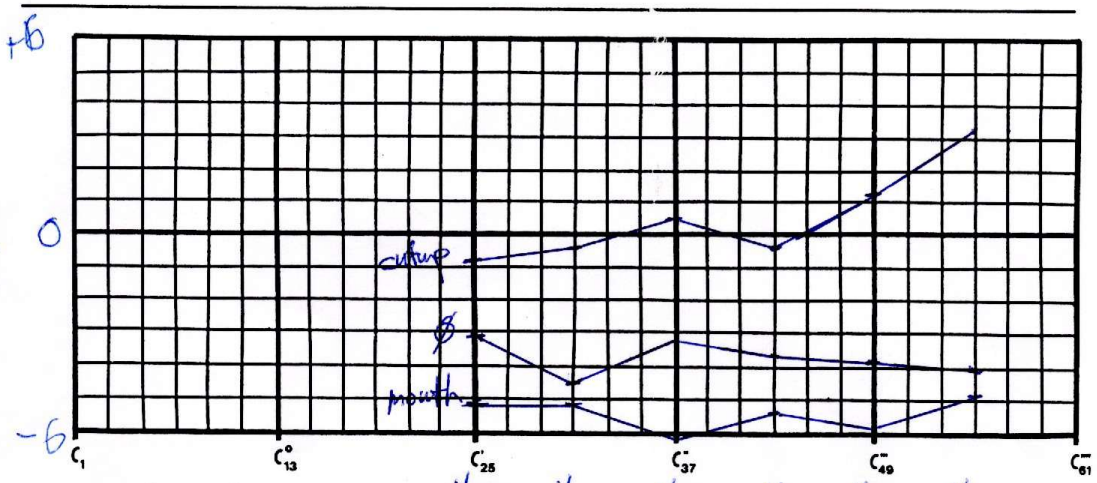
Stop: 16" Open Diap Div.: 1st

Windpressure: 76 Pitch:

Builder: William Hill Date: 1865

Church: St Johns, Hyde Park, London England

Description of site & organ:



Mouthwidth:				1/4.4	1/4.1	1/4.6	1/4.3	1/4.3	1/4.2
Cutup:				1/3.3	1/3.3	1/3	1/3.2	1/2.9	1/2.8

ACTUAL MEASURE

				C25	F#				
Top Diameter:				81	59	C48	F# 36	C 27.6	F# 21.2
Diameter at Mouth:									
Mouthwidth:				58	45	33	26.4	20	16
Cutup:				17.5	13.8	11	8.2	6.8	5.7
Metal Thickness:									
Windway:				.8	.8	.8	.75	.8	.6
Lenquid:									
Body Length:			top dia	1	1	1	1	1	1
Toe Hole ø:				9	8.4	7	6	5.4	4.5
dB 3pf				75.5	75.8	75.4	75.3	75.9	75.6
I				.76	.78	.77	.82	.79	.64

Source of Data: Material:

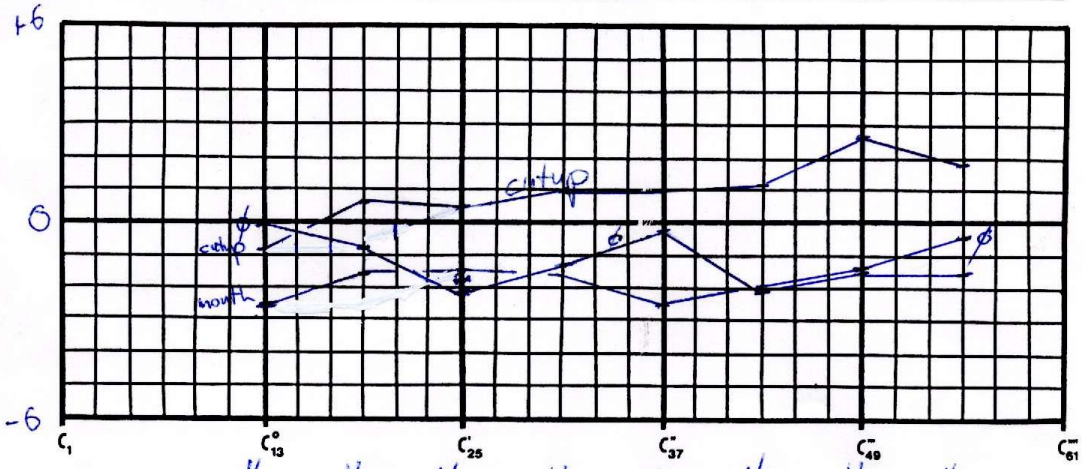
NOTES (ears, beards, slots, tuners, voicing, etc)

A. B. Batty

Stop: 8" Open Div.: G+ Builder: William Hill Date:

Windpressure: 76mm Pitch: Church: St Johns Hyde Park London England

Description of site & organ:



Mouthwidth:		1/4.4	1/4.2	1/3.9	1/4	1/4.4	1/4	1/4	1/4.2
Cutup:		1/3.7	1/3.6	1/3.7	1/3.6	1/3.4	1/3.5	1/3.3	1/3.4

ACTUAL MEASURE

		C°13	F#	C	F#	C	F#	C	F#
Top Diameter:		9.2	69	50	40	32.5	23	18.3	14.7
Diameter at Mouth:									
Mouthwidth:		65	52	40.4	31	23	18.2	14.3	11
Cutup:		17.5	14.5	11	8.7	6.7	5.2	4.3	3.2
Metal Thickness:									
Windway:		1.2	1.1	1.1	1.1	.8	.7	.8	.7
Languid:									
toe Ratio Body Length:		1.1	1.3	1.25	1.1	1.1	1.2	1.2	1.1
Toe Hole ø:		11.3	10.7	9	7	5.8	6	5.3	4
3pf 2B		78.5	79	79	79	77.3	71.2		
J		.93	.85	.9	.9	.81	.82		

Source of Data: Material:

NOTES (ears, bearus, slots, tuners, voicing, etc)

A. B. Batty

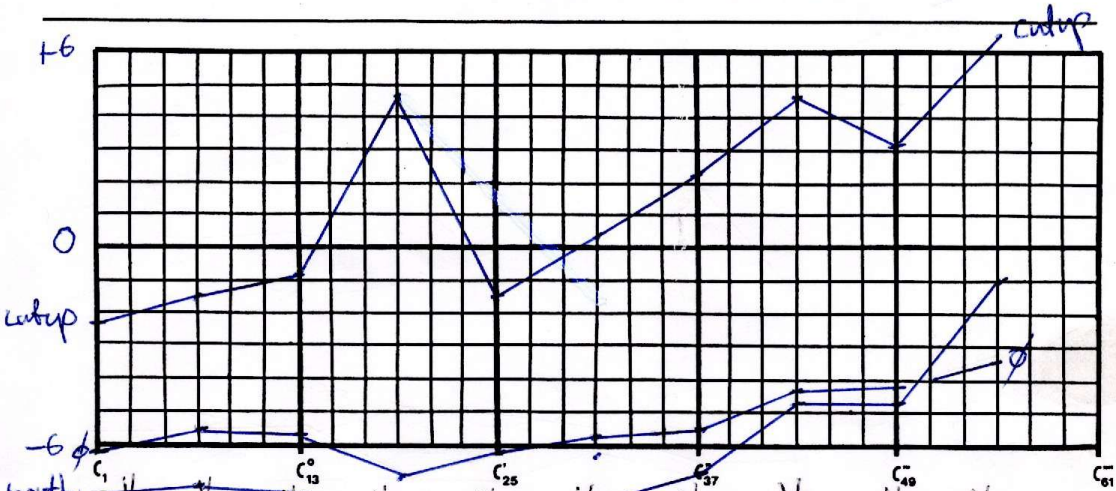
Stop: 4" oct Div.: GF

Windpressure: Pitch:

Builder: William Hill Date:

Church: St Johns Hyde Park

Description of site & organ:



Mouthwidth:	1/4.2	1/4.3	1/4.3	1/4.2	1/4.2	1/4.2	1/4.2	1/4.1	1/4	1/3.6
Cutup:	1/3.2	1/3.1	1/3	1/3.1	1/3.1	1/2.9	2.7	1/2.7	1/2.8	1/2.9

ACTUAL MEASURE	C	F#	C	F#	C	F#	C	F#	C	F#
Top Diameter:	71	56	43	31	25	19.7	15.3	12.5	9.6	7.7
Diameter at Mouth:	[illegible]									
Mouthwidth:	53	41	31.4	23	18.5	14.7	12.5	9.6	7.4	6.7
Cutup:	16.4	13.2	10.3	7.5	6	5	4.2	3.6	2.6	2.5
Metal Thickness:										
Windway:	.9	1.1	.8	.7	.8	.7	.7	.7	.5	.5
Lanquid:										
Body Length:	1.1	1.1	1	.95	.9	.9	1.1	1.1	1.4	1.4
Toe Hole*:	9.3	8.5	6.8	5.4	4.5	4.1	4.3	4	4.3	3.7
	79.6	80.8	79.5	80	79.1	79.3	80.3	81.8	80.2	82.8
	2.84	3	2.7	1.8	2.9	2.6	2.47	2.2	2.3	1.9

toe √6

dB 3pf

1

Source of Data: Material:

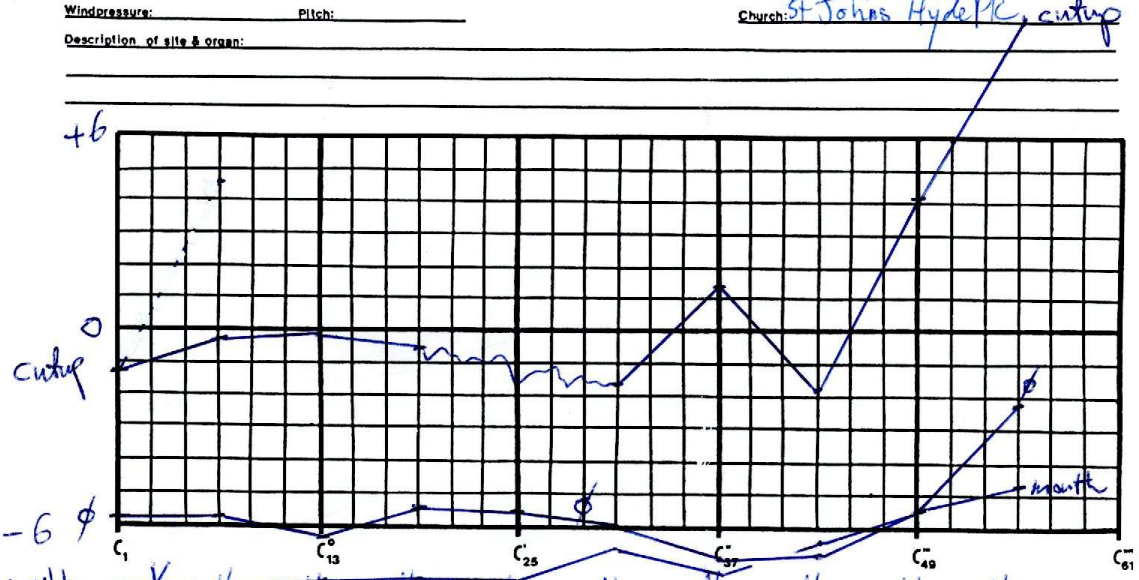
NOTES (ears, bearus, slots, tuners, voicing, etc)

A. B. Batty

Stop: ~~Fl~~ twelfth 3" Div.: Builder: Hill Date:

Windpressure: Pitch: Church: St Johns Hyde Pk, cutup

Description of site & organ:



Mouthwidth:	1/4.2	1/4.4	1/4.1	1/4.5	1/4.5	1/4	1/4	1/4	1/4	1/4.5
Cutup:	1/3.1	1/2.8	1/3	1/2.9		1/3.2	1/2.7	1/3.3	1/2.7	1/2.1

ACTUAL MEASURE	C	F#	C	F#	C	F#	C	F#	C	F#
Top Diameter:	53	41	31	24.5	19	14.3	10.6	8.3	6.7	6
Diameter at Mouth:										
Mouthwidth:	40	29	23.7	17.2	13.4	11	8.2	6.6	5.3	4.2
Cutup:	12.7	10.2	7.9	6		3.4	3	2	2	2
Metal Thickness:										
Windway:	1.1	.65	.7	.7	.6	.6	.5	.5	.4	.4
Lenguid:										
Body Length: toe Dia	1	1.1	1	1	.9	.9	.9	1	1	.8
Top Note:	7.6	7.3	5.8	5	3.7	3.2	3	3	2.4	2
dB 3pf	81	78.6	79.4	78.7		78	78	77.9	79	81
I	2.96	2.4	2.5	2.7		2.8	2.3	3	1.9	1.34

Source of Data: Material:

NOTES (ears, beards, slots, tuners, voicing etc)

A. B. Batty

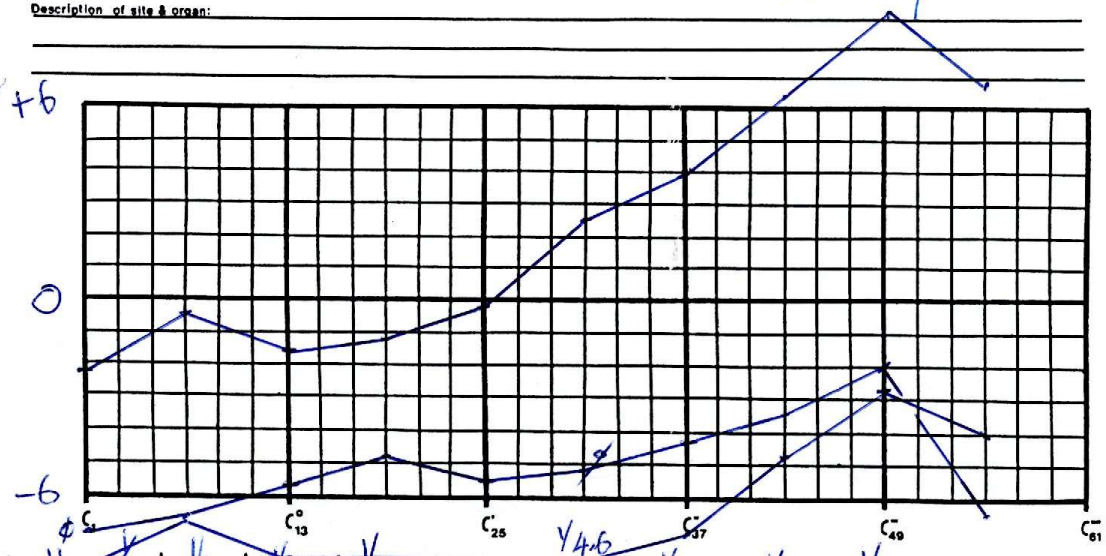
Stop: 2" Great Div.:

Windpressure: Pitch:

Builder: Hill Date:

Church: St John's Hyde Park

Description of site & organ:



Mouthwidth:	1/4.2	1/4	1/4.4	1/4.6	1/4.5		1/4.5	1/4.2	1/4.2		
Cutup:	1/3.1	1/3	1/3	1/3	1/2.8	1/2.5	1/2.5	1/2.5	1/2.4		

ACTUAL MEASURE	C	F#	C	F#	C	F#	C	F#	C	F#
Top Diameter:	41	32	25.5	20.5	15.3	12	9.6	7.7	6.3	4
Diameter at Mouth:										
Mouthwidth:	30.5	25	18	14	10.8	8.2	6.7	5.7	4.8	3.5
Cutup:	9.8	8.2	6	4.7	3.8	3.3	2.7	2.3	2	1.4
Metal Thickness:										
Windway:	.8	.9	.6	.6	.6	5	.5	.3	4	3
Languid:										
Body Length:	1	1	.8	.7	.8	.7	.9	1.0	1	
Top Hole ø	6.7	6	4.2	3	3	2.5	2.8	3	2.6	3.4
1	79	80.5	77.6	77.6	78.1	77.9	79	79	81.8	79.6
2	2.9	2.8	2.6	2.5	2.5	2	2	1.5	1.5	1.7

Source of Data: Material:

NOTES (ears, bearus, slots, tuners, voicing, etc)

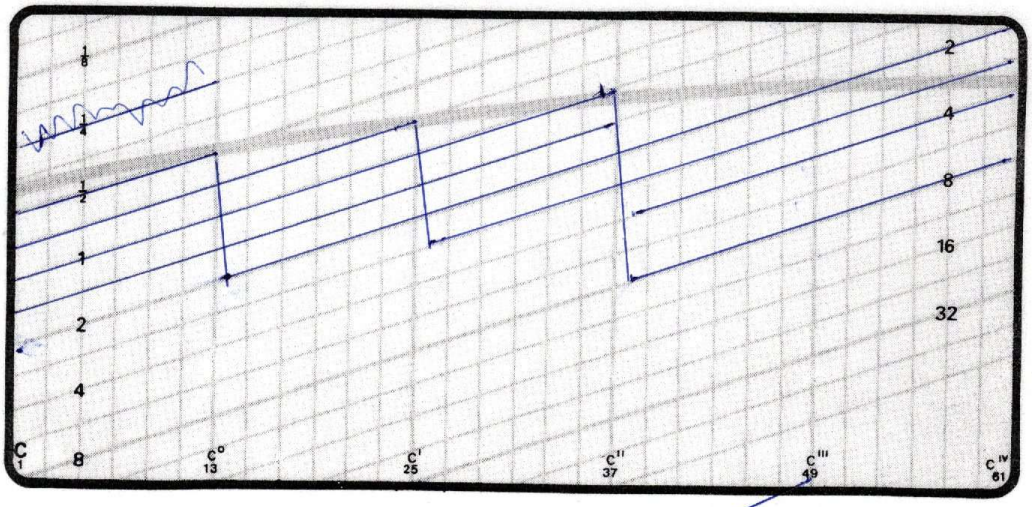
Mixture

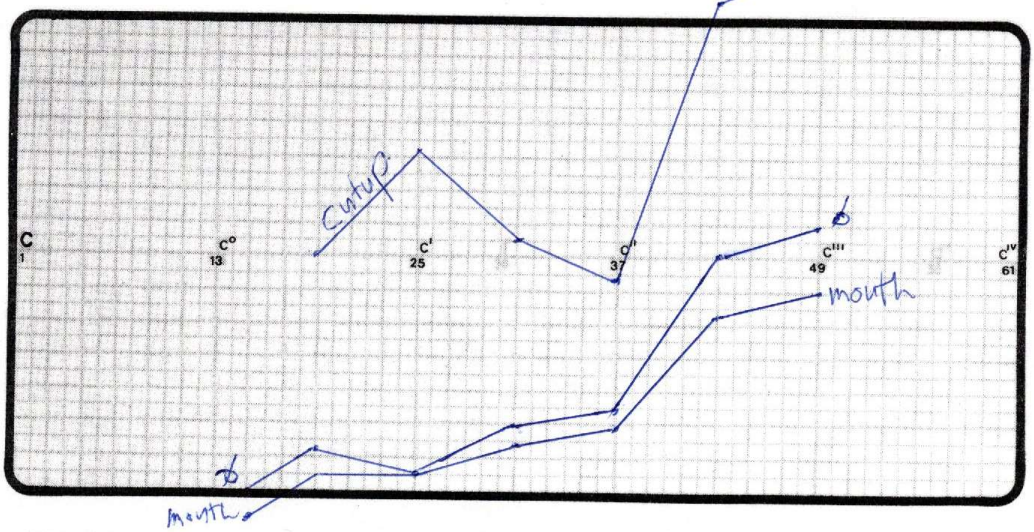
Stop Mixture @ 2' Div Church St Johns Hyde Park

Builder William Hill Opus Year Scale Wind 76 Pa. Seating Area m^2

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

Misc.

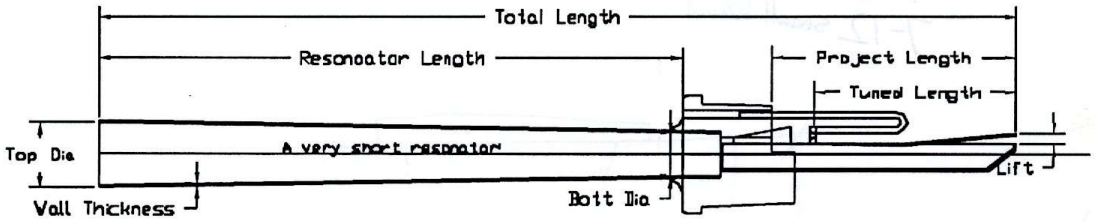




Note		D#4	F#4	F4		F#3	C3		F#2	C2		
Diameter		23	19.7	14.7		12	9.5		9	7.2		
Mouthwidth		17.5	15	11.16		9.3	7.3		6.5	5.2		
Cutup			5	4.4		3	2.2		2.4	2		
Flue		1	.8	.7		.5	.4		.3	.3		
Toe		5	4.8	4.2		3.3	3.3		3.3	3.8		
Foot Pa.												
Foot % Chest Pa.												
Flue % Mouth												
dB.												

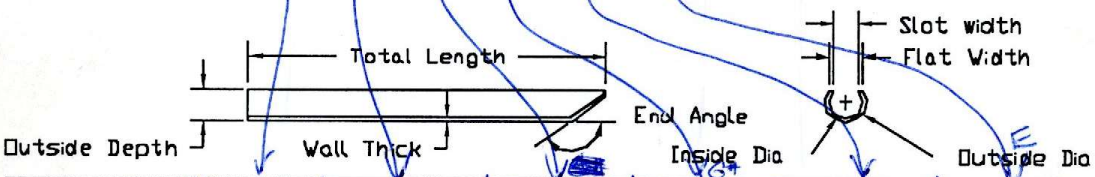
ST Johns Hyde Park
Pedal 16' Trombone
added in 1880 replacing Pedal
4' Octave.
W.P. 70mm, whole organ

Reed Scale Sheet



G# E

General	C	F#	c^0	~~G#~~ ^{0}	c^1	~~F#~~ ^{1}	c^2	$f\#^2$	c3	$f\#^3$	c^4
Resonator Top Dia		185	155	115	104	94					
Resonator Bott Dia			114	12.8	12	12					
Resonator Length			2270	1390	1101	~~1115~~					
Resonator Wall Thick	~~1.6~~	~~1.6~~	1.2/1.5	1.2/1.3	1/1.5	1.1/1.5					
Total Length			2393	1490	1186	936					
Shallot Project Length	155	118	91	74	62	51.3					
Shallot Tuned Length	~~65~~	69.4	56	45	38.7	39					
Tongue Lift	3.8	2.3	2.3	1.7	1.6	1.4					
Toe Hole	34	29	15	12	10.6	9.8					
black ϕ	55	46	40	34.5	32	31.5					
weight felt/lead	16x13x6 14x3	12x12x6 11x4	10/16 9gx2	10x9x3 5x2	8x8x3 4gx1	7x7x3 4gx1					
wire	3	2.6	2.7	2.3	2.3	2.3					



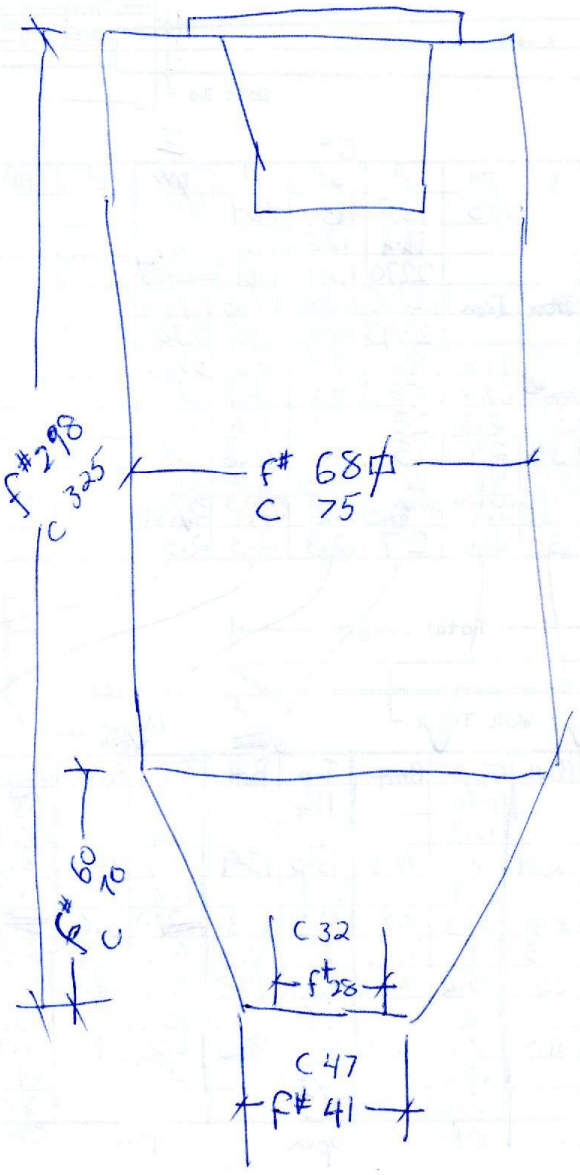
SHALLOT	Top	Bott	Top	Bott	Top	Bott	Top	Bott	Top	Bott	Top	Bott
Total Length	184		140		114		93		80		69	
Inside Diameter	16.6		13.3		11		9.2		8.4		8	
Outside Diameter	20	23.4	16	19.3	13.5	15.9	11.7	13.7	10.7	12.6	10	11.6
Wall Thick	1.5		1.4		1.4		1.2		1.3		.9	
Slot width	5.6	8.5	5.3	7.7	4.3	6.3	~~7.3~~	5.6	~~5.2~~	5.6	4.3	5.7
Flat Width	8.4	11.3	8	10.5	6	8.3	6.2	7.7	6.5	7.7	6.2	7.2
Outside Depth	8.8	22	15.2	7.8	13	14.7	10.7	12.4	9.8	11.3	9	10.6
End Angle	90		90		90		90		90		90	
Tongue Width	8.4	11.8	7.7	10.2	6.4	8.5	6.2	8	5.9	7.6	6.2	7.6
Tongue Thick	.9		.72		.57		.51		.4		.4	
Tongue Length	184		140		113		62		80		685	
Slot length	Open		Open		open		open		Open		open	

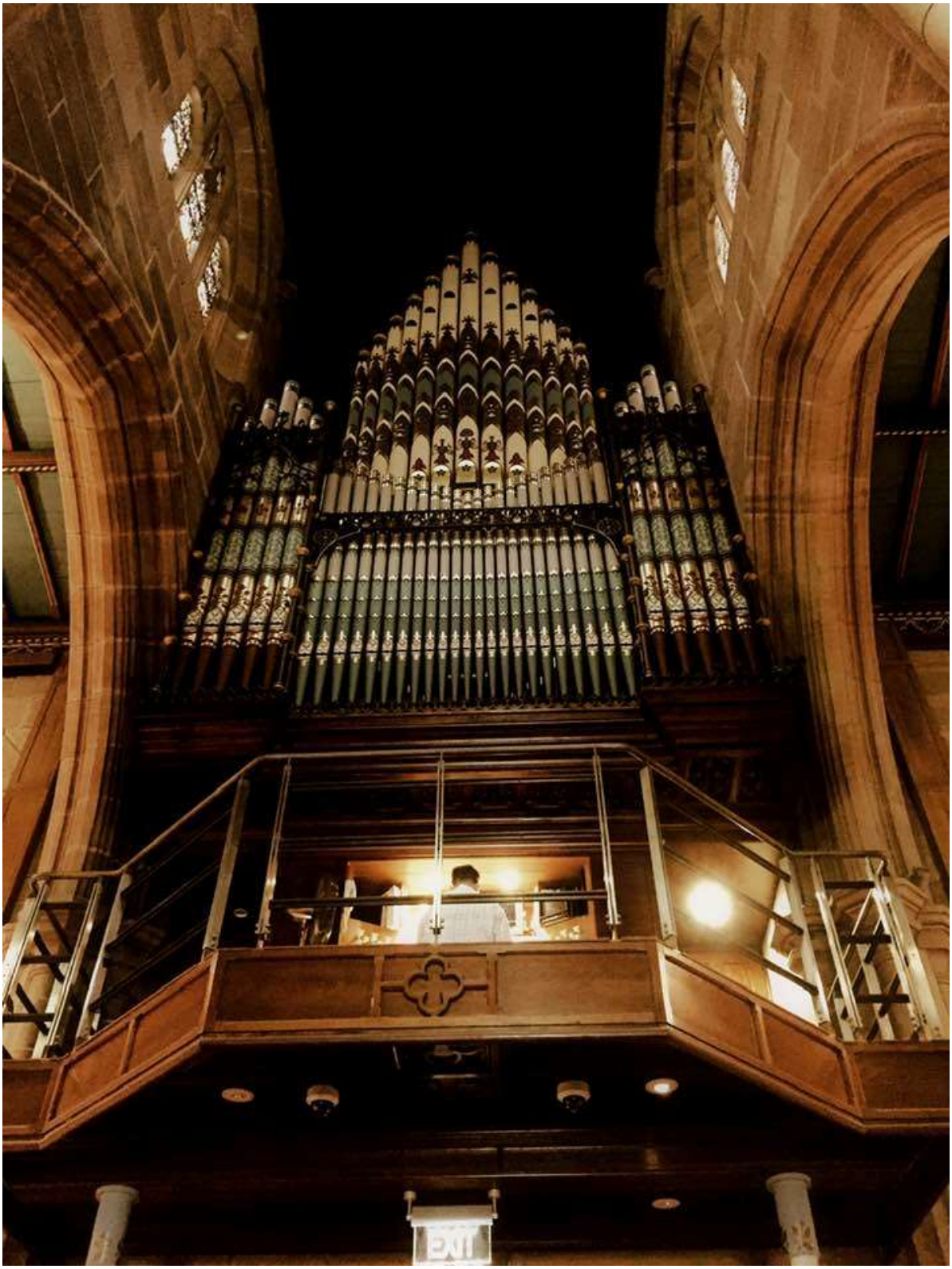
Tongue weight not original

70 Wind

Tuning wires not original

1-6 large wood Boots
7-12 small Wood





St Andrew's Cathedral Sydney, Hill

St Andrew's Cathedral Sydney, Hill

Great

16′	Bourdon
8′	Open Diapason No. 1
8′	Open Diapason No. 2
8′	Stopped Diapason
8′	Spitzflute
4′	Octave
4′	Harmonic Flute
2-2/3′	Twelfth
2′	Fifteenth
1-1/3′	Mixture V
8′	Trumpet
4′	Clarion

Bombarde

16′	Violone
8′	Open Diapason
4′	Principal
2-2/3′	Mixture IV
8′	Grand Cornet V
16′	Bombarde
8′	Bombarde

Swell (expressive)

16′	Bourdon
8′	Open Diapason
8′	Stopped Diapason
8′	Cone Gamba
8′	Voix Celeste
4′	Octave
4′	Suabe Flute
2′	Fifteenth
2′	Mixture IV
2-2/3′	Sesquialtera III
16′	Double Trumpet
8′	Horn
8′	Oboe
8′	Vox Humana
4′	Clarion
	Tremulant

Pedal

32′	Double Open Wood
16′	Open Bass
16′	Violone (Bom)
16′	Subbass
8′	Principal
8′	Violoncello
8′	Bass Flute
4′	Fifteenth
3-1/5′	Mixture III
32′	Contra Trombone
16′	Trombone
8′	Trumpet

Choir

8′	Lieblich Gedackt
8′	Dulciana
8′	Pierced Gamba
4′	Gemshorn
4′	Lieblich Flute
2′	Flautina
8′	Clarionet
Tremulant	

Solo (prepared for)

8′	Harmonic Flute
8′	Viol d'Orchestre
8′	Viol Celeste
8′	Cello
4′	Flute
2′	Piccolo
8′	Trompette
8′	Corno di Bassetto
	Tremulant

Hill & Son 1866, Davidson 1899; Hill, Norman & Beard 1952, Létourneau 1998.

In about 1997 I was able to examine parts of the Sydney Hill organ, while it was being rebuilt in the Létourneau workshop. Evan though this 56 stop tracker has been rebuilt several times, I was able to measure some of the original wooden pipework, as shown below.

Also is a 32' Bourdon from St Johns, Cambridge, courtesy of John Mander.

A. B. Batty

Cutup 12 HT

12-7HT

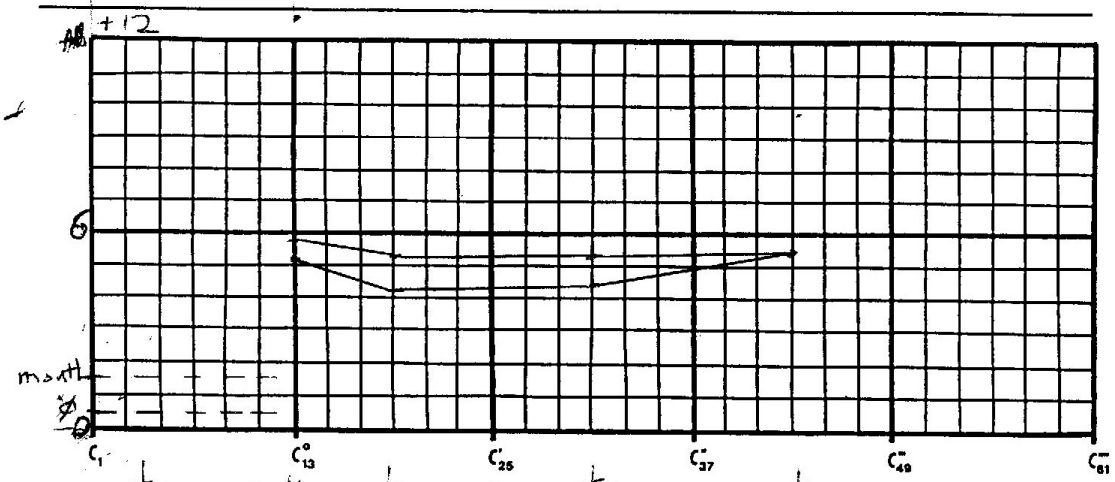
Stop: 32/16' Open Bass Div.: Sutute Ped

Builder: Hill Date: 1866

Windpressure: Pitch:

Church: St ANDREWS CATH Sydney Australia

Description of site & organ:



Mouthwidth:	1/3.8		1/3.9	1/3.8	1/3.8	1/3.9		1/4		
Cutup:	1/2.5		1/3	1/3.1				1/3		

1-12 Stopped

ACTUAL MEASURE 32' 16' f#

Top Diameter:										
Diameter at Mouth:	430		318	234	180	141		87		
Mouthwidth:	370		265	200	154	117		68		
Cutup:	147		89	65				23		
Metal Thickness:	33		28	23				14·5		
Windway:	5		5	3				2·5		
Languid:										
Body Length:										
Toe Hole:										

Source of Data: Material: WOOD

NOTES (ears, bearus, slots, tuners voicing etc)

1-12 stopped

A. B. Batty

Bourd 8'

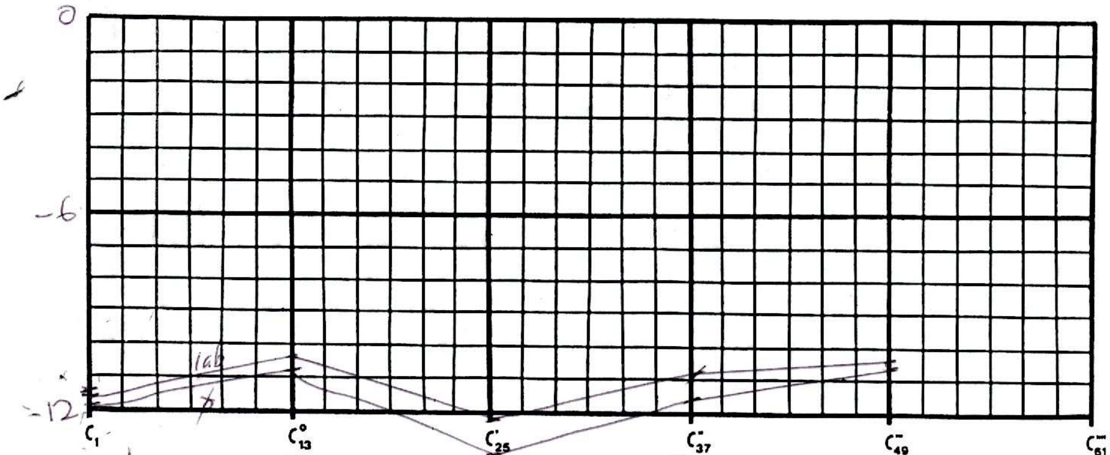
Stop: Bourdon 16'   Div.: ~~Ped?~~ Gt S Same Scale   ~~Hill~~ ~~Sydney~~ ?

Builder: Hill   Date:

Windpressure: Pitch:

Church: St Andrews Cath Sydney Australia

Description of site & organ:



	C1	C13	C25	C37	C49
Mouthwidth:	1/4.1	1/4	1/4.1	1/4.1	1/4
(Gt) Cutup:	1/1.5	1/1.5	1/1.2	1/1.7	1/2

ACTUAL MEASURE

Sw measure

Top Diameter:					
Diameter of Mouth:	162	(96)	56.4	35.1	21
Mouthwidth:	123	(77)	41.3	26.3	16.3
Cutup: (Gt)	81	53	35	15.7	8.2
Metal Thickness: (16 Ped)	93	~~55~~ 58	38.5		
Windway: (8 Ped)	14	56.7	36.7	19.2	
Languid:					
Body Length:					
Toe Hole ø:					

Source of Data: Material:

NOTES (ears, bearus, slots, tuners, voicing etc)

1- ~~sunk~~

The Gt 16, Ped 16 & 8 Bourdons are the same Scale their cutups Shown Seperately

Bourdon 16'

A. B. Batty

Hill

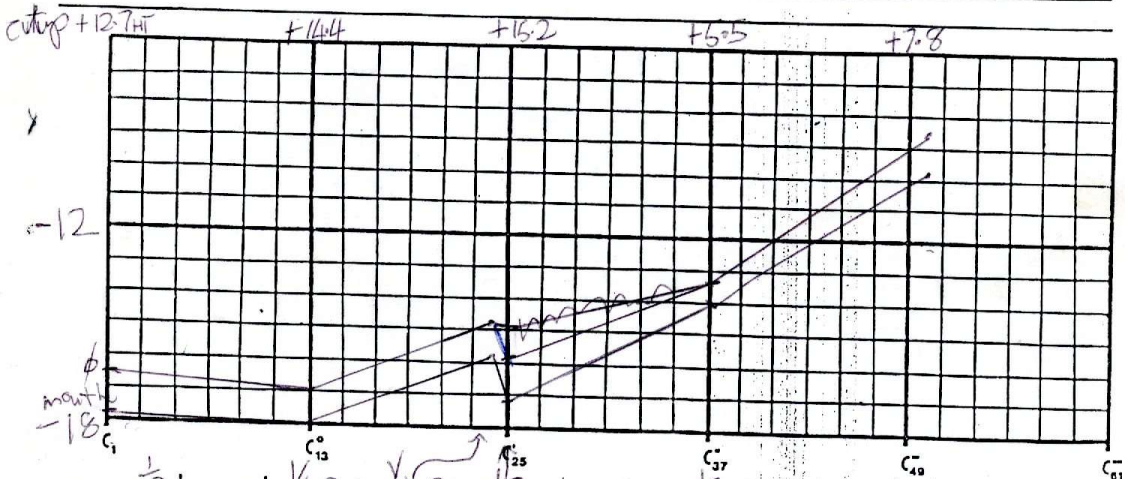
Stop: ~~Tremulant Flute~~ Div.: Swo

Builder: Hill Sydney ? Date: 1866

Windpressure: Pitch:

Church: St Andrews Cath Sydney

Description of site & organ:



Mouthwidth:	4.2		4.2	4.2	4.4		4.1		4.3	
Cutup:	1.1		1	1	1		1.7		1.9	

ACTUAL MEASURE

B Marked Probably lost → C# (C missing)

Top Diameter:										
Diameter at Mouth:	136		78	54	49		32		23	
Mouthwidth:	95		56	37.5	34.5		23.5		16	
Cutup:	89		57	38	35		13.7		8.6	
Metal Thickness:										
Windway:	3		1.3	1.3	1.5		1.2		1.2	
Languid:	30		25	17	—		+2		1	
Body Length:										
Toe Hole #:										

Sink-Block

Source of Data: Material:

NOTES (ears, bearus, slots, tungs, voicing, etc)

Box Board 1 – 12
Sunk blocks 1 – 24
flat block 25 – 36
raised block 37 –

A. B. Batty

Stop: Viehlich Gedackt 8' Div.: Ch

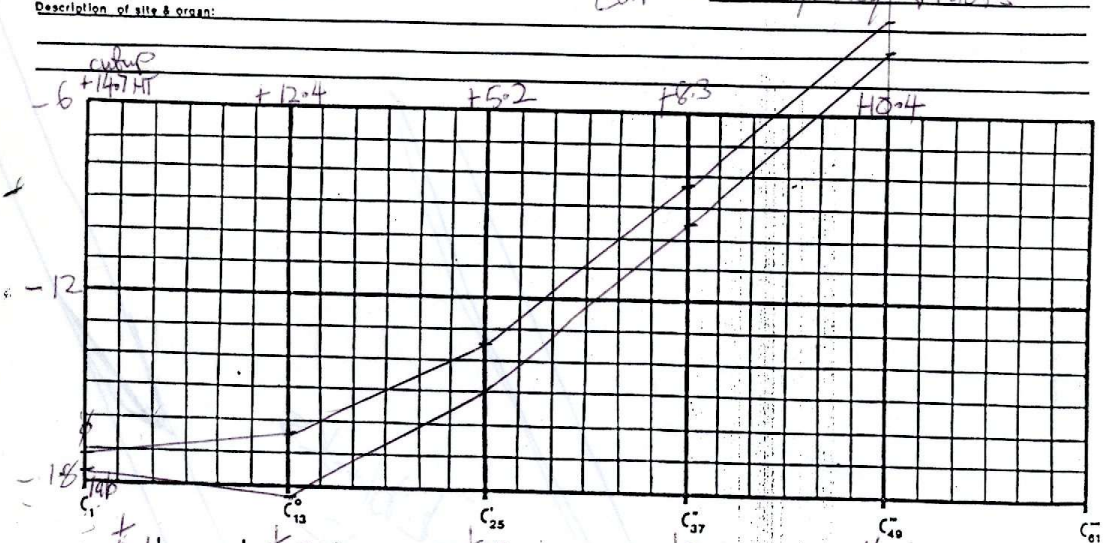
Windpressure: Pitch:

Description of site & organ:

St Andrews Cath.

Builder: Hill Date: 1866

Church: Sydney Aust.



Mouthwidth:	+ 4.1		+ 4.03		+ 4.03		+ 4.02		+ 4.2	
Cutup:	+ 1		+ 10		+ 1.7		+ 1.8		+ 2.2	

ACTUAL MEASURE

Top Diameter:										
Diameter at Mouth:	76		49		33		24		18	
Mouthwidth:	57		33		22.5		17		13	
Cutup:	57.6		31		13.5		9.2		6	
Metal Thickness:	12									
Block: Stock:	20		1		1.2		1.2		1	
Length:			0							
Body Length:										
Toe Hole #:	Rohr				7X 88		6X 80		—	

Source of Data:

Material: Pine, Caps & block face mahog.

NOTES (bars, bearers, slots, tongues, voicing, etc)

usual 2 in treble

St John's College, Cambridge – The Chapel Organ

by Ian Bell (of N P Mander Ltd)

In January of this year, the St John's chapel organ was entirely dismantled and the spacious organ-chamber completely cleared for the first time in over a century. The instrument was originally built by William Hill, in consultation with Walmisley, in 1839, and was enlarged and transferred to the newly-finished Scott chapel in 1869. The casework, by J Oldrid Scott, was added in 1889, and the organ received further attention from Norman & Beard in 1902 and Messrs Harrison in 1921.

The 1869 organ had been a very complete three-manual, including a large independent pedal section, and on paper the stoplist changed little until 1956, when the mechanism was converted to electro-pneumatic operation by Hill, Norman & Beard, and the tonal scheme was extensively re-worked in consultation with George Guest. This adventurous and imaginative project involved surprisingly little completely new material, but relied largely upon reconstruction and transposition of existing pipework. An enclosed Solo Organ was added, largely based around ranks from the former Choir Organ, but including the most obvious of the completely new additions – the short-compass horizontal Trompeta Real.

The result was a vigorous and characterful organ – undoubtedly one of the most successful rebuilds of the time, but inevitably compromised in some degree by the chequered history of the material involved, and by the exploratory and uncertain rationale common to most work of the period. The project was one which helped point the way forward, but in having done so inevitably became eclipsed in some degree by that which came later. It was perhaps equally inevitable that, given the enviable reputation of the St John's choir, the organ became better known through its rôle in choral accompaniment than as a solo instrument.

Minor alterations during the 1970s left the basic concept unaltered. By the late 1980s the key and console mechanisms were beginning to show the effects of over 30 years' very hard use, and this prompted a review of the future of the instrument. A committee was formed which included Dr George Guest and Dr Nicholas Thistlethwaite, the consultant for the project and eminent authority on Hill's work. Advice was also offered by several distinguished musicians from St John's impressive list of former organ scholars. In 1991 N P Mander Ltd were appointed as organbuilders; by this time Dr George Guest had retired as College Organist, to be replaced by Mr Christopher Robinson, who has worked with the organbuilders and Dr Thistlethwaite in the design of the new organ presently under construction.

It was clear from the beginning that major mechanical work was necessary; much of the action dated from 1902 or earlier, and the pipework stood on the much-modified 1869 soundboards. It was decided that new soundboards and mechanism were essential, and under such circumstances the opportunity to return to tracker action was both attractive and practicable. The new organ therefore has mechanical action throughout, except for the 1956 Trompeta Real which retains its electric chest. The drawstops are also mechanical, but are additionally fitted with solenoids to allow the provision of a comprehensive range of pistons.

The broad tonal style of the old instrument – particularly of the earlier work – was found well-suited to choral and congregational accompaniment, and it was accepted by all concerned that this should have a major influence on the character of the new organ. However, the very poor condition of some of the pipework, and the later revoicing of much of it for wind-pressures higher than would be ideal with tracker action, raised many questions. After detailed examination of the pipes both before and after dismantling, some 16 ranks have been retained – principally on the Pedal and Swell. The remainder of the instrument is new, including new burnished tin display pipes for the slightly re-modelled Scott casework.

The organ will remain in the wide chamber, high on the North side of the chapel, but will be arranged with the four manual divisions within the Western case, and the Pedal and Trompeta Real to the East. The new Choir section will be positioned immediately above the console, within the mock 'chaire' case which will be deepened slightly to contain it. Each half of the organ case will be completed with panelling to the sides, rear and top. The self-regulating tracker action will incorporate fine cedar trackers and hardwood squares and levers, and the winding system will include eight traditional leathered reservoirs.

Completion is expected by the end of 1993, and the stoplist will then be:–

	Great Organ	
1.	Double Open Diapason	16
2.	Open Diapason I	8
3.	Open Diapason II	8
4.	Stopped Diapason	8
5.	Principal	4
6.	Gemshorn	4
7.	Wald Flute	4
8.	Twelfth	2⅔
9.	Fifteenth	2
10.	Flageolet	2
11.	Full Mixture	III
12.	Sharp Mixture	III
13.	Mounted Cornet	V
14.	Trumpet	8
15.	Clarion	4

	Choir Organ	
1.	Open Diapason	8
2.	Gedackt	8
3.	Gamba	8
4.	Principal	4
5.	Flute	4
6.	Nazard	2⅔
7.	Fifteenth	2
8.	Flautina	2
9.	Tierce	1⅗
10.	Mixture	II-III
11.	Cremona	8

	Solo Organ	
	enclosed	
1.	Viola da Gamba	8
2.	Viola Celeste	8
3.	Hohl Flute	8
4.	Flauto Traverso	4
5.	Corno di Bassetto	8
6.	Cor Anglais	8
	unenclosed	
7.	Tuba Mirabilis	8
8.	Trompeta Real	8

	Swell Organ	
1.	Bourdon	16
2.	Open Diapason	8
3.	Rohr Gedeckt	8
4.	Salicional	8
5.	Voix Celeste	8
6.	Principal	4
7.	Stopped Flute	4
8.	Fifteenth	2
9.	Sesquialtera	II
10.	Mixture	IV
11.	Oboe	8
12.	Vox Humana	8
13.	Double Trumpet	16
14.	Cornopean	8
15.	Clarion	4

	Pedal Organ	
1.	Subbass	32
2.	Open Diapason Wood	16
3.	Open Diapason Metal	16
4.	Dulciana	16
5.	Bourdon (ext. 32)	16
6.	Principal	8
7.	Gedackt	8
8.	Fifteenth	4
9.	Flute	4
10.	Mixture	IV
11.	Contra Trombone	32
12.	Ophicleide	16
13.	Fagotto	16
14.	Posaune	8
15.	Clarion	4

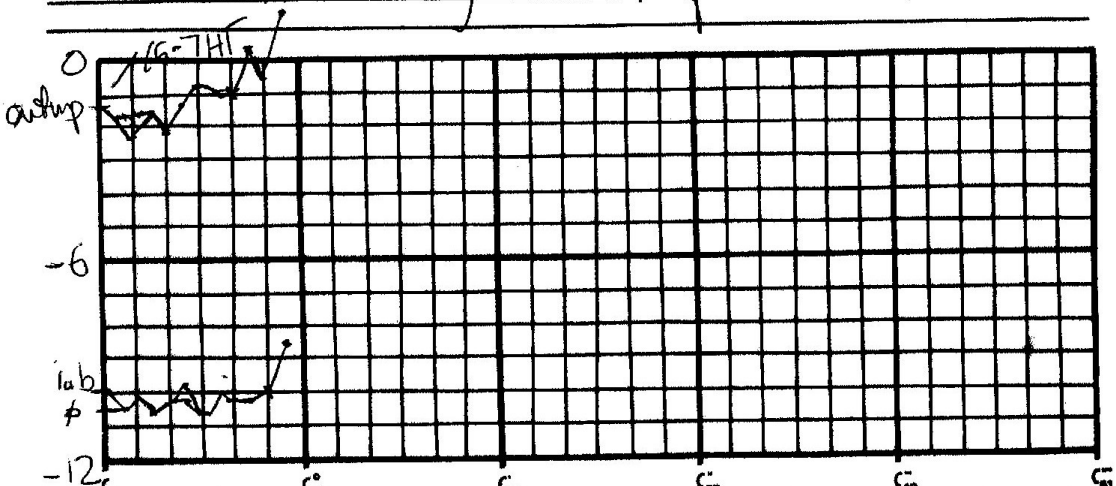
A. B. Batty

Stop: Subbass 32 Div: ext 16' Builder: Hill Date:

Windpressure: Pitch: Church: St Johns Cambridge

Description of site & scene:

measured by Michael of Manuden c/o John Manuden



Mouthwidth:	1/3.9	1/4	1/4	1/4	1/4	1/4.1	1/4	1/4.1	1/4	1/4	1/4	1/4
Cutup:	1/1.3	1/1.2	1/1.3	1/1.2	1/1.3	1/1.2	1/1.2	1/1.2	1/1.2	1/1.2	1/1.2	1/1.2

ACTUAL MEASURE

	C	C#	D	D#	E	F	F#	G	G#	A	A#	B
Toe Diameter:												
Diameter at Mouth:	275	265	255	246	238	225	215	210	200	190	180	185
Mouthwidth:	225	210	205	193	187	178	168	163	157	150	145	135
Cutup:	178	175	157	155	146	144	140	133	128	130	120	115
Wood Metal Thickness:	30	30	28	28	28	24	24	22	22	20	20	18
Windway:	5	5	5	4.5	4	4	3.5	3.5	3	3	3	3
Lenguid:												
Body Length:	5150	4930	4660	4350	4120	3920	3680	3485	3260	3085	2910	2755
Toe Hole #:												

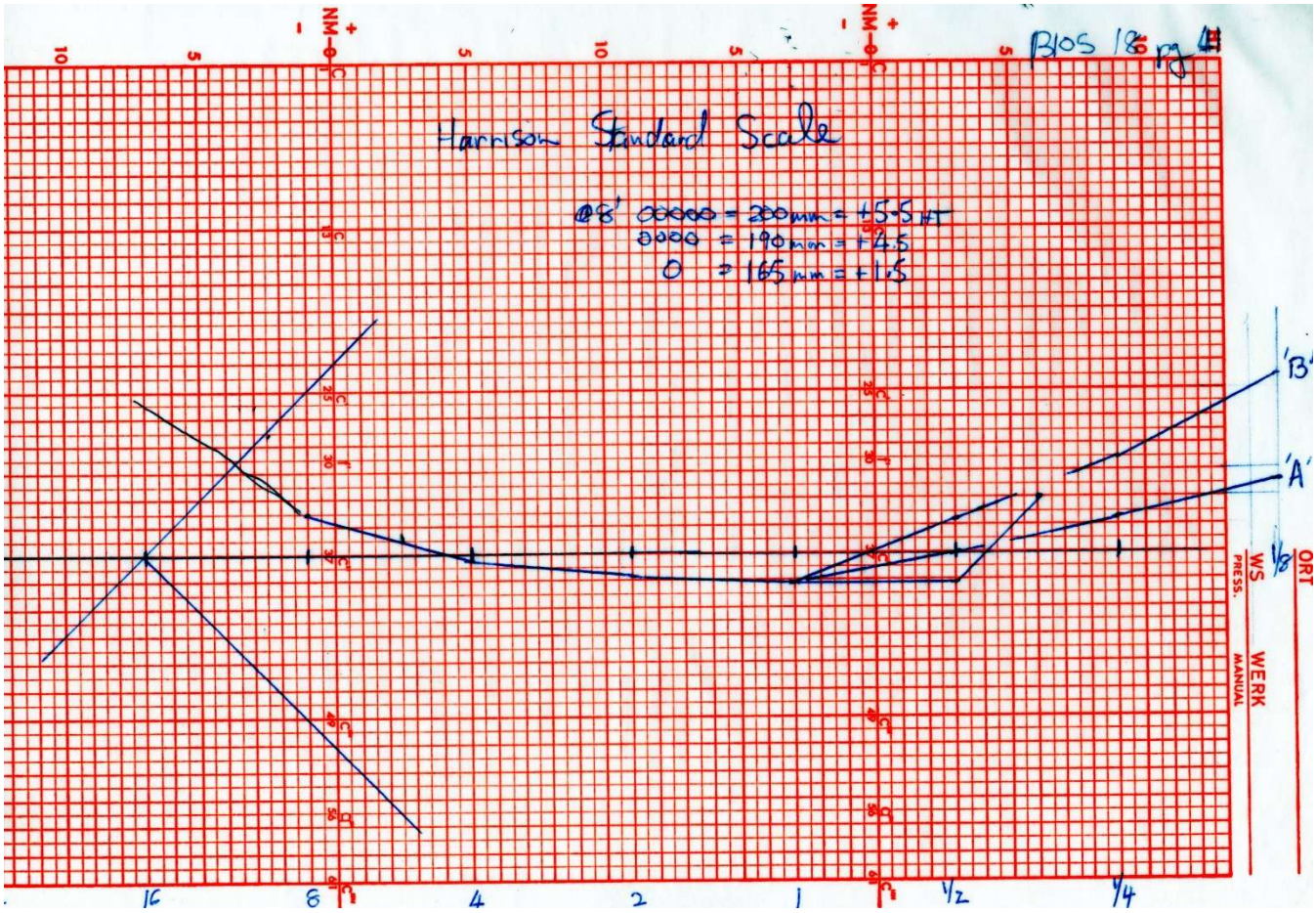
Source of Data: , Material:

NOTES (pars, bearers, slots, tuners, voicing, etc)

C - F# 5" wind
G - B 3½

Harrison

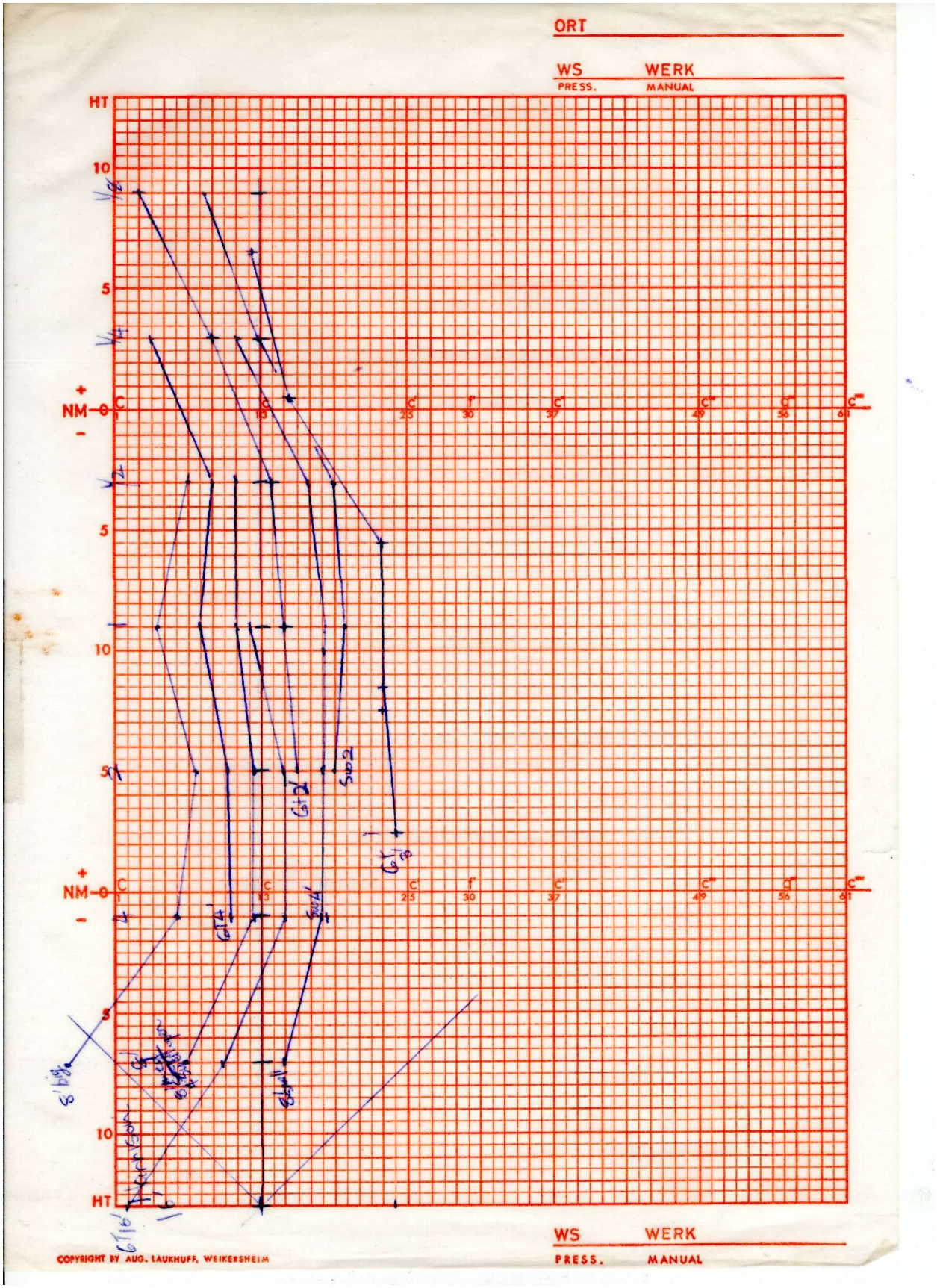
Thomas Harrison has worked as an apprentice for Willis, in the 1850's. He adapted Willis's method of a standard scale the grew fatter into the bass, and also into the treble, similar to Dom Bedoes, but not so strongly. Harrison's scale was about two pipes bigger than Willis', and followed a different curve.



Harrison's standard scale followed the French practice of being a curve on a Topfer normmeasure chart.

He transposed it by halftones to get the scale of various ranks. Published bottom C's, given in books to represent scales, often gave huge values. These huge bottom C's are explained by the fact the scale grew into the bass. The scale growth in the treble allowed him to use narrow upperwork which would grow in the treble, as it should in large and reverberant rooms.

Other ranks had special scales. Typical wind pressure is 3', 75mm.


ORT
WS WERK
PRESS. MANUAL
HT
10
5
+
NM 0
-
C
C'
f'
C''
g''
C'''
WS WERK
PRESS. MANUAL
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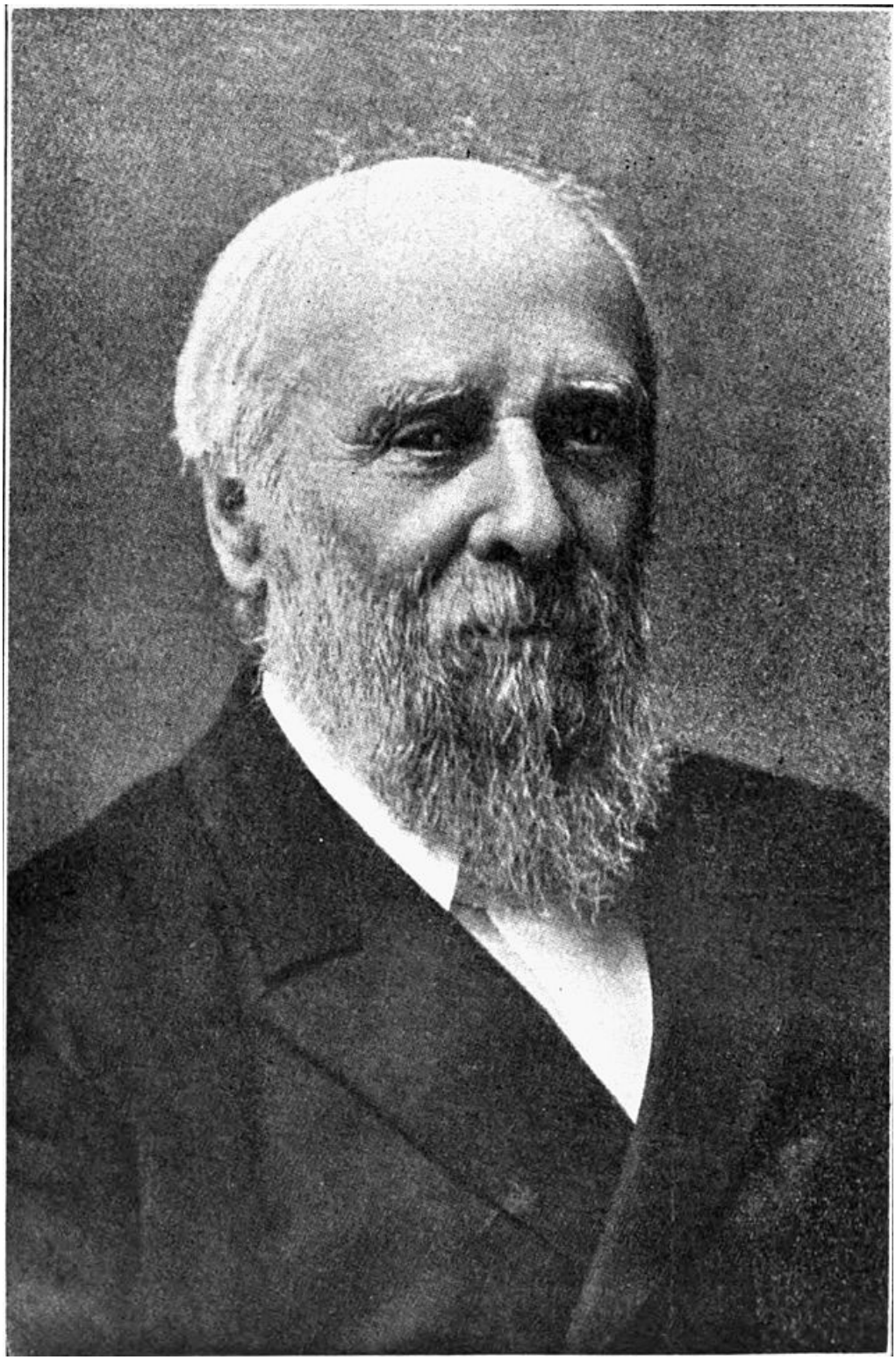


Father Henry Willis

The Willis Organ Co

The Willis firm started in the mid-19th century, and still exists today. When they started, they were innovative and while they were quick to adapt new ideas, foreign and domestic, they had their own ideas about pipe construction, voicing, scaling and reeds. This soon solidified into the Willis company's idiosyncratic style, which was then conservatively kept for generations.

It is said that organ builder's sons seldom inherit their father's organ building genes. The Willis dynasty proved not to be the exception to the rule. After Father Willis died about 1900, the son, grandson and great grandson each in turn ran the company. And each in turn made the company a little worse. Many of their mechanical and tonal changes were not improvements.

One bright spot was when the Willis firm absorbed the Lewis firm. This fresh shot of organ building DNA resulted a spat of better organs, such as the Westminster Cathedral in London. But because of the economic decline of the two world wars and loss of plunder from the colonies, the boom years of organ building of the 19th century never returned. In recent years, under the leadership of David Wyld, the Willis firm has made a remarkable comeback in reputation, building new organs and restoring old Willis organs.

The interesting period of the company for me, is of Father Willis. His organs had dignified, powerful reeds, clean bright choruses, powerful basses and colourful liebliches. It was a unique and characteristic collection of sounds that work well together. Though not perhaps to today's tastes.

I've made authentic copies of some Willis stops and put them in organs. They sound just like the originals. Unfortunately, they didn't fit with the rest of the organ and I was forced to revoice them to blend in with the rest of the organ. Willis organs are an integrated system, and you can't just adapt bits and pieces; except perhaps the reeds.

The trumpets are well worth copying! I learned reed voicing at Giesecke; a Willis reed is a very different animal. I've taken good romantic Canadian Trumpets *(with Willis style shallots)* and revoiced them with new tongues, Willis style and method, with success.

The later Willis organs are much less interesting, due to a lack of leadership and perhaps finances. The end of this essay is basically a literature search. Unfortunately, books mostly talk of the period of Willis 3 & 4. One must be careful, Messrs. Willis 3 & 4 have sometimes said misleading things. I don't know if they were trying to protect proprietary secrets, they were lying, or simply didn't know. I've talked with Willis IV and it was impressive how clever he thought he was (Dunning-Kruger effect).

I made several organ crawl trips to England in about 1996. This text includes notes and pipe measurements of several Willis organs: Union Chapel in Islington, Greater London, and The Father Willis, 1863, at St. Peter and St. Paul Anglican Parish Church, Essex, Foxearth.

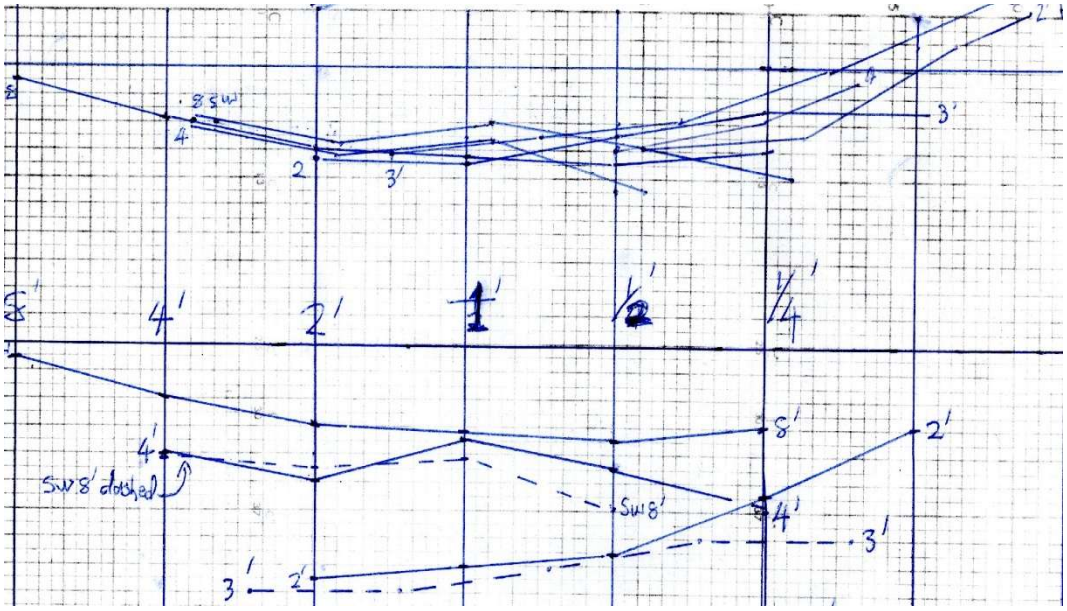
Some pipes and stops were inaccessible. At Union Chapel, I only had time for the reeds (and a couple of other things), but the reeds were my main interest.

Father Willis visited France in 1848 and 1849, met Cavaille-Coll and noted the Frenchman's Harmonic Flutes and Harmonic Trumpets. Willis's organ in the 1851 Great Exhibition launched his success. Though his stop list was conservative, organists were attracted by the voicing of the reeds and his many new patent mechanical devices. His use of 2/9 mouths, and slotted basses, narrow stopped flutes (liebliches) and higher wind pressures for reeds, are characteristic of his work.

Willis Scales

Diapasons: The Normalmensur chart below, is of the chorus of a couple of 1870's Willis organs. Note that on this graph, the horizontal scale relates to the pitch of the pipes, so all of the 2' pipes line up vertically, making it easy to compare scales with each other).

The lower part of the graph shows the scales. The upper part of the graph shows the scales shifted so that they overlap each other, exposing the original curve.



The curved line hints at French curve; though it isn't as strong. Some people judge the scale of the stop by measuring the biggest pipe, bottom "C". Because the scale grows in the bottom octave, you can be fooled into thinking the scale is bigger than it really is. Also, Fifteenth ranks start very narrow, but because they grow into the treble they are a bigger scale than the bottom "C" would suggest.

The big pipes of the Open are often used in the façade. Caution should be used if measuring them, because the scales are often exaggerated for visual reasons.

Lieblichs: have its own scale that grow strongly into the treble. It comes as small, medium and large options; each step a couple of pipes bigger.

Harmonic Flutes, Stopped Diapasons and Claribels also have their own scales.

Pitch: Old organs were seldom A:440, even if the examined organ is today. You need to be aware of the original pitch and how/if they changed it to A:440. This was often done by cutting pipes shorter, or adding a new bottom "C". Of course, this will change the sound of the pipes and confuse scale graphs. Father Willis would have tuned to Old Philharmonic pitch: 540 at C (A:454 Hz).

My Topfer graphs of Willis pipes are done as if the pitch was A-440; I haven't allowed for pitch corrections.

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15 May 1996

Mr Blair Batty
Blair Batty & Associates, Inc
PO Box 740
375 Second Avenue, West
Simcoe
Ontario N3Y 4T2
Canada

b/O7

Dear Mr Batty

Thank you for your letter of 3 May last.

The genius of Father Willis is not to be found in his scaling method, which though particular to him, did not differ greatly from other methods of those times. Just to emphasize the point, many builders in England in the last century believed that they had found the Holy Grail when they were in possession of Schultze's scales. Few of them were in possession of his methods. Those that did understand them adapted them for their own use. Although there were many Schultze followers here - one even employing a ex Schultze voicer - not one of them achieved the unadulterated Schultze effect, although the most illustrious disciple, TC Lewis, did successfully adapt the system for his own use.

You rightly remark on Willis' consistency. This he achieved by systematizing the scaling and the voicing, even to the extent that the tip hole sizes in the pipes were standardized. The pipes were not voiced on the machine. They were voiced on the bench and then tried and regulated on the machine. He set the Cs and his voicers reproduced the settings in the remainder of the stop.

When you listen to a genuine untouched Willis, rather than measure the pipes, listen first to the powers within the ranks between bass and treble and then between the ranks themselves. When examining the pipes, look first at the mouth widths and note the narrow mouths of the upperwork. Look also at the special treatment of the lower lip; this method of punched dubbing was devised by him after the bought in pipes for the 1854 St George's Hall Liverpool instrument failed to deliver exactly what he wanted. Feel also the weight of the pipes. Even in my days at Willis', a rank of pipes was weighed and recorded after manufacture. Modern pipes tend to be thinner and less substantial because of the lower pressures. But to get the fundamental effect of the Willis style, the pipes must be strong enough to contain the sounds they generate without any harmonic distortion caused by the undue vibrations of thin walls with particular frequencies.

As for the actual scaling system, there was an Open scale and a Lieblich scale; Harmonic Flutes and Claribels had their own scales. The Open and Lieblich scaling ran from 4ft C. In the case of the Lieblichs there were standard scaled

basses ranging from a scaled wooded bass for the manual Gedackts to the pedal Bourdon basses. Open basses were often on the fronts and the diameters there were more architectural than organic, but for other basses, the system continued down on a cutting board.

The system consisted of a list some 85 diameters identified by numbers running from 000, the largest to 30, the smallest, the numbers series recommencing every thirteenth note. If an Open Diapason was a number 4 one merely read the diameter against 4 in the 8ft column (150.8 mm), against 4 in 4ft column (87.3) and 4 in the 2ft column (50.8), and so on. If the Open was 4 then the Principal was likely to be 6 (138.1 at CC) and the Fifteenth 9 (41.3 at CC), indicating the Principal was two notes smaller than the Open and the Fifteenth three notes smaller than the Principal. If fact, one did not read any numbers, but cut the bodies to width in accordance with the iron plates on the 'Dulcimer'. Harrison & Harrison had a similar scheme, may be because the two Harrison sons were trained at Willis'.

Provided one applies the Willis mouth, metal and voicing treatment, the same effects can be achieved by using the normal, or seventeenth halving, scale.

For modern application, I think it is true to say that because the method is a complete system, there is no satisfaction in a partial operation, or worse, including a Willis Diapason into a stop-list that otherwise follows different methods.

I am also inclined to think that we hear differently to day. We listen with a broad brush, and we are far less interested in the constituent elements than the final effect. The time spent on the finishing in those days was very great. It is possible to find near transparent slithers of wood in the stopping the Willis wooden stops that could not make a difference to our ears, but plainly must have to our predecessors.

Which leads me on to remark that Willis devised his methods to suit the requirements of his times, and he adjusted them to suit changing fashion. I do not know about Canada, but here very different fashions hold sway now. Willis is greatly admired for what he was and what he did. Many churches still accompany worship on unaltered Willis instruments to the complete satisfaction of the player and listener alike. But where a new instrument is concerned, that style seems to be furthest from the minds of those considering the new creation. When I do now have occasion to resort to that aspect of my training, it is not the method I apply but the understanding of how the method worked.

No doubt we shall meet in July

Yours sincerely

Bruce Buchanan

Director

Willis vs Hills Reeds- Stephen Bicknell

It is unlikely that the Willis family had any insight into how Hill had achieved his results, and the reed voicing of the two firms remained different in every respect until the 1920s. Hill used open shallots, little or no loading, and exceptionally large tube scales (6" or 150mm at 8' C); a Willis tuba from the period 1867 - 1900 would have closed shallots, heavily weighted tongues, and narrower tubes. The tone in the treble would be not entirely dissimilar, but the the bass of an early Hill Tuba would be prompter, louder, brassier and more trumpet-like; the bass of a Willis tuba slower, darker, throttled and more horn-like *(for my taste they honk)*.

Essex, Foxearth, St. Peter and St. Paul Anglican Parish Church

Father Willis, 1863

This is a Willis Model organ, with an En fenêtre type console, drawstops with ivory inserts. Console has flat jambs, with sliding doors forming part of case. The pedalboard is radiating concave, C to f1, 30 keys. There are 3 combination pedals. Photos and Info from NPOR, and the Swell is enclosed. I visited it in 1996 with David Fostick, and we carefully studied the scales and voicing of much of the pipework. A few stops/pipes were inaccessible.

Pedal

16’	Bourdon	

Great

8’	Open Diapason	#5
8’	Stopped Diapason	
8’	Clarabella	
8’	Dulciana	#13
4’	Principal	#9
4’	Harmonic Flute	
2’	Fifteenth	#10
8’	Corno di Bassetto	

Swell

8’ Open Diapason
8’ Stopped Diapason
4’ Principal
8’ Cornopean

Couplers

Great to Pedal
Swell to Great
Swell to Pedal
Accessories

A. B. Batty

#5

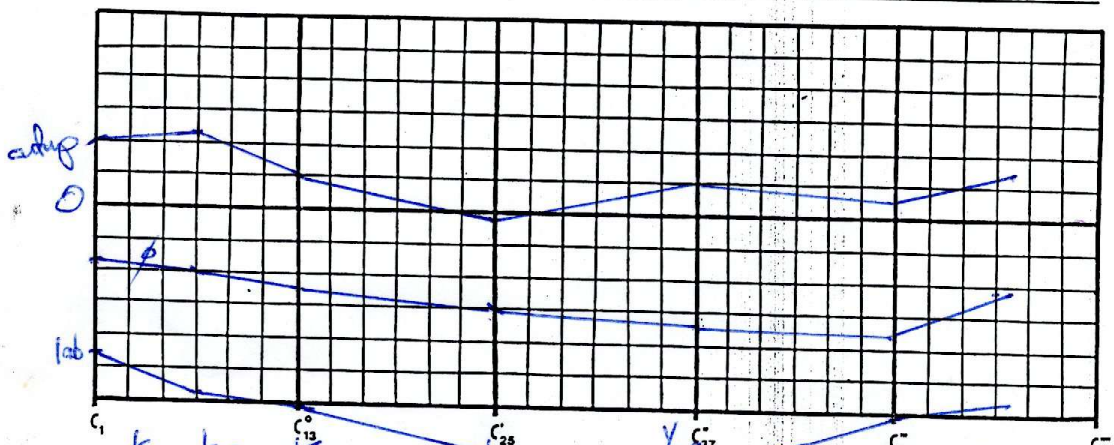
Stop: Open 8' Div.: GT

Windpressure: 68 mm Pitch:

Builder: Willis Date:

Church: Foxearth

Description of site & organ:



Mouthwidth:	1/4.5	1/4.7	1/4.7	1/4.9	1/4.9		1/4.5	1/4.7
Cutup:	1/3	1/2.8	1/2.9	1/2.9	1/2.7		1/3	1/2.9

ACTUAL MEASURE

Top Diameter:	109.8						g
Diameter at Mouth:	[illegible]	83.4	48.2	28.2	16.7	13.1	
Mouthwidth: 100	73.6	55.7	31	18.2	11.7	8.8	
Cutup: 33.3	26	19	10.7	6.7	3.9	3	
Metal Thickness: 3	1.7						
Windway:	2	1.7	1.5	1.5	1.2	1.1	
foot Pressure: [illegible]	240	230	270	300	280		
Body Length:							
Toe Hole:	16.2	12	7.3	6.1	4	3.7	
3pf dB 83.7	83.2	82.3	80.9	81			
I 1.9	1.9	2.2	2.5	2.5			

Source of Data: Material:

NOTES (ears, bearus, slots tuners voicing etc)

(Bass Shared w/ Claribel)

A. B. Batty

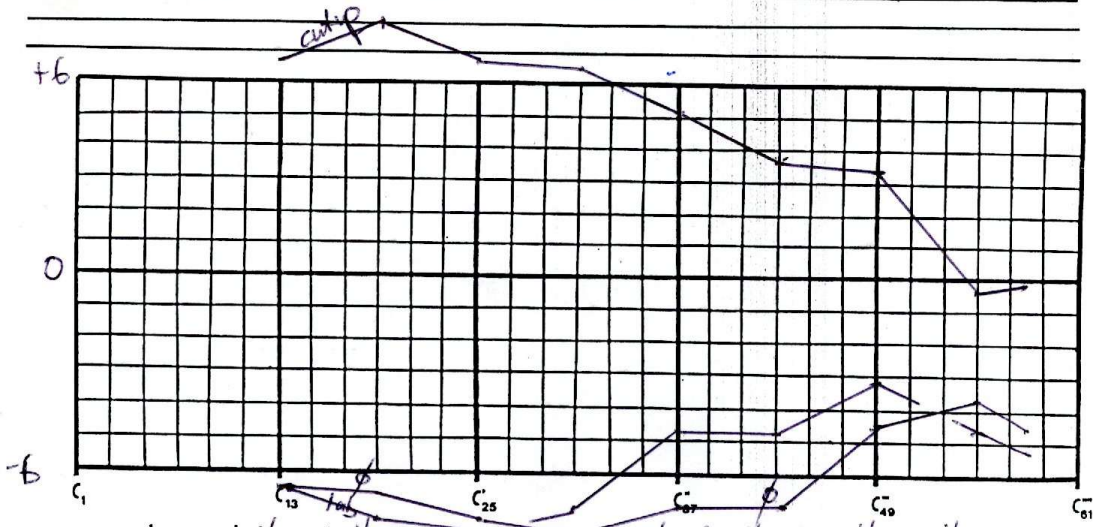
Stop: STOPPED Diap 8' TC Div.: GT

Windpressure: Pitch:

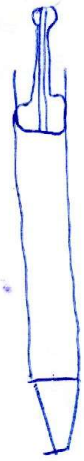
Description of site & organ:

Builder: Date:

Church: Union Chapel



Mouthwidth:		1/4	1/4.2	1/4.1	1/3.9	1/3.6	1/3.7	1/3.8	1/4.2	
Cutup:		1/2.3	1/2	1/2.1	1/2.2	1/2.6	1/2.8	1/3	1/3.3	



ACTUAL MEASURE

									f#	g
Chimney length		197	200	143	107	77	61	52	40	25.3
Chimney Toe Diameter:		10.5	7.7	7.2	6.3	6	5	4.2	3.7	3.4
Diameter at Mouth:		70	~~53.5~~	40	30.3	24.3	18.7	16	12.7	10.3
Mouthwidth:		55	~~40.5~~	31	24.6	21	16	13.3	9.6	8.3
Cutup:		24.3	19.9	14.5	11	8	5.8	4.4	2.9	2.6
Metal Thickness:		1.2	1.0	0.8	0.8	0.7	0.7	0.6	0.5	0.7
Windway:		1.3	1.2	1.0	1.1	0.7	0.6	0.6	0.5	0.4
Languid:										
Body Length:		641	475	344	251	176	135	93.2	64	54
Toe Hole ø:		3.3	7.2	5.7	5	4	3.7	4	4.8	4.7

Source of Data: Material: heavy Spott

NOTES (ears, beards, slots, tuners, voicing, etc)

ears

Willis dubbing of lower lip

flatted upper lip.

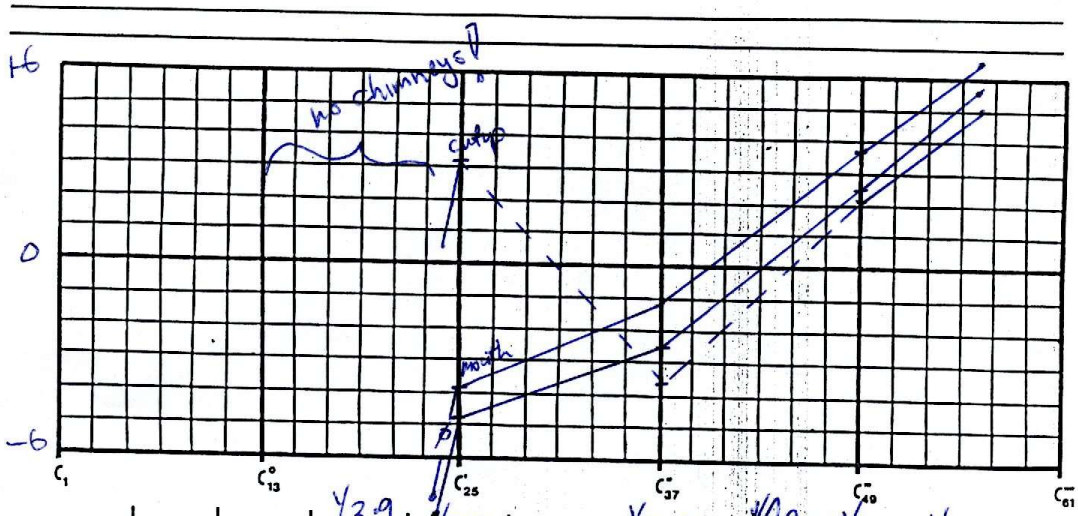
fine nicks every 4 mm on languid + lower lip, not lined up

A. B. Batty

Stop: Claribel Div.: GT Builder: Willis Date:

Windpressure: Pitch: High Willis Church: Foxearth

Description of site & organ:



Mouthwidth:			1/3.9	1/3.8		1/3.8		1/3.8	1/3.9
Cutup:			1/3	1/2.9		1/4.5		1/4.8	1/4.3

ACTUAL MEASURE

C stop'T B open g

Top Diameter:			98x82						
Diameter at Mouth:			40	42.8		27.6		20.4	17.7
Mouthwidth:			32.6	36.4		24.5		18	15
Cutup:			11	12.4		5.6		4.2	3.5
Wood Thickness:			6.5	7		5.6		5	4.7
Windway:			1	1		.8		.5	.5
Languid:									
Body Length:			323	548		252		113	67.2
Toe Hole ø:									
			1.5	1.5		1		.4	.4
cap			65	57.5		57.5		57	57

Source of Data: Material:

NOTES (scars, bearus, slots, tuners, voicing, etc) lots of close nix in cap only

#13

A. B. Batty

Stop: ~~Fox~~ Dulciana 8'TC Div.: GT

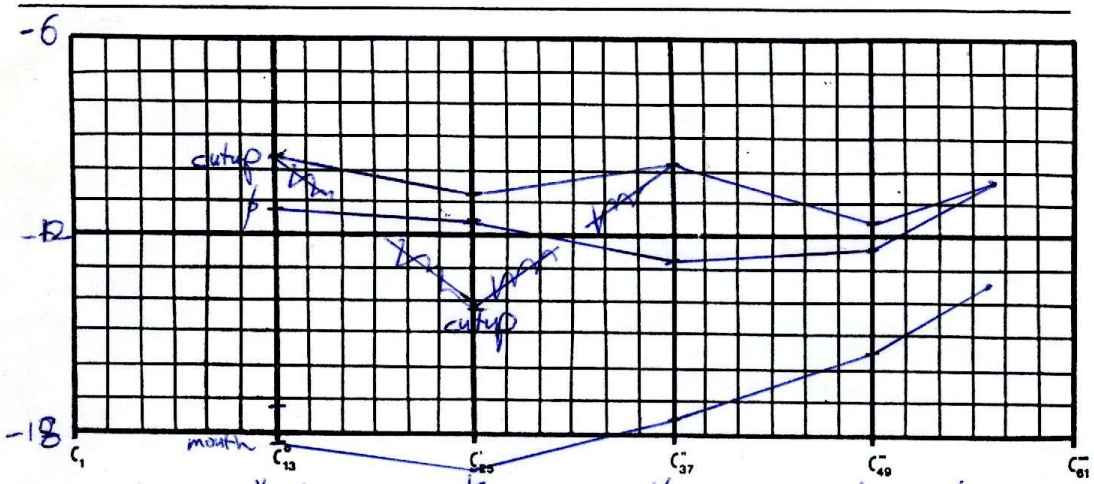
Builder: Willis I

Windpressure: 68mm Pitch:

Church: Foxearth

Date:

Description of site & organ:



Mouthwidth:		5·4		5·6		4·9	4·6	4·6
Cutup:		2·8		3·2		2·9	3·4	3·5

ACTUAL MEASURE

g#

Top Diameter:							
Diameter at Mouth:		57		33·3		18·8	11·4	9·2
Mouthwidth:		33		18·8		12	7·8	6·3
Cutup:		12		6·8		4·2	2·3	1·8
Metal Thickness:								
Windway:		1·3		1·4		1·1	1	·5
Languid:								
Body Length:								
Top Hole ø:		5·5		3·8		2·3	1·7	1·4

Source of Data:

Material: Spotted Metal (Heavy)

NOTES (ears, bearus, slots, tuners, voicing, etc) ears to C37, sharp (scythed) upper lips

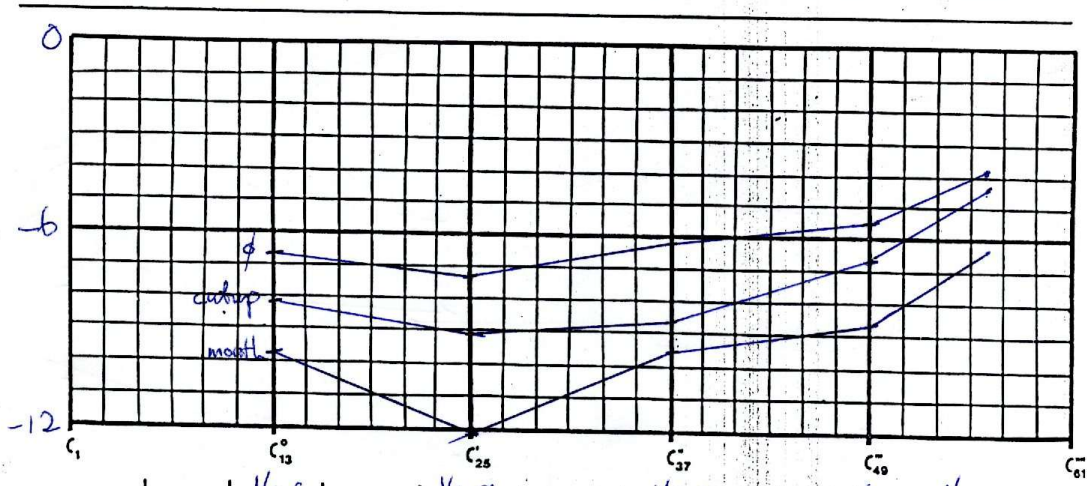
A. B. Batty

#9 Principal

Stop: ~~Octave~~ 4 Div. 6+ Builder: Willis I Date:

Windpressure: Pitch: Church: Foxearth

Description of site & organ:



Mouthwidth:		1/4.6		1/4.9		1/4.6		1/4.6	1/4.4	
Cutup:		1/2.6		1/2.7		1/3		1/2.8	1/2.8	

ACTUAL MEASURE

8.56

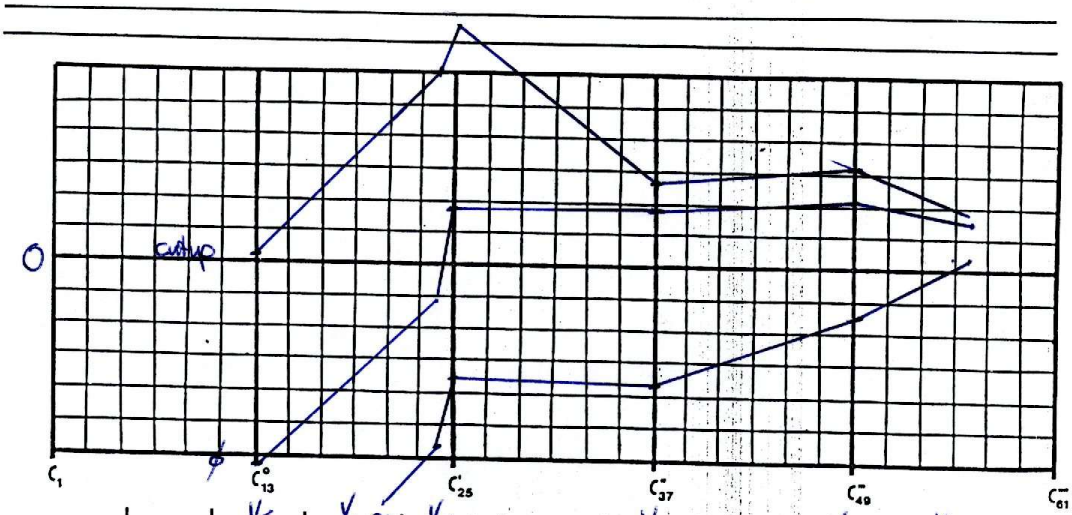
Top Diameter:										
Diameter at Mouth: 70		41.1		23.8		14.9		9.1	7.2	
Mouthwidth:		28.2		15.2		10.1		6.2	5.1	
Cutup:		9.8		5.6		3.4		2.2	1.8	
Metal Thickness:										
Windway:		1.6		1.4		.8		.6	.4	
Languid:										
Body Length:										
Toe Hole:		6.2		4.4		3.3		2.2	2.1	

Source of Data: Material:

NOTES (bars, beards, slots, tuners, voicing, etc)

A. B. Batty

Stop: Harmonic flute 4' Div.: GT
Windpressure: 63 mm Pitch: High Willis!
Builder: Willis I Date:
Church: Foxearth
Description of site & organ:



Mouthwidth:		1/5	1/4.8	1/5.1		1/5.1		1/4.7	1/4.2
Cutup:		1/2.4	1/2.4	1/2.5		1/2.8		1/3.3	1/3.8

ACTUAL MEASURE mouth ✓ B & C Harmonic

Top Diameter:								
Diameter at Mouth:	42	32.5	35.5	21		12.7	9.1	
Mouthwidth:	26.6	21.2	22	13		8.5	6.8	
Cutup:	11	8.7	8.9	5		2.6	1.8	
Metal Thickness:								
Windway:	1.5	1.5	.5	.4		.3	.3	
hole to languid			252	123		61	41	
Body Length:			571	278		140	92	
Toe Hole ø:	5.8	5.2	5.4	3.8		2.5	2.9	
bore hole			2.3	1.4		1.3	.6	

Source of Data: Material:
NOTES (bars, bearus, slots, tuners, voicing, etc) bars to 37

#10

A. B. Batty

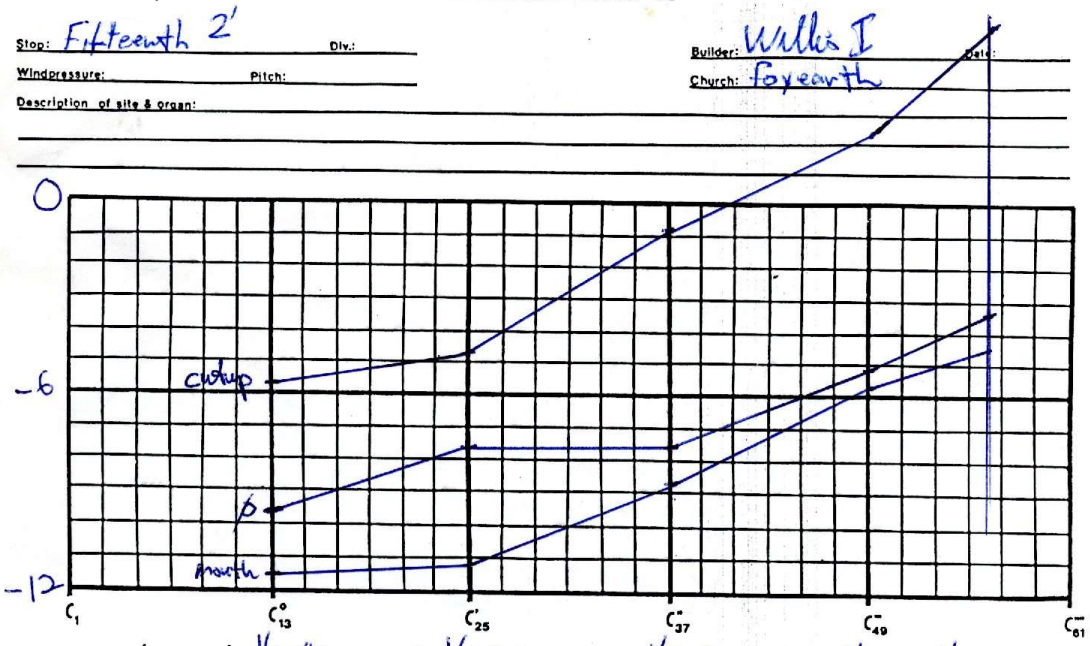
Stop: Fifteenth 2' Div.:

Windpressure: Pitch:

Description of site & organ:

Builder: Willis I Date:

Church: Foxearth



Mouthwidth:			1/4·4			1/4·6			1/4·3		1/4·1	1/4·2
Cutup:			1/3·1			1/3			1/2·8		1/2·8	1/2·8

ACTUAL MEASURE

g"

Top Diameter:												
Diameter at Mouth:			21·5			13·9			8·4		5·5	4·4
Mouthwidth:			15·5			9·4			6·2		4·2	3·3
Cutup:			5			3·1			2·2		1·5	1·3
Metal Thickness:			~~1·5~~									
Windway:			1·5			1·5			·8		·4	·3
Lenguid:												
Body Length:												
Toe Hole ø:			3·9			2·9			2		1·8	1·8

Source of Data: Material:

NOTES (ears, bearus, slots, tuners, voicing, etc) Sharp upps. Up -ears 1-12 ?

Fr Willis, Corno di Bassetto 8'

Stop: Gt Corno di Bassetto 8'			Church: St Peter & St Paul, Foxearth, Essex						Wind: 73mm	
General	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$	c3	$f\#^3$
Tongue										
Lift at free end										
Tuned length										
Total tongue length										
Width (small end)										
Width (big end)										
Thickness										
Weights										
Weight Description:										
Resonator										
Top Diameter Inside			32		28		25		22.5	
Bottom Dia (outside)			12		11		10.5		11	
Mitre "A"			44		40		26		20	
Mitre "B"			53		30		27		25	
Resonator Wall Thick			1		1					
Cone length			69		49		38.5		28	
Cylinder length			592		291		132		54	
Total resonator length			661		340		171		82	
Shallot										
Shallot Project Length										
Total length										
Inside Dia (small end)										
Outside Dia (small end)										
Inside Dia (big end)										
Outside Dia (big end)			12		9.5		8		7	
Shallot wall thickness										
Slot Width (small end)										
Slot Width (big end)										
Slot Length										
Flat Width (small end)										
Flat width (big end)										
Outside Depth (small)										
Outside Depth (big)										
Misc Data										
Boot Toe Hole										
Boot length										
Block Dia										
Total Length										

File: scales\trump9 August 11, 1996

Fr Willis Cornopean 8'

Stop: Sw Cornopean 8'			Church:St Peter & St Paul, Foxearth, Essex						Wind: 73 mm	
Notes: Willis high pitch! Bottom C probably 3-1/2" scale										
Notes	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$	c3	a^3
Tongue										
Lift at free end	1.5		1		.5		.5			
Tuned length	53		41		21		13.5		7	
Total tongue length	93		60		47.5		40		26	
Width (small end)	2				2		2		2	
Width (big end)	8.5				5.5		4.5		4	
Thickness	.55		.42		.28		.18		.12	
Weights										
Weight Description: None										
Resonator										
Top Diameter Inside					56		50		47	
Bottom Dia (outside)	16.5		13		10		10		10	
Resonator Length					512		243		111	
Mitre "A"										
Mitre "B"										
Resonator Wall Thick	1.5		1		1		1		.8	
Shallot										
Shallot Project Length	74		48.5		33.5		26		14.5	
Total length	91		60		45		36		26	
Inside Dia (small end)	7.5		6		4.5		3.5		3.5	
Outside Dia (small end)	10		8		6.5		5.5		5.5	
Inside Dia (big end)	13.5		10		7.5		6		5	
Outside Dia (big end)	16		12		9.5		8		7	
Shallot wall thickness	1.25		1		1		1		1	
Slot Width (small end)	1.5		1		1.25		1.25		1.25	
Slot Width (big end)	6.5		4.5		3.75		3.5		3	
Slot Length	31		20.5		15		12.5		9.5	
Flat Width (small end)	2.5		2		2		2		2	
Flat width (big end)	7.5		6.5		5.5		4		4	
Outside Depth (small)	10.5		8		6		6.5		5.25	
Outside Depth (big)	15		11		8.75		12		6.25	
Misc Data										
Boot Toe Hole	10		8.5		6		5.5		5	
Boot length	180		170		157		157		150	
Block Dia	36		29		25		25		23	
Total Length										

 August 11, 1996 File: \scales\trump10.chp

A. B. Batty

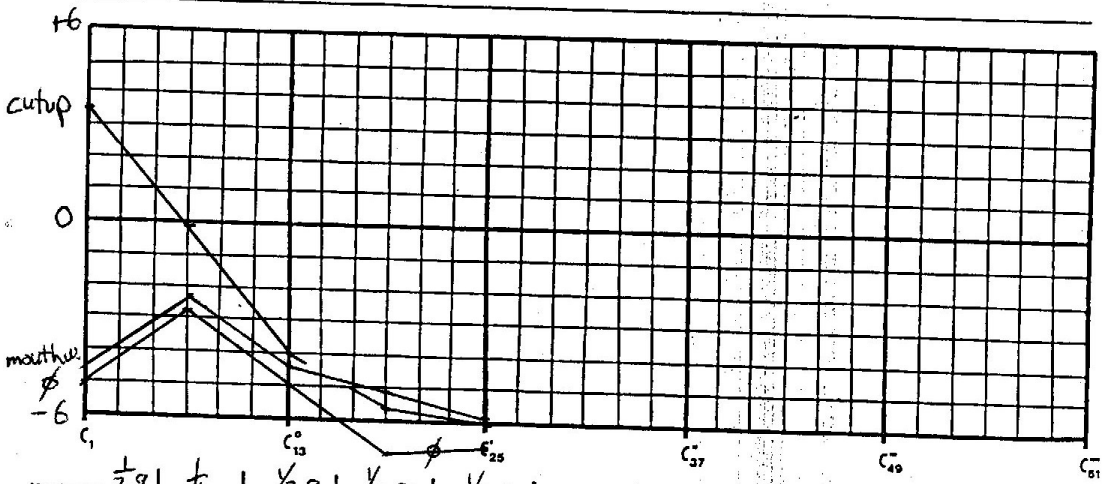
Stop: Bourdon 16' Div.: Ped

Windpressure: Pitch:

Builder: Willis I Date: 1863

Church: Foxearth, Essex

Description of site & organ:



Mouthwidth:	1/3.9	1/4	1/3.9	1/3.8	1/3.9					
Cutup:	1/2.8	1/3.7	1/4	1/4	1/4					

ACTUAL MEASURE

Top Diameter:										
depth 204 Diameter at Mouth:	178	122.3	84	67.5						
Mouthwidth: 170	143	101	74.8	56.5						
Cutup: 60	39	25.5	18.5	14						
Metal Thickness: 4	3	3	2	2						
Windway: 2	1.5	3	1	1						
Length: 290	320	130	250							
Body Length:										
Toe Hole ø:										
85	84	83	79							
1.8	2.3	2.7	2.5							

heck above cap

lind pressure in foot (Pa)

18 3pf) I)

Source of Data: Material:

NOTES (ears, beards, slots, tuners, voicing, etc)

Sharp upper lip. Cutups by pipemaker.
Lots of nicks, blacks only.

Union Chapel, Greater London, Islington

Henry Willis & Sons, 1877

The Console is attached with large, ivory labeled drawstops and angled jambs. It has a radiating, concave Pedalboard. The Great and pedal key action are compressed air Barker lever. The rest of the organ is tracker. The Stop action is mechanical. Compass starts at C and has 58 notes (pedal is 30 notes).

The pipe metal was a very poor alloy, being mostly lead. It had about 6% tin. Over 2% antimony was added. Antimony is bad: it may stiffen the pipe, but it also makes the metal creepy *(i.e. cold-flow collapse)*. Most of the organ was 3-1/2" wind, But: Choir was 3", Swell and Great reeds 7", and pedal reed 10" *(my measure)*. The Choir was not originally in a box. Gt trumpets smoother than Swell Trumpets.

Because I had limited time, I could only measure the reeds and some of the Flutes. But the reeds were what I was most interested in. The Clarabel Flute is like a Stopped Diapason, w/o stoppers.

Pedal

16’	Open Diapason	Wood
16’	Open Diapason	Metal
16’	Bourdon	
8’	Principal	
16’	Ophicleide	12" wind

Choir

8’	Lieblich Gedact	
8’	Claribel Flute	bass grooved to Lieblich Gedact
8’	Dulciana	
8’	Viol d'Amore sic	
4’	Concert Flute	
4’	Lieblich Flöte	
4’	Piccolo	1946, originally Gemshorn 4
8’	Corno di Bassetto	
	Tremulant	

Great

16’	Double Open Diapason	stopped bass
8’	Open Diapason	
8’	Stopped Diapason	
8’	Claribel Flute	grooved to Stopped Diapason
8’	Flauto Dolce	
4’	Principal	
4’	Flute Harmonique	
2-2/3’	Twelfth	
2’	Fifteenth	
iii	Mixture III	17.19.22
8’	Trumpet	
4’	Clarion	

Swell

16’	Contra Gamba	stopped bass
8’	Open Diapason	
8’	Lieblich Gedact	
8’	Salcional (sic)	
8’	Vox Angelica	
4’	Gemshorn	
4’	Lieblich Flote	
III	Mixture	17.19.22
8’	Trumpet	
8’	Oboe	
8’	Vox Humana	
4’	Clarion	
	Tremulant	

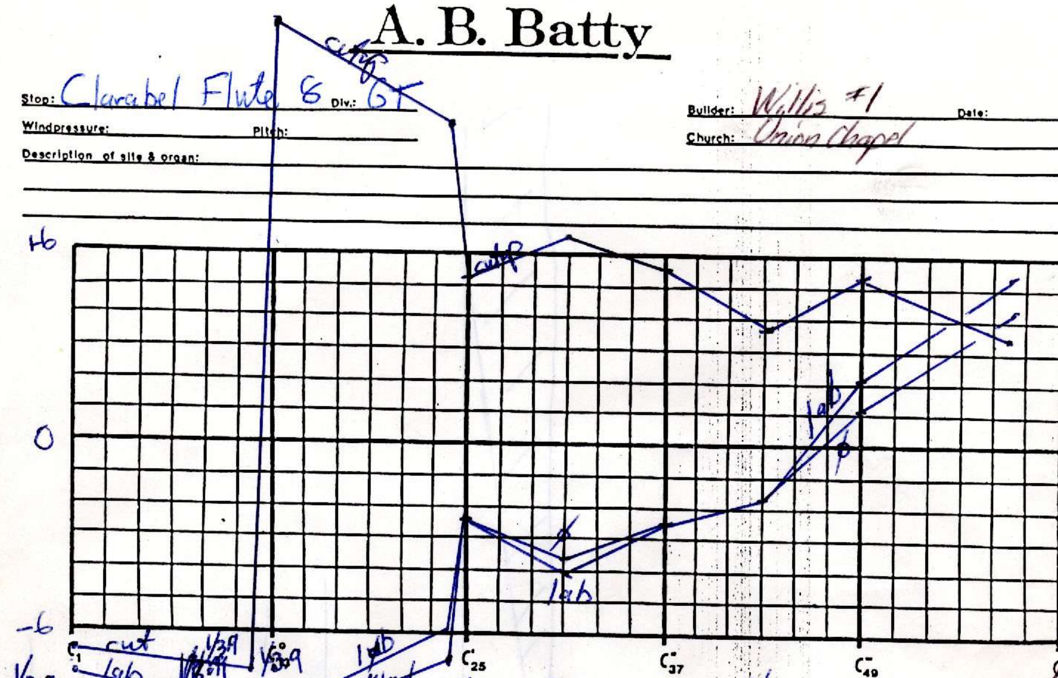
Couplers: Swell to Pedal, Swell to Great, Choir to Great, Choir to Pedal, Great to Pedal

A. B. Batty

Stop: Clarabel Flute 8 Div.: GT Builder: Willis #1 Date:

Windpressure: Pitch: Church: Union Chapel

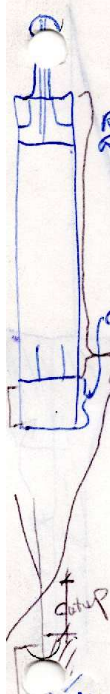
Description of site & organ:



Mouthwidth: 1/3.9				1/4	1/4	1/4	1/4	1/3.8	1/3.8	
Cutup: 1/3.9	1/3.8	1/1.4		1/2.9	1/2.5	1/2.8	1/3.2	1/3.5	1/4.3	

Stopped ← Chimney ←→ Open

ACTUAL MEASURE	B	C	B							A
Rohr length [illegible]		257	133							
Rohr Top Diameter: [illegible]		117	117							
depth Diameter of Mouth: 107.3	63.4	60.7	40.5	50	36.5	29.5	23.4	19.5		15
Mouthwidth: 89.7	53.5	49	34.7	39	28	23	18.4	16.7		13
Cutup: 23	14	24.3	17.8	13.5	11	8.2	5.8	4.8		3
wood Metal Thickness: 15.3	13.7	11	9.5	10.5	9	9	6.1	5.5		4.7
Windway: 1.3	1.3	1.3	1	1.5	1.2	1.2	1.0	0.8		0.8
Cap length Languid: 95	83	77	76	63.5	64	64	64	64.4		63
Body Length: 1165	628	631	346	520	356	247	168	116		58
Cap below lang. Toe Hole Ø: [illegible]	2.5	3.2	3.0	2	2	1.8	1.5	1.5		1.2
2.8										
[illegible]										



Source of Data:

Material: mahogany caps + blocks pine bodies

NOTES (ears, bearus, slots, tuners, voicing, etc)

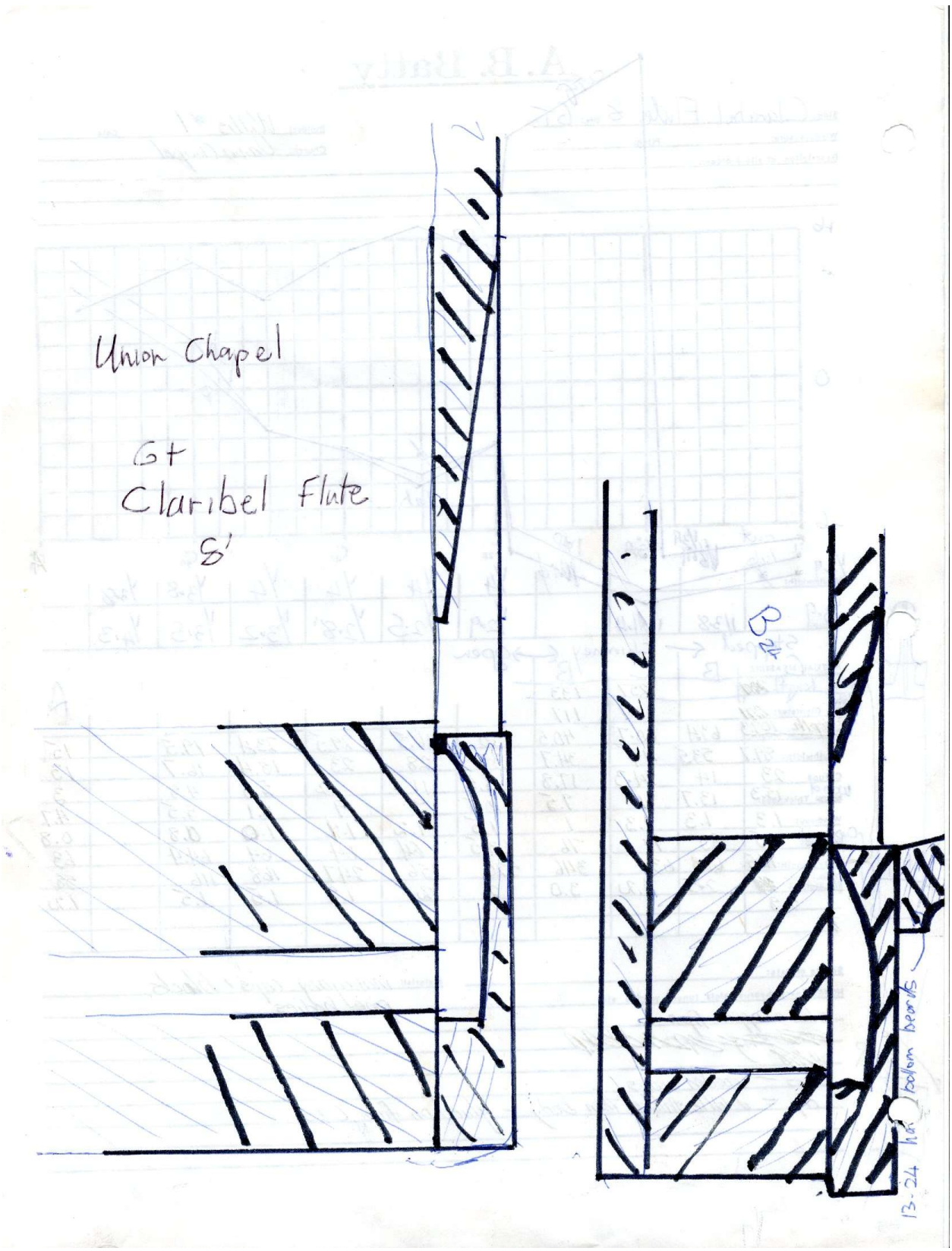
sharp upper lips

~~mahogany caps + blocks~~

~~[illegible]~~

toes — wooden wedges

cap = a little thicker than body — glued on from C25


Union Chapel
Gt
Claribel Flute
8'
B42
13-24 Bottom Boards

(Bass Shared w/ Claribel)

A. B. Batty

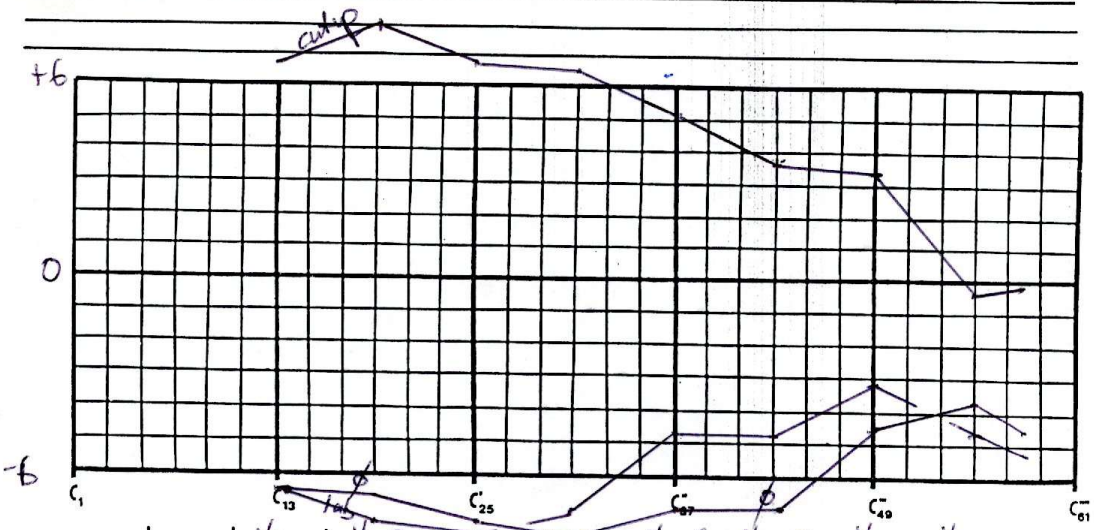
Stop: STOPPED Diap 8' TC. Div.: GT

Windpressure: Pitch:

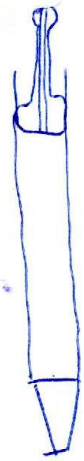
Builder: Date:

Church: Union Chapel

Description of site & organ:



Mouthwidth:		1/4	1/4·2	1/4·1	1/3·0	1/3·6	1/3·7	1/3·8	1/4·2	
Cutup:		1/2·3	1/2	1/2·1	1/2·2	1/2·6	1/2·8	1/3	1/3·3	



ACTUAL MEASURE

									f#	9
Chimney length		197	200	143	107	77	61	52	40	35.3
Chimney Diameter		10.5	7.7	7.2	6.3	6	5	4.2	3.7	3.4
Toe Diameter										
Diameter at Mouth:		70	~~53.5~~	40	30.3	24.3	18.7	16	12.7	10.9
Mouthwidth:		55	~~40.5~~	31	24.6	21	16	13.3	9.6	8.3
Cutup:		24.3	19.9	14.5	11	8	5.9	4.4	2.9	2.6
Metal Thickness:		1.2	1.0	0.8	0.8	0.7	0.7	0.6	0.5	0.7
Windway:		1.3	1.2	1.0	1.1	0.7	0.6	0.6	0.5	0.4
Languid:										
Body Length:		641	475	344	251	176	125	93.2	64	54
Toe Hole ø:		8.3	7.2	5.7	5	4	3.7	4	4.8	4.7

Source of Data: Material: heavy Spott

NOTES (ears, beards, slots, tuners, voicing, etc)

ears

Willis dubbing of lower lip

flatted upper lip.

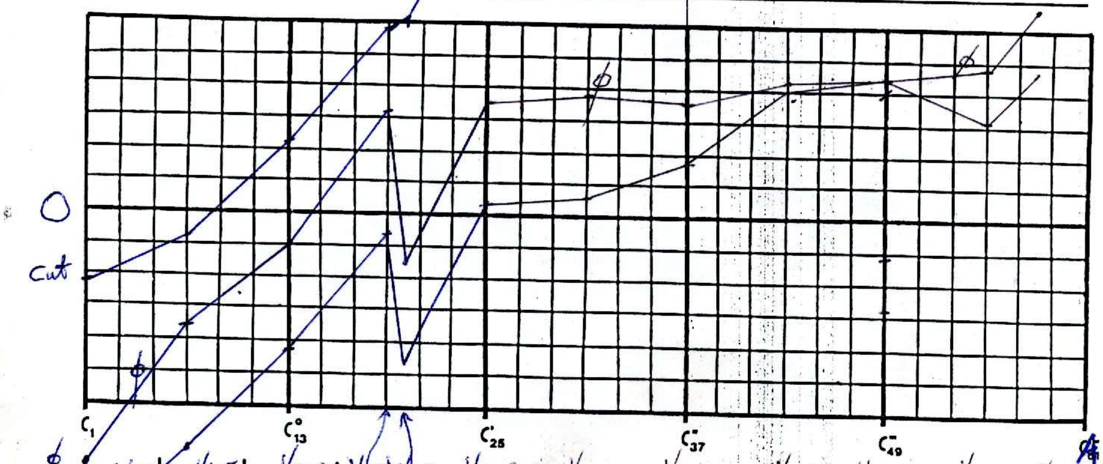
fine nicks every 4 mm on languid + lower lip, not lined up

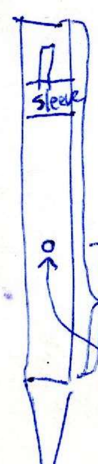
A. B. Batty

Stop: Harmonic Fl 4' **Div.:** Gt
Windpressure: **Pitch:** High Willis
Description of site & organ:

Builder: Willis **Date:**
Church: Union Chapel

11.1 10.5 10.4 9.8





f ⟷ g harmonic

	C_1		C^o_{13}			C'_{25}		C''_{37}		C'''_{49}		C_{61}
Mouthwidth:	1/4.6	1/4.8	1/4.6	1/4.7	1/4.6	1/4.6	1/4.7	1/4.3	1/4	1/4.3	1/4.3	1/4.3
Cutup:	1/2.7	1/3	1/3	1/3	1/2.5	1/2.05	1/2.6	1/2.7	1/3.1	1/3.2	1/3	1/3.3
ACTUAL MEASURE top slot from	11	10.8	8	10	8.5	8	8	5.7	5.3	5	3.4	2.3
slot wide	21	18	16	14.5	15	12.2	8.5	6	6	3	3.6	3.2
~~Toe Diameter~~ slot long:	43.7	48	41	40	28.5	19.8	17	10.7	2.3	5.5	5	9.2
Diameter of Mouth:	66	61	52.7	49	48.6	38	29.9	22.5	18	14	11	10.5
Mouthwidth:	45	40	36	32.5	33	26	20.2	16.4	14	11	8	7.6
Cutup:	16.5	13.5	12	10.7	13.5	10.4	7.8	6	4.5	3.4	2.7	2.3
Metal Thickness:	1.1	0.95	0.8	0.8		0.8	0.7	0.6	0.6	0.6	0.5	0.5
Windway:	1	0.8	0.7	0.7	0.95	0.6	0.6	0.5	0.5	0.5	0.5	0.4
~~Languid~~ hole:					314	232	162	109	75.3	51	35.3	31
Body Length:	1188	824	559	373	779	580	408	286	203	145	101	85.5
Toe Hole ⌀:	7	6.3	6	5.5	6.7	5.3	4.6	4	3.8	3.3	3.6	3.3
hole ⌀	—				8.4	7.5	6	5.3	4.7	3.6	2.5	

Source of Data: **Material:** Heavy Common Metal

NOTES (ears, beards, slots, tuners, voicing, etc)

Toes damaged @ chest holes in bass.
ears to c''
normal mouth flatting
fine close nicks
low languids

4' Harmonic flute @ Huddersfield Town Hall
@ 1'
38.2⌀
27.6
10.7
.8 flue
5 toe

Fr Willis, Gt 8' Trumpet, 5" scale

Stop:Great Trumpet 8'			Church:Union Chapel Islington, Willis 1877						Wind: 7"	
Notes	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$	c3	a^3
Tongue										
Lift at free end	2.4	1.8	1.5	1.7	1.4?	1?		.5	.3	.2
Tuned length	62.5	39.4	36	36	27 ?	20.5 ?		13.3	9.5	7
Total tongue length	125	99	82	67	59	43	37.5	32	27	22
Width (small end)	2	2	.8	2.8	.8	2	2	1.7	2	2
Width (big end)	11.3	9.3	7.4	7.8	7.3	6.3	5.5	5	4.5	4
Thickness	.73	.57	.45	.44	.38	.27	.24	.22	.17	.13
Weights	#14	#12	#7							
Weight Description: Standard thinner Willis										
Resonator										
Top Diameter Inside	125	108	90	79	71	65	61	60	60	45
Bottom Dia inside	14.5	12	11	10	10	9	9	8.5	8.5	9
Resonator Length	2205	1539	1177	743	513	355	250	170	122	
Mitre "A"	missed	145	117	95	82	66.5	60	59	50	27
Mitre "B"	missed	117	96	84	65	60	50	48.5	45	35
Resonator Wall Thick	.9/1.2	.9/1.2	1/1.2	.7/.8	.7	.7	.6	.7	.7	.8
Shallot										
Shallot Project Length	88	71	61	50.5	39	30.5	25.7	22	18	14.5
Total length	119	99	82.6	66	59	42.5	37	32	27.2	22
Inside Dia (small end)	11	9.8	7.4	7	6.5	5.7	5.5	4.7	4.3	3.8
Outside Dia (small end)	13.7	12.2	9.8	8.8	8.7	8.2	7.5	6.7	6.2	5.8
Inside Dia (big end)										
Outside Dia (big end)	20.7	17.5	14.7	12.8	12	10.4	9.3	8.4	7.4	6.6
Shallot wall thickness	1.3	1.3	1.2	1	1.2	1.3	1.1	1	1	1
Slot Width (small end)	0	0	0	0	0	0	0	0	0	0
Slot Width (big end)	8.3	7	5.6	5	6	5	4.2	4	3.4	3
Slot Length	55	44	38	30	23	19.5	17.2	15	12.5	10.7
Flat Width (small end)	2	2	1.5	1.5	2.4	2	1.5	1.7	1.5	2
Flat width (big end)	10.7	9.5	7.7	7	7.5	6.5	6	5.7	5.2	5
Outside Depth (small)	13.5	11.7	9.7	8.8	8.3	8	7.3	6.5	6	5.5
Outside Depth (big)	19.5	16.2	13.8	11.9	10.3	9.4	8.3	2.4?	6.5	5.8
Misc Data										
Boot Toe Hole	15	13.7	12	11	11	11	11	10.5	9.4	9
Boot length	225	205	185	105	83	73	255	175	100	73
Block Dia	50	45	40	36	32	28	29	26	24	24
Total Length	2330	1642	1169	819	577	405	298	213	158	100
Tuning Wire Dia	3.2	3.2	3	2.7	2.2	2	2	1.7	1.7	1.6

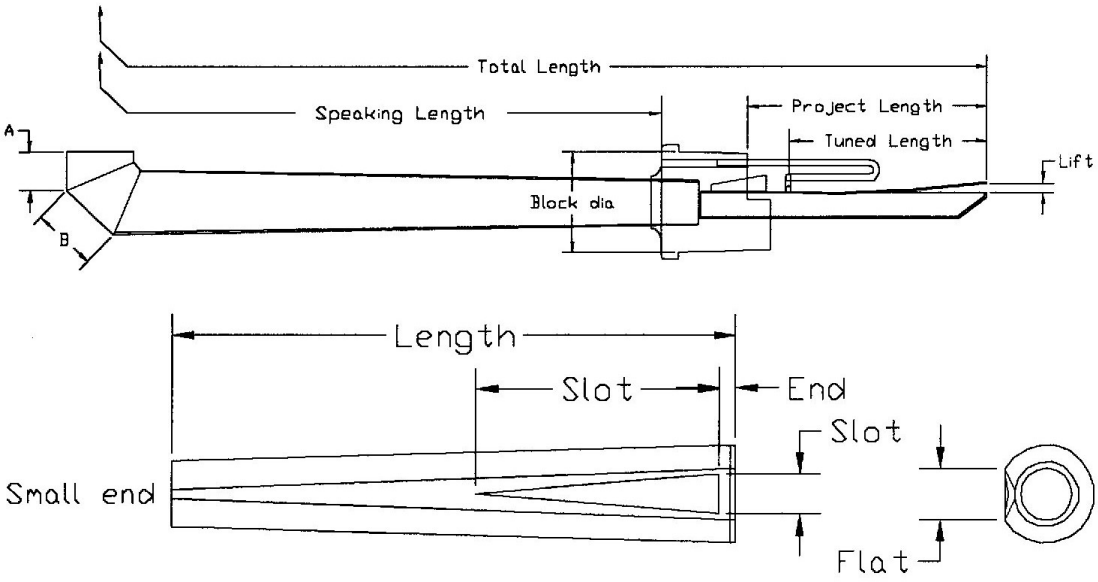
 August 3, 1996 File: \scales\trump1

Fr Willis, Gt Clarion 4'

Stop:Great Clarion 4'			Union Chapel, Islington, Willis 1877						Wind: 7"	
Notes	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$	c^3	g^3
Tongue										
Lift at free end	1.7									
Tuned length	47									
Total tongue length	90									
Width (small end)	1.7									
Width (big end)	8.6									
Thickness	.49									
Weights	#4									
Weight Description: Willis brass										
Resonator										
Top Diameter Inside	75	71	63	59	54	51	48	46		
Bottom Dia (in/outside)	11									
Resonator Length	1050									
Mitre "A"	78									
Mitre "B"	76									
Resonator Wall Thick										
Shallot										
Shallot Project Length	60									
Total length	80									
Inside Dia (small end)	7.5									
Outside Dia (small end)	9.8									
Inside Dia (big end)										
Outside Dia (big end)	14.8									
Shallot wall thickness										
Slot Width (small end)	0									
Slot Width (big end)	6									
Slot Length	33									
Flat Width (small end)	2									
Flat width (big end)	8									
Outside Depth (small)	9.8									
Outside Depth (big)	13.4									
Misc Data										
Boot Toe Hole	10.5									
Boot length										
Block Dia	40									
Total Length	1140									
Tuning wire	3									

 August 3, 1996 File: \scales\trump4

Fr Willis Reed Scale Sheet



Notes of the Vox Humana

The boots are normal length in bass. At tenor A# (#23) they suddenly become longer, then gradually shorten into the treble. There are solid, soldered-on caps for all pipes. At f#2 (#43)there are two regulating slots in the resonator, on opposing sides.

As a voicing aid, some(all?) treble resonators had small holes drilled in them. There was also evidence of holes drilled, then plugged, suggesting some experimentation. For example: c2 (#37) had a 6mm hole drilled opposite the regulating slot, and a 4.5mm hole placed 32mm above the cone/cylinder seam.

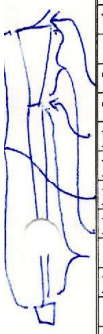
Fr Willis, Vox Humana 8'

Stop: Swell Vox Humana 8'			Church: Union Chapel, Islington, 1877						Wind: 84 mm	
Note: Heavy common, high Willis pitch, solid soldered caps, tuning sleeve over slot										
Notes	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$	$g\#^2$	c^3
Tongue										
Lift at free end		1.3	1	1	.75	.5				
Tuned length		47	37.5	30	26	19	13.5	11.5		10
Total tongue length	109	79.5	64	53	47	40	35	30		26
Width (small end)	0.8	1.5	2	1.5	2	1	1	1.5		2
Width (big end)	8	7	5.5	4.3	4.5	5	4	4.5		4
Thickness (mm)	0.48	0.35	0.33	0.3	0.25	0.21	0.19	0.17		0.15
Thichness (inch/1000)			13	12	10	8.25	7.5	6.5		5.75
Felt Weights	5x9x8	5x6x7	4.5^3							
Resonator										
Top Diameter (outside)	45.5	40.6	36.8	31	30	27.5	27	26	28.5	27.5
Bottom Dia (outside)	13.7	11.7	11.7	11	11	11	10.5	9.5	10	9.7
Resonator Length	670	483	34.3	247	179	127	90	65	118	93
Cone Length	100	85	73	63	51	45	38	32	44	55
Cylindrical length	570	397	270	184	128	82	52	33	74	38
Resonator Wall Thick	0.9		.9		1	1	1	1	1	
Tune slot Width	13.5	11.3	10	8.5	8.5	8.5	8	8.5	8.5	7
Tune slot start from top	13.5	10.5	7	6.5	4.5	3	2	2	2.5	2
Tune slot length open	24.5	24	18	23	15	20.5	16	12.5	27	11
Shallot										
Shallot Project Length	75		49	35	35	27	24.5	19		16.5
Total length	95	79.5	63.5	53.5	46	40	35			26
Inside Dia (small end)	6.9	6.5	5.5	5.3	4.5	4	4	3.6		3.5
Outside Dia (small end)	9.2	8.7	7.5	7.3	6.5	6	6	5.2		5
Inside Dia (big end)			7.5	8.5	7	6	5.3	5.1		.6
Outside Dia (big end)	15.3	13.5	10.5	9.5	9	8	7.3	6.9		7.5
Shallot wall thickness	1.3	1.2	1	1	1/1.25	1	1	.9		.75
Slot Width (small end)	1	1	1	1	1	1	1	1		1
Slot Width (big end)	6	5.2	4	3	3	3.2	3	2.3		2.5
Slot Length	32	24	19.5	16	13.5	12	10	9		8.5
Flat Width (small end)	1	1	2	1.5	1.5	1.5	1.5	1		2
Flat width (big end)	8	7.2	6.5	5	5.5	5	4.5	4.5		5
Outside Depth (small)	9.3	8.7	8	7.5	6.5	6	6.5	5		6
Outside Depth (big)	14.2	12.5	11	10	8.5	7.5	7.7	6.2		5
Misc Data										
Boot Toe Hole	10	10	6	6.5	7	7.5	7.5	7		6.3
Boot length	190	170	160	160	355	293	245	208		180
Block Dia	40	36	31.5	28.5	28.5	25.3	25.5	24		24
Total Length	780	572	418	310	235	175	134	100		125

 January 14, 1997 File: \scales\trump7

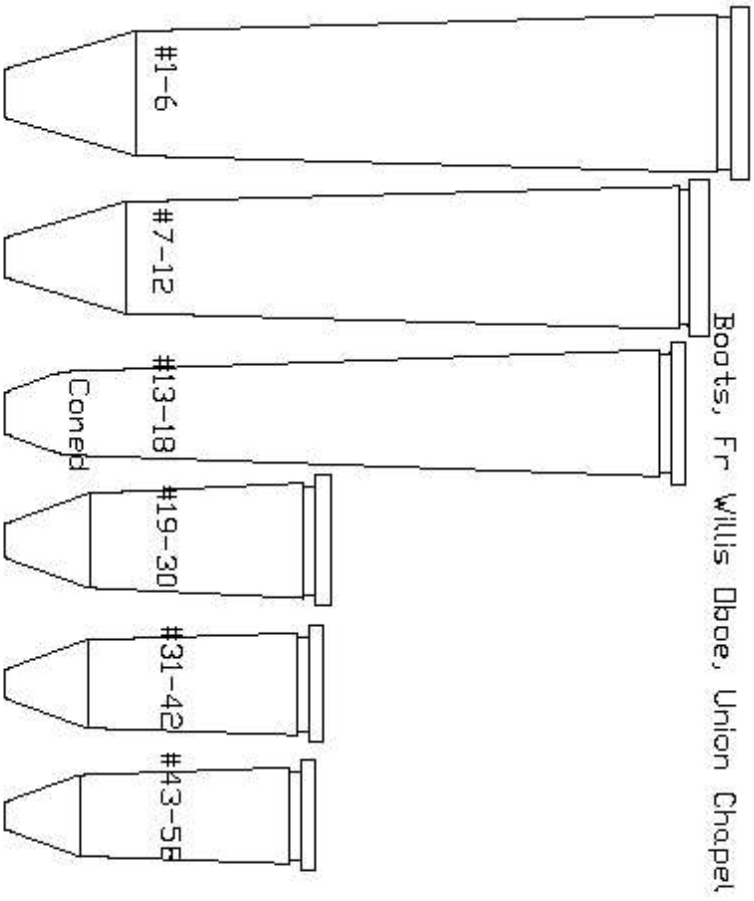
Fr Willis Oboe 8'

Stop: Swell Oboe 8'			Church: Union Chapel, Islington									Wind:89mm
Notes: . Common metal, round wood wedges, 2.5 dia bleed holes in all boots, short boots from f#19. Short 48mm long sockets to f18.												
Notes	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$	$g\#^2$	a^2	c^3	a^3
Tongue												
Lift at free end	1.5	1.3	1.1	.9	.7	.7	.6	.4			.4	.3
Tuned length	47	34	25	19.3	22	17.5	12.3	10.7			8.5	5.6
Total tongue length	95	79	64	51.5	47.2	40	33.5	27			25	19
Width (small end)	1.5	1.9	2	1.8	1.2	1.2	.5	.5			1	1.3
Width (big end)	7.8	7.5	6.8	5.5	5	4.7	3.8	4.7			3.7	4
Thickness	.50	.35	.3	.25	.25	.22	.15	.14			.13	.11
Weights	# 10	# 7	# 6	# 4								
Weight Description: Willis brass Union Chapel type, see chart												
Resonator									Oboe Conical			
Top flap opened	13	16	8.5	11	14	12	10	7.3			10	7.3
Top Diameter Inside	98	82	70	60	52	47	42	38	35	34	31.5	25
Middle Dia. (outside)	48	38	32.5	28.5	26.3	24	22.5	23	21			
Bottom Dia (in/outside)	11/in	10/in	9/in	8.3/in	9.7od	9.2	8.5	8.2	7.4	8.5	9	9.5
Resonator Length	2113	1472	1017	708	482	329	215	141	115	99	90	40
Bell Length	420	312	234	181	137	103	73.5	51	42			
Stem Length	1693	1162	784	526	345	225	141	90	74			
Resonator Wall Thick	.9	.7	.9	.8	.7	.7	.7	.6	.5	.5	.5	.5
Shallot												
Shallot Project Length	76	61	49	40.5	34.5	27.5	21.2	20			17.5	14
Total length	95	79	63.5	53.3	45.5	39.5	34.8	29.8			25	21.5
Inside Dia (small end)	7.1	6.5	5.8	5.5	4.8	4.3	4	3.8			3.7	3.5
Outside Dia (small end)	9.5	8.9	8	7.5	6.7	6	5.5	5.3			5.3	5
Inside Dia (big end)												
Outside Dia (big end)	15.4	13.7	11.8	10.4	9.2	8.2	7.4	6.8			6.8	6.2
Shallot wall thickness	1.2	1.2	1.2	1	1	.8	.8	.8			.8	.8
Slot Width (small end)	1	1	1	1	1	1	1	1			1	1
Slot Width (big end)	5.5	5	4.5	3.9	3.3	3.2	2.5	2.7			2.5	3
Slot Length	32.5	24.5	19.5	16.3	13.3	11.7	10	9			8.5	10
Flat Width (small end)	1.5	1.5	1	1	1	1	1	1			1	1.5
Flat width (big end)	7.5	6.8	6.4	5.5	5.3	4.5	4.5	4.1			4.4	4
Outside Depth (small)	9.5	8.8	8	7.4	6.7	6	5.5	5.7			5	4.8
Outside Depth (big)	14.3	12.5	10.8	9.6	8.5	7.5	6.9	6.1			6.1	5.5
Misc Data												
Boot Toe Hole	10	10.2	9	7.2	6.2	5.6	6.7	6.2			5.7	5.7
Boot length	190	180	175	78.5	78.5	77	76	73			75	76
Block Dia	40	35.8	32	28.4	28.4	25.7	25.7	24			24	24
Total Length	2220	1562	1090	769	538	3376	254	178			125	72



 August 27, 1996 File: \scales\trump11.chp

For some reeds, Father Willis liked to use short boots in the treble. This drawing is available as an Autocad drawing on my website.



f

Fr Willis, Sw Cornopean 8', 4" scale

Stop:Sw Cornopean 8'			Union Chapel, Islington, Willis, 1877						Wind 7"	
Notes	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$	c3	a^3
Tongue										
Lift at free end	2.2	1.8	1.4	1.4	1.4	1.3	.8	.4	.4	.2
Tuned length	66	50	38	32	28	21	16.5	11.9	9.7	6.4
Total tongue length	128	103	87	65	54	43	37.5	31.5	28	20.5
Width (small end)	2.3	1.2	2	2.4	2.2	2.5	2.5	2.7	2	1.7
Width (big end)	11.6	10	8.2	7	6.7	6.2	6	5.3	4.6	3.7
Thickness	.78	.55	.48	.42	.35	.3	.25	.17	.17	113
Weights	#14	#10	#7	#4						
Weight Description:										
Resonator										
Top Diameter Inside	101	88	75	69	62	58	54.7	50.3	45	35
Bottom Dia (in/outside)	14	13.6	10..58	10.3	9	9	8	8.5	8.5	.9
Resonator Length	2110	1481	1038	727	504	351	241	166	107	53.5
Resonator Wall Thick	.8	.7	.7/1	.7/1	.8	.7	.7	.8	.7	.8
Shallot										
Shallot Project Length	100	75	60	50	40	31	26	21.5	17.4	13
Total length	120	96	80	64.5	53.5	42	37.4	32	30	21
Inside Dia (small end)	11.1	9.5	7.5	7	5.8	5.7	5.4	4.7	4.3	4
Outside Dia (small end)	13.7	11.7	9.8	9.2	8	8.5	7.4	6.8	6.2	6
Inside Dia (big end)										
Outside Dia (big end)	20.5	17.4	14.9	13	11.2	10.7	9.3	8.4	7.9	7
Shallot wall thickness	1.3	1.2	1.1	1.1	1.1	1.4	1.1	1	1	.9
Slot Width (small end)	0	0	0	0	0	0	0	0	0	0
Slot Width (big end)	8.6	7	5.7	5	4.4	4.3	4.2	4	4	2.3
Slot Length	56	43	34	26	22	18	17	14	14.3	8.8
Flat Width (small end)	3.5	2.5	1.5	1.5	1.5	2.6	2.2	2	2	2
Flat width (big end)	11.1	9.3	8	6.7	6.5	6.7	6.7	5.7	5.6	4.7
Outside Depth (small)	13.6	11.9	99	9.2	8.1	8.4	7.2	6.3	6	5.6
Outside Depth (big)	19.2	16.3	13.6	12.1	10.1	9.8	8.2	7.5	7	6.4
Misc Data										
Boot Toe Hole	14.5	13.4	12.8	12	11.3	11.3	11.5	11	10	9.3
Boot length	225	210	190	106	85	74	255	180	103	73
Block Dia	50	45	40	36	32	28.5	28.5	26	24	24
Total Length	2248	1588	1128	803	568	403	291	207	143	84
Tuning wire diameter	3.2	3	3	2.6	2.3	2	2	1.	1.7	1.7

Notes: Pipes not hooded. At g#' (#33), feet become 290 long,8' stop only (not 4'), perhaps to ease tuning access. Pipe rack pins are 120 long, sockets only 60mm, so resonators can easily be removed from boots to access boot. See chart for this stop's tongue weights.

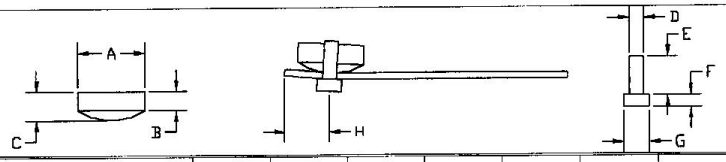
 August 3, 1996 File: \scales\trump2

Fr Willis, Sw Clarion 4'

Stop: Swell Clarion 4'			Union Chapel, Islington, Willis 1877						Wind: 7"		
Notes	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c2	f2		$f\#^2$	c^3
Tongue											
Lift at free end	1.8	1.6	1.3	.9	.6	.4	.4	.3	Flue Pipes		
Tuned length	43	37	28.5	22	17	13.5	11.2	8.3	Dia	12.5	10.4
Total tongue length	90	68	55.2	35	37	32	27	22.3	Mouth	10	8.3
Width (small end)	1.3	2.5	2	2.8	2.2	1.8	2.7	2	cutup	3.2	2.8
Width (big end)	8.8	7	6.6	6.6	5.8	5.5	5.1	43	toe	3.4	3.3
Thickness	.5	.43	.35	.31	.24	.2	.18	.18	flue	.4	.9
Weights	#4										
Weight Description: The first four pipes only, have #4 willis weights											
Resonator											
Top Diameter Inside	73	68	55.7	53	50.5	47	46.5	46			
Bottom Dia (in/outside)	9.7	9.5	10	8	8	8	8	9			
Resonator Length	1030	711	492	348	238	164	111	80			
Resonator Wall Thick	.7/.9	.7/.8	.8	.8	.7	.6	.7	.7			
Shallot											
Shallot Project Length	61	51	38.5	30	25	21	17	16			
Total length	85	69.4	55	42	37	31.7	26.6	23			
Inside Dia (small end)	7.7	7.3	6.3	6	5.3	4.6	4.5	4.2			
Outside Dia (small end)	10	9.4	8.2	8.4	7.3	6.7	6.3	5.9			
Inside Dia (big end)											
Outside Dia (big end)	15.2	13.7	11.3	10.5	9	8.3	7.4	7.1			
Shallot wall thickness	1.2	1.2	1	1.2	1.1	1.2	1	.9			
Slot Width (small end)	0	0	0	0	0	0	0	0			
Slot Width (big end)	6.2	5.3	4.6	5	4.2	3.7	3.4	3			
Slot Length	39	31	24	19	16.4	14.4	12.7	11			
Flat Width (small end)	2.2	2	2	2.2	2.5	1.5	1.5	1.5			
Flat width (big end)	8.4	7.2	6.5	6.8	6.5	5.7	5.5	5			
Outside Depth (small)	10.2	9.5	8.2	8.3	7.2	6.5	6	5.8			
Outside Depth (big)	13.8	12.5	10.2	9.5	8.2	7.4	6.6	6.1			
Misc Data											
Boot Toe Hole	11	11	12.4	11	10.4	11	10.5	10.5			
Boot length	190	105	82	74	75	71	71	71			
Block Dia	40	36	32	28.5	28.5	25.5	24	24			
Total Length	1122	789	555	400	285	205	145	112			
Tuning wire Dia	3	2.7	2.4	2	2	1.8	1.6	1.7			

 August 3, 1996 File: \scales\trump5

Fr Willis Brass Tongue Weight Scale
Union Chapel, 1877



Willis	A-Diameter			B	C	D	E	F	G	H	
#'s	X/32	inch	mm	Side	Width	O/Dia	long	Head	Head	Mount	Screw
1	1/32	1/32	0.8								
2	2/32	1/16	1.6								M1x2
3	3/32	3/32	2.4								M1x3
4	4/32	1/8	3.2	1.7	2	1.5	3.7	1.7	2.7	6 (!)	M1.4x4
5	5/32	5/32	4	1.6	2	1.5	4.4	1.7	2.7		M1.4x4
6	6/32	3/16	4.7	2.5	3	1.5	4	1.3	3		M1.4x4
7	7/32	7/32	5.6	2.5	3	1.8	5	1.7	3.5	4.9	M1.4x5
8	8/32	1/4	6.4								M1.4x5
9	9/32	9/32	7.1	2.4	3.4	2	5	1.7	3.4	5.2	M2x6
10	10/32	5/16	7.9	2.3	3.4	2	5	1.7	3.4		M2x6
11	11/32	11/32	8.7								M2x6
12	12/32	3/8	9.5	3.4	4.6	2.4	7	2	4.2	7.3	M2x8
13	13/32	13/32	10.3								M2x8
14	14/32	7/15	11.1	3.2	4.8	2.4	6.3	2	4.2	7.5	M2x8
15	15/32	15/16	11.9								M2.5x10
16	16/32	1/2	12.7								
17	17/32	17/32	13.5								
18	18/32	9/16	14.3								
19	19/32	19/32	15								
20	20/32	5/8	15.8								
21	21/32	21/32	16.7								
22	22/32	11/16	17.5								
24	24/32	3/4	19								
26	26/32	13/16	20.6								
28	28/32	7/8	22.2								
30	30/32	15/16	23.8								
32	32/32	1"	25.4								

 December 26, 1996 file: \scales\reedwhgt

Fr Willis Pedal 16'

Stop: Ophicleide 16'			Union Chapel, Islington, Willis 1877, Wind 10"					
Notes	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$
Tongue								
Lift at free end	3.2		2.5	2.2	1.6			
Tuned length	92		50	46	33			
Total tongue length	153	137	115	95	80			
Width (small end)	3.6	3.2	3	2.8	2			
Width (big end)	15	12.5	12	9	8.7			
Thickness	.8	.6	.55	.55	.41			
Felt weight	25x23x6	20x17x6	14x14x6	12x12x6	8x8x6			
Round lead weight	19x4	13x3.5	11x3	8x2	7x2			
Weight Description: Willis weights replaced by lead slug glued to felt; brass weight bolt holes in tongue!								
Resonator								
Top Diameter Inside			129		90			
Bottom Dia (in/outside)	19	18	14	13	11.4			
Resonator Length					1065			
Resonator Wall Thick								
Shallot								
Shallot Project Length	100	83	77	65	55			
Total length	153	136	118	95	79			
Inside Dia (small end)	13	11.9	11.5	9.5	8			
Outside Dia (small end)	16.4	15	14	12.2	10.2			
Inside Dia (big end)								
Outside Dia (big end)	25	22.8	21		15			
Shallot wall thickness	1.7	1.4	1.3	1.3	1.2			
Slot Width (small end)	1	1	1	0	0			
Slot Width (big end)	10.4	9	8.3	6.5	5.6			
Slot Length	84	65	55	42	35			
Flat Width (small end)	2	2	3	2.5	2			
Flat width (big end)	13.3	12	11.5	9	8.2			
Outside Depth (small)	16.2	14.5	13.7	12				
Outside Depth (big)	23.2	22	19.3	16.4	13.7			
Misc Data								
Boot Toe Hole	8	18	15	16	13			
Boot length								
Block Dia	69	63	60	50	45			
Total Length								
Tuning wire	4	3.6	3.6	3.6	3			

 August 3, 1996 File: \scales\trump3

A. B. Batty

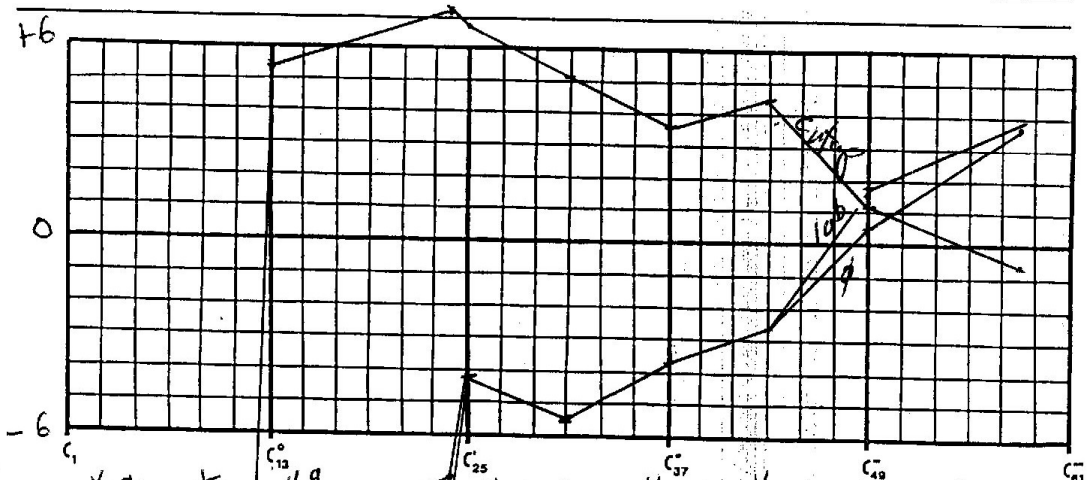
Stop: Clarabel Flute Div.: CH

Windpressure: Pitch:

Builder: Willis #1 Date:

Church: Union Chapel

Description of site & organ:



Mouthwidth:	1/3.9	1/3.9	1/3.9	1/3.9	1/4	1/4	1/4	1/4	1/3.8	1/4
Cutup:	1/3.7	1/3.9	1/2	1/2.1	1/2.8	1/2.5	1/2.9	1/2.9	1/4.1	1/4.9

C stopped → A chimney C ← B open →

ACTUAL MEASURE										
Chimney length:		253	150							a!
Chimney Diameter:		12.2	10.3							
~~Diameter at height:~~ 39.3	54.4	55.2	39	46	33	28	22.8	19	15.4	
Mouthwidth: 74.3	45	46.5	32.5	36	26.4	21.7	17.5	16.4	12.2	
Cutup: 30	11.5	23	15.3	14.5	10.4	7.5	6	4	2.5	
~~Metal~~ Thickness: 8.3	11	12.4	11.3	10	8.8	7.5	6	5.3	4.6	
Windway: 1.3	1.2	1.2	1.2	1.3	1	1	1	.8	.8	
Length: 95	92.3	77	75.8	64	63.4	64	64	63	63	
Body Length: 119	64.4	63.0	34.5	53.4	37.3	25.2	17.1	11.4	6.1	
Toe Hole:										
cap below 3.3	3.3	2.5	3.3	1.8	2	1.8	1.5	1.3	1.2	

wood

cap

Source of Data:

Material: mahogany caps + blocks and bodies

NOTES (bars, bearus, slots, tuners, voicing, etc)

- 2 cap upper lips for 3 with wooden wedges
- cap thicker than body - glued on from C25

A. B. Batty

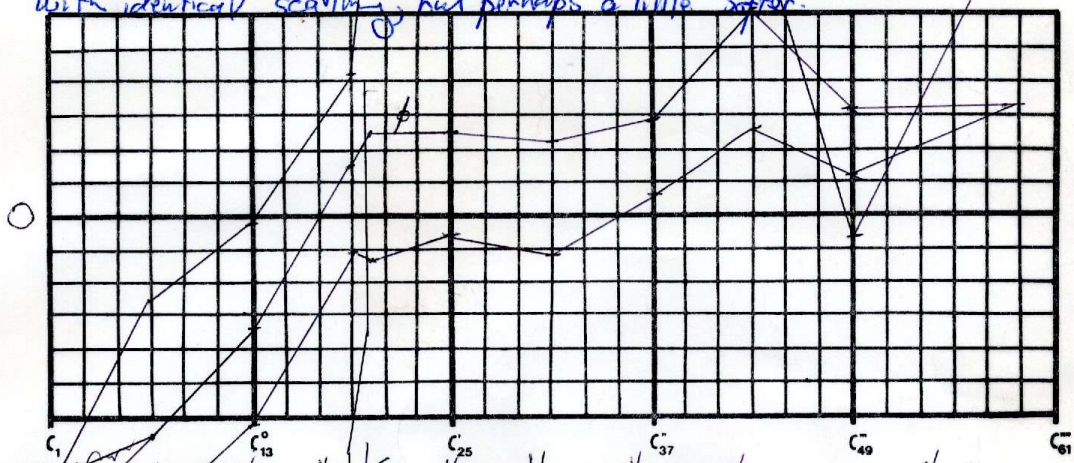
(harmonic)

Stop: Concert Flute Div.: CH. Builder: Willis #1 Date:

Windpressure: Pitch: 4' Church: Union chapel

Description of site & organ:

In another organ there was a choir harmonic flute 4' with this scale, cutups & toeholes and an identical 2' Harmonic Piccolo with identical scaling, but perhaps a little softer.



Mouthwidth:	1/4.3	1/4.6	1/4.5	1/4.5	1/4.7	1/4.6	1/4.6	1/4.4	1/4.6		1/3.9
Cutup:	1/3.3	1/3	1/3.1	1/3.2	1/2.5	1/2.8	1/2.7	1/3	1/3		1/3.3
ACTUAL MEASURE	26	24	19	21	17	11.5	7.5	11	6	5	
slot wide 11	9	9	8	8.2	6.7	4.3	3.5	3	2	1.2	
slot long 103	93	80	80	106	77	63	43	62	19	11.5	
Top Diameter: 60	54	47.6	45.2	45	36.5	27.7	22	19.5	13.2	9	
Diameter at Mouth:											
Mouthwidth: 4 3/4	37	33.2	31.7	30.1	25	18.8	15.7	13.2	9.5	7.2	
Cutup: 1.3	12.5	10.7	10	12.2	8.8	7	5.2	4.4	2.2	2.2	
Metal Thickness: .095					(damaged)				1.7		
Windway: 1.3	1.2	1.1	1	0.8	0.4	0.8	0.7	1.2	0.4	0.3	
hole				313	232	162	108	89	56	26	
Languid:											
Body Length: 125	878	607	422	861	642	446	312	249	134	91	
Toe Hole: 6	5.5	4.7	5.1	5.7	4.2	4	3.2	4.2	3	2.7	
hole #				82	6.3	3.8	3.3	3	2.5	2	

11.9 → slot from top

f# → 8

Source of Data: Material: heavy common

NOTES (ears, bearus, slots, tuners, voicing, etc)

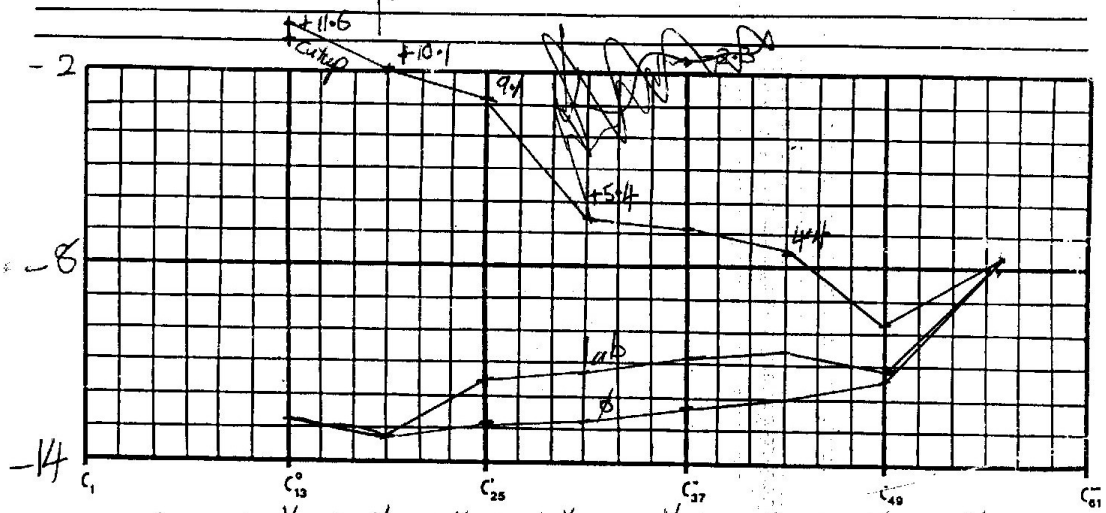
ears to c"
normal mouth flatting
fine close nicks
low languids
slots very long + open

A. B. Batty

Stop: Lieblich Gedact Div.: CH. Builder: Willis #1 Date:

Windpressure: Pitch: 8' Church: Union Chapel

Description of site & organ:



Mouthwidth:		1/4	1/4	1/3.8	1/3.8	1/3.8	1/3.8	1/4.1	1/4
Cutup:		1/1.4	1/1.5	1/1.6	1/1.9	1/2	1/2.1	1/2.2	1/3.4

ACTUAL MEASURE

Chimney length:		270	198	156	108	77	61	50	37.5
Chimney Diameter:		3.7	7.3	7.3	6.4	5.8	4.8	4.2	3.2
Mouthwidth:		41.3	31.7	26.2	20.4	16	12.5	9.3	8
Cutup:		30	21.7	16.	10.5	8	6	4.2	3.4
Metal Thickness:		1	0.9	0.7	0.7				
Windway:		1.2	1.3	1.1	1.2	1	1	0.8	0.6
Languid:									
Body Length:		662	473	353	256	188	135	93	63
Toe Hole ø: (body diameter)		18	6.3	5.2	4.2	3.8	3.6	3.3	3.8
		33	40.3	31.4	24.5	19.2	15	12	10.2

Source of Data: Material: heavy common

NOTES (ears, beards, slots, tuners, voicing, etc)

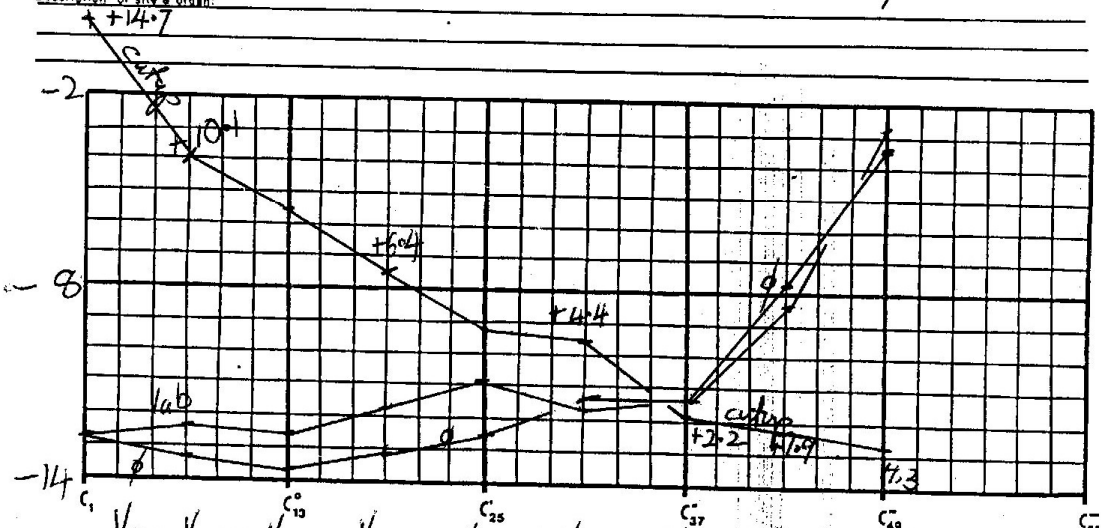
ears on all pipes
wood stoppers
Willis dubbed lower lip
flatted upper lip
fine nicks every 4 mm on languid + lip, not lined up
shares 1-12 with 3' Clarabel Flute (wood, stopped)

A. B. Batty

Stop: Lehigh Flute Div.: CH. Builder: Willis #1

Windpressure: Pitch: 4' Date:

Description of site & organ: Church: Union Chapel



Mouthwidth:	1/4	1/3.9	1/3.8	1/3-8	1/3.7	1/4.1	1/4	1/4.01			
Cutup:	1/1.04	1/1.05	1/1.06	1/1.8	1/2	1/2	1/2.3	1/2.6			
4' 272 ACTUAL MEASURE	201	146	107	76	60	47	39.5	32.5			
chimney length: 2 chimney 23											A
Diameter: 8.5	7.7	7.2	6	5.8	4.8	4	3.2	2.7			
Diameter at Mouth:	40.2	30.2	24	19	15.5	12.4	10.7	10			
Mouthwidth: 41.7	32.7	25	20	16	12	9.7	8.2	8.1			
Cutup: 30.2	21.7	15.5	11	7.9	6	4.2	3.2	2.4			
Metal Thickness:											
Windway: 1.1	1.4	1.1	1	0.7	0.5	0.4	0.3	0.4			
Languid:				189				49			
Body Length: 662	475	352	254	[redacted]	136	96	65	[redacted]			
Toe Hole ø: 8	6.2	5	4	3.5	3.7	3.4	3.8	3.7			

Source of Data: Material: heavy common

NOTES (ears, beards, slots, tuners, voicing, etc)

ears pa all pipes
wool stoppers
willis flubbed lower lip
flatted upper lip
fine nicks every 4 mm. on languid + lip, not lined up

SW. 8' Lieblich Gedact

tenor C	dia.	53 mm.	-12.8 HT	
	mw.	41 "	-13.2	1/401
	cut	32 "	+13.1	4/1.3
	wind.	1.5 "		
	toe	8.2 "		

SW. 4' Lieblich Flute

bottom C	dia.	54 mm.	-12.4 HT	
	mw	41.5 "	-12.9 HT	4/401
	cut.	35.5 "	+15.5 HT	1/102
	Wind.	1 "		
	toe	8' "		

A. B. Batty

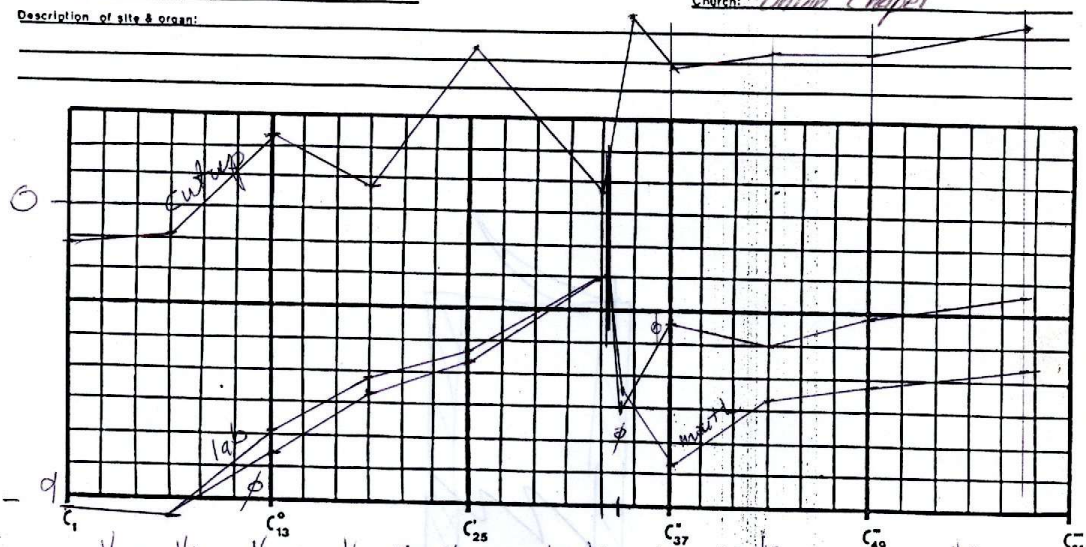
Stop: Piccolo Div.: OH. Not Original

Windpressure: Pitch: 2'

Builder: ~~Willis~~ Walker? (?) Date:

Church: Union Chapel

Description of site & organ:



Mouthwidth:	1/4	1/4	1/3.9	1/3.9	1/3.7	1/4	1/3.9	1/4.8	1/4.3	1/4.4	1/4.4
Cutup:	1/2.8	1/2.8	1/2.7	1/3.1	1/2.9	1/3.6	1/2.4	1/2.3	1/2.5	1/2.5	1/2.5

ACTUAL MEASURE

A A# metal

											A
Top Diameter:											
Diameter at Mouth:	28	22.6	19.2	15	12	9.7	10	7.5	6		~4.2
Mouthwidth: 25.3	22.5	19	15.8	13.7	9.5	7.8	6.5	5.5	4.3		3
Cutup: 10.3	8	7.1	5.1	4.8	2.5	3.3	2.8	2.2	1.7		1.2
Wood Thickness: 8	6.5	5	5	4.8	4						
Windway: 1	0.8	0.8	0.6	0.6	0.4	0.3	0.3	0.3	0.3		0.3
Cap length: 77	76	77	76.7	77	77						
Body Length: 260	460	265	178	118	59						
Toe Hole: 6	3.7	4	3.3	3.7	2.3	2.3	2	2.3	2.2		1.7
1.5	1	1	0.5	0.5	0.5						
cap thick: 9	8	8	7.2	7	5						

depth

Source of Data:

Material: wood, metal toes
some small wood pipes with metal feet
mahogany cap + blocks
pine bodies

NOTES (ears, beards, slots, tuners, voicing, etc)

melodia mouth (inverted)
sharp upper lip

metal pipes cut-up ordered

Union Chapel

Choir

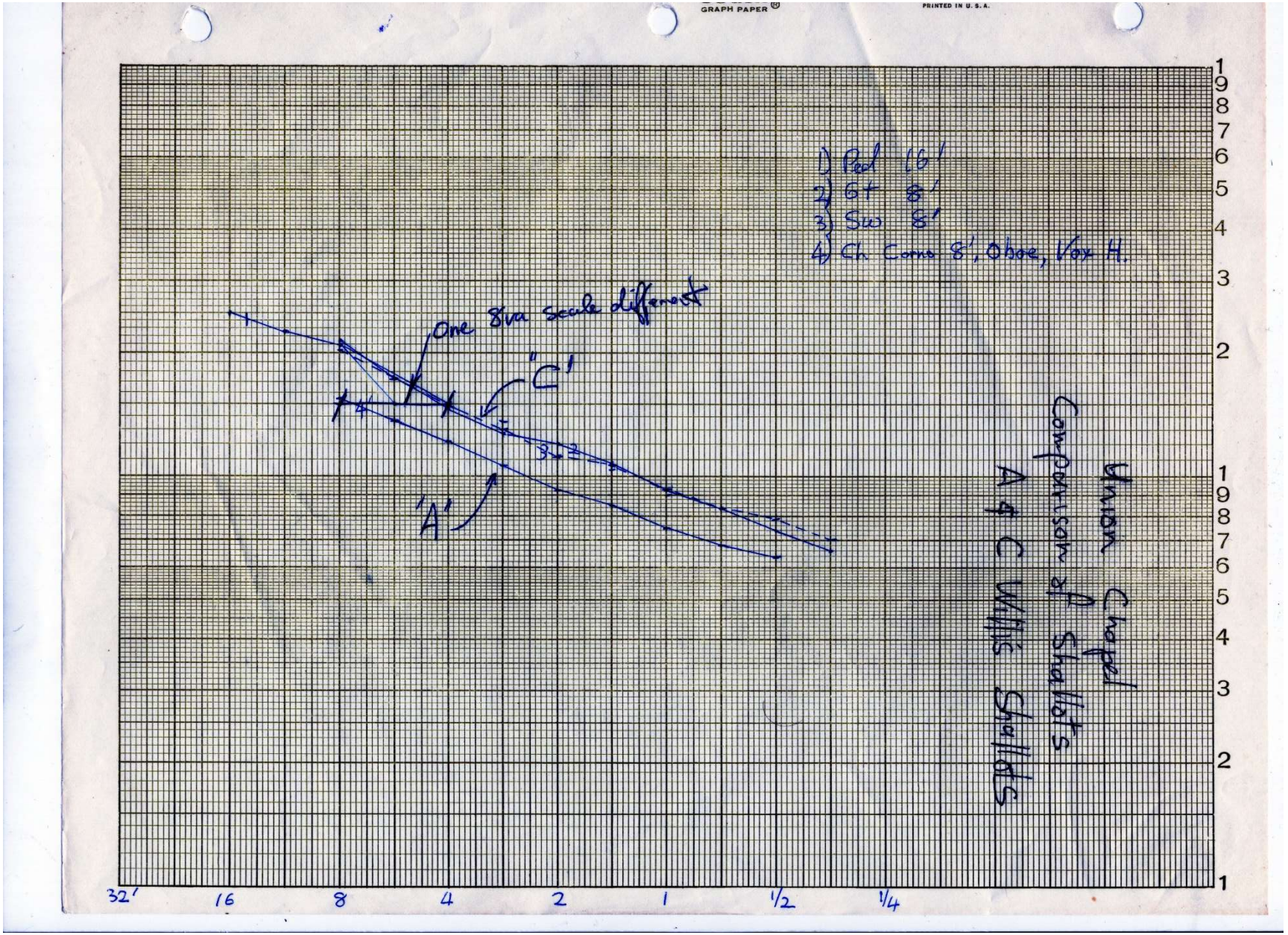
Piccolo 2'

from 1946

Fr Willis, Ch. Corno di Bassetto 8'

Stop:Ch. Corno di Bassetto 8'			Union Chapel, Islington, Willis 1877					Wind: 3-1/2"	
Notes	C	F#	c^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$	c3
Tongue									
Lift at free end	1.9	1.5	1.5	.9	.7	.8	.5	.6	.4
Tuned length	66.5	44	34.5	30.4	23	18	13.5	10.8	8.5
Total tongue length	94	80.5	65	54	45.3	40	35	30	25.5
Width (small end)	1.3	1.5	2	1.8	1.8	1.3	1.3	1.8	1.5
Width (big end)	8	7.3	6	5.4	5.2	4.9	4.8	4.5	3.8
Thickness	.52	.35	.29	.28	.21	.19	.16	.14	11
Weight., felts	10x9x4	8x8x5	7x6x4	5x4x2					
Weight Description: Felt!									
Resonator									
Top Diameter Inside	35	31	29	27.4	25	24.7	23.3	23	22
Bottom Dia (inside)	11	10	8	8	8	8	7	7	7
Total Length	1340	946	670	485	338	243	175	125	85
Cone length	95	92	73	62.5	52	40	38	35.5	26.5
Mitre "A" end of sleeve	102	49	65	59	52	43	36.4	32.5	27
Mitre "B"	65	88	45	39	36	32.5	28.5	23.6	24
Resonator Wall Thick	.7	.7	.9	.7	.8	.7	.9	.7	.6
Shallot									
Shallot Project Length	76	61	48	38.5	33	27	22.5	20	17.5
Total length	95	80	64	54	45.5	40	35	30	25.5
Inside Dia (small end)	7.3	6.8	6	5.5	4.8	4.1	4	3.6	3.4
Outside Dia (small end)	9.7	9	8.2	7.5	6.8	6.2	5.8	5.3	5.1
Inside Dia (big end)									
Outside Dia (big end)	15.5	13.7	12.1	10.6	9.2	8.5	7.5	6.8	6.4
Shallot wall thickness	1.2	1	1.1	1	1	1	1	.9	.9
Slot Width (small end)	0	0	0	0	0	0	0	0	0
Slot Width (big end)	6.2	5.2	4.7	4	3.5	3.4	2.7	2.5	2.5
Slot Length	31	25	19	17	13.7	11	10	9	8
Flat Width (small end)	2.4	2	2	1.8	2	1.7	1.7	1.8	1.5
Flat width (big end)	8.1	7.5	6.5	5.6	5.4	5	4.7	4.2	4
Outside Depth (small)	9.5	8.8	8.3	7.4	6.7	6	5.6	5	5
Outside Depth (big)	14.4	12.8	11	9.6	8.5	7.8	7	6.2	5.8
Misc Data									
Boot Toe Hole	11.3	10.3	8.4	9	9	8.6	7	6.7	6.7
Boot length	185	~~10~~	165	165	165	165	165	165	165
Block Dia	40	36	32	29	29	26	26	24	24
Total Length	1447	1035	743	528	393	290	128	161	120
Tuning wire	3	2.6	2.3	2	2	1.6	1.6	1.6	1.7

 August 3, 1996 File: \scales\Trump6


GRAPH PAPER
PRINTED IN U. S. A.
1) Pedal 16'
2) G+ 8'
3) Sw 8'
4) Ch. Cons. 8', Oboe, Vox H.
One 8va scale different
"C'
'A'
Comparison of Shallots
A + C Willis Shallots
Union Cooper
32'
16
8
4
2
1
1/2
1/4

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Attention: Blair Batty

Laboratory Sample I.D. #: 90855 Report Date: September 20, 1993

Sample Marked "WILLIS", Organ Pipe Metal

Tin:	5.8	%	(a)
Lead:	91.7	%	(a)
Copper:	0.049	%	(a)
Antimony:	2.2	%	(a)
Iron:	0.046	%	(a)
Bismuth:	0.002	%	(a)
Tellurium:	<0.001	%	(i)

Samples returned at customer's request and expense; otherwise samples retained one year from date of test.

The Galt Testing Laboratories

Per _____ Steven Huynh
Chemical Eng.

Per _____ Lethuy Hoang
Chemist

Reed Analysis

It is useful to compare the resonator top and bottom diameter, the shallot diameter, and the width of the slot in the shallot (big end). All measurements inside. If we take a good Trumpet (empirically: i.e. stable, good tone, etc), with cylindrical (not tapered) shallots, typically show:

- A Resonator Dia x8 the resonator small end dia
- A Resonator Dia x12 of the shallot diameter
- A Resonator Dia x16 of the shallot slot width

The chart shows the Willis Trumpet with normal values for the resonator and shallot slot ratios. However, Willis uses fatter shallots than our referenced X16. This is partly because the shallot is tapered and we measured the big end. The larger shallot will "smooth" the tone, compared to parallel shallots, leading to the Willis sound. I should also have compared top diameter of resonator to the shallot's small end.

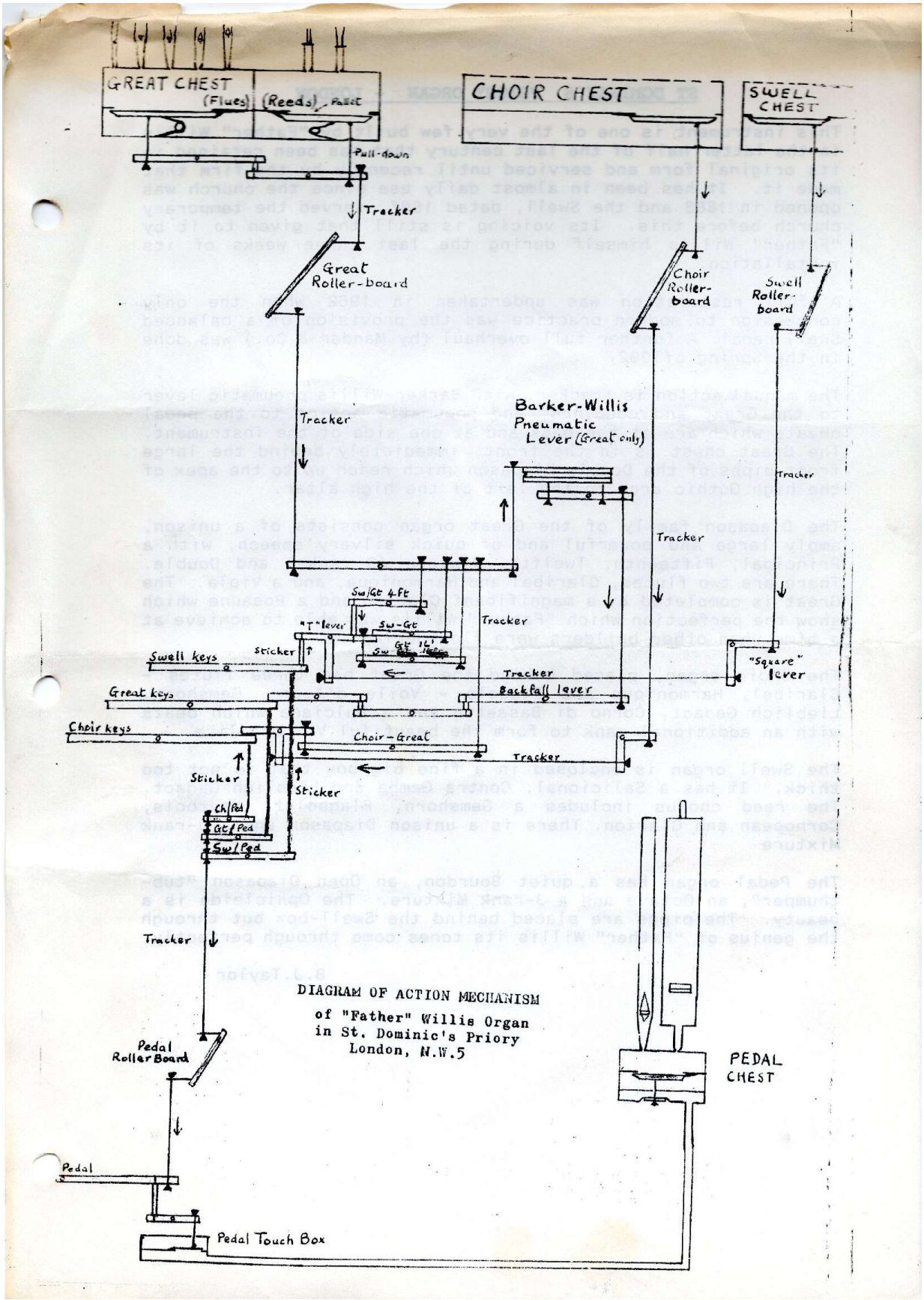
Reed 6th Trumpet 8' Church Union Chapel
Builder Willis Date WP

	1 Top ø	2 Bottom ø	Big 3 Shallot ø	4 Shallot slot	8 1/2	12 1/3	16 1/4
C	125	14.5	18.7	8.3	8.6	6.7	15
D#							
F#	108 ~~97~~	12	15.5	7	9	7	15.4
A							
C	90	11	12.7	5.6	8.2	7.1	16
D#							
F#	79	10	10.8	5	7.9	7.3	15.8
A							
C	71	10	10	6	7.1	7.1	11.8
D#							
F#	65	9	8.4	5	7.2	7.7	13
A							
C	61	9	7.3	4.2	6.8	6.8	14.5
D#							
F#	60	8.5	6.4	4	7	9.4	15
A							
C	60	8.5	5.4	3.4	7	11.1	17.6
D#							
F#							
A	45	9	4.6	3	5	9.8	15

Reed Gt Cornopean 8' Church Union Chapel

Builder Willis Date WP

	1 Top ø	2 Bottom ø	3 Shallot ø	4 Shallot slot	8 1/2	12 1/3	16 1/4
C	101	14	18·7	8,6	7·2	5·4	11·7
D#							
F#	88	13·6	15·5	7	6,5	5·7	12,6
A							
C			12·5	5,7	7·1	6	13·2
D#	75	10·5					
F#					6·7	6·4	13·8
A	69	10·3	10·8	5			
C					6·9	6·2	14
D#	62	9	10	4·4			
F#					6·4	6·9	13,5
A	58	9	8,4	4,3			
C					6·8	7·5	11,6
D#	54·7	8	7·3	4·2			
F#					5,9	7·9	12,6
A	50·3	8·5	6·4	4			
C					5·3	8·3	11·3
D#	45	8·5	5·4	4			
F#					3,9	7·6	15,2
A	35	9	4,6	2,3			
C							
D#							
F#							
A							
C							
D#							
F#							
A							
C							


GREAT CHEST
(Flues)
(Reeds)
Pallet
Pull-down
Tracker
Great Roller-board
CHOIR CHEST
Choir Roller-board
SWELL CHEST
Swell Roller-board
Tracker
Barker-Willis Pneumatic Lever (Great only)
Tracker
Tracker
Sw/Gt 4 Ft
"T" lever
Sw-Gt
Swell keys
Sticker
Tracker
"Square" lever
Great keys
Backfall lever
Choir keys
Choir-Great
Tracker
Sticker
Sticker
Ch/Ped
Gt/Ped
Sw/Ped
Tracker
DIAGRAM OF ACTION MECHANISM
of "Father" Willis Organ
in St. Dominic's Priory
London, N.W.5
Pedal Roller Board
PEDAL CHEST
Pedal
Pedal Touch Box

ST DOMINIC'S PRIORY ORGAN - LONDON

This instrument is one of the very few built by "Father" Willis in the latter half of the last century that has been retained in its original form and serviced until recently by the firm that made it. It has been in almost daily use since the church was opened in 1883 and the Swell, dated 1867, served the temporary church before this. Its voicing is still that given to it by "Father" Willis himself during the last three weeks of its installation.

A full restoration was undertaken in 1962 when the only concession to modern practice was the provision of a balanced Swell pedal. A further full overhaul (by Mander & Co.) was done in the Spring of1992.

The manual action is tracker. with Barker-Willis pneumatic lever to the Great and couplers, and pneumatic action to the pedal chests which are at the back and at one side of the instrument. The Great chest is in the front, immediately behind the large front pipes of the Double Diapason which reach up to the apex of the high Gothic arch to the left of the high altar.

The Diapason family of the Great organ consists of a unison, amply large and powerful and of quick silvery speech, with a Principal, Fifteenth, Twelfth, Mixture (3 ranks) and Double. There are two flutes, Claribel and Harmonique, and a Viola. The Great is completed by a magnificent Clarion and a Posaune which show the perfection which "Father" Willis was able to achieve at a time when other builders were floundering.

The Choir organ, placed behind the Great has three flutes - Claribel, Harmonique and Piccolo - Voile d'Amore, Gemshorn, Lieblich Gedact, Corno di Bassetto and a Dulciana which beats with an additional rank to form the beautiful Vox Angelica.

The Swell organ is enclosed in a fine big box that is not too thick. It has a Salicional, Contra Gamba and Lieblich Gedact. The reed chorus includes a Gemshorn, Flageolet, Hautbois, Cornopean and Clarion. There is a unison Diapason and a 3-rank Mixture

The Pedal organ has a quiet Bourdon, an Open Diapason "tub-thumper", an Octave and a 3-rank Mixture. The Ophicleide is a beauty. The pipes are placed behind the Swell-box but through the genius of "Father" Willis its tones come through perfectly.

B.J.Taylor

Specification of original Father Willis Organ completed 1883

St. Dominic's Priory, Southampton Road, LONDON, N.W.5.

Three Manuals, CC to G, 56 notes. "Willis" Pedal Board, CCC to F, 30 notes.

GREAT ORGAN - 11 stops - $3\frac{1}{2}$" w.g. except reeds.

		Ft.	Scales 2ft. C's (ins.)
1.	Double Diapason #5	16	1 $\frac{13}{16}$ (C^1 : $3\frac{1}{4}$) 82.5mm Slotted $\frac{2}{9}$ M.C.U. $\frac{1}{3}$
2.	Open Diapason #2	8	$2\frac{1}{8}$ (ten.C : $3\frac{3}{4}$) " " "
3.	Viola #6	8	1 $\frac{13}{16}$ 46mm 95mm " " "
4.	Claribel Flute (wood)	8	$1\frac{3}{4}$ x $1\frac{3}{8}$ 44.5 x 35
5.	Principal #6	4	1 $\frac{13}{16}$
6.	Flute Harmonique	4	$1\frac{3}{8}$ (G. sharp : 1 $\frac{11}{16}$
7.	Twelfth	2 $\frac{2}{3}$	$1\frac{1}{2}$
8.	Fifteenth #9	2	$1\frac{5}{8}$ = 41mm
9.	Sesquialtera 3 ranks 17.19.22 C' 12.15.17 F^2 sharp 8.12.15		CC 1 $\frac{3}{16}$, 1, $\frac{7}{8}$.
10.	Posaune (7" w.g.)	8	2 $\frac{7}{16}$ (CC : Tube $4\frac{1}{4}$, Shallot $4\frac{1}{2}$ x $\frac{3}{4}$) non-harmonic
11	Clarion (7" w.g.)	4	$2\frac{1}{8}$ (C : Tube 3, Shallot $3\frac{1}{8}$ x $\frac{9}{16}$) " " (CC : " $2\frac{7}{8}$, " ") " "

Couplers : Choir to Great, Swell to Great. Swell super octave to Great, Swell sub octave to Great

SWELL ORGAN - 10 stops (enclosed) $3\frac{3}{5}$ w.g. Chest dates from 1867

12.	Contra Gamba	16	$1\frac{1}{2}$ (Stopped wood CC to Ten.F sharp & metal)
13.	Open Diapason #5	8	1 $\frac{13}{16}$ 46
14.	Lieblich Gedact	8	$2\frac{5}{8}$ (Stopped metal and wood)
15.	Salicional #14	8	1 $\frac{5}{16}$ 33.3mm
16.	Gemshorn 6	4	Top : 1 $\frac{1}{16}$. 27mm $\frac{1}{5}$ M.C.U. $\frac{2}{5}$ to $\frac{4}{11}$
17.	Flageolet	2	Top : 1. " " " " "
18.	Mixture 3 ranks 17.19.22 C 12.15.17 F sharp 8.12.15		CC 1 $\frac{3}{16}$, 1, $\frac{7}{8}$.
19	Hautbois	8	2.
20	Cornopean	8	$2\frac{3}{5}$

CHOIR ORGAN – 9 stops – 3½" w.g.

		Ft.	Scales 2 ft. C's
22.	Viol d'amore	8	1 3/16 - 1/5 M.C.U. 1/5 Slotted
23.	Claribel Fluta (wood)	8	1¼ x 1⅜
24.	Lieblich Gedact	8	2⅛ (Stopped metal and wood)
25.	Dulciana #16	8	1 3/16 30.2 1/5 M.C.U. 2/7 Slotted
26.	Vox Angelica T.C.	8	do. (bass from 25) T.C. 2"
27	Gemshorn	4	1½ ¼ M.C.U. 4/7 Not conical
28.	Flute Harmonique	4	3⅛ (G. Sharp 1 11/16 2/9 M.C.U. 1/3
29.	Piccolo (Harmonic)	2	1½ (G. Sharp 1½) " " "
30.	Corno di Bassetto	8	1⅝ T.C.

PEDAL ORGAN – 5 Stops – 3" w.g.

31.	Open Diapason (Wood)	16	CCC : 15" x 13" 381 x 330 1/3.B +9.8 HT 10.9 HT
32.	Bourdon (Stopped wood)	16	CCC : 8" x 6½" 203 x 165
33.	Octave	8	CCC : 5⅛" (in West Case) 130.2 #7
34.	Mixture 17.19.22 3 ranks		No. breaks. Several pipes longer in scale than the Great.
35.	Ophicleide (H.P. wind)	16	CCC : 7".

Couplers : Swell to Pedal, Great to Pedal, Choir to Pedal

Accessories : 4 Composition Pedals to the Great and Pedal Organs
3 " " " " Swell Organ
1 Reversible Pedal, Great to Pedal Coupler

"Barker-Willis" pneumatic lever action to the Great action and its couplers

Tracker action to Swell and Choir Organs.

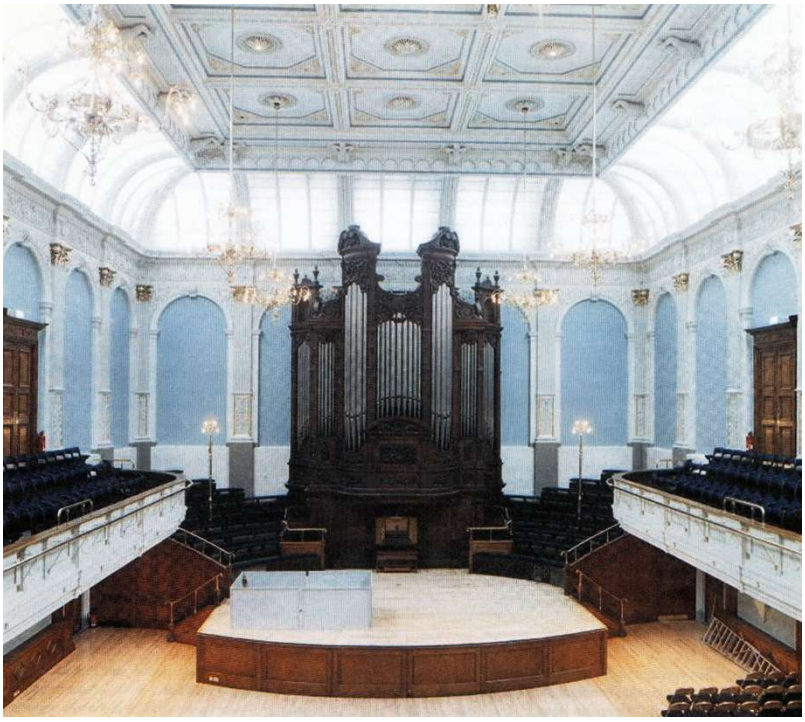
Mechanical Drawstops.

Tubular Pneumatic action to the Pedal Organ (7¼" w.g.)

Electric Rotary Blower installed in 1937

Completely restored in original condition (except Balanced Swell Pedal in place of lever) 1962.

Pitch: C.540 at 65° F.



Reading Town Hall

Henry Willis 1864

Reading Town Hall Organ Specification

PEDAL ORGAN

1 16' Open Diapason *wood*
2 16' Violone *
3 16' Bourdon
4 8' Principal
5 **16' Ophicleide ***

CHOIR ORGAN

6 8' Lieblich Gedact
7 8' Viol d'Amore *
8 8' Salicional
9 4' Flûte Harmonique
10 2' Piccolo Harmonique
11 **8' Corno di Bassetto**
12 **8' Oboe**

GREAT ORGAN

13 16' Double Diapason *
14 8' Open Diapason
15 8' Open Diapason *
16 8' Claribel Flute
17 4' Principal
18 4' Flûte Harmonique
19 3' Twelfth
20 2' Fifteenth
21 Mixture III
22 **8' Posaune**
23 **4' Clarion ***

* *Stops dating from 1882*
Register von 1882
Jeux datant de 1882

SWELL ORGAN

24 16' Double Diapason
25 8' Open Diapason
26 8' Stopped Diapason
27 4' Principal
28 2' Piccolo
29 Sesquialtera III
30 **8' Cornopean**
31 **8' Hautboy**
32 **8' Vox Humana ***
33 **4' Clarion**

SOLO ORGAN

34 8' Hohl Flute *
35 4' Concert Flute *
36 **8' Orchestral Oboe ***
37 **8' Tuba ***

COUPLERS – KOPPELN – ACCOUPLEMENTS

Choir to Pedals
Great to Pedals
Swell to Pedals
Solo to Pedals
Solo to Great
Choir to Great
Swell to Great
Swell Sub Octave (to Great)
Swell Super Octave (to Great)

ACCESSORIES – SPIELHILFEN – ACCESSOIRES

Four combination pedals to Pedal and Great *Vier Kombinatsionstritte für Pedal und HW—Quatre pédales de combinaison pour la Pédale et le Grand orgue*

Three combination pedals to Swell *Drei Kombinatsionstritte für das Schwellwerk—Trois pédales de combinaison pour le Récit*

Reversible pedal to Great to Pedals *Wechseltritt für Hauptwerk an Pedal—Tirasse Grand orgue réversible*

Swell Tremulant (foot lever) *Tremulant Schwellwerk (Fußbedienung)—Tremblant Récit (commande aux pieds)*

Lever swell pedal *Fußhebel Schweller—Pédale d'expression à cuillère*

The actions are mechanical, with pneumatic lever to the Great Organ and pneumatic action for the Pedal *Open Diapason*. Manual compass 58 notes; Pedal compass 30 notes.

Die Trakturen sind mechanisch mit Barkerhebel für das Hauptwerk, der Prinzipalbass 16' wird pneumatisch angespielt. Tonumfang Manual 58 Töne, Pedal 30 Töne.

La traction est mécanique, assistée d'une machine pneumatique pour le Grand orgue, et pneumatique pour l'*Open Diapason* à la Pédale. Étendue : 58 notes aux claviers manuels et 30 notes à la Pédale.

Reading Town Hall – Pipe Scales / Mensuren / Tailles

PEDAL	C	c	c¹
Bourdon 16		109 x 91	61 x 51
Principal 8		79	45
Ophicleide 16	195	127	95

CHOIR	C	c	c¹	c²	c³
Salicional 8	100	55	32,5	20	11,25
Viol d'amore 8	60	35	20	10	
Flûte Harmonique [a] 4	59	45	40[H]	22[H]	14[H]
Piccolo Harmonique 2	45	35[H]	21[H]	12[H]	7[H]
Lieblich Gedact [b] 8	98 x 83	56 x 46	40,5 x 32	27,5 x 24	21 x 18
Corno di Bassetto 8	44	34	29	24	23
Oboe [c] 8	65	50	38	30	26
Tuba 16	131	89	91[H]	70[H]	59[H]

GREAT	C	c	c¹	c²	c³
Double Diapason 16		143	73	40,5	24
Open Diapason 8		87	48	28	17
Open Diapason 8	144	82,5	46,5	26,5	16
Claribel Flute [d] 8	98 x 82	57 x 47	43 x 36	29 x 24	20 x 17,5
Principal 4	72	43	24,5	15,5	8,5
Flûte Harmonique 4	59	44	39[H]	24[H]	14[H]
Twelfth 2 2/3	45	28	16,5	8	5,5
Fifteenth 2	40	24,5	15	9	5
Mixture (i)	33	19	17	10,5	9
Mixture (ii)	30	16,5	15	8,5	7
Mixture (iii)	22	12	12	7	5
Posaune 8	110	76	62	52	46
Clarion 4	70	54	48	46	*flue*

SWELL	C	c	c¹	c²	c³
Double Diapason 16		98 x 83	56 x 46	35,5 x 31	24 x 21
Open Diapason 8	150	85	46,5	28	18
Stopped Diapason [e] 8	98 x 83	57 x 47	41	27	18,5
Principal 4	76	42	25	15	9
Piccolo 2	45	38[H]	23[H]	13,5[H]	9[H]
Sesquialtera (i)	30	19	16,5	10,5	8
Sesquialtera (ii)	26,5	16	14,5	9	6,5
Sesquialtera (iii)	25	14	13	7,5	5,5
Cornopean 8	103	75	63	55	47,5
Hautboy 8		75	55	45	37,5
Vox Humana 8	46	36	30	28	25
Clarion 4	74	56	50	44	*flue*

SOLO	C	c	c¹	c²	c³
Hohl Flute 8		84,5 x 73	47,5 x 36	27,5 x 22	19 x 15
Concert Flute 4	59,5	48	36	22	12,75
Orchestral Oboe [f] 8	50	35	25	23	22
Tuba [g] 8	131	89	78	91[H]	59[H]

MIXTURE COMPOSITIONS

Great Mixture & Swell Sesquialtera

C	c¹	f#²
1 3/5	2 2/3	4
1 1/3	2	2 2/3
1	1 3/5	2

Wind pressures

Pedal *Ophicleide* and Great reeds 6 1/2 inches[1] (165mm); Choir 3 inches (63 mm); Swell *Cornopean, Clarion, Sesquialtera, Piccolo* and *Stopped Diapason* 5 inches[1] (127 mm); Solo *Tuba* 15 inches[1] (381 mm); all other stops 3 1/2 inches (89 mm).

1 The high pressures almost certainly date from 1882.

Winddrücke

Pedal *Ophicleide* und Hauptwerk Zungen 165 mm[1]; Choir 63 mm; Schwellwerk *Cornopean, Clarion, Sesquialtera, Piccolo* und *Stopped Diapason* 127 mm[1]; Solo *Tuba* 381 mm[1]; alle anderen Register 89 mm.

1 Höchstwahrscheinlich stammen die hohen Winddrücke von 1882.

Pression du vent

Ophicleide de la Pédale et les anches du Grand orgue : 165 mm[1] ; *Cornopean, Clarion, Sesquialtera, Piccolo* et *Stopped Diapason* : 127 mm[1] ; *Tuba* du Solo : 381 mm[1] ; tous les autres jeux sont à 89 mm.

1 Ces hautes pressions datent presque certainement de 1882.

H Harmonic pipes / Überblasende Pfeife / Tuyaux harmoniques

a Harmonic from g' / überblasend ab gis / harmonique à partir de G'2

b Open from g / offen ab g / ouverts à partir de G2

c Bells from g' / Trichteraufsätze ab gis / en forme d'entonnoir à partir de G'2

d Open from c'; bass stoppped wood / offen ab c', Bass gedeckt und Holz / ouverts à partir de C3, basses bouchées en bois

e Pierced stoppers from c'; bass stopped wood, pierced stoppers from f# / durchbohrte Spunde ab c', Bass gedeckt und Holz, durchbohrte Spunde ab fis / tampons percés à partir de C3, basses bouchées en bois, tampons percés à partir de F#2

f External diameter / Außendurchmesser / Diamètre extérieur

g Harmonic from a#' / überblasend ab b' / harmonique à partir de A#3

The pipe scales (internal dimensions, in mm) were measured by Dr. Nicholas Thistlethwaite and by Harrison & Harrison—Die Pfeifenmensuren (Innendurchmesser in mm) wurden von Dr. Nicholas Thistlethwaite und Harrison & Harrison aufgenommen—Les mesures (diamètres intérieurs en mm) ont été prises par le Dr. Nicholas Thistlethwaite et l'entreprise Harrison & Harrison.

Scales of the Father Willis organ in Gothenburg

Built in 1871 for St Stephen's Hampstead

		C	c³	c²	c¹	c⁰	
	II Great C-g³						
1.	Double Diapason 16' #9			71,0	41,8	25,8	18 from Violone 16'
2.	Open Diapason 8' #3	125,0	90,0 #3	54,0	32,8	19,8	12 front pipes
3.	Claribel Flute 8'	111x90	82x61	45x35	30x23	21x17	Wood. C - H Stopped, c¹ - h¹ Chimney flute, c² - g³ Open
4.	Viola 8' #9	119,0	71,0	41,0	25,7	15,8	7 Front pipes
5.	Octave 4' #14	87,0	49,5	30,0	18,0	11,4	
6.	Quint 3' #12	43,5	25,7	16,3	10,2	7,0	
7.	Super Octave 2' #6	42,5	25,5	15,8	10,7	7,4	
8.	Mixture						
	C c 0'						
	1 3/5' #12 2 2/3' #12 4'	30,5	17,7	10,7	10,7	10,4	
	1 1/3' 2 #5 2 2/3'	27,0	15,9	15,0	10,2	8,7	
	1' 1 3/5' 2'	23,8	14,6	11,8	8,0	7,2	
9.	Bambarde 8'	126,0	91,0	74,0	68,0	57,0	Harmonic fr g². High pressure
	I Choir C-g³						
10.	Dulciana 8' #14	99,0	56,5	33,7	20,8	12,7	
11.	Lieblich Gedacht 8'	98x82	57,2	32,8	20,5	12,8	C - H Std wood From c¹ Chimney flute
12.	Gemshorn 4'	65,2/51,3	38,6/30,6	23,0/18,2	14,7/11,5	9,6/7,4	Reconstructed 1893
13.	Flute Harmonique 4	63,5	53,0	39,5	23,2	15,0	Harmonic from g²
14.	Piccolo 2'	46,5	34,0	20,4	12,1	8,3	Reconstructed 1893 G# - g¹ harmonic
15.	Corno di Basetto 8'	45,5	35,0	30,6	27,5	25,5	
	III Swell C g³						
16.	Contra Gamba 16' #10	173x143	117,0	64,0	38,2	23,5	12 Stopped wood
17.	Open Diapason 8' #5	151,0	82,0	48,0	28,2	17,8	
18.	Lieblich Gedacht 8'	98x82	56,5	32,7	21,0	13,1	C - H Std wood From c¹ Chimney flute
19.	Gamba 8' #15	83,0	52,0	31,6	19,8	13,2	Added later
20.	Vox Celeste 8' #19		40,5	25,5	14,3	11,6	Added later
21.	Octave 4 #5	78,0	45,5	27,8	17,5	11,0	
22.	Flageolet 2	42,0/26,5	25,5/17,3	16,0/10,5	10,2/7,5	7,4/5,5	Conical
23.	Cornopean 8'	105,0	79,0	58,0	57,0	45,0	
24.	Hautboy 8	100,0	71,5	55,0	43,3	34,3	
25.	Vox Humana 8'	36,3	30,8	27,2	25,2	25,0	
26.	Clarion 4'	75,0	59,0	54,0	46,9	11,8	Flue pipes from #'
	Tremolo						
	Pedale C-f¹						
27.	Grand Open Diapason 16'	334x282	184x155	100x86			Wood
28.	Violone Metal 16'	256	161	72			20 front pipes with different scale
29.	Bourdon 16'	208x176	120x101	67x8 ← Same as Bourdon			Added later. Stopped wood
30.	Violoncello 8' #17	120	72	41			High pressure
31.	Ophicleide 16'	140	106	78			High pressure

ST. LUKE'S CHAPEL WINTERTON HOSPITAL (formerly Durham County Asylum), nr SEDGEFIELD, Co. DURHAM.

Built by: "Father" Henry Willis (so named) in 1870's? for (private residence) ; bought by Hospital, and moved to present location in 1884.

		Features
Great:		
1. Open Diapason	8	Spotted metal. Bass pipes stand off chest.
2. Clarabel Flute	8	24 bass pipes stopped wood, trebles open spotted metal – harmonic from mid G.
3. Principal	4	Spotted metal
4. Twelfth	3	Spotted metal
5. Fifteenth	2	Spotted metal.
(6. Trumpet – prepared for only –8)		Slider disconnected, no pipes or rackboard. Upperboard fixed – not prepared over.
Swell (enclosed, vertical shutters)		
1. Bourdon	16	12 bass pipes outside, some under box. Bass stopped wood, trebles stopped spotted metal.
2. Open Diapason	8	Stopped wd. bass. 4 pipes. Spotted metal. Slotted
3. Lieblich Gedact	8	} Common stopped wood bass; 12 pipes. Stopped spotted metal. Pierced stoppers.
4. Salcional (sic!)	8	} Spotted metal. Slotted.
5. Vox Angelica	8	Tc. knowingly coupled to Salcional, tho' slider unaffected. Spotted metal. Slotted.
6. Gemshorn	4	Slightly tapered. Spotted metal.
7. Celestina	2	Spotted metal.
8. Cornopean	8	Spotted metal reeds. 3 upper fine pipes inverted. Short boots from Tenor F#
9. Hautboy	8	" " " " 2 " " " " " " " " " "
i) Tremulant (by ratchet pedal)		
Choir (unenclosed)		
1. Lieblich Gedact	8	Stopped wood bass, stopped spotted metal trebles.
2. Gamba	8	Spotted metal, with collars to treble C. Slotted. Bass pipes stand off chest.
3. Dulciana	8	Spotted metal. Slotted. Bass pipes stand off chest.
4. Flute Harmonique	4	Open spotted metal. Harmonic from mid G. Slotted.
5. Clarinet	8	Ten. C. (holes prepared over). Spotted metal resonators. Mitred. 3 upper fine pipes.
Pedals:		
1. Bourdon	16	Stopped wood.
2. Lieblich Bourdon (1965)	16	Replaced Bass Flute 8. Now borrows 12 notes from Sw.1 via pneumatic relay.
3. Violoncello	8	Open plain metal. (lowest pipe 32nd)

Couplers:

i) Great to Pedal
ii) Swell to Pedal
iii) Choir to Pedal
iv) Swell to Great
v) Choir to Great
vi) Choir to Swell (really Sw/Ped!)

- 1 Balanced Swell Pedal (1968)
- Tracker action throughout (exc. pf. fld. 2.)
- 3 composition pedals to Great/Choir/Pedal (RH jamb) and 3 to Swell (LH jamb)
- Long, thin, cast iron weights on reservoir marked 28 (one 32)
- Soundcheats split, with central passage.. C side in RH for Swell, but LH for Great and Choir.

Markings.

Stopped	Stretched
GT	Op
GT	Cla
GT	Pr
GT	12
GT	15
SW	Bour
SW	Op
SW	Gc
SW	Sal
SW	Vox
SW	Gem
SW	Celes
–	Cor
–	Obx
–	Gc
–	Gam
GT	Dulc
–	Flute
–	Cla

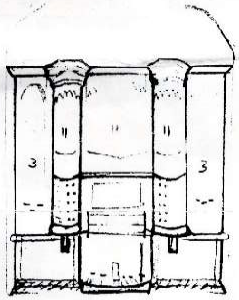
Scale of open metal pipes (approx. mm's.)

	Sounding 8'c	4'c	2'c	1'c	6'c	3'c	15'c	
(C#)	153	84	48	28	17	–	–	#15
GT	wd	wd	49	36	21	-	-	
GT	Pr	-	77	44	28	16	9	-#7
GT	12	-	-	34	20	13	8	5#13
GT	15	-	-	38	21	14	9	6#11
SW	Bour							
SW	Op	wd	78	45	27	15	-	-#7
SW	Gc							
SW	Sal	wd	51	30	19	12	-	3#16
SW	Vox	-	50	30	18	12	-	-
SW	Gem	-	56	33	18	13	8	-#14
SW	Celes	-	-	30	18	14	7	4#16
–	Cor							
–	Obx							
–	Gc							
–	Gam	95	51	29	17	12	–	-#15
GT	Dulc	90	50	29	15	11	-	-
–	Flute	-	55	43	31	18	6	-
–	Cla							
		prob	82	48	–	–	–	–

The organ is sited in a brick chamber, with quite a high sloping roof on the south side of Chancel, with relatively large openings to Chancel, occupied by the case + console, and to South Aisle, screened by a row of wooden dispersed dummies on a varnished pine base.

The instrument is simply + well laid out, Great forward of Choir, forward of Swell, with the Pedal ranks along the east (LH) side.

Access to the manual pipework, via walkways, and to the action, on basement crawlways – is quite straightforward.



Console:

Solid ivory stopknobs with plain/black Roman engraving, in 2 vertical rows on each jamb, which are angled.
Divisions only differentiated on knob (Swell, Choir + Pedals.)

Rounded # keys.
Hinged cover stows behind lifting music desk.
Scalloped keycheeks.

58 notes C to A manual compass
30 note C to F R+C pedalboard on blocks.

Wind pressure: ? 3½/4" (Summer)

Casework:

Hand painted metal dummy pipes (grain wood mock) in black painted wooden case – Classical design.
Two rounded towers of 11 pipes flank the console – jambs are mounted on the solid lower part of tower, which are supported by curved brackets. Curved pipe shades.
Central flat over music desk of 11 pipes.
Side flats of 3 longer pipes.
Whole surmounted by moulded cornice at same height.

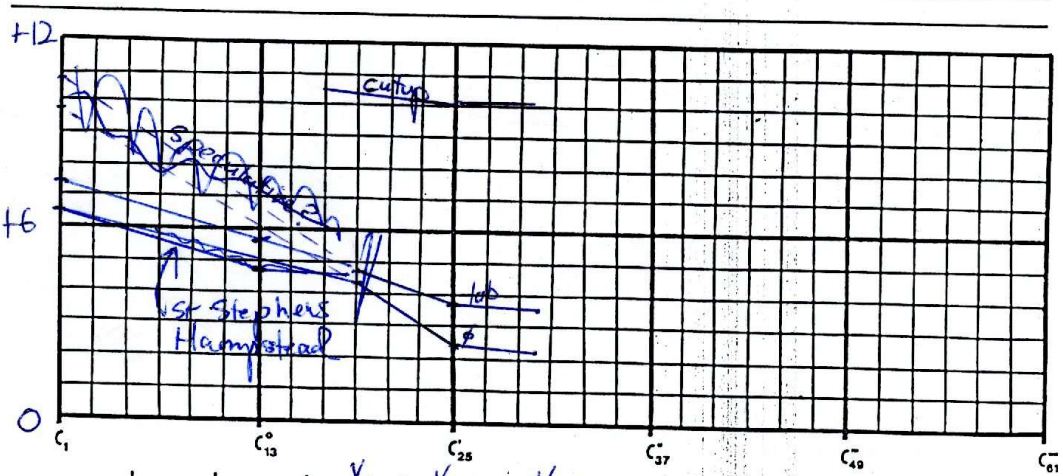
Scale is "small" – like a chamber organ.

Some Miscellaneous Stops

A. B. Batty

Stop: Open Diap 16′ Div.: Ped
Windpressure: Pitch:
Description of site & organ:

Builder: Willis I Date:
Church: Halstead Essex
St Andrews



Mouthwidth:			1/4	1/3.8	1/3.8					
Cutup:			1/3	1/3	1/3					

ACTUAL MEASURE — from St Dominics Priory

			f#°	c	f′					
Top Diameter:										
~~Diameter at Mouth:~~			143	98	77					
Mouthwidth: ~~330~~			111	85	68					
Cutup:			38	28	22.5					
~~Metal Thickness:~~			3	2	2					
~~Windway:~~ Winfield			1.5							
~~Languid~~			380							
~~Body Length:~~			90.5							
~~Toe Hole:~~			1.3							

depth
stock above cap
foot pcs
dB (3pf)
I

Source of Data:
Material: Wood
NOTES (scars, bearus, slots, tuners, voicing, etc)

A. B. Batty

7.8 Cutup 6.7 6.7 5.4 6.5 5.2

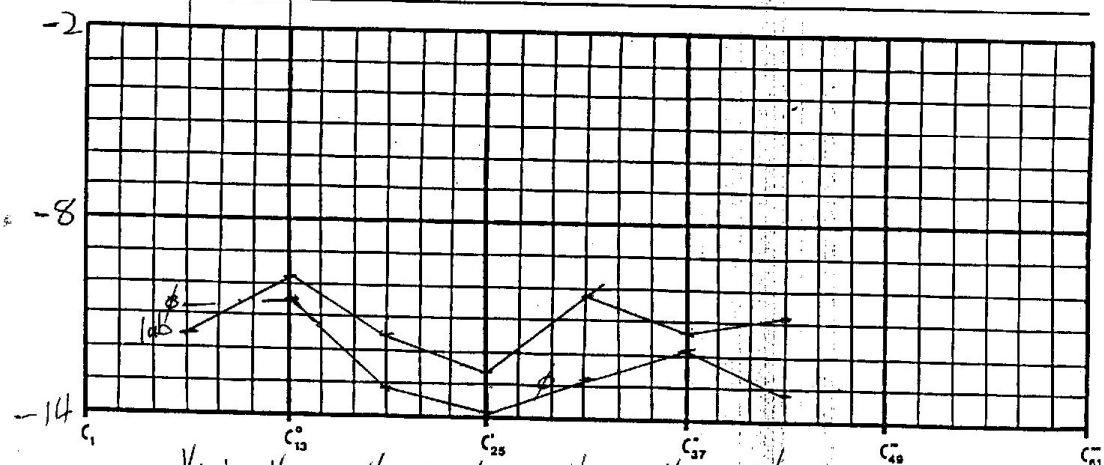
Stop: Leblich Gedact Div.: SW

Windpressure: Pitch: 8'

Builder: Willis J. Date: 1887

Church: Knebworth

Description of site & organ:



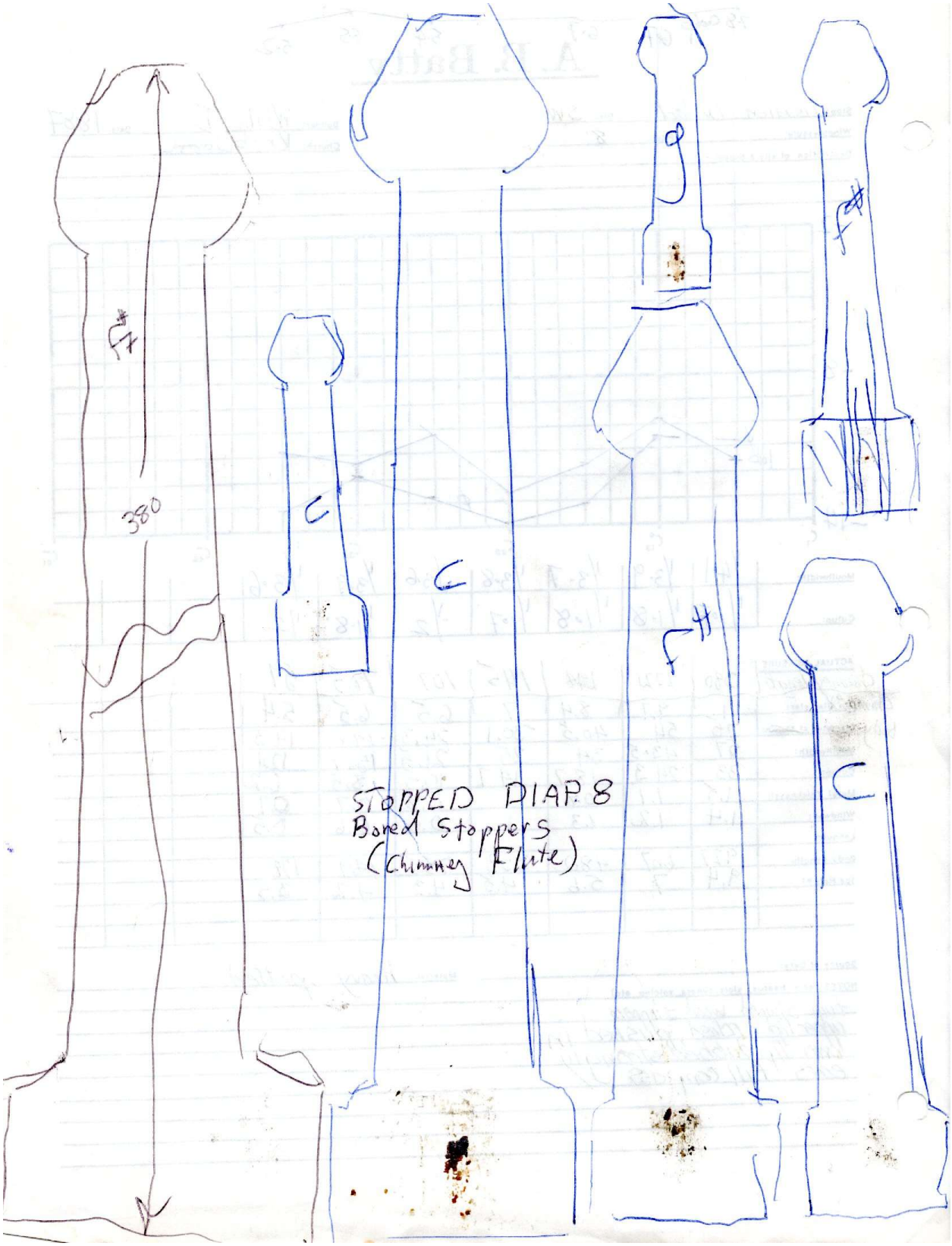
Mouthwidth:	1/4.1	1/3.9	1/3.7	1/3.8	1/3.6	1/3.9	1/3.6				
Cutup:	1/1.7	1/1.8	1/1.8	1/1.7	1/2	1/1.8	1/2				

ACTUAL MEASURE											
Chimney length	380	272	194	145	107	79.5	59				
Chimney Diameter:	11	9.7	8.4	7	6.5	6.5	5.4				
body Diameter at Mouth:	75	54	40.5	30.1	24.3	19.6	14.3				
Mouthwidth:	57	43.5	34	25	21.5	15.7	12.4				
Cutup:	33	24.3	18.7	14.7	10.5	8.5	6.2				
Metal Thickness:	1.5	1.1	0.8	1	0.9	0.7	0.7				
Windway:	1.4	1.2	1.3	1	0.5	0.6	0.5				
Languid:											
Body Length:	927	667	480	353	255	189	138				
Toe Hole ø:	9.4	7	5.6	4.3	4.3	4.2	3.5				

Source of Data: Material: heavy spotted

NOTES (ears, beards, plots, tuners, voicing, etc)

tulip shaped wood shoepers
upper lip arched, plisted in
lower lip arched strongly
ears full compass


380
C
C
STOPPED DIAP. 8
Bored Stoppers
(Chimney Flute)
C

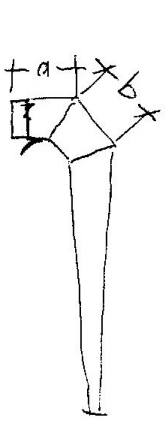
Willis 1920's, Tuba 8'

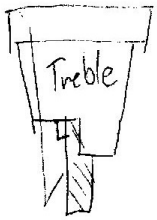
Stop: Tuba 8'			Church: St John Evangelist-Upper Norwood						Wind: 15", 381mm		
Notes:Added to Lewis organ in early 1920's, by Willis											
Notes	C	F#	c^0	f^0	$f\#^0$	c^1	$f\#^1$	c^2	$f\#^2$	c3	a^3
Tongue											
Lift at free end	2.5	1.7	1.5		0.8	0.7	.4	.4	.3	.3	
Tuned length	62	49	33.5		37	29.6	21	21.5	16.4	14	
Total tongue length	104	77.5	70		70	58	50	37.5	36.5	29.2	23.2
Width (small end)	2.7	3.3	2		1.5	1.7	1.2	1.4	1.7	1.9	1.5
Width (big end)	11	9.7	8.3		8	7.7	6	5.3	5.3	4.7	3.5
Thickness	.78	.72	.55		.71	.55	.53	.48	.41	.35	.26
Weights	#14x7	#11x6	#9x5		#8-3.5	#5-2.7	#4-2.7	#3-0.7			
Weight Description: Willis brass, thicker than usual											
Resonator (harmonic from f^0#)											
Top Diameter Inside	105.5	87.8	75.5	71	92	77	74	65.5	58	51.5	45.4
Bottom Dia (inside)	9.5	9	8.3	8.7		7.2	5.8				
Resonator Length	~2300	~1600	1110	813	1627	1142	788	551	371	250	135
Mitre "A"	220	168	122	115	230	160	145	113	85	72	49
Mitre "B"	122	106	87	76	103	88	75	67	57.5	46	37
Resonator Wall Thick	1.3	1	1	1	1	1	1	1	.9	1	.9
Tune slot Width	32	27.6	26.5	25	25	25.5	25.7	22	21.4	19.4	none
Tune slot start from top	36.5	30.5	29	20	37.5	22.4	18	16	14	10	
Tune slot length open	55	40.5	37.2	50	61	57	39	40	26.3	23	
Shallot											
Shallot Project Length	79.5	64.5	53		48	38	32.5	28	25	19	14
Total length	102	84	68.5		66.2	53	50	41.2	35.6	30.2	22.3
Inside Dia (small end)	9.2	7.2	6.5		5.3	4.7	45	3.9	3.4	3.3	3
Outside Dia (small end)	12	10.4	9		7.7	7.1	6.5	5.7	5.2	5.1	4.5
Outside Dia (big end)	18.3	15.3	13.2		11.7	10	8.8	7.6	7	6.7	5.6
Pocket end	8	6.5	4		4.8						
Shallot wall thickness	1.7	1.5	1.3		1.2	1	1	.8	.8	.8	.8
Slot Width (small end)	0	0	0		0	0	0	0	0	0	0
Slot Width (big end)	7.4	6.5	5.8		5	4.7	4.6	3.7	3.5	3.5	2.7
Slot Length	42	34	28		23	18.4	16	15	13.2	12	11
Flat Width (small end)	1.8	1	2.6		1.2	1.8	1.5	1.7	1.5	1.5	1.2
Flat width (big end)	10.7	9.2	8.5		7.8	7	6.5	5.6	5	4.5	4.3
Outside Depth (small)	12	10.5	9.1		7.7	7	6.5	5.6	5.3	5	4.2
Outside Depth (big)	16.5	13.7	11.6		11.5	9	7.9	7	6.3	5.8	4.9
Misc Data											
Boot Toe Hole	12.3	9.5	10	5.7	5.5	4.7	5.4	6.3	4.5	3.8	4.2
Tuning Wire Thickness	2.8	2.5	2.3	2		1.7	1.8	1.5	1.4	1.3	1.3
Block Dia	45.3	41	38	35	35	31	31	27	27	26.5	26.5
Total Length	2413	~1696	1190	883	1702	1206	843	599	418	20	159

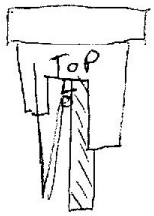
File: \scales.trump8.chp September 8, 1996

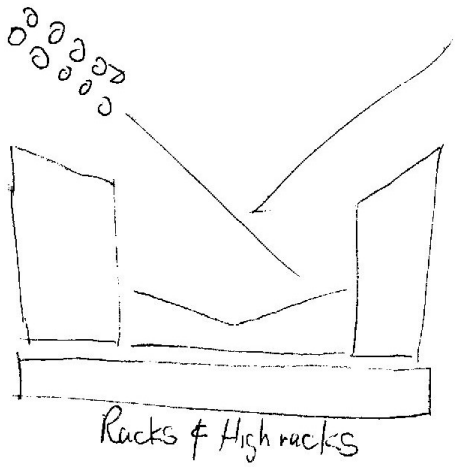
Notes

- Willis/Lewis high pitch C:540 hz
- Shallots 1-24 were pocketted, 25+ english.
- Pocketed shallots liked thinner tongues.
- Resonators Spotted metal, hooded towards nave, 1-12 mitered at bottom.
- Thick lead boots
- Boots #1-18 graduated from 200 long to 170mm long.
- Boots #19+ (front row) 85mm long
- Boots #19+ (back Row) 340 >160 mm long
- Back row boots were overlength so hooding would not collide with front row
- #1-17 back row had occasional overlength to avoid collisions
- Treble tongues very thick with almost no curve
- Willis brass weights thicker than usual
- Closed toes, with signs that they had been regulated as part of voicing
- Tuning slots at resonator very open (due to high pitch?)
- Tuning very stable
- Thick tuning wires w/ firm grip on shallot.
- Shallot supported by block.



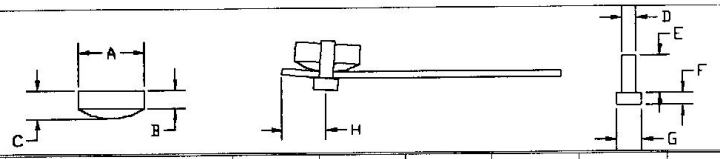






 September 8, 1996 File: \scales.trump8.chp

Fr Willis Brass Tongue Weight Scale
Samples from Willis 4, 1993



	A-Diameter			B	C	D	E	F	G	H
Willis #	x/32	inch	mm	Side	Width	O/Dia	long	Head	Head	Mount
1	1/32	1/32	0.8							
2	2/32	1/16	1.6							
3	3/32	3/32	2.4							
4	4/32	1/8	3.2							
5	5/32	5/32	4							
6	6/32	3/16	4.7							
7	7/32	7/32	5.6	3.2	4.4	1.9	4.5	1.3	3.2	
8	8/32	1/4	6.4							
9	9/32	9/32	7.1							
10	10/32	5/16	7.9							
11	11/32	11/32	8.7	4.4	5.3	2.5	6.4	1.8	4.4	
12	12/32	3/8	9.5							
13	13/32	13/32	10.3							
14	14/32	7/15	11.1							
15	15/32	15/16	11.9							
16	16/32	1/2	12.7							
17	17/32	17/32	13.5							
18	18/32	9/16	14.3							
19	19/32	19/32	15							
20	20/32	5/8	15.8							

Notes

Henry Willis 4, in 1993, said that modern weight's length is 1/2 the diameter *(i.e. C=A/2)*.

June 23, 1996

Willis Reeds, St Josephs, Seattle

from John Brombaugh, I don't know how I got them, but they were in my notebook.

CLAR

NAME	St Josephs, Seattle, Willis Choir Clarinet 8						
NOTE	C1,2....|.....|.....|.....|.....|.....|.(others listed)						
RES_LTH_UP	1240	610	300	140	57	a0 (no cyl)	
RES_LTH_CN	49.4	54	46	43	33.5	50	
RES_DIA_UP	36/5	30.8	27.7	26.1	26	26	
RES_DIA_MD							
RES_DIA_LR	19						
RES__THKS	1.2	.9	.85	.9	.8	.6	
SLOT_W_X_L							
SLT_TO_END							
TONGUE_LTH	95	70	42.5	40.4	30	23.4	
TUNING_LTH	64	35.5	18	12.5	8	4.8	
TGUE_THKNS	.50	.26	.16	.15	.1	.1	
TGUE_WTH_U	1	.8	1.5	.9	1	1.4	
TGUE_WTH_L	8.5	6.6	5.2	4.3	3.9	3.6	
TGE_WT_DIA	no weights on tongues						
SHL_LNTH_F	94.5	63.5	45.3	35	25.6	25.4	
SHL_LNTH_B	same						
SHL_LTH_MK							
SHL_DIA_MK							
SHL_DIA_UP	9.7	7.8	6.8	5.7	5.4	5.7	
SHL_DIA_LR	15.5	11.7	9.1	7.5	6.7	6.6	
SHL_FCE_UP	1	2	2.2	2	1.5	3	
SHL_FCE_LR	8.5	6.7	5.8	4.5	4.3	5	
SHL_FCE_BK	14.2	10.7	8.2	6.9	5.9	5.8	
SHL_OP_UPR	.5	.5	.5	.8	.9	1	
SHL_OP_LWR	6.1	4.4	3.6	2.8	2.4	3	
SHL_OP_LTH	37.7	19.7	13.5	9.8	8.2	11.5	
SHL_CAP_TH	1.5 thick caps at end						
SHL__THKNS	1.1	1	1	1	.8	.8	
TOE__OPNG	5.8	5.5	5	3.9	4.5	5.3	
BOOT_LNTH	195/37	165/22	165/22	165/20	165/20	155/17	boot + cone
TUNING_WRE							
ENDCOLS	|.....|.....|.....|.....|.....|.....|.....|.....						
SOURCE							
COMMENTS							
SPRDSHEET							

NAME	St Josephs, Seattle, Willis Swell Oboe 16, 8					
NOTE	C1,2....|.....|.....|.....|.....|.....|.(others listed)					
RES_LTH_UP	720 (all capped)	407	235	133	75.8	49
RES_LTH_CN	1150+1210+1330 =3690 =4410	1710+80+80 =1870 =2277	795 =1030	437 =570	142.5 =218	?
RES_DIA_UP	160	100	72	53	43	38.5
RES_DIA_MD	98.9	48	32.3	26	22	21
RES_DIA_LR	19.2	9.8id	8.7id	9.2	8	7.8
RES__THKS	--	1.05	1.05	.7	.6	--
SLOT_W_X_L						
SLT_TO_END						
TONGUE_LTH	--	--	73	55	37	33
TUNING_LTH	92	58	30	23.6	14	8
TGUE_THKNS	29 725	22 55	12 30	11 275	7 175	6 15
TGUE_WTH_U	--	1.3	.8	.5	1	1.4
TGUE_WTH_L	12.4	8	6.4	5.4	4.1	4.2
TGE_WT_DIA						
SHL_LNTH_F	142?	94	64	46	35.7	25.4
SHL_LNTH_B	same					
SHL_LTH_MK	75	50	43	40	?	?
SHL_DIA_MK						
SHL_DIA_UP	13.8	9.7	7.9	7.8	5.8	5.2
SHL_DIA_LR	22.3	15.3	11.8	9.3	7.5	6.5
SHL_FCE_UP	4	3.3	1.5	1.4	1.5	1.7
SHL_FCE_LR	11	7.8	6.6	5.8	4.7	4.6
SHL_FCE_BK	20.7	14.7	11	8.5	6.7	5.7
SHL_OP_UPR	.5	.8	.7	.7	.5	.8
SHL_OP_LWR	8.2	5.8	4.3	3.2	2.6	2.5
SHL_OP_LTH	54	37.6	20	13.3	10.6	8.7
SHL_CAP_TH						
SHL__THKNS	1.3	1.15	1.05	1.05	1.03	.95
TOE__OPNG						
BOOT_LNTH						
TUNING_WRE						
ENDCOLS	|.....|.....|.....|.....|.....|.....|.....|.....					
SOURCE						
COMMENTS	resonator caps - openings: 41, 33, 33, 14, 15					
SPRDSHEET						

Cornopean

4½" scale

NAME	St Josephs, Seattle, Willis Swell Cornopean 8					
NOTE	C1,2....|.....|.....|.....|.....|.....|.(others listed)					
RES_LTH_UP	2273	1112	525	250	110	53
RES_LTH_CN						
RES_DIA_UP	110	82	64	57	49	35
RES_DIA_MD	4.33"					
RES_DIA_LR	13	12	11	10	10	9.8
RES__THKS	1.3/.8	1.1/.9	1	.8	.6	.6
SLOT_W_X_L						
SLT_TO_END						
TONGUE_LTH	106	71.5	51	40	24	25
TUNING_LTH	60	36.5	25	15.7	10	6
TGUE_THKNS	22 55	14.5 36	10 25	8 20	6 15	4 10
TGUE_WTH_U	1	1	2	1	1.8	1.4
TGUE_WTH_L	9.3	6.6	5.6	4	3.8	3.7
TGE_WT_DIA	6.4	3.0				
SHL_LNTH_F	94	63	45.5	35.2	25	24
SHL_LNTH_B	same					
SHL_LTH_MK	60	36.5	25	15.7	10	6
SHL_DIA_MK	14	10.3	8	6.7	5.6	5.9
SHL_DIA_UP	9.6	8	7	5.6	5	5.7
SHL_DIA_LR	15.3	11.4	9	7.4	6.5	7
SHL_FCE_UP	2	1	2.7	1.2	1.4	1.8
SHL_FCE_LR	9.3	6.9	6	5	4.7	5
SHL_FCE_BK						
SHL_OP_UPR	.8	.8	.8	.8	.8	.8
SHL_OP_LWR	6.5	4.2	3.4	2.8	2.8	2.7
SHL_OP_LTH	50.5	25	13	14	11	11
SHL_CAP_TH						
SHL__THKNS	1.25	1	1	1	.9	.9
TOE__OPNG	10	9.2	8.6	7.6	8	8.7
BOOT_LNTH						
TUNING_WRE						
ENDCOLS	|.....|.....|.....|.....|.....|.....|.....|.....					
SOURCE	John Brombaugh					
COMMENTS						
SPRDSHEET	WSSC8					

NAME	St Josephs, Seattle, Willis Great Trumpet 8						
NOTE	C1,2....|.....|.....|.....|.....|.....|.(others listed)						
RES_LTH_UP	2260	1105	530	260	120	a65	
RES_LTH_CN							
RES_DIA_UP	132	95	75	64	59.5	49	
RES_DIA_MD							
RES_DIA_LR	16.6	13.7					
RES__THKS	1.2	1.1	.8	.9	.75	.75	
SLOT_W_X_L	35x70	30x70					
SLT_TO_END	30	20					
TONGUE_LTH	105	70	62	40	32	25	
TUNING_LTH	68	39.5	28	17.8	11	5.9	
TGUE_THKNS	26 65	17 42,5	13 32,5	9 22,5	6 15	5 12,5	
TGUE_WTH_U	2.4	2.4	1.8	1.8	1.1	1.3	
TGUE_WTH_L	10.5	7.5	6.2	5	4.2	4.2	
TGE_WT_DIA	weights: c1-f2						
SHL_LNTH_F	103	70	49.2	36.5	27.3	22	
SHL_LNTH_B	same						
SHL_LTH_MK							
SHL_DIA_MK							
SHL_DIA_UP	12.5	9.7	8.0	6.5	5.7	5.5	
SHL_DIA_LR	18.6	13.7	10.8	8.3	7	6.5	
SHL_FCE_UP	2.5	2	2	2	2	2.4	
SHL_FCE_LR	10.2	7.8	6.5	5.7	5.4	5.2	
SHL_FCE_BK	17.5	12.7	9.6	7.4	6	5.3	
SHL_OP_UPR	1	1	1	1	1	1	
SHL_OP_LWR	8	5.5	4.5	3.6	3.2	3	
SHL_OP_LTH	48	29.5	19.7	14	11.8	9.6	
SHL_CAP_TH							
SHL__THKNS	1.2	1.1	1.1	1.1	1	1	
TOE__OPNG	11	9.5	8.6	7.5	7.7	7.6	
BOOT_LNTH	200/34	170/25	80/23	77/20	77	77	
TUNING_WRE							
ENDCOLS	|.....|.....|.....|.....|.....|.....|.....|.....						
SOURCE							
COMMENTS							
SPRDSHEET	WGT8D						

Clarion

NAME	St Josephs, Seattle, Willis Swell Clarion 4					
NOTE	C1,2....|.....|.....|.....|.....|.....|.(others listed)					
RES_LTH_UP	1076	517	240	110	70	
RES_LTH_CN						
RES_DIA_UP	79	66	57	50	41	
RES_DIA_MD						
RES_DIA_LR	10	10.8	10.5	10.6	11.4	
RES__THKS	all 1.0					
SLOT_W_X_L						
SLT_TO_END						
TONGUE_LTH	106	71.5	51	40	24	25
TUNING_LTH	60	36.5	25	15.7	10 6	
TGUE_THKNS	.56	.37	.27	.20	.16	a/.11
TGUE_WTH_U	1	.7	2	.9	1.8	1.4
TGUE_WTH_L	9.3	6.6	5.6	4	3.8	3.7
TGE_WT_DIA	c1 dia brass: 6.4 c2 dia brass: 3.0					
SHL_LNTH_F	94	63	45.5	35.2	25	24
SHL_LNTH_B	same					
SHL_LTH_MK						
SHL_DIA_MK						
SHL_DIA_UP	9.6	8	7	5.6	5	5.7
SHL_DIA_LR	15.3 11.4 9 7.4 6.5 7					
SHL_FCE_UP	2	2	2.7	1.2	1.4	1.8
SHL_FCE_LR	9.3	6.9	6	5	4.7	5
SHL_FCE_BK	14	10.3	7	6.7	5.6	5.9
SHL_OP_UPR	all .8					
SHL_OP_LWR	6.5	4.2	3.4	2.8	2.8	2.7
SHL_OP_LTH	50.5	25	13	14	11	11
SHL_CAP_TH						
SHL__THKNS	1	1	1	.9	.9	
TOE__OPNG						
BOOT_LNTH						
TUNING_WRE						
ENDCOLS	|.....|.....|.....|.....|.....|.....|.....|.....					
SOURCE						
COMMENTS						
SPRDSHEET						

Literature Searches:

Be cautions with the literature search
Some sources refer to Willis III or IV

from The Organs of Britain: Norman

Willis used harmonic flutes inspired by Cavaille-Coll, and Schultz's narrow Lieblich Gedackts. Willis scales were narrower than Hill's, but with higher cutups. This gave a hard sound, that was good in big buildings. Slotted basses added to the reediness, which Willis felt improved blend.

Reeds

Willis refined reed tone. He sharpened the tongues and brought the pipe back into tune by lengthening the resonators. This makes the pipe softer and smoother. At wind pressures of 60-90mm, the pipes get too soft to be useful when smooth enough, so he went to higher windpressure.

Bass notes regulated smooth tend to want to fly off. Brass tongue weights allowed the tongue to be regulated much closer without flying off, and improved the balance by softening the bass. The tapered closed shallot also helped in this direction.

The pipes were often hooded to keep out dirt. The strong tongue curve that high pressure reeds have also helped avoid dirt problems. The problem with refined reed tone was poor blend and slow speech.

The Modern British Organ: Bonavia-Hunt

Organ Tone

The Great is considered the Diapason Organ, The Swell a reed organ equal in power, but contrasting the Great. Swell reeds should not be so loud as to dominate the Great chorus, loudest reeds belong on the Bombarde. There are three classes of Trumpets:

- The open toned Trumpet
- The close-toned Tromba
- The fiery open toned Trompette.

Normal Trumpets, at 16, 8, 4 are intended on Swell and Great. Some builders put smoother reeds on the Great.

Swell needs open reeds, to compensate for the boxes'p attenuation of brightness. Also, opening the swell shutters should produce a thrilling change of tone, by setting free harmonics. Closed tone reeds don't work. Trombas are too close to blend with chorus, so belong in solo, choir or Bombarde.

Heavy pressure Willis Chorus (not trombas) reeds should be used alone, but with mixtures, or you rob clarity and definition (not a happy blender). They are best used by themselves in contrast with the Diapason Chorus or low pressure Trumpet chorus.

Willis Tongue Weights, pg 71

Weights slow down the tongue, lowering its pitch, hence shortening it and increasing the fundamental, at the expense of brightness and loudness. Willis weights has a distinctive sound.

Normally, at less than 3-1/4" wind, you would weigh 1-1/2 octaves of pipes; higher as windpressure increases.

Non-resonant buildings don't favor fundamental tone, so are helped by loading, which favors fundamental.

Unweighed 8' bass tongues are too powerful and buzzy for their treble. If you try to soften them by lengthening the resonator, they will develop a choking sound. Weighting fixes all that. Willis II standardized brass weights, and used different size screws to fine-tune weight.

Thicker tongues require a curve starting close to the wedge, and distributed gradually, no end curve. Willis used thinner tongues with bold curves (lots of end curve). Low pressure reeds (3-1/2") want less end curve, more initial curve.

Harmonic Resonators, pg 72

These give purity, power and increased fundamental (Tromba tone!). A small scale, or wind pressure below 3" requires Harmonic trebles to keep up the power. The break point to harmonics depends on wind pressure, tone required and scale. Willis normally had no harmonics on 8' ranks, just 4' Trumpets. Tubas and trombas are often harmonic.

For Trumpets at 4-5" wp, the first harmonic pipe may be g32. Below this point, pipes have a nasal tone, and attempts to eliminate nasalness results in Tromba tone.

- Use same scale as the Octave below
- Use the same total length (incl shallot) as octave below

Willis Trumpets, pg 71

Scale: Small scales blend better. Large scales have more power and fundamental, but poorer quality. The beautiful ringing quality of Willis chorus reeds cannot come frome big scales, which introduce inharmonic overtones. Willis fixed 114mm for an 8' as the limit for normal purposes. Lower pressures can have narrower scales, but don't increase scales for higher pressures or tone suffers. The scale seems to be halving on the 32nd note for the 8' octave, the rest at 37-38. Resonator tips should not be smaller than shallot, nor more than 6:5.

Tuba Trumpets->>

• C 16'	178 (7")	152.4 (6")	140 (5-1/2")	127 (5")	
• C 8'	127 (5")	114 (4-1/2")	101.6 (4")	95.3 (3-3/4")	89 (3-1/2")
• C 4'	89	85.7	76	73	70
• C 2'	70	63.5	60.3	58.7	
• C 1'	57	51	49.2	47.6	

Willis Tromba, pg 73

Like Trumpets, but with a strong fundamental and few harmonics; often used as the Great reed. These were popular with Cathedral organists, probably because they had the power to fill the space.

- long resonators with sharp tuned tongues, though risk of "flying off"
- wide scales, too wide introduce inharmonics that just fight you
- Vincent Willis filled-in shallots
- thick, hard tongues
- heavy wind pressure
- tongue weights to treble c
- narrow resonator tips

Willis Tuba, pg 76

Can be a very loud Trumpet or Tromba. The Tuba is a very loud voice, for a big room and big organ. It is a solo voice, though can be coupled to full Great for special full effects. They can be harmonic from F18 if you have at least 9 inches wind. Willis standard wind is 12, 15, 20, 25" depending on power needed.

Special shallots, e.g. at 2'C:

- 65mm long
- 25mm long opening
- 12.7 mm outside diameter at big end
- 6.4 mm inside small end
- Opening almost full width of shallot

Willis Pedal Ophicleide 16', pg 83

- 16' C, the scale is 7 to 8 inches diameter.
- 3/8 oz tongue weight @ 8" wind
- 5/16 oz tongue weight up to 6" wind, 0.56-0.66 mm thick tongue

This stop has special shallots:

- Shallot outside diameter at the big end: 27mm
- Shallot outside diameter at the small end: 12.7mm
- Length: 153mm
- Length of opening: 60 mm
- Width of opening at big end: 14.3mm
- Brass wall thickness: 2.4mm

Willis Pedal Trombone 16'

This stop is like the Ophicleide, but smoother and louder due to:

- longer resonators and sharper tuned tongues
- Higher wind pressure
- Felt-and-lead weights

Willis Pedal 32' reeds

- 32'C= 12" diameter
- Westminster Cathedral: 30" wp, 89mm long tongue, 4 oz weight
- Huddersfield: 12" wp
- Hereford Cathedral: 16-1/2" wp

The #1 Open was not intended as part of the chorus. It was for massed voices, and soloing against powerful solo voices with full Swell accompaniment.

The British Organ: Clutton/Niland

St Georges, Liverpool, 1867, had four big solo reeds, 8,8,4,4, on 17-1/2" wind in the bass, 22-1/2" in the treble. Willis later abandoned bass/treble differentiated wind.

His standard pressures:

- 3-1/2" soft and solo reeds
- 7" chorus reeds
- 15" for Tubas.

Windpressures of 7" was possible due to loading of the tongues, by Willis's brother, George. This made the attack slower, pipes softer and smoother. Early Willis's had excellent Swell chorus reeds, on 3-1/3" wind. To get more power w/o sacrificing refinement of tone, use heavier pressures (getting a smoother tromba tone). Low pressure means less power, but more harmonics.

Willis Swells were softer than the Great.

American Classic Organ- Callahan

History

Willis II and Vincent became partners in firm in 1878. Vincent left the firm in 1894. Willis I died 1901, aged 79, so Willis II assumed control. Willis III became partner 1910, age 21. Because of his father's illness, Willis III gradually took control. Willis IV born 1927, is now in control.

Lower Lips pg 13

1925, Willis didn't like Skinner's flat lower lips, which he felt were useful only for small diapason work under 3 1/2" windpressure, early english type.

Tongue Weights pg 14

1925. Willis III suggests increasing tongue weighs one size for wind increase from 10" to 12".

Voicing & Scaling pg 66

1930 Willis III says halving on the 16-1/2 note is best. Don't use 2/7th mouth on over 4" wind, nor use 1/4 mouth on over 5", or the pipe will be windy & intractable and the voicers will want to beard.

• 16'	Double	1/5 lab	two pipes narrower than Open #1
• 8’	Open #1	¼	Scale to room
• 8'	Open #2	1/4,2/9,1/5	two pipes narrower than Open #1
• 4'	Principal #1	2/9	two pipes narrower than Open #1
• 4'	Principal #2	2/9	four pipes narrower than Open #1
• 2-2/3'	Twelfth	1/5	six pipes narrower than Open #1
• 2'	Fifteenth	1/5	four pipes narrower than Open #1
• Mixture	1/5		unisons 4 pipes narrower
• Quints			6 pipes narrower, 25% softer than unison
• Tierce			8 pipes narrower, 25% softer than unison

Make Cutups regular as clockwork:

Cutups	Resonant	Non Resonant
2/7 mouth	1/4	1/3.5
1/4 mouth	1/3	1/2.7
2/9 mouth	1/2.75	1/2.5
1/5 mouth	1/2.5	1/2.25

Voicing

1931, Voicers were given explicit instructions, all recorded in voicing books. Scale numbers were like #4, #6, #8, different starting points. You would use #4 to refer to the same scale, whether it was a 8', 4' or 2'. 8' Diapason #4 is about an American #44 or 151mm.

Toehole scales were given in reference to a standard scale. e.g. "Tip Open #4. 3/4 octave full" meant to use the Open #4 tip (toe) chart, but make them bigger by 3/4 of an octave.

The length scale stick was given for lengths (cone tuning). Cutups were give like: "Cut up 9 in 4 / 10-1/2 in 4". This means the bass, with ears, was cutup 9 in 4 (4/9ths); the treble was cutup 10-1/2 in 4, slightly less because the treble has no ear shading.

The bevels and nixs were strictly given, referring to standard patterns.

Windpressures

- 4-1/2" usual for Great,
- 5, 6 or 7 for Swell, according to reeds
- 5" for Swell, if reeds given 8"

Scales, mouths lower lip, windpressures, according to acoustics. 2/7 mouth unwise for over 5".

Westminster Cathedral- acoustically good

Rank	Scale	Willis #	mm	Mouth	Wind
• Open #1	7-3/8"	00	187.3	2/9	12”
• Open #2	6-1/2	2	165	2/7	4-1/2"
• Open #3	5-7/8	4	149.2	1/5	4-1/2"

Sheldonian Theatre Oxford- acoustically medium

• Open #1	7-1/8	0	181	¼	6-1/2"
• Open #2	6-1/2	2	165	2/9	3-1/2"
• Open #3	5-3/8	6	136.5	2/7	3-1/2"
• Open #4	4-3/8	11	111	¼	3-1/2"

Sheffield City Hall- acoustically bad

• Open #1	7-3/8	00	187.3	2/9	10"
• Open #2	6-1/8	3	155.6	2/7	5"
• Open #3	5-3/8	6	136.5	1/5	5"

1935 Willis III was getting away from the pre WWI Willis practice of the Swell flues on 3-1/2"and the chorus reeds on 7". Nagpur Cathedral all 4-1/2" w/ new type Cornopean. Since then Swells all got more than 5" on big organs, big rooms. Great a flue chorus, Tromba really a Tuba, to be used as such.

Reeds

Open, parallel shallots require tongues 50% thicker. For 32' reeds it is better to take normal 16' shallots down, rather than the Willis II short shallots with a tremendous weight and pneumatic starters. They speak quicker.

Shallots

- A & B sets are the same diameter
- A has longer openings than B
- C set is about an octave bigger than A or B
- A is used for small Trumpets (i.e. 3-3/4")
- B is used or Oboes *(not orchestral)*,16' Contra oboes, Dulaians, Clarinets
- B filled is used for Corno-di-Bassettos, Vox Humanas
- C is for normal Trumpets

Salisbury Cathedral. One of Willis I's bigger jobs. The only one in which the Swell chorus reeds were on the relatively light pressure of 4-1/2", so had "A" set shallots, unfilled. Normally, he would have used 7" with "C" set shallots. In the 1920's many Willis reeds were sent to Skinner.

In 1947, Williams & Co made Willis shallots, but were obligated not to supply them to others.

The Willis IV, AIO Voicing Video 1993

System Voicing

To get uniformity and blend. Treat all the pipes the same, systematically. Cutup all the pipes carefully to proportional dividers. Set toeholes to charts. Set quickness uniformly to test. Nick all the pipes the same (or rather proportionally). This is in comparison to "craft" voicing, were each pipe is treated as an individual so they all end up a little different.

Quick/Slow Speech Test

Blow the pipe by mouth to determine speed. The pipe should be able to be overblown, with much pressure, to 3, 4 &5 harmonics. Stopped pipes should overblow to 3 (odd) harmonics. Once the position of the upper lip and languid are set, you don't need to change them,weather it is an open, harmonic or stopped pipe.

Don't bucktooth, keep upper lip in. Dubb the lower lip, especially on romantic, higher pressure (5-9" wind). The further in the upper lip, the stringier the tone and the better the blend. Slotting also encourages stringyness & blend.

Strings

Strings should blow a clear octave, brought down to the fundamental w/ roller. Broad geigen string tone requires a high languid. Pulling the roller out makes it stringier and louder.

Misc Notes

W.A. Alcock- A Willis full Swell was reed chorus plus mixture. Contra-Oboe 16' had tubes and bells to 16'. Round and Smooth tone.

David Frostick

Willis Tubas of 1920's had a relatively narrow scale, especially were the resonator attached the block. This choked the sound somewhat, giving the pipes a nasal sound.

The strongly dubbed lower lips slowed the pipes, which may have improved speech when these relatively narrow scales were strongly blown.

John Willis

Besides scales, you must pay attention to metal thickness, belly, voicing, tip sizes and wind pressures. Exactly the same techniques and scaling system is used today. For example, a Lieblich scale (the standard being "middle"), you could scale the stop to compliment the rest of the instrument as "Middle, one small" "Middle, 2 large" or whatever. Middle is the standard Lieblich scale, variations being pipes larger or smaller than standard (Middle) scale.

Father Willis bellied everything, but the amount of belly depended on the stop. A string needs more belly than a diapason. Wood and metal pipes were bellied.

There were zinc boards with standard holes in them, to prevent the pipeshop from leaving the tips too large, making unnecessary work for the voicers.

All the two foot “c” flue pipes and the 4' c reed pipes are assembled in the voicing shop and voiced by Willis. The voicer would voice the rest of the organ from those samples. Each stop was bench voiced and mouth blown to insure technical correctness, before it goes on the voicing machine. Cutups were determined by the windpressure and flutyness desired. Each stop was checked by Willis while still on the machine.

Pipework is scaled according to the instrument. If the instrument is to be on the large scale, all the scales of the individual stops would relate to each other. Some sample "Open" scales:

- 000 scale, 16' pipe is 13-5/16", 8' c would be 7-11/16'
- 00 is 12-11/16
- 0 is 12-1/8
- 1 is 11-5/8"

The Lieblich scale had a large, middle and small scale. Willis terminology is "Middle two small".

Middle Scales:

- 16' 6-9/16"
- 8' 3-15/16"
- 4' 2-11/32"
- 2’ 1-7/16"
- 1' 15/16"
- 1/2' 9/16"

Mouthwidths are probably consistent within a stop, but check it! Sw Gemshorn 4' is really a spitz-principal to be used with the 8' Geigen.

Blair's Observations

For non-chorus stops, the scales, cutups, toe holes varied very little, from organ to organ. For example, Lieblich flutes and Harmonic Flutes were almost identical in Huddersfield town Hall and Union Chapel.

Foxearth Gt scales, windpressure & voicing were the same as the Union Chapel Choir. The Huddersfield Gt Claribel was only a pipe bigger than Union Chapel. The main difference was the wind pressure, which varied from organ to organ.

The Diapason chorus did vary in scale according to the size of the room and organ.

Standard Father Willis wind pressures are 3-1/2" for normal flue and non-chorus reeds, 7" for chorus reeds and 10" or 14" for Tubas and Pedal 16' reeds. Choirs ver viewed as miniature Greats so had a reduced pressure of about 2-3/4". Smaller organs had a reduced pressure (Foxearth of 2-5/8", Knebworth 3"), and huge organs had more wind (Huddersfield Town Hall 5").

The Great Leiblich was really a Stopped Diapason *(and often called that)*, with Leiblich construction, but scaled about six pipes bigger than a normal Lieblich. At Huddersfield Town Hall, the Swell 16' Lieblich was about a pipe bigger than the Sw 8' Lieblich.

The Diapasons all crescendo into the treble, though not as much as the Cavaille Coll organs. The Octave is a little softer than the Open, though is more telling as it is brighter. The Superoctave is a lttle softer, but even brighter. The Tierce Mixture is very reedy and dirty, useless as part of the plenum for Bach. The scale dramatically narrows for upperwork, keeping it quite bright and stringy; in comparison, classical upperwork is wider and flutier, building powerful resultants.

It was intended to be used alone with the reeds as sort of principal scaled Cornet to fill out the reed chorus, and also to bind the reeds to the Diapasons for full organ. However, the reeds are most effective by themselves (but with the Mixture); adding Diapasons simply dilutes the contrast between the reeds and the Diapason chorus.

The Pedal bourdon 16' was the identical scale and voicing at Foxearth and Halstead. It is a normal scale, growing into the bass, except for the bottom 6 notes which became narrower toward the bass,

probably to save space. The Bass has a high cutup (1/3) to keep the narrower pipes fundamental, but by F# 7 has become 1/4 cutup with sharp upper lips, giving a prompt speech and a solid, bright and slightly quinty tone.

The pedal Open 16' are huge scaled wooden pipes, becoming narrower into the treble, with 1/3 cutups, providing a powerful fundamental to the full organ.

Only liebliches and loud Diapasons are dubbed. Strings, Harmonic flutes, Swell Geigens were not dubbed.

The Willis Principal Chorus is transparent and almost contrapuntal; no fat leathered lips here! Willis had a horror of ponderous basses masking the treble notes and inner parts. Stops should grow into the treble so the treble note would just stand out "enough" and the inner parts followed easily.

Don't put Tubas in the box. 1918 Willis took over Lewis & co,. 1924 Willis abandoned slider chests, in favor of Skinner type pitman.

Pitch of Royal Alexander Hall, `87`, was c540, the old Philharmonic (Concert pitch of the time. Gt of this organ similar to C-C's Gt St. Sulpice.

Willis Model Organs (Smaller Organs)

by John L. Speller

A while back there was a thread on the 1881 2-8 Willis "Organ on Wheels" at St. Paul's Cathedral; here are some data on other Willis 2 manual "Model" organs (a long standing interest of mine) partly gleaned from the NPOR (though I have changed the dates in square brackets since I think they are wrong on NPOR*)*:

A	Higham,	St. John,	c.1860
B	Wych	St. James	1857
C	Waltham StLawrence	St. Lawrence	c. 1860
D	Colnwick	St. John	c. 1860
E	Foxearth	Ss. Peter & Paul	1863
F	St. Margaret, Knightswood,	Glasgow,	1865
G	Trinity Congregational	Croydon,	1867
H	St. Mary, Stapleford	Tawney,	1869
I	All Saints,	Great Horkesley,	[c. 1870]
J	St. Catherine's School,	Bramley,	1870
K	Godalming Congregational Church, Godalming?		1870
L	Fetcham	St. Mary's	1873
M	Gartuk Church,	Coatbridge,	1870
N	Royal Seaman's Orphanage,	Liverpool	[c. 1875]
O	Christ's Hospital,	Hertford,	1876
P	St. David,	Davidstow,	1876
Q	St. Luke,	Wimmerleigh.	1876
R	St. Leonard,	Wollaton,	1889
S	St. Thomas,	Northaw,	1881
T	St. Katherine,	Tottenham,	c.1885
U	Strabungo Church,	Glasgow,	1888
V	Cheriton Baptist Church	Folkestone	1891
W	Ss. Peter & Paul,	Madehurst	
X	St. Lawrence	Cliddesden	1891
Y	St. John	Stanford on Soar	1895
Z	St. Mary	Dennington	1898

In the following table, stops are marked with the number of ranks present (more for mixtures) for each of the above organs:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
GREAT																										
16' Contra Gamba												1														
8' Open Diapason	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8' Claribel Flute	1		1	1	1	1	1	1		1		1	1	1	1	1	1	1	1		1			1	1	
8' Stopped Diapason		1																								
8' Lieblich Gedact									1											1		1	1			
8' Viol d'Amour	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
8' Salcional	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8' Dulciana	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1
4' Principal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4' Flute Harmonique	1	0	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	0	0	0	1
2' Fifteenth	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sesquialtera	0	0	0	0	0	2	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
8' Clari(o)net	0	0	0	1	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0
8' Corno di Bassetto	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8' Trumpet													1													
SWELL																										
16' Double Diapason	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8' Open Diapason	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0
8' Stopped Diapason	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8' Lieblich Gedact	0	0	0	1	0	1	1	0	1	1	1	1	1	0	0	0	1	0	0	1	0	1	1	0	0	0
8' Salcional	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
8' Vox Angelica T.C.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
4' Principal	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4' Gemshorn	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8' Cornopean	0	0	1	1	1	0	1	1	1	1	0	1	1	0	1	1	1	0	1	1	1	1	0	1	1	1
8' Trumpet	1																									
8' Hautboy	0	1	0	0	0	0	1	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0
PEDAL																										
16' Open Diapason													1													
16' Bourdon	1	1	1	1	1	1		1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1
16' Violone							1																			

A number of trends are apparent. The basic Great Organ is 8' Open Diapason, Claribel Flute, Dulciana, 4' Principal, 2' Fifteenth. Where only four stops are present and the Dulciana is omitted, the 8' Flute is generally an 8' Lieblich Gedact *(Stopped Diapason in some of the earliest instruments)*, so as to be a compromise in volume between the Dulciana and Claribel Flute. Where there is one additional stop it is generally a 4' Flute Harmonique. Some organs also have a Clarionet or Corno di Bassetto, and very occasionally there is a Sesquialtera (tierce chorus mixture), additional string or rarely, a 16' Contra Gamba or 8' Trumpet. In very early instruments the 8' flutes are divided treble/bass.

The basic Swell Organ is 8' Open Diapason, 4' Gemshorn *(Principal in the earliest instruments)* and 8' Cornopean. Sometimes the Cornopean is replaced by an Hautboy, presumably in buildings where the Cornopean would be considered overbearing. Where there is a fourth stop it is generally a Lieblich Gedact *(or Stopped Diapason)*, and a fifth is generally a Salcional (thus spelt by Willis, rather than *Salicional)*. Again, there is occasionally a second string, second reed, 16' Double *(Stopt)* Diapason, etc. in larger instruments.

Typical Larger Organ: Brisbane City Hall 1891

Great

16'	Double Diapason	metal
8'	Open Diapason	metal
8'	Stopped Diapason	metal
8'	Claribel Flute	wood, stopped bass
4'	Harmonic Flute	metal
4'	Principal	metal
3'	Twelfth	metal
2'	Fifteenth	metal
III	Sesquialtera	metal
8'	Trumpet	metal
4'	Clarion	metal

Swell

16’	Lieblich Bourdon	Stopped wood and metal
8'	Lieblich Gedackt	Stopped wood and metal
4'	Lieblich Flute	Stopped wood and metal
2'	Flageolet	metal
8'	Giegen Diapason	metal
4'	Gemshorn	metal
III	Mixture	metal
8'	Salicional	metal
8'	Vox Angelica	metal
16'	Trumpet	metal
8'	Trumpet	metal
4'	Trumpet	metal
8'	Vox Humana	metal
8'	Hautbous	metal

Pedal

32'	Contra-Violone	metal , (from Violone)
16'	Violone	metal
16'	Open Diapason	wood
8'	Octave	wood, (From Open Diapason)
16'	Bourdon	Stopped wood
8'	Flute Bass	wood
16'	Ophicleide	metal
8'	Posaune	metal

Choir

8'	Dulciana	metal<R>
8'	Lieblich Gedackt	Stopped wood & metal
8'	Claribel Flute	stopped bass, wood, softer than great
8'	Viola-da-Gamba	metal
4'	Flute d'Amour	
2'	Piccolo Harmonic	
8'	Corno-di-bassetto	

Solo

8’	Flute Harmonic	metal
4'	Concert Flute	

8' Clarinet
8' Orchestral Oboe
8' Tuba

Windpressures

- 3-1/2" for all except
- 7" Great & Swell chorus reeds
- 10" Pedal reeds
- 15" Tuba

Tonal Analysis

Great

- Diapasons at 16', 8', 4', 3', 2', III
- (Chorus wasn't a powerful as a Lewis or Schulze, it needed reed for full organ)
- (excellent blend and balance between the ranks)
- Open Flutes 8', 4'<R>
- Tromba type Chorus reeds at 8'&4'

Swell

- The Willis full Swell is Trumpets 16' & 8' and the Mixture. In a small
- organ use the Cornopean<MI> (really a Trumpet)<D> plus the Principal.
- Strings were the prompt <MI>(due to rollers)<D>, calm and interesting
- Salcional and the gently undulating Vox Angelica. Gedackts (liebliches),
- even the 16', were clear and transparent with sparkling trebles. The
- Swell Open was less aggressive that the later Geigens of 1930's.
- Liebliches at 16', 8', 4', (plus 2' Flageolet)
- String & Celeste
- Giegens at 8' & 4' (Gemshorn - a cylindrical principal)
- Bright Chorus reeds: 16', 8', 4'
- Solo reeds: Vox and Oboe

Choir

The choir was a collection of solo and accompmental stops. In big organs, it had a miniature "echo" chorus.

- Liebliches 8,4,2
- Dulciana
- Viol d'amore
- Clarabel Flutes
- Corno-di-bassetto

Solo

- Open and/or harmonic Flutes
- Prompt, moderate scale strings,
- Solo Reeds (don't put the Tuba in a box.

Pedal

Open Diapason 16' was a wooden, huge scaled pervading, pervasive, fundamental stops that sat comfortably below full organ. The 32' was an octave extension of this.

The Bourdon 16' was firm and hard, rather than pervading, with the quint having some prominance for "ensemble" reasons. It was the usual pedal stop for small organs, because it was compact and cheaper

than full length stops; but was sometimes omitted in larger organs in favor of full length stops like the Violone 16'.

The Violone 16' *(which Willis preferred to the Bourdon 16')* avoids string tone. It is sometimes extended to 32' pitch.

- Violone 32' & 16
- Open Wood 16' & 8'
- Stopped Wood 16' & 8'
- Trumpet 16' & 8'

Willis had a horror of the possibilities of octave couplers being used on medium sized instruments, to the detriment of blend and balance.

Standard Fr Willis Mixtures