

# Early Eighteenth-Century English Harpsichord Tuning and Stringing

by Thomas McGeary

A source offering new information about the tuning and stringing of English harpsichords circa 1730 is a manuscript treatise entitled *Musica Practica. An Essay, (Plan or Model) for a Compendium of Practical Music* written by Ar. Wood.<sup>1</sup> Nothing is known at the moment of the author - probably Arthur Wood. Although he may have been only an amateur musician, his treatise clearly shows he was well-read and knowledgeable in music theory. Perhaps he was related to other musicians with the surname 'Wood' who were active in early 18th-century England as publishers, performers, or composers.

Wood's treatise, which deals extensively with music theory, contains a chapter *Tuning the Harpsichord, or Organ* and a chapter *Of Stringing the Harpsichord, or Spinnet*. These chapters are transcribed below, followed by brief comments.

[p. 96]

## Tuning the Harpsichord, or Organ

To the preceding discourse of the Thorough Bass, it may be very proper to shew the best manner of Tuning the Instrument it is so commonly Performed on. viz. the Harpsichord. Also the Spinnet and Organ.

The Harpsichord or Spinnet being justly Strung and equally Pen'd [i.e. quilled]. Or the Organ, Principal or Diapason Stop, well and equally Voiced: See the following Scheme: wherein observe, the Notes express'd by Crochets are to be Tun'd to those express'd by Minims, and whensoever a Note is express'd by a Minim, the same, or its Octave, hath been in the Tuning before, and is repeated in order to be prov'd to some other Note than that it was first Tuned to.

Scheme for Tuning.



The image shows a musical staff with ten numbered articles (Art. 1. to 10.) illustrating the tuning scheme. Each article shows a sequence of notes and chords. Article 1 shows a C note. Article 2 shows a G note. Article 3 shows a D note. Article 4 shows an F note. Article 5 shows a B note. Article 6 shows an F# note. Article 7 shows a C# note. Article 8 shows a G# note. Article 9 shows a D# note. Article 10 shows an A note. The notes are written as minims, and the chords are written as minims.

The particular directions to each Article are as follows.

- Art. 1. Csolfaut and its Octave nicely Tun'd to a Pitch pipe, or a Consort Flute, exactly blown.
- Art. 2. Tune G. a 5th and E. a 3d Major above Csolfaut; in doing which, observe and take special care that the 5th, and also all the 5ths that arise hereafter in the Tuning, except as hereafter excepted, are Tun'd bearing Flat, i.e. that the interval be not exactly Perfect but inclining to a Deficiency; and that the 3d, and all the 3ds Major, except the last, viz. between E[?] and G. are Tun'd exact full Sharp 3ds [i.e. pure major thirds]. Thus have we the Chord of C. Tun'd, as is intimated by the following Minims.
- Art. 3. Dt|. Tun'd a 5th, and B. a 3d above G. according to the [p. 97:] foregoing directions in Art. 2. So is the Chord of G. Tun'd.
- Art. 4. Fq Tun'd a 5th below Csolfa, and Alamire a 3d above Ffaut. Observe in Tuning this 5th, that F is to bear somewhat upward to C. so that C. be an exact bearing flat 5th to F. as directed in Art. 2.
- Art. 5. This article is to direct up to prove, first that Alamire be a proper 5th below Ela as well as a good 3d to Ffaut. 2dly, that it is a proper 5th above Dlasolre, whose 8ve was Tun'd in Art. 3. Thirdly that B. is a proper bearing 5th above Elami, as well as a good 3d to G.  
These must be effected, and all our Tuning hitherto examin'd and perfectly settled [sic] before we proceed farther. So have we the Natural Notes of the Scale Tun'd.
- Art. 6. F# Tun'd a 5th above B. with special care at the same time, that it answers as a good 3d Major to D. These fix the Chord of Btl, and D#.
- Art. 7. C# Tun'd a 5th above the 8ve to the last Tun'd F#, being careful that it be a good 3d Major to A.

Art. 8. G#, Tun'd a 5th above the Octave to the last Tun'd C\$, being more especially careful, that it produce a good 3d major to E. in as much as this last Harmony is more frequently used than the first. Thus have we all the Sharp Notes Tun'd.

Art. 9. 6(7, a 5th below F. NB. This 5th may be as near Perfect, as a particular regard to D. will allow, viz. that B[?] and Dti are a good 3d major.

Art. 10. Et> as perfect a 5th below 8(7, as Gq its 3d major will allow it; having special regard also to its making a tollerable [sic] 3d major to Bt| (in its 8ve above) in as much as this is a Chord of frequent use in several Keys. And thus it may [be] brought to be a better 5th to G#.

'Tis to be remark'd in Tuning (as well as in Mathematical truth) that E|? is allow'd to be somewhat more [p. 98:] than a perfect 5th above G#, that the greatest imperfection of the Instrument may lie on one of the least useful Chords, yet even here shou'd we endeavour that E'r> exceed as little as conveniently we can.

Tune the rest of the Instrument exact 8ths, 15ths and 22nds, to those already Tun'd as above directed.

Thus are those Instruments Tun'd the the most to advantage for general Use, that so small a division of an Octave is capable of.

But yet I cannot but add, that by frequent revising and examining the Tuning in all its different Chords, it is possible to bring all the Bearings to be so Equal throughout the Instrument, as to make it sufficiently perfect, even to a nice Ear.

### fp. 99] Of Stringing the Harpsichord, or Spinnet

As very great inconveniencys often attend the frangibility of the Strings, especially the Spinnet (which hath but One to a Note) it will be necessary therefore that you know how to supply any of the same that shall happen to be wanting.

In order to [do] this, observe the following Scheme, wherein the several Numbers or Sizes, for either Harpsichord or Spinnet, are particularly set down over the Note or Bar where they severally begin, which said beginning Note for your better distinction, is express'd by a Minim; and as many Notes or Keys as the said Size is to be continued up

to, is expressed by Crochets, set within the same Bar.

#### Scheme of the Sizes of Strings

If it happen, either from a defect of the Wire, or extraordinary length of the String, that any Size, as here set down, don't Hold, take the next less Size.

Some Harpsichord Makers of late, have Mark'd the Sizes of the Strings upon the Bridges of the Instrument. This may be very necessary as well as convenient; for an Instrument should have a different Sizing, according as it iss [sic] made Thicker or Thinner, and according to the length of String required.

\* \* \*

#### TUNING

There seems to have been no concensus about keyboard tuning in early 18th-century Britain, for a variety of tunings and temperaments were reported and advocated in printed and manuscript sources. Godfrey Keller's directions for tuning were published in 1707 and were widely reprinted thereafter.<sup>2</sup> These somewhat vague directions describe a regular temperament whose thirds and fifths were respectively 'as sharp' and 'as flat as the Ear will permit'. A strict application of his directions is difficult; but with equal temperament and j-comma meantone eliminated, the result most likely was a temperament approaching | - or -| -comma meantone.

Pythagorean tuning was one of two tuning schemes given by Alexander Malcolm, in *A Treatise of Musick* (1721), who reports that most tuners used this tuning [X, §3]. In addition to giving Keller's directions, Books IV-XIV of Walsh's *The Harpsichord Master* (1712-54) also included directions for Pythagorean tuning.

Meantone formed the basis for several temperaments. Malcolm also reported that those tuners who 'affect a greater Nicety . . . diminish all the Sths by a quarter of a Comma' - thus producing j-comma meantone. What was no doubt also intended to be j-comma meantone was advocated by Nicolo Pasquali in *The Art of Fingering the Harpsichord*

(c!760) and William Holder in *A Treatise of the Natural Grounds, and Principles of Harmony* (1694 and 1731), p. 180. Both describe setting the fifths slightly flat (Holder specifying 'as much as a quarter of a Comma, which the Ear will bear with in a 5th'). But since neither precisely specifies the quality of the major thirds, 1- or |comma meantone also remain consistent with their directions.

Roger North's manuscript *Theory of Sounds* (1726)<sup>3</sup> gives detailed directions for setting what is basically J-comma meantone, but with the exception that B|7 is to be tuned a pure fifth below F. North remarks on the 'wolf fifth' and the imperfections of the more remote triads in meantone temperament; these imperfections, he points out, can be ameliorated by 'Some very good tuners [who] will help a little, by robbing Peter to pay Paul; as by making G\$ over sharp'.

And finally, to add to this variety of temperaments are three British tuning schemes found in manuscript sources and published by George Sargent.<sup>4</sup> All three are irregular temperaments. The second is based on Pythagorean, and the third on meantone - though the directions are imprecise enough to allow a variety of interpretations in both cases.

In Articles 1 to 8 of his chapter *Tuning the Harpsichord or Organ* Wood adds to this variety and gives step-by-step directions that produce meantone temperament for the cycle of notes F-C-G-D-A-E-B-F#-C#-G# with each fifth tempered narrow by J-comma. But for the two remaining notes in the octave (8(7 and Ejj), Wood departs from the usual j-comma tempered fifths, thus technically producing an irregular temperament. With 8(7 and E|> departing from their usual meantone values, some of the more frequently used remoter triads will be more acceptably in tune.

Wood's directions in Articles 9 and 10 suggest compromise values for these two notes, so each will acceptably serve several harmonic functions. Rather than a tempered meantone B|?-F fifth (with the 6(7 at 1006.9 cents), Wood prescribes B|? to approach a somewhat lower 'pure' fifth below F (at 1001.4 cents), but not so pure a fifth that the third B|?-D will be unacceptable.

Wood's directions in Article 10 for setting E|? prescribe an even more complex 'rob Peter to pay Paul' compromise. But his value for E|? cannot be precisely determined, due not only to the complex compromise involved but also due to the flexibility allowed in setting the 8(7 (from which the E|> is partially determined). Wood desires £(7 to be wider

(i.e. lower) than a regular meantone fifth below 8(7, that is, somewhat lower than 304.8 to 310.3 cents (depending on the pitch chosen for 6)7) and to approach a perfect fifth below 8(7 (i.e. approaching 299.4 or 304.9 cents), but not so wide or low as to render the E(7-G third unacceptable (E|> as a pure third below G would be 310.3 cents). These specifications would suggest an E|? at about 302 to 307 cents, which is rather difficult, however, to reconcile with Wood's other *desideratum* that E|j function as a tolerable D\$, that is, a major third above B, which would be considerably lower at 269.2 cents (yet still somewhat higher than a perfect fifth above G\$, i.e. higher than 274.7 cents).<sup>5</sup>

A precedent for Wood's variant of meantone temperament is found in some of Marin Mersenne's directions for tuning keyboard instruments. Mersenne seems to have intended to prescribe the usual i-comma meantone; but Mark Lindley has pointed out that an ambiguous and inadvertent direction by Mersenne that the descending fifths F-B|7 and B|?-E|j should be tuned 'forte' (strong) could have been misunderstood, effecting a cumulative lowering of 8(7 and E|? from their usual meantone values.<sup>6</sup>

Despite the care he had taken in describing his tuning scheme, Wood takes an utterly practical turn in the last paragraph of his directions when he points out that an even more serviceable temperament ('sufficiently perfect' with regard to the remoter triads) can be achieved 'by frequent revising and examining the Tuning in all its different Chords'. By 'Bearings' Wood means tempered intervals; and if by suggesting 'all the Bearings to be so Equal throughout the Instrument' he meant to suggest adjusting *all* the thirds and fifths, he would have been inviting a tuning approaching well- or equal-temperament.

That Wood is no more precise about this 'frequent revising' of the tuning should caution us to remember that much historic tuning must have been far from theoretically accurate, and that as Wood suggests 'a nice Ear' must always have been the ultimate judge of an instrument's tuning.

A summary of Wood's tuning scheme expressed in cents is given as Table 1.

### STRINGING

Wood's list of string gauges is clear and unambiguous, though it is disappointing he doesn't indicate the type of instrument to which it applies. Nor does he indicate if the stringing is to be all in brass wire; or, if iron and brass are to be used,

tempered 5th above FJ

where the change-over occurs.

As a means of evaluating Wood's stringing list Table 2 compares string gauges from other early-18th-century English harpsichords (only the 8 choirs are listed).

Table 3 gives two recent interpretations of 18th-century English string gauge numbers. Both an considerably thinner than those reported by Hugl Gough,<sup>7</sup> which have generally been regarded as to <

**TABLE 1**  
**Wood's Keyboard Temperament**  
**Expressed in Cents**

C	O	tempered 5th above G
C*	76.1	compromise between
	193.2	Eb as a major third (i.e. D#) above B(
D	> 269.2 and	= 269.2)
Eb	< 310.3	Eb as a larger than perfect 5th above
		G#(> 274.7)
		Eb approaching a perfect 5th below
		Bb(> 299.4 or < 304.9)
		Eb as a major third below G
		(-310.3)
		major third above C
		tempered 5th below C
E	386.3	tempered 5th above B
F	579.5	tempered 5th above C
F#	772.7	tempered 5th above C#
G	1001.4	major 3rd above F
Gf	1006.9	compromise between
A	1082.9	Bb as perfect 5th below F (= 1001.4)
		Bb as major 3rd below D (= 1006.9)
B		major 3rd above G
b		
B		
C		

**TABLE 2**  
**Some Early 18th-Century English**  
**Harpsichord Stringing Gauges**

	I	II	III	IV	V	VI
B			22	2	4	4
e3			22	2	4	4
eb <sup>3</sup>			22	2	4	4
d3	1		2	2	4	4
C#3	(1)		3	2	4	4
C3	1		3	3	4	4
b <sup>2</sup>	1		3	3	4	4
bb <sup>2</sup>	?		3	3	4	4
a <sup>2</sup>	?		3	3	4	4
a <sup>2</sup> #	?		3	3	4	4
e <sup>2</sup>	2	2	3	3	4	4
e <sup>2</sup> #	2	2	3	3	4	4
f <sup>2</sup>	2	2	4	3	4	4
f <sup>2</sup> #	2	2	4	3	4	4
e <sup>2</sup> b	2	2	4	3	4	4
eb <sup>2</sup>	2	2	4	4	4	4
d <sup>2</sup>	?	3	4	4	4	4
c <sup>2</sup>	2	3	4	4	4	4
c <sup>2</sup> #	?	3	4	4	4	4
b <sup>1</sup>	(3)	3	5	4	5	5
bb <sup>1</sup>	(3)	3	5	4	5	5
ai	(3)	3	5	4	5	5
a <sup>1</sup> #	(3)	4	5	4	5	5
e <sup>1</sup>	(3)	4	5	5	5	5
e <sup>1</sup> #	(3)	4	5	5	5	5
f <sup>1</sup>	(3)	4	5	5	5	5

e!	(3)	4	6	5	5	5
eb!	(3)	4	6	5	5	5
d!	(3)	5	6	5	5	5
c#!	(3)	5	6	6	5	5
c!	3	5	6	6	5	5
b	(4)	5	6	6	6	5
bb	(4)	5	6	6	6	6
a	(4)	5	6	6	6	6
a#	(4)	5	7	6	6	6
g#	(4)	5	7	7	6	6
f#	(4)	6	7	7	7	6
f	(4)	6	7	7	7	6
e	(4)	6	7	7	7	6
eb	(4)	6	7	7	7	7
d	4	6	7	7	7	7
c#	?	6	8	8	8	7
c	4 or 5	7	8	8	8 iron	7
B	5	7	8	8	8 brass	7
Bb	(5)	7	8	8	8	8
A	5	?	8	9	8	8 iron brass
G#	?	?	9	9	8	8
G	5 or 6	?	9	9	8	8
F#	(5 or 6)	?	9	9	8	8
F	5 or 6	?	9	10	9	9
E	6 or 7	?	10	10	9	9
Eb	7	?	10	10	9	9
D	8	?	10	10	?	9
C#	?	?	10	11	?	10
C	8 or 9	?	11	11	?	10
BB	?	?	11	11	?	10
BBb	?	?	11	11	?	11
AA	9 or 10	?	12	12	?	11
GG#	?	?	12	12	?	12
GG	11 brass or copper	?	13	12	?	12
FF#				(?)	-	-
FF				13	?	13

I. Talbot *Ms.* (c1670-1700: Oxford, Christ Church Library Music Ms. 1187). Manuscript in the hand of James Talbot describing in part "Jennys" harpsichord. Talbot gives the scaling as  $c^3=4|''$ ;  $c^2=10J''$ ;  $c^1=20''$ ;  $c=37|''$ ;  $C=60''$ . Talbot mentions iron wire for gauge numbers 1-6 and copper for numbers 6-12; he seems to imply that brass wire came in 12 gauges, but doesn't list for which gauge numbers.<sup>8</sup>

II. Single manual harpsichord by Thomas Barton, London 1709, Boalch no. 01. Compass GG/BB-d<sup>3</sup> (broken octave). Scaling (giving shorter string):  $d^3=112mm$  (4|'');  $c^3=130mm$  (5J'');  $c^2=270mm$  (10f);  $c^1=535mm$  (21^'');  $c=985mm$  (38ff'');  $C=1530mm$  (6Qi'');  $BB=1550mm$  (61'')<sup>9</sup>

III. String gauges given in Wood's ms. treatise (c!730); upper limit of compass and scaling not given.

IV. Single manual harpsichord by Joseph Mahoon, London 1742. Colt Clavier Collection, Bethersden, Kent. Compass FF-f<sup>3</sup>. Scaling (giving longer string):  $f^3=135mm$ ;  $c^3=174mm$ ;  $c^2=344mm$ ;  $c^1=677mm$ ;  $c=1169mm$ ;  $C=1692mm$ ;  $FF=1849$ .<sup>10</sup>

V. Harpsichord by Joannes (II) Ruckers, Antwerp 1612 (rebuilt in 18th century), Boalch no. 16. This instrument was originally a double manual instrument with a C/E-d<sup>3</sup> compass; the pitch of one of the manuals was a fifth below Rucker's normal pitch. Since the instrument was enlarged and fitted with a new action in England sometime in the 18th century, the stringing gauges stamped on the nut are included in this table. The present compass is GG, AA-f<sup>3</sup>. Scaling (giving longer string): f<sup>3</sup>= 129mm; c<sup>3</sup> = 168mm; c<sup>2</sup> = 351.5mm; c<sup>1</sup> = 694mm; c=1158.5mm; C=1644mm; GG=1718mm.<sup>11</sup>

VI. Double manual harpsichord by Jacob Kirkman, London 1745. Boalch no. 109. This instrument is part of a claviorganum built with John Snetzler. Compass FF<sub>3</sub> GG-f<sup>3</sup>. Scaling (giving longer string): f<sup>3</sup>=135mm; c<sup>3</sup>=174mm; c<sup>2</sup> = 347mm; c<sup>1</sup> = 694mm; c=1192mm; C=1637mm; FF=1801mm.<sup>12</sup>

**TABLE 3**  
**English String Gauge Equivalents**

Gauge number	Diameter in millimeters	
	I	II
2	O'Brien (0.183)	Thomas 0.16
3	(0.204)	0.19
4	0.229	0.225
5	0.256	0.25
6	0.286	0.275
7	0.320	0.325
8	0.359	0.375
9	0.401	0.40
10	0.449	0.46
11	0.502	0.50
12	0.562	0.60
13	0.629	0.71 or 0.82

I. Communicated by Mr Grant O'Brien, Edinburgh. The diameters are based on measurements taken from late-18-century square pianos with original strings and original gauge markings.

II. Reported by Michael Thomas and based on original strings and gauge marking found on 1760 and 1785 Kirkman harpsichords.<sup>13</sup>

1. Bodleian Library, Oxford, Ms. Mus. e. 32. Permission to publish this transcription kindly granted by The Keeper of Western Manuscripts. The manuscript is carefully copied and set out in a form suggesting intended publication. Although the title-page is undated, certain correction slips and interpolations to the text suggest the manuscript was in the process of composition or revision during or after 1728. The present late-19th-century binding carries the date 1730, which may have been copied from the original cover. The chapters transcribed are on pp. 96-99. In the transcription, original spelling and punctuation are retained, although abbreviations have been expanded. Editorial additions are given in square brackets.
2. Keller's *Rules for Tuning the Harpsichord or Spinett* first appeared at the end of his *A Compleat Method for*

*Attaining to Play a Thorough Bass* (1707), which went through six editions. The rules were also included in the revised edition of William Holder's *A Treatise of the Natural Grounds, and Principles of Harmony* (1731); in *The Harpsichord Illustrated and Improved*, Part VI of the many editions of Peter Prellieur's *The Modern Musick-Master* (1730/31); in the psalmody books of William East, *The Voice of Melody* (1750), and William Tans'ur, *A Compleat Melody, or the Harmony of Sion* (5 edns. 1734-43); and in Tans'ur's *A New Musical Grammar and Dictionary* (1756). They even made their way to France, appearing in Michael Corrette's *Le maitre de clavecin* (1753).

3. Transcribed in *Roger North on Music*, ed. by John Wilson (London: Novello and Co., 1959), pp. 206-12.
4. *Eighteenth-century tuning Directions: precise intervallic Determination*, (*Music Review* 30 (1969), pp. 27-34). My interpretations of these directions vary from those given by Sargent.
5. Practical trials suggest a good realization of Wood's directions would be to set the B flat toward its lower limit (about 1002 cents); to make the E flat function tolerably as a D sharp (a fifth to G sharp and a third to B) it can be taken down to about 290 cents, beyond which the E flat-B flat fifth becomes unacceptable.
6. See 'Mersenne on Keyboard Tuning', *Journal of Music-Theory* 24 (1980), pp. 175-79; 'Instructions for the clavier diversely tempered', *Early Music* 5 (1977), p.22; and 'Temperaments' in *The New Grove Dictionary of Music*, Vol. 18, p. 664.
7. Given in Donald Boalch, *Makers of the Harpsichord and Clavichord* (London: George Ronald, 1956), p. 106; and in Frank Hubbard, *Three Centuries of Harpsichord Making* (Cambridge, Mass.: Harvard University Press, 1965), p. 207. But Gough's diameters have recently been endorsed by W. R. Thomas and J. J. K. Rhodes, 'Harpsichords and the Art of Wire-Drawing', *Organ Yearbook* 10(1979), p. 132.
8. The portion of the manuscript containing Talbot's notes on the harpsichord has been discussed and transcribed by Frank Hubbard, pp. 148-49 and 260-64; and Charles Mould, 'James Talbot's Manuscript. VII. Harpsichord', *Galpin Society Journal* 21 (1968), pp. 40-51. Both have remarked on the difficulty of deciphering the careless handwriting. My interpretation of the string gauges differs slightly from that given by Hubbard on p. 263. In the manuscript, Talbot gives measurements for 'Jennys' harpsichord possibly an English instrument. The width is given as 30", and Hubbard and Mould variously suggest it would accommodate a compass of GG-c<sup>3</sup>, C-c<sup>3</sup>, or C-d<sup>3</sup>. The compass of Talbot's stringing list is GG-d<sup>3</sup>, which Mould points out is certainly too wide for an instrument 30" wide (assuming of course that the dimensions and stringing list are referring to the same instrument). But since Talbot begins his stringing list by giving the notes in the order G, C, A, D, perhaps the instrument had some form of a short-octave compass GG/BB-d<sup>3</sup>.
9. My thanks to Dr. Roger Mirrey, who graciously allowed me to examine this instrument in his possession. On the Barton harpsichord, see Charles Mould, 'An Early-Eighteenth-Century Harpsichord by Thomas Barton', *English Harpsichord Magazine* 1 (1974), pp. 36-38.
10. Scaling and gauges given in Friedemann Hellwig, "Strings and Stringing: Contemporary Documents," *Galpin Society Journal* 29 (1976), p. 94. It is not specified whether the compass included FF sharp.
11. Scaling and probable original disposition communicated by Mr. Grant O'Brien.
12. Scaling and gauges communicated by Mr. Grant O'Brien.
13. See 'String Gauges of Old Italian Harpsichords', *Galpin Society Journal* 24 (1971), pp. 70 and 78.

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