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Early-Baroque Keyboard Instruments

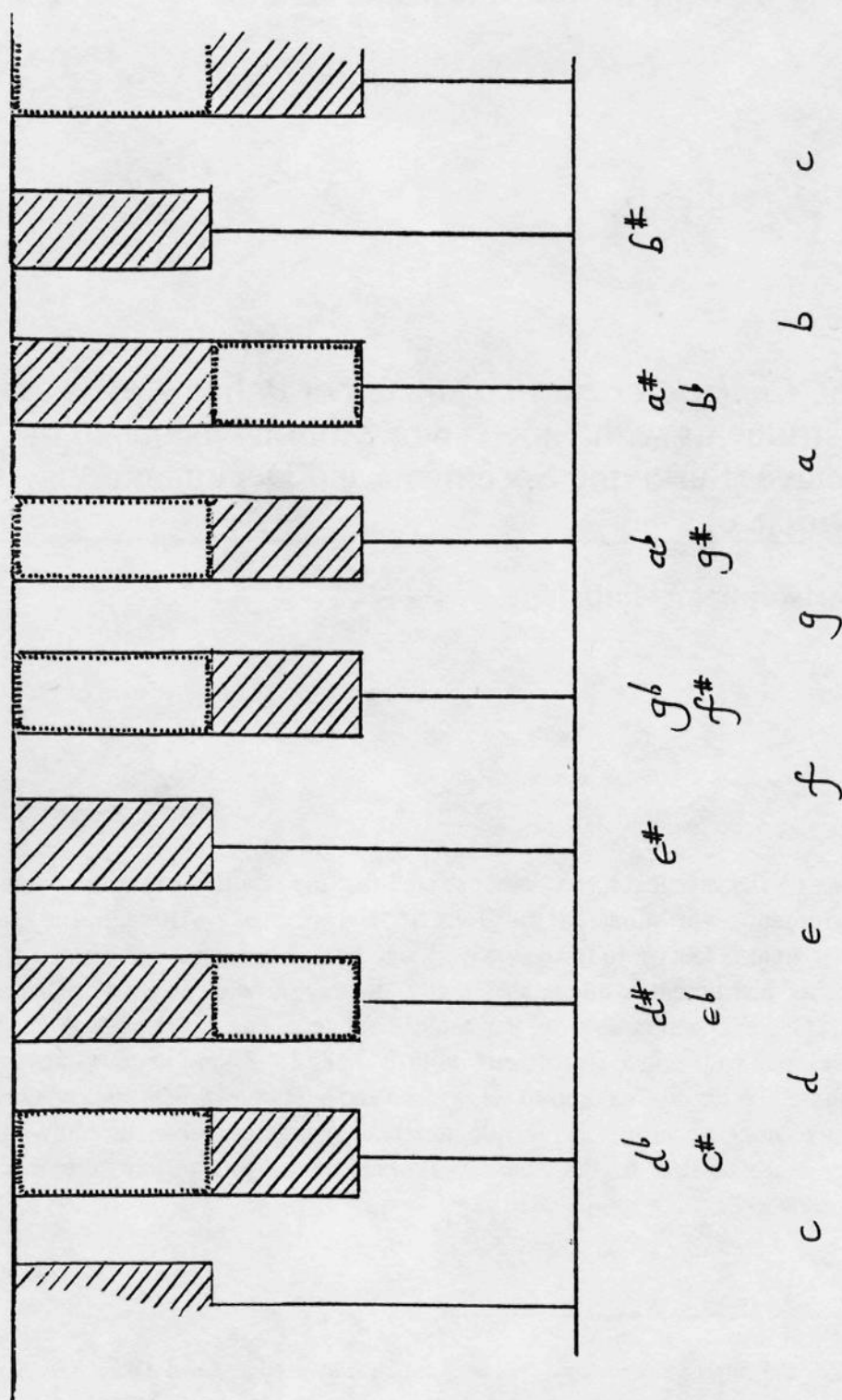
The *Cimbalo cromatico* and Other Italian Keyboard Instruments with Nineteen or More Divisions to the Octave (Surviving Specimens and Documentary Evidence)

Christopher Stembridge

In an earlier article¹ it was demonstrated that the *cimbalo cromatico* was an instrument with nineteen divisions to the octave. Although no such instrument is known to have survived, one harpsichord and a keyboard from another instrument, while subsequently altered, show clear traces of having had 19 keys per octave in the middle range. The concept was further developed to produce instruments with 24, 28, 31, 3, and even 60 keys per octave. With the exception of Trasuntino's 1606 *Clavemusicum Omnitonium*, none of these survives; documentary evidence, however, shows that they were related to the *cimbalo cromatico*, as this article attempts to demonstrate.

¹Christopher Stembridge, "Music for *Cimbalo cromatico* and Other Split-Keyed Instruments in Seventeenth-Century Italy," *Performance Practice Review* 5 (1992): 5-43.

**Luython Harpsichord as Described by Praetorius,
Syntagma Musicum , pt. 2, 64**



SURVIVING SPECIMENS

The Faber Harpsichord (1631)

The harpsichord made by Francesco Fabbri (Franciscus Faber)² of Senigallia (a small town on the Marche coast between Pesaro and Ancona) now in the *Germanisches Nationalmuseum*, Nuremberg, was almost certainly originally a *cimbalo cromatico* with a four-octave range C/E-c^{'''}. The first octave was not, however, fully chromatic, being a normal "broken" octave with the first two black keys split, resulting in D/F# and E/G# respectively. The evidence of the balance-pin-holes in the key-frame shows that the first extra chromatic key was for B#. For the next two-and-a-half octaves, the keyboard followed the pattern of the *cimbalo cromatico* as far as e^{'''}. The top three chromatic keys (f^{'''}, g^{'''} and b^{'''}) were not divided.³

Strangely, the pin-holes for the split chromatic keys are placed side by side, so that no attempt was apparently made to change the balance-point according to the length of the key. It can only be assumed that the keyboard followed the conventional pattern of placing the "normal" chromatic keys at the front (c#, e^b, f#, g# and b^b), the added ones behind them.⁴

The keyboard of the Faber harpsichord therefore had 65 keys distributed as in Illustration no. 1. Given that this was a short-octave instrument, it is not surprising that no extra chromatic keys were added in the bass. It is nevertheless curious that no A# was included while the less useful B# was. Perhaps the single black key for B^b served as a necessary reminder to the

²Fabbri was born c. 1591 and is known to have been active in Rome from 1659 until his death in 1675. See Patrizio Barbieri, "Cembalero, organaro, chitarraro, e fabbricatore di corde," *Recercare* 1 (1989) 123-209 (150-51).

³The pattern is described in Stenbridge, "Music for *Cimbalo cromatico*," 7-8. John Henry van der Meer states that the evidence of the pin-holes shows this harpsichord to have been fully chromatic up to b^{'''}. See his "Partiell und vollständig enharmonische Saitenklaviere zwischen 1548 und 1711," *Das Musikinstrument* (July 1987): 12-20. I have examined the key-frame together with Klaus Martius and no extra holes for split-keys at the top of the range can be found. I am most grateful to Klaus Martius and Dieter Krickeberg (director of the Instrument Collection) for their kind cooperation. This is corroborated by Denzil Wraight's independent examination.

⁴In theory it could be argued that the keys might have been split into left and right halves rather than back and front. This would seem quite impracticable given the *Stichmaß* of 49.5. No evidence of keys split into left and right halves is known to the present writer. See below (p. 42) for a discussion of Zarlino's illustration.

player that the split-keys below it were not for extra chromatic notes but simply constituted the normal "broken" octave. The lack of extra chromatic keys at the treble end coincides with their omission in most instruments with split keys. Since the purpose of the *cimbalo cromatico* was primarily that of an accompanying instrument, extra chromatic notes in the top octave would have been something of a luxury.⁵

The Anonymous Keyboard in the Rome Collection

A keyboard that shows all the signs of having originated as part of a rather larger *cimbalo cromatico* is currently housed in a harpsichord to which it apparently did not originally belong; this is now in the Museo nazionale degli strumenti musicali in Rome.⁶ In this case, the evidence is provided not only by balance-pin-holes in the key-frame but corroborated by the fact that the original ivory key-covers have in most cases been reused for the existing (later) key-levers. Thus extra pieces of ivory have been inserted where the original covers were cut away to allow spaces for the black half-keys (e#s and b#s).

While the key-frame shows signs of having held four fully chromatic nineteen-note octaves, the irregularity in the pattern of the pin-holes is not easy to interpret.⁷ The lowest chromatic key, C#, was apparently not split—in other words, there was no D^b. Thereafter all the chromatic keys seem to have been split except in the top octave. Here, there would seem to be no holes for d^b" or d#", while there are holes for g^b" and a^b". In some cases the hole for the balance-pin of the back half-key is to the right, where one would expect it to be to the left. Thus the position of the holes would imply that E^b was behind D#, B^b behind A#, while d^b was apparently behind c#.⁸ Until closer examination of this key-frame is permitted, it can

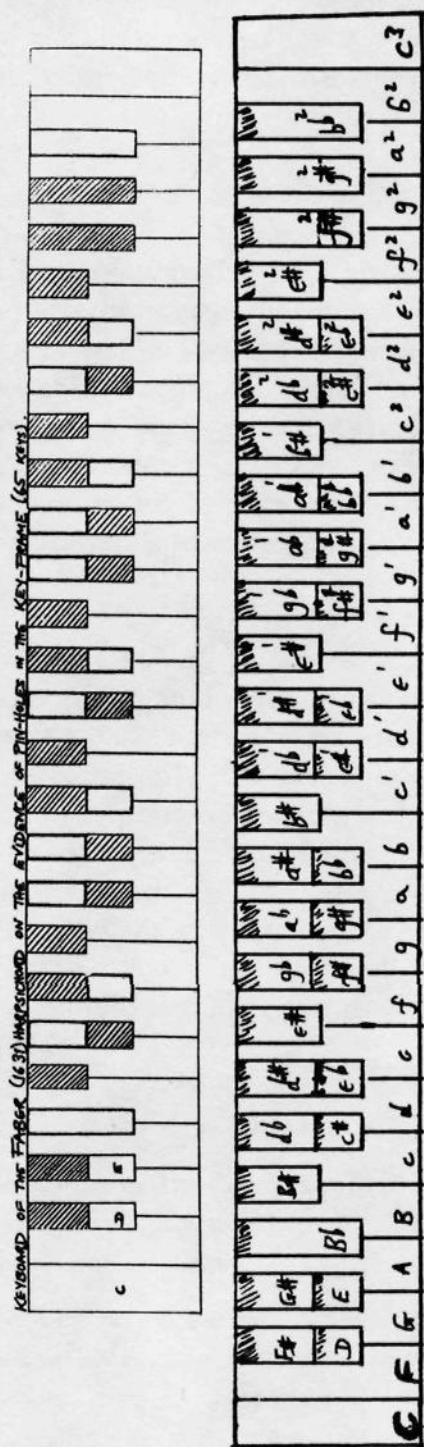
⁵Stembridge, "Music for *Cimbalo cromatico*," 8-9.

⁶Cf. Van der Meer, 16-17. According to Grant O'Brien (communication to the author), there are no signs of the harpsichord ever having had nineteen divisions to the octave; the key-frame has clearly been cut at the bass end to make it fit into the harpsichord.

⁷Unfortunately I was not permitted to examine the key-frame adequately. The Director of the Museo allowed me to remove only one or two keys at a time and in any case not from the whole keyboard.

⁸It is perhaps worth noting that in the drawings of the keyboards for Nicola Vicentino's *archicembalo* the position of the balance-pins would indicate that the back half-key was invariably pitched higher than the front one. This would be at variance with the tuning instructions, being in fact the opposite throughout in the upper keyboard (first tuning)! Cf.

Keyboard of the Faber (1631) Harpsichord on the Evidence of Pin-Holes in the Key Frame (65 Keys)



L'antica musica (Rome, 1555, facsimile reprint, Kassel, 1959, with drawings inside the back cover.)

only be assumed that it originated in a *cimbalo cromatico* that had a keyboard almost identical to that of the Luython instrument, but without D^b and possibly without some of the split chromatic keys in the top octave.

DOCUMENTARY EVIDENCE

The Luython Harpsichord

The *Clavicymbalum universale, seu perfectum* described by Praetorius was mentioned in the previous article.⁹ The same instrument is also the subject of a manuscript report—which includes some tuning instructions—written by Urban Vielhawer von Hohenhaw, formerly organist to Karl, Archduke of Austria, in 1660.¹⁰

While neither source gives us as much information as we would like, certain characteristics are quite clear. It was fully chromatic from C to c'', each octave having nineteen notes with the keys set out as shown, there being 77 keys in all.¹¹ It was strung at 8' pitch.¹² (One may perhaps assume that it was, like most instruments of this kind, single-strung.)¹³

An apparently unique feature of this instrument was its transposing device. The keyboard, so both sources tell us, could be moved to seven different playing positions, covering a range of a major third. (In other words, when

⁹M. Praetorius, *Syntagma musicum*, Pt. 2, *De organographia* (Wolfenbüttel, 1618, 1619, repr. Kassel, 1958, 63-66).

¹⁰Cf. Alfred Koczirz, "Zur Geschichte des Luython'schen Klavicimbels," *Sammelbände der internationalen musikwissenschaftlichen Gesellschaft* 9 (1907-1908): 565-570. The manuscript is now in the Österreichisches Staatsarchiv, Vienna, where it is filed under *Niederösterreichische Herrschaftsakten*, W61/A/32, fol. 627-630. The tuning instructions will be the subject of a discussion in a subsequent article.

¹¹"...daß es also in den vier Oktaven vom C biß in alles 77. Claves gehabt hat." Praetorius, *Syntagma* Pt.2, 64.

¹²"Mit aequal Saitten bezogen," *ibid.*, 127, where Praetorius makes it clear that by "Aequal Thon" he means 8' pitch.

¹³The Faber Harpsichord, discussed above, was single-strung, as was Vicentino's *Archicembalo* and Trasuntino's *Clavemusicum Omnitonum* (see below, pp. 49ff.).

moved to the right, bottom C would play C#, when moved further it would play D^b, and so on, through D, D#, and E^b to E).¹⁴

This means therefore that the overall range of the instrument was four octaves and a third (83 strings)—unless strings were missing at the top when the keyboard was not playing at its lowest possible pitch, which is unlikely, since the instrument would have had to be wide enough to accommodate the keyboard being shifted seven positions to the right. As Praetorius describes the transposition device as movable *up* from C, it is probably safe to assume that bottom C sounded when the keyboard was playing at its lowest possible pitch.

Praetorius was an adherent of mean-tone temperament with pure major thirds.¹⁵ As he lavishes much praise on the Luython instrument, it is virtually certain that such a temperament was used for this harpsichord.¹⁶ This implies that the strings were not tuned to equal intervals. For instance, the distance between C and C# would have been a minor semitone or 2/5 of a tone, that between C# and D^b would only have been 1/5 of a tone. Using the transposing device would therefore have necessitated some retuning. However, the 1660 ms. would seem to suggest that the most useful pitches were that of the *Chorton* (the lowest pitch of the instrument), the *Kammerton* (one whole tone higher), and one tone above *Kammerton*—the intermediate intervals being curtly described as "semitones."¹⁷ As long as only these were used, retuning would be kept to a minimum. Assuming that the instrument were tuned at *Chorton* to the intervals Praetorius describes in 1/4 comma mean-tone, if the keyboard were moved to play one whole tone higher, there would be only two notes in any one octave that would be out of tune, or rather, have a different tuning: the E# and B# keys would now sound F^b and C^b respectively.

¹⁴"Es kan aber dasselbige Clavicymbel oder Instrument sieben mal/ als nemblich durch das c cis des d dis es biß ins e/ und also drey volle Tonos fortgerücket werden/ . . .," Praetorius, *Syntagma*, Pt. 2, 65.

¹⁵Cf. his tuning instructions (p. 150), where he prescribes pure thirds and octaves ("Daß alle Oktaven und Tertiae perfectae seu majores gar rein gestimmt werden . . .")

¹⁶Praetorius refers to Marenzio's vocal music and quotes the notation, since it displays the "natürliche Harmonia" better than tablature letters. He goes on to describe the harpsichord as "ein Instrumentum perfectum, si non perfectissimum" (64-65).

¹⁷"Diese zwey seindt Semithon . . . Diese zwey seindt auch Semithon." Cf. Koczirz, "Luython'schen Klavicimbels," 567.

It is just possible to imagine that the instrument had a full compliment of 31 strings in each octave so that no retuning was ever necessary whatever position the keyboard was moved to. This seems unlikely for obvious practical reasons. It is also quite clear from both descriptions of the harpsichord that there were seven different possible pitches between C and E; the 1660 source even refers to the harpsichord as a 7 *Semithon instrument*.¹⁸ Had there been 31 strings to each octave, there would then have been eleven possible pitches between C and E, a fact that is unlikely to have been passed over in silence.

That such a transposing harpsichord was rare or even unique is clear both from Praetorius's remark that no other instrument possessed the same variety of chromatic notes and from the fact that Giovanni Valentini is reported as saying that he had not seen such a harpsichord in the whole of Italy.¹⁹ Koczirz made the plausible suggestion that this instrument was invented and commissioned by Jacques Buus, who moved from Venice to Vienna in 1550. Since Buus died in 1565, this would mean that the instrument was rather older than was suggested by Praetorius, but it is perhaps significant that Zarlino's instrument had been built by Domenico da Pesaro in Venice while Buus was still there.²⁰

A remark in the Hohenhaw report in the Vienna 1660 ms. could possibly be taken to suggest that the instrument was quite large: it appears that a two-horse chaise was required to move it.²¹

¹⁸*ibid.*, 568.

¹⁹"... dergleichen Variation durch alle Super- & Semitonia uff andern Instrumenten nicht zu finden," Praetorius, *Syntagma*, Pt. 2, 65. "Wie auch Joann Valentini . . . damals A^o1617 . . . Bekennt hat, Daß Er solchen Kunstreichen (der 7 Semithon instrument) Flügel in gantz Italia nit gesehen hat," Koczirz, "Luython'schen Klavizimbels," 568.

²⁰Cf. Koczirz, 569. Praetorius, writing in 1618, states that the harpsichord had been made about 30 years previously in Vienna ("so vor 30. Jahren"). For a description of the Zarlino/Domenico da Pesaro harpsichord see below p. 43ff.

²¹"Solches Clavicimbel abzuholen kann mit schlechten Unkosten von 2 Roßen undt Kalessen . . . wohlverwarter abgeholt werden," quoted in Koczirz, "Luython'schen Klavizimbels," 568.

Other Documented Instruments with 19 Keys to the Octave

A reference to possible *cimbali cromatici* is found in inventories of music and instruments at the Ferrarese court in 1598.

The first of these, described as *cromatico* with two keybards, is perhaps more likely to have been the *archicembalo* which Luzzaschi played; the *istromento cromatico da una corda* in another inventory may refer to the same instrument, or indeed be a reference to a 19-division *cimbalo cromatico*.²²

There are, furthermore, several references to other instruments with split keys. While the number of split keys is unfortunately not specified, it is not impossible that one or more of these was a *cimbalo cromatico*; two were *claviorgana*.²³

An inventory of instruments belonging to Cardinal Francesco Barberini in Rome (c. 1631-36) includes what is possibly a *cimbalo cromatico* made by Boni.²⁴

The painter Domenichino is also reported to have commissioned a single-strung harpsichord with "split black keys" from Albano, possibly the same

²²Cf. Elio Durante and Anna Martellotti, *Cronistoria del Concerto delle Dame Principalissime di Margherita Gonzaga d'Este*, Florence, 1979, 205-9. The three inventories—A209, A209bis, and A210—tend to triplicate each other. The entries are found under A209/2805: "Un istrumento cromatico con due tastadure una sopra l'altra, n. 1," and A209bis/22: "Un istrumento cromatico da una corda" (varied spellings as in the original). A210, final entry, refers also to A209/2805 (Cf. below n. 41).

²³*ibid.* Cf. A209/2804: "Un istrumento adorato con la tastadura tagliata da due registri, n. 1," A209bis/5: "Un istrumento a doi registri con i tasti tagliati depicta la cassa," A210 (third and fourth entries): "Un istrumento con li semitoni tagliati tutto lavorato de groppi con il suo organo sotto, n. 1. Un istrumento da li semitoni tagliati, tutto di groppi, con il suo organo sotto, n. 1."

²⁴"Un Cimbalo da sonare à tre ordine fatto dal Cortonese che sta alli Mathei longo p. mi otto largo p. mi tre û quarto con la sua Coperta di corame rosso," quoted in Frederick Hammond, "Girolamo Frescobaldi and a Decade of Music in Casa Barberini," *Analecta Musicologica* 29 (1979), 94-124, cf. esp. 103-4. Hammond speculates that "ordine" might mean registers. This seems unlikely. Other instruments with some, but not all, chromatic keys split were occasionally labelled "a tre ordine" (cf. my subsequent article).

maker referred to by Giovanni Battista Doni as having made several *cembali enarmonici*.²⁵

Praetorius mentions two Italian instruments with keyboards like the Luython harpsichord. The first may have been a harpsichord, the term spinet possibly suggesting that it was single-strung.²⁶ The whereabouts of this instrument is not specified beyond Italy, where it belonged to a certain Giulio Cesare. The other instrument, of Italian origin, at the court in Graz, is possibly the only known documented *organo cromatico*.²⁷

The only known documented clavichord with a fully chromatic keyboard was commissioned by Praetorius himself.²⁸ While this was not made in Italy, it was based on the idea of the Luython instrument. Further references, such as Colonna's repeated mention of the *cimbalo cromatico*—in one instance he even calls such instruments *Cembali Chromatici communi*—together with the evidence of music published for such harpsichords suggest that a number of other similar instruments must have existed during this period.²⁹

Instruments with More than 19 Keys per Octave Related to the *Cimbalo cromatico*

²⁵Cf. Frederick Hammond, "Some Notes on Giovanni Battista Boni da Cortona, Girolamo Zenti, and others," *Galpin Society Journal* 40 (1987), 37-41 (esp. 41).

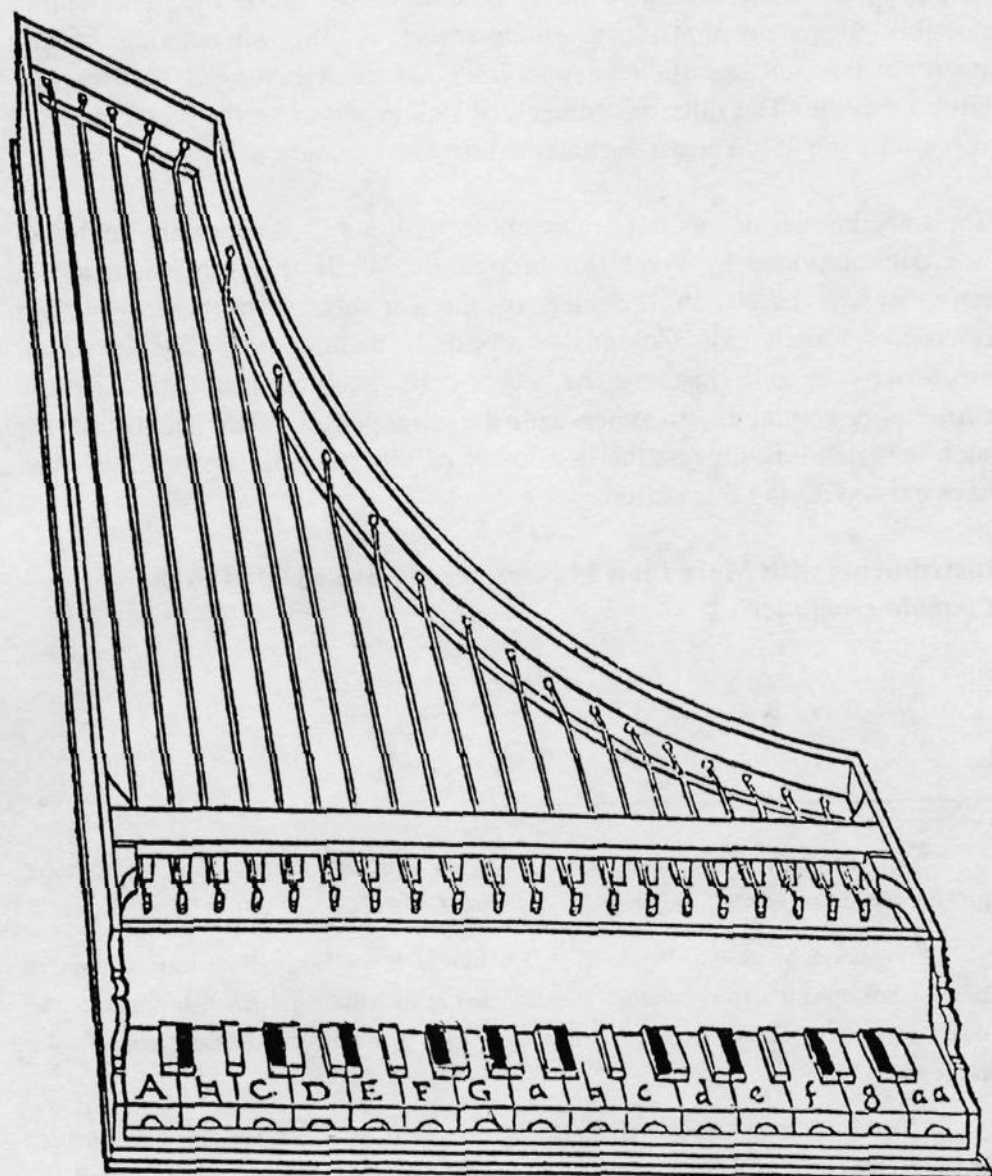
²⁶Praetorius, *Syntagma*, Pt. 2, 66: "Ich bin auch von einem fürnemen Musico zu Cassel/ Christophoro Cornet berichtet worden/ daß er in Italia dergleichen Instrument oder Spinett (wie es daselbsten genennet wird) bey einem Italianer, mit Namen Iulius Caesar gesehen habe."

²⁷*ibid.*: "Vor etlichen wenig jahren ist auch ein herrlich Positiff an den Ertzhertzoglichen Hof naher Gratz aus Italia gebracht worden/ darinnen gleichergestalt alle Semitonia doppelt und vollnkömlich zu finden/ und ein trefflich Werck sein sol."

²⁸*ibid.*, 61-2: "Dieses Jahr habe ich ein Clavichordium C/E-a² . . . einem guten Meister in die Hand geben/ darinnen nicht allein die Semitonia *dis gis* und *b* dupliret/ sondern auch das *cis* und *fis*/ sowol zwischen den Clavibus e und f: h und c noch ein sonderlich Semitonium zu finden; Allermassen/ wie in dem Clavicymbalo Universali . . ."

²⁹See the previous article, 10ff., and Fabio Colonna, *La Sambuca Lincea* (Naples, 1618; repr. Bologna, 1980), 69.

**Woodcut from Zarlino, *Istitutioni harmoniche* (1558),
p. 141**



The earliest known representation of a keyboard with nineteen keys to the octave is found in Zarlino's *Istitutioni harmoniche* of 1558.³⁰ There are several problems posed by this woodcut, some of which have often been overlooked. First of all, since the instrument illustrated has a range of two octaves and as the number of strings represented (20) does not correspond to the number of keys (39), the result would seem to be not an illustration of a particular instrument, but rather a diagram. The author's intention is presumably to demonstrate where the extra chromatic keys are inserted into the normal mean-tone tuned keyboard and how the usual chromatic keys (*chromatiche*) may be distinguished from the extra ones (*enharmoniche*) by having a different color. In fact, it is only in connection with this latter point that Zarlino refers explicitly to the illustration anywhere in his text.³¹ As will be seen below, when he uses the phrase "istromento alla simiglianza di quello ch'io hò mostrato" (p. 140), the word "mostrato" must mean "demonstrated in the text" rather than in the illustration. Unlike any known surviving instrument with split keys or any other representation of any such keyboard, the one in Zarlino's woodcut shows the keys to be split into left and right halves instead of front and back. This, in line with the aspects mentioned above, is almost certainly also diagrammatical. Given the impreciseness and lack of detail in the illustration, it would hardly have been possible to show which notes the added keys played, had they been drawn behind, rather than alongside, the ordinary semitones. As it is, the diagram makes quite clear the difference between the normal chromatic keys (*chromatiche*) which are black, and the added ones (*enharmoniche*) which are white (and presumably intended to be colored red to distinguish them from the naturals). Thus, for instance, it is obvious that A# (white) is to the left of, and therefore lower in pitch than B^b (black), while D^b (white) is to the right of C# (black.) Finally, it is possible that the number of strings shown is not coincidental but represents a complete octave A-a (19 + 1 notes). The keyboard shows two such octaves.

Many recent writers have assumed that the instrument made for Zarlino in 1548 by Domenico da Pesaro was a *cimbalo cromatico* with nineteen notes to the octave.³² This confusion has obviously arisen because Zarlino

³⁰Gioseffo Zarlino, *Le Istitutioni harmoniche* (Venice, 1558; repr. New York, 1965), 141.

³¹Cf. *ibid.*, 140: "... le Enharmoniche; Le quali si conosceranno nel Tastame delli detti Istrumenti in questo: che a differenza delle diatoniche, & delle chromatiche, si poranno di colore rosso: come nel sotto posto istromento si può vedere."

³²Cf., for instance, *Early Keyboard Instruments* (in the Grove music instruments series), ed. Edwin Ripin et al. (London: Macmillan, 1989), 23.

discusses this instrument in the same chapter in which he includes the above illustration. However, the text makes it perfectly clear that the instrument had more than nineteen strings to the octave.

Following Zarlino's instructions for adding the enharmonic strings would, in fact, give us eight extra pitches (in addition to the nineteen of the *cimbalo cromatico*), as he states that every chromatic string should have a corresponding major and minor third both above and below.³³ These new pitches would be:

F## - major third above d#, minor third below a#
C## - major third above a#, minor third below e#
G## - major third above e#, minor third below b#
D## - major third above b#

but also:

C^b - major third below e^b, minor third above a^b
F^b - major third below a^b, minor third above d^b
B^b - major third below d^b, minor third above g^b
E^b - major third below g

Fortunately another description of the Zarlino/Domenico da Pesaro instrument has survived. This is in Martino Pesenti's introduction to his publication of music partly written for an enharmonic keyboard instrument. The relevant section of this is reproduced below, with translation. From this it becomes clear that Zarlino's harpsichord had not 27 but only 24 keys to the octave. The range was extended in the manner Zarlino prescribed, but only in the sharp direction, and with the addition of A##. Thus the instrument was like a *cimbalo cromatico* with the addition of five extra keys; these were for F##, C##, G##, D ##, and A##. The flat notes (even F^b and C^b) were not added. The Trasuntino harpsichord, to which Pesenti compares the Zarlino/da Pesaro instrument, in fact had 28 keys. According to Pesenti, however, these did not follow Zarlino's prescription quoted above either; while F^b and C^b were included, E## and B## were chosen in preference to E^{bb} and B^{bb}. This feature coincides with the general preference, already determining the pattern in the Zarlino/da Pesaro harpsichord, to extend the chromatic range in the sharp rather than the flat direction. It is, of course, just possible that Pesenti misinterpreted

³³*Istitutioni* (1558), 140: "... che ogno chorda diatonica, & ogni chromatica delli detti istrumenti, si verso il grave, come etiando verso l'acuto, haverà una chorda corrispondente per un Ditono, & per un Semiditono"

Trasuntino's intentions, but if the relevant keys were indeed situated between E and F, and between B and C, clearly the double sharp would be more likely. Similarly, it would be more logical in practice to include A## rather than the B^{bb} suggested by Zarlino's theory.

A PROFESSORI DI MUSICA

Per Maggior Intelligenza³⁴

Si ritrovava l'anno 1621, appresso l'illustrissimo Sig. Nicolò de Rossi all hora Residente di sua Maestà Cesarea in Venetia un Clavicembalo di mano di Vido Trasentino fabricato l'anno 1601. il quale era Diatonico, Cromatico, & Henarmonico, e perche con occasione d'haver io servitii con quell'Illustrissimo Sig. mi comandò à dover tasteggiare detto Clavicembalo, se bene fosse mai acconcio, per non haver mai potuto trovare (doppo la morte dell'Autore) chi gli lo cordasse; mi risolsi, eccittato da sommo desiderio di servire un tanto mio Padrone, di accordarlo, se bene fuori di mia professione, e nell'oprar ritrovai, che dall'A, La, mi, re, ascendendo fino al G, sol, re, ut era ogni corda col B. molle, & il #, & anco il # maggiore; Continuai à tenerlo accordato fino l'anno 1634. che passò all'altra vita il detto Illustrissimo Residente, Il che causò, che il detto Clavicembalo fù mandato all'Imperatore, se bene per certo accidente rimase à Trieste dove credo si ritrovi anco al presente. Il che mi fu di grandissimo ramarico vedendomi privo dell'essercitio di Stromento così stravagante, e degno; Pure bisognò haver pazienza fino l'anno 1641. quando mi capitò alle mani il Clavicembalo inventato dal Zerlino, e fabricato da Domenico da Pesaro l'anno 1548. il quale fu il primo Clavicembalo, che fosse mai fabricato col Diatonico, Cromatico, & Henarmonico. Si può parangonare quel di Vido à quel del Zerlino. Prima nell'A, La, mi, re vi è il B. molle, il # & il # maggiore, & in quel di Vido è anco l'Istesso; In quel del Zerlino vi è il b, fa, b, mi, b, molle, & il #, ma vi è questa differenza, che in quel di Vido vi è un # maggiore di più. Al c, sol, fa, ut del Zerlino vi è il #, & il # maggiore. In quel di Vido vi è il b, molle, il #, & il # maggiore, In D,La,sol,Re del Zerlino, vi è il b molle il # & il #, maggiore, & in quel di Vido vi è l'istesso. In E, La, mi del Zerlino vi è il b molle, & il #, In quel di Vido vi è il b molle il #, & il # maggiore. Nel F,Fa,ut del Zerlino vi è il # & il # maggiore in quel di Vido vi è il b molle, il # & il # maggiore. In G,sol,Re,ut del Zerlino vi è il b molle, il #, & il # maggiore & anco in quel di Vido è L'istesso. Di maniera che nascono in quel di Vido doi corde Fra il b,Fa,b,mi & il, c,sol, Fa ut, cioè il # maggiore, di b,fa,b,mi, & il b, molle di c,sol,Fa,ut, che è semituono maggiore. Nascono anco in quel di Vido doi corde tra E,La ,mi,

³⁴From the Introduction to Martino Pesenti's *Correnti, gagliarde, e balletti diatonici, trasportati parte cromatici, e parte henarmonici . . . libro quarto*, op. 15 (Venice, 1645/6).

& F,Fa,ut il # maggiore d'E,La,mi, & il b molle di F,Fa,ut, semituono parimente maggiore. Hò paragonato li doi detti Clavicembali, acciò possino vedere i Musici, che intendono più di me la differenza, che vi è tra l'uno, e l'altro. A mio senso ellegerei più tosto il Clavicembalo del Zerlino come il più regolato del tutto, e qui sotto riporterò le sue formali parole. Dove tratta dell'institutioni Henarmoniche libro 2, capitolo 47. Potrà adunque per l'avenir fabricare . . .

TO MUSICIANS, for Greater Clarification

In 1621, in the house of the noble Lord Nicolò de Rossi, His Imperial Majesty's diplomatic representative in Venice at the time, I came across a harpsichord made by Vido Trasuntino in 1601 which was diatonic, chromatic, and enharmonic. Since I had occasion to be of service to that noble Lord, he requested me to try out the said harpsichord to see whether it was in working order, as he had never been able to find anyone to tune it since the maker's death. Spurred on by the keen desire to serve such a master, I resolved to tune it, even though such activity was not my *métier*, and in the process I discovered that, in ascending from A la mi re right up to G sol re ut, each note was provided with its flat, its sharp, and its double sharp.

I continued to keep it tuned until 1634, when the same noble Lord died, as a result of which the said harpsichord was sent to the Emperor, although by some accident it got no further than Trieste, where, I believe, it remains to this day. Being deprived of playing on such an extraordinary and fine instrument caused me the greatest distress. I had to bear this loss patiently until 1641, when I came upon the harpsichord that was invented by Zarlino and built by Domenico da Pesaro in 1548; this was the very first harpsichord ever to have been made to play in the diatonic, chromatic, and enharmonic modes.

Vido's instrument may be compared to Zarlino's as follows:

Firstly, for A la mi re there is the flat, the sharp, and the double sharp, and in Vido's there is the same.

Zarlino has, for b fa b mi the flat and the sharp—but here there is a difference: Vido's instrument has an extra double sharp.

For C sol fa ut Zarlino's has the sharp and the double sharp, while Vido's has the flat, the sharp, and the double sharp.

For D la sol re Zarlino's has the flat, the sharp, and the double sharp and Vido's has the same.

For E la mi Zarlino's has the flat and the sharp, while Vido's has the flat, the sharp and the double sharp.

For F fa ut Zarlino's has the sharp and the double sharp, Vido's has the flat, the sharp, and the double sharp.

For G sol re ut Zarlino has the flat, the sharp, and the double sharp and Vido's has the same.

Thus there are two extra strings in Vido's instrument between b fa b mi and c sol fa ut: i.e. b fa b mi double sharp and c sol fa ut flat, which makes a major semitone. There are also two extra strings in Vido's instrument between E la mi and F fa ut: E la mi double sharp and F fa ut flat, which also makes a major semitone.

I have compared the two said harpsichords so that those musicians who have more understanding than I have can see the difference between the one and the other. Personally I would rather choose Zarlino's harpsichord as having the better design (being better regulated) and I quote below his own words from the *Istitutioni harmoniche*, where he deals with the question in Book I, chapter 47.³⁵

* * *

The differences between these two harpsichords may perhaps be more easily comprehended if set out as follows:

ZARLINO

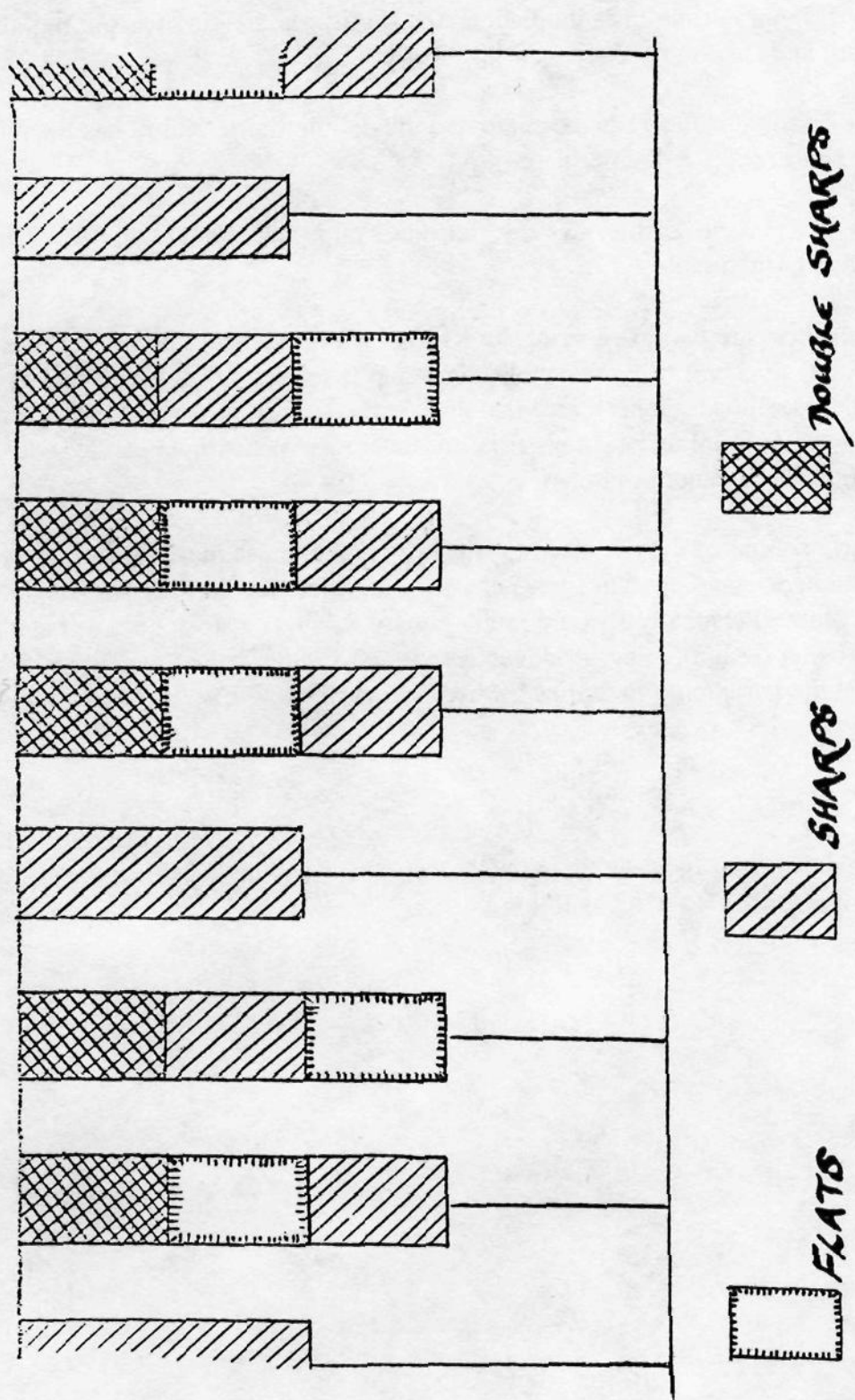
b	#	##	A
b	#		B

TRASUNTINO

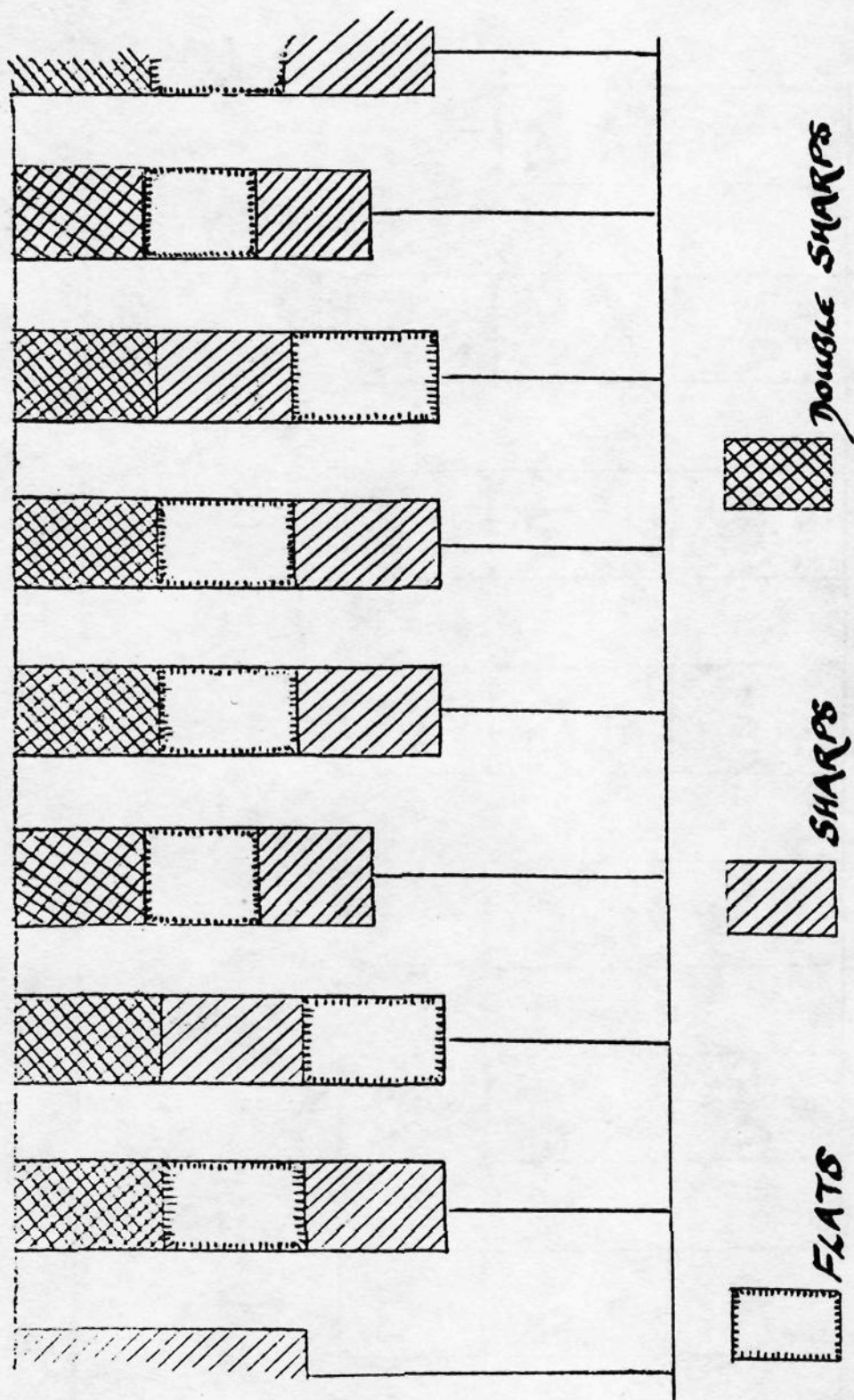
b	#	##
b	#	##

³⁵See subsequent article.

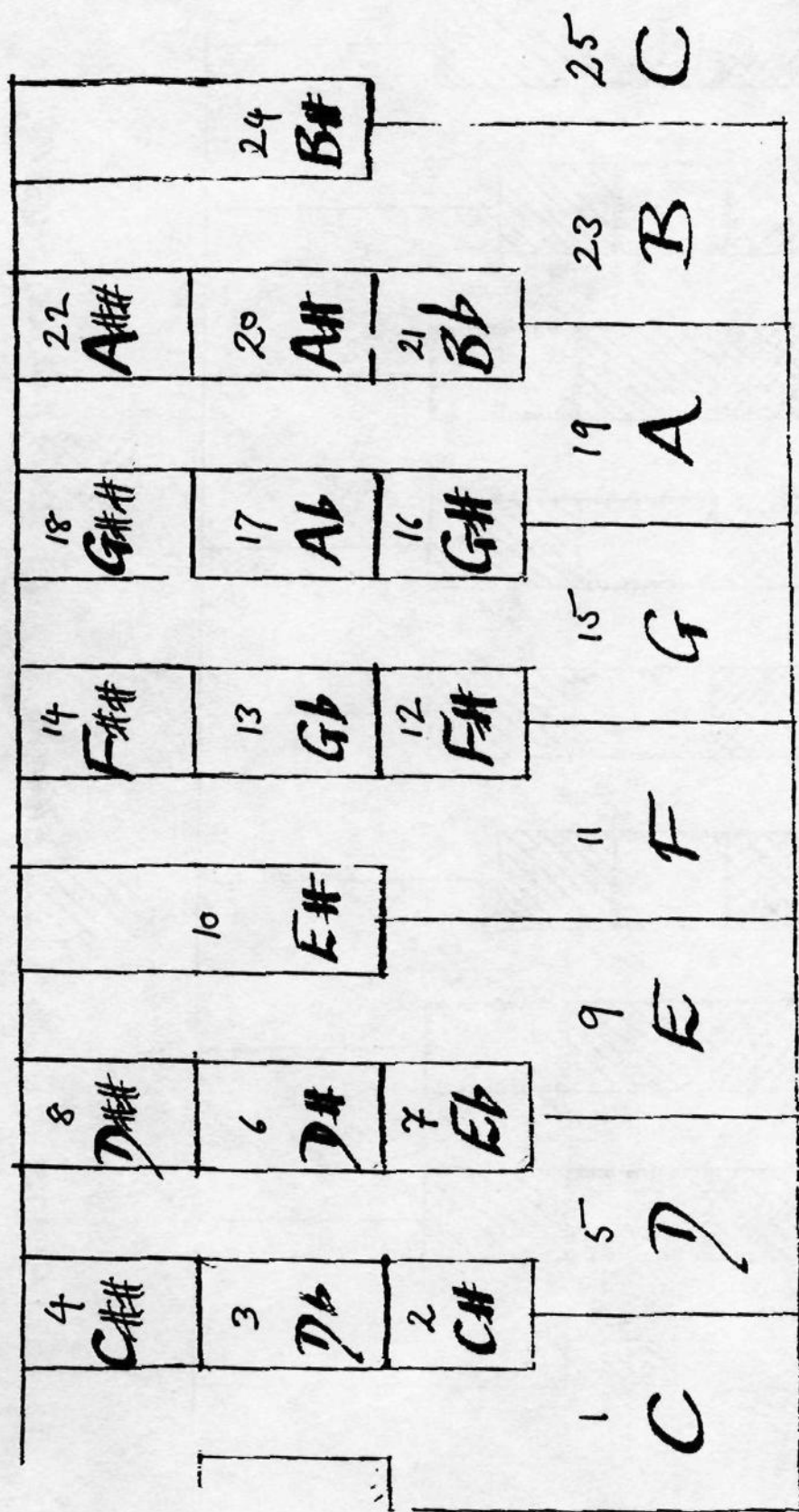
24-Key Octave of Harpsichord Made by Domenico da Pesaro for Zarlino (1548)



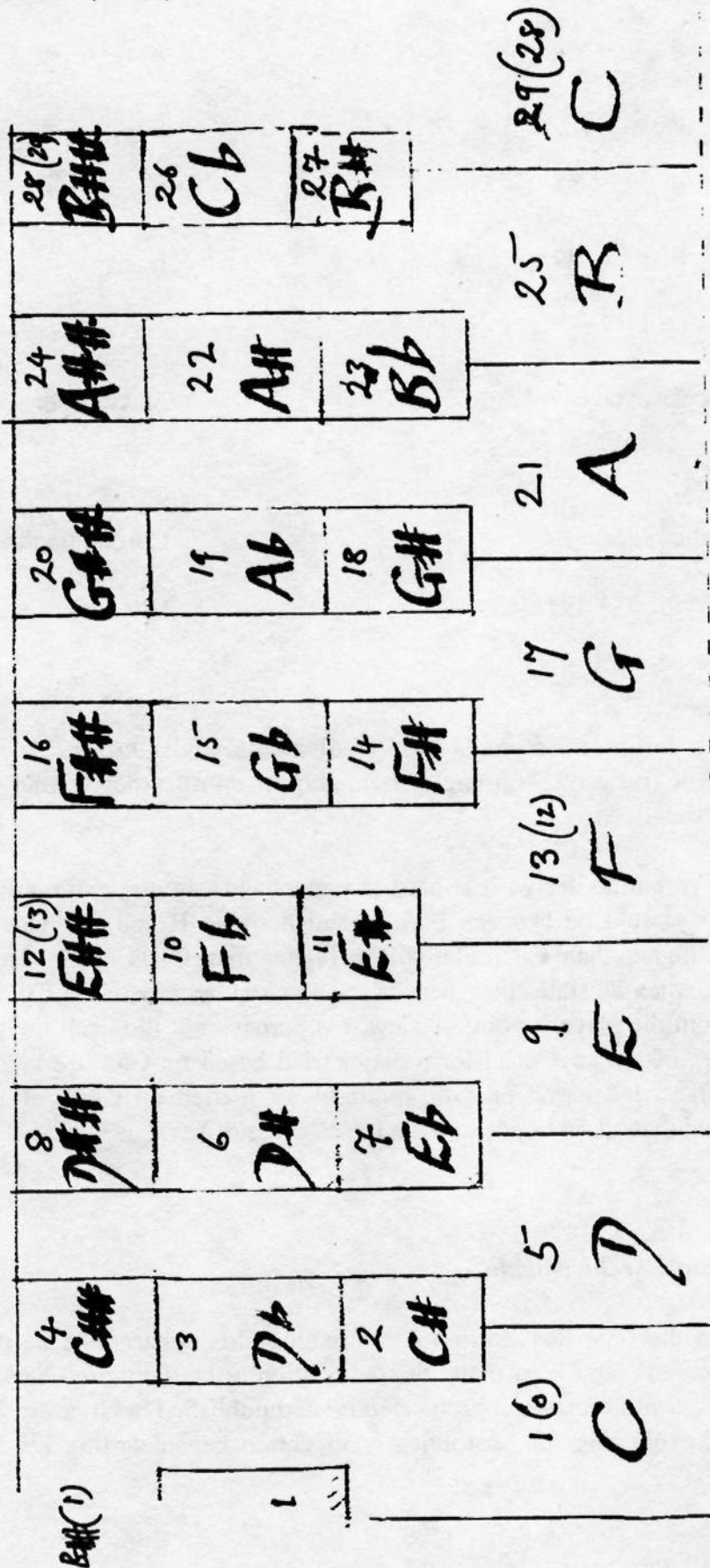
Zarlino/Domenico da Pesaro (1548)



28-Key Octave of Harpsichord Made by Trasuntino (1601)



Trasuntino (1601)



	#	##	C	b	#	##
b	#	##	D	b	#	##
b	#		E	b	#	##
	#	##	F	b	#	##
b	#	##	G	b	#	##

24 keys per octave

28 keys per octave

Chromatic range:

Chromatic range:

G^b - A^{##}F^b - B^{##}

Zarlino's design corresponds to a 19-divison *cimbalo cromatico* with the additon of five keys, forming, presumably, a fourth order behind the five split chromatic keys.

In the Trasuntino design it is hard to understand why the extra strings E^{##} and B^{##} should be *between* E & F, and *between* B and C. That E^{##} is pitched higher than F (similarly B^{##} higher than C) is acknowledged by Pesenti, when he states that there is a major semitone between C^b and B^{##} etc. From the player's point of view it is perhaps not illogical: the physical distances of the keys used for a major triad based on G^{##} are identical to those of a triad based on G[#] (similarly for a triad on C^{##}). It may be presumed that all ^{##} keys formed a fourth order of keys.

Vicentino's *Archicembalo*

Between the time that Zarlino commissioned his enharmonic harpsichord from Domenico da Pesaro and the publication of his *Istitutioni harmoniche* Nicola Vicentino made an *archicembalo* and published his treatise, *L'antica musica*, explaining this instrument. Vicentino began writing his book in

1550 and since he constantly refers to the *archicembalo* even in the first book, it seems likely that he had by that date already had such an instrument made. A reference by Salinas, who does not however mention Vicentino by name, appears to suggest that the *archicembalo* had been made before 1537, thus antedating Zarlino's invention.³⁶ Zarlino also makes some remarks without naming names; these would seem to refer to Vicentino's use of unnecessary notes in addition to those on the Zarlino/Domenico da Pesaro harpsichord.³⁷

The *archicembalo* had 36 keys to the octave, distributed over two keyboards. The lower keyboard was identical to that of the *cimbalo cromatico* and tuned in the same way (for both of the alternative tuning systems that Vicentino proposes). The upper keyboard, with 17 notes to the octave, was similar but without the chromatic half-keys between B and C, and between E and F.³⁸

Apart from an *archicembalo*, Vicentino also had an *arciorgano* made by the Venetian organ-maker Vincenzo Colombo. This, like the *archicembalo*, was based on a 31-note division of the octave, but had fewer keys than the former, presumably having no more than the necessary 31 keys to the octave (whereas the *archicembalo* had an extra five). Since it had 126 pipes and the same number of keys, it probably had a lower keyboard of 19 keys per

³⁶F. de Salinas, *De musica libri septem* (Salamanca, 1577; repr. Kassel 1958), 164: "... instrumentum quoddam quod in Italia, citra quadraginta annos fabricari coeptum est, ab eius autore, quisquis ille fuit, Archicymbalum appellatum."

³⁷Zarlino, *Istitutioni* (1558), 140-1: "Ma si debbe sempre avertire, come altre volte hò detto, che quelle chorde son poste con qualche utilità in uno istrumento, & in alcuno ordine, ... come son quelle, che si ritrovano in questo istrumento. Così per il contrario, quelle sono poste senza utile alcuno, quando non hanno tali corrispondenti [Cf. above, note 30] ... Et ancora che se ne potessero fare de gli altri con diverse divisioni; nondimeno io credo, che da loro si possa cavare poca utilità. Percioche in loro senza alcuna necessità sono moltiplicate le chorde; le quali ... non sono atte ad esprimere altri concetti ... Et se alcuni credessero, che possino esprimere altri concetti, che li tre sopradetti [*Diatonici, Chromatici, Enharmonici*] di gran lunga s'ingannano ... Et dirò anco, che quando si volesse aggiungere al numero delle mostrate chorde alcuna altra chorda, senza dubbio sarebbe cosa vana, & superflua ..."

³⁸Cf. Vicentino, *L'antica musica...* (see note 6). For a description of a modern reconstruction of the instrument see Marco Tiella, "The Archicembalo of Nicola Vicentino," *English Harpsichord Magazine* 1 (1975), 134-44.

octave (four octaves F-f" = $4 \times 19 + 1 = 77$) with an upper keyboard of 12 keys per octave ($4 \times 12 + 1 = 49$; $77 + 49 = 126$).³⁹

Clearly, several such instruments—*arciorgani* as well as *archicembali*—existed, though none is known to have survived, with the exception of the slightly different Trasuntino instrument described below. Those documented include:

1. The prototype *archicembalo ante 1550* (*ante 1537?*) discussed above.
2. The instrument (possibly = 1) played by Luzzaschi in Ferrara.⁴⁰
3. The instrument listed in Ferrarese inventories (possibly = 2).⁴¹
4. The original *arciorgano* of 1561.
5. The *arciorgano* made for the Este Cardinal in Rome.⁴²
6. The *arciorgano* made under Vicentino's supervision in Milan, 1575.⁴³
7. Francesco Palmieri's *organo cromatico enarmonico*, Florence, 1592, which had 80 keys set out on two keyboards, two ranks of cypress pipes.⁴⁴

³⁹Vicentino produced a description of the *arciorgano* published in Venice in 1561. This is reproduced and translated in Henry W. Kaufmann, "Vicentino's Arciorgano; an Annotated Translation," *Journal of Music Theory* (April, 1961), 32-53.

⁴⁰This is reported by Hercole Bottrigari in *Il desiderio* (Venice, 1594); cf. English translation by Carol MacClintock (*Musicological Studies and Documents* 9, American Institute of Musicology, 1962), 51. It was also certainly the "certo strumento Inarmonico" on which Luzzaschi played to Gesualdo and others in 1594. Cf. Durante and Martellotti, *Cronistoria* . . ., 193.

⁴¹"2805 Un'istrumento cromatico con due tastadure una sopra l'altra, n. 1," and "Un Clavicembalo cromatico con due testadure, n. 1," quoted in Durante/ Martellotti, *Cronistoria* . . ., 205, 209.

⁴²Cf. Bottrigari, *Il desiderio* (trans. MacClintock), 51.

⁴³*Ibid.*, 51-2.

8. Francesco Palmieri's "organo . . . inarmonicho," Florence, 1596, with 132 keys set out on two keyboards (C-f" without e#"?), two ranks of cypress pipes.

9. Scipione Stella's *tricembalo*, Naples, ante 1618. This was probably based on the *archicembalo*, but had a more complex keyboard, although it was still clearly related to the *cimbalo cromatico*.⁴⁵

Trasuntino's *Clavemusicum Omnitonum*

The Trasuntino instrument made in 1606 and still preserved (though not playing) at the Museo Civico Medievale, Bologna, has 31 keys to the octave distributed on a single keyboard.⁴⁶ The front part of the keyboard also follows the *cimbalo cromatico* pattern. In order to accommodate the extra 12 keys in each octave, Trasuntino has simply developed the design of his 1601 instrument.⁴⁷ Here, there are four rows of chromatic keys, i.e. five "ordini." There are, however, only two chromatic keys between B and C, and between E and F (C^b/B[#] and F^b/E[#] respectively) since the B^{##} and E^{##} now form part of the circle of 31 divisions and function also as D^{bb} and G^{bb};

⁴⁴Details of both of Palmieri's organs are quoted in Pier Paolo Donati, "Regesto Documentario," *Arte nell'Aretino*, ed. Donati et al. (Florence, 1979), 214. These are presumably the same instruments as those listed in other Florentine inventories reproduced in Mario Fabbri, "La Collezione Medicea degli strumenti musicali in due sconosciuti inventari del primo seicento," *Note d'archivio*, new series, 1 (1983), 51-62 (cf. 57: "Dua altri Organi . . . con dua tastature per ciascuno, con le loro divisioni di vocie . . ."), and in Frederick Hammond, "Musical Instruments at the Medici Court in the Mid-Seventeenth Century," *Analecta Musicologica* 15 (1975), 202-19 (cf. 205: "Due Organi doppii inarmonici . . ." and 209: "Un Organo di Cipresso, Gromatico, con Tastatura doppia . . .," also "Un Organo Gromatico di Cipresso à due Registri . . .")

⁴⁵Colonna, *Sambuca*, 69 ff. A discussion of this instrument will be found in Patrizio Barbieri, "La *Sambuca lineea* di Colonna e il *tricembalo* di Scipione Stella," *La musica a Napoli durante il seicento, Atti del convegno, Napoli, 11-14 aprile 1985* (Rome, 1987), 16-216, cf. 179 for a clear redrawing of Stella's keyboard. Stella accompanied Gesualdo on his visit to Ferrara in 1594, where he must have heard Luzzaschi play the *archicembalo* (see above, note 40).

⁴⁶There is a working copy of the instrument in the Germanisches Nationalmuseum, Nuremberg.

⁴⁷See above, 52-53.

they are therefore positioned in the fifth order of keys, behind C## and F## respectively. While there is an obvious theoretical logic behind the design of such a keyboard, it is wellnigh impossible to play using the fourth and fifth orders. The flats and sharps alternate within the single line of the four chromatic keys from front to back, i.e. from second to fifth order. This means, for instance, that the back (fifth order) key behind G# and A^b is A^{bb}, while the neighbouring fifth order key behind B^b plays A##, thus we find neighbouring keys sounding a minor third apart while the relatively distant fifth order key pairs of A## and D^{bb}, or D## and G^{bb}, sound only a whole tone apart.⁴⁸ Clearly Vicentino's design, with the 31 (+ extra) keys spread over two keyboards, was very much more practicable for the player.

Francesco Nigetti, a Florentine pupil of Frescobaldi, designed three different, though related, instruments between 1640 and 1670. The first appears to have had a lower keyboard with 19 keys per octave (i.e. like the *cimbalò cromatico*) and a normal 12-note-octave upper keyboard—thus it was a simplification of Vicentino's *archicembalo* (or, as suggested above, the same design as the *arciorgano*). Nigetti's second instrument had a single keyboard but avoided Trasuntino's problems by going to the opposite extreme: here, there were five orders of naturals, with no black keys at all! This solution highlights the fact that the object of such instruments was to enable diatonic music to be transposed to any desired degree of the 31-note octave. As long as the equivalent of C major was used, playing this instrument was presumably easy; otherwise, as a contemporary report makes clear, nobody except Nigetti and one of his pupils could play it. The final version, the *Instrumentum omnisonum*, added chromatic keys so that it, in fact, consisted of five ordinary keyboards, each pitched a fifth of a tone above the one below.⁴⁹

It has been suggested that the instrument that Francisco de Salinas had had made in Rome was a *cimbalò cromatico*.⁵⁰ Unfortunately, no description is known to have survived. Salinas mentions it, in passing, in his *De musica libri septem* (Book 3, Chapter 8, which deals with the enharmonic genus). Salinas's system includes perfect fourths and fifths in addition to perfect major thirds. It therefore seems likely that the instrument incorporated these perfect intervals and thus departed from the normal *cimbalò cromatico*

⁴⁸For a photograph of the keyboard, see *New Grove*, vol. 6, 205.

⁴⁹For further discussion cf. Patrizio Barbieri, "I temperamenti ciclici da Vicentino (1555) a Buliowski (1699): teoria e pratica *archicembalistica*," *L'organo* 21 (1983), 129-208, see 177 ff.

⁵⁰Robert Stevenson, "Salinas, Francisco de," *New Grove*.

design that formed the basis of all the instruments discussed above.⁵¹ It will therefore be discussed, not in this section, but separately in a subsequent article, which will also deal with questions of tuning.

⁵¹Cf. Claude V. Palisca, "Salinas, Francisco de," *Die Musik in Geschichte und Gegenwart*, vol. 11, 1305, where it is assumed that the instrument had 24 keys to the octave.