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Harpsichord making during this period may be divided into three major groups. One of these comprises an ‘international style’, practised with regional variations throughout most of northern Europe and perhaps also in Spain. Instruments of this group have many of the characteristics observed in 16th-century north European instruments (see §2(ii) above). Another major stylistic group, which by the final decades of the 16th century was already distinct as an outgrowth of the first group, was centred in the Low Countries under the dominant influence of the Ruckers family. The third major style of harpsichord making, largely separate from the first two, was that practised in Italy.

(i) The Low Countries.

The development of the harpsichord in the Low Countries during the late 16th- and 17th-centuries harpsichord of the Low Countries is inevitably associated with the work of the Ruckers family, a dynasty that dominated Antwerp harpsichord building for a century beginning in 1579, and whose instruments continued in use (sometimes radically rebuilt) throughout Europe as long as harpsichords were commonly played. In addition to a wide variety of virginals, the Ruckers workshops produced single-manual harpsichords of several different sizes, double-manual harpsichords and rectangular instruments consisting of a single- or double-manual harpsichord with an octave virginal built into the space beside the tail and played from one side of the rectangular case. Of these, the most common seems to have been a single-manual instrument approximately 183 cm long and 71 cm wide, with one 8′ and one 4′ register, and a buff stop, consisting of leather pads carried on a sliding batten, for the 8′. The range of these instruments was almost invariably four octaves, *C/E–c‴*, although a few surviving examples originally had fully chromatic basses and sometimes extended to *d‴* in the treble. By the mid-17th century the Couchets, heirs of the Ruckers, made instruments of this type with a chromatic bass octave, and even with a keyboard extending chromatically down to *F* and sometimes with a 2 × 8′ disposition. Documents show that the Couchets also sometimes gave their instruments the more modern 2 × 8′, 1 × 4′ disposition, although no surviving instrument shows evidence of this. A late instrument, probably by Joseph Joannes Couchet (*c*1680; in the Nydahl Collection, Stockholm) had a compass from *F–d‴e‴*, only one note short of the five-octave compass common by the mid-18th century.

The tone of a two-register Ruckers harpsichord differs appreciably from that of an Italian instrument of the time, in having a more sustained brilliance and a somewhat less pronounced attack. The balanced differentiation in timbre produced by the gradual change in plucking-point from a third of the string length in the extreme treble to about a tenth in the bass is adequate for distinguishing contrapuntal lines but not so pronounced as to prevent projecting a homogeneous sound in homophonic contexts; the 4′ register has a pleasant sound in its own right and is usable as a solo stop (as most 4′ registers on historic harpsichords are not) and when combined with the 8′ lends a marked brilliance and carrying power to the ensemble. A buff stop can be used to

damp the higher overtones of the 8′ strings, producing a muted pizzicato effect. This buff stop was normally split between *f*′ and *f*♯′ enabling either the treble or bass to be damped and contrasted with the sound of the undamped strings of the other half of the register. Registration was changed by reaching round the instrument and pushing or pulling extensions of the jackslides that passed through the treble cheekpiece, thereby moving the jackslide to the left or right to engage or disengage the register. Thus the player could not change registers except during a pause between movements or individual pieces.

The addition of a second 8′ register to the basic design (whether by the original maker or at a later date), though increasing the number of possible registers and yielding a louder ensemble when all stops are engaged, seems to spoil the sound of the individual registers, partly as a result of its slightly shifting the plucking-points and partly by its loading the soundboard with additional downward force from the added strings.

The basic characteristics of Ruckers harpsichords may have arisen at any time from about 1565 but were certainly well established at the end of Hans Ruckers's career in the 1590s. Like their virginals, Ruckers harpsichords were made in a range of sizes, with string lengths proportional to the intended pitch. The *c*″ strings of harpsichords tuned to the Ruckers's normal 8′ pitch (estimated to have been one or two semitones below modern pitch) were standardized at about 35·7 cm, while instruments designed to be tuned a whole tone higher (a type which became popular during the 1640s) had strings eight-ninths as long; a unique harpsichord at 'quint' pitch by Andreas Ruckers (1627; Gemeentemuseum, The Hague) has strings two-thirds the normal length. The cases of Ruckers harpsichords are made of poplar about 14 mm thick, with a moulding cut into the upper inside edge, the bottom is attached to the lower edges of the walls. The interior is reinforced by separate upper and lower belly rails and by two bottom braces and two upper struts in single-manual instruments (three of each in doubles). Around each bridge there is a crescent-shaped area of soundboard unencumbered by ribs.

The outside of a Ruckers harpsichord was painted in imitation of marble, or more rarely with strap-work, and the inside decorated with block-printed papers, of which four or five different types were usually used on a single instrument. In instruments in which the inside of the lid was not decorated with a painting, the printed paper would have one or more Latin mottoes lettered on it. The soundboard decorations included arabesques and flowers and were executed in gouache, with a cast lead 'rose' – a soundhole ornament that included the maker's initials (*see* **RUCKERS**, [not available online]). Only a few surviving Ruckers and Couchet harpsichords retain their original stands; contemporary paintings showing instruments of this kind reveal two common designs, either framed structures with thick turned legs, or complex affairs with heavy pierced fretwork ends connected by arcades supported by numerous turned balusters. The natural keys of these harpsichords are covered with bone and the sharps are made of bog oak. The fronts of the natural keys are usually decorated with a punched paper design glued on to a layer of coloured parchment. At the back of the keyboard there is a slotted rack similar to that found in an Italian harpsichord. However, instead of a slip of hardwood to fit into the appropriate slot in the rack, a Ruckers keyboard has a metal pin driven into the end of the key, and the rack is topped with a padded overrail that limits the upward motion of the keys. This system is also used in the lower manual of two-manual instruments; however, there is no space for a rack behind the keys of the upper manual of a two-manual instrument, and the backs of the upper-manual keys are therefore guided by vertical wires rising between the keys at the back of the plank of wood on which the upper-manual balance rail is mounted.

Two-manual instruments were built in the Ruckers workshops as early as the 1590s. They had only two sets of strings, like the typical single-manual instrument, and only one of the two keyboards could be used at a time. In the most common type of Ruckers double (*see* **RUCKERS**, [not available online]), the lower keyboard had 50 keys and a range of *C/E–f*‴, and the upper had 45 keys and the smaller range of *C/E–c*‴. The *c*‴ key of the upper keyboard was aligned over the *f*‴ key of the lower keyboard, and a wide block filled in the space to the left of its lowest key (*see* **TRANSPOSING KEYBOARD**, for [not available online]). Playing a piece on the lower keyboard transposed it down a 4th with respect to the tonality it had when played on the upper manual. Because of the addition of strings in the bass to extend the range downwards a 4th from the *C/E* on the upper manual, and the additional space required for the added lower manual, two-manual instruments of this kind are some 7·5 cm wider and 40·5 cm longer than the normal four-octave single-manual harpsichord of just under 2 metres. As a special refinement, extra 8′ and 4′ strings

were added to each of the G♯ keys on the lower manual, so that these keys would not be obliged to sound A♭ corresponding to the E♭ on the upper manual. Because of these extra strings, the keyboards of such instruments could not use any rows of jacks in common, and instruments so equipped had four rows of jacks (one 8′ and one 4′ on each keyboard) for their two sets of strings. Pictorial evidence and two much-altered examples (the Ruckers of 1599 in the Händel-Haus, Halle, and an unsigned instrument, probably also made in the 1590s, in the Instruments Museum, Brussels) suggest that this refinement was sometimes omitted, such that an instrument might have only three rows of jacks (one a dogleg playable from both manuals); if conventional mean-tone temperament was used, the upper-manual E♭ strings would have to be retuned for use as G♯ on the lower manual.

The musical purpose for which the Ruckers 'transposing' harpsichords were made remains disputed (see Shann, G1985). The lower manual may have been used for transposing music to sound a 4th lower than notated (necessary in accompanying certain choral music; *see* CHIAVETTE). This explanation is consistent with the statement by Q.G. van Blankenburg (1654–1739) that musicians were 'so inexperienced in transposing that … they made expressly a special second keyboard in the harpsichord' (*Elementa musica*, 1739).

There is no evidence that the Ruckers or the Couchets made two-manual harpsichords with aligned keyboards (i.e. at the same pitch), but evidence from paintings of about 1618 to 1626 suggests that such instruments existed by then in the Low Countries. The only known pre-18th century example, in the Germanisches Nationalmuseum, Nuremberg, was made in 1658, probably in the Dutch Republic. It originally had two aligned keyboards with compass *C/E–c‴* but with only one set of 8′ strings and one set of 4′ strings. However, it had four registers: a close-plucking nasal stop played only by the upper maual and two 8′ registers both plucking the same string but separated by the 4′ register, all three of which could be played by the lower manual. Such an instrument can be considered as a 'contrasting' double in that the nasal stop on the upper manual could be contrasted with the more mellow sound of either of the sets of jacks plucking the same string from the lower manual. But there would be little dynamic contrast between the combined 1 × 8′, 1 × 4′ on the lower manual and the more agressive sound of the lute on the upper manual, and the sounds could not be contrasted without a pause to change registration, since (as is also the case in transposing doubles) damper interference prevents registers acting on the same set of strings from being engaged simultaneously on both keyboards. The only instantanteous contrast possible would have been between the 4′ played on the lower manual and the nasal 8′ played on the upper.

In view of the Dutch and Flemish makers' apparent antipathy toward multiple 8′ stringing, it is likely that any aligned two-manual harpsichords made during the first half of the 17th century had 1 × 8′, 1 × 4′ stringing. If they did not have nasal stops, they may have been disposed like Ruckers transposing doubles with aligned keyboards. Van Blankenburg described a practice of altering Ruckers doubles by rearranging the lower-manual keys so that they play at the pitch of the upper manual but without adding a second set of 8′ strings. Several Ruckers harpsichords altered in this conservative manner still exist. Certainly neither the 1658 harpsichord nor these 'aligned transposers' can be considered as 'contrasting' two-manual harpsichords like those beginning to be made in France during this period (see §3(ii)(a) below). Rather, these early Dutch or Flemish non-transposing doubles are like two single-manual harpsichords with different tone qualities contained within the same case (while transposing doubles are like two single-manual harpsichords tuned to different pitches). The principal advantage of the 1658 harpsichord over contemporary German four-register instruments with a single keyboard is that, with fewer jacks carried by each key, the action would be more supple.

About a dozen harpsichord makers in addition to the Ruckers family were active in Antwerp in this period, and about two dozen makers' names are known from elsewhere in the Low Countries. The small number of their instruments that have been preserved are almost identical to those of the Ruckers, whose influence was dominant both through the large-scale importation of their instruments and through the emigration of makers trained in Antwerp. Many makers of German origin were also active in the northern Netherlands, and the nasal register in the anonymous two-manual harpsichord of 1658 indicates that the German style of harpsichord making (see §3(ii)(c) below) had some influence there. The earliest definite appearance of true contrasting two-manual harpsichords in the Low Countries is found in an advertisement of 1687 by the maker Cornelis

van Dort in The Hague, who offered a three-manual harpsichord as well as two-manual instruments with four registers and three sets of strings.

Edwin M. Ripin/Howard Schott (with G. Grant O'Brien)/John Koster

(ii) Transalpine Europe outside the Low Countries.

While Ruckers harpsichords were being shipped to many parts of Europe and even to the Spanish colonies of the New World, harpsichords of a different kind were being made elsewhere in northern Europe. Most of these instruments were discovered in the late 20th century and their places in the history of the harpsichord have not yet been thoroughly assessed. Many seem to present a mixture of Italian and Ruckers-style features. This has sometimes been explained either as the result of influence from both directions or as a stage of arrested development between the Italian style (as the presumed source of all harpsichord making) and that of the Ruckers. A more recent interpretation is that these instruments are part of an indigenous north European tradition, already apparent in the 15th century and observable in the work of such 16th-century masters as Hans Müller, Joes Karest and Lodewijk Theeus (ii) (see §2(ii) above).

Although the particular origins of harpsichord making in 17th-century England, France and Germany may be disputed, the instruments themselves are important because of their association with notable composers of the period. These, including the English virginalists, the early French *clavecinistes*, and such German-speaking composers as Froberger, Buxtehude and J.S. Bach, greatly outnumber the important composers, such as J.P. Sweelinck and Frescobaldi, associated with the better known harpsichords of the Ruckers and the Italian makers. Further, while the Ruckers influence strongly affected north European 18th-century harpsichord making, it did not penetrate far into central and southern Germany. Even in Ruckers-dominated 18th-century French harpsichord making, some important aspects of the earlier style persisted.

(a) France.

The 'contrasting' or 'expressive' harpsichord, with two keyboards that can be used simultaneously or in rapid alternation, was developed in France by the mid-17th century. This type of instrument soon became known throughout northern Europe and continued to be made until the obsolescence of the harpsichord at the end of the 18th century. Also arising in 17th-century France was an important school of harpsichordists, including Chambonnières, Louis Couperin and J.-H. d'Anglebert, whose compositions, skilfully exploiting the idiomatic capabilities of the harpsichord, were long and widely influential.

What little is known about the harpsichord in 16th-century France stems from inventories. These suggest that wing-shaped harpsichords were rare, while inexpensive small *épinettes* (virginals) predominated. The earliest clear evidence of a harpsichord is in an inventory made in 1600 of the estate of the Parisian organist Pierre de la Barre (i), who left a 'clavesin' as well as a clavichord and three 'espinettes'. In 1617 the organist J. Lesecq (*fl* 1583–1626) owned two harpsichords, each with two stops. Further technical details are in a 1632 inventory of the workshop of Jean Jacquet, where there were two harpsichords, one with a single set of strings, the other with 100 strings (presumably having two registers and a keyboard compass of 50 notes, probably *G′/B′–c‴*, a small downward extension of the *CD–c‴* compass common in French organs of the period).

The most voluminous French source of information about harpsichords before the 1640s is Mersenne's *Harmonie universelle* (1636–7), but this must be used with caution: Mersenne described not only the commonplace and native but also the unusual and foreign, without always specifying the difference, and added his own suggestions and theorizing. His passing remark about harpsichords with seven or eight *jeux* (stops or combinations of stops) and two or three keyboards may refer to otherwise unknown early 17th-century French harpsichords, but it is also consistent with the familiar two-manual transposing harpsichords of the Ruckers, in which the two registers on each keyboard provide three *jeux* (8′ alone; 4′ alone; 8′ and 4′ together), at least two additional *jeux* are provided by the buff stop, and a third keyboard is sometimes available in a virginal built into the hollow of the bentside.

Mersenne's main description of the harpsichord is illustrated by a fine, realistic engraving of a single-manual instrument, presumably a typical Parisian harpsichord of the period. The illustration is generally consistent with what is known about early north European harpsichord making and with the few details known from other French sources. Like Ruckers harpsichords, it has a 1 × 8′, 1 × 4′ disposition. As in the pre-Ruckers harpsichord made by Lodewijk Theeus (ii) (see §2(ii) above), the nuts in Mersenne's harpsichord are straight and may lie on the resonant soundboard; the 4′ wrest pins are grouped together with the 8′ pins near the nameboard, such that the 4′ strings must pass through holes drilled through the 8′ nut. The scaling is quite long in the treble, evidently intended for iron strings, and is strongly foreshortened in the tenor and bass. Although the keyboard, with compass *C–c‴*, is consistent with Mersenne's initial description of an instrument with 49 notes, the engraving shows sets of 50 wrest pins, strings and jacks. Mersenne stated that the harpsichord ordinarily has 50 keys and 100 strings. This corresponds both to the 100-string harpsichord in Jean Jacquet's workshop in 1632 and to the typical *G′/B′–c‴* compass of later 17th-century French harpsichords. Mersenne mentioned that the registers of a single-manual harpsichord can be controlled by a conventional stop mechanism but that many persons preferred a different system in which the keyboard was pushed in and pulled out. In this arrangement a small block is glued near the distal end of each key lever. With the keyboard shoved all the way back, the blocks push up the jacks in the rear row but miss the front row; with the keyboard pulled out they push up only the front jacks; in an intermediate position they engage both sets of jacks. This mechanism, later occasionally used in Italy and Germany but not found in any extant French harpsichord, would have been especially advantageous in harpsichords in which the jacks were guided by stationary slots in a soundboard extending to the nameboard, as seems to have been the case in the instrument shown in Mersenne's illustration.

Approximately 35 17th-century French harpsichords are known; half of those whose origin can be determined were made in Paris, and about a quarter in Lyons. Most were discovered after 1970. The earliest signed and dated example (Musée de l'Hospice Saint-Roch, Issoudun) was made by Jean Denis (Paris, 1648). It has two keyboards, originally *G′/B′–c‴*, with three sets of strings and three registers, 8′ and 4′ on the lower manual, 8′ on the upper. It may thus be regarded as a combination of two typical single-manual harpsichords, one disposed 1 × 8′, 1 × 4′, like Mersenne's, the other with only a single 8′ stop, like the single-strung harpsichord in Jacquet's workshop in 1632. The use of such two-manual harpsichords was explained by Denis in his *Traité de l'accord de l'espinette* (1643), where he mentions 'harpsichords with two keyboards for passing all the unisons', that is, on which it is possible to play *pièces croisées*, the earliest extant examples of which were written by Louis Couperin. The Denis harpsichord of 1648 has a shove coupler, now operated by shifting the upper manual; but before the compass was enlarged around 1700, the coupler may have been engaged by pulling the lower manual forward to bring the coupler dogs under the distal ends of the upper manual keys. This arrangement is found in several later 17th-century French harpsichords. The shove coupler allows the keyboards to be separated for playing *pièces croisées* or combined for playing all the registers from the lower manual. A few 17th-century French harpsichords have been found with only a 4′ stop on the upper manual or with dogleg jacks rather than a shove coupler. Such dispositions, which do not allow *pièces croisées* to be played, are in most instances probably the result of misguided restorations. Well-preserved instruments that have been examined in detail almost invariably have the standard dispostion of 1 × 8′ and 1 × 4′ on the lower manual, 1 × 8′ on the upper, and a shove coupler.

Only a few single-manual harpsichords from this period are known. Generally, as in an instrument by Nicolas Dufour (Paris, 1683; now at America's Shrine to Music Museum, Vermillion, South Dakota), they are disposed 2 × 8′. The more substantial tone provided by this disposition in comparison with 1 × 8′, 1 × 4′ may reflect increased use of the harpsichord for basso continuo accompaniment. Nevertheless, an inventory shows that in 1672 Jean Denis was still making single-strung harpsichords in addition to larger models. Two one-manual harpsichords with three sets of strings, presumably 2 × 8′, 1 × 4′, were listed in the inventory of d'Anglebert's estate in 1691.

French two-manual harpsichord action, 17th–18th century

While some harpsichords with expanded compasses, such as *G′A′–c‴*, began to be made shortly before 1700, the *G′/B′–c‴* compass (sometimes with the *E* key divided to provide both *B′* and *E*; sometimes also with the *C* key divided to provide both *A′* and *C*) was commonly made as late as the 1690s. The keyboards and

actions of 17th-century French harpsichords are especially elegant. Keys are quite small, with natural heads often as short as 30 mm. The three-octave measure is very narrow, typically about 470 mm, allowing a normal hand to span the interval of a 10th, as is required in certain French compositions of the period. The naturals are covered in ebony; the sharps are usually blocks of solid bone. The natural fronts are usually decorated with carved trefoils. The backs of the keys of single-manual harpsichords and the lower manual of doubles are guided by metal pins fitting in the slots of a wooden rack. Upper-manual keys are guided by a slot cut through each key-lever, near the back but in front of the jack. For each slot there is a vertical pin held in the back rail of the key-frame. The jack slides and lower guides consist of thin wooden battens covered with leather, the mortises in the wood being oversized, so that the jacks bear only against the leather (**fig.2**).

Although extant instruments show much uniformity in dispositions and in details of the keyboards and actions, other features of design and construction vary considerably. No chronological progression is apparent in case shape, construction, materials or scaling. Three of the earliest examples, by Jean Denis (1648) Claude Jacquet (Paris, 1652; Ringling Museum, Sarasota, Florida), and Louis Denis (Paris, 1658; private collection, France), are similar in construction. The case walls, of softwood or poplar, are thick, about 12 to 13 mm, and the spine somewhat thicker. The bottom board is applied to the bottom edges of the walls. There are separate upper and lower belly rails. The several bottom braces, butted to the spine and bentside, are approximately perpendicular to the latter. The ends of the braces in the two Denis instruments are shaped like knees reaching up the liners, and all three instruments have several upper struts between the spine and bentside liners. In the Jacquet there are also several diagonal struts to the bentside liner.

These thick-cased instruments, made of inexpensive woods intended to be painted, superficially resemble Ruckers harpsichords. In many other French instruments, for example, by Louis Denis (1677; Musée de la Musique, Paris), and Antoine Vaudry (Paris, 1681; Victoria and Albert Museum, London), the cheekpiece, bentside, and tail are of walnut, only about 10 mm thick, with the spine of softwood, often thicker than the other walls. Presumably the handsome walnut wood was originally left unpainted, while the plain back of the spine, placed near the wall of the room, was usually not visible. In some instruments, for example by Nicolas Dufour (1683) and Gilbert Desruisseux (Lyons, *c*1680; Musée de la Musique, Paris), the tail is combined with the bentside in an S-shaped curve.

Bracing systems other than those made by Jacquet and the Denis are known. In the Vaudry harpsichord, for example, there are four bottom braces with ends shaped like knees, but no upper-level braces or diagonal struts. In an anonymous Parisian harpsichord dated 1667 (Museum of Fine Arts, Boston) the bentside is braced only by two diagonal struts. A harpsichord dated 1668 (Musée de la Musique, Paris), made at least partly by Girolamo Zenti, is constructed in the Italian false inner-outer manner. The walls are attached to the edges of the bottom board, and the interior structure includes knees and a belly rail in the Italian style. Some native French makers, for example Vincent Tibaut of Toulouse and Nicolas Blanchet of Paris in a harpsichord dated 1693 (private collection), also attached the walls to the edges of the bottom board.

Bridges were sometimes bent to their curve but sometimes sawed, and were made with various cross sections, sometimes truncated-triangular (as in Ruckers harpsichords), sometimes moulded (as in Italian harpsichords). Normally, the 4′ hitch pin rail is very light, only about 20 mm wide in the bass. Ribbing patterns vary considerably in detail, but there are usually several ribs that cross under the bridges.

Scalings also varied considerably. Some instruments, for example the anonymous Parisian harpsichord of 1667 with a *c″* string length of 26·5 cm, were undoubtedly intended to be strung in brass throughout the compass. The many instruments with longer scalings, for example the Denis harpsichord of 1648 with a *c″* length of 34·5 cm, would have had iron strings in the treble. The otherwise quite similar harpsichord of 1652 by Claude Jacquet (i), with a *c″* length of 31·6 cm, may have been designed for a higher pitch. The existence of more than one pitch standard is implied by ‘a harpsichord with one keyboard which transposes one tone’ (presumably by sliding toward the treble or bass) in the Denis workshop in 1686 (see Hubbard, A1965). Nevertheless, the exceptionally long scaling of a harpsichord by Michel Richard (Paris, 1688; Yale University Collection, New Haven, Connecticut), with a *c″* length of 38·8 cm, might not imply that it was intended for a much lower pitch than the more typical *c″* scalings of about 34·5 cm, but rather that the strings were more highly stressed. Richard seems to have imitated a Ruckers two-manual

transposing harpsichord that had been modified into a French-style contrasting double. In conversions of actual Ruckers harpsichords, the addition of a second set of 8′ strings on the bass side of the jacks results in similarly long scalings.

As early as the 1640s, and perhaps earlier, harpsichords from Antwerp were used in France. Towards the end of the century Ruckers harpsichords were beginning to influence some French makers. Although the Ruckers style of scaling, case construction and soundboard design became dominant in the 18th century, important aspects of the native style, particularly in dispositions and the design of the keyboards and action, were never abandoned.

John Koster

(b) England.

Despite the importance of the English harpsichord composers active during the last quarter of the 16th century and the first quarter of the 17th, very little is known about the instruments that they played. Apart from one or two examples of dubious authenticity, only two English harpsichords from this period are known, both made in London: one by Lodewijk Theeus (ii) in 1579 (see §2(ii) above) and the other by John Hasard in 1622 (Knole House, Sevenoaks, Kent). It has often been assumed that the early English harpsichordists played instruments mainly imported from Italy and Antwerp, but the English repertory of the period frequently requires accidentals that were usually lacking in the short-octave basses of continental instruments. English-made instruments with chromatic bass compasses, already present in the Theeus harpsichord of 1579, were probably in common use. The dearth of surviving examples is explicable as a result of such events as the Fire of London (1666) and of the 18th-century rise in prosperity, which allowed outdated instruments to be discarded for new ones.

The Hasard harpsichord of 1622 is now a shell without its soundboard and keyboard. The compass was 53 notes, probably *C* to *e‴*. With moderately thin oak walls (8 mm), separate upper and lower belly rails, a plate-like lower guide, and one of the nuts placed on active soundboard, the instrument is closely related to the north European tradition seen earlier in the work of Hans Müller and the pre-Ruckers makers of Antwerp. The 20 or so extant English virginals, dated between 1638 and 1684, also have characteristics of this early style. The state of the Hasard harpsichord precludes a definite reconstruction of its disposition, but with three sets of strings and three rows of jacks it undoubtedly provided a wide variety of tone colour. One stop was probably tuned about a 4th below 8′ pitch, with the others an octave higher, one of these being a close-plucking nasal stop.

The only other surviving 17th-century English harpsichord was made by Charles Haward in London in 1683 (Hovingham Hall, Yorkshire). It has moderately thin (8 mm) walnut walls, with an S-shaped bentside. The short scaling, with *c″* about 27 cm long, is suitable for brass strings at 8′ pitch. Similar characteristics of construction and scaling are seen in English bentside spinets of the period. The disposition of the Haward harpsichord, now 2 × 8′, has been altered, but it originally included one or perhaps even two nasal stops. A further indication of a relish for varied tone colour is a report by Thomas Mace (*Musick's Monument*, 1676) that John Haward (almost certainly a close relation of Charles) invented a harpsichord with several stops controlled by pedals.

The few surviving English harpsichords made during the first quarter of the 18th century, before the ascendancy of Jacob Kirkman and Burkat Shudi, are stylistically similar to the late 17th-century instruments. Single-manual harpsichords, for example by Thomas Hancock (London, 1720; Russell Collection, Edinburgh) and William Smith (London, *c*1720; Bate Collection, Oxford), however, were now made without nasal stops, being disposed 2 × 8′. Two-manual harpsichords start to appear, the earliest surviving example being by Joseph Tisseran (London, 1700; Bate Collection, Oxford). This and one by Francis Coston (London, *c*1725; Russell Collection, Edinburgh), are scaled for iron strings in the treble and have three-stop dispositions, with 1 × 8′ and 1 × 4′ on the lower manual and a dogleg 8′ playable from both keyboards. A harpsichord made by Hermann Tabel in London in 1721 (County Museum, Warwick) has the same disposition with the addition of a nasal stop on the upper manual. This instrument, however, lacks the vestiges of 17th-century style still evident in the Tisseran and Coston doubles and is

essentially a fully developed example of the pattern followed by Tabel's pupils, Kirkman and Shudi, and their successors throughout the 18th century (see §4(ii) below).

John Koster

(c) Germany.

Only a few harpsichords made in Germany and regions to the east and north survive from this period. While varying greatly in detail, in general they belong stylistically to the same tradition as the Hans Müller harpsichord of 1537 (see §2(ii) above). Case walls are usually of moderately thin hardwood and are sometimes attached to the edges of the bottom. While most instruments have a normal bentside and tail, bentsides are occasionally S-shaped, a form first seen in Praetorius's illustration of a clavicytherium (1620); or the tail may be composed of two small straight sections angled to approximate a reverse curve. Nuts are often on resonant soundboard wood. Usually there are soundboard ribs crossing under the bridges. While many instruments seem to have been scaled for iron strings in the treble, brass scalings were also used. Some harpsichords were probably intended to be tuned to Chorton (*a′* = *c*465), the pitch of organs in many places.

The dispositions usually provide a wealth of tone colour and often include buff stops and multiple 8′ stops with widely different plucking points. One of the few signed and dated examples, a harpsichord made by Johann Mayer in Salzburg in 1619, is typical, having two sets of 8′ strings acted upon by three rows of jacks, one of them a close-plucking nasal stop. An anonymous early 17th-century German clavicytherium (Germanisches Nationalmuseum, Nuremberg) has a similar disposition, with a 4′ stop as well. In an anonymous German harpsichord of *c*1630 (Bayerisches Nationalmuseum, Munich) there are two sets of 8′ strings plucked by two registers of jacks with normal plucking points, two nasal registers (one of them with metal plectra), and a fifth register with plucking points exceptionally far from the nut, therefore with a flute-like tone. Some harpsichords, however, had less elaborate dispositions, as in two early 18th-century instruments in conservative styles, one made by I.N. Cousseneers in Düsseldorf in 1726 (private collection, USA; described in Watson, C1997), with 1 × 8′, 1 × 4′, and an anonymous Thuringian harpsichord (Bachhaus, Eisenach), with 2 × 8′. Towards the end of the 17th century, two-manual harpsichords were undoubtedly made, but none has survived.

John Koster

(d) Austria.

Those few instruments of the 17th century that are extant in Austria show more parallels with the organ and harpsichord traditions of central and southern Germany than with those of Italy. Two magnificent claviorgans by Valentin Zeiss, the Linz organ builder and court joiner to Ferdinand III, have been preserved. The harpsichord part of the claviorgan of 1634 (Museum Carolinum Augusteum, Salzburg) is mounted on a large rectangular chamber organ with three stops and a pedal. That of 1646 (private collection) has no pedal, but the sets of jacks are arranged in a fan shape, allowing the harpsichord section to produce strong contrasts of tonal colour. This feature and other stylistic peculiarities are found in several harpsichords of this period that are assumed to be south German or Austrian, the 'Habsburg type' of harpsichord (Museum Carolinum Augusteum, Salzburg and the Bayerisches Nationalmuseum, Munich). Another instrument (Hungarian National Museum, Budapest) was also originally combined with an organ. Its case is made without any crossbars, braces or struts. (According to tradition, this instrument came into the possession of Emperor Joseph II.) An Innsbruck court inventory of Archduke Siegmund Franz, drawn up in 1665, mentions a harpsichord with several registers, made by the Tyrolean organ builder Daniel Herz (1618–78).

The only other signed 'Austrian' harpsichords of the 17th century are an instrument made by Johann Anton Mikliš in Prague in 1671, and a harpsichord signed 'AN 1696' and probably made in Vienna. Stylistically and technically the latter is conservative, especially in the absence of braces in the case, the thin, lightly ribbed soundboard, the divided bridges in the bass, and the hollow wrest plank, which is covered with a soundboard. The keyboard, with a range of *F′–g‴*

(unusually large for this period), is diatonic in the lowest octave, and has natural keys split into twos or threes with contrasting intarsia work (this is known as a 'Viennese bass octave'). This feature seems to have been the norm in Austria by 1676, as it appears to have been presupposed in a number of compositions and a set of instructions for stringing given by Alessandro Poglietti in his *Compendium* (1676), and it remained standard type until the middle of the 18th century.

Alfons Huber

(e) Spain.

16 genuine 17th- and 18th-century harpsichords probably or definitely attributable to Spain have been located. Considerable doubts exist about the authenticity of a least eight further instruments with inscriptions giving the makers' names and indicating that they had been made in Spain during the 17th century. In contrast, none of the genuine instruments are signed or dated. The great variety in the styles of these instruments shows that Spanish makers (frequently organ builders) had an idiosyncratic approach to their craft, each producing his own blend of personal and borrowed elements. One early example is an instrument found in Castille and now in the private collection of R. de Zayas (Seville) that has two 8′ registers like a harpsichord, a protruding keyboard like a spinet and a long side that forms an atypical angle of 140° with the left-hand cheek. After restoration in the Dolmetsch workshop it has a full four-octave compass. Developments that took place in other countries appear also to have occurred in Spain. The question of enharmonic instruments was raised in 16th-century Spain by Francisco de Salinas and Juan Bermudo among others, and an experimental five-manual harpsichord was built in the mid-17th century by, or to the order of, Felix Falco de Belaochaga, who was responsible for its tuning. An Italian, Bartolomé Jovernardi, who for some years was a musician in the Spanish Royal Chapel, made and presented a one-manual 'cimbalo perfetto' to Philip IV in 1634. As well as three innovatory 8′ registers that could be changed quickly while playing to produce *piano* and *forte* effects, it had split D♯/E♭ and G♯/A♭ keys.

Beryl Kenyon de Pascual

(iii) Italy.

The history of Italian harpsichords from the 16th century to the 18th is not the seamless continuum described by some earlier authors. Modification of early instruments, adapting them to later taste, for some time obscured an understanding of the change in traditions that took place between the 16th and 17th centuries. It is now known, for instance, that after about 1600 the *C*/*E*–*f*‴ compass became less popular and the 4′ register was rarely provided. In this period the Italian harpsichord was called upon to provide a basso continuo, for which two 8′ registers were obviously judged more suitable. Whereas no harpsichord at 8′ pitch with 1 × 8′, 1 × 4′ disposition and a *C*/*E*–*f*‴ compass is known to have been made after 1585, a few 2 × 8′ harpsichords with this compass were built between about 1600 and 1674. Throughout the 17th century, but particularly in the first half, the *C*/*E*–*c*‴ compass was the most commonly used.

Not only did new instruments no longer conform to typical 16th-century specifications, but older instruments were modified. A document reveals that a harpsichord made in 1570 by Vito Trasuntino had already had its 4′ bridge removed by 1674; the practice of modifying old instruments continued until about 1700. In most instances the older *C*/*E*–*f*‴ compass was changed to *G*′/*B*′–*c*‴, a modification easily achieved since the same number of keys is involved. At the same time the 4′ bridge was usually removed, sometimes also with a minor modification to the position of the 8′ nut in order to adjust the scale. The resulting change of scale, typically from about *c*″ = 35 cm to about *c*″ = 27 cm, required the use of brass wire instead of the previous iron wire: because of the difference in the tensile strength of iron and brass wire, the pitch remained at the same basic level. Of course, the new *G*′ key sounded a 4th lower than the original bottom *C*, but it may be supposed that the principal motivation in these changes was to achieve a wider

range in the bass. This was possible without any significant compromise in tonal quality since the 16th-century design with its bottom *C* note used a case length (*c*220 cm) which was almost the same as that later used for instruments starting on *G* (*c*230 cm).

The earliest surviving harpsichord with *G* as its lowest note is probably of about 1619 and attributed to Boni; it has multiple split natural keys (private collection, England; see Wraight, H1997), but its original compass is uncertain. A more conventional keyboard, *G*/*B*–*c*‴, was unsigned, but now attributed to Albana and dated *c*1624–48 (Metropolitan Museum of Art, New York, Inv.no. 45.41), and the oldest dated occurrence of this range is in a Boni harpsichord of 1653 (private collection, Vienna). The *G*/*B* short octave was never as popular in Italy as the *G*/*A* arrangement (i.e. lacking *G*♯), the first dated instance of the latter being the 1662 harpsichord of Giacomo Ridolfi (Germanisches Nationalmuseum, Nuremberg), but it was probably already used in the 1620s. Although many compasses started on *G*, it was uncommon in the 17th century for them to exceed *c*‴ the datable exceptions reaching to *d*‴, (*d*‴*e*‴), or *f*‴. This has seemed puzzling in view of the earlier use of compasses reaching to *f*‴ at 8′ pitch even though the normal range of music did not usually exceed *f*″, but these changes in compass are evidence of a changing performing practice which in the earlier period had made much more use of the extra octave (*f*″–*f*‴) as an effective ‘octave’ (4′) register. The lowest range used in Italian harpsichords emerged at the end of the 17th century: *F*/*G*/*A*–*c*‴ is first found in an unsigned instrument dated 1695, now known to be by Antonio Migliai (Händel-Haus, Halle; see Wraight, H1992). The less common *F*/*G*–*c*‴ compass was used in Rome by Mattia di Gand (*b* 1663–7, *d* after 1740) in 1675 (Tagliavini collection, Bologna).

As in the 16th century, single-register harpsichords were made; ten that survive can be assigned to the first half of the 17th century. Although the principal disposition in use in the 17th century was 2 × 8′, stop knobs were rarely provided for changing registers; it appears that rapid changes of colour were not an essential part of performing practice. Some instruments, including one each by Boni and Albana, were made with 3 × 8′, an arrangement which is only possible if one of the sets of strings is at a different level (see §1 above, and Wraight, H1997). Albana appears to have achieved this by using two nuts. Another 3 × 8′ harpsichord, attributable to Migliai around 1702 (private collection, England; see Wraight, H1997), used two different bridges so that iron and brass strings were at the same pitch.

Throughout the 17th century short scales (*c*″) at 25–9 cm) predominated and in most cases these indicate normal 8′ pitches (*a*′ = *c*415–*c*467) intended for brass wire stringing. Some may have been intended for the high 8′ pitch (*a*′ = *c*520), strung with iron wire, but (as discussed in §2(i) above) it is difficult to distinguish this design from the brass-strung harpsichord. Indeed, it is possible that what has come to be seen as the ‘traditional’ Italian harpsichord with a short, brass-wire scale is in fact the restringing of a 16th-century, iron-wire scaled design. Scales used, and therefore pitch levels, after 1600 were substantially the same as those of the 16th century; no general rise in pitch seems to have taken place. The harpsichord of 1610 by Vincentius of Prato (Vassar College, Poughkeepsie, NY) could have been intended for the high 8′ pitch strung in iron wire, but the scaling of the 1637 Zenti bentside spinet (*see* **SPINET**, [not available online]) demonstrates more clearly that this high pitch was still used well into the 17th century. Another exception is the 1628 Albana harpsichord (*c*″ at 24·8 cm; Museo Civico, Bologna) which was probably intended to stand a 4th higher than normal 8′ pitch. Long scales (*c*″ at *c*35 cm) at normal 8′ pitch intended for iron wire, which were common in the 16th century, are unknown in harpsichords of this period, although used in virginals until the 1630s. A few harpsichords, even as late as 1700 (e.g. by Migliai, *c*1680, described below) have *c*″ at about 30 cm, which, when strung with iron wire, corresponds to the higher of the two 8′ pitches normally used before 1600. There is little evidence to explain why brass wire scales at the same pitch as iron wire scales should have been preferred in the 17th century. That brass wire gives a louder, even coarser sound had already been noted by Virdung in 1511. The clear tendency towards a 2 × 8′ disposition in the 17th century also suggests the desire for a high volume of sound. However, it must also be remembered that this assumption of a change of string material is based on the comparison of mostly Venetian scales before 1600 with largely Florentine and Roman scales after 1600. It is possible, though not proven, that there was always a strong tradition of using brass scales in Rome and Florence.

There are some documentary references to harpsichords with an *ottava bassa*: Urbani (*fl* 1642) and Zenti made such instruments, and since both worked in Rome this may have been a Roman speciality. A harpsichord by Zenti, now in the Deutsches Museum, Munich, and thought to be

identical with the instrument of 1658 mentioned in the Medici inventory of 1700, was made with a single manual and a 2 × 16′ disposition (it was subsequently given two extra manuals and a fake ‘Bartolomeo Cristofari’ inscription; see Wraight, H1991, and Gai, C1969).

It is the early 17th century that provides the most examples of keyboards with split keys, included to extend the chromatic degrees of the tuning, usually providing D♯ as well as E♭ and A♭ as well as G♯. The common practice was to place the note more often used at the front of the split sharp, for example E♭ in front and D♯ in back. In most such instruments the *C*/*E* short octave was also filled out with the addition of *F*♯ and *G*♯ as split sharps. Whereas it was previously thought that these instruments (including virginals) were made throughout Italy over a period extending into the 18th century, it has now become clear that most of them were made between about 1620 and about 1650, and that many of them were the products of Poggi's workshop in Florence and Boni's in Rome (Wraight and Stembridge, H1994).

Two-manual harpsichords are rare in the Italian tradition: one interesting exception, attributed to Migliai around 1680 in Florence (Germanisches Nationalmuseum, Nuremberg, Inv.no. MIR 1078), also has a 4′ register as well as 2 × 8′ despite having been built at a time when the 4′ stop was no longer common. The keyboard has no coupler and the 4′ is on the upper manual.

Most 17th-century harpsichords were ‘inner-outer’ instruments, that is, made with thin case sides and kept in separate decorated outer cases. One of the earliest virginals made in the ‘false inner-outer’ fashion, with a single case having mouldings around the inside edge to give the illusion of two separate cases, is dated 1587 (Celestini; Beurmann Collection, Hamburg), but this style was apparently not adopted for harpsichords until the early 18th century, as in some Cristofori instruments.

Francesco Poggi, Pasquino Querci (*fl* 1610–25), Stefano Bolcioni (*fl* 1627–41) and Antonio Migliai (*fl* 1682–1704) are the 17th-century Florentine instrument makers whose work was best known in the late 20th century; some of those working in Rome whose instruments survive are Boni, Albana, Filippo Fabbri (*b c*1636–41; *d* 1691), Zenti, G.B. Giusti (*b c*1624–35; *d* after 1692), Ridolfi (*fl* 1650–82) and Giuseppe Mondini (*fl* 1678–1718). Among these makers the reputation of Zenti (*b* ?1609–11; *d* 1666–7) appears to have been the greatest, since he worked at royal courts in Sweden, England and France. His surviving instruments are competently made but not elaborate.

Denzil Wraight