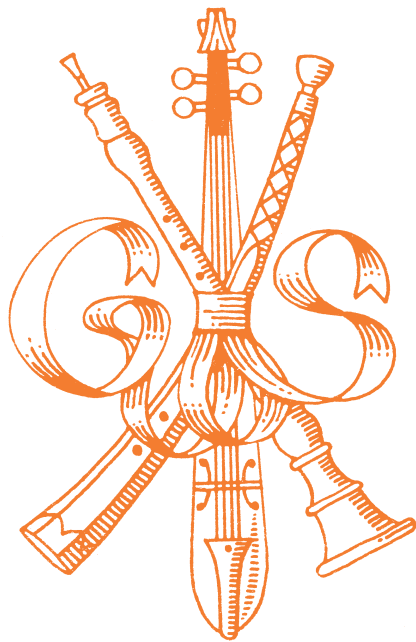


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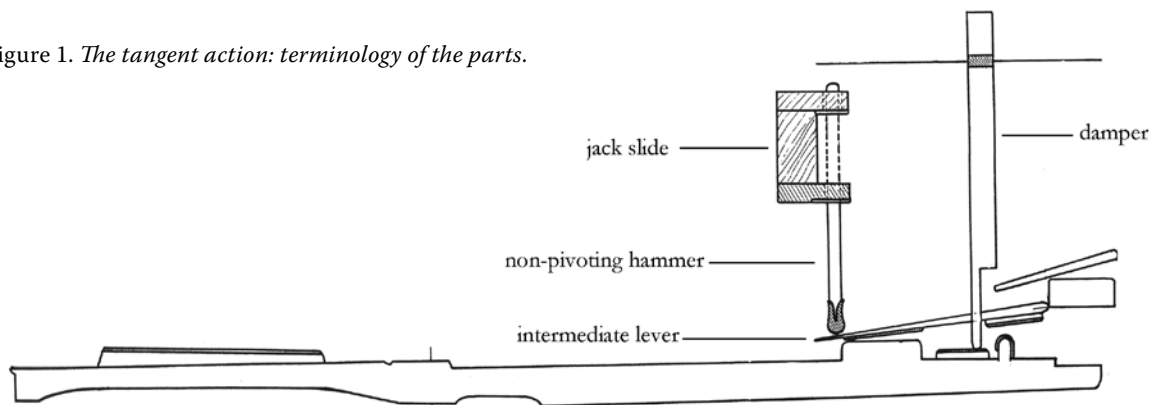
The *Tangentenflügel* and Other Pianos with Non-Pivoting Hammers

In memory of John Henry van der Meer

The standard definition of a piano is of a 'keyboard instrument in which the strings are struck by rebounding hammers rather than plucked (as in the harpsichord) or struck by tangents that remain in contact with the strings (as in the clavichord)'.¹ Cristofori's mechanism with hammers pivoted at the end of the shaft furthest from the hammer (since the hammer head rotates about the pivot, I have henceforth called these rotating moving hammers), intermediate levers, escapement mechanism, check and dampers was the first and most sophisticated piano action designed during the eighteenth century. Nevertheless, after Cristofori's

invention, a number of makers experimented with piano actions that were easier to make and simpler to keep in good playing order but often less refined in their mechanism. Usually, these instruments have either a *Stoßmechanik* or a *Prellmechanik* without either an escapement mechanism, a check or an intermediate lever.² All these pianos have hammers that are thrown up against the strings and immediately rebound to allow the strings to vibrate. Furthermore, all these actions enable the player to produce a dynamic range according to their touch, the distinctive feature of the piano. One of these simplified striking actions made during the

Figure 1. *The tangent action: terminology of the parts.*



* This article is derived from my doctoral dissertation: Giovanni Paolo Di Stefano, '*Tangentenflügel* e altri pianoforti con martelletti non imperniati', PhD dissertation (Rome: University 'La Sapienza', 2007). For his invaluable help, I would like to thank Michael Latcham who patiently read the first draft of this article making numerous corrections and helpful suggestions.

¹ 'Pianoforte', in *The New Grove Dictionary of Music and Musicians*, 2nd edition, ed. Stanley Sadie (London: Macmillan, 2001), p. 655.

² Generally speaking, the *Stoßmechanik* and the *Prellmechanik* can be distinguished by the articulation of the hammer. In the *Stoßmechanik*, the hammer is located off the key lever and usually pivoted from a rail. The impulse to the hammer is given by a push of the key lever. In some *Stoßmechanik* the hammer is thrown up directly by the key, in others by an intermediate lever. In the *Prellmechanik* the hammer is generally mounted in a *Kapsel* fixed to the rear of key lever and its point of articulation moves with the key lever itself. When the key is pressed, an obstruction stops the travel of the rear end of the hammer that strikes the strings.

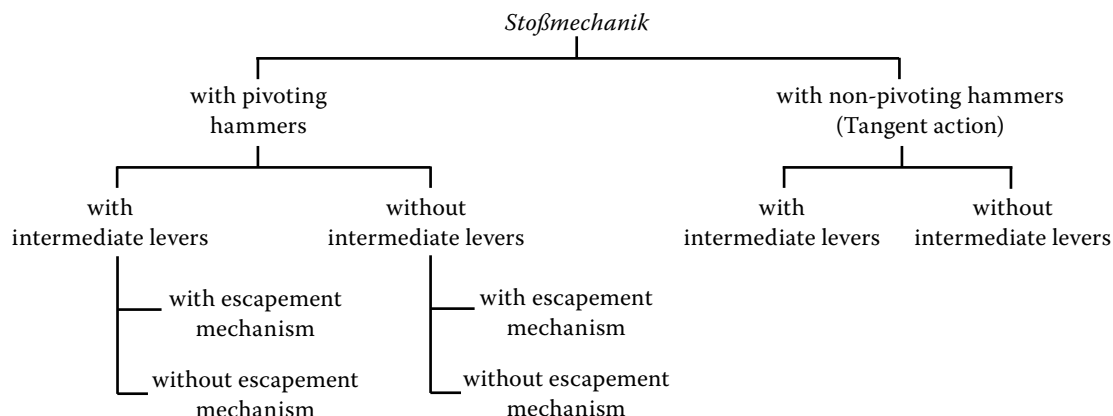


Figure 2. A Classification of the *Stößmechanik* family of actions including the so-called tangent action.

eighteenth century can be found in the keyboard instruments usually known as ‘tangent pianos’ or by the German name *Tangentenflügel*.³

THE TANGENT ACTION: CLASSIFICATION

In the so-called tangent action the strings are struck by vertical staves instead of by rotating pivoting hammers. After striking the strings, these staves (termed tangents) rebound like ordinary piano hammers. This allows the tangent action to be considered as a piano action with vertical hammers. The distinguishing feature of the so-called tangent action is that the vertical hammers are not attached to any other part of the action but move up and down in a guide similar to the jack guide of the harpsichord. Often, this aspect of the tangent action led to the description of the *Tangentenflügel* as an instrument half way between the harpsichord and the pianoforte. The non-pivoting vertical hammers are propelled towards the strings from below, either by the keys on which they rest or by intermediate levers interposed between the keys and the

hammers.⁴ This allows the so-called tangent action to be defined as a special form of the *Stößmechanik* since the vertical hammer (the tangent) is located off the key and the impulse is given by a push.

TANGENTENFLÜGEL AND PIANOS WITH A TANGENT ACTION: TERMINOLOGY

It seems that the word *Tangentenflügel* came into use about 1791 when an instrument made by Franz Jacob Späth and Christoph Friederich Schmahl of Regensburg, was described using this name in the *Musikalischer Korrespondenz der deutschen Filarmonischen Gesellschaft*.⁵ Barely a year later, the term *Tangentenflügel* was used by Gerber in his *Historisch-Biographisches Lexicon* with reference to instruments without quills by Späth.⁶ In 1770 Späth had used the term *Tangirung* in an advertisement for his ‘new invention’, an instrument he called his *Clavecin d’Amour*. This instrument, he wrote, was ‘without hammers and quills’. The term *Tangirung* may have given rise to the name *Tangentenflügel*.⁷ The term *Tangentenflügel* may not have entered the

³ The first contribution to the study of the *Tangentenflügel* was the doctoral dissertation presented in 1927 by Heinrich Herrmann at the University of Erlangen. Heinrich Herrmann, *Die Regensburger Klavierbauer Späth und Schmahl und ihr Tangentenflügel* (Erlangen: Buckdruckerei Karl Döres, 1928). Important recent work includes: Reinhardt Menger, ‘Der Tangentenflügel - ein Fortepiano’, in *De musica et cantu, Studien zur Geschichte der Kirchenmusik und der Oper. Helmut Hucce zum 60. Geburtstag*, ed. Peter Cahn and Ann-Katrin Heimer (Hildesheim, Zürich, New York, 1993), pp. 523-526; Michael Latcham, ‘Franz Jakob Späth and the *Tangentenflügel*, an Eighteenth-Century Tradition’, *The Galpin Society Journal* LVII (2004), pp. 150-170.

⁴ The intermediate levers can be mounted on the key lever or hinged above the keys. Both these types of intermediate levers can face towards the player or away from the player.

⁵ Latcham, ‘Franz Jakob Späth and the *Tangentenflügel*’, pp. 150-151. Latcham remarked that today Späth’s name is normally written ‘Späth’ but it was usually written with no umlaut in Späth’s day. Some instruments are signed ‘Späth und Schmahl’ but they were made by Schmahl alone after Späth’s death. On the other hand, all the earliest sources and a number of eighteenth-century writers did not use an umlaut on the a. While it is probable that both ‘Späth’ and ‘Späth’ were used during the eighteenth century, I have chosen to use ‘Späth’.

⁶ ‘die sogenannten Tangentenflügel ohne Kielen, welche vielen Beyfall gefunden haben’. Ernst Ludwig Gerber, *Historisch-Biographisches Lexicon der Tonkünstler*, (Leipzig: Verlegt Johann Gottlob Emmanuel Breitkopf, 1792), II, p. 538.

⁷ ‘Tangirung ohne Hämmer und Kiele’. *Musikalische Nachrichten und Anmerkungen*, ed. J. A. Hiller (Leipzig, 30 April 1770), p. 142. See also Latcham, ‘Franz Jakob Späth and the *Tangentenflügel*’, p. 165.

Table 1. Historical references to instruments with non-pivoting hammers.				
YEAR	SOURCE	MAKER	INSTRUMENT NAME	HAMMER NAME
1716	<i>Dossier Marius</i> ⁸	Marius	<i>Clavecin à maillet</i>	<i>sautereau sans languette</i> [jack without plectra]
1758	Adlung ⁹	-	<i>Pandoret</i> [Clavichord with additional jacks]	<i>holzerne Docken</i> [wooden jacks]
1759	<i>Académie des Sciences</i> ¹⁰	Veltman	<i>Clavecin</i>	<i>espèce de sautereaux</i> [a kind of jack]
1764	Marpurg ¹¹	Schröter	<i>Piano-forte</i>	<i>Springer</i> [jack]
1770	Hiller ¹²	Spath	<i>Clavecin d'Amour</i>	-
1779	Mozart ¹³	Spath [<i>spättischen</i>]	<i>Clavier</i>	-
1782	Forkel ¹⁴	Spath	<i>Pianoforteinstrumente in Flügelform</i>	-
1787	<i>Rolls Chapel Reports</i> ¹⁵	Walton	<i>Pianoforte</i>	<i>perpendicular Hammer</i>
1791	<i>Musikalischer Korrespondenz</i> ¹⁶	Schmahl & Spath	<i>Tangentenflügel</i>	-
1792	Gerber ¹⁷	Spath & Schmahl	<i>Tangentenflügel</i>	-
1793	Rigler ¹⁸	-	<i>Fortepiano</i>	<i>hölzerne Stecher</i> [wooden stave]
1802	Koch ¹⁹	Spath	<i>Tangentenflügel</i>	
1806	Schubart ²⁰	-	<i>Pantalon</i>	<i>Tocken</i> [jacks]
1817	Thon ²¹	Schmahl and Spat[h]	<i>Tangentenflügel</i>	-
1868	Sievers ²²	-	<i>Cembalo</i>	<i>salterelli a percussione</i> [percussive jacks]

⁸ Archives de l'Académie des Sciences de Paris, 'Projet pour dresser le certificat du Père Sébastien et de M. Terasson', in *Dossier Marius* (Paris, 1716), unnumbered manuscript.

⁹ Jacob Adlung, *Anleitung zu der musicalischen Gelahrtheit* (Erfurt: J. D. Jugnicol, 1758), pp. 575-576.

¹⁰ Archives de l'Académie des Sciences de Paris, *Registre de l'Académie Royale des Sciences*, vol. 78 (Paris, 14 August 1759), p. 671.

¹¹ Friedrich Wilhelm Marpur, *Kritische Briefe über die Tonkunst CXLI* (Berlin, 3 September 1763), p. 100.

¹² *Musikalische Nachrichten...*, p. 142.

¹³ *Mozart. Briefe und Aufzeichnungen 1777-1779*, ed. W. A. Bauer and O. E. Deutsch, vol. II (Kassel, Basel, London, New York: Bärenreiter-Verlag, 1962), p. 68.

¹⁴ Johann Nikolaus Forkel, *Musikalischer Almanach für Deutschland auf das Jahr 1782* (Leipzig: Schwickertschen Verlag, 1781), p. 201.

¹⁵ National Archives of London, Rolls Chapel Reports, Patent for Inventions n. 1607 - 177, 'Improvements on the musical instrument called the pianoforte & other instruments', 6th Report (London, 25 May 1787), manuscript C 54/6799 part 4 no. 2.

¹⁶ *Musikalischer Korrespondenz der deutschen Filharmonischen Gesellschaft für das Jahr 1791*, No. 2, column 10. This document is quoted in Latcham, 'Franz Jakob Spath and the *Tangentenflügel*', p. 151.

¹⁷ Gerber, *Historisch-Biographisches Lexicon...*, p. 538.

¹⁸ Franz Paul Rigler, *Anleitung zum Gesange, und dem Klaviere, oder die Orgel zu spielen* (Buda, 1798), p. 48.

¹⁹ Heinrich Christoph Koch, *Musikalisches Lexicon*, vol. II (Frankfurt am Main, 1802), column 1493.

²⁰ Christian Friedrich Schubart, *Ideen zu einer Ästhetik der Tonkunst* (Wien, 1806), p. 289.

²¹ Christian Friedrich Gottlieb Thon, *Ueber Klavierinstrumente* (Sondershausen: Bernhard Friedrich Voigt, 1817) quoted in Bernard Brauchili, 'The Clavichord in Christian Friedrich Gottlieb Thon's Keyboard Manual "Ueber Klavierinstrumente" (1817)', *Journal of the American Musical Instrument Society* IX (1993), p. 72.

²² Giacomo Ferdinando Sievers, *Il Pianoforte. Guida pratica per Costruttori, Accordatori, Dilettanti e Professori di Pianoforti* (Napoli: Stabilimento Tipografico Ghio, 1868), p. 6.

literature before 1791, although tangent actions had certainly been made several decades before the 1780s and 1790s, the period usually associated with Spath and Schmahl's manufacture of *Tangentenflügel*. Table 1 lists historical references to instruments which had a tangent action giving the source, the name used for the instrument in the source, the maker and the name used for the non-pivoting hammer.

Before 1791, no instrument with a tangent action was defined as *Tangentenflügel* and the hammers were not called tangents. Most of the sources appear to classify the perpendicularly moving non-pivoting hammers simply as 'jacks' in order to distinguish them from the pivoting hammers and to emphasize the analogy (because of the vertical movement within the jack slide) with the jacks of the harpsichord. Furthermore, the use of the term 'tangent' for the non-pivoting hammers is confusing in other ways. First, it is usually reserved for the little staves, generally of brass, which strike the strings of the clavichord and define the sounding length of its strings. In Scandinavian languages the word 'tangent' is used to mean the keys of a keyboard instrument. More importantly, in German-speaking countries the word *Tangent* was also used in the eighteenth century to refer to the jacks of the harpsichord. This use occurs in Johann Gottfried Walther's *Musikalisches Lexicon* of 1732 when he discusses the harpsichord and by Jacob Adlung when discussing the clavictherium in his *Anleitung zu der musicalischen Gelahrtheit* of 1758.²³ Adlung states: 'the jacks [*Docken*] are also called tangents [*Tangenten*] - (from the verb 'to touch' derived from the Latin word with its corresponding antique meaning) *subsilia* (Latin), *saltarelli* (Italian), *sautereaux* (French) and *Springern* (German)'.²⁴ On the other hand, Christian Friedrich Schubart used the term *Tangenten* for the bare hammers of *Pantolon*-type pianos that could be either ordinary 'hammers or percussive jacks [*Tocken*]'.²⁵ In this case, it seems that Schubart used the word *Tangenten*

for every type of bare hammer, whether they were pivoted or not.

It was only at the end of the eighteenth century that the term *Tangentenflügel* became widely adopted, and even then only to refer specifically to instruments by Spath and Schmahl and their school. In modern times, the term has been extended to include other keyboard instruments with vertical non-pivoting hammers. Nevertheless, before the emergence of the term *Tangentenflügel* at the end of the eighteenth century, the two types of instrument now distinguished as hammer instruments and tangent instruments were both regarded as pianos.²⁶ In other words, all these instruments were considered to be pianos, that is hammer instruments, whether their hammers were pivoted or not.

The English expression 'tangent action' (most likely derived from *Tangentenflügel*) has effectively entered piano terminology and literature. In this article the term tangent action will therefore be used to refer to the particular form of the *Stoßmechanik* in which the hammers are not attached to any other part of the action. The term *Tangentenflügel* will be reserved to refer only to those instruments with a tangent action made by Spath, Schmahl and those other builders who were clearly their followers. All the *Tangentenflügel* made by these makers include the following features:

- ◆ the wing-shaped form
- ◆ a tangent action with bare hammers (without any top covering) and intermediate levers
- ◆ a sustaining device activated by a knee lever
- ◆ an *una corda* device usually activated by a knee lever
- ◆ the use of a moderator that inserts cloth or leather between the strings and the hammers, softening the sound
- ◆ the use of a harp stop in which a fringe of tasselled cloth presses against the strings from below close to the nut.

²³ 'Cembalo... ist ein langes, und in Form eines Flügel besaitetes Schlag, mit Tangenten versehen, durch deren Federkielen die Saiten klangbar gemacht werden'; 'Clavictherium... ist eine Clavicymbel oder Flügel, dessen corpus etwas dünner, als die ordinären, und nicht liegend, sondern in die Höhe stehend eingerichtet ist, auch deswegen weniger Raum einnimmt. Die tangenten werden durch einen Draht wiederum zurückgetrieben'. Johann Gottfried Walther, *Musikalisches Lexicon* (Leipzig: Verlegts Wolfgang Deer, 1732). See also Menger, 'Der Tangentenflügel', p. 523.

²⁴ 'Die Docken nennt man auch Tangenten, (vom Anrühren) *subsilia* (lat.), *saltarelli* (ital.), *sautereaux* (französ.) vom Springen'. Adlung, *Anleitung...*, p. 557, footnote n.

²⁵ 'Da es bloß Tangenten hat, die aus Hämmerchen oder Tocken bestehen; so muß es mehr geschnellet, als durchgeknetet werden'. Schubart, *Ideen...*, p. 289.

²⁶ See for this same point of view Menger, 'Der Tangentenflügel', pp. 523-526 and Latcham, 'Franz Jakob Spath and the *Tangentenflügel*', p. 154.

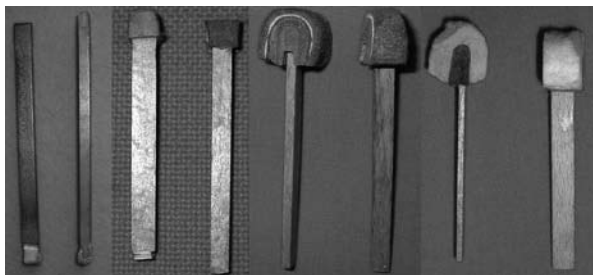


Figure 3 (shown at a larger scale in the colour section). Different types of non-pivoting hammers. From the left: bare hammers (*Tangentenflügel* C. F. Schmahl, Regensburg 1791); leathered hammers (anonymous piano, Italy c. 1825); leathered hammers (square piano F. Puglisi, Catania 1849); felt hammers (anonymous square piano, Italy c. 1850).

This full set of features defines *Tangentenflügel*. Other types of pianos with the so-called tangent action have only some of these features. Characteristics of the *Tangentenflügel* may also be found in other pianos of the relevant period that also have pivoting hammers. The above features are not exclusive to pianos with a tangent action. For instance, the use of bare wooden hammers was also common in other piano actions of the eighteenth century, particularly in southern German instruments with numerous stops.²⁷ Johann Andreas Stein, for example, may have incorporated bare wooden hammers and an optional moderator in his *Hammerflügel* until about 1781. The sound created by these pianos would have been similar to that of Schmahl's *Tangentenflügel*.²⁸ Furthermore, many pianos with a tangent action have vertical hammers that are leathered, as are the more familiar rotating hammers. The use of stops to change the timbre of the instrument is also not exclusive to the *Tangentenflügel*. Pianos that give the player the possibility of combining and selecting various mutations of stops or *Veränderungen*, as

they were called in Germany, were common in the eighteenth century. Johann Gottlob Wagner's *Clavecin-royal* and a considerable number of German square and 'lying-harp pianos' with *Stoßmechanik* or *Prellmechanik* reflect this eighteenth-century tradition of making pianos with a variety of stops for expressive playing.²⁹ Nevertheless, there are other pianos with a tangent action that have no extra stops. Figure 3 above (see also in the colour section) shows different types of non-pivoting hammers.

HISTORICAL OVERVIEW OF THE DIFFUSION OF THE TANGENT ACTION THROUGH EUROPE

The use of a tangent action in a variety of pianos can be traced back to the early eighteenth century and followed in several countries up to the beginning of the nineteenth century and even later.³⁰ Below, some of the most significant aspects of the history of this tradition of piano-making from the beginning of the eighteenth century to the mid-nineteenth century will be illustrated.

MARIUS

The first attested documentary reference to a tangent action is to Jean Marius's presentation of his 'inventions to play the harpsichords without quills' at the Royal Academy of Sciences in Paris. This was just one of several actions designed by this ingenious inventor. His intention was to convert the ordinary harpsichord into an expressive instrument that would produce 'l'imitation des accents humains'.³¹ Short descriptions and plates of four of these actions were published in 1735 after Marius's death.³² More information about these pianos can be found in Marius's original manuscripts and drafts that are

²⁷ See Michael Latcham, 'Swirling from one level of the affects to another. The expressive *Clavier* in Mozart's time', *Early Music* XXX/4, November 2002, pp. 502-520. This tradition of bare hammered pianos may stem from the *Pantolon*, the large hammered dulcimer played with bare wooden beaters that had a great success, especially in Germany, during the eighteenth century.

²⁸ The oldest extant instrument by Stein, the 1777 piano-harpsichord *vis-à-vis* kept in Verona, has small bare wooden hammers and originally had a moderator and probably a harp stop for the piano. The claviorganum by Stein of 1781 now in Gothenburg may also originally have had bare hammers. See Michael Latcham, 'Johann Andreas Stein and the search for the expressive *Clavier*', to appear in: Thomas Steiner (ed.), *Proceedings of the harmoniques International Congress, Lausanne 2006* (Bern, Berlin, etc.: Peter Lang, 2007).

²⁹ Michael Latcham, 'The *Clavecin royal* of Johann Gottlob Wagner in the context of the eighteenth century', in *Geschichte und Bauweise des Tafelklaviers. Proceedings of 23. Musikinstrumentenbau-Symposium, Michaelstein 11. bis 13 Oktober 2002*, ed. Monika Lustig (Augsburg: Wißner-Verlag, 2006), pp. 127-184.

³⁰ It might be possible that instruments with a tangent action were produced before Cristofori's invention. Stewart Pollens, *The Early Pianoforte* (Cambridge: University Press, 1995), p. 33.

³¹ Archives de l'Académie des Sciences de Paris, *Dossier Marius*, unnumbered manuscript.

³² *Machines et Inventions approuvées par l'Académie Royale des Sciences*, vol. III (Paris, 1735), pp. 83-90.

preserved in the archives of the Academy.³³ These unpublished documents give several details and information that are not included in the printed version.

One of Marius's aims was to make harpsichords that were easier and cheaper to keep in good playing order. This could be achieved by inserting:

a simple wooden, or other material, peg in a jack without tongue that rides up and down inside a guide different from the ordinary ones. This peg goes through the centre of the jack jutting out of about three lines and is about one inch under the strings. When the jack is propelled, it strikes the three strings from below.³⁴

Basically, Marius replaced the jacks of the harpsichord with vertically moving percussive staves and moved the jack slides in such a way that the staves were aligned under the strings so that they would strike the strings from below. These striking elements were similar to harpsichord jacks but with the quills replaced by rigid wooden pins. According to Sébastien and Terrasson, this action, like all the other piano mechanisms designed by Marius, had several advantages:

1. The sounds of the three strings are better united by means of the simple striking of a hammer rather than the combination of three plectra. These often get stuck or fail to move, one

behind the other, because of their diversity and this produces a difference in the touch of the keyboard. These new harpsichords will always have an identical movement in the way in which they are calibrated at the start, more agile and lighter to the touch, and the cadences will have a brighter effect, more crystal-clear and a touch which is more suited to virtuoso music and which is of great technical difficulty.

2. Since these percussive elements are not at all subject to wearing out or mutating due to constant repairs, unlike plectra which often break while playing, this invention provides a remedy to the situation which necessitated a continuous maintenance regime in the ordinary harpsichord, and it adds a perfection and quality which is very advantageous to the instrument itself.
3. In regard to the sounds. Many seemed new to us and different from those produced with the plectra. Better because they are more powerful with a less metallic sound, despite the use of metal strings, and usually hold the sound longer than those which use gut strings.³⁵

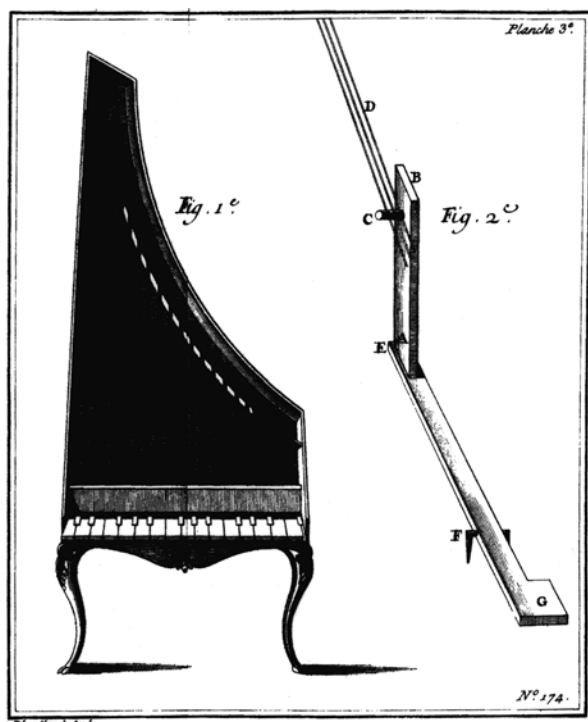
In 1735, a drawing of Marius's non-pivoting hammer was included in the descriptions published by the Academy. There is a plate which represents a sort of percussive jack together with what appears to be an upright instrument.³⁶ It is clear that the percussive 'jack without a tongue that rides up and

³³ For a general account of these documents see Albert Cohen, *Music in the French Royal Academy of Sciences. A study in the evolution of musical thought* (Princeton: University Press, 1981), pp. 50-51; and also Albert Cohen, 'Jean Marius' Clavecin brisé and Clavecin à maillets revisited: the "Dossier Marius" at the Paris Academy of Sciences', *Journal of the American Musical Instrument Society* XIII (1987), pp. 23-38: 30-36.

³⁴ 'L'une est d'ajuster une simple cheville de bois, ou autres matières, à un sautereau sans languette, conduit [sic] par des registres peu différents de l'ordinaire. Cette cheville traverse le sautereau vers le milieu, elle sort d'un côté d'environ la longueur de 3 lignes, et se trouve à peu près à un pouce au dessous des cordes. Son usage est de frapper les 3 cordes en dessous quand on fait mouvoir le sautereau'. Archives de l'Académie des Sciences de Paris, 'Suite d'Inventions tirées du frapement pour faire sonner les clavecins sans plumes', *Dossier Marius*, unnumbered manuscript.

³⁵ 'Les sons des 3 cordes partent mieux ensemble, par le simple frapement d'un maillet que par l'acrochement des trois plumes, qui souvent partent ou s'échappent [sic] les unes après les autres par leurs inégalités ce qui cause de même de l'inégalité dans le toucher du Clavier. Ceux dans ces nouveaux Clavecins se trouveront dans un mouvement toujours égal et tel qu'il aura été réglé d'abord, plus libre, plus léger à toucher, les cadances [sic] en seront plus vives, plus perlées, et le toucher plus convenable pour la musique rapide et d'une exécution difficile [sic]. 2° Ces corps qui frappent n'étant point sujets à s'user ni alterer par leur frapement comme les plumes qui rompent en jouant, il remédie à l'inconvénient des réparations continuelles où l'usage de ces plumes assujettissait le clavecin ordinaire, ce qui ajoute une perfection très avantageuse à l'instrument. La 3^{es} se trouve dans les sons. Ils nous ont paru d'un caractère nouveau, très différents de celui qui est tiré par les plumes, supérieurs, en ce qu'ils sont plus grands, qu'ils sentent moins le métal dont ces instruments sont montés, et qu'en général ils tiennent davantage de son des instruments montés de cordes de boyaux'. Archives de l'Académie des Sciences de Paris, 'Projet pour dresser le certificat du Père Sébastien et de M. Terrasson', unnumbered manuscript. Sébastien and Terrasson were two members of the Academy of Sciences of Paris.

³⁶ *Machines et Inventions*, p. 87, plate 3.



‘Figure 4. Marius’s ‘sauttereau sans languette’ as it was drawn in the volume ‘Machines et inventions approuvées par l’Academie Royale des Sciences’ (Paris, 1735)’.

down’, described by Marius, could not work in such an upright instrument. Maybe Marius’s drafts were misinterpreted by the engraver who made the plates after his death. The harpsichord with jacks ‘without tongues’, described in the maker’s original drafts, was certainly an ordinary horizontal instrument.

Marius’s *clavecins à maillet* had three registers, two at 8-foot pitch and one at 4-foot pitch, like the ordinary French harpsichords of the time. Marius’s hammered instrument only had one nut on the wrestplank, however. The strings of the 8-foot and 4-foot stops thus lay in the same plane and could be

struck together by the hammers from below. Like the *Tangentenflügel* of Spath and Schmahl, the hammer guide could move laterally for the *una corda*:

Since, in order to make use of the three strings that are positioned above each key, and are struck by a hammer or other element, it was necessary to change the order of the bridges. Before this, there were two nuts on the wrestplank and now there is only one, in which the register which is termed *petite octave*, usually two or three *lignes* [a unit of measurement] above the others, is now placed parallel to the two unisons. The two bridges on the soundboard are placed at the same height, with the difference that those that support the strings of the *petite octave* contain many small notches or mortises to give greater freedom to the two unison strings which run above. The function is obtained by leathered jack guides which are pushed by a spring from behind; and these jack guides deactivate one or two registers when tuning is carried out. Furthermore, it is possible to exclude a keyboard in this type of construction, since the keyboard of new instruments will employ only one out of the two or three registers, thanks to the perfection with which it has been constructed, to make sounds with echoes and nuances of varying intensity with just one keyboard.³⁷

Marius’s *una corda* was thus not only used to make tuning easier but also as a stop to modify the sound and decrease the volume of the instrument.³⁸ In the 1750s, Marius’s drawings might have inspired Andries Veltman, an organ and harpsichord maker from Amsterdam, who submitted a plan for a combined harpsichord-piano to the Academy of Sciences of Paris in 1759.³⁹ Unfortunately, no drawing

³⁷ ‘Car pour disposer les 3 cordes qui sont au dessus de chaque touche a recevoir le coup de maillet ou des autres corps frapants, il a falu [sic] changer l’ordre des chevalets. Il y en avait 2 sur le saumier, il n’y en a plus qu’un à présent, où le jeu nommé petite octave, qui est ordinairement à 2 ou 3 lignes au dessous des autres, se trouve posé parallèlement avec les 2 unissons. Les 2 chevalets de la table sont à [la] même hauteur, avec cette différence que celui qui soutient les cordes de la petite octave contient plusieurs petites crans ou mortaises pour donner la liberté aux vibrations des cordes des 2 unissons qui passent par dessus. Les jeux se tirent par des registres drapés, repoussés par des ressorts; et ces registres imposent silence à un ou à 2 jeux quand l’on veut accorder; de plus il y a supression d’un Clavier à cette fabrique, puisque celui des nouveaux instruments tiendra l’un seuls [sic] de 2 ou 3 par la nouvelle perfection qui s’y rencontre, de pouvoir faire sur un seul Clavier des echots et adoucissements à plusieurs degrés.’ Archives de l’Académie des Sciences de Paris, ‘Projet pour dresser le certificat du Père Sébastien et de M. Terasson’, unnumbered manuscript.

³⁸ This description of 1716 is the earliest source known to me of an *una corda* device used as a stop to modify the volume of the instrument.

³⁹ In addition to the ordinary harpsichord action, this instrument was provided with ‘a row of hammers, that are jacks, that strike the string from below with their leathered upper part instead of plucking it with a quill’ (un rang de marteaux, c’est à dire de sautereaux, qui au lieu de pincer la corde avec une plume la frappent en dessous par leur extrémité superieure qui est garnie de cuir). Archives de l’Académie des Sciences de Paris, Registre de l’Académie Royale des Sciences, vol. 78 (14 August 1759), f. 671.

FEATURE	SCHRÖTER	SPATH AND SCHMAHL
Non-pivoting hammers	leathered	bare
Damper device	dampers attached to the top of the hammers.	dampers similar to the ones of Cristofori and Silbermann but they could be lifted from the strings by means of a knee lever.
Intermediate levers	connected to the key by means of a metal pivot pin that is driven into the key lever. The intermediate levers face towards the internal part of the case.	hinged to the back rail of the key frame. They face towards the player.
Stops	only a damper-lifting device	at least four stops operated by means of knee levers and hand levers.

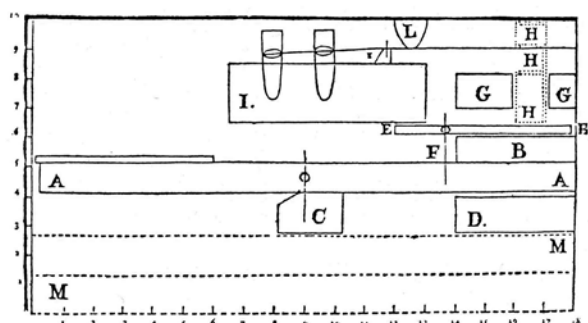


Figure 5 (left). *Schröter's second action as it appeared in Marpur's Kritische Briefe (Berlin, 1763). A = Key, B = wooden element attached to the back end of the key, C and D = key frame, E = intermediate lever, F = metal pivot pin driven into the key, G = hammers guide, H = leathered non-pivoting hammer with a damper fixed by a wire on its top, I = wrestplank, K = nut, L = strings pressure iron, M = shove under rail to lift the dampers.*

of this piano action has survived so whether it had non-pivoting hammers cannot be established.

SCHRÖTER

Christoph Gottlieb Schröter played a major part in the development of the tangent action in Europe, at least in theory. In 1763, he published a long description in Marpur's *Kritische Briefe* together with plates of two different piano actions that he had probably invented between 1721 and 1739.⁴⁰ The first one was a *Stoßmechanik* with intermediate levers that may have been derived from Cristofori's action.⁴¹ Unlike the latter however, Schröter's action was not furnished with an escapement mechanism or a check. The hammer was propelled by a moving jack that rested on the intermediate lever. In Schröter's second action the moving jack was the striking element itself.

Schröter's second action can thus be considered to be the first known example of a *Stoßmechanik* with intermediate levers and perpendicularly moving non-pivoting hammers. These hammers had a leather capping and dampers attached to their upper part so that when the keys were at rest, the hammers hung from the strings by their dampers.⁴² According to Schröter, the dampers were covered with dyed parchment and emerged from a rail so that every damper was visible only when the corresponding key was pressed:

These painted upper part of the jacks [*Springer*], when not playing, should be completely hidden in a pierced rail lying over the strings and, when played, they are driven upwards and thereby made visible; this important detail gave rise to my second design.⁴³

⁴⁰ Friedrich Wilhelm Marpur, *Kritische Briefe über die Tonkunst CXXXIX* (Berlin, 20 August 1763), pp. 81-87; CXL (27 August 1763), pp. 89-95; CXL (3 September 1763), pp. 97-104. See also Pollens, *The Early Pianoforte*, pp. 159-169; and Stewart Pollens, 'Cristoph Gottlieb Schröter, inventor or fraud?', *Early Keyboard Journal* XVIII (2000), pp. 139-153.

⁴¹ Pollens, *The Early Pianoforte*, p. 168.

⁴² A similar damping system can be observed in the Bonafinis spinet that was converted to such a piano. Stewart Pollens, 'The Bonafinis Spinet: An Early Harpsichord Converted into a Tangent Piano', *Journal of the American Musical Instrument Society* XIII (1987), pp. 5-21; also Stewart Pollens, *The Early Pianoforte*, pp. 33-42.

⁴³ 'Diese bemahlten Obertheile der Springer stehen ausser dem Spielen in einem über den Saiten liegenden durch brochenen Stege ganz verborgen, und werden im Spielen aufwärts getrieben, folglich sichtbar gemacht, welcher Hauptumstand diesen zweyten Abriß veranlasst'. Marpur, *Kritische Briefe*, p. 101. This effect must have been inspired by the *clavecin oculaire* invented between 1725 and 1735 in Paris by Louis Bertrand Castel. The *clavecin oculaire* was based on the synaesthetic theories of Kircher and on Newton's research about optics. This instrument, designed to

Schröter defined the non-pivoting perpendicularly moving percussive element of his second action as a ‘jack or hammer’ (*Springer oder Hammer*). Apart from this terminological specification, the maker did not draw attention to any significant functional or musical difference of these percussive elements from the traditional pivoting hammers of his first action. Schröter asserted that, after 1721, piano actions with pivoting as well as non-pivoting hammers were made by several German builders:

In more than twenty cities and towns known to me, the manufacture of the ordinary harpsichord was replaced, after 1721, with keyboard instruments having hammers or jacks [*Springern*].⁴⁴

But, as far as is known, none of these pianos with *Springern*, made in Germany in the first half of the eighteenth century, has survived.⁴⁵

SPATH AND SCHMAL

Spath’s contribution to the diffusion of the piano, especially in German speaking regions, is undeniable. During the second half of the eighteenth century, his workshop in Regensburg was one of the most productive and best known among musicians and instrument makers. It is not known if Spath knew Schöter’s tangent action or if he may have encountered any of those instruments with

Springern that might be traceable to that tradition. Nonetheless, some of the main features of Spath and Schmahl’s *Tangentenflügel* built from the 1780s onwards differ from Schöter’s design. These differences are summarized in Table 2.

It is not known if Spath had any relation with Schröter but certainly he had contacts with some of the most famous contemporary keyboard instrument makers such as Andreas Silbermann and Johann Andreas Stein. Indeed, in 1755, Silbermann noted:

[Spath] wrote me from Regensburg on 10 July 1755. Since he had to build a 16-foot organ, he needed a good assistant able to hammer the tin and he asked me to find someone because he knows that the best workers want to work with me.⁴⁶

Six years earlier, after his time at the Silbermann workshop in Strasbourg, Stein went to Regensburg where he worked for some months as a journeyman with Spath before settling his own workshop in Augsburg in 1750.⁴⁷ Spath may have made his first pianos during the period in which Stein was with him: Adlung mentioned that Spath presented an instrument with many changes of timbre to the Elector of Bonn in 1751.⁴⁸ Although there is no description of Spath’s 1751 piano action or of any other instrument made by him at this early date, it is possible that he already made pianos with non-

⁴³ (continued) produce a music of colours, should demonstrate the analogy between sound phenomena and light. Every note of the *clavecin oculaire* was associated with a coloured lantern whose light became visible after pressing the corresponding key of the keyboard. Schröter could have known the description of Castel’s ocular harpsichord published in 1739 by Georg Philip Telemann. Louis Bertrand Castel, *L’optique des couleurs, fondée sur les simples observations, & tournée sur-tout à la pratique de la peinture, de la teinture & des autres arts coloristes* (Paris: Briasson, 1740). And also Maarten Franssen, ‘The ocular harpsichord of Louis-Bertrand Castel. The Science and Aesthetics of an Eighteenth Century Cause Célèbre’, *Yearbook for the History of Science, Medicine, Technology and Mathematics* III (1991), pp. 15-77.

⁴⁴ ‘Mehr als zwanzig Städte und Dörfer sind mir bekannt, in welchen statt der sonst gebräuchlichen Clavycymbel seit 1721. solche Clavierinstrumente mit Hämmern oder Springern gemacht worden’. Marpur, *Kritische Briefe*, p. 83.

⁴⁵ Two square instruments made during the second half of century by Jan Skórski of Sandomierz, southern Poland, might be somehow related to Schröter’s tradition, however. Indeed, they have non-pivoting hammers propelled by intermediate levers that are attached to the key like Schröter’s second model. But in these Polish pianos the strings are struck by two sets of non-pivoting hammers, one leathered and the other one without any covering, that allow the player to have two different timbres. Benjamin Vogel, ‘Two Tangent Square Pianos in Poland’, *Journal of the American Musical Instrument Society* XX (1994), pp. 84-110. I am grateful to Benjamin Vogel for providing me with some pictures of these instruments.

⁴⁶ ‘Von Regensburg hat Aô: 1755. den 10. July an mich geschrieben. Weilen er ein 16. füßig Orgelwerk unterhanden hatte, wozu er einen perfecten Orgelmachers-Gesellen, der auch mit der Zinn-Arbeit wohl zuzugehen wüste, benötigt hätte, ersuchte er mich, ein solchen ihme zukommen zu lassen, weil ihm wohl bewust ist daß sich bey mir besten Leute von allen Orten um Condition bewerben’. Silbermann’s notes are reported in Marc Schaefer, *Das Silbermann-Archiv: Der Handschriftliche Nachlaß des Orgelmachers Johann Andreas Silbermann (1712-1783)* (Wintherthur: Amadeus Verlag, 1994), p. 309.

⁴⁷ Michael Latcham, ‘The apotheosis of Merlin’, in *Musique ancienne – instruments et imagination. Actes des Recontres Internationals harmoniques Lausanne 2004* (Bern: Peter Lang, 2006), p. 277.

⁴⁸ Adlung, *Anleitung zu der musicalischen Gelahrtheit*, pp. 576-577.

pivoting hammers at the time. However, it has been already said that the use of the word *Tangentenflügel* referring to the instruments made by Spath and his son-in-law Schmahl is not supported by documentary evidence until 1791. Before that date, Spath and his contemporaries referred to the Regensburg pianos as *Pandaleons Forte-pianos* (1765), *Clavecin d'Amour* (1770) or *Pianoforteinstrumente in Flügelform* (1781).⁴⁹ But it is likely that the pianos manufactured by Spath were often simply defined as a *Clavier* just like any other *Hammerflügel* of that time. This is the term used by Mozart in his famous letter to his father of 17 October 1777 when he compared the '*spättischen Clavier*' with Stein's '*Piano forte*' with an escapement mechanism.⁵⁰ Until that period, Spath had probably been regarded as one of the best southern German maker but at the end of the 1770s Mozart, like other musicians, turned to Stein's pianos. On 2 November 1777, Leopold Mozart wrote to his son:

She [the Countess Lodron] asked and told me a lot of thoughts about Stein's Piano Forte, and I told her what you wrote to me; she agrees with the approval of Countess Schönborn who told her that she went to Augsp[urg] because she found Stein's instruments far better than the ones of Späth and she bought one of them for 700 fl.⁵¹

According to Carl Ludwig Junker, Beethoven also did the same; during his early youth, he had played 'a Späth piano (*Späthischer Flügel*)' but around 1783 he 'only got accustomed to one by Stein'.⁵²

Schmahl married Spath's daughter Anna Felicitas and worked with Spath from 1772 onwards. Spath died in 1786: many of the *Tangentenflügel* known



Figure 6. A *Tangentenflügel* of the long type made by Schmahl in 1790 (Private Collection, Italy).

today were made by Schmahl after that date. The last known *Tangentenflügel* by Schmahl is of 1802. He was a conservative maker, continuing in the tradition of his master Spath until the beginning of the nineteenth century. Except for a few changes, he reproduced the same action with non-pivoting bare hammers, internal construction and stop devices.⁵³

THE FOLLOWERS OF SPATH AND SCHMAL

Spath and Schmahl's workshop in Regensburg achieved considerable renown and was one of the most productive of southern Germany. It is likely that several journeymen and builders must have worked with Spath until his death in 1786 and with his son in law Schmahl after Spath's death. Some can be identified from historical sources. One was Johann Michel Bühler (Vaihingen 1746-1832) who worked in Württemberg, south-west Germany, at the end of the eighteenth century. Gerber, in his *Lexikon*

⁴⁹ *Leipziger Zeitungen* (Leipzig, 10 September 1765), p. 564. This announcement described Spath's *Forte-piano-Clavecins* or *Pandaleons-Clavecins* that were combined harpsichord-pianos. See also *Musikalische Nachrichten und Anmerkungen*, ed. J.A.Hiller (Leipzig, 30 April 1770), p. 142; and Forkel, *Musikalischer Almanach...*, p. 201. These documents are quoted in Latcham, 'Franz Jakob Spath and the *Tangentenflügel*', pp. 142, 154.

⁵⁰ *Mozart. Briefe und Aufzeichnungen...*, pp. 68-69. For an English translation of this famous letter see Richard Maunder, 'Mozart's keyboard instruments', *Early Music* XX/2 (1992), p. 214.

⁵¹ 'Sie sagte mir eine Menge und fragte mich eine Menge wegen der Piano Forte vom Stein, und ich erzählte ihr was du mir davon geschriben, sie gab dir aus dem Beyfahl der Gräfin Schönborn recht, die ihr erzehlt hätte, dass sie wegen den Steinischen Instrumenten über Augsp: gegangen, solche unendlich besser als die Spätischen gefunden, und für sich eines zu 700 fl angefrümmt hatte'. *Mozart. Briefe und Aufzeichnungen*, vol. II, p. 97.

⁵² 'Noch hörte ich einen der größten Spieler auf dem Klavier, den lieben guten Bethofen [sic]; von welchem in der speierischen Blumenlese vom Jahr 1783, Sachen erschienen, die er schon im 11. Jahr gesetzt hat. Zwar ließ er sich nicht im öffentlichen Konzert hören; weil vielleicht das Instrument seinen Wünschen nicht entsprach; es war ein Späthischer Flügel, und er ist in Bonn gewohnt, nur auf einem Steinischen zu spielen'. This document is quoted in Tilman Skowronek, 'The Keyboard Instruments of the Young Beethoven', in *Beethoven and his World*, ed. Scott Burnham and Michael P. Steinbergton (Princeton: University Press, 2000), p. 162.

⁵³ A detailed description of Spath and Schmahl's surviving *Tangentenflügel* is given below.

of 1812, reported that Bühler was:

an organ and musical instrument maker in Vayhingen on Enz, Württemberg, in 1791; before settling his own workshop, he had been working for a long time with Späth and Schmahl of Regensburg, a fact that reflects a good opinion about his competence. He makes pianos with two keyboards for 18 *Carolin* and unfretted clavichords for 30 fl.⁵⁴

Unfortunately, not one of Bühler's instruments has survived but it is likely he made *Tangentenflügel*. For instance, his two-manual pianos, reported by Gerber, might have been related to the combined *piano-forte-clavecins* reported to have been made by Spath in 1765 and 1770.⁵⁵

Bühler's instruments could also have been similar to the 1786 combined piano-harpsichord made by Carl Gottlob Sauer preserved in Norway in the Drammens Museum of Austad Gård.⁵⁶ This instrument combines a two register harpsichord (1x8' + 1x4') with a non-pivoting hammer piano action that is very similar to that of Spath and Schmahl's *Tangentenflügel*.⁵⁷ Gerber wrote that Sauer was:

a wise mechanic and maker of keyboard

instruments in Dresden, born in Brandenburg. Initially, he worked as a carpenter. Since, a little after his apprenticeship, he had the opportunity to learn some rudiments of the technology of musical instruments making, he turned to this art that gave a lot of scope for his knowledge of mechanics. About 1780, he settled permanently in Dresden as a maker of musical instruments. He tried to make more powerful Fortepianos, without losing the simplicity of the mechanism. At the same time, he tried to arrange the stringing with progressive measurements. His accurately measured monochords are in great demand and considered the best.⁵⁸

Another follower of Schmahl was Johann Wilhelm Berner (see Figure 7 in the colour section) whose 'Fortepianos in the shape of a harpsichord were particularly appreciated'.⁵⁹ According to Gerber, after his apprenticeship in Regensburg, Berner moved to Hamburg where he founded his own workshop in the 1790s. Another southern German builder who made *Tangentenflügel* was possibly Carl Heinrich Käferlen (Baden-Württemberg 1768 – Ludwigsburg 1834).⁶⁰ Gerber stated that Käferlen made *Tangentenflügel* based on Spath's instruments.

⁵⁴ 'Orgel und Instrumentmacher zu Bayhingen an der Enz im Württembergischen im J. 1791, hat, ehe er sich selbst etablirte, viele Jahre bey Spath und Schmahl zu Regensburg gearbeitet, was allerdings ein gutes Vorurtheil für seine Geschicklichkeit erwecken muß. Er verfertiget Fortepiano's mit 2 Tastaturen für 18 Carolin und bundfreye Klaviere für 30 Fl.' Ernst Ludwig Gerber, *Neues historisch-biographisches Lexicon der Tonkünstler*, vol. 1 (Leipzig: Kühnel, 1812), col. 545. About Bühler, see also Martin Friedrich Jehle, *Württembergische Klavierbauer des 18. und 19. Jahrhunderts* (Frankfurt am Main: Verlag das Musikstrument, 1982), p. 22.

⁵⁵ *Leipziger Zeitungen* (Leipzig, 10 September 1765), p. 564.

⁵⁶ (inv. no. 2001). I am grateful to Michael Latcham for providing me with some pictures of this instrument. The name of one of Sauer's journeyman, called Haucken, is inscribed on the bottom of this instrument. The inscription reads: 'Auf Ersuchen diesen Tischler/ Haucken wird hier/ mitt attestiert, dass selbiger bey mir Endes/ benant ein helbes Jahr in Arbeit ge-/ standen und sich in dieser Zeit Ehrlich/ und wohl verhalten, welches ich zur/ bestätigung der Wahrheit unterschrie-/ ben, und mit meiner Petschier/ untersiegelt. Dresden, den 12ten/ Juni 1786./ Carl Gottlob Sauer/ Instrumentenmacher'. Donald Boalch, *Makers of the Harpsichord and Clavichord 1440-1840*, ed. Charles Mould (Oxford: Clarendon Press, 1995), p. 603.

⁵⁷ Latcham, 'Franz Jakob Spath and the *Tangentenflügel*', p. 167.

⁵⁸ 'ein einsichtsvoller Mechanikus und Tasteninstrumentmacher zu Dresden, geb. im Brandenburgischen, widmete sich anfangs der Tischlerprofession. Nachdem er aber bald nach überstandner Lehre Gelegenhet fand, sich die zum Instrumentenbau gehörigen mechanischen Grundsätze zu eigen zu machen; so überließ er sich gänzlich dieser Kunst, welche seinen theoretischen Kenntnissen in der Mechanik so vielen Spielraum gab, und ließ sich um 1780 zu Dresden ganz als Instrumentemacher nieder. Er sucht besonders seinen Fortepiano's mehrere Stärke im Tone zu geben, ohne daß ihr leichtes Traktament dabey verlieren darf. Zugleich sucht er seinen Bezug nach wenig abwechselnden Nummern einzurichten. Besonders aber werden seine genau abgemessenen Monochorde gesucht und für die besten gehalten'. Gerber, *Neues historisch-biographisches Lexicon...*, vol. IV, col. 24.

⁵⁹ 'dessen flügel förmige Fortepiano's ums J. 1800 besonders gerühmt wurden'. Gerber, *Neues historisch-biographisches Lexicon...*, vol I, col. 358-359.

⁶⁰ An unreliable story about him is reported by Gerber, who wrote that this maker was blind from early childhood. Gerber, vol III, col. 1. Actually, it seems that Käferlen lost his sight, in old age, through cataracts. Jehle, *Württembergische Klavierbauer*, pp. 51-52.

None of those pianos has survived, however.⁶¹ The influence of Spath and Schmahl spread to Vienna, where pianos with a tangent action were made by Franz Múnzenberger, and to Northern Italy.⁶²

ENGLISH MAKERS

The fact that the piano was brought to England in the 1760s by a group of German-born immigrant makers is well known. The first of these was Johann Christoph Zumpe, a South-German maker from Fürth near Nuremberg. In the 1750s, Zumpe moved to London where he worked as a journeyman with the harpsichord maker Burkat Shudi. In 1761 Zumpe set up his own workshop in Princes Street where he made the first pianos known in England. The surviving instruments by this maker are all dated 1766 or later. They are small square pianos with a simple *Stoßmechanik* with no escapement mechanism, intermediate lever or check.

Although there is no evidence that Zumpe might have made other types of piano, a fascinating piece of information in this respect is provided by the Neapolitan piano maker Giacomo Ferdinando Sievers in his treatise *Il Pianoforte* (Naples, 1868):

In England and Germany some harpsichords were made with jacks that struck two unison strings. In 1828, when I was in Riga, I repaired several of these instruments that had been made in Nuremberg in 1754. In England, during that period, Zumpe produced the same model with an



Figure 8. *Anonymous English square piano, c. 1790* (College of Music Collection, Osaka).

intermediate lever. This maker covered the jacks with soft leather, thus they produced a faint but quite pleasant sound; those [percussive jacks] made in Germany were not covered with leather and produced a shrill sound. These jacks were placed inside a leathered guide, which looked like a comb, that was supported in order to allow space between the key and the jack; Zumpe's intermediate lever was hinged on the back by means of a parchment.⁶³

It is possible that Sievers confused Zumpe with some other maker. Nevertheless, Sievers' book, with its accurate descriptions and some three hundred technical drawings is, with Blüthner and Gretschel's *Lehrbuch des Pianofortebaues* (Weimar, 1872), the most important and precise survey of piano making written during the nineteenth century.⁶⁴ From the

⁶¹ A square piano with *Prellmechanik* signed 'Charles Kaefferle/ Ludwigsburg n. 2' is kept at the Germanisches National Museum of Nurnberg (inv. no. MINE 172). Another square piano dated 1793 is preserved at the Czech Museum of Music in Prague (inv. no. E 16).

⁶² A *Tangentenflügel* by Múnzenberger from the end of the eighteenth century, is preserved at the Ueno Gakuen Collection of Tokyo. N. Funayama, N. Uchino, C. Honma, *Catalogue of the European musical instruments of the XVIIth, XVIIIth and XIXth centuries in the Ueno Gakuen Collection* (Tokyo: Ueno Gakuen College, 1980), pp. 104-114, 219 (photo). For further biographical details on Múnzenberger see Helmut Ottner, *Der Wiener Instrumentenbau 1815-1833* (Tutzing: Verlegt bei Hans Schneider, 1977), pp. 104-105; and also Rudolf Hopfner, *Wiener Musikinstrumentenmacher 1766-1900* (Tutzing: Verlegt bei Hans Schneider, 1999), p. 346. Spath's *Tangentenflügel* were certainly known in Vienna. A combined harpsichord-piano with two keyboards, by this maker, was offered for sale in the *Wiener Diarium* of 1779. Another piano with four stops made by Spath was described, in 1782, in an advertisement from the same periodical. Richard Maunder, *Keyboard instruments in Eighteenth-Century Vienna* (Oxford: Clarendon Press, 1998), p. 149.

⁶³ 'In Inghilterra e nella Germania si fecero cembali coi saltarelli [sic] a percussione su due corde unisone. L'anno 1828 ne accomodai diversi in Riga, fabbricati a Norimberga nel 1754. Nell'istessa epoca in Inghilterra un certo Zumpe li faceva sull'istesso modello, con l'aggiunzione d'una controleva. Questo fabbricante guerniva i saltarelli di sottile pelle; in tal guisa producevano una voce debole, ma piuttosto grata all'udito; quelli di Germania invece erano di semplice legno, e per conseguenza di suono stridulo. Questi saltarelli eran disposti in una specie di pettine interamente garnito di pelle, con appoggio per lasciare spazio fra il tasto ed il saltarello; la controleva di Zumpe era flessibile di dietro per mezzo di pergamena'. Sievers, *Il Pianoforte*, pp. 6-7. A drawing of this action, based on Sievers' description, was published in Cesare Ponsicchi, *Il Pianoforte: sua origine e sviluppo* (Firenze: Guidi Editore, 1876), p. 38, plate 3.

⁶⁴ Blüthner and Gretschel reprinted some of Sievers' drawings in their book. Julius Blüthner and Heinrich Gretschel, *Lehrbuch des Pianofortebaues* (Weimar: Voigt, 1872, reprint Frankfurt: Bochinsky, 1992).

accuracy of Sievers' description it seems that he had genuinely seen the English piano with non-pivoting hammers described above. But was it really the work of Zumpe? The surviving fifty or so square pianos by Zumpe from when he worked alone and when he worked together with Gabriel Buntebart and Meincke Meyer represent a small proportion of at least 1250 instruments he produced during that period.⁶⁵ It cannot therefore be excluded *a priori* that Zumpe experimented with some other types of pianos. Square pianos with a tangent action were certainly made in London in the 1790s by the German-born maker Frederick Beck. He received a patent for these instruments.⁶⁶ They have the appearance of an ordinary English square piano made in the late eighteenth century. But like the English instruments described by Sievers, Beck's pianos have non-pivoting hammers covered with leather. As Sievers remarked, this makes the English instruments different from the southern German ones. The latter are usually fitted with bare wooden hammers and a moderator. Furthermore, the action of these instruments is different from that of Spath and Schmahl and their pupils. Like Schröter's piano, these English squares have intermediate levers that are pivoted at the rear of the key levers.

In 1787, another maker from London, Humphry Walton, received a patent for a grand piano with non-pivoting hammers. Walton's patent for his *Piano-forte and other instruments* was registered on 15 June 1787. In this document the maker asked a permission to use:

within England, Wales and the town of Berwick upon Tweed my invention of certain new improvements on the musical instrument called the Piano-forte and other instruments.⁶⁷

Walton's description, enrolled in His Majesty's High Court of Chancery, gives many details of the action of this piano with 'perpendicular hammers'.

These latter were propelled by intermediate levers that faced away from the player, rather than towards the player as in the southern German instruments of Spath and Schmahl and their pupils. Walton observed that these levers worked like the pivoted hammers of the ordinary English pianos. But apart from this action with non-pivoting hammers, Walton made some mechanical devices to increase the dynamic possibilities of the instrument. One was the *una corda* that, as in Spath and Schmahl's *Tangentenflügel*, shifted the hammer guide laterally. But Walton used a pedal, instead of a knee lever, that moved the hammer row to the right so that it struck only one or two strings in each choir of three.⁶⁸ A second pedal moved the key frame backwards or forwards. This changed the position of the jacks in relation to the intermediate levers, thus varying the force used to propel the hammers against the strings.

ITALIAN MAKERS

The pianoforte action invented by Cristofori in Florence at the end of the seventeenth century may have experienced an uncertain development in Italy during the first half of the eighteenth century, but there seems to have been a renaissance of interest in the piano in the 1760s. The arrival of abundant instruments from Germany and England during the second half of the eighteenth century seems to indicate a preference for foreign types of pianos rather than for those made in a continuation of the Cristofori tradition. Using the imports as models for some, if not all aspects of construction, several Italian harpsichord makers began to make pianos with a tangent action.

Notable imports of German instruments include the two *vis-à-vis* piano-harpsichords, one from 1777, now in Verona, and the other of 1783, now in Naples as well as those pianos purchased by the courts of Tuscany and Naples in the 1780s. Stein must have built

⁶⁵ Christopher Clarke, 'The English piano', in *Music of the past: instruments and imagination*, p. 259.

⁶⁶ A square piano signed 'A. F. Beck 1790. Patent' is described below.

⁶⁷ The National Archives of London, Rolls Chapel Reports, Ms. C 54/6799 part 4 no. 2, f. 177. Not much is known about Walton, a musical instrument maker of the Parish of Saint Pancras in the County of Middlesex, near Oxford Street. A brief description of this piano can be found in *Patents for invention. Abridgments of specifications relating to music and musical instruments A. D. 1694-1866* (London: Eyre and Spottiswoode, 1871), p. 20; reprint (London: Bingham, 1984). See also Rosamond Harding, *The Pianoforte. Its History Traced to the Great Exhibition of 1851* (Cambridge: University Press, 1933; 2nd edition, Old Woking: Gresham Books, 1978), p. 49.

⁶⁸ An *una corda* pedal had been used in London by Americus Backers in 1772. Warwick Henry Cole, 'Americus Backers: Original Forte Piano Maker', *The Harpsichord Magazine* IV/4 (1987), p. 81. In 1786 Merlin invented a quadruple strung grand piano in which the whole piano mechanism could be moved laterally by means of a pedal so that the hammer struck one, two, three or four strings. Latcham, 'The apotheosis of Merlin', p. 290.

up a clientele in Italy, whether directly or through intermediaries.⁶⁹ Besides Stein's pianos, Spath and Schmahl's instruments were widespread.⁷⁰ An Italian source of 1795 notes that the piano had been 'relatively unknown until, due to market demand, it became widespread in the whole of Europe through the instruments of the makers in London, Paris, and those of Regensburg and many others. In this way, during a twelve to fifteen year period, the piano came into common usage'.⁷¹ The imports of Bavarian *Tangentenflügel* must have encouraged some Italian makers, such as Baldassare Pastore of Milan, to construct similar instruments.⁷²

Besides the instruments of Spath and of Schmahl as well as their followers in Italy, there appears to have been another stream of makers of instruments with tangent actions. During the eighteenth century it appears to have been common practice in Italy to convert harpsichords to pianos by substituting vertical hammers for the jacks. To make a piano in this way it was sufficient to replace the jacks of the harpsichord with vertically moving non-pivoting hammers, and to move the jack slides in such a way that these hammers would stand below the strings ready to strike instead of between the strings ready to pluck them.

In the second half of the eighteenth century, one of the makers who appears to have made pianos with a tangent action was the Neapolitan priest and organ builder Donato Del Piano, active in Sicily between

1720 and 1785. A 'cembalo a piano e forte' by Del Piano was sent as a gift to the Queen of Naples some time before 1774.⁷³ This is the first known mention of such an instrument in Naples before the purchase by the court of Naples of a Stein piano and an English piano in the early 1780s.⁷⁴ Over a period of sixty years, Del Piano built a large number of organs in several towns of Sicily and Malta. The instrument for the Benedictine church of Catania with its five keyboards, 2368 pipes and 72 stops allowed three performers to play at the same time. It became one of the principal tourist attractions of the town and fascinated many contemporary writers and travellers including the Frenchman Dominique Vivant Denon whose travel diary *Voyage en Sicile*, compiled in 1778, included a description of the organ. In the same diary Denon also described a piano by Del Piano:

This ingenious priest invented harpsichords that do him honour; amongst others there is one in which the jacks hit the strings with so much vivacity as to produce a strong and brilliant sound like the plucking of the plectra but without being strident, and they allow the musician the possibility to play *forte* or *piano*, using greater or less force on the key. This harpsichord has several stops, in particular the imitation of the harp is perfect; [...]. A no less accomplished invention is that of lowering, raising or changing the pitch so that the singer is not forced to sing in the written tonality.⁷⁵

⁶⁹ John A. Rice, 'Stein's "Favorite Instrument": a Vis-à-vis Piano-Harpsichord in Naples', *Journal of the American Musical Instrument Society* XXI (1995), pp. 32-34. Rice notes that Norbert Hadrava imported Stein's instruments into Italy.

⁷⁰ The instruments made by both Stein and Spath and Schmahl must have been well-known in Italy since a high percentage of the instruments made by these makers have been found in the country. *Tangentenflügel* found in Italy include the ones in the Shrine to Music Museum of Vermillion, in a private Italian collection, in the Gemeentemuseum of The Hague, in the Technisches Museum of Vienna, in an English private collection and maybe the one in a private American collection. Other anonymous *Tangentenflügel* probably of German origin are documented in Italian collections. Of the instruments made by Stein, those in Ringve, in private ownership in Boston and the one in the Bayerisches Nationalmuseum (besides the two *vis-à-vis* instruments) were all originally exported to Italy. This is five of the existing sixteen Stein.

⁷¹ Mario Fabbri, 'L'alba del pianoforte: verità storica sulla nascita del primo cembalo a martelletti', in *Dal clavicembalo al pianoforte*, ed. Federico Mompellio (Milano: Nuove Edizioni di Milano, 1968), p. 21.

⁷² A *Tangentenflügel* by Pastore, dated 1799, is described below.

⁷³ Domenico Sestini, *Lettere del signor abate Domenico Sestini scritte dalla Sicilia e dalla Turchia a diversi suoi amici in Toscana*, vol. I (Firenze: Gaetano Cambiagi, 1779), p. 64. See also Giovanni Paolo Di Stefano, 'I «clavicembali singolari» di Donato Del Piano. Fonti documentarie e contesto storico', in *Donato Del Piano e l'organo di S. Nicolò l'Arena di Catania*, ed. Luciano Buono (Catania, forthcoming).

⁷⁴ The purchase of these foreign instruments was mentioned in a letter written on 27 September 1785 by Norbert Hadrava, the secretary of the Austrian ambassador in Naples. Giuliana Gialdrone, 'La musica a Napoli alla fine del XVIII secolo nelle lettere di Norbert Hadrava', *Fonti musicali italiane* I (1996), p. 96.

⁷⁵ 'Cet ingénieux prêtre a fait des clavecins qui ne lui sont pas moins d'honneur; l'un, entre autres, dont les sautereaux viennent marteler la corde avec tant de vivacité, qu'ils lui sont rendre un son aussi fort, aussi brillant, que le pincement de plume, sans en avoir le glapisement, et laissent au musicien la facilité du forte ou piano, par le plus ou moins de

Denon's description found its way into other publications prior to 1788, used without acknowledgement by other authors. The earliest of these appears to have been Jean Benjamin de la Borde who inserted Denon's description, with some minor changes, into his *Essai sur la Musique Ancienne et Moderne* published in Paris in 1780.⁷⁶ Further details about the pianos made by Del Piano are contained in the travel diary of another French writer, Jean Marie Roland de la Platière, who was in Catania a year earlier than Denon, in 1777. Roland got to know Del Piano personally and heard one of his pianos with four stops:

On a *Forte-piano*, of his invention, with four stops, without any action save that of the spirit visible on his countenance, he played the harp with all the delicateness of the most agile fingers: it could have been sworn that it was a harp. He had started with the harpsichord stop; I have never heard it played with such lightness. And then he changed to the organ; it was exactly like a wind instrument: it had absolutely nothing of the raucous sound of a metal string vibrating. The *Forte-piano* was uncovered; I looked at it from above: I saw the movement of all the strings, the illusion was just more perfect. There are not quills; there are only small hammers covered with leather. He ended with the dulcimer: suddenly the sounds of this instrument were easily audible. We asked him, in out naivetè, how much

time he had required to prepare an instrument like this; *it depends on the inspiration*, he replied: *it is not a problem of labour; but of here*, he added, touching his head. In my whole life I have never listened to an instrument that gave me such pleasure; in my whole life I have never seen such an inspired expression on the face of a mere mortal: it was such that, according to the abbot Winkelman [sic], it characterizes the divinity; this wholeness of faith, without violent expression, without anything excessive in its movements. He thanked us, and greeted us, and returned inside the church with the same candour as when he came out.⁷⁷

From these accounts it seems that the pianos of Del Piano reproduced, for example in the choice of stops, some characteristics of instruments from the German school of makers. However, until now there has been no documentation of any instrument by Del Piano. Denon's description of percussive jacks makes it probable that he was discussing pianos with a tangent action, Roland's description makes clear that they were leathered. This hypothesis is strengthened by the fact that in eastern Sicily, a good number of locally made instruments exist that belong to this category.

In Sicily, the construction of pianos with a tangent action, often without dampers, continued until 1850 while in Germany the production of pianos with such an action stopped at the beginning of the nineteenth

⁷⁵ (continued) force à battre sur la touche. Ce clavecin est susceptible de plusieurs jeux, et particulièrement de celui de la harpe qui est parfait; il a encore l'avantage, en fatiguant moins la corde, de ne lui faire presque jamais perdre son accord. Une invention non moins heureuse, c'est, par l'augmentation ou la soustraction d'une hausse, c'est, par baisser ou hausser le ton de tout le diapason à la fois, et ôter ainsi l'inconvénient qu'a cet instrument de contraindre les voix à chanter à son ton'. Dominique Vivant Denon, *Voyage en Sicile* (Paris: Didot L'Ainé, 1788), pp. 30-31.

⁷⁶ Jean Benjamin de la Borde, *Essai sur la Musique Ancienne et Moderne*, 4 vols, vol. I (Paris, Imprimerie de Ph. D. Pierres, 1780), p. 351. I thank Michael Latham for having brought this text to my attention. The same text appeared in the *Arts et Métiers Mécaniques* of the *Encyclopédie Méthodique* in the section 'Clavecins singuliers'. 'Instrumens de musique, et lutherie (Art du faiseur d')', in *Encyclopédie Méthodique. Arts et Métiers Mécaniques*, vol. IV (Paris: Panckoucke, 1785), p. 10. Denon's description, as it appeared in the *Encyclopédie Méthodique*, was subsequently taken up again in 1865 by Julien Turgan in his work *Les Grandes Usines*. Julien Turgan, 'La manufacture de pianos de MM. Pleyel, Wolf et Cie', in *Les Grandes Usines. Études industrielles en France et à l'étranger*, vol. II (Paris: Michel Lévy Frères, 1865), p. 283; and also in Harding, *The Pianoforte*. p. 50.

⁷⁷ 'Sur un *Forte-piano*, de son invention, à quatre registres, sans autre action que celle de l'ame peinte sue le visage, il a joué de la harpe avec toute la délicatesse des doigts les plus exercés: on avroit juré que c'en étoit une. Il avoit préludé de clavessin; je n'en ai jamais entendu jouer avec cette légèreté. Il a passé ensuite à l'orgue; c'étoit tout entier l'instrument à vent; j'avois le nez desus: je voyois le mouvement de toutes les cordes, l'illusion n'en étoit que plus parfaite. Il n'y a point de plumes; ce ne sont que de petits marteaux recouverts en peau. Il a terminé par le tympanon: tout-à-coup les sons, vraiment ceux de cet instrument, se sont fait entendre. On lui a demandé bêtement combien de temps il étoit à composer un semblable instrument; *suivant que le génie sert*, a-t-il répondu: *ce n'est pas l'affaire des bras; mais delà*, a-t-il ajouté, en montrant sa tête. De la vie le son d'aucun instrument ne ma jeté dans pareil ravissement; de la vie je n'ai vu sur le visage d'un mortel, un air également inspiré: c'é toit celui qui, selon l'abbé Winkelman, catactérise la Divinité; cette plénitude de soi, sans rien d'outré dans les mouvements. Il nous a remercié, salué. & est retourné à l'Eglise avec la même candeur qu'il en étoit sorti'. Jean Marie Roland de la Platière, *Lettres écrites de Suisse, d'Italie, de Sicile et de Malthe*, vol. III (Amsterdam, 1780), pp. 188-190.

century. This is an interesting case of conservatism, perhaps due to the geographic position of Sicily, a country in many senses isolated, thus allowing the continuation of traditions which had long since ceased elsewhere. Along with the production of pianos in the style of Érard or of other famous makers of the time, the nineteenth century saw a continued construction of square instruments with small-ranged keyboards, sometimes only of five octaves, with a non-pivoting hammer action and no dampers. Just like the Swedish clavichords of the nineteenth century, this tardy production of square pianos with a tangent action seems to be linked to organ builders and organists: they were probably cheap instruments for the organists' daily musical practise. The fact that the range of the keyboard would not have allowed the performance of much contemporary piano repertoire suggests that these pianos were also used domestically for the accompaniment of singing, perhaps even religious, or for dance music.

A SURVEY OF EXTANT INSTRUMENTS

The following section comprises a description of pianos with a tangent action, including the *Tangentenflügel* of Spath and Schmahl, kept in public and private collections in Europe, the United States of America and Japan. The instruments have been catalogued according to the area of origin, the makers and the period in which they have been made.

SPATH AND SCHMAHL'S TANGENTENFLÜGEL

A list of the *Tangentenflügel* by Spath and Schmahl, known to the author, is given in Table 3. Many *Tangentenflügel* by these makers are dated after 1786 and were therefore made after Spath's death

by Schmahl alone. Each instrument has been given a reference code: 'S&S' for the *Tangentenflügel* apparently made before Spath's death and 'Sch' for the ones made by Schmahl after 1786. The list includes just the *Tangentenflügel* signed by Spath and Schmahl or that can be attributed to these makers with certainty. The organ-square attributed to Schmahl that is preserved at the Bachhaus in Eisenach (inv. no. 192) has not been included in this list since it can not be considered a real *Tangentenflügel*.⁷⁸

Inscriptions

Spath and Schmahl's *Tangentenflügel* usually bear a handwritten signature on the left side of the soundboard, near the wrestplank, along the spine. Although Spath died in 1786, Schmahl maintained the firm's name on his clavichords and pianos for some years, until about 1793, when he began to use only his own name. Some instruments of before this date were, however, also signed by Schmahl alone.⁷⁹

Construction

After about 1790, Schmahl produced *Tangentenflügel* of two different sizes: a long type (about 220-230 cm) and a short type (about 190 cm). In the short model the scale is about 30 cm shorter in the bass so that the strings have to be thicker. In many of Schmahl's short *Tangentenflügel* the first few choirs have or had the right-hand string of each choir of brass covered with a close winding of brass while the left-hand string was of iron and could have been tuned to 4-foot pitch, probably to give more brightness to the bass.⁸⁰

All Spath and Schmahl's *Tangentenflügel* have a gap spacer between the wrestplank and the bellyrail to counter the tension of the strings. Above the gap spacer, between the notes c1 and c#1, the makers placed a dummy choir of strings.⁸¹

⁷⁸ About this instrument see Wolfgang Wenke, 'Tafelklaviere in der Restaurierungswerkstatt – Vielfalt der Typen und Probleme', in *Geschichte und Bauweise des Tafelklaviers*, pp. 325-340. Other anonymous instruments usually attributed to Spath and Schmahl, for instance Clinkscale's no. 2 and no. 7, were not made by these makers. Martha Novak Clinkscale, *Makers of the Piano 1700-1820* (Oxford: University Press, 1993), pp. 271-272.

⁷⁹ The 1793 *Tangentenflügel* in the Musikinstrumenten Museum of Berlin is the only one made after 1791 that is signed 'Späth & Schmahl'. None of the harpsichords built in Regensburg by Spath and Schmahl is known. Clavichords made by Schmahl after Spath's death are preserved in the Fritz Neumeyer Collection of Bad Kronzingen (1787), Museum Carolino Augusteum of Salzburg (1794), Städtisches Museum of Regensburg (1794). In 1802 Schmahl's elder son, Jakob Friedrich, became a business partner of his father. A clavichord signed 'C. Friedrich Schmahl und Söhne in Regensburg 1812' is kept in the Musikinstrumenten Museum of Berlin. In 1812 Jakob Friedrich formed, with his brother Christian Carl, the 'Gebrüder Schmahl'. A clavichord signed 'Gebrüder Schmahl in Regensburg' c. 1815 is preserved in the Deutsches Museum of Munich; a 1814 piano with *Prellmechanick* signed 'C. Fried. Schmahls Söhne' is kept at the Germanisches Nationalmuseum of Nurnberg.

⁸⁰ Such short grand pianos may have been made also by Stein who wrote in his own notebook a stringing scheme for a *Forte Piano* petit with overspun strings in the bass. Latcham, 'Mozart and the pianos of Johann Andreas Stein', *The Galpin Society Journal* LI (1998), pp. 120-121.

Table 3. A list of surviving <i>Tangentenflügel</i> by Spath and Schmahl.			
Code	Location	Date	Inscription
S&S1780c.	Württembergisches Landesmuseum, Stuttgart (inv. no. 9.315)	c.1780	–
S&S1785c./a	Private Collection, USA [former owner: Sheridan Germann, Boston]	c.1785	–
S&S1785c./b	Shrine to Music Museum, Vermillion (inv. no. NMM4145)	c.1785	Spath e Schmahl, Regensburg 178[?]
Sch1790c./a	Händel-Haus, Halle (inv. no. MS-30)	c.1790	J. Späth u. Schmahl Regensburg [no longer legible]
Sch1790c./b	Universitäts Musikwissenschaftliches Seminar Erlangen (inv. no. 9)	c.1790	–
Sch1790c./c	Technisches Museum, Vienna (inv. no. 39318)	c.1790	C. Fr. Schmahl Regensburg
Sch1790c./d	Bachhaus Eisenach (inv. no. 183)	c.1790	–
Sch1790/a	Private Collection, Italy	1790	Späth e Schmahl Regensburg 1790
Sch1790/b	Musikinstrumenten-Museum, Leipzig (inv. no. 211)	1790	Späth & Schmahl Regensburg 1790
Sch1791	Gemeentemuseum, The Hague (inv. no. 991-0011)	1791	C. Fr. Schmahl Ratisbone 1791
Sch1793	Musikinstrumenten Museum, Berlin (inv. no. 3400)	1793	Späth & Schmahl Regensburg 1793
Sch1794/a	Germanisches Nationalmuseum, Nuremberg (inv. n. MINe 98)	1794	C. Friedr. Schmahl [Regensburg] 1794
Sch1794/b	Private Collection, Weikertshofen [lost?]	1794	C. Friedr. Schmahl Regensburg 1794
Sch1797/a	Private Collection, England	1797	C. Friedr. Schmahl Ratisbona 1797
Sch1797/b	Private Collection, Switzerland	1797	C. Friedr. Schmahl Regensburg 1797
Sch1798	Kunsthistorisches Museum, Vienna (inv. no. SAM 818)	1798	C. Friedr. Schmahl Regensburg 1798
Sch1800	Deutsches Museum, Munich (inv. no. 1908-16812)	1800	C. Fredr. Schmahl Regensburg 1800
Sch1801	Sammlung Fritz Neumeyer, Bad Kronzingen	1801	C. Friedr. Schmahl Regensburg 1801
Sch1802	Sibelius Museet, Turku (inv. no. SIB. MUS. N. 100)	1802	C. [?] Friedr. Schmahl, Regensburg 1802 [no longer legible]

Spath and Schmahl's instruments have a distinctive internal construction. There is an inner frame across the bottom of the instrument. Fixed to the upper side of this inner frame are vertical blocks that support the curved bentside liner. Diagonal bottom braces are mortised to the frame. Between these braces there are struts from the upper edge of the inner bentside to the bottom of the frame along the spine. Spath's structure, with little changes in the distribution of the internal struts that connect the

bellyrail to the bentside, was used by Schmahl for all his pianos.⁸² A *Tangentenflügel* of the short type made by Schmahl in 1797, and a detail of covered and 4' pitch strings, are shown in the colour section.

The exterior of the Spath & Schmahl *Tangentenflügel* is usually veneered in walnut. Some of the long-type instruments have richly decorated case sides with geometrical inlays in various woods, bone (Sch1790/a, Sch1793), brass (S&S1785c./a). The short ones have less elaborate veneers and inlays

⁸¹ The *Tangentenflügel* made before 1797 have a wooden gap spacer (S&S1780c., S&S1785c., S&S1790c./a, Sch1790c./b, Sch1790c./c, Sch1790/a, Sch1791, Sch1797/a) but from that date Schmahl always used an iron gap spacer (Sch1797/b, Sch1800, Sch1801, Sch1802).

⁸² As Latcham notes, a similar construction, with a continuously curved bentside liner mounted on blocks, was also used by Stein, who worked as a journeyman with Spath, and by Stein's pupil Johann David Schiedmayer. Stein's *claviorganum* in Gothenburg have such a construction. Latcham, 'Mozart and the Pianos of Johann Andreas Stein', p. 148. See also William Jurgenson, 'The importance of the *Tangentenflügel* to the Development of the German Piano', in *Instruments à claviers – expressivité et flexibilité sonore. Actes des Recontres Internationales harmoniques, Lausanne 2002*, ed. Thomas Steiner (Bern: Peter Lang, 2004), pp. 55-61:55-56.

only on the nameboard, on the keyboard end-blocks and brackets.

Stringing

All Spath and Schmahl's *Tangentenflügel* have two strings for each choir throughout the compass. Several of them have retained their original gauge marks (S&S1785c./a, S&S1785c./b, Sch1790c./c, Sch1790/a, Sch1791, Sch1793, Sch1794/a, Sch1797/b, Sch1800, Sch1802). These are written next to the tuning pins of each corresponding choir. Table 5 provides a comparison of the strings length of some of the existing *Tangentenflügel*:

Keyboard and action

The keyboards usually have ebony naturals, carved fronts of hardwood stained black and sharps of stained wood covered with bone. Some short instruments also have less costly keyboards with the natural rear key-tops of stained black fruitwood instead of ebony (Sch1794/a, Sch1797/a, Sch1797/b, Sch1800, Sch1801).

As noted above, all Spath and Schmahl's *Tangentenflügel* appear originally to have had bare hardwood hammers (usually pearwood). Some *Tangentenflügel* (S&S1785c./a, Sch1794/a) originally had bare hammers that were later covered in leather. These are about 90 mm high, 7 mm wide and 3-5 mm thick. They taper towards the treble where they are lightened by two vertical slots. The hard wood and lesser mass of these hammers reduce the risk of rebounds caused by the lack of an escapement mechanism.

The lower part of Spath and Schmahl's non-pivoting hammers is always leathered, probably to

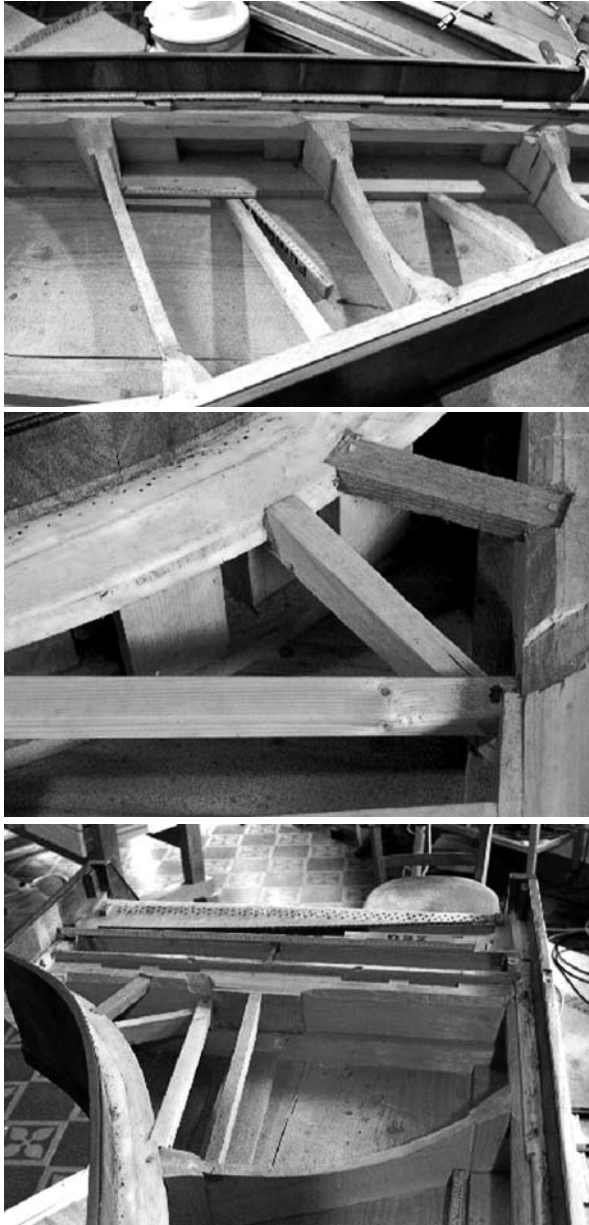
Table 4. Comparison of some features of Spath and Schmahl's *Tangentenflügel* (mm).

Code	Total length	c2	Stichmaß	Compass	Back-pinning at the bridge
S&S1785c./a	2278	305	476	FF-f3	FF-g#1
S&S1785c./b	2205	307	476	FF-f3	FF-g#1
Sch1790c./a	2185	300	478	FF-f3	FF-g#1
Sch1790c./b	2214	303	476	FF-f3	FF-g#1
Sch1790c./c	1910	307	474	FF-f3	FF-g#1
Sch1790c./d	2240	-	477	FF-f3	FF-g#1
Sch1790/a	2209	290	476	FF-f3	FF-g#1
Sch1790/b	1873	271	474	FF-f3	FF-g#1
Sch1791	1888	284	474	FF-f3	FF-g#1
Sch1793	2220	306	477	FF-f3	FF-g#1
Sch1794/a	1819	292	474	FF-f3	FF-g#1
Sch1797/a	1885	286	475	FF-f3	FF-g#1
Sch1797/b	1897	281	474	FF-f3	FF-g#1
Sch1798	1906	287	479	FF-f3	FF-g#1
Sch1800	1904	285	474	FF-f3	FF-f3
Sch1801	1990	280	474	FF-f3	FF-f3
Sch1802	2229	267	472	FF-a3	FF-a3

diminish both their friction and rebound with the intermediate levers. The latter are oriented towards the player and hinged to the back rail of the key frame. Each lever has a rectangular opening through which the leg of the damper jack passes. This makes it necessary to extract all the dampers from their

Table 5. Comparison of the strings length of Spath and Schmahl's *Tangentenflügel* (mm).

Code	FF	C	F	C	f	c1	f1	c2	f2	c3	f3
S&S1785c./a	1797	1613	1414	1160	911	632	449	305	234	160	116
S&S1785c./b	1742	1576	1364	1049	839	606	445	307	232	159	121
Sch1790c./a	1763	1559	1344	1051	847	587	432	300	227	150	111
Sch1790c./b	1758	1586	1371	1064	850	601	441	303	231	157	115
Sch1790c./c	1464	1331	1174	949	789	585	434	307	238	165	121
Sch1790/a	1745	1556	1329	1019	806	421	449	290	221	154	119
Sch1791	1427	1261	1112	904	754	553	408	284	214	149	112
Sch1793	1780	1570	1375	1025	875	615	448	306	227	152	112
Sch1794/a	1450	1299	1084	906	745	546	400	292	225	155	111
Sch1797/a	1426	1287	1126	904	749	542	407	286	219	151	114
Sch1797/b	1477	1310	1146	925	762	550	402	281	217	147	114
Sch1800	1439	1364	1163	930	768	560	410	285	219	149	107
Sch1802	1758	1515	1293	995	795	539	390	267	204	136	101



Figures 11, 12 and 13. *The internal construction of a Tangentenflügel by Schmahl dated 1797.* (Photos by Mirko Weiss).

guides before removing the key frame. Until 1797, Schmahl used two different types of intermediate levers for bass and treble. The first one (FF-c1) has a rectangular hole in the middle, the second a gap to the left-hand side. The use of two different types of intermediate levers is due to the position of the dampers. In the bass section (FF-c1), the wedge dampers run between the unisons and cross the levers in the middle. The flat headed dampers for the treble (c#1-f3) run to the left-hand of each choir and thus cross the levers to their left-hand. Nonetheless, from 1797 (Sch1797/b), Schmahl used wedge shaped

dampers positioned to the left-hand of the unisons and intermediate levers of the second type. These late dampers become gradually wider in the bass to muffle the heavier strings.

Mutation stops

There are four basic stops used by Spath and Schmahl for their instruments: damper-lifting device, *una corda*, moderator and harp stop. The *una corda* and the sustaining device are usually operated using knee levers while the others are engaged by hand levers placed by the sides of the wrestplank. The knobs for the hand levers project through the nameboard (S&S1780c. and S&S1785c./a) or over its uppermost edge as can generally be seen in all the instruments made after 1785.

Spath and Schmahl's damper-lifting mechanism has dog legged dampers that rest on a movable leathered strip of wood hinged to the back rail of the key frame. This strip of wood lifts all the dampers at once when raised in the middle by a lever that is hinged to the bottom of the balance rail. It is pulled from below by an iron linking lever positioned in the baseboard of the keywell and operated by the right-hand knee lever.⁸³ In several *Tangentenflügel*, Spath and Schmahl split this strip into two pieces (FF-c1, c#1-f3). This allowed the player to raise just the treble dampers section of the wooden strip by means of a knob placed on the right-hand side end block of the keyboard. The *Tangentenflügel* provided with this stop are shown in Table 6.

The *una corda* stop shifts the hammer guide a few millimetres to the right so that they strike only one string of each choir of two while the keyboard is fixed in a stationary position. This mechanism is different by the ordinary *una corda* device for pianos with pivoting hammers in which keyboard is shifted laterally.

All the *Tangentenflügel* have a moderator with leather tabs that is usually operated by a knob on the right-hand side of the wrestplank. However, some *Tangentenflügel*, especially the ones made after 1797, have a knee lever to operate the moderator. This knee lever is placed to the right of the other two for the *una corda* and sustaining device (Sch1790/a, Sch1797/b, Sch1798, Sch1800, Sch1801, Sch1802). The addition of this knee lever gave players the possibility of changing the timbre of the instrument while playing without removing the hands from the keyboard.

The harp stop of Spath and Schmahl's *Tangentenflügel* is a fringe of cloth that presses against the strings from below near the nut muffling

⁸³ In Cristofori and Silbermann's pianos this wooden element is not hinged to the back rail of the key frame.

Table 6. Stops in the existing <i>Tangentenflügel</i> by Spath & Schmahl.				
Code	Number of stops	Stop descriptions	Knee levers	Hand levers
S&S1780c.	5	damper-lifting device, una corda, harp stop, moderator, treble damper-lifting device	1	4
S&S1785c./b	4	damper-lifting device, una corda, harp stop, moderator	2	2
Sch1790c./a	4	damper-lifting device, una corda, bass harp stop, treble harp stop	2	2
Sch1790c./b	4	damper-lifting device, una corda, harp stop, moderator	2	2
Sch1790c./c Sch1790c./d	5	damper-lifting device, una corda, harp stop, moderator, treble damper-lifting device	2	3
Sch1790/a	5	damper-lifting device, una corda, moderator, bass harp stop, treble harp stop, treble damper-lifting device	3	3
Sch1790/b Sch1791 Sch1793	5	damper-lifting device, una corda, harp stop, moderator, treble damper-lifting device	2	3
Sch1794/a	4	damper-lifting device, una corda, harp stop, moderator	2	2
Sch1794/b	5	damper-lifting device, una corda, moderator, bass harp stop, treble harp stop	3	2
Sch1797/a	5	damper-lifting device, una corda, moderator, bass harp stop, treble harp stop	2	3
Sch1797/b Sch1798 Sch1800 Sch1801 Sch1802	6	damper-lifting device, una corda, moderator, bass harp stop, treble harp stop, treble damper-lifting device	3	3

Table 6 should be interpreted as follows. One knee lever: damper-lifting device; two knee levers: una corda (left), damper-lifting device (right); three knee levers: a couple of two in the middle for una corda (left) and damper-lifting device (right) and one for the moderator placed to the right of the couple of two. Two hand levers (always on the wrestplank): harp stop (left) and moderator (right); three hand levers: two on the wrestplank, for the bass harp stop (left) and treble harp stop (right), and one on the right-hand side end block of the keyboard for the treble damper-lifting device; four hand levers: two on the wrestplank, for the harp stop (left) and moderator (right), and two above the keyboard for the una corda (left) and treble damper-lifting device (right).

the higher partials and giving a *pizzicato* effect.⁸⁴ Schmahl also made instruments with separate harp stop hand levers for the bass (FF-c1) and treble (c#1-f3) section (Sch1790c./a, Sch1790/a, Sch1797/b, Sch1798, Sch1800, Sch1801, Sch1802). In these pianos there are two knobs at the sides of the wrestplank. Table 6 below lists the stops in the existing *Tangentenflügel* by Spath and Schmahl studied until now. Figure 14 in the colour section shows the knee levers and hand levers in Schmahl's *Tangentenflügel* after 1797.

GERMAN AND AUSTRIAN TANGENTENFLÜGEL AND PIANOS WITH A TANGENT ACTION
In public and private collections there are various

German pianos with a tangent action that are not traceable to the workshop of Spath and Schmahl. Some of these instruments are similar to the *Tangentenflügel* of Regensburg and were probably made by makers who knew the instruments of Spath and Schmahl or worked with them. They are listed in Table 7.

The *Tangentenflügel* of Berner of 1796 and 1798 are easily distinguishable from the ones of Regensburg: they have a different form of the bentside and tail, with a square-ended case, a divided bridge (FF-G, G#-f3) and ivory white keyboards.⁸⁵ But their action, with intermediate levers oriented towards the player and hinged to the back rail of the key frame, non-

⁸⁴ In some southern German pianos this fringe presses the strings from above.

⁸⁵ A picture of the 1796 *Tangentenflügel* of Berner was published in Wilhelm Stauder, *Alte Musikinstrumente*

Table 7. <i>A list of surviving German and Austrian pianos with a tangent action.</i>				
Type	Maker	Origin	Date	Present Location
Combined Harpsichord- <i>Tangentenflügel</i>	C. G. Sauer	Dresden	1786	Drammens Museum, Austad Gård, Norway (inv. no. 2001)
Grand (<i>Tangentenflügel</i> type)	J. W. Berner	Hamburg	1796	Private Collection, Germany
Grand (<i>Tangentenflügel</i> type)	J. W. Berner	Hamburg	1798	Musikhistorisk Museum & The Carl Claudius Collection, Copenhagen (inv. no. A 21)
Grand (<i>Tangentenflügel</i> type)	unsigned (school of S&S)	southern Germany	c.1790	Musikwissenschaftlichen Instituts der Universität zu Köln (inv. no. MWI D 12)
Grand (<i>Tangentenflügel</i> type)	unsigned (school of S&S)	southern Germany	c.1790	National Museum, Helsinki (inv. no. NM 41001: 982)
Grand (<i>Tangentenflügel</i> type)	unsigned (school of S&S)	southern Germany	c.1790	University of Michigan Ann Arbor (inv. no. 1344)
Grand (<i>Tangentenflügel</i> type)	unsigned	southern Germany	c.1790	Musik Museum, Basel (inv. no. 1956.556)
Grand (<i>Tangentenflügel</i> type)	unsigned	southern Germany		Historisches Museum der Stadt Regensburg
Grand (<i>Tangentenflügel</i> type)	unsigned	southern Germany	c.1800	Germanisches National Museum, Nuremberg (inv. no. MIR 1094)
Grand	unsigned	Southern Germany	c.1800	Private Collection, Italy
Grand (<i>Tangentenflügel</i> type)	F. Münzeberger	Vienna	c.1800	Ueno Gakuen Collection, Tokyo (inv. no. 55)
Upright grand	J. Hipp	Innsbruck	c.1800	Germanisches National Museum Nuremberg (inv. no. MIR 1095)

pivoting hammers and four stop devices (damper-lifting device, *una corda*, moderator and harp stop operated by three knee levers and one hand lever) are very similar to the ones in the instruments of Spath and Schmahl. Presumably the leather of the hammers in the 1798 Berner piano was a later addition. Like Schmahl's *Tangentenflügel*, the damper-lifting device, *una corda* and moderator are operated by three knee levers. A hand lever, on the left-hand side of the wrestplank, moves the harp stop fringe under the strings.

Another German piano with a tangent action, from about the beginning of the nineteenth century, is to be found at the Germanisches Nationalmuseum of Nuremberg (MIR 1094).⁸⁶ Like Berner's instruments, this one has a square-ended case and a divided bridge (FF-G, G#-f3) but triple stringing in the treble (a1-f3). The case has walnut veneers with geometric

and floral inlays. Like some Regensburg instruments, this one has two knee levers (damper-lifting device, *una corda*) and two hand levers (moderator and harp stop). Its perpendicular non-pivoting hammers, now leathered, may originally have had no covering. Also an instrument by Franz Münzenberger of Vienna, preserved in the Ueno Gakuen Collection of Tokyo, has a square-ended case like the pianos described above and an action that is very similar to the examples from Regensburg. Furthermore, Münzenberger's piano has two knee levers (damper-lifting device, *una corda*) and traces of two missing hand levers (possibly moderator and harp stop) like Spath and Schmahl's *Tangentenflügel*.⁸⁷

The tangent action was occasionally also used for upright pianos. This is the case with an instrument, made by Joseph Hipp of Innsbruck, that is kept at the Germanisches Nationalmuseum of Nuremberg

⁸⁵ (continued) (Braunschweig: Klinkhardt & Biermann, 1973), p. 285. The 1798 *Tangentenflügel* of the Musikhistorisk Museum of Copenhagen was described by Herrmann, *Die Regensburger Klavierbauer...*, pp. 74-75. The inscription on the soundboard says: 'Joh. Wih. Berner/ Hamburg A. 1798/ N. 182'. My thanks to Lisbet Torp for allowing me to examine this piano.

⁸⁶ My thanks to Frank Bär and Klaus Martius for allowing me to examine this piano.

⁸⁷ Funayama, Uchino and Honma, *Catalogue of the European musical instruments*, pp. 104-114, 219 (photo).



Figure 15. *Upright grand piano Joseph Hipp, Innsbruck c.1800 (Germanisches Nationalmuseum, Nuremberg, inv. no. MIR 1095).*



Figure 16. *A perpendicular hammer of Hipp's Upright grand piano.*

(MIR 1095).⁸⁸ As with the horizontal pianos, the perpendicular hammers move inside a guide but here strike the strings from behind. Each hammer has a hook at the end. These hooks join the hammers to the L-shaped intermediate levers. The latter are pushed from below by wooden sticks that move in a guide like the jack guide of a harpsichord. When the key is pressed, the wooden stick pushes the intermediate lever upwards and this throws the hammer against the strings. On its return to rest the lever drags the hammer back.

ENGLISH INSTRUMENTS

Some surviving English pianos testify to a quite unknown tradition of making pianos with a tangent action that was possibly related to the German school of makers (see Table 8).

An interesting English square piano with a special type of tangent action was made in London in the 1790s by the German-born maker Frederick Beck. A very similar anonymous English square is preserved at the College of Music in Osaka (for the hammers of this instrument, see Figure 18 in the colour section).⁸⁹ Both these pianos have the appearance of an ordinary English square made in the late eighteenth century. The action is different from that of Spath and Schmahl and their pupils. Indeed, these English squares have intermediate levers that are pivoted at the rear of the key levers like in the action designed by Schröter. But here, there are two intermediate levers for each key, one for the hammer (left) and the other one for the

⁸⁸ Before the new attribution made in this article, this instrument had been catalogued as a work of Hepp of Amberg. Renate Huber, *Verzeichnis sämtlicher Musikinstrumente im Germanischen Nationalmuseum Nürnberg* (Wilhelmshaven: Florian Noetzel Verlag, 1989), p. 141. The upright grand piano of Joseph Hipp is the only instrument known of this maker. The printed paper label glued onto the baseboard of the keywell reads: 'Joseph Hipp/ Claviermacher in Innsbruck/ wohnhaft außer der Insbrücke/ Nro. 65'.

⁸⁹ The inscription on the nameboard of Beck's square reads: 'By the King's/ Patent/ No. 10 Broad Sreet Soho/ Friedericus Beck Londini Fecit'. Another handwritten inscription on the soundboard, near the bridge, states: 'A. F. Beck 1790. Patent'. Furthermore, a third inscription ('John Statman'), is found in ink on the guide of the hammers. Statman was probably one of Beck's journeymen. I am very grateful to Malcom Rose and Sabine Klaus for bringing this instrument to my attention and for providing me with some pictures of this piano. The square piano in Osaka was sold in 1992 by Sotheby's in London. A brief description of this piano was published in the catalogue of the auction. Sotheby's, *Musical Instruments* (London, Thursday 5th November – Thursday 26th November 1992), pp. 222-223. I thank Yoko Fujimoto for photos of this piano.

Type	Maker	Origin	Date	Present Location
Square	Frederick Beck	London	c.1790	Private Collection, England
Square	Frederick Beck [?]	London [?]	c.1790	Museum of the Osaka College of Music
Grand	unsigned	[?]	1798	Germanisches National Museum, Nuremberg (inv. no. MINe 1094)



Figure 17. A square piano by Frederick Beck, c. 1790 (Private Collection, England). Photo by Malcom Rose.

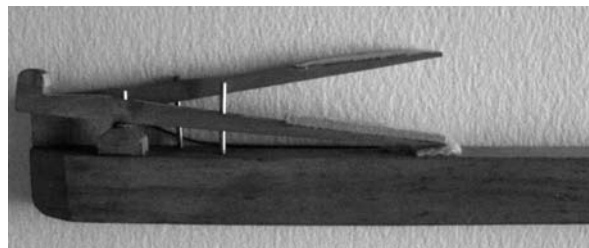


Figure 19. Intermediate levers of the square piano by Beck. Photo by Sabine Klaus.

damper (right), that are oriented towards the player. The levers are connected to the key by means of two metal pivot pins that are driven into it. When the key is stationary, the right-hand intermediate lever, held in place by means of a spring, holds the damper against the two unison strings from below. But as soon as the key is pressed, the other intermediate lever lifts the hammer while the damper lever goes down and moves the damper away from the strings. The hammers are not bare like several southern German instruments but covered with leather.

Both these English squares have soundboards which cover the entire surface of the case (excluding the wrestplank) instead of ending to the right of the keyboard as in ordinary eighteenth century

clavichords and square pianos.⁹⁰ The hammer guide is placed in a gap between the soundboard and the hitchpin plank. Similar to some southern German instruments, the piano in Osaka has a fringe of cloth fitted for the harp stop instead of a strip of leather for the buff stop, typical of the English squares.

ITALIAN INSTRUMENTS

The imports of Bavarian *Tangentenflügel* and of pianos with a tangent action must have encouraged several Italian makers to construct similar instruments. Some Italian pianos with a tangent action are described in Table 9.

Eighteenth century

A *Tangentenflügel* made in Milan in 1799 by the harpsichord maker Baldassare Pastore (It03) has all the characteristics of Spath and Schmahl's *Tangentenflügel*, demonstrating that Pastore must

Code	Type	Maker	Origin	Date	Present Location
It01	Grand	Unsigned	Catania	second half of the eighteenth century	Private Collection, France
It02	Grand	Unsigned	western Sicily	second half of the eighteenth century	Private Collection, Verona
It03	Grand (<i>Tangentenflügel</i> type)	Baldassare Pastore	Milan	1799	Private Collection, Milan

⁹⁰ This is also a characteristic of several southern German harp-shaped pianos. Sabine K. Klaus, 'German Square and Harp-Shaped Pianos with *Stoßmechanik* in American Collections: Distinguishing Characteristics of Regional Types in the Eighteenth and Early Nineteenth Centuries', *Journal of the American Musical Instrument Society* XXVII (2001), p. 123.

Table 10. A list of surviving Italian harpsichords converted to pianos with a tangent action.

Code	Type	Original maker	Origin	Conversion	Present Location
It04	Converted spinet	Franciscus Bonafinis	Venice [?]	[?]	Metropolitan Museum, New York
It05	Converted spinet	Unsigned	Sicily [?]	[?]	Private Collection, Palermo
It06	Converted harpsichord	Unsigned	Catania (Sicily)	[?]	Museo Belliniano, Catania (inv. no. 61571)
It07	Converted harpsichord	Unsigned	Southern Italy	[?]	Collegio Capizzi, Bronte, Catania
It08	Converted harpsichord	Unsigned	Southern Italy	Raffaele Polidoro	Private Collection, Italy
It08	Converted harpsichord	Unsigned	Southern Italy [?]	[?]	Beurmann Collection, Hamburg
It10	Converted folding harpsichord	Carlo Grimaldi	Messina (Sicily)	[?]	Museo Nazionale degli Strumenti Musicali, Rome

have been acquainted with the instruments of these makers (see Figure 20 in the colour section).⁹¹ Pastore's piano is more elaborately decorated than the Regensburg instruments with hunting scenes executed in inlays of ebony and other woods, and ivory. The instrument is of the long type (about 232 cm). As on Schmahl's instruments, one knee lever allows the player to disengage all the dampers and another allows the hammer guide to move laterally for the *una corda*. In addition, there are two hand levers on the wrestplank, one on the right to activate the moderator, and one on the left for the harp stop. On either side of the keyboard there are two hand-operated levers, one to disengage the dampers in the alto section, the other to disengage those in the tenor.⁹²

Some other Italian pianos with a tangent action (for example It01 and It02) appear to belong to a more or less independent Italian school. The differences of these pianos from those of the Regensburg school include, for instance, the fact that the Italian instruments have non-pivoting hammers covered by one or more layers of leather. These hammers do not rest on intermediate levers or the keys but hang

from the jack slide in which they move. Furthermore, the Italian instruments, if they have intermediate levers, have them facing away from the player, rather than towards the player. Other differences include the fact that the Italian instruments of this type usually were not furnished with dampers and did not always have the same type of stops that are seen in the *Tangentenflügel* of the Regensburg makers.

Several Italian (including It04-It10) harpsichords and spinets have been transformed into pianos with a tangent action. A list of instruments that met this fate is provided in Table 10.⁹³

Nineteenth century

As already discussed, the construction of pianos with non-pivoting hammers, often without a damper system, continued up until the end of the first half of the nineteenth century, as recorded in Table 11.

A piano with a triple-curved bentside and tangent action may be found at Catania's Museo Belliniano (It13). It appears to have been made in Vienna between about 1815 and 1830, perhaps around 1825. The keyboard has a compass of five and a half octaves (GG-c4), which is somewhat small compared with

⁹¹ Elena Ferrari Barassi, 'Un raro esemplare di fortepiano milanese (1799)', in *Restauro, Conservazione e Recupero di antichi strumenti musicali* (Firenze: Leo S. Olschki Editore, 1986), pp. 111-123. Photos of this instrument were published in Aldo James Gobbett, 'Fortepiano a tangenti (Tangentenflügel) Späth e Schmahl Regensburg 1790', in *Strumenti per Mozart*, ed. Marco Tiella and Romano Vettori (Rovereto: Longo Editore, 1991), p. 188.

⁹² These two levers are not usually found on Schmahl's instruments but there is one on the right of the keyboard for disengaging all the treble dampers.

⁹³ The piano kept at the Museo Belliniano in Catania (inv. no. 61571) was possibly constructed making use of the case of an Italian harpsichord of the 'false inner-outer' type. The piano in question was studied in the 1980s by John Henry van der Meer in 'A curious instrument with a five-octave compass', *Early Music* XIV/3 (1986), pp. 397-400. This article has also been commented on by Beryl Kenyon de Pascual, 'The five-octave compass in 18th century Spanish harpsichords', *Early Music* XV/1 (1987), pp. 74-75; and also in John Henry van der Meer, 'Observations', *Early Music* XV/1 (1987), p. 75. The harpsichord transformed into a piano in 1786 by Raffaele Polidoro was described in Marco Tiella 'Clavicembalo italiano anonimo (1680) trasformato in fortepiano', in *Strumenti per Mozart...*, pp. 139-143. The vertical hammers of the Grimaldi's folding harpsichord have been lost after a restoration that replaced the original plucking mechanism.

<i>Code</i>	<i>Type</i>	<i>Maker</i>	<i>Origin</i>	<i>Date</i>	<i>Present Location</i>
It11	Square	Unsigned	Sicily	c.1800	Private Collection, Palermo
It12	Square	Unsigned	Northern Italy	c.1820	'Ad Libitum' Collection, Etobon
It13	Grand	'M. R.'	Catania	c.1825	Museo Belliniano, Catania (inv. no. 61569)
It14	Square	Francesco Puglisi	Catania	1844	Private Collection, Messina
It15	Square	Unsigned	Ragusa	c.1845	Private Collection, Ragusa
It16	Square	Unsigned	Ragusa [?]	c.1845	Private Collection, England
It17	Square	Salvatore Cavaliere	Ragusa	1849	Private Collection, Agrigento
It18	Square	Salvatore Cavaliere	Ragusa	c.1850	Private Collection, Italy
It19	Square	Unsigned	Ragusa [?]	c.1850	Private Collection, Palermo



Figure 21. An anonymous Sicilian piano, second half of the eighteenth century (Private Collection, Verona).

the Viennese instruments of the period. The non-pivoting hammers have a thin layer of leather; there are no dampers and it appears that it was originally a harp stop. Some Italian square pianos made in Italy during the nineteenth century have non-pivoting hammers. Italian square instruments of this type, like English ones, usually have a soundboard which covers the entire surface of the case (excluding the wrestplank). A large (almost two metres long) anonymous northern Italian square piano with non-



Figure 22. Detail of the hammers.

pivoting hammers can be found in the 'Ad libitum' collection of Etobon (It12).⁹⁴ The hard wooden hammers are leathered. A pedal exists to activate the dampers, but they are now lost; the moderator and the fringe harp stop are controlled by two knee-levers. Most nineteenth century Italian square pianos with a tangent action (It14-19) are Sicilian instruments with the following characteristics:

- ◆ There is a harp-stop (instead of individual dampers) that consists of a fringe of cloth attached to a wooden frame. This fringe presses on the strings from above and muffles them. The harp stop is usually fastened to the spine of the instrument above the hitchpin plank.
- ◆ The soundboard covers the entire surface of the case. It is constructed like a box with a second table positioned above the keyboard area, which forms a case similar to that of a

⁹⁴ One special characteristic of this piano, which dates from about 1820, is the location of violin-style f-holes in the soundboard. The Italian origin of this piano is confirmed by inscriptions on the bottom and other places. In the position of the jack slide we find the Italian inscription 'cassetta de' salterelli' (box for the jacks). I thank Alain Roudier for allowing me to examine this piano.

Table 12. Comparison of Sicilian square pianos with a tangent action.

Maker	Compass	Number of notes	Number of strings	Stops	Hammers
unsigned	c/e-f3	38	Single e-c#1, double d1-f3	none	leathered
Puglisi	C-c4	61	single C-E, double F-c4	harp	leathered
unsigned	C-c4	61	single C-E, double F-c4	harp	leathered
unsigned	C-c4	61	-	-	leathered
Cavaliere	C-f4	66	single C-C#, double D-c4	harp	leathered
unsigned	C-c4	61	single C-F, double G-c4	harp	felt

dulcimer.

- ◆ The keyboard slides in and out of the keywell like a drawer. The compass is usually five or five and a half octaves.
- ◆ The non-pivoting hammers have little heads covered with one or more layers of leather or felt. They hang from their guide so that it is possible to remove the keyboard without extracting all the hammers from their guides.
- ◆ The intermediate levers face towards the internal part of the case and are hinged with parchment onto a wooden frame positioned above the keyboard.
- ◆ There are neither covered strings nor brass strings in the bass, but thick iron strings.

Some Sicilian square pianos with a tangent action were made in Ragusa, one of the southern-most Sicilian locations and the town that maintained this piano-making tradition for the longest period.⁹⁵ One of these instruments, kept in Palermo, must date from the 1850s. The hammers, which are larger in the bass and become progressively smaller towards the treble, are covered in felt. This instrument has a harp stop that is activated by a knee lever; an unusual characteristic for the mid-nineteenth century. This five-octave Sicilian piano is the last of this type so far documented in Europe. For Sicilian pianos see Tables 11-12 and Figure 23 in the colour section.

CONCLUSION

The presence of instruments with a tangent action can be traced throughout the whole eighteenth century and even later. Sometimes these instruments are primitive harpsichord-to-piano conversions and in other cases they are refined instruments made as pianos with a *Stoßmechanik* with non-pivoting vertical hammers. It would be best to consider all

these instruments to be members of the piano family rather than to call them hybrid instruments.

Apart from the first simple models of Marius around 1716, Schröter was probably the first to design a more sophisticated action with non-pivoting hammers propelled by intermediate levers; this was in the 1730s. Southern Germany was the main centre for the construction of this type of piano. The most notable of the type are the instruments known as *Tangentenflügel*, made by Spath and Schmahl and their followers.

Pianos with non-pivoting hammers and intermediate levers connected to the keys or hinged above them were possibly exported from Germany to other countries. The pianos of this type made in England and Italy during the eighteenth and nineteenth centuries might be traceable to the German tradition, but are probably not directly related to the school of Spath and Schmahl.

In Italy, the pianos with a tangent action were made until the mid-nineteenth century. But in the rest of Europe, this type of action was made only until the beginning of the nineteenth century. Then, the need for louder and more powerful instruments made it necessary to make pianos with thicker strings and heavier hammers covered with multiple layers of soft leather. These large soft-leathered hammers permitted a stronger blow and damped out the higher harmonics when played with more force. Generally speaking, pianos with large hammers need an escapement mechanism.⁹⁶ Thus, during the end of the eighteenth and the first decade of the nineteenth centuries, these important changes in piano manufacture determined the gradual extinction of the many variants of non-escapement pianos, with both pivoting and non-pivoting hammers, including the *Tangentenflügel* and all other pianos with similar actions.

⁹⁵ In this town Salvatore Cavaliere produced a large number of instruments of this type like the one of 1849 in a private Sicilian collection. The soundboard label on one surviving square reads 'Fabrica/ di/ Salvatore Cavaliere/ Ragusa 1849 Nr. 423'.

⁹⁶ Christopher Clarke, 'Fortepiano Hammers: a field report', in *Instruments à claviers – expressivité et flexibilité sonore*, pp. 229-237.

GIOVANNI PAOLO DI STEFANO

The *Tangentenflügel* and Other Pianos with Non-Pivoting Hammers

Figure 3. Different types of non-pivoting hammers. From the left: bare hammers (*Tangentenflügel* C. F. Schmahl, Regensburg 1791); leathered hammers (anonymous piano, Italy c. 1825); leathered hammers (square piano F. Puglisi, Catania 1849); felt hammers (anonymous square piano, Italy c. 1850).



Figure 7. *Tangentenflügel* by Johann Wilhelm Berner, Hamburg 1798 (The Danish Music Museum - Musikhistorisk Museum & The Carl Claudius Collection, Copenhagen, inv. no. MMCCS no. A 21).



Figure 9. A *Tangentenflügel* of the short type made by Schmahl in 1797 (Private Collection, Switzerland).



Figure 10. Covered and 4' pitch strings in the bass of a 1797 Schmahl piano (Private Collection, Switzerland).



Figure 18. Hammers and dampers of the anonymous square piano in Osaka (College of Music Collection, Osaka).



Figure 23. Anonymous Sicilian piano, 1850 c. (Private Collection, Palermo).



Figure 14. Arrangement of the knee levers and hand levers in Schmahl's Tangentenflügel after 1797 (Tangentenflügel C.F.Schmahl 1801, Sammlung Fritz Neumeyer, Bad Kronzingen).



Figure 20. Pastore's Tangentenflügel, Milan 1799 (Private Collection, Milan).