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The Invention and Evolution of the Wheatstone Concertina

The concertina, one of the very few musical instruments to be invented and developed in England, was created in the very early 1830s by Charles Wheatstone, and over the subsequent 170 years has become a highly iconic instrument throughout British and European social music and culture; its remarkable social mobility has led it from its initial adoption as a highly fashionable instrument of the upper and middle classes and concert performers of the early Victorian years; to the concertina bands and street musicians of the working classes of the 1880s and beyond; to the Music Hall performers, comedians, and traditional musicians of the early twentieth century; and now to the many enthusiasts, bands, collectors and soloists that adopted it during the 1960s folk revival, and in the ‘concertina revival’ of the 1970s onwards.¹

Many competing manufacturers arose during the mid-nineteenth century, and the introduction of many new fingering systems and many so called

‘improvements’ led to a wealth of instruments being sold under the name *Concertina*. In this article, the very earliest musical inventions of Charles Wheatstone are examined, and the European instruments that influenced him in his development of the Wheatstone ‘English’ concertina are discussed.

The years from the closing decade of the eighteenth century up to 1825 saw a profusion of new musical inventions in Europe involving the use of metal free reeds, which was said to stem from the appearance in Europe of examples of the Chinese free-reeded mouth organ or *sheng*, and also from modifications of plucked idiophones such as the Jews’ harp.² By 1825, several new mouth-blown free-reeded instruments were in production, such as the German *Mundharmonica*, its English variant called the *Æolina* or *Æolian* and (with the addition of hand-operated bellows), the *Accordion*, as patented in Austria by Demian in May 1829 (Figure 1).³

¹ Stuart Eydmann, ‘The Life and Times of the Concertina: the adoption and usage of a novel musical instrument with particular reference to Scotland’, Dissertation, (The Open University, 1995). Also cited at www.concertina.com/eydmann. Note that www.concertina.com is the main repository and portal for concertina information. The constant appearance, modification, and disappearance of web-based information sources and of the material they contain has led to the citing of websites being discouraged in academic publications. However, the majority of the research material and source documentation pertaining to the history of the concertina has for many years been best accessed via this website. It is administered by a team of researchers and contributors headed by the noted software engineer, author and collector, Dr Robert Gaskins, and is quoted with confidence as a principal source for much of the research cited here.

² J.Howarth, ‘Free-reed instruments’, in A.Baines (ed., for the Galpin Society), *The Penguin Book of Musical Instruments* (Harmondsworth, 1961).

³ Cyrill Demian; Patent no 1757, for the *Accordion*. Vienna, 6 May 1829.

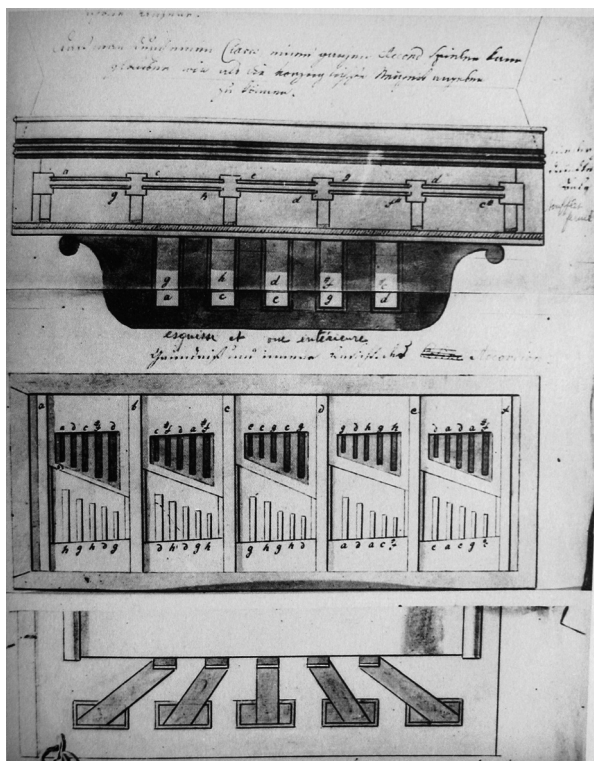


Figure 1. Cyrill Demian Patent no 1757, Vienna, 6 May 1829, for the 'Accordion'; illustrated in *L'Accordeon*, Pierre Monichon, Van de Velde/Payot Lausanne, 1985, pp 35, 36.

The young musical instrument manufacturer and academic Charles Wheatstone (1802–1875) was closely involved with these developments. Together with his brother William at their manufactory at 20, Conduit Street, London he manufactured and sold variants and improvements of the *Æolina*; imported, modified and sold Demian's accordions; and by 1829 Charles Wheatstone had patented his own mouth-blown variant of the free-reeded *Æolina* — with the addition of controlling buttons in a sophisticated and logical fingering system — that he named the *Symphonium* (which he always referred to, however, as a '*Symphonion*'). His 1829 patent⁴ hinted at a bellows-powered version of the symphonium, and by 1830, he was probably using this new instrument, the *Concertina*, in his Friday Evening Discourses at the Royal Institution, where, in lectures read for him by his friend Michael Faraday, instruments including the *sheng*, Jew's harp, *Æolina*, symphonium and concertina were used to demonstrate aspects of the

nature of sound, resonance and of musical tones.⁵

This article reviews the invention and evolution of the concertina, covering Wheatstone's work on the *Æolina* or '*Mund-harmonica*', his invention of the symphonium, and the influence of the Austrian accordions of the mid-1820s on Wheatstone's free-reeded inventions, and traces the development, through the surviving Wheatstone 'open pallet' instruments (see Appendix A) and via his later 1830s research prototypes, to the standard, oft-copied and much-modified 1844 design of the Wheatstone 'English' system concertina.⁶ This research has been assisted by the recent discovery of a very early open pallet prototype concertina, that was formerly housed in the original Wheatstone Laboratory collection, King's College, London, (see Appendices A and B).

1: NEW FREE-REEDED MUSICAL INSTRUMENTS OF THE 1820s

The evolution of the earliest free reed instruments that were created as a consequence of the arrival of Asian free-reeded mouth organs into the European scientific and musical community may be summarised as follows.

THE *ÆOLINA* OR *ÆOLIAN*.

The German *Mund-harmonica*, or '*Harmonika*', known as the *Æolina* or *Æolian* in England, may have originated as early as 1810, as Eschenbach's *Aeoline*. Eschenbach gave his ideas freely to other experimenters such as Christian Friedrich Buschmann of Berlin, who in 1821 created a 15-reeded, single-action mouth organ that he named the *Aura* or *Mundæoline*. C.F. Buschmann's '*Harmonika*' is variously claimed as originating in 1824, 1826 or 1828, though in 1822 he invented a bellows-operated tuning aid based on free reeds which he named the *Handharmonika* or *Handæoline*. It was, however, the concept of a multi-tongued reed-plate as used in Buschmann's *Mundæoline*, where the individual reed-tongues were framed by raised metal channels and the individual reeds either selected or blocked by lips and tongue, that was taken up by English manufacturers and importers. The *Æolian* was

⁴ Charles Wheatstone, *Improvements in the Construction of Wind Musical Instruments*, Patent No 5803, 19 December 1829 (actually granted in June).

⁵ Brian Bowers, *Sir Charles Wheatstone FRS, 1802–1875*, 2nd edn., Institution of Electrical Engineers, (London, 2001), pp. 36–41.

⁶ Charles Wheatstone, *Improvements in the Action of the Concertina, &c. by Vibrating Springs*, British Patent No. 10041, 1844.



Figure 2. The single Octave Chromatic Æolian from the Willis German Æolian Tutor, 1830.

championed by Willis & Company's *German Æolian Tutor*.⁷ This tutor offered for sale a range of Æolians: The single (Figure 2) and two-octave Chromatic Æolian; the three-chord, eight-chord and chromatic *Pandean Æolian*; and the *Trumpet Æolian*.

The unnamed author of this booklet claimed that the instrument was first brought to England in 1827, and received a public debut at the Theatre Royal, Drury Lane, played by a Mr T.Cooke. Examples of the Single Æolina and Triple Æolina, (both made by Wheatstone at Conduit Street) are in the Chambers Collection,⁸ and the Wheatstone Double Æolina from the Concertina Museum Collection (Figure 3).

The Æolina was demonstrated in Wheatstone's Royal Institution lecture (given for him by Faraday) on 9 May 1828,⁹ and an engraving of the Wheatstone Triple Æolina appeared in an article in *The Harmonicon* of February 1829.¹⁰ Chambers considers the Æolina to be the first commercially-successful European free-reed instrument, which led to the invention of the accordion and led, via the symphonium, to Wheatstone's concertina, to later German concertinas and more modern mouth organs.¹¹

THE DEMIAN ACCORDION

The Æolina or Æolian, in its various forms, was

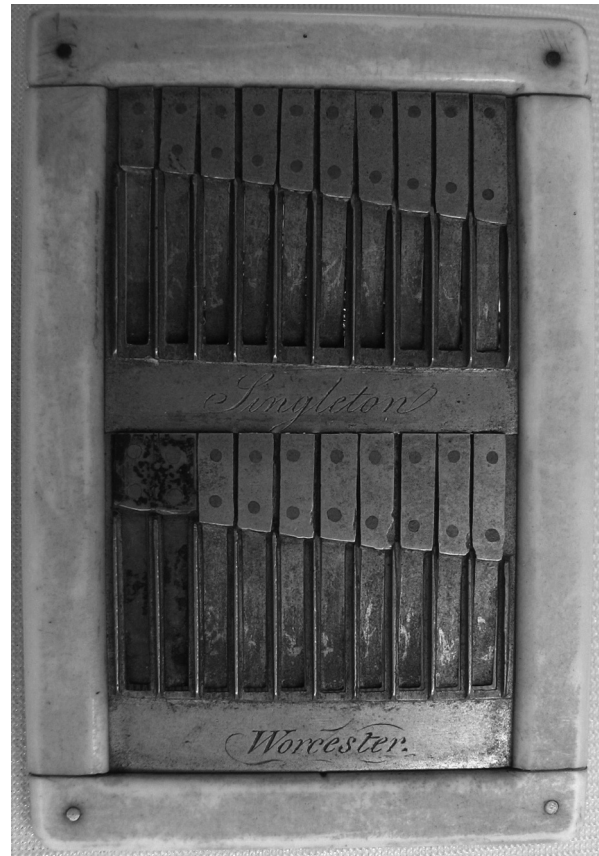


Figure 3. Double Æolina, made by C.Wheatstone for Singleton's of Worcester. Photo N.Wayne © The Concertina Museum Collection Collection.

always a mouth-blown instrument, and all its variants required complex tonguing to select which of the reeds on the reed-plates were to be sounded. A major step in the evolution of bellows-powered free-reed instruments occurred when Cyrill Demian patented his *Accordion* in Vienna on 6 May 1829. In the patented instrument, he inserted five pairs of reed-plates, each similar to the reed-plate of the single Æolian, into five separate chambers within a simple bellows. These were controlled via a series of five simple keys which lifted levers and 'pallets' to allow air to flow into and out of the reed chambers, so that chordal melodies could be played by depressing selected keys whilst pressing and drawing the bellows. The keys were stamped with numbers 1

⁷ *The German Æolian Tutor*, (I.Willis & Co: London, Dublin & Paris, 1830), cited at Missin, www.patmissin.com/history/aeolina.html

⁸ Stephen Chambers, 'The Chambers Collection', in *Proceedings of 20th Musikinstrumentenbau-Symposium, held at Stiftung Kloster, Michaelstein, 19–21 November 1999*, cited at www.concertina.com/chambers

⁹ Bowers, *Sir Charles Wheatstone*, pp. 36–37.

¹⁰ *The Aeolina*, unknown author, in *The Harmonicon* 7, (London, 1829).

¹¹ Chambers, 'The Chambers Collection', op. cit.

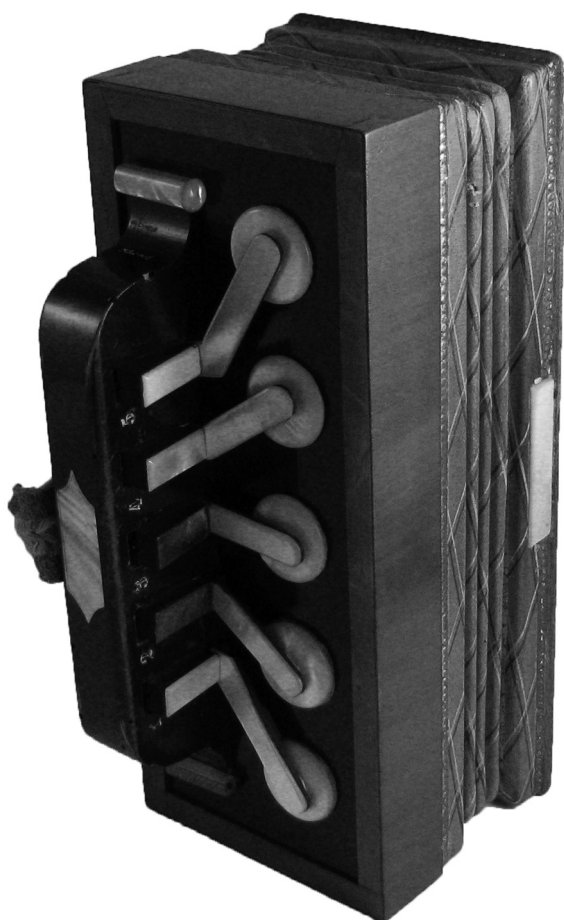


Figure 4. *The Demian 5-key accordion, from the Wheatstone Laboratory, c.1825. The Horniman Museum Wayne Collection, cat. No: M15-1996. Photo N.Wayne, © The Horniman Museum.*

to 5, presumably to assist beginners playing from the tutor books provided for Demian's accordions.

It is evident from the five Demian and Demian-style accordions retrieved from the remnants of the Wheatstone Laboratory at King's College (described in Table 1 below), that Charles and William Wheatstone were importing the original 5-key Demian accordion, as illustrated in the 1829 Vienna patent. Furthermore, 8-key, 10-key, 17-key, 18-key and 21-key variants were also recovered from the Wheatstone Laboratory, most bearing a pink paper *Wheatstone & Co, 20 Conduit Street, Regent Street* label, inserted into the air-valve hole on their left-hand ends, with the 17-key instrument bearing the impressed stamp of London dealers Keith, Prowse & Co. Only the 5-key Demian (Figure 4) retains the *Æolian*-influenced 5-tongued reed-plates (Figure 5).



Figure 5. *The reed-plates of the 5-key Demian accordion, c.1829. The Horniman Museum, Wayne Collection, cat. no: M15-1996. Photo N.Wayne, © The Horniman Museum.*

The later models from the 8-key onwards have plates with single reeds, or plates bearing reed-tongues on each side of a single plate, one acting on press, one on draw. A Viennese newspaper, quoted by Maurer and cited by Chambers,¹² says that Demian was making accordions with 6, 7, 8, 9, and 10 keys as early as July 1829.

Other European manufacturers were also devising new musical instruments using the principle of metallic free reeds, combined with levers and pallets to select various notes; the *Psallmelodikon*, invented around 1828 by Prussian shoemaker Johannes Weinrich (1793–1855) and H.König (Figure 6), has twenty-five German silver reeds set beneath salt-spoon keys, these keys being somewhat randomly spread over a wooden body resembling a double flageolet or bassoon, and blown via an ivory fipple.

Another instrument, of which two examples were found in the remains of Wheatstone Laboratory Collection, was the keyed free-reeded flute of Bouveret & Cordier (Figure 7). This instrument also

¹² *Wiener Zeitung*, 22 July 1829, quoted by Walter Maurer in *Accordion*, (Edition Harmonia: Vienna, 1983), p. 57; cited by Chambers, *op. cit.*

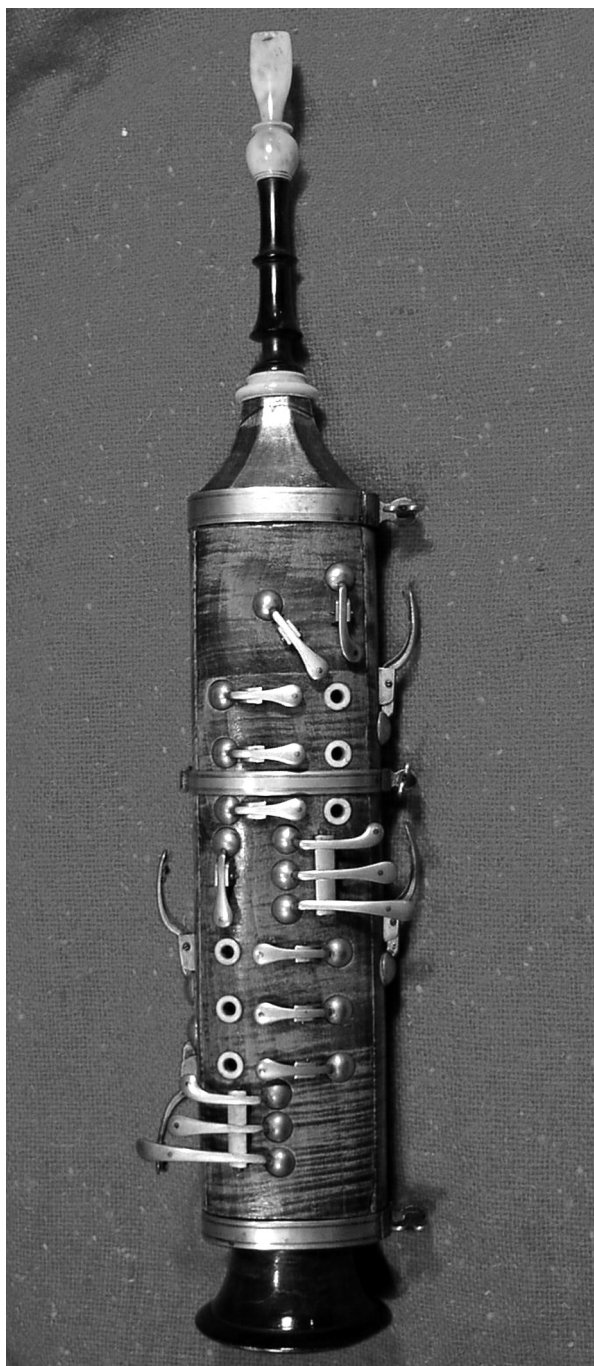


Figure 6. *Psallmelodikon*, invented by J. Weinrich & H. König of Heiligenstadt in 1828. Flamed maple body, 6 finger-holes plus 2 thumbholes bushed with ivory, 25 German silver salt-spoon keys in saddles, German silver reeds, ivory mouthpiece. In external appearance resembling a double-flageolet with some bassoon-like features, the body must have been built by a maker of woodwind instruments. From *Proceedings of 20th Musikinstrumentenbau-Symposium*, held at Stiftung Kloster, Michaelstein, 19–21 November 1999. Photo N.Wayne © Chambers Collection.

has small metal free reeds set beneath salt-spoon keys, in two groups, on a silver-plated tubular body

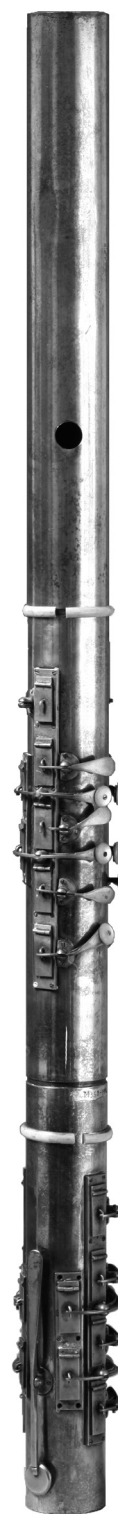


Figure 7. *The Bouveret and Cordier free-reeded flute*, Horniman Museum Wayne Collection No. M358-1996. Photo © Heini Schneeberli, The Horniman Museum.

of flute proportions, and appears to be blown via a *faux-embouchure* towards one end.

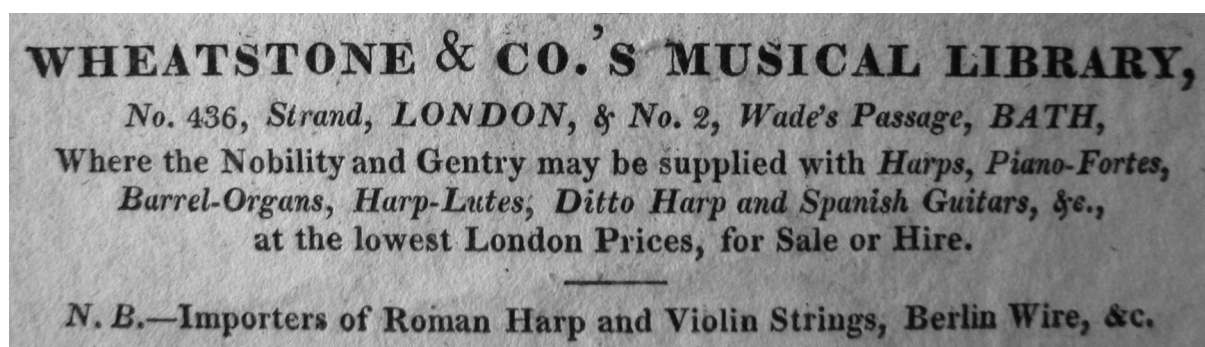


Figure 8. Frontispiece of musical publication giving trade details of the Wheatstone music publishing business at 436 Strand, c1815. Photo N.Wayne © Concertina Museum, Belper.

2: THE PROGRESSION TO WHEATSTONE'S SYMPHONIUM AND BEYOND

By 1825, the 23-year-old Charles Wheatstone had accumulated some experience in the design, manufacture and promotion of new musical devices. He had worked for his uncle Charles' music selling business at 436 Strand; set up automata in the family's Gloucester shop; devised the keyed *Flute Harmonique*; demonstrated the *Enchanted Lyre*; demonstrated the *Diaphanicon*; and had shown *The Apparatus of the Invisible Girl*, for which no written details survive. He was clearly an idiosyncratic inventor, with a marked bent towards matters acoustic, even at this young age.¹³

In 1826, the musical business of Charles and his brother William was amalgamated with that of their father William, who was trading at 436, Strand, London (Figure 8), and from 1829 traded at 20 Conduit Street, which also became Charles' home until his marriage in 1847. Their business activities included the marketing of imported Demian accordions, music publishing, a musical library, and the manufacturing of their own Wheatstone *Æolinas*.

By 1829, he had completed work on his patent for the symphonium, and therein acknowledges the influence on his invention of the 'instrument known in China by the name of tsching or ching... one of the pipes having at its end... inserted into the wind chest a tongue or spring [reed] resembling that of the *Æolina*.' An ancient *sheng*, closely similar to that illustrated in the 1829 patent, was recovered from the remains of the Wheatstone Museum in 1963, and is now in the Concertina Museum Collection.

In addition to the free reeded *tsching* (Figure 9) or *sheng*, Charles Wheatstone was familiar with the German *Mund-harmonicas* and the Bouveret

& Cordier reeded flutes. However, his logical mind was dismissive of the method of clumsy tonguing needed to play the various *Æolinas* and *Mund-harmonicas*, and of the limited facility for melodic playing permitted by the first Demian accordion. It is not known if he was aware of the *Psallmelodikon*, (though he did have the Bouveret & Cordier keyed free-reeded flutes in his collection) but in the patent claims that describe his own free reeded instrument the *Symphonium*, he dismissed the somewhat random array of reeds and 'keys' used within other keyed free-reeded 'flute-like' instruments, and made pertinent claims for the improved disposition of the reeds or 'springs' of his proposed new instrument, and for the compact and eminently-playable arrangement of its buttons or 'keys' which control the air supply to each reed. In his patent specification, he provided the following comments and patent claims:

On existing free reeded instruments:

Several of these [reeds] being placed in apertures arranged parallel to each other side by side in a plate, and tuned to the notes of a common chord, constitute one of the simplest forms of a wind musical instrument, known in Germany under the name of the *Mund-harmonica*, and in England by that of the *Æolina*. Finger keys have also been added to such instruments, somewhat similar to those of flutes, but always placed at such distances apart as to allow space for the fingers to apply themselves to each key when the instruments are held in ... the manner of fingering the flute or flageolet

On his principal patent claims for the new instrument:

I do claim the employment of two parallel rows of finger studs on each end or side of the instruments fitted with keys to terminate the ends of the levers

¹³ Bowers, *Sir Charles Wheatstone*, pp. 6–11.

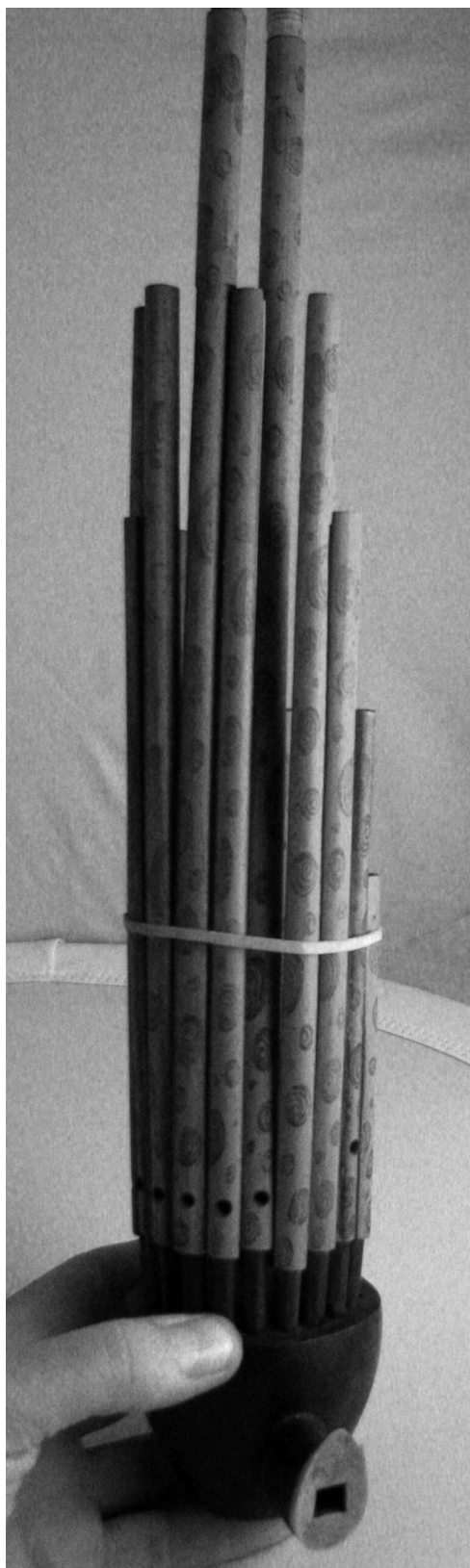


Figure 9. *The early tsching or sheng from the Wheatstone Laboratory, King's College. Photo N.Wayne © Concertina Museum Collection.*



Figure 10. *An early 17-Key Wheatstone Symphonium, c1825–1829. The Concertina Museum, Belper. Photo: N.Wayne © The Concertina Museum Collection.*

of the keys, and the so placing them with respect to their distances and positions as that they may, singly, be progressively and alternately touched or pressed down by the first and second fingers of each hand, without the fingers interfering with the adjacent studs, and yet be placed so near together as that any two adjacent studs may be simultaneously pressed down, when required, by the same finger.... In the ordinary keyed wind instruments, fingering is effected by the motion sideways of the hands and fingers... In this new arrangement, that mode of fingering is rendered entirely inapplicable and a motion not hitherto employed is rendered available, namely, the ascending and descending motions of the fingers... This mode of arranging the studs enables me to bring the keys much nearer together than has hitherto been done in any other instrument of a similar nature, and thereby to construct such instruments of greater portability.¹⁴

His earliest models had as few as 17 keys, whilst later versions had extra rows of accidental notes or semitones added to the two-row layout, to create the four-row 24- and 32- and 44-key *Symphoniums*, with the so-called 'English' fingering system, which was to be used on the subsequent Wheatstone concertinas:

I likewise claim the introduction of two additional rows of finger studs on each end or side of the instruments, parallel to those of the preceding arrangement for the purpose of introducing semitones, when required...

¹⁴ Wheatstone, *Improvements in the Construction of Wind Musical Instruments*, op. cit.



Figure 11. Reed-plate of an early 17-Key Wheatstone Symphonium, c.1825–1829. Photo N.Wayne © The Concertina Museum Collection Collection.

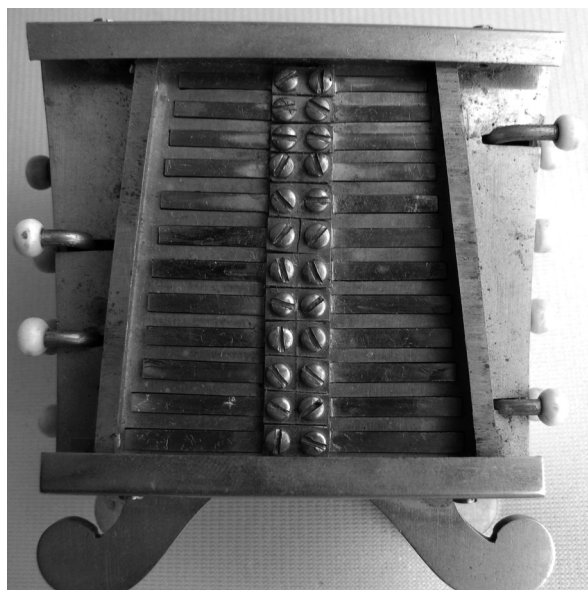


Figure 12. Reed Plate of a later 24-Key Wheatstone Symphonium, serial no 171. Photo N.Wayne © The Concertina Museum Collection Collection.



Figure 13. A later 24-Key Wheatstone Symphonium, serial no 171. The Concertina Museum, Belper. Photo N.Wayne © The Concertina Museum Collection.

Considering Figures 3, 5, 11 and 12, the reed plates of the Wheatstone *Double Æolina*, those of the ex-Wheatstone Museum 5-key Demian accordion, those of the early 17-key Wheatstone symphonium, and those of the ‘standard’ 24-Key symphonium serial no. 171, clearly indicate how these multi-tongued reed plates show a direct lineage, from

the *Æolina*, via those in the Demian accordion, to the symphonium’s reeds, housed in their compact and logical enclosure and each reed simply and individually operable by the fingertips for both single note and chord performance.

An early symphonium in the Chambers collection, numbered 18, has 15 keys, with the two accidental note keys being contemporary additions to the original 13-key layout.¹⁵ The Patent itself shows drawings of 16-key and 32-key variants,¹⁶ and a 44-key model is in the Horniman Museum,¹⁷ The 24-key symphonium, numbered 171 is of the later, more common, and possibly ‘standard’ design (Figure 13). Its key layout was used in the next stage of Wheatstone’s research on free reed instruments, the development of the concertina.

3: WHEATSTONE’S FIRST CONCERTINAS

The 1829 *Symphonium* patent includes some tantalising comments and drawings that give insight into Wheatstone’s planning towards the creation of a bellows-powered free reeded instrument based on the fingering system he had devised for the symphonium (Figure 14).¹⁸ In the closing pages of the

¹⁵ Chambers ‘The Chambers Collection’, op. cit.

¹⁶ Wheatstone, *Improvements in the Construction of Wind Musical Instruments*, op. cit.

¹⁷ The 44-Key Wheatstone symphonium: The Horniman Museum, Wayne Collection, No. M17a-1996.

¹⁸ Wheatstone, *Improvements in the Construction of Wind Musical Instruments*, op. cit.

patent, Wheatstone writes:

an end view of an instrument with the substitution of portable bellows for the wind chest. I can likewise apply.. the instruments described in Figs 1, 2, 3, 4 and 25 [the three variants of the symphonium] to the portable bellows, as shewn in Fig 45, where the ends of the bellows are formed of plates with rows of tongues or springs [reeds] mounted in apertures... and furnished with keys or valves with finger studs to them, as shewn at each end of the bellows in Fig 45.

Thus, whilst not actually mentioning the name *Concertina* in this patent, he describes, (and claims as patent): a bellows with rows of reeds mounted under 'end plates' and set into 'apertures'; covered by 'valves'; and operated by 'finger studs' – all strongly suggestive of the early concertina that was so soon to follow, where the reeds would be set beneath wooden end-plates; set into the spaces in radial reed-pans beneath the end-plates; covered by exposed valves or pallets; and activated by pressing ivory finger studs or keys.

Eydmann has noted that a motivation for Wheatstone's commercial production of the bellows-blown concertina was 'the novelty of the *symphonium* wearing off, and its abandonment through its being "extremely fatiguing to the performer"'.¹⁹

It appears that less than twelve months after the grant of the *Symphonium* patent, a form of the Wheatstone concertina may have been introduced to the public, for on 21 May 1830, Faraday gave one of the Royal Institution's *Friday Evening Discourses* titled 'On the Application of a New Principle in the Construction of Musical Instruments' during which he is said to have described both the symphonium and the concertina. Bowers states that the 'new principle' introduced in this *Discourse* was the use of the free reed, which in Faraday's words, 'is now so well known for its popularity in the *Æolina* or mund-harmonica, where a spring of metal being fixed by one end, in an aperture which it nearly fills, is thrown into vibration by the breath or any other soft current of air passing by it, and produces musical sound.' In the 21 May discourse, according to the proceedings of the Royal Institution :

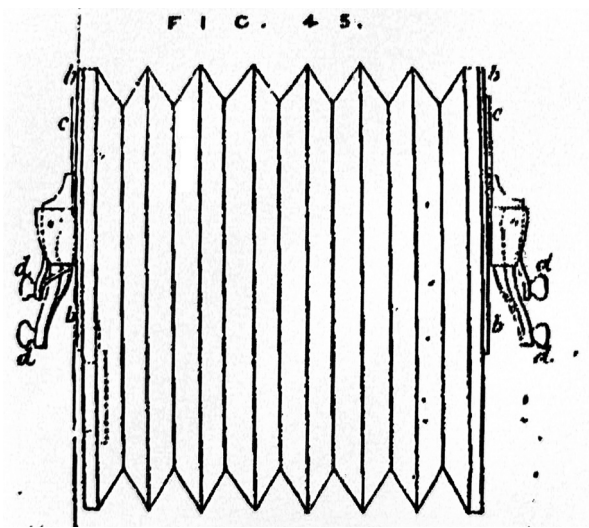


Figure 14. The free-reeded bellows instrument shown in Fig. 45 of Wheatstone's 1829 patent for the symphonium.

This was one of the series of evenings devoted to the consideration and developement (sic) of various parts of the science of sound. The illustrations were given by Mr Faraday, but, with the matter, were supplied by Mr Wheatstone. The principle is the one now so well known for its popularity in the *æolina*, where a spring of metal being fixed by one end, in an aperture which it nearly fills, is thrown into vibration by the breath or any other soft current of air passing by it, and produces musical sound. The general laws of the vibrations of rods and springs were first given, and partly illustrated by an instrument called a tonometer invented by Mr Wheatstone, in which the sound produced by any length of a uniform spring could be ascertained. Then the application of these springs, in a great variety of instruments, was shewn, first in the mund-harmonica, or *æolina*, down to those of most recent construction.²⁰

During this May 1830 *Discourse*, the further instruments mentioned in the report included the single, double and triple *æolina*, Wheatstone's *flute harmonique* of 1818, and Wheatstone's *symphonium*. Others mentioned were: Dowler's *glossophane*, Dretz's *ærophone*, and Day's *æolian organ*. The symphonium ('a beautiful instrument, small in size, but of great power in expression, melody and harmony') was demonstrated by a Mr Godbé,²¹ its arrangement

¹⁹ Hall, King, *The Harmonium: Novello Primer*, (London, n.d.), p. 11, cited in Eydmann, 'The Life and Times of the Concertina', op.cit.

²⁰ 'On the Application of a New Principle in the Construction of Musical Instruments', *Quarterly Journal of Science*, (April–June 1830), p. 397f.

²¹ Mr Gödbé arranged concertina music for Wheatstone & Co in the 1840s; for example, his *Reminiscences of Rossini – No 10*, is in the George J. Lockyer Music Archive, Vol. 4, now in the Concertina Museum, Belper.



Figure 15. The pallets and levers of the 5-key Demian accordion, c.1829. The Horniman Museum Wayne Collection, cat. No. M15-1996. Photo N.Wayne © The Horniman Museum.

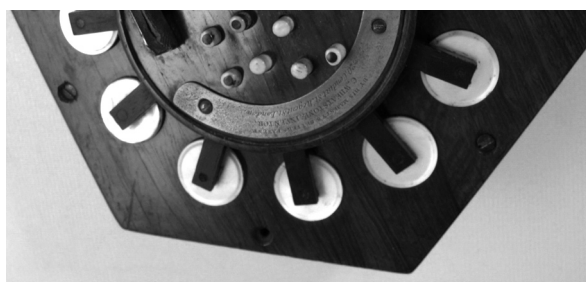


Figure 16. The Pallets and levers of the KCWM Wheatstone Lab Open Pallet concertina, c.1830. Photo N.Wayne © The Concertina Museum Collection.

of keys and extreme facility of fingering were also explained. A number of other reed instruments were demonstrated and described, including the Chinese *tsching* ('sheng'), which Wheatstone had described, and for which he had suggested reed and bellows modifications in his 1829 patent. It is not known whether a concertina was amongst the many reeded instruments demonstrated at this discourse, or was merely described during the lecture, but since Wheatstone had examples of the Demian accordion (which combined free reeds, bellows, levers and pallets) in his possession by 1830, and had hinted, in Figure 45 of his 1829 Patent²² at the addition of keys and bellows to the free reeds as used in the symphonium (Figure 14), it is possible that an early version of his concertina may have been present.

A little later, when Wheatstone was appointed to King's College in 1834, he gave a series of lectures on sound; Bowers has cited a reference from the King's College Archives (1834),²³ wherein amongst the 21 'Experiments and Diagrams' listed as used or displayed in his first lecture, is the following entry which shows that in late 1834 he was clearly both displaying a concertina and using the name:

18. Experiment on the formation of the musical scale with an instrument, (a concertina).

At the time of the May 1830 *Discourse*, Wheatstone had a range of instruments and manufacturing skills at his disposal including the Demian accordions, and the various *Æolinas* made at Conduit Street. He was involved in active production of the symphonium using the technology for reed-making available in the Wheatstone brothers' Conduit Street manufactory. Also, he was able to experiment with the combining of the logical and compact fingering

system which he had devised for the symphonium, and the simple and efficient system of keys, levers and exposed pallets that he had seen in the 5-key Demian accordion, (they are briefly hinted at in his 1829 patent drawings) to create this new instrument. Table 1 sets out the salient features of the five Demian and Demian-styled accordions that were in the Wheatstone Laboratory Collection that Wheatstone built up during his time at King's College. Analysis of the features of the five earliest open pallet Wheatstone concertinas (Table 2, below) reveals that features of the earliest 5- and 8-Key Demian instruments were adapted by Wheatstone, who introduced pearl pallets and ebony levers, (and in some cases, the 'slide-in, slide-out' method of removing the end of the instrument), into the designs of the first concertinas.

In creating a bellows-powered instrument, the reed tongues that in the symphonium were compactly gathered and arranged upon a single reed plate, (closely resembling the reed plate of its forerunner the *Æolina*) would, (in any bellows-based instrument), need to be separated around the ends, and the compact 4-row, 24-key layout of keys devised for the symphonium logically would have 12 keys on the left end, and 12 keys on the right end, and placed centrally on each end of the bellows, thereby maintaining Wheatstone's wish for an efficient division of notes between left and right hands - an arrangement that would still enable rapid playing of the keys, and easy fingering of two- and three-note chords.

The hexagonal shape was adopted by Charles Wheatstone (as well as by honey bees) because the design provided the maximum usable space for the minimum numbers of corners and joints. All of his non-experimental concertinas were of hexagonal

²² Wheatstone, *Improvements in the Construction of Wind Musical Instruments*, op.cit.

²³ Brian Bowers, personal communication.

<i>Keys</i>	<i>Pallet Material</i>	<i>Levers</i>	<i>Key facing</i>	<i>Feet</i>	<i>Main Reeds</i>	<i>R-Hand Chord Reeds</i>	<i>Label</i>	<i>L-hand Basses</i>
5-key	Pearl	Pearl	Pearl	Pearl	5-tongued plates	None	Wheatstone	None
8-key	Pearl	Ebony	Pearl	Pearl	Single tongue per side	5-tongue	Wheatstone	None
10-key	Pearl	Pearl	Pearl	Pearl	Single tongue per side	4-tongue	Wheatstone	None
17-key	Absent	Brass	Pearl? (now absent)	Pearl	Single tongue per side - linear	4-tongue, left-hand end	Keith, Prowse & Co	Two plus air-valve
21-key	Bone	Ebony	Bone	Bone	Single tongue per side - lengthways	4-tongue, plus single bass reeds	Wheatstone	None

Table 1. *Features of the five Demian accordions from the Wheatstone Laboratory.**Explanation of terms used in Table 1.*

- Key:* The touch-piece that is depressed to lift the lever and pallet.
- Key Facing:* Material upon the key's surface
- Lever:* The piece connecting key to pallet
- Pallet:* The circular or oval disc that allows air to flow into and out of the reed chamber, when the key is depressed and the lever lifts the pallet
- Feet:* The studs at each corner of the left-hand end, upon which the instrument can rest.
- Main Reeds:* The nature of the reed-plates beneath each pallet: each chamber contains two reeds or reed-plates, one playing on press and one on draw, fitted with leather valve flaps preventing air loss via the non-playing reed.
- Right Hand Chord Reeds:* Later instruments have rise & fall brass pallets added to the right end's hand-bar, controlling air access to multi-tongued reed-plates that deliver drone chords when opened.
- Left-Hand Basses:* Only present on the 17-key instrument: two brass keys controlling pairs of 4-reeded bass chord plates, plus one key-operated air-valve. (This is the only known Demian instrument with left-hand bass keys).

form, prior to the introduction of the rectangular *Duette* model that was first advertised in 1854.²⁴

By the very early years of the 1830s, he had produced his first 24-key, open pallet concertina. The close similarity of the levers and pallets is shown in the illustration of the pallets of both the 5-key Demian and the 24-key ex-Wheatstone Laboratory open pallet; it is as if the pallets and levers of the rectangular accordion have been 'folded' to fit around each hexagonal end of this new instrument (Figures 15 and 16).

4: THE FIVE EXISTING OPEN PALLET WHEATSTONE CONCERTINAS – THEIR FEATURES AND THE EVOLUTION TOWARDS THE MORE 'STANDARD' ENGLISH-SYSTEM CONCERTINA

There are five known examples of the 24-key, open pallet Wheatstone concertina currently; they are in various collections (see Appendix A for details):

- 'KCWM': ex-King's College Wheatstone Laboratory, now in The Concertina Museum, Belper (Figure 17)
- 'CC2': Chambers collection, example 2. (Figure 18)
- 'HMWC': Serial No XXX11, ex-Boosey & Hawkes, now in The Horniman Museum's Wayne Collection, ref M19-1996. (Figure 19)
- 'CC1': ex-C.Wheatstone & Co, now in Chambers collection, example 1. (Figure 20)
- 'MMNY': From a French collection, Vichy, 2004; now in the Metropolitan Museum, New York. (Figure 21)

²⁴ The Wheatstone Duett, cited as *Early Wheatstone Duett System Duet Concertina* at www.concertina.com/duett

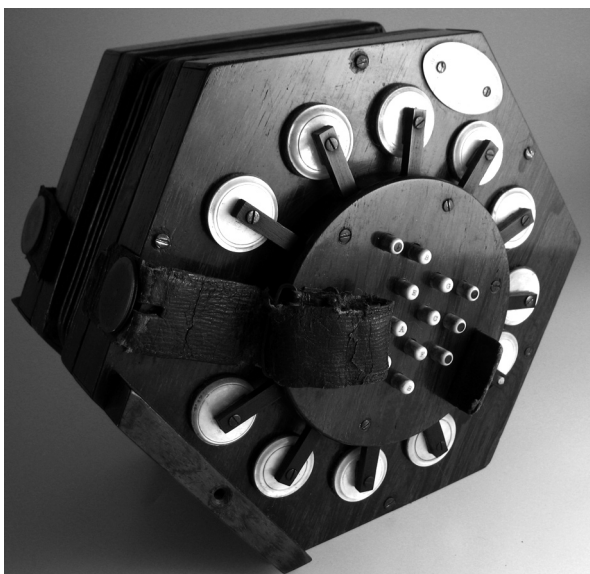
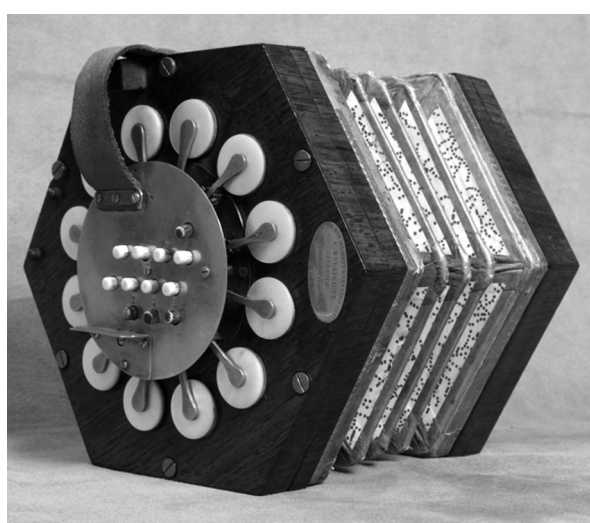
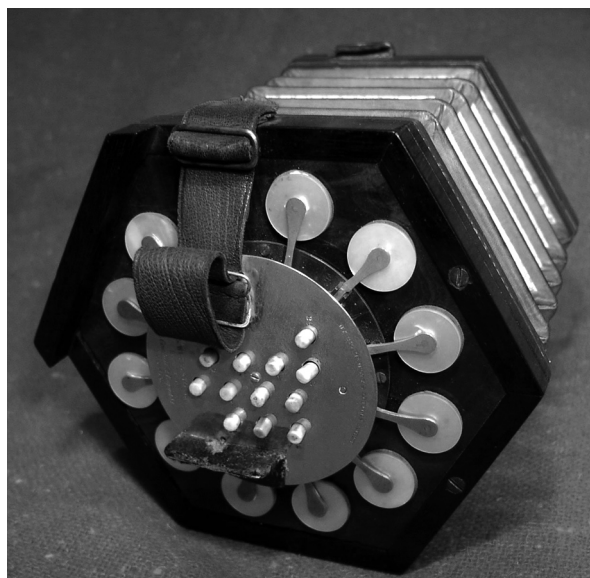
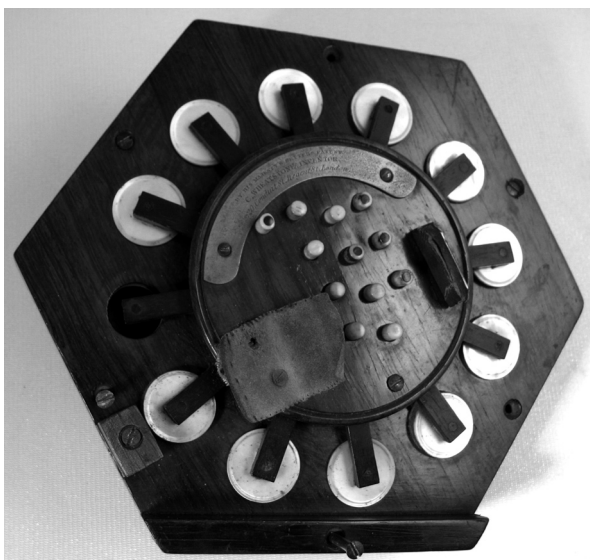


Figure 17 (left top). *The 24-key open pallet concertina, ref KCWM from Wheatstone's King's College collection ('The Wheatstone Laboratory') now in The Concertina Museum, Belper. Photo N.Wayne © The Concertina Museum Collection.*

Figure 18 (left middle). *The 24-key open pallet concertina, ref CC2 from The Chambers Collection, Co Clare. Photo Neil Wayne © The Chambers Collection.*

Figure 19 (left bottom). *The 24-key open pallet concertina, ref HMWC from the Boosey and Hawkes' Wheatstone Collection, ex-Concertina Museum, Belper, now in The Horniman Museum, Wayne Collection, cat. No. M19-1996. (Photo - N.Wayne, © The Horniman Museum)*

Figure 20 (right top). *The 24-key open pallet concertina, ref CC1 from CWheatstone & Co, via Harry Minting, (the company's final manager); now in The Chambers Collection, Co Clare. Photo Stephen Chambers © The Chambers Collection.*

Figure 21 (right bottom). *The 24-key open pallet concertina, ref MMNY (left-end). From a collection in Vichy, France; now in The Metropolitan Museum, New York. Photo Herbert Heyde © The Metropolitan Museum.*



Figure 22. *Wheatstone prototype concertina XXXVIII 'no 38', end view. Photo N.Wayne © The Concertina Museum Collection.*

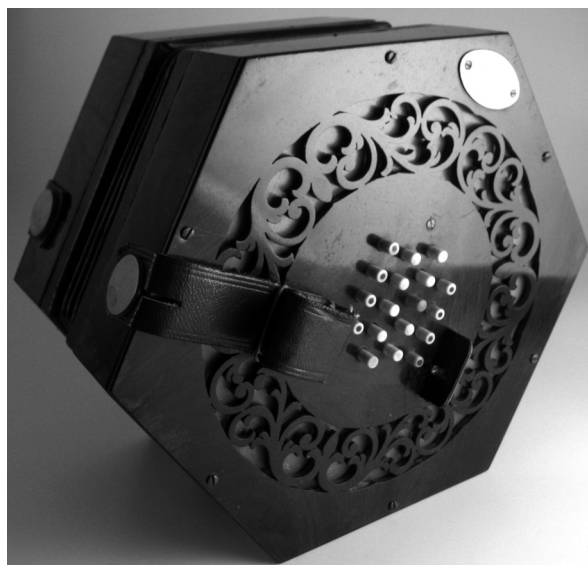


Figure 23. *Wheatstone concertina no LXXII 'No 72', Horniman Museum M-279-1996. Photo N.Wayne © The Horniman Museum.*

In an earlier article in this journal²⁵ I classified the design features of twelve early Wheatstone concertinas with serial numbers ranging from open pallet HMWC, ('No XXX11') made around 1830 to Wheatstone 'English' No. 967, (sold July 1845), by their 'early' and 'late' features. Approximately thirty principal features of each instrument were tabulated, and the gradual change of the 'early to late features' ratios (from 26:1 in the c.1830 instrument, to 3:27 by 1845) illustrates the steady transition to the more 'standard' models of the late 1840s. Regarding instrument XXXII, the only open-pallet widely known in 1991, now included among the five open pallets analysed here, I wrote:

It is evident that instrument XXXII is an extremely early production, with predominantly 'early' features, and furthermore with ten features that are found only in this one instrument, such as open pearl pallets, no strap metals, simple woodscrew end-bolts, ebony levers, a solid wood action with carved pivots, just twenty-four keys, stapled reed-beds and stamped accidentals – all unique details. Appreciable numbers of 'new' features appeared by instrument LXXII, and by instrument 546 [sold 1842] only three early features remain in the design. After about 1847, all 'early' features have been superseded, and.... the standard design from 1847 onwards was the... 48-key 'English' concertina.

Now that four more open pallet Wheatstone concertinas have become available for study, a similar analysis can be applied to all five instruments (and their immediate successors in the Wheatstone manufactory's output of prototype concertinas) thereby more fully tracing the evolution of the first Wheatstone concertinas. Details have also been included for two post-open-pallet models, which are highly relevant to the ongoing design changes in these earliest instruments. These are:

- 1: Wheatstone 24-key treble concertina, serial number XXXVIII ('No 38'), Concertina Museum, Belper (Figure 22).
- 2: Wheatstone 36-key baritone concertina, serial number LXXII ('No 72'), Horniman Museum Wayne Collection, ref M279-1996 (Figure 23).

It is likely that most of the five open pallet concertinas, as well as most concertinas with Roman numerals lower than about No.50 (and indeed most of the un-numbered patent prototypes from the Wheatstone Laboratory that are now in the Horniman Museum Wayne Collection), were devised by Wheatstone first and foremost for acoustical and research purposes, rather than exclusively for commercial sale. W.H.Preece, who knew Wheatstone, said that he was neither a philosopher nor a 'deep investigator', but essentially a designer of delicate

²⁵ Neil Wayne, 'The Wheatstone English Concertina', *Galpin Society Journal* 44, (March 1991), pp. 117-149.

	Early	Late	Very Late
1	Serial Number		
	None	Roman	Numeric
2	Label		
	Silver, semicircular arc	Engraved on circular silver or nickel action-cover	Oval silver plaque, pinned to end (inset to end on later model)
3	Levers		
	Ebony slats, with brass leaf-springs pinned to end, acting on underside of action cover: horizontal pins as pivots, and single pin securing to ivory key	Spatulate silver or nickel, with short ivory keys secured to end of lever by articulated joint	Internal brass or wood levers beneath fretwork
4	Pallets		
	Circular pearl, with chamfered edge, screwed to ebony lever	Turned ivory disc, secured to pallet by ivory button	Flat pearl disc
5	Action Cover		
	Rosewood disc, chamfered edge, secured to action block beneath by 6 screws: Thumb-strap metal and straight finger-rest screwed to surface	Circular silver or nickel disc, secured to action base-board via screws through 3-4 brass spacer columns	Conventional fret-worked ends
6	Action Assembly (under the Action Cover)		
	Thick circular wood disc, routed to form lever-channels, pivot rests and key-base spaces	Metal Levers, articulated to hold short, metal-mounted ivory keys	Sheet-brass levers, pinned to brass pivots, beneath fretwork
7	End-fitting method		
	Slide-in Action board, secured with two screws	Fit-over onto raised inner bellows-frame and reed-frame, with six end-bolts	Action board fits flush onto bellows frame, six end-bolts
8	Thumb-strap-screw mounting		
	Small cubic block of wood mounted to edge of action board, with brass insert for thumb-screw's thread	No Block: The Thumb-Screw inserts to side of instrument	Thumb-screw inserts to side of action-frame

Table 2. *The 'Early', 'Late' and 'Very Late' Diagnostic Features of Wheatstone concertinas that assist in assessing the development of the standard concertina design from its forerunners the Demian accordion and symphonium.*

apparatus.²⁶ J.C.Kassler supports this view, writing that 'While both the Æolina and Symphonium were playable musical instruments, they were invented by Wheatstone for acoustical purposes. Indeed, like Sir William Hescel [read: Herschel], Wheatstone used music as a means for studying and experimenting with non-musical phenomena.'²⁷

It appears that the 24-key prototype concertinas were also created more for study and acoustical experimentation, rather than for commercial sale, (though Wheatstone may well have passed an

occasional example on to members of his circle of scientific friends). Details of the evolution from the open pallet format instruments to the first of the conventional concertinas are described below. In common with the analysis of the 'early' and 'late' features of twelve Wheatstone concertinas below serial number 967,²⁸ many features of the five open pallet and the two early roman-numbered instruments are allocated to the classification of 'Early', 'Late', or 'Very Late', to more fully assess the order of manufacture of these prototypes, and to

²⁶ W.H.Preece, 'The Telegraphic Achievements of Wheatstone', *Proceedings of the Royal Institution*, 13 February 1880, pp. 28-97 at p. 304, cited in Bowers, op. cit., p. 221f.

²⁷ J.C.Kassler, *The science of music in Britain, 1714-1830*, (Garland: New York, 1979), cited in Eydmann, *The Life and Times of the Concertina*, op. cit.

²⁸ Wayne, 'The Wheatstone English Concertina'.

	Early	Late	Very Late
9	<i>Gilt bellows Trim</i>		
	None	Thin gilt and embossed paper strip (similar to that upon continental reed instruments) all around edge of bellows frame	
10	<i>Folds in Bellows</i>		
	3-fold bellows	4-Fold bellows	5-fold bellows
11	<i>Bellows Papers</i>		
	Circle-and-dot pattern	Varied	Standard cross and dots pattern
12	<i>End-frames, Bellows Frames, Reed Pan insertion/reed-pan cradle</i>		
	Separate end-frames, transverse veneer, end slips over raised bellows-frame rim	Reed-pan flush to bellows-frame	Reed-pan flush to bellows-frame; triangular corner supports within bellows-frame
13	<i>Black Core to Accidental keys?</i>		
	Yes, unstamped	Yes, with stamps	All-black accidentals, no stamps
14	<i>Stamped Accidentals - # and ♭</i>		
	No	Yes	All black, no stamps
15	<i>Palm-rest bars</i>		
	Yes, glued to end beneath ball-of-thumb area to protect pallets from hand contact	Absent, but fixing pegs present for removable bar at ball-of-thumb position	None needed since pallets and levers beneath fretwork

Table 2 (continued).

chart the steady introduction of the changes which led to the ‘standard’ Wheatstone ‘English’ system concertina.

Notes on some features in Table 2.

2: Label: All the labels on the five open pallets and two roman-numbered instruments are worded ‘By His Majesty’s Letters Patent. C.WHEATSTONE, INVENTOR, 20, Conduit St. Regent St. LONDON’ which is either placed on a semicircular arc of silver, or engraved onto the circular silver plate that supports the keys and covers the action and levers that lift the pallets, or is engraved on an oval silver plaque, as illustrated in Figure 24.



3: Levers: In the earlier open pallet instruments, the Demian-influenced use of ebony slats as levers is retained. Since Wheatstone’s later prototype instruments were probably made for display and performance as well as research, more lavish nickel silver and sterling silver was used both for levers and for the circular action cover, instead of ebony for the levers and rosewood for the action-cover. When fretwork-ended concertinas were introduced, firstly wood, then brass levers of various patterns were used, but concealed beneath the frets.

4: Pallets: Natural and visually-pleasing materials (pearl, ivory) appear on the early open-pallet instruments, as on the continental accordions; in the first fretwork-ended concertinas bone was used. As cardboard technology improved, discs of this material were universally employed for pallets in all later conventional concertinas.

5, 6: Action and lever arrangements: A simple routed wood-block contains the levers, pivots and seating of the ivory keys on the early open pallet instruments.

Figure 24 (left). *The oval silver-engraved makers’ plaque on open-pallet Wheatstone XXXII ‘No 32’.* The Horniman Museum, Wayne Collection, cat. No. M19-1996. Photo N.Wayne © The Horniman Museum.

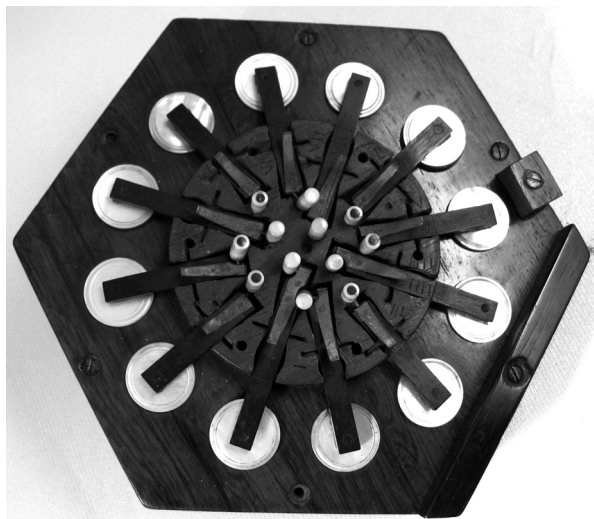


Figure 25. *The Pallets, action block and levers of the Wheatstone Laboratory Open Pallet concertina, ref. KCWM, c.1830. Photo N.Wayne © The Concertina Museum Collection.*

The later variants had silver or nickel action covers and metal levers, and were fitted with complex metal crank-connections of the keys to the ends of the levers, in common with the metal flute keys of the period. The action and lever arrangements of two subsequent open-pallet models are shown in Figures 26 and 27.

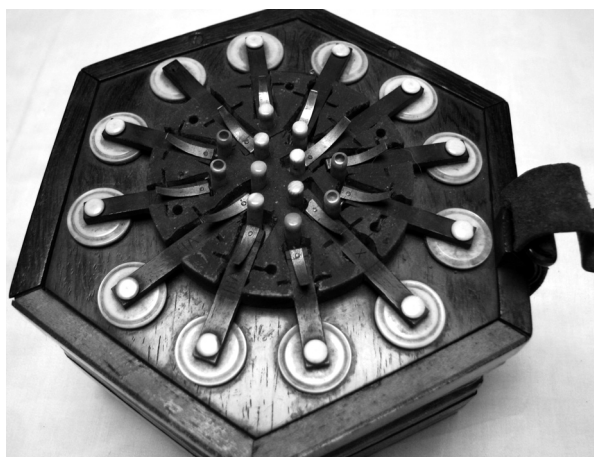


Figure 26. *The Pallets, action block and levers of the Chambers Collection Open Pallet concertina, ref. CC2. Photo N.Wayne © The Chambers Collection.*

7: End-fitting: The 'slide-in' method of securing the ends (which held the pallets, keys and levers) to the bellows frame and to the reed pans within it, was adopted by Demian for all the known variants of his accordions, and was the method used by most subsequent European manufacturers and developers of the accordion, the French *Accordéon* or *Flutina*, the *Harmoniflute* and many similar



Figure 27. *The Pallets, action block and levers of the Chambers Collection Open Pallet concertina, ref. CC1. Photo N.Wayne © The Chambers Collection.*

continental inventions. However, this method relied on the maintenance over time of a tight fit between underside of the action and the tops of the reed chambers. The 'slide-in' method did not accommodate a means of adjusting or increasing this tightness of 'fit', and Wheatstone soon adopted a 'screwed-on' method for fitting the action to the bellows of his concertinas, usually with six screws at each edge of the hexagonal end-plate. This permitted a measure of tightening to be applied, and offered the option of adjusting the thickness of the leather gasketry upon the dividing walls of the reed chambers to ensure an airtight seal.

8, 15: Screw mounting block: This small cube of wood, containing an brass plate inset to receive the screw-thread of the strap-securing screw, appears on the early open pallet instruments only, and (along with the raised hand-bar under the thumb area of the keyboard), this design helped to prevent the leather thumb-strap obstructing the rise of the exposed pallet beneath the strap.

The constructional changes within the group of five open pallet instruments demonstrate the progression from the Demian accordion-influenced array of pearl pallets and ebony levers, with delicate woodwork and individually hand-made parts, to a version with silver levers, large silver action cover, and oval silver labels similar to those that later would be applied to concertinas from around serial number 70 onwards, these being concertinas that would be created for sale, rather than just research. All the five models retain the compact 24-key fingering system that Wheatstone was careful to claim in his 1829 Patent, wherein he strongly emphasised its logic and

<i>Features</i>		KCWM	CC2	HMWC	CC1	MMNY	#38	#72	“Standard” Wheatstones
		Ex-Wheatstone Museum collection	Chambers collection No 2	Horniman Museum, ex- Booseys, ex- Wheatstone & Co	Chambers collection No 1, ex Wheatstone & Co	New York Metropolitan Museum	Concertina Museum, Belper	Concertina Museum, Belper	Concertina Museum, Belper
1	<i>Serial No</i>	E	E	L (roman)	E	E	L (roman)	L (roman)	V - Numeric
2	<i>Label</i>	E	E	V	L	L (oval silver, inset flush to end)	V (paper)	L (oval silver)	V - Paper Oval
3	<i>Levers</i>	E	E	E	L	L	V (unique)	V (brass)	V - Brass
4	<i>Pallets</i>	E	E	E	L	L	V (bone)	V (bone)	V - Card
5	<i>Action Cover</i>	E	E	E	L	L	V (standard)	V (standard)	V - Standard frets
6	<i>Action Assembly</i>	E	E	E	L	L	V (unique)	V (standard)	V - Radial levers
7	<i>End fitting</i>	L	E (slide in)	L	E (slide in)	L	L	L	V - Two- layer: frets upon action
8	<i>Thumb mount</i>	E	E (none on slide- in)	E	E (none on slide- in)	E	V (none)	V (none)	V - (none)
9	<i>Gilt Trim</i>	E (none)	L	E (none)	L	L	L (none)	V (none)	V - (none)
10	<i>Bellows Folds</i>	E (3)	E(3)	L(4)	L (4)	E (3)	L 4	L4	V - 4 – 5 folds
11	<i>Bellows Papers</i>	E (circle & dot)	E (8-point star)	E (8-point star)	E (8-point star)	L (floral tracery)	V Later gilt shamrocks	V (Gold star)	V - Gold star/ dots
12	<i>Ends/ Frames</i>	E	E (slide in)	E	E (slide in)	E	V (frets over action)	V (frets over action)	V - Two- layer: frets board upon action board
13	<i>Cored Accidentals</i>	E	E	E	L (all white)	L (all black)	E	E (yes)	V - (none)
14	<i>Stamped Accidentals</i>	E (stamps)	L (poss stamps?)	E	L (no stamps)	L (?)	E (stamps)	V No	V - (none)
15	<i>Palm Rests</i>	E	E (R H only)	E	E	L (mountings present)	V (none)	V No	V - (none)
Early to Late ratios:		E : L : V	E : L : V	E : L : V	E : L : V	E : L : V	E : L : V	E : L : V	E : L : V
		14 : 1 : 0	13 : 2 : 0	11 : 3 : 1	6 : 9 : 0	4 : 11 : 0	2 : 4 : 9	1 : 4 : 10	0 : 0 : 15

Table 3. *The five existing open pallet Wheatstone concertinas and two early fretted concertinas, their features and the evolution of the more ‘standard’ English system concertina.*

playability. This system was soon applied to 32-, 36-, 38-, 44-, and 48-key formats of early concertinas, as Charles and William Wheatstone’s commercial concertina manufacturing expanded in the late 1830s. It became the standard ‘English’ fingering system, oft copied and invariably claimed as ‘improved’ by the many copyist manufacturers of his

concertina design that sprang up as the instrument soared in popularity, after the patent protection over Wheatstone’s 1844 patent designs lapsed.

The full fingering system was finally set out in detail in Wheatstone’s patent of 1844, wherein the ‘English’ system and its many variants were claimed by Wheatstone, and where the name *Concertina* was

finally applied to his invention within the framework of a Patent.²⁹

The two closed-pallet instruments analysed here ('No. 38' and 'No. 72', these numbers stamped in Roman numerals) show the beginnings of a steady transition from the earliest open pallet items (such as those deriving from Wheatstone's own Laboratory collection at King's College and those from the early and later ownership of the Wheatstone company, or those made its former employees who left to set up their own manufacturing) to the more conventional or 'standard' concertinas prepared for sale via the Conduit Street shop. More and more of the early, Demian-related features were superseded, and simpler ways of connecting the keys to the pallets were introduced. The 'slide-in' method of securing the action board into the bellows frame was changed to the use of screws at each face of the hexagonal ends, and the use of intricate black-cored accidental-note keys was replaced by simple black-stained ivory keys. Four-fold bellows were introduced, and since the pallets were henceforth to be enclosed beneath pierced and fret-cut rosewood end-plates, the pallet/lever/action construction could then be simplified, given that the action components were now internal and unseen, these parts did not need to be made of visually-appealing but costly pearl and ebony materials, but rather could be of simpler, economical materials such as brass, bone and cardboard.

The newly-introduced fret-cut wooden end-plates were of a thin layer of rosewood, reinforced with six slim wooden bracing struts, inset from the edge of the underside of the frets, and glued to the underside. A thin hexagonal pine baffle-board was positioned beneath the frets, to highlight the look of the intricate fretwork, to limit the possibility of dust entering the action and reed areas, and to deter moths from attacking the lambs wool padding on the faces of the pallets within. The sides of the ends were also modified, and the two level system wherein the wooden action frame was slipped over the wooden bellows from the open pallet design, was changed to a single, deep rosewood end-frame, into which the thin fretwork end was nestled, and was guided by its hexagon of inset support struts. This new, deep end-frame in turn slipped over the raised bellows frame which contained the hexagonal inset reed-pan. With the advent of this design, the bellows frame no longer retained its wooden sides, and the new production of concertinas for sale had this single-layered, wooden-end construction.

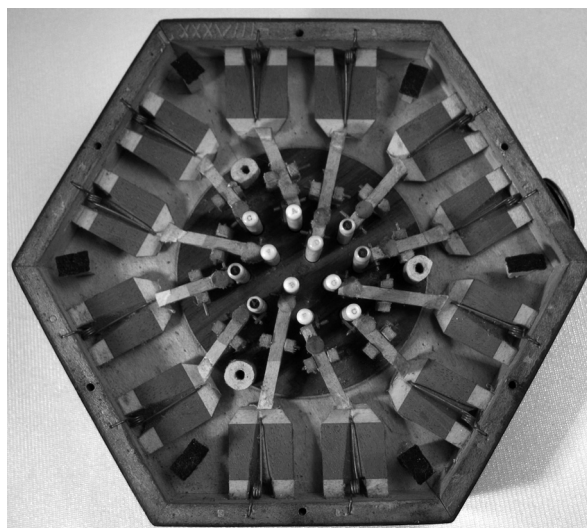


Figure 28. *Prototype concertina XXXVIII 'No. 38', showing action block, levers and pallets. The Concertina Museum, Belper. Photo N.Wayne © The Concertina Museum Collection.*

The Wheatstone concertina XXXVIII ('No. 38') is of interest (Figure 28), since it is the earliest roman-numbered prototype that is of closed-pallet form, though produced shortly after open pallet No. XXXII ('No. 32') in the sequence of roman-numbered instruments (Figure 19). This instrument underwent modifications, all completed by the early 1840s, including replacement fretwork of laminated rosewood on the ends, and a replacement Wheatstone label. It seems likely that Wheatstone's initial trials using very thin, fret-cut but single-layer rosewood sheets as a cover to pallets and action, as on 'No 38' may have led to distortion, lifting and cracking of the fretwork, despite of the hexagon

Serial No.	Sold	Condition
98	July 1837	Serious cracking, lifting at corners
120	summer 1837?	Warped and distorted left hand end, around key area. Some fret loss.
122	June 1837	Rosewood ends replaced with contemporary brass fret-worked ends; six original support struts glued to interior face of action frame
147	Aug/Sep 1837	Lifting of frets at corners, distortion around keys area

Table 4. *Condition of trial concertinas.*

²⁹ C.Wheatstone, *Concertinas and other Musical Instruments*, British Patent No 10,041, 7 August 1844.

	KCWM	CC2	HMWC	CC1	MMNY	#38	#72
<i>Reeds and reed-tongue details</i>	Ex-Wheatstone Laboratory collection; Concertina Museum, Belper	Chambers collection No 2	Horniman Museum – Wayne Collection M19-1996 ex Wheatstone & Co	Chambers collection No 1 ex Wheatstone & Co	Metropolitan Museum New York collection	Concertina Museum, Belper	Horniman Museum – Wayne Collection ref: M279-1996
<i>How is the reed-tongue secured to its frame?</i>	By two screws holding down a brass crosspiece	By two screws holding down a brass crosspiece	By two screws holding down a brass crosspiece	By two screws holding down a brass crosspiece	By two screws holding down a brass crosspiece	Single brass screw through end of tongue	By two screws holding down a brass crosspiece
<i>Reed tongue material?</i>	Blued steel	Blued steel	Brass	Blued steel	Steel	Brass	Brass
<i>How are reed-frames fitted onto INNER face of reed-pan?</i>	Each reed frame held to face by four metal staples	By small wooden blocks, glued to either side of the reed frame	Each reed held to face by four metal staples	By one large screw, and two glued wooden blocks, one on either side of the frame	Each reed held to face by four metal staples	Parallel-sided, brass reed-frames slide into routed channels on face of reed-pan	Tapered, square-end reed-frames slide into routed channels on face of reed-pan
<i>How are reed-frames fitted within OUTER chambers of reed-pan?</i>	Each reed held within chamber by four metal staples	By a small wooden block, holding the reed frame against the reed chamber wall	By two metal staples on outer edge, and glued block on reed chamber wall	By one large screw, and one glued wooden blocks, one on outer side of the reed-frame	By two metal staples on outer edge, and glued block on reed chamber wall	Parallel-sided, brass reed-frames slide into routed channels within reed-chamber	Tapered, square-end reed-frames slide into routed channels in reed-chamber

Table 5. *Reed and reed tongue arrangements in early concertinas.*

of support struts glued beneath the edges of the fretwork. An examination of the early rosewood-fretted and oval-silver-labelled concertinas in the Concertina Museum Collection shows that all these instruments exhibit some distortion and cracking of their frets (see Table 4).

The new laminated frets of three-ply rosewood veneer appear to have been fitted to concertina ‘No. 38’ by the early 1840s, since the concertina’s Wheatstone label, (which at this period would have been the oval silver type) (Figure 24), has been replaced with an oval paper label, that bore the same ‘By His Majesty’s Letters Patent...’ wording as used on open pallet instruments. This is the label wording on most instruments made for sale prior to Wheatstone’s 1844 patent; after that date, the standard wording for all C.Wheatstone & Co labels was changed to a text beginning ‘By Her Majesty’s Letters Patent’ to acknowledge Queen Victoria’s

grant of the 1844 Patent. Also by around 1840, the instrument was fitted with 4-fold replacement bellows, and these were somewhat thicker than the delicate bellows of bookbinders’ leather found on the earliest prototypes; to accommodate the extra thickness of these bellows, the original rosewood-veneered hexagonal case has had the height of its lid extended by about 10mm to accommodate the extra depth of the instrument.

Its reed-pan is inset into a raised and suede leather-lined section of the bellows frame, in common with its open pallet predecessors. However, for the first time, the parallel-sided brass reed-frames are inset into routed grooves in the wood of the reed-chambers, rather than being held on the reed-pan’s surface by a set of four L-shaped clamps or pins, or being clamped in place by glued wooden blocks, as used on the open pallet prototypes.

Each reed-tongue of ‘No 38’ is secured with a

single screw through the end of the tongue, in the manner of many of the early Demian accordions, even though the reed-tongues in most open-pallet and most later concertinas are secured to their frames by a brass cross piece held down by two screws. A survey of the various reed and reed tongue arrangements in the early concertinas are set out in Table 5.

Not until the time of manufacture of 'No 38' were routed channels in the wood of the reed-pans introduced to accommodate the reeds' frames, which henceforth became the standard method of fitting reeds into reed-pans.

In 'No 38' (Figure 28) the 'action' (the keys, and their associated levers) is mounted on a circular mahogany block, which is extremely similar to the action block used in the three earliest open pallets - instruments KCWM, CC2 and HMWC. But rather than having levers mounted in routed grooves within the block, there are simple wooden levers, pivoted by brass axles, onto wooden supports and connected to the keys by a brass crank. The keys themselves include black-cored accidental note keys that are stamped with sharps and flats symbols, in common with some of the open pallet models. Its white-keys are also stamped on their flat tops with their note names; this practice was adopted to help guide and direct the amateur musicians (who were beginning to take up the fashionable new instrument in ever greater numbers) to locate and play the correct notes. Throughout the nineteenth century, note names appear on the white keys upon the vast majority of Wheatstone concertinas with ivory keys, with the substitution of red-stained keys for the 'C' keys on instruments from about No. 230 onwards.

A major feature of 'No. 38', which places it squarely amongst Wheatstone's experimental instruments, is its unique lever and pallet system that is totally unrelated to any previous open-pallet feature, even to those on a Demian accordion. Furthermore, no other known concertina exhibits pallets in any way similar to this prototype, whose trapdoor-style wooden pallets are hinged into the inner face of the surrounding action frame. Their springs are mounted on the surface of these pallets; these springs are pinned into the upper edge of the action frame (where note names also are stamped). The pallets are connected the levers with a connecting flap of thin, zephyr-style leather. Finally, the little-finger rests on the instrument, rather than being of the short and straight form used on virtually all instruments with serial numbers lower than 280, have been replaced with longer, curved ended versions.

Since 'No. 38' appears to have been returned to 20 Conduit Street for attention to its frets and bellows, it may have fulfilled all research functions for which it had been designed by Wheatstone, and by then had been made available for sale: this instrument was acquired for the Concertina Museum, Belper from a player and collector in Australia in the late 1990s.

The second roman-numbered concertina that continues the progression towards the standard 'English' concertina is roman-numbered LXXII, 'No. 72' (Figure 23). This instrument exhibits only one of the fourteen 'early' features of the open pallet instruments, namely the black-cored accidental note keys. It has fine rosewood frets with pine baffles beneath, and a more conventional action and pallets (though with complex brass levers and lever supports, bone pallets, and reed tongues of nickel silver); and embodies the first recorded use of tapered, square-ended reed frames, which provide a better fit to the pans than the parallel sided rectangular plates used in the open pallet models and prototypes such as 'No. 38'. It bears the oval-silver engraved plaque, with 'By His Majesty's...' wording, but no serial number appears upon the plaque; its roman serial number is only stamped within. Its 36-note compass enables this instrument to play a very much wider range of compositions, and its full complement of accidental notes is a great improvement over the old 24-key fingering layout of the symphonium, the open pallet concertinas, and of research prototypes such as 'No. 38'. By the time 'No. 72' was produced, the foundations for the commercial manufacture and sale of fully functional concertinas appear to have been laid.

5: WHEATSTONE CONCERTINAS - THE MOVE TOWARDS MANUFACTURE FOR COMMERCIAL SALE

Instrument 'No. 72', though roman-numbered (as were the many surviving early, prototype, and patent models that are more likely to have been made for research and acoustical demonstrations) could just as well have been made for commercial sale. It was (and still is) a good and versatile playing instrument. At the start of the 1830s, the Wheatstone workshops at 20 Conduit Street had begun making much of Wheatstone's scientific and acoustical equipment (and later, his King's College lecturing and research materials). The open pallet concertinas and fretwork-ended concertina prototypes were also being made there, yet the firm was still manufacturing the symphonium. Indeed, this early invention was

still being made and played into the 1850s, with published music still available for the instrument; Wheatstone displayed a sophisticated version of the symphonium at the Great Exhibition of 1851, and as late as 1872, he was granted a patent (with John Matthias Stroh) for a highly modified variant of the symphonium packed with a complex mechanism that featured a single 'gliding-reed'.³⁰

The Conduit Street premises provided a stable base of operations for many years, both for the support of Charles' scientific work, and for the business activities of music publishing, and musical instrument manufacture (Figure 8). William Wheatstone (Charles' brother) had amalgamated with the business of their father (also William) in 1826, and in 1829, moved the operations to 20 Conduit Street. Even though Wheatstone was made Professor of Experimental Philosophy (a discipline we would now call practical physics) at King's College in 1834 at the age of 32, it was not a full time job, and he continued with his musical business alongside his academic duties. He and John Green were granted a patent in 1836, for 'new and improved' free reed instruments such as the 'wind piano' and a 'Table-top' concertina.³¹

Wheatstone described himself in this patent (even after his appointment to a Professorship) as 'Charles Wheatstone, Musical Instrument Manufacturer'. In the *London Trade Directories*, Charles and William were listed as 'Wheatstone & Co, Music Sellers and publishers' until 1837; from 1837 to 1842, as 'Wheatstone, Charles & William; Musical Instrument Makers and sellers'; and after 1847, following Wheatstone's marriage and move to Hammersmith, as 'Wheatstone, William & Co'.³²

Much information about what the Conduit Street shop was making and selling, and about the shop's customers, can be found in the *Wheatstone Sales Ledgers*, a collection of handwritten notebooks listing concertina sales and other data from the mid-1830s until about 1891 (see Appendix C). The ledgers enable easy searches for details of any numbered concertina that is recorded as sold through Wheatstone & Co, during the period. However, none of the roman-numbered 'prototype'

concertinas discussed here (24-key open pallet No. XXXII, 24-key No. XXXVIII, 36-key No. LXXII) appear in the first or any other volumes of the ledgers. Although having lines to accommodate entries for all the concertinas numbered 1 to 1500, the first ledger has many empty lines, with no instrument or buyer details.

If the hypotheses in this paper are correct, the roman-numbered Wheatstone concertinas were made from as early as 1830, but were constructed primarily as acoustical research and lecture-demonstration apparatus, rather than finished instruments for commercial sale, thereby explaining the absence of entries in the first sales ledger for any of the known roman-numbered instruments. Furthermore, no conventionally numbered concertina is listed as being sold prior to April 1835.

Table 6 lists all the instrument sales in the ledger prior to the year 1837, so from 1830, when a concertina may have first been demonstrated, (and when the case is here made for creation of the earliest open pallet instruments), to early 1835, (when the first retail sales appear to be recorded), no concertina sales were listed in the Conduit Street Sales ledgers. The putative 1834 date of sale of instrument 352, (the last entry Table 6) is likely to be in error, given that all instruments between No. 320 to No. 370 were sold between 1839 and 1848.

Kassler's opinion³³ that Wheatstone's early instruments were made primarily for study and for experiment, rather than for sale, receives support as the concertina sales prior to 1837 in the first ledger are listed in order of their dates of sale, as shown in Table 6. Few very low-numbered instruments appear in this first sales ledger, which shows only one with the early 24-key layout, and neither roman-numbered prototypes, nor open-pallet concertinas, (whether roman-numbered or unnumbered) actually appear as items that were sold conventionally.

The early years of the first Wheatstone sales ledger have very few entries per page. For example, page 4 has lines & spaces that would accommodate the listing of all instruments with serial numbers 61 to 80, has but four actual sale entries, those for concertinas numbered 69, 71, 74 and 79.³⁴ The

³⁰ Charles Wheatstone and J.A.Stroh, *Improvements in Musical Instruments in which Vibrating Tongues are acted upon by air are employed*, British Patent no. 39, 4 January 1872.

³¹ Charles Wheatstone and John Green, *Improvements in Concertinas*, British Patent, London, 1836.

³² Bowers, *Sir Charles Wheatstone FRS, 1802–1875*, op. cit.

³³ J.C.Kassler, *The science of music in Britain, 1714–1830*, op. cit.

³⁴ Sample page from the *Wheatstone Concertina Sales Ledgers*, showing sparse sales details recorded in earliest years. The Horniman Museum, Wayne Collection, Item C104a, also cited at www.horniman.info/WNCMARC/C104A/PAGES/C1P0040S.HTM

<i>Date of Sale</i>	<i>Instr No</i>	<i>Keys</i>	<i>Buyer</i>	<i>Ledger Page</i>	<i>Comments</i>
4 Apr 1835	119	-	Howlet	6	Inked name, pencil date
2 May 1835	263	38	Mrs Campbell	11	
12 Oct 1835	79	-	M Esdale	4	
17 Jan 1936	107	32	Dr Arnott	6	
22 Jan 1836	100	-	Capt Hughes	5	
4 Mar 1836	92	28	Col Rowan	5	
20 Mar 1836	89	24	Miss Herrington	5	Early 24-key format?
6 Apr 1836	95	28	G W Scott	5	
20 May 1836	108	-	Rev Hornby	6	
9 Jun 1836	101	28	E Thomise	6	
14 Aug 1836	99	28	Miss Gibbs	5	
26 Aug 1836 ?	69	-	Duke of Newcastle	4	Date unclear
25 Oct 1836	105	28	Rev Gray	6	
5 Nov 1836	112	28	Mr Woolright	6	[now in Chambers Collection]
9 Nov 1836	115	36	Mr Erdale	6	
22 Dec 1836	83	-	R Addams	5	
22 Dec 1836	74	-	Patrick Esq	4	
3 May 1834 ?	352	-	Rev Leach	18	Inked name, unclear pencil date

Table 6. *All sales of numbered concertinas prior to 1837 in the first Wheatstone Sales Ledger.*

Wheatstone manufactory seems to have started its production of more conventional, non-roman-numbered concertinas for commercial sale in 1835. The instruments were not sold in numerical order, which may indicate that batches of consecutively-numbered instruments (of various qualities and key arrangements) were made, with buyers who visited the Conduit Street shop making their choices from instruments of from recent production. Only one 24-key concertina (having the key layout of the earliest and open pallet instruments) appears in these pre-1837 sales entries.

The later ledgers contain a wealth of information about the price of each concertina, and all dates when particular instruments were returned to the shop, for exchange, re-sale, return after loan, or to be repeatedly hired out to various players, over several years. The many instruments bought by, hired by and lent to the noted Victorian virtuosi Richard Blagrove and Giulio Regondi are evident throughout many of the Ledgers. The digitisation of this resource and its secured and global availability continues to be a huge asset to concertina research around the world.³⁵

CONCLUSIONS

The invention of many new musical instruments based on the principle of the free reed during the late eighteenth and early nineteenth centuries was engendered by the arrival in Europe of examples of the Chinese metal-reeded *sheng* and similar Asian devices. Most of these new European inventions involved the insertion of metal free reeds into instruments of the woodwind family, creating flute or flageolet-like instruments, such as the Bouveret keyed free-reeded 'flute', and the *Psallmelodikon* of 1828. A new group of mouth-blown instruments including the *Mund-harmonica* and various *Æolinas* or *Æolians* appeared around this time, embodying the new principle of a multi-reeded plate whose variously-tuned reed-tongues were selected for blowing by careful use of the lips and tonguing.

The young Charles Wheatstone became familiar with the *Æolina* and his family music business made and sold them from around 1825. Wheatstone was not exclusively a musical instrument maker and dealer, but was actively pursuing what was to become a lifelong interest in acoustics and the

³⁵ www.concertina.com

natural sciences. He adapted the principle of the multi-reeded plate found in the *Æolina*, by placing such plates within a logically-designed mouth-blown enclosure, in which finger-operated keys and levers could expose single notes (or runs and chords) to the breath of the player, and named it the *Symphonium*, which he patented in 1829. His patent made strong claims for the logical, ordered nature of the arrangement of the instrument's keys and the consequent ease of playing of its notes, and also hinted at the application of a bellows to the instrument.

Wheatstone was also familiar with Demian's newly-patented accordion, which housed sets of *Æolina*-like reed plates within a simple rectangular bellows, but he appears to have considered that its musical potential and arrangement of its keys were inferior to that patented in his symphonium. In his 1829 patent, Wheatstone had claimed the application of a logical 24-note key-fingering pattern for the symphonium, and applied this fingering system to a new bellows-driven instrument, where the finger-keys operated single-tongued reeds via a range of exposed levers and pallets which, though based on those of the Demian accordion, were positioned centrally upon either end of a hexagonal bellows. Though the bellows instrument was not named concertina in this 1829 patent, the instrument was probably introduced as one of the many free reeded instruments demonstrated in the Royal Institution lecture on 'Free reeds in the construction of musical instruments', given by Faraday on behalf of Wheatstone in May 1830.

From its inception in 1830, until around 1835, the early open-pallet forerunner of Wheatstone's concertinas was first and foremost made as an instrument for acoustical research, lecture demonstrations, and (after his King's College professorship in 1834), for his college lectures, demonstrations and exhibition. During this period, Wheatstone continued to create a range of prototype concertinas, many with roman serial numbers; introduced fret-worked ends to enclose the levers and pallets; added increased numbers of keys; and experimented with a range of improvements to levers, reeds and fretwork.

By early 1835, Charles and William Wheatstone had begun offering a range of concertinas for sale through their Conduit Street shop, and by 1844, a

fairly standard design had evolved, retaining none of the early design features of the open pallet and early fretted prototypes, and now bearing conventional Arabic serial numbers. Wheatstone consolidated all of these changes to his design within his patent of August 1844.

Instruments were hand-made at this period, with finely detailed hand-cut frets, hand-filed reed-frames and complex pivoted levers; bellows were outworked to skilled bookbinders. However, from 1844 onwards, Wheatstone employed the young Swiss engineer and toolmaker Louis Lachenal to supervise the revolutionary tool-making that would, by 1848, enable mass production of a standard model of his concertina.³⁶

The growing demand for this fashionable and popular instrument could thus be more fully satisfied, and in 1848 the firm of Wheatstone & Co announced 'the improved concertina', in treble, tenor, and bass versions, which, as the announcement emphasises 'The above Instruments are also made in sets, accurately tuned together, according to the standard pitch, for the performance of Trios, Quartets, &c.'³⁷ All Wheatstone instruments were to henceforth embody the improvements brought by the mass production techniques introduced by Lachenal's engineering.

So, for the next decade or so, the place of the concertina as an instrument of choice, firmly centred within bourgeois, urban and amateur musical society, was assured. However, with the passage of time, there grew an ever-wider popularity of this unique little instrument as craftsmen and outworkers, many familiar with the Wheatstone workshops, took their skills and set up their own manufactories. New makers such as Joseph Scates, George Case and Rock Chidley, all with experience of the Wheatstone workshops and aware of Louis Lachenal's transformation of the manufacturing techniques of the new instrument, set up their own workshops. There arose a network of craftsmen in the London of the 1850s and 1860s, skilled in concertina manufacture, which moved between the new, often short-lived workshops, and catered to the growing demand for the concertina. Prices fell as production increased (and the instruments' quality often declined), and the social mobility and class migration of the instrument led to its fall from popularity with the bourgeoisie as the concertina passed into the

³⁶ S. Chambers, 'Louis Lachenal: "Engineer and Concertina Manufacturer"', *The Free-Reed Journal* 1 (1999), pp. 7-18. Cited at: www.concertina.com/chambers

³⁷ Wheatstone's 1848 announcement of 'The Improved Concertina', The Horniman Museum, Wayne Collection, Ref: Item C824, also at: www.concertina.com/pricelists

welcoming hands of the working classes. German-made instruments, based upon the diatonic 'push-pull' format of continental accordions, became widely available throughout Britain; the newer London-based makers offered instruments with new fingering systems, such as the *Maccann Duet*, the *Jeffries Duet* and the *Crane's Patent Duet*, and took on the German imports by producing their own 'Anglo-German' diatonic concertinas, of far better quality. In the mill towns of northern England and Scotland, concertina bands sprang up, with leading makers Wheatstone & Co and Lachenal creating instruments of tenor, baritone or bass compass to enable brass band musical arrangements to be played. Never an organisation to miss a recruitment opportunity, the Salvation Army adopted the concertina for its street bands. Instruments were readily adopted by country players, and appeared in the hands of English Morris and country dance musicians such as William Kimber, and began to supplant the pipes and fiddle as the instrument of many Irish traditional musicians, especially in Co Clare. However, a combination of the rising prices of quality concertinas, and the toll wrought by the First World War upon the lost generation of men who played, and would have played, the instrument, led to the concertina's decline from the 1920s onwards. The aggressive marketing of the cheaper piano accordion, the rise of the gramophone and radio, and the steady disappearance of the firms who made the instrument, left the concertina as a largely forgotten instrument of mainly solo gentleman players. However, the post war folk revival, initially via the folk dance movement, and later in the new folk clubs and the Morris dance renaissance, sounded the first notes of a revival of interest in the instrument. Founding fathers of the folk revival such as A.L.Lloyd and Ewan Maccoll chose the concertina as their accompaniment of choice, and the appearance of the enthusiast-run *Concertina Newsletter* in the late 1960s (later to be called *Free Reed Magazine*) with its regular, well-attended 'Concertina Conventions' held around Britain and its readership of over 3000 players and collectors, set in motion a Concertina Revival that is now worldwide, involving magazines, CD labels, dedicated museum collections, historians and collectors, many new concertina makers, specialist websites and concerts, clubs and bands. The future of Charles Wheatstone's scientific curiosity now seems assured.

ACKNOWLEDGEMENTS

I am indebted to Sir Charles Wheatstone's biographer Dr Brian Bowers, for his generous advice and help.

I acknowledge the help and advice given me by the late Frank E Butler, the grandson of one of Wheatstone's first craftsmen, whose gift to me of his early Wheatstone instruments and archives in the 1960s did much to set me on my path of 40 years' concertina research. Since my last *GSJ* article, a large and enthusiastic community of collectors, restorers, conservators, players and researchers has sprung up; I here acknowledge and thank them: the collector Stephen Chambers, whose research has done much to further his interpretations of the concertina and its history; the repairer and restorer David Leese; Dr Margaret Birley of the Horniman Museum, London and her staff; Professor Allan Atlas, of CUNY, New York, researcher on the concertina and its players; Dr Randall Merris of Washington, USA for his early guidance; Dr Herbert Heyde and Dr J Kenneth Moore at the Metropolitan Museum, New York; Robert Gaskins and his collaborator Wes Williams, the prime movers of the web availability of concertina research. Finally, I salute the memory of the many older players and makers of the instrument – Harry, Neville and Geoff Crabb, Harry Minting, Reuben Shaw, Wilf Pearce, Arthur Austin, Tommy Williams, Hubert Greene, Jim Harvey, Henry Stanley, Harry Hatton, Gordon Cutty, and so many more, from whom I first learned about the concertina and its role in the social and musical life of so many people during the nineteenth and twentieth centuries.

Appendix A.

THE EX-WHEATSTONE MUSEUM OPEN PALLET CONCERTINA, AND OTHER SURVIVING EXAMPLES

The further research documented in this paper was initiated when the Concertina Museum acquired a very early Wheatstone *Open Pallet* concertina, with provenance back to the original George III Museum at King's College (Figure 29) that was used by Charles Wheatstone to display his inventions from the 1830s onwards, and later known as 'The Wheatstone Laboratory'.

This instrument was part of the large collection of Wheatstone's scientific and musical apparatus that was displayed in *The Wheatstone Laboratory* after his death in 1875. Cleared from the college's museum rooms some years after his death, the concertina was finally retrieved (in very distressed condition) from its attic store-room in the 1960s.

Open pallet concertinas have their air-valve pads or 'pallets', and their associated levers exposed on

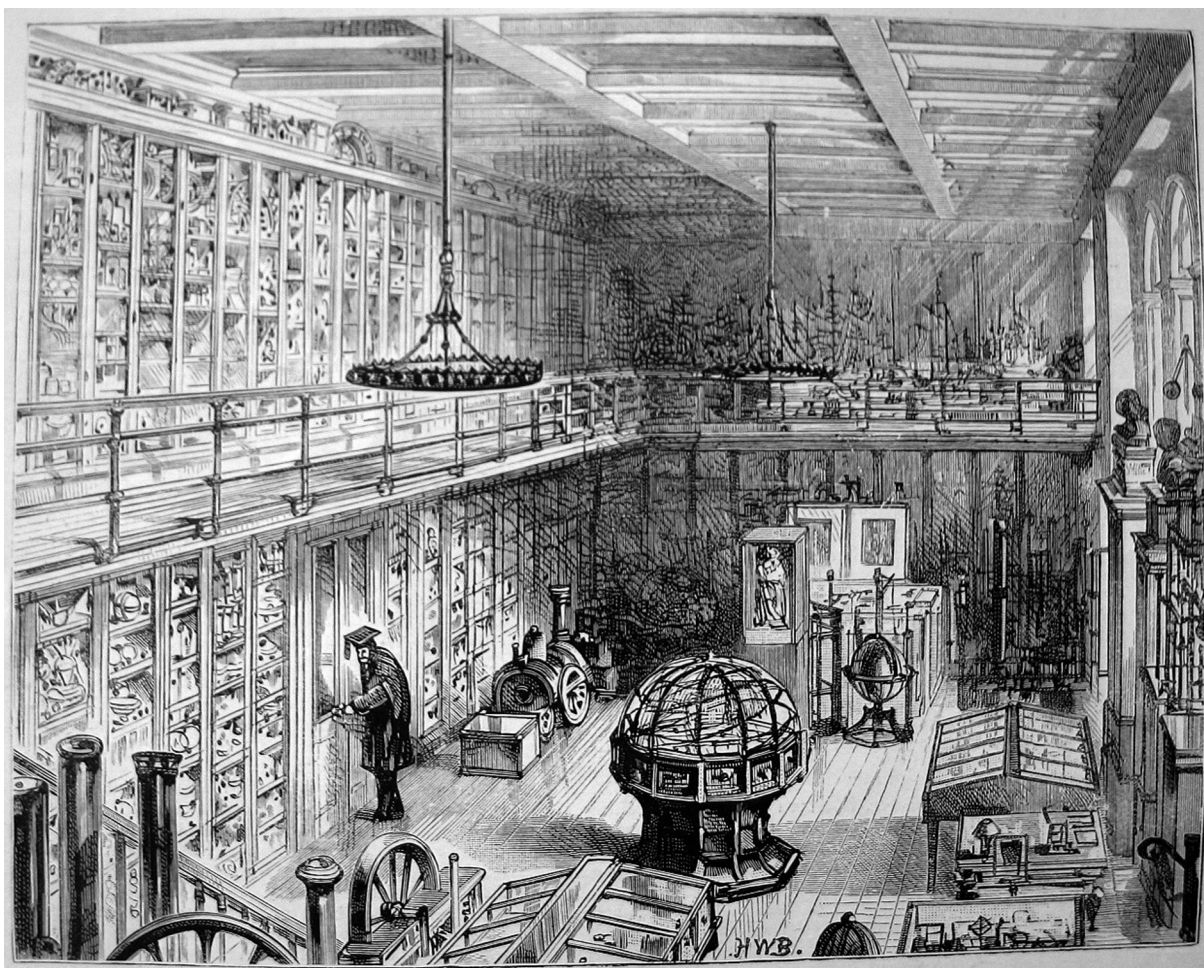


Figure 29. Engraving of the King's College 'Geo III Museum' showing the layout of the inventions displayed there, from 'The Graphic' London, Nov 1890. The Concertina Museum, Belper. Photo N.Wayne © The Concertina Museum Collection.

the ends of the instrument, in much the same manner as the late 1820s accordions patented by Demian and other makers, rather than enclosed beneath fret-cut wooden end-plates. The instrument is a 24-key open pallet, 'English' fingering system concertina, made at Charles & William Wheatstone's manufactory at 20 Conduit Street, off Regent Street, London.

Five such open pallet instruments are known to exist, all of which are analysed and illustrated herein. This instrument is the fifth known open pallet Wheatstone to appear in collections around the world; the evolution of the familiar mid-Victorian concertina design through these early prototypes to is discussed in detail above. The five known examples (**illustrated above, p.12**) are:

- 24-key Wheatstone, no serial number, ex-King's College Wheatstone Laboratory, now in The Concertina Museum, Belper, ref: KCWM. (Figure 17)
- 24-key Wheatstone, no serial number, Chambers collection, Co Clare. Ref CC1. (Figure 18)
- 24-key Wheatstone, serial number 32 (XXX11), ex-C Wheatstone & Co's factory collection, ex-Boosey & Hawkes collection, ex-Neil Wayne collection, now in The Horniman Museum's Wayne Collection, No M19-1996. Ref: HMWC. (Figure 19)
- 24-key Wheatstone, no serial number, ex-C Wheatstone & Co's factory collection, ex-Harry Minting (CW & Co's last manager), now in Chambers collection, Co Clare. Ref CC2. (Figure 20)
- 24-key Wheatstone, no serial number, ex-A French collection, 2004, now in the Metropolitan Museum, New York, ref: MMNY. (Figure 21)

These five surviving prototype examples show many individual variations in reeds, pallet material,

levers, bellows frames and labelling, analysed in Table 3 above, but all are of the 24-key format that Wheatstone originated for his 24-key symphonium, developed from around 1825, and which he patented in 1829. The ex-Wheatstone Laboratory collection's open pallet instrument is the earliest of the many concertina prototypes and patent models that were saved from the various dispersals of the King's College 'Wheatstone Laboratory', and its provenance is discussed in Appendix B.

Appendix B.

THE PROVENANCE OF THE EX-WHEATSTONE LABORATORY OPEN PALLET CONCERTINA

The origin of this very early open pallet instrument was as a continuance of physicist and inventor Charles Wheatstone's research on controlling musical reeds via compact and logical arrangements of buttons or 'keys'. It is in part an acoustical experiment and demonstration apparatus, and in part a new musical instrument prototype for eventual sale via the family business, and it was created during his days at the family's musical instrument and publishing shop at 20 Conduit Street, London. When Wheatstone took up his professorship at King's College in 1834, many of his inventions were housed there in the George III Museum (Figure 29).

There was a range of symphoniums, Demian accordions and many concertina prototypes and patent models in this Museum's displays, together with many of Charles' telegraphic, optical, electrical and telegraphic inventions and models, including a striking 'bellows fiddle' (Figure 30).

The collections were later moved to spacious top-floor rooms which became known as 'The Wheatstone Laboratory'. After Wheatstone's death in 1875, and due to growing demand for space as the College grew in scope and status as a major academic institution, the Wheatstone Laboratory was steadily cleared of all exhibits. Several national museums were invited to view the items, and to select pieces for transfer to their own collections: The Science Museum (London) made an early and extensive selection, and in the 1950s, the Smithsonian Institution (Washington, USA) acquired some items. However, few of Wheatstone's musical inventions and prototypes appeared to have been chosen, so the remnants, in a very poor condition, were finally transferred to an attic-level cupboard, high above the top floor laboratory prep-rooms – a storage space through which ran large central heating pipes!

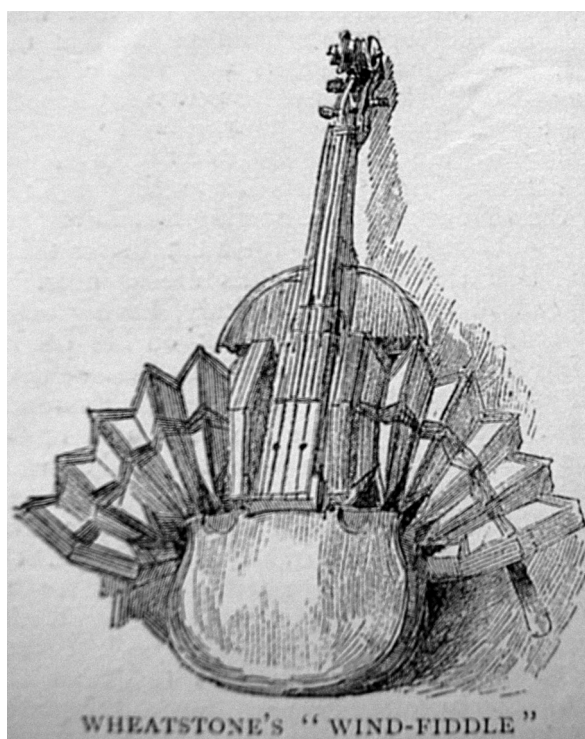


Figure 30. Engraving from *Geo III Museum* showing Wheatstone's inventions the 'Wind-Fiddle'. From *'The Graphic'* London, Nov 1890. The Concertina Museum, Belper. Photo N.Wayne © The Concertina Museum Collection.

There is revealing comment on the state of the King's College collection in a book by Geoffrey Hubbard:

[Wheatstone] left all his books and apparatus to his college, from whence most of the complete items of historical importance have passed to the national museums. What is left at King's is mostly fragmentary, often almost allusive, but it was here that I was most conscious of the certainty that Wheatstone was a creative inventor. Even today, the bulk of these surviving relics is impressive.

I was fortunately able to see them during a grand sorting out of the laboratories where they are kept, preserved out of respect for their creator but undoubtedly something of an embarrassment to an expanding college department on a severely limited site. There were musical instruments, boxwood recorders and double recorders, flutes and oboes. There was a keyed bugle, and a violin in which the strings were made to vibrate by the air-stream from a concertina type bellows. There were all the different forms of concertina and mouth organ, either complete examples or fragments. Naturally, there were a number of ABC telegraphs...

The astonishing thing, among all this wealth of bits and pieces, is how much of it still works, or could be

made to work. The man responsible for it (and the little labels on the backs in the Professor's distinctive fine writing leave no doubt about that) had a craftsman's feeling for what could or could not be done with the materials available, and by a combination of instinct and steady development he achieved what he intended.³⁸

Dr Hubbard's visit to King's and to its dwindling Wheatstone collection was probably made around 1960. Shortly after that visit, in May 1963 (or possibly even during the Hubbard visit) a young college employee was asked to proceed with a second 'sort out'. It was in these jumbled remnants of the old Wheatstone Laboratory exhibits that the early open pallet instrument discussed here was first found, during one of the periodic attempts to clear the remaining items. The owner from whom the early open pallet instrument and other musical and technical apparatus were obtained (a Physics Department technician at the College in the 1960s) tells his tale:

About 40 years ago I worked in King's College, where Wheatstone did his research. The professor asked a few of us to sort out the whole collection. We uncovered weird things like the 'Wheatstone Violin', the original Mouth Organ (nothing like the present day ones), a virginal, and odds and ends of scientific equipment – the list goes on. Having made two groups [of the material] Group One went off to a museum for restoration and display; the rest was going to be thrown away, but being an interested collector of gear I was given permission to take what I wanted. The concertina is one of them, and somewhere I have a sort of accordion and strange bits to do with communication.³⁹

Some years after this further clearance, the author of this paper met the Wheatstone Professor of Physics, William 'Bill' Price (1909-1993) at King's College in 1974 to offer his collaboration for the commemorations of the centenary of Charles Wheatstone's death. This was planned for 1975, with exhibitions at both at King's and at The Science Museum, London. On asking to view any surviving Wheatstone artefacts, the author was shown to the Physics Department technicians' rooms,

where a small display case in the canteen held an octagonal Morse code transmitter, and a 36- or 44-Key Wheatstone English concertina with external switches to select reeds within of either equal or unequal temperament. On enquiring of one of the older technicians about further surviving items from the Wheatstone Museum, he was told that they were all in the old attic off the top prep room. This room adjoined the large top floor laboratory that once housed the Wheatstone Laboratory, and high on the wall was small door, reachable only by stepladder.

It was on first looking within that the author experienced his 'Howard Carter Moment'. In a most distressed state, and within a 4 cubic metre chamber run through with hot cast-iron heating pipes, was a wealth of early concertina prototypes from the 1836, 1844 and 1861 patents: the *bellows fiddle*; the Wheatstone/Stroh *gliding reed concertina*; the 1836 *tripod-table top concertina*; 'double' *fingering system* instruments; a range of Demian and Wheatstone accordions; boxwood flutes, clarinets and recorders from the Wheatstone & Co Conduit Street shop; and many acoustical and telegraphic items, including the Wheatstone electric clock. The condition of the instruments was poor: thick dust, bone-dry woodwork, crumbling leatherwork, with many instruments separated into several parts amongst the debris. Professor Price was then approached with a request to donate some of the concertina-related items to the Concertina Museum. On the author's return to King's College some days later, he found that the entire contents of the storage chamber were awaiting his collection, and he was told that Professor Price had said that all items were to be taken by the Concertina Museum, the third major clearance of the remains of the Wheatstone Museum. Years later, some electrical items were returned to King's College under a private agreement.

In 1996, after full cataloguing and conservation, all the musical and archival items in the Concertina Museum, Belper that had come from the Wheatstone Laboratory were transferred to the Horniman Museum and now form part of the Wayne Collection there.⁴⁰ The King's College archives contain much material related to their collections of Wheatstone artefacts and their dispersals from the collection. The list of the 'Wheatstone Collection of scientific

³⁸ Hubbard, Geoffrey, *Cooke and Wheatstone and the Invention of the Electric Telegraph* (Routledge & Kegan Paul, 1965), p. 130f.

³⁹ Concertina Museum, Belper, Private communication, 2008.

⁴⁰ The complete Horniman Museum catalogue may be accessed on-line at: www.horniman.ac.uk

apparatus as seen by Officers of the Science Museum⁴¹ from the King's College Archives, bears handwritten annotations of the names of six organisations to which items were passed during the various dispersals:

B = Belfast
 SM = Science Museum
 NW = Mr Neil Wayne
 Edi = Royal Scottish Museum, Edinburgh
 Smith = Smithsonian Institution, Washington
 WM = Whipple Museum of the History of Science, Cambridge

The College later sold further Wheatstone items, (including some of those returned from The Concertina Museum) by auction at Christies South Kensington, in London, 5 March 1987.⁴²

Appendix C.

THE C.WHEATSTONE AND COMPANY SALES, PAYMENT AND PRODUCTION LEDGERS AND THEIR DIGITISATION

The ledgers contain chronological records of the dates of sale and purchaser's name for almost all instrument sales made through the Conduit Street shop, and are, thanks to the research and diligence of Robert Gaskins and Wes Williams, now permanently accessible via the major on-line concertina research database www.concertina.com. The concertina sale ledgers are directly accessible at www.horniman.info, together with an 1866-1891 production ledger, 1845-

46 and two 1848-49 wages and expenditure ledgers, (from the Wayne Collection), and the 1910-1974 production records (from the Stephen Dickinson Collection). Background information on the digitisation of the ledgers is at www.concertina.com/ledgers, which contains hyperlinks to the digitised ledgers at www.horniman.info.

Appendix D.

THE CONCERTINA MUSEUM COLLECTION

The first major Concertina Museum collection, housed in The Old Chapel, Belper, Derbyshire consisted of over 1600 instruments, patent prototypes, manuscripts and archives, including 690 concertinas by every known maker, and related accordions, flutinas and almost all known variants of free-reeded instruments. This collection was acquired by The Horniman Museum in 1996, and their on-line catalogue of the 'Horniman Museum – Wayne Collection' is at: www.horniman.ac.uk/music/music/free_reed_index.html

The author has continued to research the history and sociology of the concertina, and has formed a further research collection of around 250 early instruments, specialising in instruments from British concertina makers working prior to 1860, the early prototypes from the Wheatstone workshops, and memorabilia and inventions related to Charles Wheatstone, together with hundreds of images featuring the instrument and its players. The entire collection is accessible through an on-line database at www.concertinamuseum.com.

⁴¹ King's College Wheatstone Apparatus Dispersals list, April 1949. KCL Archives, Wheatstone Collection, File W6/3-4.

⁴² Auction catalogue: *Scientific and medical instruments, including a collection of scientific instruments and philosophical apparatus from The Wheatstone Laboratory*, King's College, London. Christies, South Kensington, London (5 March 1987).