Dr Stelzner's origina instruments

Alfred Stelzner's scientifically refined violins delighted Joachim, Ysaÿe and Wilhelmj. Why were they so quickly forgotten? asks **James Christensen**

RIGHT a Stelzner viola, showing the tapering rib height

Main instrument photos: Musikinstrumenten Museum Markneukirchen

What science underlies the shape of the violin family? I asked myself this question two years ago when I played an eccentric cello in a dealer's shop in Denmark. The remarkable character of its sound led me to buy it at once and, later, to unearth the story of its forgotten maker, Dr Alfred Stelzner. He asked that same question over a century ago and found part of the answer, or so he believed.

The development of acoustics late in the 19th century, largely by Helmholtz, should have spurred immediate study of the science of the violin. Yet the conviction of most musicians and luthiers that the empirically derived pattern constitutes perfection held back most scientists. Within the lifetime of Helmholtz, however, Stelzner used science to try to improve the sound of the violin by refining its design, achieving widespread recognition.

Born in 1852, a son of the Hamburg photographer and painter of miniatures Carl-Ferdinand Stelzner, Alfred studied the piano and violin as well as mathematics from childhood. He published short fiction in his youth and served a brief apprenticeship in a precision machine-tool factory. His further education, involving both music and mathematics, led to a doctoral degree, said to be from Heidelberg, in mathematics and physics. It seems he entered no regular career after his education, perhaps devoting himself immediately to the problem of the violin, for he had dissipated a large inheritance by the time of his death.

Various sources indicate that he first performed acoustical studies on master violins, but I have found no documents or calculations to support this. He seems to have kept secret his work in developing his ideas. Even the patent for his new design issued in 1891 gives little theoretical background. Its lack of detail may have been meant to make infringement difficult.

The patent, Configuration of the Resonating Bodies in Stringed Instruments, concerns the violin, viola, cello, contrabass and violot an instrument he invented. The four-stringed violotta, tuned in fifths one octave below the violin and played on the arm like a violi was meant to replace the second violin in a string quartet and fill a gap in orchestral music, providin a range and timbre between the viola and cello. Its body length is normal for a viola, about 40cm, b its ribs are much deeper (47mm a the top of the body, 59.5mm at th C-bouts and 53.5mm at the botto and its string length is a little greater. Its music was notated in treble clef but it was meant to sound an octave lower than this.

The patent introduces four inno vations in the sound box: changes the shape of the body outline, in t shape of the two main blocks connecting the belly and the back, the rib shape and in the f-hole sha (see diagram above, a representat of the three figures in the patent).

According to the patent, the outline of the body should consis as much as possible of connected ellipses rather than connected pa of circles and free-form curves. Ellipses, it says, provide better

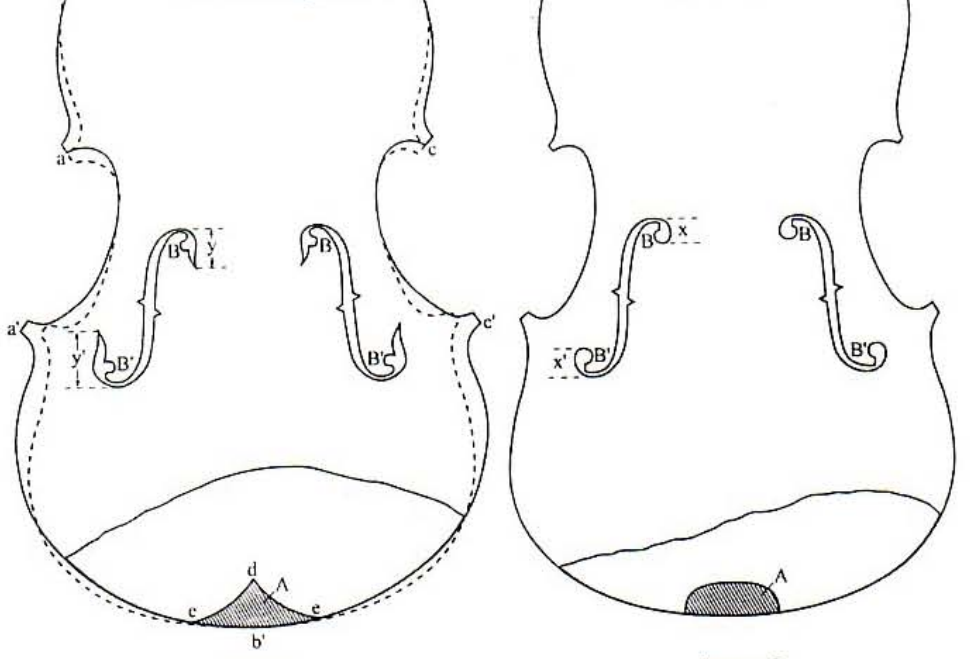


figure 1

figure 2

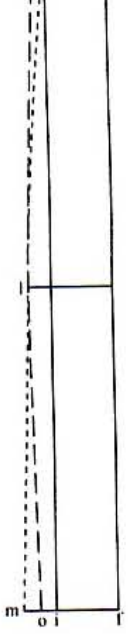


figure 3

resonance conditions because the sound waves produced in the interior air mass 'reinforce each other reciprocally rather than creating interference, thus allowing the vibrating air molecules to develop the maximal energy.'

The two end-blocks should be carved so that their surfaces curve as parabolas 'whose foci, axes and diameters are so related to the ellipses... that at every point there is an amplification of the sound waves.'

The ribs should taper in height, being formed 'so that their upper edges form parabolas, which may be simple or compound'. That is, in some cases the ribs are to be deepest at the middle of the body, tapering to both ends, while in other cases they are deepest at the bottom of the body, tapering parabolically to the top. 'The belly of the instrument is carved, in the usual fashion, out of a plate of wood lying in one plane. When it is glued to the parabolically curved ribs, it must be forced into place on them by means of screw clamps.' The lower edge of the ribs may also follow a slight parabolic curve.

The conventional f-hole forms two tongues of wood, a smaller one at the top and a larger one at the bottom. Stelzner believed the size of these two tongues to be critical. He therefore changed the f-hole shape to make them bigger, saying: 'The purpose of this modification is to produce increased vibration of the tongues and thus amplification.'

The patent provides no mathematical definitions of the ellipses and parabolas, no numerical values and no precise geometrical relationships 'because the acceptable limits within which these relations lie are fairly broad'. It gives no specific dimensions for the different instruments. Stelzner explains only that 'the new instruments use elliptical and parabolic lines whose curvatures relate to one another in such a way as to provide optimal resonance conditions for the sound waves generated as the instrument is played.'

The patent makes no mention of the cellone, a later Stelzner instrument. A large cello, it has four strings tuned to fifths one octave below the violotta and consequently a fourth below the cello. Intended to fill a harmonic gap between the cello and the contrabass, it was notated in the bass clef and it sounded without transposition. In the two that I have seen, the body length (76cm) and dimensions of the bouts are similar to those of a normal cello. However, the ribs are much deeper, measuring 11.5cm at the neck, 13.5cm at the top of the C-bouts, 14cm at the bottom of the C-bouts and 12.75cm next to the endpin. Its string length is 71cm, nut to bridge, longer than that of a cello.

According to newspaper accounts of Stelzner's speeches, he believed his scheme of mathematically calculated surfaces to underlie the design of all instruments constructed according to the traditional pattern. He thought ▸

The three figures, slightly redrawn, presented in Stelzner's patent

FIGURE 1 the proposed outline of the bouts, shown by the curves abc and a'b'c'. The dotted line represents the outline of conventional instruments consisting of connected circles (arcs), while the solid lines show the proposed outline based on ellipses. The two main blocks, labelled A, are configured so that their surfaces, de, form curves, parabolas, 'whose foci, axes and diameters are so related to the ellipses, abc and a'b'c', that at every point there is an amplification of the sound waves'

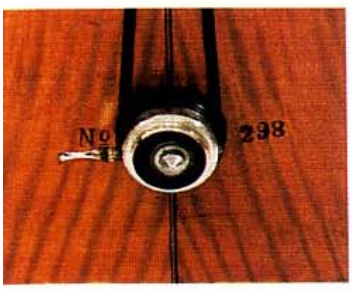
FIGURE 2 the standard nondescript ovoid shape for the blocks. The body line and f-holes are also conventional

FIGURE 3 the proposed configuration of the ribs, where the rectangle fghi approximates the conventional design in which the ribs are only infinitesimally higher at the lower end of the instrument than at the upper. The proposal is for the upper edge of the rib, defining the surface to be covered by the belly, to form a parabola, either simple, as in the curve klm, or compound, as in the curve nlo. The latter curve, producing ribs that are highest at about the level of the bridge, was selected for the violottas that I have seen, whereas the former, in which the rib is highest at the bottom or base of the body, was used in the cellos that I know about.

The shape of the f-holes is altered so that the lengths x and x' (see figure 2) are replaced by the greater lengths y and y' (see figure 1) to increase the mass of the two vibrating tongues of wood B and B'

ABOVE with its new timbre, somewhere between that of the viola and cello, the violotta proved particularly popular. 'It opens many orchestral possibilities which were not available earlier,' reported one newspaper in 1891

BELOW each instrument had a serial number, which was written on the label and branded beside the end-peg



that empiricism had led Italian makers of the 17th and 18th centuries to come close to the plan he had discovered. The best instruments, he believed, approach his defined system, their tone varying in beauty, strength and carrying power to the extent that they approximate it.

Stelzner's changes are not excessive. In conventional instruments, a series of linked arcs that approach an elliptical curvature forms the outline of the bouts, and the ribs taper slightly. Also, the shape, size and position of their f-holes vary to a considerable degree. Stelzner simply rationalised, defined and standardised certain features of the sound box that had been found empirically to be important.

I have discovered no precise numerical descriptions of the geometry of the Stelzner models written by him or anyone else, and his moulds and tools seem not to have survived. His different instruments are not simple scale models of one another but show considerable variations in their proportions. He clearly found the acceptable limits for the relationships of the various sections to be broad, as the patent states, and he modified those relationships for each kind of instrument according to ideas or principles that we cannot now discover.

With the support of a few investors, Stelzner established production at Wiesbaden even before his patent was issued. He did not make instruments himself, employing instead the established violin maker Richard Wiedemann. Stelzner moved his operation to Dresden in 1893, where Augustus Paulus produced the instruments. Paulus, who came from Markneukirchen, had taken over Weichold's Dresden workshop.

The table on p.1125 lists the Stelzner instruments that I have inspected or know something about reliably. The unique outlines of the body and the shapes of the f-holes are conspicuous. The handwritten labels contain Stelzner's signature, the handwritten date of completion and the serial number. He numbered his instruments in sequence of production, regardless of kind, the number appearing also as an external brand next to the end-peg. The inside of the back contains two other brands, one saying 'nach Dr Alfred Stelzner's

Fittings of identical design characterise all the instruments: a ribbed ebony tailpiece and ebony pegs with bulbous outer margins. He always used high-quality maple and spruce and a spirit varnish without vivid staining or decoration. The rib height follows a compound parabolic line in the violotta and cellone, a simple parabola in the others.

My inspection of the instruments and Stelzner's surviving business records suggest that he produced all kinds of instrument simultaneously and rapidly. No.7, violin, is dated 1891, while no.100, viola, is dated April 1893. Thus he made 93 instruments in 28 months. A comparison of higher serial numbers and dates indicates a much slower rate of production later. The instruments he produced of one kind appear to be identical.

Stelzner promoted and sold his instruments, at least in 1893, through agents in Hamburg, Brussels, London and New York. He was not without ego, writing: 'I believe that in the future I will be recognised as the foremost authority on the manufacture of bowed stringed instruments, as well as the creator of the definitive form of the violin's resonating body.'

Many testimonials by experts appear in a booklet apparently produced by Stelzner as a marketing tool. Eugène Ysaÿe wrote: 'Your instruments are desirable for the power and beauty of their tone, and there is no doubt of the advance you have achieved through the originality of your construction methods.' Cellist and composer David Popper said: 'To my delight I found that the tone of this instrument did not have the unfinished quality one usually finds in new instruments. On the contrary, especially on the bass strings, the tone more like the noble sound of the old Italian master instruments.' A more specific comparison with Italian instruments came from August Wilhelmj: 'Your new violin won a signal victory when compared with the splendid Guarneri you own, and the ▸

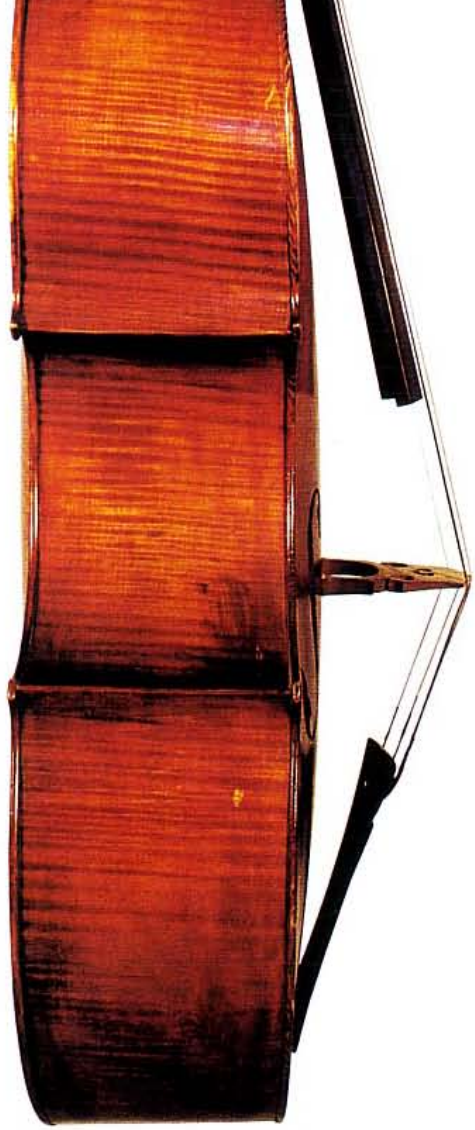
of your bass instruments were unparalleled by anything I have ever heard.' Other newspaper articles allude to commendations from Joachim (who apparently purchased some of the instruments) and from Helmholtz himself.

Newspapers also enthusiastically described concerts performed on Stelzner instruments by the Halir, Rappoldi and Rosé Quartets. Other concerts incorporated all the instruments that Stelzner made. Special music was needed for these combinations, composed by Stelzner himself and by established minor composers of the time, Arnold Krug, Ferdinand Behm, Otto Kaletzsch, A.E. Gerspacher and Felix Draeseke.

To demonstrate his different instruments' timbre in orchestral string sounds, Stelzner composed operas (apparently both libretto and music) incorporating them. These included *Rübezahl*, a seven-act opera performed in the Dresden Court Theatre in 1902, and *Swatowit's Ende*, performed at the Court Theatre in Kassel in 1903. Max Schillings scored the violotta as a solo instrument in the orchestra in his opera *Der Pfeifertag*.

Several articles praised the new instruments, especially the violotta. said on 7 November 1891: 'The violotta with its new timbre necessarily opens many orchestral possibilities which were not available earlier. It is believed that the new instrument will create something like a revolution in composing for stringed instruments.' And from the *Berliner Lokal-Anzeiger* of 20 December 1891: 'The invention of this new system is an event of the first rank, quite capable of ushering in a new epoch in the luthier's art... We will yet see Stelzner's instruments completely replacing the conventional ones.'

Other accounts described Stelzner's innovation as another in a series of such reforms, all failures. Arnold Dolmetsch, writing in the Musical News, disparaged the Stelzner instruments exhibited at Wigmore Hall in 1891, where a lecture by the maker preceded performances on a violotta and a string quartet composed of Stelzner instruments. Dolmetsch asserted that Stelzner's acoustical theories were deduced from wrong principles, that other scientific principles he accepted were controversial and that several of his statements were incorrect. He condemned the sound of the violotta, saying that the player gave pleasure in spite of ▸



The cellone's measurements are similar to those of the cello, except for the ribs, which are much deeper. Its strings are tuned a fourth below the cello's

Stelzner instruments seen by or reported to James Christensen

Number	Class	Site	Date	Label	Brands	Fittings	Varnish	Location
7	Violotta	Wiesbaden	1891	Typical	Typical	Typical	Typical	Markneukirchen
21	Violotta	Wiesbaden	Feb 1892	Typical	Typical	Typical	Atypical	Markneukirchen
92	Violin	Dresden	Apr 1893	Typical	Typical	Typical	Typical	Markneukirchen
100	Viola	Dresden	Apr 1893	Typical	Typical	Typical	Typical	Markneukirchen
144	Violin		1893					Nuremberg
151	Bass	Dresden	July 1893	Typical	Typical	Unknown	Typical	Pvt – Lübeck
152	Cellone		1893					Cologne?
175	Violotta		1893					Nuremberg
177	Cellone		1893					Nuremberg
252	Cello	Dresden	Dec 1893	Typical	Typical	Unknown	Typical	Pvt – Molsheim
	Cellone		1893					Leipzig
296	Viola		1894					Nuremberg
298	Cello	Dresden	1894	Typical	Typical	Typical	Typical	Pvt – Iowa City IA
325	Violotta	Dresden	1896	Typical	Unknown	Typical	Typical	Vermillion SD
329	Violotta	Dresden	1899	Typical	Typical	Typical	Typical	Berlin
	Violotta		1899					Leipzig
	Violin	Dresden	Unknown	None	None	Atypical	Atypical	Halle
	Cellone	Unknown	Unknown	None	Typical	Typical	Atypical	Markneukirchen

pvt: private collection

of Stelzner instruments produced a rough and unsympathetic tone.

Such attacks were anticipated. An article in *Zeitschrift für Instrumentenbau* said of Stelzner's newly established firm: 'The partners in this enterprise must come to terms with the fact that they will encounter great difficulties in the introduction of these instruments, for there are no more conservative circles than those of our violinists and cellists, and the advantages of the new family of instruments would have to be quite concrete in order to sway these gentlemen in any way.'

A warning in the *Neue Zeitschrift für Musik* in December 1891 said:

> The significance of Stelzner's innovation is also demonstrated by the fact that, as with every innovation, two parties arise, a party of light and a party of darkness. The former, led by the best and most famous artists, such as Professor Emile Sauret at the Royal Academy of Music and Monsieur Eugène Ysaÿe, recognise without any hesitation the beauty and fullness of tone which distinguishes the new instruments to such a high degree, and they recognise that their students and lesser musicians will now be able to obtain for a moderate price an instrument which equals all the good qualities of the old Italian master instruments. But the other party that has formed is the party of envious grumblers, the charlatans who wrap art in a mysterious darkness in order to exploit their clients, the uninformed. Who are these but the dealers who traffic in old instruments, yearly bringing in thousands upon thousands of pounds sterling. It is no wonder that these gentlemen hope to delay the day of reckoning as long as possible.

Thus Stelzner's life was not easy. In 1894 a notice appeared of a bankruptcy hearing concerning his firm. Later that year he published an appeal to 'rich, unprejudiced friends of music and capitalists' to raise money for his instrument-

A Stelzner violin, with the distinctive f-holes he designed to amplify the instrument's sound

He stated that he already had built over 300 bowed instruments, sold all over the world. Some financiers must have appeared, for he continued to produce instruments as late as 1899, but bankruptcy ultimately ensued. He took his own life on 14 July 1906, three days after sending the unpublished score of his opera *Cecelia* to his brother.

I do not doubt the depth of Stelzner's commitment and the strength of his belief that he had made a wonderful discovery. He probably imagined that the future would bring him the reputation he deserved. Instead, however, he was soon forgotten. In 1920 Apian Bennewitz summarised the reception of Stelzner's instruments: 'Time has shown that this kind of instrument has fallen into obscurity. It has been impossible to introduce it in spite of all the good reports. The configuration of tensions between the back and the belly created by the high middle ribs created a characteristic tone that had no relation to the ideal tone we are accustomed to – free, Italian, agreeable. And so these instruments, interesting though they may be, have only a curiosity value.' Yet at least a few makers admired the model, for the musical instrument museum at Markneukirchen, of which Bennewitz was the director, has two copies of Stelzner violins.

Why did Stelzner so quickly fall into obscurity? His secretiveness about his thinking may have put off other violin makers. He was a major force neither in the world of mathematics and acoustics, nor in the world of musicians and instrument makers. He was a German who ventured to enter a world dominated by Italians. He worked in Saxony, whose violins were then viewed with a degree of condescension. Considering all this, it seems remarkable that he achieved the recognition he did.

I suggest that Stelzner's instruments should be looked at, not as novelties to be compared to the established tradition, but as the results of a first scientific approach to the design of the violin and its kindred. How would modern acoustical methods define the distinctive tone qualities of his instruments? Exactly which elements of his innovative plan produce them? A detailed and dispassionate study of those that survive might help to dispel some of the mystery and mysticism that still surrounds the structure of violins. ■

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