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ROBERT HOWE

The Boehm System Oboe and its Role in the Development of the Modern Oboe

Histories of the oboe present Guillaume Triébert and his sons as the prime movers of 19th century progress. While their role in developing the modern French oboe is indisputable, the contributions of a competing Parisian inventor, Louis August Buffet, are overlooked. Most historians view Buffet's Boehm oboe as an inconsequential flash in the pan which was rarely made or played;¹ others ignore it entirely.² Indeed, some of the largest museum collections in the United States lack specimens of this instrument.³ A close examination of the evidence, however, shows that the Boehm oboe was used by major players in Paris and London; was used extensively in military and other outdoor music in western Europe and North America until the middle of the 20th century; was manufactured widely throughout Europe; and suggested the design of later oboes, including those that are universally used today. This paper examines Buffet's Boehm system oboe and the pivotal role that it played in the development of the modern oboe.

THE ORCHESTRAL WOODWINDS IN THE 1830S AND '40S

By 1830 each of the orchestral woodwinds had keys to give a complete chromatic scale without excessive use of fork or half fingerings. The 8-key flute, 10- 12-key oboe, 12- 13-key clarinet and 9-key bassoon were all 'simple system' instruments: individual keys, which did not interact, were placed around the six major fingerholes. The design started with the hand and the instrument was built to fit it. The positions of a woodwind's toneholes are not rigidly fixed; a smaller hole higher up will give the same pitch as a larger tonehole further down, but the smaller hole will produce a more resistant note with a smaller sound. In the simple system woodwinds, many of the toneholes were drilled smaller and higher on the instrument than would have otherwise been the case in order to fit the hand, resulting in mismatches in the timbre and response of various notes.

¹ Philip Bate, *The Oboe*. (London: Ernest Benn Limited, 1956), 71–4. Other writers echo Bate's opinion. Anthony Baines, *Woodwind Instruments and their History*. (New York: W.W. Norton, 1963) 326–8. Leon Goosens and Edwin Roxburgh, *Oboe*. (New York: Schirmer Books, 1977), 22. Gunther Joppig, *The Oboe and the Bassoon*. (Portland, Oregon: Amadeus Press, 1988), 84–5. Translation by Alfred Clayton of *Oboe und Fagott*. (Bern: Halliwag AG, 1981). Mary Remnant, *Musical Instruments*. (Portland, Oregon: Amadeus Press, 1989), 124–125. Geoffrey Burgess, 'Oboe' (II, 3). In Stanley Sadie, ed: *The New Grove Dictionary of Music and Musicians*, second edition (London: Grove, 2001) 18: 273.

² 'Oboe'. In H. C. Colles (editor), *Grove's Dictionary of Music and Musicians*, (third edition). (New York: Macmillan, 1927, 3: 674–7. Cecil Forsyth, *Orchestration*, second edition. (London: Macmillan, 1935; reprinted by Dover, New York, 1982) 204–19. Adam Carse, *Musical Wind Instruments*. (London, 1939; reprint by Da Capo Press, New York, 1975), 120–147. Anthony Baines, *The Oxford Companion to Musical Instruments*. (Oxford: University of Oxford Press, 1989), p. 224. Karl Ventzke, in his monograph *Boehm-Oboen und die neueren französischen Oboen-systeme*. (Frankfurt am Main: Verlag Das Musikinstrument, 1969), 10, complains that modern organologists repeat negative judgements on the Boehm oboe derived from earlier sources without further study.

³ Specimens are found in the Fiske Museum and the Smithsonian, but not at the Metropolitan Museum, the Yale Musical Instrument Collection, America's Shrine to Music Museum, nor the Museum of Fine Arts, Boston. Several distinguished European collections also lack Boehm oboes.

In 1832 there began a revolution in woodwind design, led by Theobald Boehm of Munich. Boehm had a unique combination of skills; he was a jeweller, flautist and flute maker. He was also a keen student of acoustics, a nascent branch of physics at the turn of the 19th century.⁴ He could thus realize what the simple system flute lacked in pitch and response, devise a rational solution to the problems, and build the fine metal parts needed to construct a flute that would solve these problems.⁵ His design of the first Boehm system flutes occurred as an epiphany, which he described thus:

On a flute thus improved, but constructed on the old system, I played in 1831, first in Paris, and afterwards in London; where I was struck with the powerful tone which Charles Nicholson, then playing with all his energy, was able to produce. This was owing to the uncommon largeness of the holes of his flute, and the consequent freer development of the notes. But it required Nicholson's extraordinary talents and excellent embouchure to conceal the defects of his flute in regard to intonation and equality of tone—defects which were owing to the incorrect position of the holes....

...I resolved to adopt neither the large-holed ordinary flute, nor other mere mechanical changes, but rather to spend time and trouble upon the construction and practice of a *totally new flute*, in which equality of tone and pure intonation should be united with the means for executing every possible combination of notes by a new kind of key-mechanism.

On my return to Munich, in 1831, I began immediately the execution of my project; and, after having carefully re-examined different bores, and several systems of fingering which I had sketched out before I decided upon that with ring-keys as, on the whole, the best.

The success answered my expectations. In a few months I had acquired the facility of playing at concerts and in the orchestra...the full and even tone, and the pure intonation of my flute, were immediately observed and appreciated.⁶

Quoting Boehm again:

1. Free and therefore powerful tones can be obtained only from large holes which are placed as nearly as possible in their acoustically correct positions.

2. If the holes are small and are considerably removed from their proper places, the formation of the nodes of vibration is disturbed and rendered uncertain.

3. The smaller the holes, the more distorted become the tone waves, rendering the tone dull and of poor quality.

4. The pure intonation of the third octave depends particularly upon the correct position of the holes.⁷

Modern acoustics concurs with these theorems.⁸

Boehm introduced this new model in 1832. His unique insight was to redesign the flute from first principles. Rather than drilling holes at the locations of fingers 1 to 6 and applying keys as needed, Boehm took the acoustical requirements of the flute as his starting point and calculated the locations of large tone holes.⁹ His mechanism allowed the player to cover each tone hole by pressing a conveniently-located ring (a *brille*). Fingers could cover holes far removed from their normal reach, obviating the need to move or to alter the size of the tonehole. The salient characteristic of a Boehm system woodwind is this use of large tone holes, activated as need be from a distance.

By 1838, French woodwind makers recognized the value of Boehm's innovation and borrowed freely from his designs, which required more elaborate key systems than had hitherto been used.¹⁰ Keys before Boehm were typically simple, single pieces mounted in wooden blocks left during the turning of the instrument or in metal boxes screwed into the wood. To make more sophisticated key systems, makers took advantage of developments in metal and woodworking during the second quarter

⁴ Patrizio Barbieri, 'Musical Instruments and Players in J.-A. Charle's *Acoustique* (Paris, c.1787–1802) and Other French Technical Sources,' *Journal of the American Musical Instrument Society* XXIII (1997): 94–120.

⁵ Theobald Boehm. *The Flute and Flute-Playing*. (New York; Dover, 1964), V. Translation by Dayton C. Miller, 1922, of *Die Flöte und das Flötenspiel*, (Munich, 1871).

⁶ Theobald Boehm, *An Essay on the Construction of Flutes, giving a history and description of The Most Recent Improvements, with an explanation of the principles of acoustics applicable to the manufacture of wind instruments*. (Leipzig: Oppenheimer Brothers, 1882), 12–13.

⁷ Boehm, *The Flute*, 26.

⁸ Arthur H. Benade, *Fundamentals of Musical Acoustics*. (Oxford: Oxford University Press, 1976; reprinted by Dover, New York, 1990), 430–504. Cornelius J. Nederveen, *Acoustical Aspects of Woodwind Instruments*. (De Kalb, IL: Northern Illinois University Press, 1998), 73–79. Neville H. Fletcher and Thomas D. Ross, *The Physics of Musical Instruments*. Second Edition (New York: Springer-Verlag, 1998), 461–502.

⁹ The term 'fully vented' is often used with reference to Boehm's work, but never defined. I thus prefer to avoid the term.

¹⁰ Tula Giannini, *Great Flute Makers of France*. (London: Tony Bingham, 1993), 106–31.

of the 19th century. Most important were *brilles*,¹¹ which could be applied to a single tone hole from a block mount. Boehm's application of *brilles* to consecutive toneholes was impractical for block mounted keys and thus required pillars drilled into the wood, a device to accurately pierce these pillars so that the keywork between them ran true, and the use of long axles: Boehm invented all of these. Other advances included the invention of needle springs by Louis August Buffet in 1837; the use of the drill press for tone hole boring, which allowed precise and reproducible placement of a perfectly straight-sided tone hole; Iwan Müller's use of countersinks to cut a sharp edge for pad seating and of stuffed pads of soft material in place of hard felt;¹² the use of harder metals as bits and bores, allowing the use of more stable tropical hardwoods;¹³ the use of German silver and nickel silver as key materials,¹⁴ and application of the scientific method and acoustical research to wind instrument design.

Guillaume Triébert, a Hessian emigré to Paris, used these advances to mechanize the 10-key oboe without greatly changing the bore or tone holes. His *Système 3* (1840) applied Henri Brod's half-hole device to simplify the middle register notes C#2, D2 and E♭2.¹⁵ Simple system oboes used a corrector key, awkwardly opened by the middle or ring finger of the right hand, to bring the fingering 1234 up to pitch for F#. Triébert placed a *brille* on 5 and 6 which depressed to close a hole below 4; this hole was opened for F#, thus properly tuning the note in both octaves and improving technique. Triébert's *Système 4* (1843) made minor refinements to the *Système 3*: he placed a *brille* on hole 2 to tune the middle-finger C2, put a solid key on hole 5 to stabilize d3, added

the 'butterfly' axle (as is still used) for D# and low B, and standardized the array of three touchpieces for C, C# and E♭ for the right small finger. (Figure 1, which will be found in the colour supplement. Figures 2, 8, 9, 10, 12, 13 and 15 are also in the supplement and when referred to in the text are followed by the letters cs.)

These improvements were inadequate to meet the demands of the music of the era. Berlioz wrote in 1843 that the useful melodic range of the oboe (Triébert's *Système 3*) was limited to g1–d3 and cautioned against excessively technical writing, noting that of 61 possible whole and half-step trills within the range of the oboe (B to f3), 13 were difficult and 13 others impossible.¹⁶ The time was ripe for further improvements in the oboe's design.

Louis Auguste Buffet was a prominent Parisian wind instrument maker. With the Parisian flautist Victor Coche, he produced Boehm flutes with Boehm's tacit permission and advice. In modifying the 1832 Boehm flute he invented key work that included a rod travelling within another rod, in order to carry two distinct trill keys.¹⁷ He patented this flute and presented it to the Paris Conservatoire and the 1839 Paris Exhibition.¹⁸ Buffet thus was intimately familiar with Boehm's theorems and the mechanical problems of large countersunk toneholes, *brilles*, and other current developments in woodwind technology.

In 1839 Buffet demonstrated a clarinet based on Boehm principles at the Paris Industrial Exhibition.¹⁹ In 1844 he patented this and a similarly designed oboe: both took bronze medals at the Paris

¹¹ *Brilles* were invented (but not used on extant instruments) by Fredrick Nolan in 1808 (British Patent 3183, 26 November 1808). Posts and the equipment to place them were invented and first used with *brilles* (but not patented) by Theobald Boehm around 1830. It is not known if Boehm was aware of Nolan's work. See *Patents for Inventions. Abridgements of Specifications Relating to Music and Musical Instruments. A.D. 1694–1866*. (London: Office of the Commissioners of Patents for Inventions, 1871. Facsimile published by Tony Bingham, London, 1984). Also see Boehm, *The Flute*, 28.

¹² William Waterhouse, *The New Langwill Index. A Dictionary of Musical Wind-Instrument Makers and Inventors*. (London: Tony Bingham, 1993), 275. Jack Brymer, *Clarinet*. (New York: Schirmer Books, 1976) 43–44.

¹³ Boxwood, the material of choice for the upper woodwinds before this time, was too sensitive to humidity to permit a mechanized oboe or clarinet. Robert Howe, 'The First Mechanized Oboes: Triébert's *Systèmes 3* and *4*', *The Double Reed*, 24:2, 17–29, 2001.

¹⁴ German silver was invented in 1823 as Neusilber by Henninger in Berlin and in Lößnitz by Geltner. Maillechort, or nickel silver, was invented in 1820 by Maillot and Chorrier, hence the name. Both are alloys of copper, zinc and nickel; the terms are interchangeable in modern usage. Waterhouse, *Langwill Index*, 500.

¹⁵ Robert Howe, 'Development of the French Simple System Oboe 1800–1840', *The Double Reed* 24:1, 59–75, 2001.

¹⁶ Hector Berlioz, Richard Strauss, *Treatise on Instrumentation*. (1904; translated and edited by Theodore Front. New York: Dover Publications, 1991), 163–4.

¹⁷ Nancy Toff, *The Flute Book*. Second edition (Oxford: Oxford University Press, 1996) 50–57, discusses the 1832 Boehm flute and Buffet's improvements to it in clear detail.

¹⁸ Giannini, *Great Flute Makers*, 109–10; 216–7.

¹⁹ Albert R. Rice, 'Berr's Clarinet Tutors and the 'Boehm' Clarinet'. *Galpin Society Journal* XLI: 12, 1988.

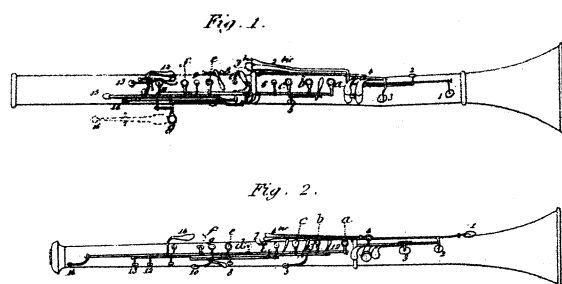


Figure 3. Boehm oboe and clarinet as illustrated in 1844 patent. Courtesy Tony Bingham, Bruno Kampmann. By permission, Bureau de Brevet. Institut National de Propriété Industrielle, Paris.

Exhibition of that year (Appendix 1, Figures 2cs, 3).²⁰ The clarinet was the Boehm system as used today, which Buffet had developed not with Boehm but rather with Hyacinthe Klosé, professor of clarinet at the Paris Conservatoire.

Buffet's oboe was designed with the help of Pedro Soler, a Parisian oboist.²¹ Boehm also advised Buffet,²² supplying a boring bit and tone hole dimensions. This led to a wider bore and larger tone holes than were found on Triébert oboes.

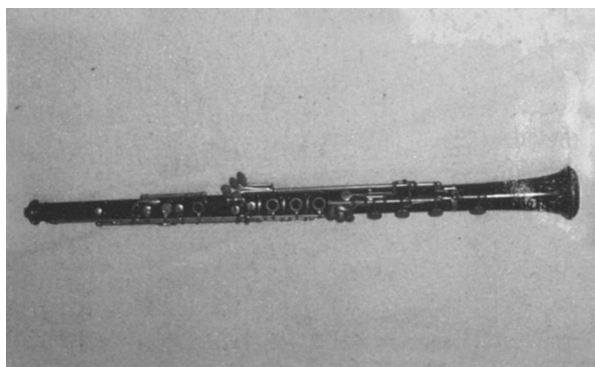


Figure 4. Boehm system oboe by Louis August Buffet demonstrating model shown in patent. Bate Collection Oxford, #237. By courtesy of the Bate Collection and Dr. Hélène La Rue.

TECHNICAL ANALYSIS OF THE BOEHM OBOE

An early Boehm system oboe is shown in Figure 2cs. Made by Buffet-Crampon in Paris,²³ it has no serial number. The body is of palissander with nickel-silver keys. The two body pieces are bridged by keywork which permanently joins them; the oboe is not disassembled for storage. The trademark includes the initials 'SDGD',²⁴ proving a date after 1844, while the salt-spoon keys suggest a date before 1860.

The Boehm oboe's mechanism is virtually a copy of Buffet's adaptation of the Boehm flute (Figures 4, 5); this was as technically advanced a woodwind as was possible at the time. The left hand C key is reserved, as on the flute, for the left thumb, which is raised for C but closes the key for B and lower notes. The thumb also has an octave key for E-G#; the left palm opens an octave vent for higher notes. The six main tone holes are furnished, as on the flute, with a solid key (plateau) for 1, and *brilles* for 2–6. By starting with only 1 down and adding first the left thumb, then 2, 3, 4, 5, 6 and the right small finger in succession, a C major scale results. A halfhole mechanism under 1 regulates this critical vent, used for C#–D# in the second octave. B♭ can be obtained as a forked note (1–3) or with a right hand side key, as on a simple system, Triébert Système 3 or Système 4 oboe. The Boehm oboe has a connection between the two hands so that closing 4, 5 or 6 lowers a key between 1 and 2 which puts B down to B♭. Thus, 1–3, 1–4, 1–5 or 1–6 also produce B♭, simplifying slurs from G, F, E or D. A second key for the right palm opens C.

The fingerings for F and F# reverse the *brille* mechanism Triébert used; 1234 sounds F and 1235 or 1236, F#: this mechanism is often referred to as 'Boehm fingering' and simplifies playing in flats.²⁵ A unique feature of the Boehm oboe is a touch for 6 which closes the F# tonehole to allow a trill or slur from F to F#; this differs from the mechanism Boehm used on the flute, and from that Buffet/Klosé used on the clarinet, to accomplish this slur.²⁶ Successive

²⁰ Waterhouse, *New Langwill Index*, 50; Gianninni, *Great Flute Makers*. 106–110, 217. 'Boehm system clarinet' is a misnomer, as Boehm had no role in the development of this instrument. 'Klosé système' might be more accurate, but a century and a half of usage will not be denied.

²¹ Bate, *The Oboe*, 72. Waterhouse, *New Langwill Index*. 377.

²² Bate, *The Oboe*, 71–74.

²³ A nephew and rival of Louis Auguste Buffet, Jean Louis Buffet adopted the trade name 'Buffet-Crampon' c.1840. Waterhouse, *New Langwill Index*, 49. In this paper 'Buffet' refers to Louis Auguste.

²⁴ 'Sans gaurantee du Gouvernement', ie, the French government assigned a copyright without certifying the novelty or validity of the idea. This is seen in specimens made after the patent law of 1844. (Loi du 5 Juillet 1844, articles 32, 33. By courtesy of Bruno Kampmann).

²⁵ Simple system flutes, simple and Albert clarinets and Triébert oboes all use 1234 for F# and 1234–6 for F.

²⁶ In Klosé's clarinet, the little key opens a small closed tonehole to bring F up to F#, rather than closing an open tonehole to bring down G.

open-standing keys are sequentially depressed to produce low C#, C and B; this logical system gives low D, C# and C with uniform tone, unlike the mechanism adopted in the other oboes of the day and carried over to today.²⁷ There is no articulation between the right hand and the G# key, but it is not needed. Fingering F# as 1236 and leaving the right hand down while opening the G# key produces an in-tune trill between F# and G#.²⁸ Similarly, C# and D# are not articulated, but the large toneholes give a clean trill by keeping the C# key down with the right hand and trilling D# with the left. A key for 5 trills b1 to c#2, or their octaves; later Boehm oboes have a second such key for 4 to trill c2 to d2.

In accordance with Boehm's theorems, the large toneholes and bore of a Boehm oboe are located further down on the body of the instrument than those of a Triébert Système 3 or 4 oboe, and produce a stronger sound. Basic bore and tonehole data for a collection of Boehm oboes are compared to those of Triébert Système oboes in Tables 1–4.

The earliest Boehm oboes had the three touchpieces for E flat, C sharp and C in a row. These were moved for facility; the later, preferred configuration is identical to that of the same keys on the Boehm flute. Buffet's patent describes a low C touch for the right thumb, which proved to be redundant.²⁹ Some Boehm oboes had ranges extending to Bb or even to A. The model illustrated in Figure 2cs had become standard by the 1860s³⁰ and is seen in virtually all extant specimens.

EARLY USE OF THE BOEHM OBOE BY SYMPHONIC PLAYERS

The Boehm oboe was introduced by a prominent maker at the time and place where experimentation in woodwind design was at its historical peak. It was thus auditioned by many leading players. It is unlikely that this radical change in oboe design

would have been given a fair trial anywhere else; players are understandably conservative to fundamental changes in the nature of their instruments.

Apollon Marie Rose Barret was a Parisian player who became prominent in London. The introduction to the 1862 revision of his *Method* (still used at American conservatories) described the development of his Barret system oboe. He noted, 'Many endeavours also have been made to improve the tone and fingering of the oboe. *Boehm's system prevailed for some time*, but the great inconvenience of that system, which diminishes the compass and changes entirely the quality of the tone, has induced me to make new researches.'³¹ Barret also thanked Triébert for his help in developing the Barret system oboe.

The Boehm oboe was used by two major players through their careers. Antoine Joseph Lavigne, another French expatriate, played first oboe at the Italian Opera in London. A contemporary writer noted

'...the Boehm oboe has been adopted in this country...' (i.e., England) '...by M. Lavigne, who is so celebrated as a solo player. His execution on it is amazing, and it seems to have double the power of the old oboe, enabling him to make extraordinary *crescendos* and *diminuendos*. Unfortunately, however, when playing in the orchestra he does not always refrain from using the extra power he has at his command, and so causes the oboe to unduly predominate. This creates a prejudice against the instrument, especially as the characteristic reedy tone is intensified, and assumes a piffero-like *timbre* in the loud sounds.

...I learn from M. Buffet, who made the instrument on which Lavigne plays, that, though it was bored on a model, or bit, as it is technically called, he received from Boehm, the holes, by M. Lavigne's instructions, were made larger than those proposed by Boehm. This, of course, would account for the altered tone.'³²

²⁷ Robert Howe, 'The Development of Simple System Keywork, 1800–1825'. *The Double Reed* 23:4, 2000, 21–28. Howe, 'French Simple System Oboe', 67–68.

²⁸ This is a trick that Boehm clarinet players can use for the famous f#2-g#2 trill in the march *Les Dragons d'Alcala* from Bizet's *Carmen*. The passage is often played on A clarinet as g2-a2, but works perfectly with this method.

²⁹ A similar mechanism, introduced by Couesnon on saxophone in the early 20th century, also gained no lasting fame. The auxiliary low C on a modern Conservatory system oboe, which is hard to reach and has a poor mechanical advantage, is used only for the very rare low C-Db trill.

³⁰ This is shown by the Triébert catalogue discussed below, by catalogues of other makers, and by the great bulk of extant specimens. *Catalogue des Instruments de Musique de la Manufacture Generale de Gautrot Aine & Cie.* (Rennes Typographie Ch. Oberthur & Fils, 1867). Reprinted in *Larigot*, X Special, April 1999, 132–35. Also, *Catalogue General Illustré des Instruments de Musique de Maison David.* (Paris: N.-M. Duvall, 1883). Reprinted in *Larigot* 17, August 1995, 15–29.

³¹ The italics are in the original. Apollon Marie Rose Barret, *A Complete Method for the Oboe.* (London: Boosey & Hawkes, No Date; reprint of Second Edition 1862). 2:1.

³² Christopher Welch, *History of the Boehm Flute.* (New York: McGinnis & Marx, facsimile reprint of 1892 second edition, 1961), 5, 226. Two of Lavigne's unique oboes are items 227 and 228 in the Bate collection of the University of Oxford; these are shown in Bate (*The Oboe*, 72–3, 169, plate V), while an unfinished oboe is Bate collection number 229. The Belgian musicologist François-Joseph Fétyis commented favourably on Lavigne in his *Rapport des Sons et de*

Table 1.

BORE DIAMETERS OF BOEHM AND TRIÉBERT SYSTÈME OBOES.

Instrument	Bore at: Top	3	6	C	Bell
Boehm, Buffet-Crampon, c.1860	4.95	11.8	15.5	19.8	34.8
Boehm, Buffet-Crampon, c.1880	5.31	12.0	15.6	19.4	32.2
Boehm, Buffet-Crampon, c.1920	4.75	11.2	14.9	19.2	36.6
Boehm, Carcassone, c.1880	5.59	11.9	15.3	19.1	30.6
Boehm, Lauber, c.1915	5.06	11.1	14.2	19.1	31.5
Boehm, Rampone & Cazzani, c.1920	5.43	12.0	15.4	21.0	31.2
Nouveau Boehm, Triébert, c.1880	4.29	8.5	12.2	15.7	28.9
Système 3, Triébert, c.1840	4.21	8.6	12.2	16.3	38.3
Système 4, Triébert, c.1850	4.29	8.8	11.9	16.6	37.9
Système 6, Lorée H39, c.1895	4.07	8.7	11.8	16.0	38.8
Oboe-Sax, Lorée AE69, 1930	3.89	8.8	11.5	15.0	35.5
Système 6bis, Lorée CY68, 1973	3.90	8.6	11.8	14.8	37.6
Système 6bis, Lorée MZ05, 1997	3.99	8.5	11.7	14.9	36.3

Data are in mm.

Table 2.

TONEHOLE DIAMETERS OF BOEHM AND TRIÉBERT SYSTÈME OBOES.

Instrument	Diameter of: 3	6	C	T/B Ratio of: 3	6	C
Boehm, Buffet-Crampon, c.1860	6.90*	8.27*	9.57*	0.585	0.534	0.481
Boehm, Buffet-Crampon, c.1880	7.49	8.37	9.52	0.624	0.537	0.491
Boehm, Buffet-Crampon, c.1920	7.57	8.49	9.31	0.676	0.570	0.485
Boehm, Carcassone, c.1880	7.50*	6.99*	10.37*	0.630	0.457	0.543
Boehm, Lauber, c.1915	7.01	7.85	9.30	0.632	0.553	0.487
Boehm, Rampone & Cazzani, c.1920	7.54	7.02	9.34	0.628	0.456	0.445
Nouveau Boehm, Triébert, c.1880	6.59*	7.26*	7.26*	0.77	0.595	0.462
Système 3, Triébert, c.1840	2.33*+2.01*	4.43*	9.73*	0.36	0.363	0.597
Système 4, Triébert, c.1850	2.11*+2.03*	5.37*	9.58*	0.33	0.451	0.577
Système 6, Lorée H39, c.1895	3.84*	5.42*	9.53*	0.44	0.459	0.596
Oboe-Sax, Lorée AE69, 1930	3.89*	5.95*	8.85*	0.44	0.527	0.590
Système 6bis, Lorée CY68, 1973	3.58*	5.48*	9.34*	0.42	0.464	0.631
Système 6bis, Lorée MZ05, 1997	3.80*	6.33*	9.71*	0.45	0.541	0.652

Data are in mm. *Asterisk indicates undercut tonehole. 'T/B Ratio' is the tone hole diameter over bore diameter (from table 1). For Triébert instruments with double 3, T/B Ratio is calculated by assuming a single tonehole of area equal to the sum of the areas of the smaller holes, and using the diameter of this hypothetical tonehole. These calculated diameters are respectively 3.07 and 2.93 mm for the Système 3 and Système 4 instruments.

Table 3.

TONEHOLE LOCATIONS OF BOEHM AND TRIÉBERT SYSTEM OBOES.

Instrument	Location of: 3	6	C	Total length
Boehm, Buffet-Crampon, <i>c.</i> 1860	227	337	466	544
Boehm, Buffet-Crampon, <i>c.</i> 1880	227	339	468	544
Boehm, Buffet-Crampon, <i>c.</i> 1920	227	338	468	544
Boehm, Carcassone, <i>c.</i> 1880	226	334	469	543
Boehm, Lauber, <i>c.</i> 1915	219	331	462	538
Boehm, Rampone & Cazzani, <i>c.</i> 1920	224	335	466	543
Nouveau Boehm, Triébert, <i>c.</i> 1880	227	339	468	538
Système 3, Triébert, <i>c.</i> 1840	199	322	462	563
Système 4, Triébert, <i>c.</i> 1850	200	322	462	568
Système 6, Lorée H39, <i>c.</i> 1895	194	321	463	567
Oboe-Sax, Lorée AE69, 1930	201	327	465	606*
Système 6bis, Lorée CY68, 1973	199	325	459	601*
Système 6bis, Lorée MZ05, 1997	200	323	459	599*

Data are in mm, measured from top of instrument to center of tonehole.

*Range to low B \flat ; other oboes in table range only to B.

Table 4.

CONICITY OF BOEHM AND TRIÉBERT SYSTEM OBOES.

Conicity (Cn) is expressed in percent expansion per length; it is calculated for the conical portion of the bore between the reed well and the tonehole venting low C.

Instrument	L (A)	L (B)	∂L	D(A)	D(B)	∂D	Cn
Boehm, Buffet-Crampon, <i>c.</i> 1860	466	18.2	448	4.95	19.8	14.8	3.3
Boehm, Buffet-Crampon, <i>c.</i> 1880	468	18.8	449	5.31	19.4	16.1	3.6
Boehm, Buffet-Crampon, <i>c.</i> 1920	468	18.8	449	4.75	19.2	14.4	3.2
Boehm, Carcassone, <i>c.</i> 1880	469	17.1	452	5.59	19.1	13.5	3.0
Boehm, Lauber, <i>c.</i> 1915	462	17.8	444	5.06	19.1	14.0	3.2
Boehm, Rampone & Cazzani, <i>c.</i> 1920	466	18.4	448	5.43	21.0	15.6	2.9
Nouveau Boehm, Triébert, <i>c.</i> 1880	468	16.3	452	4.29	15.7	11.4	2.5
Système 3, Triébert, <i>c.</i> 1840	462	16.7	445	4.21	16.3	12.1	2.7
Système 4, Triébert, <i>c.</i> 1850	462	18.8	443	4.29	16.6	12.3	2.8
Système 6, Lorée H39, <i>c.</i> 1895	463	17.1	446	4.07	16.0	11.9	2.7
Oboe-Sax, Lorée AE69, 1930	465	18.3	447	3.89	15.0	11.2	2.5
Système 6bis, Lorée CY68, 1973	460	18.0	442	3.90	14.8	10.9	2.5
Système 6bis, Lorée MZ05, 1997	460	19.0	441	3.99	14.9	10.9	2.5

L (A) is length from top of instrument to C tonehole. L (B) is depth of reed well. ∂L is the difference, giving the length used to calculate Cn. D(A) is the bore diameter at the reed well. D(B) is the bore diameter at the tonehole for C. ∂D is the difference, giving the diameter used to calculate Cn. $\partial D/\partial L = Cn$ calculates conicity, Cn. All data are in mm except Cn, which is in percent. Representative Cn of other woodwinds: Adolphe Sax saxophones (1855–1870), 6.6–7.5%; Selmer saxophones (1922–1990), 7.0%; Triébert (1840) and Buffet (1910) bassoons, 1.5%.

Pedro Soler was a Spaniard who played first oboe at the Italian Opera in Paris,³³ worked with Buffet on the 1844 oboe, and used such an oboe. His *Souvenir of Madrid* for oboe and piano is pleasant, formulaic and banal; it leaves no specific insight to the capabilities of its composer. One presumes that Lavigne's and Soler's colleagues on second oboe were obliged to use Boehm oboes, in order to match the tone of their principals.

THE BOEHM OBOE'S TONE AND ITS FAILURE

The Boehm flute had become a standard instrument in Paris and London by 1840;³⁴ the Boehm oboe was adopted briefly by symphonic and operatic players because it was new and 'scientific', because the Triébert Système 4 oboe had significant technical limitations, and because of the cachet of Boehm's name. It had advantages over the Triébert Système 3 and 4 oboes; technique was markedly improved, the notes matched very well, and the scale is accurate; thus it did indeed meet Boehm's goals. However, I have found no evidence of use of the Boehm oboe in opera or symphony work outside of London and Paris. After the initial enthusiasm, this oboe was abandoned by orchestral players due to the change that it wrought in the tone and registration of the oboe; the instrument was too bright and loud for orchestral use. This is no surprise; Boehm's objective in the 1832 flute, as exemplified by his theorems,

was to make a louder instrument with more even notes.³⁵ Applying this method to the oboe, which had never been a loud instrument, was bound to change the instrument's sound.

What did Parisian musicians of 1844 expect an oboe to sound like? Berlioz noted that:

Candour, artless grace, soft joy, or the grief of a fragile being, suits the hautboy's accents; it expresses them admirably in its cantabile. A certain degree of agitation is also within its powers of expression; but care should be taken not to urge it into utterances of passion—the rash outburst of anger, threat or heroism; for then its small acid-sweet voice becomes ineffectual, and absolutely grotesque.³⁶

We can see this description exemplified in Berlioz' writing for oboe; his oboe does not have a powerful voice, but rather an intimate whisper.

What did the Boehm oboe sound like? Buffet noted in his patent that Boehm oboes had 'more force in all the entire chromatic range... while preserving its primitive tones and its pastoral accents, the oboe acquires more roundness, more force and a remarkable sonority.' (appendix 1). Playing experiments with instruments in Figures 2cs, 5, and 8cs show that these oboes are loud, and bright beyond what modern taste can accept; their timbre is the antithesis of Berlioz's 'fragile being'. Triébert's comments of c. 1861 that 'The advantages of ease of

^{32 cont} *l'Exécution des Instruments de Musique à Vent of 1847*: 'Parmi les hautboïstes les plus remarquables de l'époque actuelle, on distingue VERROUST et LAVIGNE, formés tous deux au Conservatoire de Paris par les soins de Mr. VOGT'. *Larigot*, 27:9, August 2001. (Among the most remarkable oboists of the current time, one distinguishes VERROUST and LAVIGNE, both trained at the Paris Conservatoire by the tutelage of Mr VOGT).

³³ Pedro Soler, *Souvenir de Madrid*. In Albert J. Andraud (ed), *The Oboist's Concert Album* (San Antonio: Southern Music, 1940), 47 (oboe), 161 (piano). Andraud gives only Soler's professional affiliation. Bate (*The Oboe*, 169) lists him as working at the Opéra-Comique, gives his dates as 1810–50 and concludes that he used the 'standard' Boehm oboe.

³⁴ Toff, *Flute Book*, 54. Giannini, *Great Flute Makers*, 106–110.

³⁵ Not everyone liked the Boehm flute, which did not achieve universal use in Eastern Europe even in the 20th century. Wagner noted that 'the players, flautists particularly, have transformed their formerly delicate instruments into power tubes (Gewaltsröhren).' Richard Wagner, *On Conducting*. Translated by Edward Dannreuther. (London: William Reeves, 1897), 33. Similarly, the Oehler clarinet used today in Eastern Europe preserves smaller tone holes than the Boehm.

³⁶ 'La candeur, la grâce naïve, la douce joie, ou la douleur d'un être faible, conviennent aux accents du hautbois : il les exprime à merveille dans le cantabile. Un certain degré d'agitation lui est encore accessible, mais il faut se garder de le pousser jusqu'aux cris de la passion, jusqu'à l'élan rapide de la colère, de la menace ou de l'héroïsme, car sa petite voix aigre-douce devient alors impuissante et d'un grotesque parfait.' From Hector Berlioz, *Grand Traité d'instrumentation et d'orchestration modernes*. (Paris, 1843). Edited by Peter Bloom, this will be included in the New Berlioz Edition, vol. 24, to be published by Bärenreiter in 2003.

This English translation was prepared under Berlioz' direction; since Berlioz spoke English, it is definitive. It is taken from Hector Berlioz, *A Treatise on Modern Instrumentation and Orchestration, dedicated to Frédéric William IV, King of Prussia*. (London, New York: Novello, 1855). By courtesy of Geoffrey Burgess. A later translation, found in a common reference, is: 'Artless grace, pure innocence, mellow joy, the pain of a tender soul—all these the oboe can render admirably with its cantabile. A certain degree of excitement is also within its power; but one must guard against increasing it to the cry of passion, the stormy outburst of fury, menace or heroism; for then its small voice, sweet and somewhat tart at the same time, becomes completely grotesque.' Berlioz and Strauss, *Treatise on Instrumentation*, 163–164.

fingering could not hide the imperfection of the tone³⁷ and Barret's subtle '...changes entirely the quality of the tone...' are evidence that oboists of 1860 felt the same way.

Why did it sound that way? The wide bore and large upperjoint toneholes were the major reasons. The bore of the Boehm oboe was wider than that of the Triébert Système oboes and it expanded more rapidly. The rate of conical expansion of a reed woodwind ('conicity') is an excellent predictor of its tone colour; instruments with greater conicity have brighter, louder timbres (Table 4). The Boehm oboe's conicity, 2.9–3.6%, exceeded that of any oboe before or after.

Similarly, larger toneholes open up the sound, which in fact was Boehm's intention with the flute. As Table 2 shows, the ratio of tone hole diameter to bore diameter for hole 3 (representing the upper joint) is larger for the Boehm oboe than for other mechanized French oboes, past or current.³⁸ Further down the instrument, the Boehm oboe's 6 toneholes are still larger than on Triébert system or modern instruments, but the ratio of tonehole to bore is reduced, suggesting a deliberate attempt to mitigate the Boehms' timbre in the lower register.

The large tone holes on Boehm oboes are often straight-sided. These were apparently cut with a drill press, without the maker then undercutting the tonehole to round the corners. The sharp corners so created where the tonehole meets the bore increase turbulence in the airstream, making the instrument play less freely and thus requiring a freer-blowing, brighter sounding reed.³⁹

All of these factors conspire to create a free-blowing, bright sounding, loud oboe whose 'remarkable sonority' was unsuitable for the orchestra. Why then was the Boehm oboe produced? The answer was—for the military. The Boehm oboe quickly caught the eyes of military musicians; if its tone did not suit the orchestra, a future in military music beckoned.

MILITARY USE OF THE BOEHM OBOE

The suitability of an oboe for military use may seem trivial today, but this was no small matter in the 1840s. Music played outdoors by military wind bands was essential to French, German and English cultural life in the 19th century, and to the commercial success of scores of musical instrument makers (see Appendix 2).

When Buffet introduced his new oboe and clarinet, Parisian wind instrument makers were reacting to the threat of Adolphe Sax. Sax had set up shop in Paris in 1843 and was systematically attempting to reform band instrument manufacturing. He threw established Parisian wind instrument makers into panic; they organized a cartel to oppose his efforts and to attempt to drive him out of business.⁴⁰

French military bands of the time had heterogeneous, unstandardized instruments of variable quality. Brasses were found with and without keys or valves, resulting in predictable difficulties of tone and intonation.⁴¹ In his efforts to promote his instruments, Sax induced a French commission on band reform to hold a public competition on 22 April 1845, at the Champ de Mars. This pitted a band of the traditional model against one organized by Sax. Sax featured his saxhorns and saxotrombas but used neither oboes nor bassoons, recognizing that these instruments were of little use outdoors. Sax made an impressive showing and his ideas were largely adopted by the Commission, whose recommended instrumentation furnished Sax with a virtual monopoly in the manufacture of military brass instruments, thus further enraging his enemies.

The Commission's standard band included two 'German system' oboes.⁴² These oboes, which were simpler and presumably cheaper than the Triébert Systèmes 3 and 4 then current, are illustrated in Kastner's *Manuel de Musique Militaire* of 1848 and

³⁷ Triébert, *Nouveau Prix-Courant*. (Paris: Imp. Caillet, c.1861). Reprinted in *Larigot* 4, January 1989, 4–5. I will publish a translation and commentary of this fascinating document in the near future.

³⁸ I have presented these as ratios of diameters. It would be equally valid to present ratios of areas, ie, the cross-sectional area of the tone hole versus that of the bore at the center of the tonehole. Since area is a square function, presenting the ratios in this way would accentuate the differences between Boehm, Triébert système, and modern instruments.

³⁹ Arthur H. Benade, 'Woodwinds: The Evolutionary Path Since 1700'. *Galpin Society Journal* XLVII, March 1994, 86–7; 103–5.

⁴⁰ Malou Haine, *Adolphe Sax. Sa vie, son oeuvre, ses instruments de musique*. (Brussels: Éditions de l'Université de Bruxelles, 1980), 176–9. Wally Horwood, *Adolphe Sax 1814–1894*. (Baldock, Herts, England: Egon Publishers Ltd, 1983), 79–106. Horwood describes vividly the cutthroat competition among instrument-makers selling to the French and German armies.

⁴¹ Arthur Clappé, *The Wind Band and Its Instruments* (New York: Henry Holt and Co., 1911), 129–30. Quoted in Rebekah Ellen Crouch, 'The Contributions of Adolphe Sax to the Wind Band'. (PhD dissertation, Florida State University, 1968; University Microfilms, no. 69–587), 39.

⁴² *Moniteur de l'Armée* 50 (10 September 1845): 2. In Haine, *Adolphe Sax*, 104.

contrasted to a French Simple Système oboe; Kastner shows neither a Boehm system oboe, nor the Triébert Systèmes 3 or 4.⁴³

In 1849, King Louis-Phillipe of France was overthrown. As one of the first acts of the new government, Sax's monopoly was nullified; the effect on his business was staggering.⁴⁴ A new commission promptly established a normal complement of two Boehm system oboes in an infantry band of 54 players: this politically motivated choice was the first acceptance of the

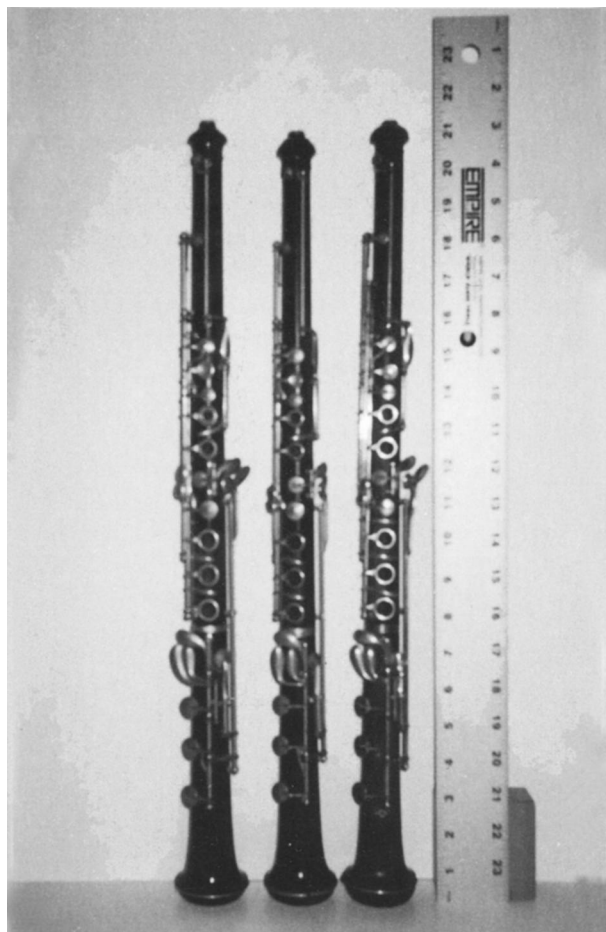


Figure 5. Boehm oboes by minor makers. Left to right, by Carcassone, Paris, c.1900; by Laube, Paris, early 20th century; by Rampone and Cazzani, Milan, 1912–50.

Boehm oboe. The opportunity to replace hundreds of 'German' oboes with expensive, French designed, French made Boehm oboes was understandably appealing to Parisian woodwind makers, so they put considerable effort into this instrument. Buffet's five year patent expired in 1849; Boehm system oboes were soon produced by Buffet-Crampon, Gautrot, David, Triébert and others (Tables 5, 6). In 1860, the Boehm oboe was again specified for military use; Sax's prospectuses of 1860 and 1867 included Boehm system oboes (Figure 6), while his earlier catalogues do not.⁴⁵

Such an oboe was undoubtedly a great addition to bands of the era, which lacked a prominent woodwind in the oboe's range; clarinets do not carry well out of doors, so a bright oboe sound added substance to a military band. Buffet exhibited this oboe 'for military bands' at the 1851 London Universal Exhibition.⁴⁶



Figure 6. Boehm oboes as depicted in catalogues. Left to right, Adolphe Sax, 1860; Maison David, 1883; Berteling, 1894; Couesnon (Triébert) 1911; Martin 1905; Buffet-Crampon 1922. See Table 5 for references.

⁴³ Georges Kastner, *Manuel général de musique militaire*. (Paris: Firmin-Didot Frères, 1848), plate XI. By courtesy of Bruno Kampmann.

⁴⁴ The silver lining to this cloud was that his new situation allowed Sax the time to perfect the tenor, soprano and new model bass saxophones. See Robert Howe, 'Invention and Development of the Saxophone 1840–55'. *JAMIS* 2003, in press. The political uncertainty of the time led to large losses in sales by most wind instrument makers, not only by Sax. Malou Haine, *Les facteurs d'instruments de musique à Paris au 19e siècle*. (Brussels: Editions de l'Université de Bruxelles, 1985), 65–99.

⁴⁵ Although I find no mention of the term 'Boehm system' on any of Sax's advertisements, a Sax prospectus from c.1850 clearly shows a Boehm oboe. Sax applied Boehm's theorems extensively in his design of the saxophone and in his unsuccessful redesign of the bassoon. Howe, *Invention of the Saxophone*. For Sax advertisements from c.1846 and c.1855 see Haine, *Adolphe Sax*, 58, 60, 131; from c.1848 and February 1850, see Horwood, *Adolphe Sax*, 127–8, 160.

⁴⁶ Giannini, *Great Flute Makers* 220.

CHARLES TRIÉBERT'S 'NOUVEAU BOEHM' OBOE

1850 thus found Parisian oboe makers in a schizophrenic world. Symphonic players used simple system or Triébert Système 3 and 4 oboes; for military players, the Boehm oboe was now the norm. Neither model was entirely satisfactory. The Boehm oboe's tone kept it from use indoors, while the mechanically less sophisticated Triébert oboes were less adept. Differences in the fingerings and reeds for these two oboes made it inconvenient for a player to alternate between them.⁴⁷ There thus was a great motivation to develop an oboe that would satisfy both groups of oboists.

After Guillaume Triébert's death in 1849, his sons Charles Louis (1810–67) and Frédéric (1813–78) controlled the firm. Charles Louis was primarily a player and Frédéric, a maker.⁴⁸ Charles Louis⁴⁹ designed a Boehm oboe with a narrower bore and undercut toneholes; it was almost a Boehm système applied to a Triébert bore. As tables 1–4 show, the bore diameters and conicity of this 'Nouveau Boehm' oboe (my term) are closer to those of earlier Triébert oboes than to other Boehm oboes; the tone hole sizes and locations are those of the Boehm oboe. The extreme distal bore of the Nouveau Boehm is reduced in conicity, and the lowest five tones holes are all the same size (these vent c1 through e1 and c#2–e2; on a standard Boehm oboe each successive tonehole is larger); these changes were no doubt intended to help tame the tone of this oboe.

Frédéric Triébert and Theobald Boehm collaborated closely in 1855 on a Boehm system bassoon; it is overwhelmingly likely that Boehm advised the Triéberts on this oboe as well,⁵⁰ as he had shown his own prototype Boehm oboe at the 1851

London Universal Exhibition.⁵¹ At the Paris Exhibition of 1855 Charles Louis Triébert won a medal for the Nouveau Boehm oboe. This was Charles Louis' apogee as an oboe maker; he succeeded Verroust as professor of oboe at the Conservatoire in 1863 and held that position until his death.

A useful reference is the '1855' Triébert Catalogue and commentary (Figure 7).⁵² The prominent '1855' on the first page is not the date of publication, but rather is when Charles Triébert won his Boehm oboe medal; the newly honoured model assumed a position of importance in the firm's

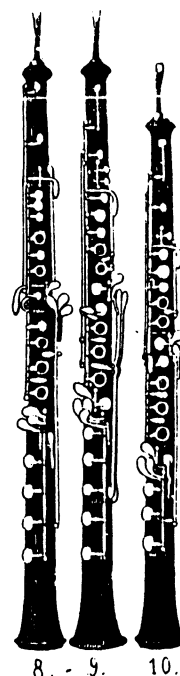


Figure 7a, Oboes 8, 9, and 10 from Triébert et Cie prospectus, c.1861.

⁴⁷ Several French makers' catalogues offered different reeds for Boehm and Triébert system oboes; see Table 5.

⁴⁸ Jose da Silva, 'Contribution aux Tentatives de Reperage Chronologique des Hautbois Triébert fils (Frédéric)', *Larigot* 10, February 1992, 8–16.

⁴⁹ Gustave Chouquet. Triébert. In H. C. Colles (editor), *Grove's Dictionary of Music and Musicians*, third edition. New York: Macmillan, 1927), 5: 381.

⁵⁰ That Triébert worked with Boehm directly is evidenced by a September 1855 letter printed in Giannini, *Great Flute Makers*, 171–3. The Boehm bassoon was a pet project of Triébert (and also of Sax) that never came to success. Sax's brass Boehm system bassoon is displayed at the Musée de la Musique, Paris (E.1465). See *Guide du Musée de la Musique* (Paris: Éditions de la Réunion des musées nationaux, 1997), 231. Triébert's Boehm bassoons are pictured in the company's *Nouveau Prix-Courante* of c.1861 (*Larigot* 4, January 1989, 4–5) and in Baines, *Woodwind Instruments*, 327. A similar bassoon by LeComte is shown in Bruno Kampmann, 'Catalogue de la collection d'instruments de musique a vent, tome 3,' *Larigot IX spécial*, 67,68, 106 September 1998. Also, see Lyndesay Langwill, 'The 'Boehm' Bassoon: A Retrospect', *Galpin Society Journal* XII, 63–67, 1959. Karl Ventzke, 'Boehm System Bassoons in the 19th Century', *Journal of the International Double Reed Society* 5:61–66, 1977. Jerry Voorhees, 'Some Notes on the Fingering Systems of "Boehm" Bassoons,' *Journal of the International Double Reed Society* 5:67–78, 1977. Jerry Voorhees, 'A Privately-Owned Boehm Bassoon in the U.S.A.?', *Journal of the International Double Reed Society* 5:79–81, 1977.

⁵¹ Giannini, *Great Flute Makers*, 219.

⁵² Triébert, *Nouveau Prix-Courant*.

MEDAILLE D'HONNEUR.

1849. 1855. 1851.

TRIEBERT ET C^{ie}
N^o 11.
Rue Saint-Joseph,
PRÈS LES MESSAGERIES IMP.
FOURNISSEURS
des CONSERVATOIRES de PARIS

de Bruxelles
et des Théâtres Impériaux.

BREVETÉS
sans Garantir du Gouvernement

1855.

TRIEBERT

Fabricants d'Instruments de Musique.

HAUTOIS, COR-ANGLAIS, BARYTONS.
BASSONS, SYSTEME AIGU & BOURNE.
DECO-POMPE A TABLE MOBILE
ANCHES DE HAUTOIS.
BASSONS, CLARINETTES, ETC.

Chaque instrument est garanti pour la facture desanches

HAUTOIS EN RE^b
pour Musiques Militaires

SEULS FOURNISSEURS DE HAUTOIS & DE BASSONS DU CONSERVATOIRE IMPÉRIAL.

Réduction au septième.

HAUTOIS.
N^o 11 en si b. N^o 12 en ré b. N^o 13 en mi b.

HAUTOIS PASTORAL, COR ANGLAIS, BARYTON
N^o 14, en sol aigu. N^o 15, en la aigu. Hautbois alto, Hautbois tenor 17, 18, 19, 20, 21 N^o 22, 23

INSTRUMENTS EN UT.

HAUTOIS.
N^o 1, 2, 3, 4, 10.

HAUTOIS.
5, 6, 7, 8.

N^o 9.

BASSON.
25, 26.

N^o 27.

Figure 7a. First page of Triébert et Cie prospectus, c.1861. Courtesy Bruno Kampmann.

advertising. Internal evidence suggests the document is from 1861–3.⁵³

This catalogue includes seventeen varieties of oboe. 'Hautbois ancien système' range in price from 100–260 francs (Fr). These are the 11- or 12-key simple system oboes which were by then inadequate for symphonic work. Hautbois 'Nouveau systèmes' were priced at 210–750 Fr. These include the Triébert Système 3 and 4 oboes, developed respectively in 1840 and 1843, and the Système 5 (thumbplate) and Barret systems of c.1855–60. At 320–750 Fr, Boehm oboes are the most expensive oboes sold. In a clear attempt to disassociate the Triébert product from earlier Boehm oboes, these are described as 'nouvelle perce' ('new bore', implying an improved bore and tone holes). Barret's oboe was also 750 Fr; the next most expensive oboe was a model with a Boehm right hand.

Similarly, cors anglais are listed in various configurations at 180–550 Fr, the most expensive again being the Boehm and Barret. Triébert also sold a pastoral oboe, or musette. Like their oboes and cors anglais, these were available in a Boehm configuration; the best selling pastoral oboe was not the Boehm (140 Fr) but rather the 10-key (80 Fr). The Triéberts sold reeds and reed equipment as well as instruments; this catalogue lists reeds, cane, gougers and shapers for oboe reed cane, but makes no mention of Boehm oboe reeds. One thus presumes that the Nouveau Boehm oboe used the same reeds as the Système 5 or Barret.

This catalogue includes detailed descriptions of the instruments for sale. Oboe '8' is a standard oboe with Boehm fingerings for the right hand; oboes '9' and '10' are Boehm oboes, the former with range to low A and the latter, to B. The catalogue reads:

8. Among the advantages of the Boehm system, we appreciate especially the fingering system of the right hand. Among the considerable number of works achieved by Charles Triébert for the improvement of the oboe family, we must count the addition of the Boehm mechanism for the right hand with the advantages that are contained, on other models, within the left hand.⁵⁴

9. Boehm system oboe with new bore. This instrument, first built on uncertain data, for a long time was less than ideal. The advantages of ease of fingering could not hide the imperfection of the tone. A number of experiments by Charles Triébert have shown better results so we are keeping one model, which has the exact traditional sound of the oboe, in which the mechanism is not complete.⁵⁵ To satisfy players who have decided to adopt the Boehm system, we have established temporarily this model, [which is] good in all ways, but with the sound not fully satisfactory. The model that we offer today is built after the calculations, bore and tenons of Boehm, if it does not have the traditional sound at least it is good and powerful. We have worked very seriously to improve this mechanism and with the help of M. L.—⁵⁶, the most fervent partisan of that system, a fine artist full of innovation, we have reached our goal faster.

The fingering chart that we will publish of this instrument and our recent improvements will give a more complete idea than we can do here.

10. Boehm oboe (new bore). The model mentioned above [number 9] descends to A, and although all the details of its mechanism have their reasons for being, there are certain points, of secondary importance, that we have judged to be less important in this model, so as to decrease its chance of being damaged and [to minimize] the rise in its price. With these modifications we have made an instrument valuable for military music. The construction of the keys for E flat and G sharp offers less fragility, and the removal of the D# trill key and of low B flat and A takes away nothing essential and permits us the addition of the branched key for the double E flat.⁵⁷

This improved Boehm oboe generated great interest. Berlioz wrote of the Système 3 and 4 oboes in 1843 and 1855: 'With the application of Boehm's system the present difficulties of fingering will disappear, as for instance in rapid passages from the middle C# (D \flat) to the note above...'.⁵⁸ This suggests that Berlioz, who was acutely aware of ongoing developments in wind instrument manufacture, felt that the Boehm oboe could establish a valid place in the orchestra.

⁵³ Baines (*Woodwind Instruments*, 327) displays part of a Triébert advertisement from c.1865 showing Boehm, thumbplate, and Système 4 oboes. From its proportions, the Boehm oboe appears to be Triébert's revision. These pictures are not credited but are identical to those in the '1855' prospectus and were probably extracted by Baines from that document.

⁵⁴ The Boehm mechanism for the right hand simplifies playing in flat keys, which are overwhelmingly used in bands; other French band instruments were pitched in D \flat , A \flat , E \flat , and B \flat .

⁵⁵ ie, not exactly a Boehm oboe by virtue of the small bore.

⁵⁶ This presumably was Antoine Lavigne.

⁵⁷ See Appendix 3 for the original French text.

⁵⁸ Berlioz and Strauss, *Treatise on Instrumentation*, 163–164. Berlioz was keenly aware of the progress of musical instrument manufacture and was a passionate champion of Adolphe Sax.

The eminent musicologist François-Joseph Fétis wrote a historical summary of the oboe (and of other instruments) in his report on the 1855 Paris exhibition.⁵⁹ He noted that it was only by applying Boehm's *brille* mechanism that French makers were able to perfect a straight-bodied *cor anglais*, replacing the curved, leather covered 'cor anglé'. His description of the Boehm oboe, and of Triébert's modifications in particular, was extensive and enthusiastic (Appendix 4). Fétis commented very favourably on the Nouveau Boehm oboe's purity of intonation and uniform tone, especially in the lower register; he also commented that it sounded more like a clarinet than it should.

A leading oboe tutor of the day was Vény's *Méthode Abrégée* (abridged method) of 1828.⁶⁰ This was reprinted around 1859 with some changes as: *Complete method for 8 and 15 key oboes. New edition with fingering charts for Boehm and Triébert oboes, and with 4 grand études by V. Bretonnière*.⁶¹ It is telling that Bretonnière troubled to mention the Boehm system in the title of his edition.

An 1869 book by Oscar Commettant noted 'With the gift to the oboe of Boehm's bore and tone holes, as perfected by Mr. Triébert, the instrument no longer lags behind in progress of manufacture'.⁶²

The firm of Millereau's 1874 catalogue lists two models of Boehm oboe. It describes one as 'modele adopté par l'Armée (grande puissance de son)'...the model adopted by the Army (very powerful sound);⁶³ the other is listed simply as 'système Triébert', without any comment on its power, suggesting that it had a less robust sound.

A Nouveau Boehm oboe is shown in Figure 8cs. It is of blackwood with nickel-silver keys. The bore is smaller than those of standard Boehm système oboes by four makers, but the toneholes are just as large (Tables 1–3). I played part of Soler's *Souvenir of Madrid* on this oboe at the American Musical Instrument Society meeting in June 1999; it has a very bright but pleasant tone, which is less raucous than the standard Boehm oboes, and can be pushed to play very loudly. Using a wider reed than for a Triébert Système 4 oboe helps.⁶⁴ To generalize on limited experience is dangerous; it seems more suitable indeed for outdoor use than for operatic or symphonic work, but it could certainly be made to work. The late American physicist Arthur Benade, who owned this oboe before me, showed that when played with a modern American reed it has a much higher cutoff frequency (a measure of the frequency of the highest overtones an instrument will produce: higher cutoff frequencies translate to brighter timbres) than any of four other modern and historical oboes he studied; unfortunately he did not compare it to a standard Boehm oboe.⁶⁵

Similarly, an anonymous Boehm system oboe in the Edinburgh University Collection of Historic Musical Instruments was described as having 'Good intonation and response'.⁶⁶ The pleasant tone has a contained, almost nasal, quality perhaps because of the small bore'.⁶⁷ The 'small bore' presumably refers to a Nouveau Boehm oboe.

The Nouveau Boehm oboe was meant to be all things to all players: why did it not succeed? Its failure to capture the approval of the oboe professors at the Paris Conservatory certainly was a

⁵⁹ François Joseph Fétis, *Exposition universelle de Paris, en 1855. Fabrication des Instruments de Musique. Rapport de M. Fétis, member de jury, rapporteur de la 27 classe*. (Paris: Imprimerie Imperiale, 1856), 1-12. By courtesy of Albert R. Rice.

⁶⁰ Vény, *Méthode abrégée pour le hautbois*. (Paris: Pleyel et Cie, 1828). By courtesy of Geoffrey Burgess.

⁶¹ V. Bretonnière, *Méthode complète pour le hautbois à 8 et à 15 clefs nouvelle édition augmentée de Tablatures des systèmes Boehm et Triébert et suivie de 4 Grands Etudes par V. Bretonnière*. (Paris: Cotelle, rue St Honoré, 1855) (Complete method for 8 and 15 key oboes. New edition with fingering charts for Boehm and Triébert oboes, and with 4 *grands études* by V. Bretonnière). By courtesy of Geoffrey Burgess.

⁶² 'C'est grace à l'application au hautbois de la perce de BOEHM, perfectionnée par M. Triébert, que cet instrument n'est pas resté en arriere de progress de toute la facture'. From 'La Musique, les Musiciens et les Instruments de Musique chez les Differentes Peuples du Monde' ('The Music, Musicians and Musical Instruments of the Different People of the World'). Reprinted in *Larigot* 22: 9–13, December 1998.

⁶³ Bate, *The Oboe*, 73; Table 5.

⁶⁴ A tip width of 6.5mm was standard for the Triébert oboes. Philip Bate, 'Oboe'. In Stanley Sadie (ed), *The New Grove Dictionary of Music and Musicians*. (London: Macmillan, 1980). 13:462–475. My Lauber Boehm oboe has a reed box and five reeds; the only intact tip has a width of 7.2 mm.

⁶⁵ Benade, *Fundamentals*, 487.

⁶⁶ The intonation of Boehm oboes is generally very good, as Buffet and others claimed. Dietrich Hilkenbach found the intonation of a Triébert Boehm oboe (said to be from 1865) to be superior to that of 19th-century Système 5 and 6 oboes. Ventzke, *Boehm-oboen*, 34.

⁶⁷ Arnold Myers, *Historic Musical Instruments in the Edinburgh University Collection*. (Edinburgh: Edinburgh University Collection of Historic Musical Instruments, 1990). Volume 1, The Illustrations, 80. Volume 2 part E fascicle i: Oboes, 40–41 (ed. Simon Milton).

critical factor; without their imprimatur, an oboe (or an oboe maker) could not possibly succeed in art music. The Nouveau Boehm oboe, being more gently voiced than the standard Boehm, may have been too soft for the military, yet too bright for the orchestra. It also appeared too late; by 1855, the Boehm oboe's very effective mechanism had inspired its own competitors, the thumbplate and Barrett systèmes, which became the next standard French oboe mechanisms.

THE BOEHM OBOE IN SPAIN

In 1862 the Spanish instrument maker, clarinettist and conductor Antonio Romero y Andía visited the London Universal Exhibition at which Buffet, Buffet-Crampon, David, Gautrot, Sax, Triébert and 328 other makers displayed musical instruments.⁶⁸ Back in Madrid he recommended military bands of piccolos, flutes, F piccolo and B♭ soprano clarinets, Boehm system oboes, saxophones in E♭, (bass) sarrusophones in B♭ or bassoons, and brass instruments.⁶⁹

The Boehm oboe was quickly accepted in Spain;⁷⁰ a Madrid maker's fingering chart for Boehm oboe is reproduced in Ventzke.⁷¹ It remained current until the mid-20th century; the 1934 Couesnon catalogue listed 'Spanish' and 'French' Boehm oboes,

illustrating a Nouveau Boehm as the 'French' model. One supposes that Couesnon made standard Boehm oboes as the 'Spanish' model.⁷² MacGillivray (in 1961) described hearing a Boehm oboe 'in a Spanish village band quite recently'. Interestingly, Catalonian bands even today include unique mechanized shawms, the tiple and tenora, which have enormous toneholes, broad reeds, and even brighter sounds than the Boehm oboe:⁷³ these appear to have been developed in the late 1840s.⁷⁴ One wonders if the Boehm oboe was fashionable in Spain because of a national preference for bright, piercing woodwind sounds, or a predominance of outdoor performance.

CONTINUED USE OF THE BOEHM OBOE

Although the Boehm oboe had faded from use in art music, it remained popular in the French and Belgian military for the rest of the 19th century.⁷⁵ Many period catalogues show the Boehm oboe, often as the most expensive model (Table 5); this suggests that they were high quality instruments used by professional players.⁷⁶ This conclusion is buttressed by the observation that Boehm systems cors anglais were also made (Tables 5, 6).

⁶⁸ Haine, *Adolphe Sax*, 152.

⁶⁹ Beryl Kenyon de Pascual, 'Quelques observations sur les instruments de la musique militaire faites par Antonio Romero après sa visite à l'exposition internationale de Londres de 1862' *Larigot* 18 (February 1996): 5–7. The species of saxophone indicated is uncertain; it might have been alto or baritone, but was probably the latter. Romero's preference for the B♭ bass sarrusophone over the B♭ bass saxophone may have been due to the lighter weight and more cutting tone of the sarrusophone. For further discussion of this see Robert Howe, 'Invention of the Saxophone'.

⁷⁰ Bate, *The Oboe*, 73.

⁷¹ The chart is titled 'Escala del oboé y del corno inglés sistema Boëhm, segun el ultimo modelo modificado por Triébert.' It describes three minor fingering differences with the 'primitivo modelo de oboé sistema Boëhm'. Ventzke, *Boehm-Oboen*, Tafel IV. ('Scale of the Boehm system oboe and English horn, showing the final model modified by Triébert'; 'early model Boehm system oboe')

⁷² Couesnon & Cie, *Catalogue Illustré 1934*. (Paris: 1934), 64–5. By courtesy of Tony Bingham.

⁷³ James MacGillivray, 'The Woodwind'. In Anthony Baines (ed.), *Musical Instruments Through the Ages* (Baltimore: Penguin, 1961), 256.

⁷⁴ Henri Frances, 'Andre Toron et l'évolution de la tradition musicale en Catalogne'. In, *Le Roseau et la Musique*. (Aix-en-Provence, France: Editio Arcam/Edisud, 1988), 68–73.

⁷⁵ The Boehm oboe never caught on in British bands, despite Lavigne's advocacy (Bate, *The Oboe*, 63). This is demonstrated in a Hawkes (London) catalogue of the early 20th century, which describes six models of Military oboes, illustrating not the Boehm but rather Système 5. *Illustrated Price List of the "Hawkes" Military Band Instruments*, (London; c.1903), 42–3. *Larigot* V special, November 1995.

⁷⁶ It may also reflect the fact that many of these oboes were bought with government funds.

Table 5
BOEHM OBOE MAKERS KNOWN BY CATALOGUE REFERENCES.

MAKER	CITY	DATES	MODELS
Association Générale des Ouvriers Réunis ⁷⁷	Paris	1898	'Hautbois système Boehm'; Reeds 'de hautbois' 18 Fr/10 Reeds 'de hautbois Boehm', 20 Fr/10
Berteling ⁷⁸	New York	1893–5	Sold by August Pollmann, New York. 'Boehm System oboe' and 'cor-anglais', at \$110 and \$150 their most expensive models.
Besson ⁷⁹	Paris	1910	'Hautbois... syst. Boehm'. No Boehm Cor anglais.
Ditta Bottali ⁸⁰	Milan	c.1918	oboe, corno inglese, 'sistema Boehm'
Buffet Crampon et Cie	Paris	1922 ⁸¹	'Hautbois, système Boehm, à anneaux mobiles, plus une clé index main droit pour triller <i>mi♭</i> .' Boehm system oboe with mobile rings, with a key for the right index finger to trill E♭. Cors anglais sold, not in Boehm system.
		1932–33 ⁸²	'Buffet Paris make, full Boehm system with connecting rings and latest improvements.' Shows a standard Boehm oboe to B, with C♯–D♯ trill.
Couesnon/Triébert	Paris	c.1911 ⁸³	'Hautbois Triébert, ébene ou grenadille, système Boehm' At 220 Francs the second cheapest of their 'Hautbois Triébert'. Their cheaper oboes not available in Boehm system. No Boehm cor anglais.
	Paris	1934 ⁸⁴	'Hautbois, perce Couesnon...système Boehm, modèle français.' 'Hautbois, perce Couesnon...système Boehm, modèle espagnol.' 'cadence de fa♯ annulaire droit et cadence de mi♭ index droit, argenté' also available for both models. (F♯ trill for ring finger, E♭ trill for index finger). The French model is shown as a narrow bodied Boehm oboe (ie, Triébert's Nouveau Boehm); the Spanish model is not shown. Low B♭, automatic or semi-automatic octave mechanisms available.
Maison David ⁸⁵	Paris	1883	'Hautbois Système Boehm', 'Cor Anglais Système Boehm'. To B.
Gautrot ⁸⁶	Paris	1867	Oboes and cors anglais 'Ordinaire' and 'système Boehm'. Standard Boehm to B. Boehms are the most costly.
G&A Klemm ⁸⁷	Mark-neukirchen	c.1880	'Oboen System Böhm'. At 250 marks, their most costly oboe.
LaFleur ⁸⁸	London	c.1870	'Triébert's oboe...with Boehm system for the right hand.' 'Our own make oboes. Boehm system, cocoa;...'
Lorée ⁸⁹	Paris	1913, 1924	'Système Boehm', with standard bore and toneholes.

⁷⁷ *Larigot* 23:32–33, August 1999.

⁷⁸ August Pollman, *Catalogue 1894-'95* (New York, 1893), 136–7. By courtesy of Albert R. Rice.

⁷⁹ Besson, *Catalogue*, Reprinted in *Larigot* 5, May 1989, 26.

⁸⁰ By courtesy of Francesco Carreras.

⁸¹ Buffet-Crampon & Cie, *Extrait du Catalogue 1922*. (Paris 1922), 7. By courtesy of Albert R. Rice.

⁸² Continental Music Company, *General Catalog 1932–33*. (Chicago: 1932), 37. By courtesy of Tony Bingham.

⁸³ Couesnon & Cie, *Catalog*. (Paris: c.1911), 122–23. By courtesy of Tony Bingham.

⁸⁴ Couesnon & Cie, *Catalog Illustré 1934*. (Paris: 1934), 64–5. By courtesy of Tony Bingham.

MAKER	CITY	DATES	MODELS
Maino & Orsi ⁹⁰	Milan	1898	Oboe, corno inglese, 'sistema Boehm'.
Martin Freres & Famille ⁹¹	Paris	1905	'Hautbois système Boehm', standard Boehm to B. Shows different reed proportions for 'système Boehm ou Triébert'.
Millereau ⁹²	Paris	c.1900	(standard) 'Hautbois en ut, système Boëhm' to B.
Millereau ⁹³	Paris	c.1905	Two models: 'modèle adopté par l'Armée'; also 'Système Boehm, même perce que le Système Triébert' Ranges to B, optionally to B♭.
Rudall, Carte & Co. Ltd. ⁹⁴	London	c.1931	'Boehm's system' oboes to B or B♭. Cors anglais and oboe d'amore sold, but not in Boehm system.
Schoenaers-Millereau ⁹⁵	Paris	1910	'Hautbois en ut, système Boehm, modèle adopté par l'Armée' (3 models). 'Système Boehm, même perce que le Système Triébert'. Ranges to B, optionally to B♭.
Moeremans ⁹⁶	Gand, Belgium	1906	'Hautbois Triébert...système BOEHM' to B.
Romeo Orsi ⁹⁷	Milan	c.1926	'Oboe sistema tutto Boehm, ad anella'. Full Boehm system with rings.
Robert ⁹⁸	Paris	1897	'modèle adopté par l'armée.'
Adolphe Sax	Paris	1860 ⁹⁹ 1867 ¹⁰⁰	Standard Boehm to B.
W. Stowasser's Soehne ¹⁰¹	Verona	1929	oboe 'sistema mezzo Boehm' (half Boehm). oboe 'sistema Boehm completo ad anella mobili'. Full Boehm system, with mobile rings.
Triébert ¹⁰²	Paris	c.1861	'Hautbois système Boehm (nouvelle perce)'; two models described. In C, range to A or B. Cor anglais 'Système Boehm'.
Ch. & J. Ullmann ¹⁰³	Paris	1907	Hautbois, Système Boehm. 260 Fr. Their most costly oboe. No Boehm cor anglais. No distinction between Boehm and 'Système Triébert' reeds.

⁸⁵ *Catalogue Général Illustré des Instruments de Musique Fabriqués par la Maison David*. (Paris: N.-M. Duvall, 1883). In *Larigot* 17:27, August 1995.

⁸⁶ *Catalogue des Instruments de Musique de la Manufacture Générale de Gautrot Ainé & Cie*. (Rennes, Typographie Ch. Oberthur & Fils, 1867), 132–3. *Larigot X Special*, April 1999.

⁸⁷ G. & A. Klemm, *Musikinstrumente und Saiten*. (Markneukirchen, c.1880), 96. By courtesy of Albert R. Rice.

⁸⁸ Baines, *Woodwind Instruments*, 329–30.

⁸⁹ F. Lorée, L. Lorée successeur, *Prix-Courant 1913* (Paris: de l'Est, 1913), 8–9. In *Larigot* 20:26, September 1997. F. Lorée, L. Lorée, fils. *Prix-Courant 1924* (Paris, 1924), 8–9. By courtesy of Michael Finkelman.

⁹⁰ By courtesy of Francesco Carreras.

⁹¹ Martin Frères et Fille, *Catalogue*. 1905. Supplement to *Larigot*, June 1991, 19–20.

⁹² Millereau, *Catalogue*. (Noyon: H. Copillet, c.1900), 8. Dayton C. Miller Collection, Library of Congress. By courtesy of Robert Sheldon.

⁹³ Millereau, *Catalogue*. (Paris: Lahure, c.1905), 12. Dayton C Miller Collection, Library of Congress. By courtesy of Robert Sheldon.

⁹⁴ Rudall, Carte & Co. Ltd, *Catalogue*. (London; c.1931) 19, 20. By courtesy of Albert R. Rice.

⁹⁵ Schoenaers-Millereau, *Catalogue*. Reprinted in *Larigot* 11, 30, September 1992.

⁹⁶ Moermans, *Catalogue*. Reprinted in *Larigot VIII Special*, December 1997, 31.

⁹⁷ By courtesy of Francesco Carreras.

⁹⁸ Robert, *Catalogue 1897*. (Paris: Dernery, 1897). Dayton C. Miller Collection, Library of Congress. By courtesy of Robert Sheldon.

⁹⁹ Adolphe Sax, 'la réorganisation des Musiques militaires sous Napoléon III'. *Larigot* 25;33–34, March 2000.

Table 6

BOEHM OBOE MAKERS KNOWN BY EXTANT INSTRUMENTS.

Maker	City	Dates	Source	Comment ¹⁰⁴
Theobald Boehm	Munich	1860	Ventzke ¹⁰⁵	
Louis Auguste Buffet	Paris	1844–85	Bate ¹⁰⁶	
Louis Auguste Buffet	Paris	1844–85	Versailles ¹⁰⁷	Cor anglais
Buffet-Crampon	Paris	1884–c.1930	Howe, Joppig ¹⁰⁸ Melville-Mason ¹⁰⁹	
Carcassone	Paris	1860–1926	Kampmann, Howe, Vichy ¹¹⁰	
Conn “The Wonder”	Elkhart	c.1900	Deitch ¹¹¹	
Gautrot	Paris	1845–84	Sotheby’s ¹¹²	
Laube	Paris	1895–post 1900	Howe	
LaFleur	Paris, London	c.1870	Bingham ¹¹³	In three parts with a detachable bell and range to B \flat . Serial A81
Lorée	Paris	1883	Bingham	
Millereau	Paris	1861–1938	Vichy ¹¹⁴	
Merit	?German	? c.1900	Burgess ¹¹⁵	Oboe d’amore
Penzel & Mueller	New York	1899–1950	Fiske Museum ¹¹⁶	
Rampone	Milan	1850–1912	Abel ¹¹⁷	
Rampone and Cazzani	Milan	1912–50	Howe	
Rudall Carte	London	1872–1943	Abel	
Adolphe Sax fils	Paris	c.1910	Musée de Musique, Brussels ¹¹⁸	
Adolphe Edouard Sax	Paris	1907	Haine and de Keyser ¹¹⁹	
Jerome Thibouville-Lamy		p.1866–	Montagu ¹²⁰	
H. Todt	Markneukirchen	1822–1929	Burgess ¹²¹	
Triébert ¹²²	Paris	1849–1883	Young, ¹²³ Kampmann, ¹²⁴ Ventzke, ¹²⁵ Ventzke and Joppig ¹²⁶	
Triébert/Couesnon	Paris	p.1883	Young; Peterson ¹²⁸	
Joseph Wallis	London	1848–1928	Bate Collection ¹²⁹	

¹⁰⁰ Horwood, *Sax*, 78.

¹⁰¹ By courtesy of Francesco Carreras.

¹⁰² Triébert, *Nouveau Prix-Courant* 3.

¹⁰³ Ullman, *Catalogue*. 1907, 138–9. Reprinted in *Larigot* 4 Special, November 1994.

¹⁰⁴ All are ‘standard Boehm’ instruments unless noted.

¹⁰⁵ Ventzke, *Boehm-Oboen*, Tafel I. The oboe shown is a copy by Heckel of Boehm’s original, which has plateau keys.

¹⁰⁶ Bate, *The Oboe*, plate V. Also, Graham Melville-Mason, *An Exhibition of European Musical Instruments*. (Edinburgh: Lorimer & Chalmers, 1968), 20, item 106.

¹⁰⁷ Versailles (France) Auction catalogue, *Instruments de Musique*. Sale of April 26, 1997, lot 145 (pictured).

¹⁰⁸ Joppig, *Oboe and Bassoon*, 82.

¹⁰⁹ Melville-Mason, *European Musical Instruments*, 21, item 107.

¹¹⁰ Bruno Kampmann (*Larigot* I bis Special, December 1986; 49, Figure XXXII), writes that this oboe is pitched in D \flat . However, all Carcassone references are to one specimen, now owned by the author, which plays unequivocally in C. Vichy (France) Auction Catalogue, *Instruments de Musique*. June 13, 1998, lot 139.

¹¹¹ Formerly in the collection of Daniel Deitch, San Francisco.

¹¹² Sotheby’s (London) auction catalogue, *Musical Instruments Including Early Music*. Sale L00583, November 16, 2000, lot 272.

¹¹³ By courtesy of Tony Bingham.

¹¹⁴ Vichy (France) Auction Catalogue, *Instruments de Musique*. June 1, 1996, lot 440 (pictured).

¹¹⁵ This maker is not listed in Waterhouse, *New Langwill Index*. Geoffrey Burgess, personal communication August 10, 2001.

There is one known specimen of a Boehm Système oboe d'amore, by the German maker Merit (dates uncertain) (Figure 9cs). The oboe d'amore did not enjoy its renaissance until after 1875:¹³⁰ it is used only in the music of Bach, a few of his contemporaries, and in vignettes by Richard Strauss, Ravel and Debussy. This specific instrument, which is most probably from after 1900, suggests that the Boehm oboe enjoyed some use by orchestral musicians into the twentieth century. For the venerable Triébert firm, data exist to estimate the percentage of production that was Boehm oboes in the late 19th century. The mechanisms for 50 Triébert oboes from 1849 to 1900 are published: six of these are Boehms (12%).¹³¹

The Boehm oboe is mentioned as the standard military oboe and accompanied by a fingering chart (range B–G) in a 1911 book¹³² by Arthur Clappé,

director of the United States Army Music School, who also mentioned the use of Boehm oboes for wind bands in 1921.¹³³ A collection of photographs of American jazz bands shows several players using Boehm oboes as 'doubling' instruments in the 1920s.¹³⁴ By 1935, however, the British writer Cecil Forsyth did not trouble to mention the Boehm oboe at all in his unusually comprehensive textbook of orchestration.¹³⁵

Catalogues show that the Boehm oboe was initially the most expensive, highly touted oboe, followed by its mere inclusion among a host of choices late in the nineteenth century. It became less prominent in twentieth-century catalogues, being listed in French and American catalogues (which dealt in imported oboes) until at least 1936 (Table 5). Several makers are of interest for not selling Boehm oboes. Husson & Buthod¹³⁶ (Paris, 1856) made no Boehm oboe but did make Boehm flutes

¹¹⁶ Albert R. Rice, personal communication March 17, 2002.

¹¹⁷ Richard Abel, personal communication June 17, 2002.

¹¹⁸ Malou Haine, *Musical Instruments in Belgian Collections*. (Liège BE: Mardaga, 1989), 123.

¹¹⁹ Malou Haine, Ignace de Keyser, *Catalogue des Instruments Sax au Musée Instrumental de Bruxelles*. (Gent: Erasmus, 1980), 267. This may be the same instrument as in the previous reference.

¹²⁰ Jeremy Montagu, *Reed Instruments*. (Lanham, MD, USA: Scarecrow Press, 2001), 53.

¹²¹ Geoffrey Burgess, personal communication March 7, 2002.

¹²² Instruments marked 'Triébert' can be dated by their marks. Those with a three-merlon castle were made by Guillaume Triébert, 1810–48. Those with the same castle and the word 'Brevete' were made by his sons Charles and Frédéric, 1849–81. Those with a four-merlon castle were made by Gautrot (1881–3) or Couesnon (1883 on) after the Triébert name was sold in 1881 upon Frédéric's death. Waterhouse, *New Langwill Index*, 403–4.

¹²³ Phillip T. Young, *4900 Historical Woodwind Instruments*, (London: Tony Bingham, 1993), 239–43. Young lists six Boehm oboes by Triébert; one from Nürnberg described below descending to A; four to B; and one without an inferred range.

¹²⁴ *Larigot IX Special*, September 1998, 62–3, 105.

¹²⁵ Ventzke, *Boehm-Oboen*, Tafel I.

¹²⁶ Karl Ventzke, Gunther Joppig, *Hohes Holz: Die Oboe Sammlungen von Karl Ventzke und Gunther Joppig*. This privately printed exhibition checklist, for which no publication data are given, shows a Triébert system 9 Boehm oboe with range to A, German Nationalmuseum Nürnberg, MJ 417. By courtesy of Michael Finkelman.

¹²⁷ Sotheby's (London) auction catalogue, *Early Musical Instruments*. Sale LN7691, December 17, 1997, lot 83.

¹²⁸ John Peterson, personal communications March 25 and April 2, 2002.

¹²⁹ www.ashmol.ox.ac.uk/bat/oboes/html

¹³⁰ Bate, *The Oboe*, 99–100; plate VIII.

¹³¹ These include four oboes from the author's collection, three of Jose da Silva's, one of Alain Coulet's and 42 listed in Young. Jose da Silva, *Catalog de la Collection d'Instruments de Musique a vent*. Larigot 2 Special (February 1993), 28–33. Alain Coulet, *Catalog de la Collection d'Instruments de Musique a vent*. Larigot 7 Special (April 1997), 17–18. Philip T. Young, *4900 Historical Woodwind Instruments*. (London: Tony Bingham, 1993), 239–43. The firm of Buffet-Crampon, represented by three Boehm oboes in this paper, remains active today; their historian, Maurice Vallet, was unable to find 19th-century records to evaluate the number or percentage of Boehm models in their oboe production. Paul Baronnat, letter to the author, 9 December 2002.

¹³² Arthur Clappé, *The Wind Band and Its Instruments*. (New York: Henry Holt & Co, 1911), 129–30. By courtesy of Tony Bingham.

¹³³ Arthur Clappé, *The Principles of Wind-Band Transcription*. (New York: Carl Fischer, 1921), 39.

¹³⁴ Boehm system oboes are clearly seen in Erskine Tate's Vendome Theater Orchestra (1920) and the Hugh Swift Orchestra (1927). As an extreme example of doubling, the three woodwind players in Roger Wolfe Kahn's New York band (c.1925) display 27 instruments, including three Boehm system oboes and a system 6 English horn. Orrin Keepnews and Bill Grauer Jr, *A Pictorial History of Jazz*. (New York: Crown Publishers, 1966), 39, 40, 122.

¹³⁵ Forsyth, *Orchestration*, 204–19.

¹³⁶ Husson and Buthod, *Catalogue*. (Paris, 1856). reprinted in *Larigot 16*, February 1995, 12.

and clarinets. Boosey of London made a prototype Boehm oboe with range to B in 1889, as shown by Workshop Book Three: this was never offered commercially.¹³⁷ Hawkes made 17 models of oboe c.1903, including six varieties of the système 3 with thumbplate B \flat as the 'military' model, but no Boehm oboe.¹³⁸ The Belgian maker Van Engelen Freres¹³⁹ was a supplier to the Belgian, French, Dutch, and Dutch Indian armies. Their 1913 catalogue shows oboes with 13–17 keys, Boehm clarinets and Boehm flutes, but no Boehm oboes.

The most telling evidence of the importance of the Boehm system oboe is the number of makers who produced these instruments. The Belgian collector Jacques Cools and Professor Francesco Carrerras of Pisa have kindly provided data from 106 unpublished French, Belgian and Italian makers' catalogues, 1850–1950: all made some variety of oboe. Of these, 53 list no Boehm oboes (50%);¹⁴⁰ 19 list Boehm oboes and English horns (18%);¹⁴¹ and 34 list Boehm oboes only (32%).¹⁴² Adding the evidence of all catalogues and specimens shows 62 discrete makers of Boehm oboes. When 107

catalogues that can be accurately dated (including those in Table 5) are analysed, we see that from 1850 to 1899, 20 out of 27 makers made Boehm oboes (74%); from 1900–1919, 16 out of 31 (52%); from 1920–1940, 15 out of 36 (42%), the last being in 1936.¹⁴³ Thus as the twentieth century progressed there was a steady drop in the number and percentage of makers who provided Boehm oboes.

Data showing Boehm oboes by 62 makers and in catalogues from the twentieth century prove its importance and continued use. If it was to be found in catalogues, someone must have been buying it. Inconsequential flashes in the pan do not stay in sales catalogues for 90 years.

THE BOEHM OBOE, SOPRANO SAXOPHONE, AND SOPRANO SARRUSOPHONE

The years of the Second Empire were 'L'age d'or de la facture instrumentale', a time of great creativity and commerce in French musical instruments.¹⁴⁴ The Boehm oboe was not the only bright sounding

¹³⁷ Kelly J. White, *Woodwind Instruments of Boosey & Company*. Master of Music Thesis, University of Edinburgh, 2002.

¹³⁸ *Illustrated Price List of the Hawkes' Military Band Instruments*. (London; c.1903), 42–3. *Larigot V* special, November 1995.

¹³⁹ Van Engelen Freres, *Catalogue des Instruments de Musique de la Manufacture Générale*. (Liere, 1913). Reprinted in *Larigot 7*, December 1990, 4–5.

¹⁴⁰ These are Belgian makers Joseph Buyst (Bruxelles, c.1933), F. & L. De Cart (Lierre, c.1900), De Prins (Anvers, 1901–50), C. De Saux (Bruxelles, dates unknown), Melchior De Vries (Lierre, 1930 and two without date), Florent Hofinger (Bruxelles c.1930), Mahillon & Co. (Bruxelles, 1897, 1902, 1911, 1926), Léon Moeremans (Gand c.1924), A. F. Rousseau (Bruxelles, 1934–50), and Van Engelen frères (Lierre, 1913). In France, all makers are Parisian unless otherwise noted. These were: Louis Augu (Bourges, 20th century), J.-B. Barbe (Berck-Plage, 1900–26, two catalogues), Auguste Buffet (c.1920), Michel Chapuis (Lyon, 1908), Couesnon & Cie (1906–8, 1910, 1928), Gaudet & DesLaurier (c.1917, 1928), G. Deschamps (1935), Henri Dolnet (c.1927), Raymond DuBois (1932), Joseph Fissore (Fleury-Courtois, 1929), Les fils de P. Gautier (Toulouse, c.1923), P. Gautier & Fils (Toulouse, 1910), J. Gras (Lille, 1921, 1923), Laduron (St. Amand, no dates), Lyrst (c.1927), Margueritat (1898, 1904, 1911, 1922), Pelisson, Guinot & Blanchon (Lyon, 1905–11), Henri Selmer (Mantes la Ville, 1925), Manufacture St. Etienne (St. Etienne, 1907), J. Lavest (Montluçon, 1933), Georges LeBlanc (1937, 1938), P. Moquet (no dates), Jerome Thibouville Lamy (1900). The Italian makers were Tito Belati (Perugia, c.1920), Pupo Pupeschi (Florence, c.1900), Fernandino Roth (Milan, 1895), Ambrogio Santucci (Verona, c.1900), Saporetti & Cappelli (Florence, 1908) and Luigi Zelweger (Biella, 1894).

¹⁴¹ These are the Belgian makers De Prins frères, (Anvers, 1935, c.1935) and Van Engelen (Lierre, dates uncertain). In France, all makers are Parisian unless otherwise noted. These were: Couesnon & Cie (1893–94, 1934), Evette & Schaeffer (1907, 1927), Gautrot Aîné & Cie (1867), René Guenot (c.1930), A. LeComte & Cie (1879), L. Lorée Fils (1910), Millereau-Schoenaers (c.1906, c.1910), Triébert (c.1861), Henri Selmer (Mantes la Ville, 1928), F. Sudre & Cie (1873), and P. Thiberville (Ezy, 1936). See Table 5 for Italian makers.

¹⁴² These are the Belgians Emile Fauconier (Gand, 1880–1924), Harmonia (Bruxelles, 1930–31, 1932), Léon Maheu (Tournai, 1908) and Léon Moeremans (Gand, 1906). In France, all makers are Parisian unless otherwise noted. These were: Zéphir Bajus (Avesnes le Comte, 1894–95, c.1904), F. Besson (1891, 1911), Paul Buescher (c.1925), Chapelain fils (La Couture, 1890–1917), Couesnon & Cie (1900, 1906–08, 1929), David (1883), Emile DePlais (1899), Evette & Schaeffer (1922, 1926), J. Gras (Lille, 1910), Jacques LaFleur (c.1931), A. LeComte (c.1902), Masspacher (1928), P. Moquet (1892), Pajot jeune (Jenzat, 1928 and no date), Pajot fils (Jenzat, before 1875), F. Sudre & Cie (1893), A. Sudre fils (1914), Adrien Thibouville (Ivry la Bataille, 1910–20), Les fils d'Eugène Thibouville (Ivry la Bataille, 1893 and no date), Ch. & J. Ullmann (1907). See Table 5 for Italian makers.

¹⁴³ Individual instruments cannot be included in the calculations of these percentages, as specimens cannot be used to demonstrate that a maker did *not* supply a particular variety of instrument.

¹⁴⁴ Haine, *Les facteurs d'instruments de musique*, 100–162.

conical reed instrument developed in mid-nineteenth century Paris. Two others were the soprano saxophone, which came into commercial use in 1850,¹⁴⁵ and the soprano sarrusophone, invented in 1856.¹⁴⁶ Saxophones and sarrusophones were both produced in vast families of instruments, from soprano to contrabass; the soprano member of each family had roughly the same functional range as an oboe. Soprano saxophones have an oboe-like tone which is richer and darker than that of a Boehm oboe. They were employed regularly in French and Belgian bands and are popular to this day. The soprano sarrusophone had range, bore and tonehole dimensions similar to those of a Boehm oboe and, like the oboe, was played with a double reed. It had a more strident tone than the Boehm oboe and offered no compelling musical advantages; thus, it never achieved popularity.¹⁴⁷ A soprano sarrusophone was redundant in a band that included Boehm oboes.

THE BOEHM OBOE'S ROLE IN MODERN OBOE DESIGN

The most important role of the Boehm oboe was not its brief use in French and British orchestras, nor its use in bullring bands, nor its application by military bands on the continent. Rather, it was as an example of technology. A careful analysis shows that the Boehm oboe was fundamental to the development of the modern oboe.¹⁴⁸

The oboes used in 1850 were not standardized as they are today. German players used a 12-key Sellner oboe until the 20th century, while French, British and Belgian players chose from 12-key, Triébert Systèmes 3 and 4, Boehm and hybrid models. Stanislas Xavier Verroust (1814–63), a professor at the Conservatoire Nationale, used a 9-key oboe as late as 1849.¹⁴⁹

In the 1840s Triébert's Systèmes 3 and 4 were new, and yet not new. They improved the oboe's technique somewhat, using more or less the same toneholes as did simple system oboes. The Système 4 oboe had significant flaws. The side venting for B \flat 1

and c2 used tiny tone holes, producing thin, nasal sounding notes. The player had to move his right hand out of position to reach the touchpieces for these keys. Third, several intervals required the simultaneous opening and closing of two keys, and thus were effectively impossible at any speed. These included b to c \sharp 1, C \sharp to D \sharp in both octaves, and F \sharp to G \sharp in both octaves. Their intimate tone was no match for the Boehm flute and clarinet, and the mechanized brasses then coming into use.

The technical problems of a completely mechanized woodwind were formidable: solutions were found in the Boehm flute, oboe and clarinet. Buffet's Boehm oboes were the first redesign of the oboe from first principles: although not suitable for the orchestra, they showed that, like the Boehm flute, a fully mechanized oboe could have a key to account for every whole and half step trill on the instrument and still work well. Guillaume Triébert's sons took this example to heart and devised a succession of increasingly complicated designs to provide oboists with continually greater technical resources, while keeping the bore, the tone holes, and most importantly the sound of the earlier instrument (Table 7).

The Boehm oboe thus raised the intellectual bar, thereby providing the basis for the various oboes—Système 5, Barret Système, Système 6, and Conservatoire—that followed, most of which remain in use today. To convince yourself of this, simply look at Figure 10cs, which shows clearly that the Barret oboe resembles the Boehm more than it does the Système 4. The Boehm oboe may not be the direct parent of the modern French oboe, but it can legitimately claim to have been present at its conception.

THE SYSTÈME 5 OBOE

The first product of this work was the Système 5, which is a Système 4 with a thumbplate mechanism (Figure 11).¹⁵⁰ Charles Louis Triébert solved the Système 4's problematic B \flat and C by applying a mechanism modified from the Boehm flute and

¹⁴⁵ Howe, 'Invention of the Saxophone'.

¹⁴⁶ Gautrot Aine et Companie, *Catalog des Instruments de Musique*. (Paris, 1867). Reprinted in *Larigot Special X* (April 1999) 3–9. Forsyth, *Orchestration*, 170–2. Gunther Joppig, 'Sarrusophone, Rothophone (Saxorusophone) and Reed Contrabass.' *JAMIS* 12 (1986): 68–106. Michel Jolivet, 'An English translation of a Monograph on the Sarrusophone Written by Roger Leruste.' *The Double Reed* 24.3 (November 2001): 73–88.

¹⁴⁷ The contrabass sarrusophone, however, was the standard Western European contrabass reed instrument until the invention of the French system contrabassoon early in the 20th century.

¹⁴⁸ Montagu, *Romantic & Modern Musical Instruments*, 56. Ventzke, *Boehm-Oboen*.

¹⁴⁹ *Guide du Musée de la Musique*, 80–84.

¹⁵⁰ As Bate notes, (*The Oboe*, 64–5) the Système 5 and Barret oboes have become confused over the years. Descriptions in these sections are therefore taken from the earliest available reference, the Triébert *Nouveau Prix-Courante* of c.1861 (oboes 5, 6), and Barret's *Method* (2nd edition, 1862).

Table 7.

TRIÉBERT'S CHANGES TO THE OBOE'S MECHANISM AND THEIR DERIVATIONS.

Oboe Model	Inventor, Date	Mechanical Changes	Derivation
Système 3	G. Triébert, 1840	<i>Brille</i> on 5, 6 for F# Second octave key Low B standard Left hand E♭ standard Axles replace levers for low C, C#, E♭ Suppression of internal bell rim	Boehm 1832 flute New Sellner oboe Sellner oboe Boehm 1832 flute Clarinets
Système 4	G. Triébert, 1843	<i>Brille</i> on 2 providing alternate c2 'Butterfly' key for D#, B Plateau key for 5 (variable) Left hand b1-c2 trill Standard location for right small finger touches, with rod-within-a-rod for C and C#. Suppression of double hole for 3 (variable)	Boehm 1832 flute Boehm 1832 flute New Boehm 1832 flute Buffet's 1839 Boehm flute
Système 5 (Thumbplate)	C.L. Triébert, 1849	Thumb mechanism for B♭, C	Modified from Boehm flute, oboe
Barret	A.M.R. Barret, 1855	<i>Brilles</i> on 2,3,4,5,6 Mechanical link R to L hand, for B♭ and C Automatic octave keys Low B♭ Articulated G# Suppression of double hole for 3	Boehm 1832 flute, oboe, clarinet Modified from Boehm oboe New Seen rarely on earlier oboes New Système 4 oboe
Système 6 (Conservatoire)	F. Triébert, 1875	<i>Brilles</i> for 2,3,4,6; solid ring for 5 Semi-automatic octave keys Mechanical link 4 to L hand, for B♭ and C Articulated B-C#	Boehm flute; Système 4 oboe Barret oboe Barret oboe New
Système 6bis (Gillet)	A. L. Lorée, 1906	Plateau keys 1,2,3,4,5 Split key 6 Duplicate low C	Boehm 1847 flute New Buffet Boehm oboe

oboe. This is a touch for the left thumb, which closes B on the Boehm oboe. In Triébert's version depressing this touch closed two tiny holes on the upper joint. One of these vented the note c2, and the other, B♭1. Thus, covering hole 1 and depressing the thumb gave b1; 1 with the thumb up gave c2. Similarly, covering holes 1 and 2 while depressing the left thumb gave a1, and lifting the thumb, B♭1. This action was duplicated by a long key for the right palm.¹⁵¹

The Système 5 oboe is, with several modern modifications, the least flawed oboe in use today.¹⁵² It is favoured in Great Britain, where other makers freely adopted the thumbplate mechanism. Moving between g1 and B♭1 or between g1 (or a1) and c2 (and their higher octaves) on a thumbplate oboe requires the comfortable lifting of thumb and one or two fingers of the left hand. On a Système 6 or 6bis oboe, these combinations require the cumbersome picking up of one or two finger(s) on the left hand

¹⁵¹ This mechanism was adopted by British and Belgian clarinet makers in the 'Clinton' system clarinet. Waterhouse, *New Langwill Index*, 19, 66.

¹⁵² Modern specimens may include a B-C# or F#-G# articulation, left hand F or C# and low B♭, most of which were introduced by Barret.

and placing down of another on the right, which introduces audible glitches into many legato passages. Certain passages which are virtuosic on the Système 6 oboe are child's play on the Système 5 (Figure 11).



Figure 11. Mozart, *Quartet K314 for oboe and strings, III: Rondeau Allegro*.

THE BARRET OBOE

The London oboist A.M.R. Barret further modified the Système 5 oboe, borrowing heavily from the Boehm oboe. Barret began with the B \flat thumb mechanism of the Système 5. The most important aspect of the Barret système was that it included an alternative to the use of the left thumb for creating B \flat and C, without moving the right hand up to touch the long key for the palm. The *brilles* for 4, 5 or 6 when depressed moved a lever that acted across the upper joint to open the little keys otherwise activated by the left thumb. This was the mechanism used by Buffet on the Boehm oboe, but modified so that it opened the B \flat and C holes, rather than closing the B \flat hole. With this system the player could move (for example) from d2 to c2 merely by closing the half-hole and lifting 2 and 3. Neither a movement of the thumb nor a shift of the right hand was necessary. The long B \flat /C key for the right palm, now redundant, was suppressed, as the player had the choice to activate B \flat and C with the thumb, 4, 5 or 6 (Figure 10cs).

Barret made several other changes. He made the choice of octave keys automatic. He kept the critical *brilles* on 2, 5 and 6, suppressed the double hole for 3, and placed a *brille* on 4 which created an articulation between the joints to allow a true F \sharp -G \sharp trill. He introduced left hand F (which is clearly illustrated in his *Method*) to Western Europe, kept

the butterfly key for low B and E \flat , articulated C \sharp to D \sharp , and extended the oboe's lower range a semitone to B \flat .

THE SYSTÈME 6 OBOE

The Barret oboe seemed to be the answer to the Boehm in every respect. It was new and therefore, in the logic of the day, it was good. It looked rather like a Boehm oboe, with its neat row of *brilles* on holes 2 to 6. It used a similar bore and toneholes as Triébert's earlier systèmes, thus preserving the tone of the oboe. The use of fingers 4 to 6 to produce B \flat 1 and C2 had a pleasantly covering effect on the tone of these two notes. The several articulations and added trill keys palpably improved the oboe's technique. But players distrusted the linkage between the two little vent holes, the left thumb touch, and the right hand, which depended on the relative strengths of mutually-opposed springs. This mechanism was probably more prone to mechanical failure than the Système 5 or Boehm oboes. Also, having the *brilles* on 5 and 6 act across the joint meant that players had to remove their hands entirely from the lower joint for any a1 or B1, no matter how brief, to avoid sounding B \flat 1 or C2.

Frédéric Triébert altered the Barret right hand mechanism so that only key 4 would open the B \flat 1 and c2 vents, removed the thumbplate mechanism and introduced semi-automatic octave keys.¹⁵⁴ This simplified Barret oboe was introduced as the Système 6 in 1875. Adopted by Georges Gillet of the Paris Conservatoire in 1882, it became known as the Conservatory system (a name which is also often given to the Système 6bis oboe).¹⁵⁵

Georges Gillet later collaborated with Adolphe Lucien Lorée (son of François) to design the Système 6bis. Introduced in 1906, this is often known as the Gillet or Modified Conservatory model (Figure 12cs). All the changes are in details. Most notable are the plateau (covered) keys, which derive from Boehm's 1847 flute.¹⁵⁶ Perhaps the most important

¹⁵³ Barret, *Method*, 15a. Left hand F is found on the Sellner oboe as early as 1820.

¹⁵⁴ The earliest octave keys were not interconnected; the player used one or the other. Barret's automatic octaves placed a mechanism on hole 3 such that when 3 was depressed, only the lower octave key could open; when 3 was open, only the upper octave key could open. This was convenient but was felt, perhaps unfairly, to be prone to failure; a similar mechanism works well on saxophones. Writers sometimes note that this removes harmonic fingerings from the oboist's bag of tricks, but the complaint is trivial; composers of the time never wrote harmonics, and modern composers rarely do so (in 30 years of orchestral and chamber music oboe playing, I have twice encountered a request for harmonics). The semiautomatic octave keys most commonly used on modern oboes allow the player to choose to use the higher octave key while keeping the thumb on the touch for the lower, thus simplifying technique but still permitting the player to use harmonic fingerings.

¹⁵⁵ Laila Storch, 'Georges Gillet—Master Performer and Teacher.' *Journal of the International Double Reed Society* 5:1–19, 1977. Laila Storch, 'The Georges Gillet Etudes: a Little-Known Early Edition.' *The Double Reed* 8(2); 34–38, Fall 1985.

¹⁵⁶ A plateau key for 5 was introduced in the Triébert système 4 to correct the pitch of d3. Plateaus on 2 and 3 allowed better tuning of trills between A \flat -B \flat and G \sharp -A. The split ring on 6 allows a correctly tuned trill for D \sharp -E but has its own problems; a superior method of tuning this trill was seen on Couesnon's Bleuzet model oboe of the 1930s (Robert Howe,

reason for plateau keys is that they simplify holding the instrument; the fingers do not need to be in perfect position (although one can argue that this is not a virtue), and the oboe is thus more comfortable for a small-handed player.

HALF-BOEHM OBOES

Several interesting but archaic oboes use a Boehm mechanism for the right hand only, with small tone holes; these may be thought of as 'half-Boehm' oboes (Figure 13c). They are easily recognized by the small vent associated with 4 being placed above, rather than below, 4. These give F as 1234 and F# as 1235, making for smoother technique in flat keys than on other oboes. The Triébert '1855' prospectus is the first evidence of such oboes. Buffet-Crampon made oboes with a *Système* four top joint and Boehm bottom joint.¹⁵⁷ The British maker John

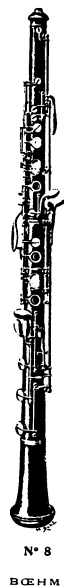


Figure 14. Lorée's Boehm oboe, from *Prix-Courante* 1924. Courtesy Michael Finkelman.

Sharpe made oboes of his own design.¹⁵⁸ He used a *Système* 5 mechanism (not a Barret) for the left hand and the Boehm oboe's arrangement of keys for the right small finger. His tone holes, were small; this is a Boehm-like mechanism on a normal oboe bore. A specimen by Malerne (sold and marked by Roche, New York), of about 1955, also unites Boehm and *Système* 5; it was made to order for a New York saxophonist. An oboe by Uebel uses a Barret action with 1234 as F, 1235 as F#. A set of Lorée oboe and English horn from the 1920s have *Système* 5 upper joints and Boehm lower joints.¹⁶⁰ Catalogues of Stowasser and LaFleur¹⁶¹ describe half-Boehm oboes.

THE LORÉE BOEHM OBOE

Frédéric Triébert's last foreman was François Lorée, who took the position on Charles Louis Triébert's death in 1867. Lorée established his own *atelier* in 1880 after the death of his employer. In October 1881, Lorée sold his first oboe to Rudall Carte of London and secured the contracts to supply oboes to the Paris Conservatoire and the National Schools of Music. As these contracts had previously been Triébert's, they established Lorée as the pre-eminent French oboe maker during his first year in business.¹⁶²

From the first years of his business¹⁶³ Lorée made oboes with normal bore and tone holes, but with keys adapted to Boehm fingering (Figure 14); these are in their catalogue until at least 1924.¹⁶⁴ These are not truly Boehm oboes, as they do not vent through large toneholes: they may be viewed as a type of half-Boehm oboe. They gave the oboe the technical advantages of the Boehm fingerings for F and F# while maintaining the tone and response of the oboe. These were infrequently made; in years of searching I have found only one extant specimen (Table 6). Five Lorée Boehm oboes, six Boehm English horns, and one Boehm bass oboe are

^{156cont} 'A Bleuzet model oboe by Couesnon/Triébert', *The Double Reed*, 25:2, July 2002, 117–20. A plateau for 4 is not needed but allows consistency and eases hand position, especially with the downward extension of the key seen on newer models. The B-c#1 trill is useful for such passages as the opening solo in Ravel's *Le Tombeau de Couperin*.

¹⁵⁷ One of these is at the Library of Congress in Washington DC; another sold at the Vichy auction on 14 December 2002.

¹⁵⁸ John Sharpe, active at Pudsey, near Leeds, England, 1882–1940. He developed this model in 1920. Waterhouse *New Langwill Index*, 371. Bate *The Oboe*, 79–80.

¹⁵⁹ Benade, *Woodwinds: the Evolutionary Path*, plate XI Comments by Virginia Benade, from whom I bought this oboe, suggest that it is the very instrument described in the Galpin Society's catalogue of the exhibition of musical instruments from the 1968 Edinburgh International Festival. See Melville-Mason, *European Musical Instruments*, 21, item 108.

¹⁶⁰ Serial LL27 and LL28, these are in the collection of Patricia Pape, Chicago.

¹⁶¹ Table 5.

¹⁶² Laila Storch, '100 Years F. Lorée: 1881–1981'. *Journal of the International Double Reed Society* 9:28–42, 1981.

¹⁶³ Bate (*The Oboe*, 74) describes Lorée as introducing this model in 1880; since François Lorée sold his first oboe in 1881, this cannot be. A registry of the first several months of Lorée's sales shows no Boehm oboes.

¹⁶⁴ Lorée, *Prix-Courant* 1913, 8–9. Lorée, *Prix-Courant* 1924, 8–9.

documented before 1900.¹⁶⁵ Unique specimens of clarinet- and flute-fingered oboes by Lorée suggest the firm's willingness during the 1920's to adapt their Boehm fingered oboe to individual customers' needs; the flute-fingered specimens are essentially Lorée's Boehm oboe.¹⁶⁶ (Figure 15cs)

THE OBOE-SAX

In the late 1920's, Lorée and other makers attempted to capitalize on the American craze for saxophones by selling an oboe with saxophone fingerings. In theory, a saxophonist could play the oboe-sax merely by mastering the oboe's double reed,¹⁶⁸ thus making the oboe a logical doubling instrument for jazz band saxophonists. Since the saxophone is derived from Boehm's principles, the oboe-sax fingerings very much like a Boehm oboe.

To make an oboe-sax one could place pearl touches on fingers 1-6 of Lorée's Boehm-fingered oboe, then tidy up the few remaining differences between oboe and saxophone mechanisms. The little finger keys were easily altered to the saxophone's pattern. To play the higher octaves the oboe uses two octave vents and a half-hole; on the modern saxophone, one key opens either of two mechanically-chosen octave vents. Oboe-sax makers, borrowing from Buffet's 1844 patent, modified the half-hole mechanism so that lifting the first finger entirely, with finger 3 held down, would leave a small octave vent open at hole 1. Closing 1 would cover this. Adding this to an oboe built with automatic octave keys gave a reasonable compromise between the two systems.

A substantial difference between oboe and saxophone is in the production of the notes d3-f3. On oboe, flute and clarinet these are the third partials of low register notes, with differences in

fingerings to maintain proper pitch; these fingerings are awkward on the oboe. On the saxophone, four small toneholes are opened by the palms to produce these notes.¹⁶⁹ Oboe-sax makers placed keys for d3-e3 as on a saxophone: f3 was produced by playing e3 and adding 3, and higher notes were available as cross fingerings.¹⁷⁰ Unfortunately the three tiny tone holes produce a shriller sound than the same notes played on the standard oboe, negating the advantage of increased facility.

The oboe-sax was introduced after 1929. I find no oboe-saxes in a set of photos of 1920s jazz bands, although several players do have conservatory or Boehm system oboes. Robert de Gourdon of Lorée noted that 'Oboe "AD 53" has been made in 1930 by Mr Lucien LORÉE'.

'We think that actually this instrument must have a real value as it has been made almost ten instruments of this model only..., and the last one around 1930....'¹⁷¹

Besides the oboe referred to in this letter, I have found Lorée oboe-saxes with serial numbers AE 62, AE 69, AE 78, AE 79, AE 93, AH8, and AI 52;¹⁷² other Lorée oboe-saxes of the AE series are known to exist.

Two American catalogues of c.1932 show the Lorée oboe-sax.¹⁷³ Carl Fischer sold these for \$300; the same catalogue prices the Lorée conservatory oboe at \$440-460 while the Lorée English horn is a bargain at \$380. The Continental Music Company sold Lorée 'Sax Oboes' for \$250 and metal bodied oboe-saxes by Kohlert for \$180.¹⁷⁴ Continental sold the Lorée conservatory oboes for \$440-460, the Kohlert grenadilla conservatory oboe for \$190, Kohlert's metal conservatory oboe for \$184, Buffet-Crampon's standard Boehm oboe for \$170, the

¹⁶⁵ Lorée's Boehm system cor anglais serial A38 sold to Friguel; B7 to Mélé; D40 to Cabot; F61 to Lemaire; F85 to Singier; K38 to Courtal. Friguel also purchased F64 Boehm oboe at English pitch (A=452), suggesting that between A38 (1882) and F64 (c.1890-92) he moved to Britain. Lemaire also purchased Boehm bass oboe F42; since Lorée began to make bass oboes only in 1889 (Bate, *The Oboe*), this establishes serial F42 as 1889 or later. Other early known serial numbers for the firm include A1-A5, 1881; A6-A21, January-July 1882; A99, 1885; X96, 1908. By courtesy of Geoffrey Burgess. Another early Lorée Boehm oboe, serial A81, was sold at the Versailles auction on April 26, 1997, lot 141.

¹⁶⁶ Oboe XX7 and oboe d'amore VV56, c.1926, were made to order for an American player with fingerings exactly like the Boehm flute.

¹⁶⁷ For a detailed study of the oboe-sax see Robert Howe, 'An Oboe-Sax by F. Lorée', *The Double Reed*, 25 (1) 75-80, 2002.

¹⁶⁸ When this turned out to be more than many saxophone players could manage, single reed mouthpieces for the oboe were manufactured.

¹⁶⁹ Contemporary saxophones are often keyed to f#3 or g3, adding two more such toneholes.

¹⁷⁰ As they are also on a saxophone.

¹⁷¹ Letter to Lennart Olsen, Berrien Springs MI, dated May 16, 1973, regarding oboe-sax AD53. Lorée's AB series was from 1929.

¹⁷² America's Shrine to Music Museum, Vermillion, South Dakota. By courtesy of John Peterson.

¹⁷³ Carl Fischer Musical Instrument Company, *Catalog*. (New York, after 1932). By courtesy of Paul Cohen. Continental Music Company, *General Catalog*, 37. By courtesy of Tony Bingham.

¹⁷⁴ Kohlert made oboes in a wide variety of fingering configurations.

Kohlert military system oboe for \$60, and the Lorée English horn for \$480.

The cheapness of the oboe-saxes in both catalogues gives the distinct impression that retailers were trying to unload a stock of oboe-saxes, which were not selling, by reducing the price well below that of the standard model. From Robert de Gordon's letter and these catalogues it appears that Lorée made a batch of oboe-saxes around 1930 but abandoned the model when it failed. Perhaps the American dealers specially ordered a batch (undoubtedly of more than ten) in 1929.

Although the preponderance of oboe-sax specimens are Lorées, several other makers (besides Kohlert) produced these instruments. Boosey & Hawkes advertised their oboe-saxes on the back of the oboe part to the first printing of Benjamin Britten's *Phantasy* for oboe and strings (1935).¹⁷⁵ Joppig illustrates an oboe-sax by the Louis Musical Instrument company of London; Waterhouse notes that Louis made 'oboes modelled on Lorée'.¹⁷⁶ Cundy-Bettony of Boston made metal-bodied oboe-saxes¹⁷⁷ and Gebruder Mönning sold similar instruments in America as 'Sax-Oboes'.¹⁷⁸ A Selmer oboe-sax is in a Parisian collection.¹⁷⁹

The oboe-sax filled no pressing need among musicians and was introduced just as its target audience—middle-class American and British amateurs—were plunged into the Great Depression. Its prompt failure is little surprise.

SUMMARY

Although denigrated by most historians, the Boehm oboe represented a major technological development. It provided a functional oboe for French military bands for almost a century, preventing the acceptance of the soprano sarrusophone. By showing a fully mechanized oboe with the capability to play all trills within its compass, the Boehm oboe set the intellectual stage for the invention of the Barret oboe, which in turn led to those species of modern oboe now used throughout the world. Uncommon and often unique examples of Boehm keywork applied to the oboe continue to delight organologists and collectors.

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Carreras, Richard Cochran, Paul Cohen, Jacques Cools, Daniel Deitch, Bill Fetcher, Michael Finkleman, Grant Green, Brent Hages, Bruce Haynes, Tosiya Kamakura, Bruno Kampmann, Felix and Marcia Kraus, Guy Laurent, John Peterson, Albert Rice, Robert Sheldon, and Susan Thompson, all of whom provided data or other support for this paper.

APPENDIX 1

TEXT OF THE BOEHM PATENT

[English translation by the author. Note that the references to 'plate 5, Figure 1' under CLARINET and 'Figure 2' under OBOE refer to figures in the patent and not to figures in this article.]

Five year Patent

On this date, February 19, 1844

From (Louis-Auguste) BUFFET, Esquire, in Paris,

For the application of mobile rings to clarinets and oboes.

The clarinet with thirteen keys, which initially looked perfect, left much to be desired. Indeed, boring the tone holes of the clarinet according to the spacing of the fingers produced vicious intonation, soft weak notes or overly loud notes; the mechanism of the keys, obliging the player to slip from one key to another to slur two notes, created insurmountable difficulties of technique which prevented one from playing in all the keys equally well; finally the forked fingerings caused a false effect, since one was obliged to voice several notes by means of only one hole.

The oboe had the same disadvantages, the same fork fingerings, the same slidings; the second octave did not correspond to the fingerings of the first; the vent hole for middle C# was used for three notes; for D and E flat, it had to be reduced by half, which the artists called the difficulty of the half-hole; finally the smallness of the tone holes created another disadvantage, that they were promptly blocked by water resulting from simple blowing; these frequent false notes (called, ironically, 'ducks'), even the same most skilful artists could not avoid, since a simple water globule was generally the only cause.

These are the difficulties which had to be overcome, the inconveniences and defects which had to be corrected; these were the goals which I established and which I spent five years to reach.

¹⁷⁵ Now in the collection of the Cleveland Institute of Music, Cleveland OH. By courtesy of Felix and Marsha Kraus.

¹⁷⁶ Joppig, *Oboe and Bassoon*, 85. Waterhouse, *New Langwill Index*, 244.

¹⁷⁷ Active 1907-after 1950, Cundy-Bettony sold metal oboe-saxes under their own and the 'Boston Wonder' names. Waterhouse, *New Langwill Index*, 77; Grant Green, personal communication, December 2002.

¹⁷⁸ Howe, *Oboe-Sax*, 79.

¹⁷⁹ Geoffrey Burgess, personal communication September 2001.

What sacrifices did I not make, what experiments of imperfect instruments did I not try! But, fortunately, success came to reward me for my sorrows, and I managed to apply the mobile rings to the clarinets and the new oboe system; and understand here, I applied the mobile rings not simply to put on mobile rings, but to put them so as to create a valid instrument, an instrument more perfect than the old one, in a word to remake an instrument.

Indeed, the application of the mobile rings to clarinets and the oboes can be looked at as the final solution of the problem, which was of knowing how to apply them to arrive at a perfect instrument; because, before making an instrument similar to those described further, I naturally applied the mobile rings but, still not knowing the precise manner to apply them, a new start was needed. It will be understood easily that, in an instrument whose perfection and accuracy depend on the least of things, if a tone hole is badly placed or badly bored, the goal is suggested but not reached; yet by the full consent of the masters, the instrument is judged good.

The invention thus consists not only in the application of the mobile rings, but again in their application in the manner and in the order indicated on the drawings, because the least change would be enough to establish an instrument perhaps preferable to the old, but inferior to mine.

However I reserve to myself the right to apply to clarinets and oboes the mobile rings as described below, but either entirely or partially, because a partial application only could also produce good effects.

CLARINET

See plate 5, Figure 1.

1, touchpiece taken with the right small finger, closing key 3 and giving B natural.

1 bis, touchpiece taken with the left small finger, changing keys 1 and 3 and giving B natural.

2, touchpiece taken with the right small finger, closing key 3 and giving C sharp.

2 bis, touchpiece taken with the left small finger, closing key 3 and giving C sharp.

3, touchpiece taken with the right small finger and giving C natural.

3 bis, touchpiece taken with the left small finger and giving C natural.

4, touchpiece taken with the right small finger and giving D sharp or E flat.

5, touchpiece taken with the right ring finger and giving F sharp.

6, touchpiece with three rings for the toneholes a, b, c, which close the tonehole 6 and give G natural.

This key has a connection (across the joint) which makes it close key 9 and gives B flat with one or the other of the first three fingers of the right hand.

7, touchpiece taken with the left small finger and giving G sharp.

8, touchpiece taken with the left ring finger and giving B flat.

8 bis, touchpiece taken with the right ring finger and giving B flat.

9, key with a ring on the tonehole which closes tonehole 9, which makes B natural.

10, touchpiece for trilling F sharp to F natural, taken with the right index finger.

11, touchpiece which has a mobile ring on F and tone hole 11, which makes the G natural: it has a ring connecting to the hole G, which makes F natural and F sharp.

12, touchpiece taken with the second phalange of the left index finger which gives G sharp in the chalumeau register.

13, touchpiece taken with the left index finger, giving A natural in the chalumeau register.

14, touchpiece taken with the right index finger, trilling B flat and A natural in the chalumeau register.

15, touchpiece taken with the right index finger, trilling C natural and B flat.

16, touchpiece taken with the left thumb, giving B flat.

OBOE

Figure 2.

1, touchpiece taken with the left little finger, giving low B, closing all toneholes.

2, touchpiece taken with the right little finger, giving C natural; its rod is extended from key 1, which also makes it function.

3, touchpiece taken with the right little finger giving C sharp.

4, touchpiece taken with the right little finger giving D sharp or E flat.

4 bis, touchpiece taken with the left little finger giving D sharp or E flat.

5, touchpiece taken with the right ring finger giving F sharp.

6, touchpiece with three rings for toneholes a, b, c closing tonehole 6, giving G natural.

This key has a connection which closes key 9, giving B flat with one or the other of the first three fingers.

7, touchpiece taken by the left little finger giving G sharp.

8, touchpiece taken by the right index finger giving B flat.

9, touchpiece with a ring around the tonehole which also closes tonehole 9, giving B natural.

10, touchpiece closed by the right thumb giving C natural.

10 bis, touchpiece closed by the right index finger giving C natural.

11, key which has an internal connection so that, while acting on the plate F, the tone hole for middle C sharp is closed: it has an opening which crosses the cap and gives what is called the half-hole.

The plate F acts on a cross-piece which closes the half-hole.

11 bis, touchpiece taken with the left ring finger for trilling C sharp and B.

12, touchpiece taken with the right middle finger for trilling D natural and C sharp.

13, touchpiece taken by the second phalange of the left index finger, opening the octave key and supporting the notes from C sharp in the second octave. It comes to rest upon a small tube which passes into the bore, arriving at the end of the reed well.

By means of the provisions described above, the fork fingerings are removed, as well as sliding from one key to another.

Indeed, difficulties which only the right hand could execute in the old instruments can, by means of this new system of connections, be carried out by the left hand, and vice-versa.

Seven fingers suffice to stop ten holes.

The fingering is made easier, more regular, more rational.

The tone obtains an incontestable equality and accuracy of the notes, and more force in all the entire chromatic range.

Moreover, the holes of the oboe became larger, more numerous; they number ten, and are stopped by seven fingers.

The difficulty of the half-hole is overcome, since the mechanism compensates for it without the executant having to occupy himself.

The fingering of the second octave now conforms with that of the first.

Pressure of the lips on the reed raises the note an octave.

Lastly, while preserving its primitive tones and its pastoral accents, the oboe acquires more roundness, more force and a remarkable sonority.

One thus sees that these two instruments, made more perfect, more convenient, more facile than the old ones, without the executant having, so to speak, to need to lend the ear, will be quite preferable for those who have not learned the old clarinet and the old oboes, because they will be put at it more easily, and their progress will be faster; but also for artists who know the old instruments, because their playing will become surer and much more beautiful.

b. Original French text

BREVET D'INVENTION DE CINQ ANS

en date du 19 février 1844,

Au sieur BUFFET (Louis-Auguste), à Paris,

Pour l'application des anneaux mobiles aux clarinettes et hautbois.

La clarinette à treize clefs, regardée d'abord comme parfaite, laissait pourtant beaucoup à désirer.

En effet, le percement originaire des trous de la clarinette, calculé d'après l'écartement des doigts, produisait des intonations vicieuses, des notes sourdes, faibles ou trop éclatantes; le mécanisme des clefs, obligeant à glisser d'une clef sur l'autre pour lier deux notes, entraînait des difficultés insurmontables de doigté qui empêchaient de jouer dans tous les tons indifféremment; enfin les fourches occasionnaient un faux doigté, puisqu'on était obligé d'accorder plusieurs notes au moyen d'un seul trou.

Pour le hautbois, mêmes inconvénients, mêmes fourches, mêmes glissages; la seconde octave ne correspondait plus au doigté de la première; le trou d'ut dièse médium servait à trois notes; pour le ré et le mi bémol, il fallait le déboucher à moitié, ce que les artistes appelaient la difficulté du demi-trou; enfin l'exiguïté des trous entretenait un autre inconvénient; en effet, ils étaient promptement obstrués par l'eau résultant de la simple insufflation; de là la fréquence de ces fausses notes appelées ironiquement canards, à laquelle même les plus habiles ne pouvaient se soustraire, puisqu'une simple globule d'eau en était le plus souvent la seule cause.

Voilà les difficultés qu'il fallait vaincre, les inconvénients, les défauts qu'il fallait corriger, c'est là le but que je m'étais proposé et que j'ai mis cinq années à atteindre.

Aussi quels sacrifices n'ai-je pas faits, quels essais immédiatement suivis d'instruments défectueux n'ai-je pas tentés! Mais, heureusement, le succès est venu me récompenser de mes peines, et je suis parvenu à appliquer les anneaux mobiles aux clarinettes et aux hautbois nouveau système; et j'entends ici par appliquer les anneaux mobiles non pas simplement mettre des anneaux mobiles, mais bien les mettre de manière à créer un instrument (sic) juste, un instrument plus parfait que l'ancien, en un mot refaire un instrument.

En effet, l'application des anneaux mobiles aux clarinettes et aux hautbois peut être regardée comme la solution d'un problème à résoudre, dont l'inconnu était de savoir comment les appliquer

pour arriver à un instrument parfait; car, avant de faire un instrument semblable à ceux décrits plus loin, j'ai naturellement appliqué les anneaux mobiles; mais, n'étant pas arrivé encore à la manière précise de les appliquer, il fallait recommencer, et on comprendra aisément que, dans un instrument dont la perfection et la justesse dépendent de la moindre des choses, d'un trou mal placé ou mal percé, le but proposé n'était atteint que, de l'aveu des maîtres, l'instrument était jugé bon.

L'invention consiste donc non-seulement dans l'application des anneaux mobiles, mis encore dans l'application de la manière et dans l'ordre indiqués sur le dessin, car le moindre changement suffirait pour établir un instrument peut-être préférable aux anciens, mais inférieur aux miens.

Toutefois je me réserve le droit d'appliquer aux clarinettes et aux hautbois les anneaux mobiles de la manière décrite ci-dessous, mais soit en totalité, soit partiellement, car une application partielle seulement pourrait produire de bons effets.

Clarinette.

Pl. 5e, fig. 1re.

1, clef qui se prend avec le petit doigt de la main droite, ferme la clef 3 et donne le si naturel.

1 bis, clef qui se prend avec le petit doigt de la main gauche, ferme les clefs 1 et 3 et donne le si naturel.

2, clef qui se prend avec le petit doigt de la main droite, ferme la clef 3 et donne l'ut dièse.

2 bis, clef qui se prend avec le petit doigt de la main gauche, ferme la clef 3 et donne l'ut dièse.

3, clef qui se prend avec le petit doigt de la main droite et donne l'ut naturel.

3 bis, clef qui se prend avec le petit doigt de la main gauche et donne l'ut naturel.

4, clef qui se prend avec le petit doigt de la main droite et donne le ré dièse ou mi bémol.

5, clef qui se prend avec l'annulaire de la main droite et donne le fa dièse.

6, clef à trois anneaux sur les trous a, b, c, qui ferme le trou 6 et donne le sol naturel.

Cette clef a une correspondance qui fait agir la clef 9 et donne le si bémol avec l'un ou l'autre des trois premiers doigts de la main droite.

7, clef qui se prend avec le petit doigt de la main gauche et donne le sol dièse.

8, clef qui se prend avec l'annulaire de la main gauche et donne le si bémol.

8 bis, clef qui se prend avec l'index de la main droite et donne le si bémol.

9, clef qui a un anneau sur le trou e et qui ferme le trou 9, qui fait le si naturel.

10, clef qui sert à triller fe dièse sur fa naturel: elle se prend avec l'index de la main droite.

11, clef qui a un anneau sur le f et le trou 11, qui fait le sol naturel: elle a un anneau de correspondance sur le trou g, qui fait le fa naturel et le fa dièse.

12, clef qui se prend avec la seconde phalange de l'index de la main gauche et donne le sol dièse (chalumeau).

13, clef qui se prend avec l'index de la main gauche et donne le la naturel (chalumeau).

14, clef qui se prend avec l'index de la main droite et sert à triller le si bémol sur le la (chalumeau).

15, clef qui se prend avec l'index de la main droite et sert à triller l'ut naturel sur le si bémol.

16, clef qui se prend avec le pouce de la main gauche et donne le si bémol.

Hautbois

Fig. 2e.

1, clef qui se prend avec le petit doigt de la main gauche et donne le si naturel d'en bas, tous les trous bouchés.

2, clef qui se prend avec le petit doigt de la main droite et donne l'ut naturel; sa branche se prolonge sur la clef 1, qui la fait fonctionner.

3, clef qui se prend avec le petit doigt de la main droite et donne l'ut dièse.

4, clef qui se prend avec le petit doigt de la main droite et donne le ré dièse ou mi bémol.

4 bis, clef qui se prend avec le petit doigt de la main gauche et donne le ré dièse ou mi bémol.

5, clef qui se prend avec l'annulaire de la main droite et donne fa dièse.

6, clef qui a trois anneaux sur les trous a, b, c et forme le trou 6, qui donne le sol naturel.

Cette clef a correspondance qui fait agir la clef 9, qui donne le si bémol avec l'un ou l'autre des trois premiers doigts.

7, clef qui se prend avec le petit doigt de la main gauche et donne le sol dièse.

8, clef qui se prend avec l'index de la main droite et donne le si bémol.

9, clef qui a un anneau sur le trou e et ferme le trou 9, qui donne le si naturel.

10, clef qui se ferme avec le pouce de la main droite et donne l'ut naturel.

10 bis, clef qui se ferme avec l'index de la main droite et donne l'ut naturel.

11, clef qui a une correspondance intérieure combinée de telle sorte que, en agissant sur le plateau f, le trou d'ut dièse médium se trouve fermé: elle possède une ouverture qui traverse la calotte et donne ce qu'on appelle le demi-trou.

Le plateau f agit sur une traverse qui vient fermer le demi-trou.

11 bis, clef qui se prend avec l'annulaire de la main gauche et sert à triller l'ut dièse sur le si.

12, clef qui se prend avec le médium de la main droite et sert à triller le ré naturel sur l'ut dièse.

13, clef qui se prend avec la seconde phalange de l'index de la main gauche et fait octavier et tenir les notes depuis le la jusqu'à l'ut dièse d'en haut de la seconde octave: elle vient boucher un petit tube appelé âme et qui dépasse dans la perce et arrive au bout de l'emboitage de l'anche.

Au moyen des dispositions ci-dessus décrites, les fourches sont supprimées, ainsi que les glissades d'une clef à l'autre.

En effet, les difficultés que la main droite pouvait seule exécuter dans les anciens instruments peuvent être, au moyen de ce nouveau système de correspondance, exécutées par la main gauche, et réciproquement.

Sept doigts suffisent pour boucher dix trous.

Le doigté en est devenu plus facile, plus régulier, plus rationnel.

Les sons ont obtenu une égalité de notes et une justesse incontestables, et plus de force dans toute l'étendue de la gamme chromatique.

De plus, les trous du hautbois sont devenus plus grands, plus nombreux; ils sont au nombre de dix, bouchés par sept doigts.

La difficulté du demi-trou est vaincue, puisque le mécanisme y supplée sans que l'exécutant ait à s'en occuper.

Le doigté de la seconde octave est devenu conforme à celui de la première.

La pression des lèvres sur l'anche octavie la note.

Enfin, tout en conservant ses qualités de sons primitifs et ses accents champêtres, le hautbois acquiert plus de rondeur, plus de force et une sonorité remarquable.

On voit donc que ces deux instruments, rendus plus parfaits, plus commodes, plus facilement justes que les anciens, sans que l'exécutant ait, pour ainsi dire, besoin de prêter l'oreille, seront bien préférables pour ceux qui n'ont pas encore la pratique des anciennes clarinettes et des anciens haubois (sic), car ils s'y mettront plus facilement, et leurs progrès seront plus rapides, mais aussi pour les artistes qui ne connaissaient que les anciens instruments, car leur jeu en deviendra bien plus sûr et bien plus beau.

APPENDIX 2

SHAW ON THE TONE QUALITY OF WIND INSTRUMENTS.

Bernard Shaw, a fervent advocate of community music and a keen amateur pianist and singer,

complained in his inimitable way that wind instruments had become too bright in tone. His comments, although more applicable to brasswinds, shed light on the importance of military bands in the musical culture of the 19th century:

'The fact is, we want some genuine artist to take up the work of producing fine instruments...The instrument-makers will never do it, because all their efforts are aimed at better intonation, greater facility of execution, and perfect smoothness of tone. Now smoothness of tone is all very well in its way; but the question remains, what sort of tone? The instrument-makers care only for that one variety, dear to Kneller Hall, which is the true characteristic tone of the saxhorn or euphonium but which robs the trumpet, the trombone, and the horn of their individuality.

I verily believe that the instrument-makers would like nothing better than to make all the brass in the orchestra sound as if it consisted of a happy family of saxhorns, from the bombardon to the cornet. Their ideal orchestra would consist of the string quartet with a cavalry band for the brass, and a set of English concertinas, bass, tenor, alto, and treble, for the woodwind. That is why I want an artist craftsman to take the matter up, with the object, not of inventing some new instrument like the saxophone or sarrusophone which nobody wants, but of giving us back the old instruments which everybody wants, with their individuality developed to the utmost.

In short, we want a maker of instruments for the classical orchestra; and we shall certainly not get him on strictly commercial line at present, because the great bulk of the instrument business lies with military bands, and with the innumerable bands on the military model which exist throughout the country, from those of the Salvation Army to the amateur bands of the industrial counties, which compete as eagerly for prizes as rival football teams do, and which spend considerable sums out of these prizes in perfecting their instrumental equipment.¹⁸⁰

APPENDIX 3

BOEHM OBOE TEXT FROM TRIÉBERT NOUVEAU PRIX-COURANTE, c.1861

8. Parmi les avantages du système Boehm, nous apprécions surtout celui du doigté de la main droite, et dans le nombre des travaux considérables accomplis par Ch. Triébert pour l'amélioration de la famille des hautbois, nous devons compter

¹⁸⁰ George Bernard Shaw. 'Wanted: A Flute that is a Flute.' *The World*, 7 March, 1894.

l'adjonction du mécanisme de Boehm pour la main droite aux avantages que comporte, sur les autres modèles, celui de la main gauche.

9. Hautbois système Boehm (nouvelle perce). Cet instrument, construit d'abord sur les données incertaines, est resté longtemps imparfait et quelques avantages de doigtés ne pouvaient dédommager(sic) de l'imperfection de son timbre; de nombreux essais, faits par Ch. Triébert, eurent un résultat plus heureux, et nous conservons un modèle ayant exactement le son traditionnel du hautbois, mais dont le mécanisme est encore inachevé; en sorte que pour satisfaire les personnes décidées malgré tout à l'adoption du système Boehm, nous avons temporairement établi un modèle, bon sous tous autres rapports, mais dont le timbre, quoique amélioré, ne nous satisfaisait pas encore entièrement. Le modèle que nous proposons aujourd'hui, est construit d'après les calculs et la perce que nous tenons de Boehm, et s'il ne conserve pas le son traditionnel, du moins celui qu'il possède est beau et puissant; nous nous sommes sérieusement occupés du perfectionnement de son mécanisme, et sans l'intervention obséquieuse de M. L..., le plus fervent partisan de ce système, artiste aussi habile qu'innovateur inexpérimenté, nous eussions plus rapidement atteint le but que nous nous proposons.

La tablature que nous publierons de cet instrument et de nos récents perfectionnements, en donnera un aperçu plus complet que nous ne pourrions le faire ici.

10. Hautbois système Boehm (nouvelle perce). Le modèle mentionné ci-dessus (numero 9) descend au *la*, et bien que tous les détails de son mécanisme aient leur raison d'être, il y a certains points, d'une utilité secondaire, que nous avons jugés à propos de supprimer dans ce modèle-ci, afin de diminuer ses chances d'avaries et l'élévation de son prix. Ces modifications en font selon nous, un instrument précieux pour les musiques militaires, la construction des clefs de *mi*^b et de *sol* # offre moins de fragilité, et la suppression d'une clef de cadence de *re* # et des clefs de *si*^b et de la graves n'enlève rien d'essentiel et nous a permis l'adjonction de la branche du double *mi*^b.

APPENDIX 4a

Fétis's comments on the Boehm oboe.

Courtesy Albert R. Rice. Editorial comments are [in square brackets].

Manufacture of Musical instruments. Report of Mr. Fétis. Paris, 1856.

...Gradually the number of toneholes has increased on the oboe, like that of the keys, with the aim of improving the accuracy [of pitch]. In the oboe improved by the Boehm mechanism, the keys number fourteen. Messrs Triébert and Co. have further modified it with new improvements, and the combinations are such that the same finger acts automatically without difficulty on several keys. The best instruments of this kind are manufactured by the house of Triébert and Co., Paris. The oboes placed at the Exposition by this maker go down to A [i.e., rather than to the usual B or B^b], which improves the sonority of the notes above, B flat, B, C, C sharp and D. The quality of sound, very pure, is that which was always preferred in the French oboe; all the details of the mechanism are finished with great perfection. The half-hole key, added to the ordinary oboe by these makers, is a happy innovation, in that it makes the greatest fingering difficulties of the instrument disappear, and gives more safety in the execution. One notes also, in their new instruments, of particular arrangements of the D, F sharp, G sharp, B flat, C and C sharp keys, the effect of which is to render the fingering of large numbers of passages simpler and more facile. Established more than one half-century ago by the father of the current makers, the house of Triébert and Co. has never ceased to progress; its perseverance to seek improvements for its products is never denied. Their mechanical devices, and in general their tools for the manufacture of precision parts are worthy of much interest.

... However, the cor anglais remained a long time defective from the point of view of the accuracy [of pitch], because the tone holes were not in their [proper] places, and because one was obliged to bore them obliquely [this refers to the curved, leather covered cor anglais]. The efforts of many artists and some makers to make the defects disappear have had only incomplete results. The application of Boehm's system of ring keys allowed Messrs Triébert and Co. to rectify the chromatic scale of this instrument, and to replace it with better acoustic conditions, by rectifying the tube and giving it a more conical bore.

... the oboe is less indebted to Mr. Boehm than the flute; because the theoretical and practical research of this artist, a distinguished acoustician, has resulted in a radical reform of this instrument, giving intervals of perfect accuracy and homogeneity of the sounds. Doctor [Karl F. E.] Schafhäütl's new theory of wind instruments had provided him [Boehm] with these data:

1. The length of the airstream of a conical pipe is calculated from the apex to the base of the cone.

2. This ideal length between the apex of the cone and the tonehole is reduced, which corresponds to

the volume taken by the insertion of the reed. This point is marked by a horizontal line; then one draws two lines [from the apex], passing by the ends of the horizontal line, which should have only the length of the small diameter, and the slope of these prolonged lines over the entire length of the remainder of the airstream gives as its product the exact proportions of the cone until its base.

But these theoretical indications, although instructive, do not determine unquestionably all the conditions of good sonority and accuracy [of pitch]. It was by multiple tests that Mr. Boehm arrived at the exact knowledge of these conditions; and to achieve this goal, he needed the help of Mr. Lavigne, oboist of a very distinguished talent, who had gone to Munich to contribute to the experiments. The results of this research are:

1. The overall length of the airstream of an oboe which goes down to A is 710 millimeters;
2. The part of this column which corresponds to the insertion of the reed is 147 millimeters;
3. From whence it follows that the remainder of the airstream on the basis of this point, marked by a transverse line, is equal to 563 millimeters;
4. But, if one gives 5 millimeters as the fixed diameter of the higher part of the instrument, and if the cone has a slope of 0.304 mm out of 100 millimeters length, the base of this cone will be 24.14 mm in diameter(sic).¹⁸¹

Such are indeed the proportions of a conical oboe which goes down to A.

The determination of the position of the holes required great care and patience, because the distances between these holes are in an increasing but irregular progression, because of the conical slope of the tube. Finally Mr. Boehm managed to fix the distances and the diameters of fourteen holes, which give twelve semitones perfectly right, not including the three small holes placed in the higher part of the tube as octave vents.

It appears useful to give here the table of proportions, showing the dimensions of a new conical instrument, built in normal proportions; a fact which will exert a great influence on the future of wind instruments.

Normal positions of the holes of conical oboe in A, the overall length of the airstream being 710 mm:

B	153.83 mm
B \flat /A \sharp	173.85
A	194.00
G \sharp /A \flat	215.44
G	237.96
F \sharp /G \flat	261.92
F	287.31
E	314.20
E \flat /D \sharp	342.70
D	372.89
D \flat /C \sharp	404.87
C	438.76
B	474.66
B \flat /A(\sharp)	512.70
A	Full length of the tube

Regarding the mechanism of the keys, Mr. Boehm left the design to the intelligence of Mr. Triébert, to whom is entrusted the construction of the new instrument; the recognized skill of this maker realized, in the most complete manner, the inventor's designs. The new oboe, such as was heard by the Jury, leaves nothing to be desired in the accuracy and the homogeneity of the sounds; like the flute of the same maker, it is the standard instrument, in that the chromatic scale of the twelve semitones is formed by closing or by opening all toneholes in regular succession, so that the acoustic monstrosities of the forks and the half-holes have disappeared. Nevertheless, one cannot deny that this rebuilding of the oboe changed the sympathetic nature of its quality of sound, and gave it some analogy to the sonority of the clarinet. From the point of view of instrumental colour, this analogy [to the clarinet's tone] is bad; because the contrasts of notes in music are one of the most powerful causes of the emotions produced by this art.

The need to gradually enlarge the cone of the tube, obliged Mr. Boehm to give to this oboe a diameter larger than that of the old oboe, whose narrow tube was precisely the cause of small volume (of sound) and rustic sonority.

¹⁸¹ This shows an error in Fétis' description. A conicity 0.304% would give an actual bell diameter of 5mm + (5.63 x .304)mm = 5mm + 1.71mm = 6.71 mm. However, 24.14 mm is the exact result obtained by determining the base by proportional triangles. Fétis almost certainly meant to indicate a slope of 3.40mm/100mm, which gives the correct result of (5.63 x 3.40)mm + 5 mm = 19.14 mm + 5 mm = 24.14 mm. It is reasonable to surmise that Fétis did not understand the mathematics and that, in simply writing what he had been told, he transposed two digits and misplaced the decimal point; or that the printer made a similar mistake.

APPENDIX 4b

Fabrication des Instruments de Musique. Rapport de M. Fétis.
Paris, 1856.

Progressivement le nombre des trous c'est augmenté dans le hautbois, ainsi que celui des clefs, dans le but d'améliorer la justesse. Dans le hautbois perfectionné par le mécanisme de Boehm, le nombre des clefs est de quatorze. MM. Triébert et Cie viennent de le modifier encore par de nouveaux perfectionnements, et les combinaisons en sont telles, que le même doigt fait sans difficulté l'office de plusieurs. Les meilleurs instruments de ce genre sont fabriqués par la maison Triébert et Cie, de Paris. Les hautbois placés à l'Exposition par cette maison descendent au la, d'où résulte une amélioration de sonorité pour les notes supérieures si bémol, si, ut, ut dièse et re. La qualité de son, très-pure, est celle qui a toujours été préférée dans le hautbois français; tous les détails du mécanisme sont terminés avec une grande perfection. La clef du demi-trou, ajoutée au hautbois ordinaire par ces facteurs, est une heureuse innovation, en ce qu'elle fait disparaître une des plus grands difficultés du doigter de l'instrument, et donne plus de sûreté dans l'exécution. On remarque aussi, dans leurs nouveaux instruments, de dispositions particulières des clefs de ré et de fa dièse, de sol dièse, si bémol, ut et ut dièse, dont l'effet est rendre le doigter d'un grand nombre de traits plus simples et plus faciles. Établie, il y a plus d'un demi-siècle, par le père des facteurs actuels, la maison Triébert et Cie n'a cessé de progresser; sa persévérance à chercher des améliorations pour ses produits ne s'est jamais démentie. Ses appareils mécaniques, et en général son outillage pour la précision dans la fabrication des pièces sont dignes de beaucoup d'intérêt.

...Toutefois, le cor anglais est resté longtemps défectueux au point de vue de la justesse, parce que les trous n'étaient point à leur place, et parce qu'on était obligé de les percer obliquement. Les efforts de plusieurs artistes et de quelques facteurs pour en faire disparaître les défauts n'avaient eu que des résultats incomplètes. L'application du système de clefs à anneaux, de Boehm, a permis à MM. Triébert et Cie de rectifier l'échelle chromatique de cet instrument, et de le remplacer dans de meilleures conditions acoustiques, en redressant le tube et lui donnant une perce plus conique.

...Le hautbois n'est pas moins redevable à M. Boehm que la flûte; car les recherches théoriques et pratiques de cet artiste, acousticien si distingué,

viennent d'avoir pour résultat une réforme radicale de cet instrument, sous les rapports de la justesse parfaite et de l'homogénéité des sons. La nouvelle théorie des instruments à vent, de M. le docteur Schafhäült, lui avait fourni cette donnée:

1. La longueur de la colonne d'air d'un tuyau conique se calcule du sommet à la base du cône.

2. Cette longueur idéale de se raccourcit de l'espace compris entre le sommet du cône et le trou le plus rapproché, lequel correspond au son de l'anche. Ce point se marque par un trait horizontal; puis on tire deux lignes, passant par les extrémités de ce trait, qui ne doit avoir que la longueur de petit diamètre, et l'inclinaison de ces lignes prolongées dans toute la longueur du reste de la colonne d'air donne pour produit les proportions exactes du cône jusqu'à sa base.

Mais ces indications théoriques, bien qu'instructives, ne déterminent pas d'une manière assez certaine toutes les conditions de bonne sonorité et de justesse. Ce fut par des essais multipliés que M. Boehm parvint à la connaissance exacte de ces conditions; et pour atteindre son but, il lui fallut le secours de M. Lavigne, hautboïste d'un talent très-distingué, qui s'était rendu à Munich pour aider aux expériences. Le résultat de ces recherches fut celui-ci:

1° La longueur totale de la colonne d'air d'un hautbois qui descend au la est de 710 millimètres;

2° La partie de cette colonne qui correspond au son de l'anche est de 147 millimètres;

3° D'où il suit que le reste de la colonne d'air en partant de ce point, marqué par un trait transversal est égal à 563 millimètres;

4° Or, si l'on donne 5 millimètres au diamètre fixe de la partie supérieure de l'instrument, et si le cône a une inclinaison de m. 000,304 sur 100 millimètres de longueur, la base de ce cône aura 24mm, 14 pour diamètre.

Telles sont en effet les proportions d'un hautbois conique qui descend au la.

La détermination de la position des trous n'exigea pas moins de soins et de patience, car les distances de ces trous sont en progression croissante mais non régulière, à cause de l'inclinaison conique du tube. Enfin M. Boehm est parvenu à fixer et les distances et les diamètres de quatorze trous, qui donnent douze demi-tons parfaitement justes, non compris trois petits trous placés dans la partie supérieure du tube pour octavier.

Il paraît utile d'en donner ici la table proportionnelle, parce qu'il s'agit du fait absolument nouveau d'un instrument conique, construit dans des proportions normales; fait qui exercera une grande influence à l'avenir sur la facture des instruments à vent.

Positions normales des trous de hautbois conique en la, la longueur totale de la colonne d'air étant 0^{mm},710:

Si	0mm,153,83
Sib ou la#	0,173,85
La	0,194,00
Sol#-lab	0,215,44
Sol	0,237,96
Fa#-solb	0,261,92
Fa	0,287,31
Mi	0,314,20
Mib-ré#	0,342,70
Ré	0,372,89
Réb-ut#	0,404,87
Ut	0,438,76
Si	0,474,66
Sib-la(#)	0,512,70
La	longueur du tuyau

A l'égard du mécanisme des clefs, M. Boehm en a laissé la combinaison à l'intelligence de M. Triébert, à qui est confiée la construction du nouvel instrument; l'habileté reconnue de ce facteur a

réalisé, de la manière la plus complète, les vues de l'inventeur. Le hautbois nouveau, tel qu'il l'a fait entendre au Jury, ne laisse rien à désirer sous les rapports de la justesse et de l'homogénéité des sons; comme la flûte de même auteur, c'est l'instrument dans les conditions normales, en ce que l'échelle chromatique des douze demi-tons se forme en fermant ou en ouvrant tous les trous dans leur ordre successif et régulier, de telle sorte que les monstruosité acoustiques des fourches et des demi-tours ont disparu. Toutefois, on ne peut nier que la reconstruction normale du hautbois n'ait changé la nature sympathique de sa qualité de son, et ne lui ait donné quelque analogie de sonorité avec la clarinette. Au point de vue du coloris de l'instrumentation, cette analogie est un mal' car les oppositions d'accents sont dans la musique une des causes les plus puissantes des émotions produites par cet art.

La nécessité de développer progressivement le cône du tube, a obligé M. Boehm à donner à celui-ci un diamètre plus grand que celui de l'ancien hautbois, dont le tube étroit était précisément la cause du volume mince et champêtre de sa sonorité.