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## **French Makers' Improvements to Brass Instruments in the mid-19<sup>th</sup> Century, Compared with Those by Adolphe Sax**

**Introduction** Adolphe Sax's major inventions are well known, and were far superior to those of his contemporaries in France. However, many Sax patents have today been forgotten, while the patents of certain French instrument makers proved important in the history of the improvement of brass instruments. Certain innovations by Sax had also been invented in part and patented by people before him, and some of these devices are now widely used.

This paper deals with several important improvements to brass instruments that originated with French makers, and we shall here compare them with those of Adolphe Sax in order to determine what was really new about Sax's ideas.

**General context** During the 19<sup>th</sup> century, the invention of pistons and valves completely changed the design of brass instruments. They became fully chromatic, and the crooks and shanks slowly and progressively disappeared because they were no longer necessary. The numerous universal exhibitions held in Western Europe were major world events, and each instrument maker endeavoured to present new models and inventions at every such occasion. This stimulated research in general, and all makers were keen to invent extraordinary devices to help them win medals and be recognised as prominent in their field. New improvements could concern:

- the kind of valves,
- valve combinations,
- the instruments' bore and shape,
- the mouthpiece,
- or additional useful devices.

**Labbaye** On 7 December 1826, Jacques-Michel Labbaye patented a *trompette d'harmonie à ventilateur et à piston* (Figures 1 and 2). This trumpet had the standard shape, with three Stoelzel valves in the standard descending pattern (respectively one tone, a semitone, and one-and-a-half tones below the fundamental). It was one of the first patents for a valve instrument in France. Up until 1840, many cornets were built with only two valves. However, this trumpet had no tuning slides. Labbaye wrote:

“The drawings attached to my request only correspond to trumpets with three valves: their number can be augmented by two more. I propose to equip French horns with the same mechanism as the one described above. My rights must then be extended to that latter instrument, as they are to the

perfected trumpet. [...] My new trumpets are liable to be built with a variety of shapes; but the shape that seems preferable to me is that of figure 1: it is much easier to handle, and the sound that comes out of the bell is freer and more powerful. As the case may be, I shall build those in all shapes, and the amateurs who like those sorts of instruments will ultimately judge for themselves.”

“Les dessins qui accompagnent ma demande ne représentent que des trompettes à trois ventilateurs: ce nombre peut être augmenté de deux autres. Je me propose d’établir des Cors d’harmonie auxquels j’adapterai le même mécanisme que celui-ci-dessus décrit. Mon droit privatif doit donc s’étendre à ce dernier instrument, comme à la trompette perfectionnée. [...] Mes nouvelles trompettes sont susceptibles de recevoir toutes espèces de formes; mais celle qui me paraît devoir être préférée, est représentée par la fig. 1<sup>ère</sup>: elle est beaucoup plus commode à manier, & le son qui sort par le pavillon, est plus libre & plus sonore. Du reste, j’en établirai de toutes les formes, & les amateurs de ces sortes d’instruments jugeront en dernier ressort.”<sup>1</sup>

Patents for brass instruments began being filed in France long before Sax. The three-valve arrangement, the general shape, different variations in the shape, and applying these to several families of instruments – nearly all these important matters had already been invented.

**Jahn** On 19 October 1835, Frédéric Jahn patented a *trombone à pistons* (Figure 3), which was probably the first-ever mention of this instrument. The patent states:

“He is gratified to state that the trombone comes in three types, in other words there exist a bass trombone, an alto trombone and a tenor trombone. But they are all still the same model, the only difference residing in the size and volume of the instrument”.

“Il a l’honneur de faire observer que le trombone possède trois dénominations, c’est-à-dire qu’il existe trombone basse, trombone alto et trombone ténor, et cependant c’est toujours le même modèle, qu’il n’y a de différence que dans le volume de l’instrument qui est plus ou moins grand”.<sup>2</sup>

This valve trombone has the same shape as the slide trombone, and the bore is close to that of the “clavicorn” patented by Guichard that same year. This patent is clearly made for a complete family of instruments, so Sax was not the first maker to patent a complete family of instruments with the same pattern!

**Couturier** On 13 October 1852, Jacques Couturier patented an *ophicléide à cylindre ou à piston* (Patent 14657, Figure 4). He stated the following:

“The key system of the present-day ophicleide counts ten keys placed on the bell and one on a branch. The tone of the last four keys is always very muted, because the air flows through a narrow tube. To

- 1 Brevet d’invention Jacques-Michel Labbaye (1826), Institut national de la propriété industrielle, Paris [INPI], IBA2532, pp.4f. (all English translations by the author). All patents cited may be found online: <http://bases-brevets19e.inpi.fr> (26 June 2018).
- 2 Brevet d’invention Frédéric Jahn (1835), INPI, IBA5189, p. 3.

make it louder and cleaner, I got rid of them and replaced them with a piston or rotary valve that demands a new fingering that is simpler and easier to play than the previous instrument.”

“Le jeu de l’Ophicléide actuel se compose de dix clefs qui sont placées sur le pavillon et sur une branche. Le son des quatre dernières clefs qui passe par un tube étroit est toujours très sourd. Pour le rendre plus fort et plus net, je les ai supprimées en les remplaçant par un piston ou cylindre à rotation qui a exigé un nouveau doigté dont le jeu est plus simple et plus facile que dans l’ancien instrument.”<sup>3</sup>

However, when the valve is used in combination with the keys, the ophicleide is out of tune.

Adolphe Sax later also patented saxhorns with valves and keys that have the same problems. In this case, his purpose was not to replace keys with valves, but to add keys to a standard saxhorn to enable it to play trills and ornaments.

**Halary** On 9 August 1855, Jules-Léon Anthoine patented the *pavillons à coupe parabolique applicables aux instruments de musique* (Patent 24419; he is named Jules-Léon Halary in this patent). He explained:

“In our military bands, and mainly in cavalry ones, instruments with vertical bells (called upright bells) are used. That shape is clearly adverse to the transmission of sound, as it is thrown towards the higher regions where the air is more rarefied and consequently less able to conduct sounds. Without modifying the shape of the body of the instrument, my new bell preserves all the sonorousness, brightness and ease of the instrument, and thus stands as a faithful reproduction of the human throat and larynx.”

“Dans nos musiques militaires et principalement celles de cavalerie, on se sert d’instruments à pavillons verticaux dits pavillons en l’air. Cette forme est tout-à-fait contraire à la transmission du son, puisqu’il est lancé dans les couches supérieures de l’air plus raréfiées et par conséquent moins conductrices du son. Mon nouveau pavillon sans modifier la forme du corps de l’instrument, lui fait rendre toute sa sonorité, tout son éclat et toute sa facilité, il est la reproduction fidèle du Gosier ou Larynx humain.”<sup>4</sup>

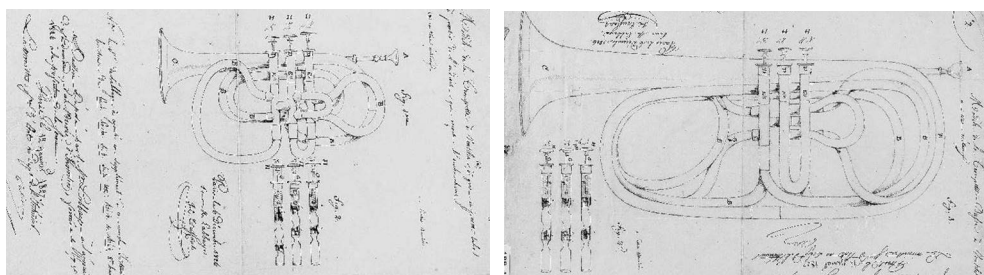
Note his scientific explanation of this kind of bell: the upper levels of the air are more rarefied, he claims, and in consequence the sound is less powerful. This might be true if we were talking about several miles in altitude, but not the couple of feet involved here.

Sax patented the same parabolic bell in 1859, but instead of a fixed position, it has a pivoting bell.

**Guichard** On 29 December 1835, just 15 years after Halary’s ophicleide patent, Jean-Auguste Guichard patented his *ophicleide à pistons* (Figure 5). It is pitched in E $\flat$  (equivalent to an alto or quinticlavé), with crooks for C and B. The bore is rather big and conical, but

3 Brevet d’invention Jacques Couturier (1852), INPI, IBB14657, p. 2.

4 Brevet d’invention Jules-Léon Halary (1855), INPI, IBB24419, p. 2.



FIGURES 1 AND 2 Facsimile of Labbaye's patent from 1826.

Source: Institut National de la Propriété Industrielle, INPI

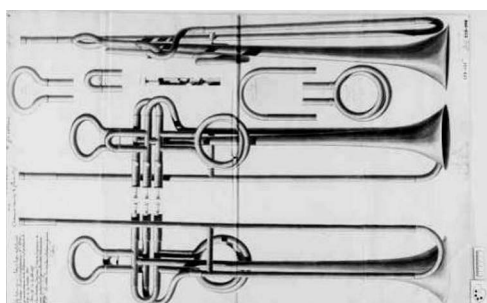


FIGURE 3 Facsimile of Jahn's patent from 1835. Source: INPI

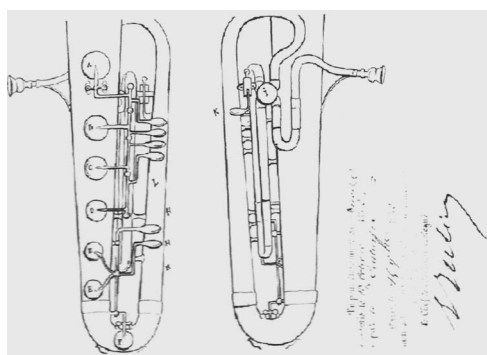


FIGURE 4 Facsimile of Couturier's patent from 1852. Source: INPI

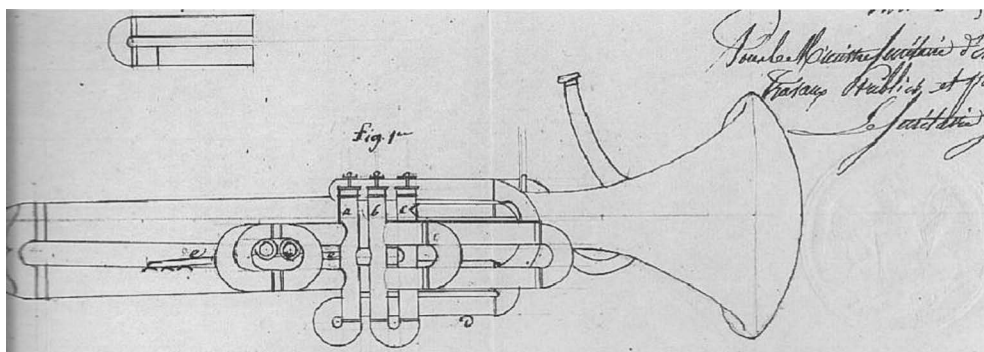


FIGURE 5 Facsimile of Guichard's patent from 1835. Source: INPI

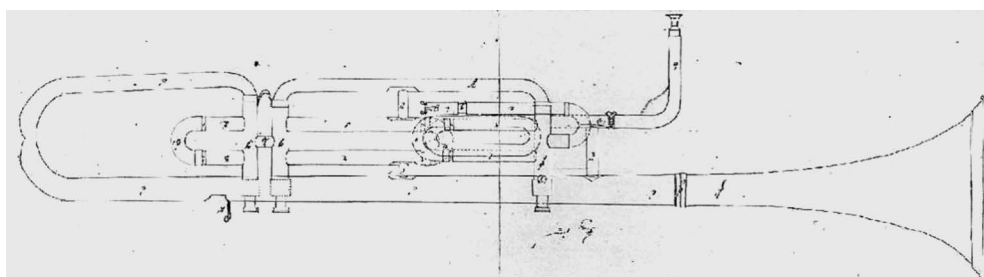


FIGURE 6 Facsimile of Guichard's patent from 1838. Source: INPI

the tube length is twice that of the keyed ophicleide. If you replace the Stoelzel valves with Berlin valves, then this instrument is not very different from a saxhorn.

On 22 May 1838, Jean-Auguste Guichard patented his *clavicor* (Figure 6). It is pitched in E $\flat$  (equivalent to an alto or quinticlavé), with crooks for C and B. He says: “instrument en cuivre nommé Clavicor, et pouvant remplacer avec avantage l’ophicléide-alto”.<sup>5</sup>

The bore is rather narrow and cylindrical. If you replace the Stoelzel valves with Berlin valves, then this instrument is not very different from a saxotromba.

**Gautrot** Gautrot was the most important manufacturer in the second half of the 19<sup>th</sup> century, offering cheap instruments, *pacotille*, as well as high-quality ones. He was frequently involved in lawsuits with Sax, and offered saxhorns identical to his. Gautrot was a businessman, not an inventor, but his firm patented many brass improvements, with each patent and its appendices containing several different inventions. It is not the purpose of this paper to describe them all in detail,<sup>6</sup> but the following table lists the main inventions for each patent:<sup>7</sup>

N° patent	Date	Nature of the invention
5874	01/07/1847	Omnitonic horn with 3 rotary valves and 1 slide
	20/09/1847	Omnitonic cornet with 1 rotary valve and 1 slide
	11/02/1848	
	06/05/1851	
6211	21/08/1847	Perfections on the ophicleide
13732	27/05/1852	Water key for slide trombone (“syphon”) Rubber joint for pistons
	01/12/1852	Rotary valve moved by piston
	17/01/1853	Rotary valve moved by piston (improvement)
20292	22/07/1854	Omnitonic horn (rotary valve with 10 tubes)
		Clock spring for rotary valves or ophicleide keys
		Omnitonic cornet (rotary valve with 8 tubes)
		Automatic tuning of slides

5 “[A] brass instrument called Clavicor, which can replace the alto ophicleide advantageously”. Brevet d’invention Jean-Auguste Guichard (1838), INPI, IBA6768, p. 1.

6 For more information on Gautrot see for example Cyrille Grenot’s article on “La facture instrumentale des cuivres dans la seconde moitié du XIX<sup>e</sup> siècle en France” and Claude Maury’s on “Les cors omnitoniques”, in: *Romantic Brass. Französische Hornpraxis und historisch informierter Blechblasinstrumentenbau. Symposium 2*, ed. by Daniel Allenbach, Adrian von Steiger and Martin Skamletz, Schliengen 2016 (Musikforschung der Hochschule der Künste Bern, Vol. 6), pp. 11–102 and 103–153.

7 This list only contains the wind instrument patents – some more were granted to Gautrot on timpani and percussions, see <http://bases-brevets19e.inpi.fr/>.

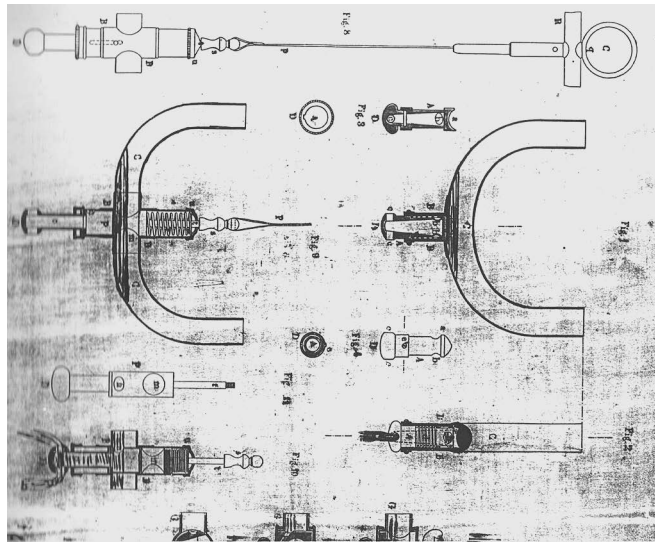
		Pistons with reduced course
		Pistons moving in a spiral
		Pistons with smooth angles
	22/12/1854	Ophicleide transposing in 2 different keys
	15/01/1855	Omnitonic horn (rotary valve with 8 tubes)
	05/06/1857	Tap replacing additional crook
28000	04/06/1856	Conical bore (all kind of valves)
	19/09/1856	Piston without screw
		New design for rotary valve
	06/07/1857	Conical bore (extension to all families)
	30/10/1857	Stoelzel valves without air at the bottom (toric shells)
	08/04/1858	Stoelzel valves with shortened air column in the valve
	28/07/1858	Device for introducing clock springs into cases easily
	09/09/1858	Circular design for brasswind families
	22/12/1858	2 Stoelzel valves without air at the bottom and 1 Périnet valve between them
		Compensating valve ("piston à double effet") for duplex instruments
	27/01/1862	Compensating valve ("piston à double effet") for double horn
		Transposing valve ("piston transpositeur")
46117	28/07/1860	Stoelzel valves without air at the bottom, improvements, light shells
	25/08/1860	Stapled, curved, additional tubes for valves
56450	22/11/1862 <sup>8</sup>	New design for saxhorns with bell and mouthpipe on opposite sides
65313	01/12/1864	Compensating valve ("equitonique") for 5 valves (3 rows of additional tubing)
	05/07/1865	Compensating valve ("equitonique"), new applications
	25/10/1865	Compensating valve ("equitonique"), application to instruments playing in 2 pitches

Some of these inventions are really useful and still in use today. For example, there are the *syphon*, an automatic water key for slide trombone (Figure 7), and the *système équitonique* (Figure 8), the first efficient compensating system, patented a long time before the Blaikley system to which it is identical. By contrast, Sax's patents for brasswind instruments were generally not a success. Only his saxhorn/saxotromba family was widely used, but there was nothing really new about that invention.

**Thibouville-Lamy** Jérôme Thibouville-Lamy patented a *clé corrective* on 8 August 1874 (No. 104550, Figure 9). One or two keys on the saxhorn bell, used either open or closed, help to correct the pitch of valve combinations. However, the valve combinations are too high, and it is more useful to lower the note than to elevate it. It has the same idea as Sax's invention of saxhorns with valves and keys.

8 A "certificat d'addition" to this patent was added on 11 September 1863.

**FIGURE 7** Facsimile of  
Gautrot's patent from 1852.  
Source: INPI

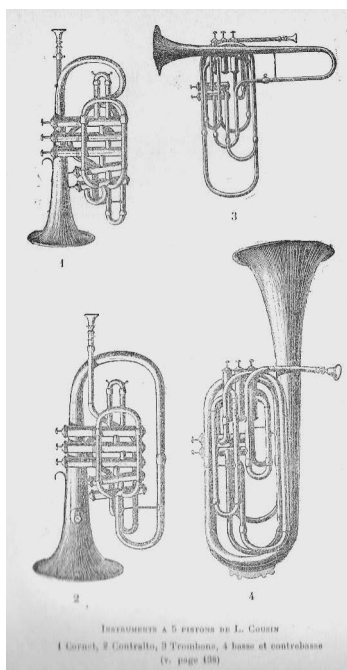


**FIGURE 8** A Gautrot saxhorn equitonique with  
3 rows of tubing. Source: Musée de la Musique,  
Paris; photo: Thierry Ollivier

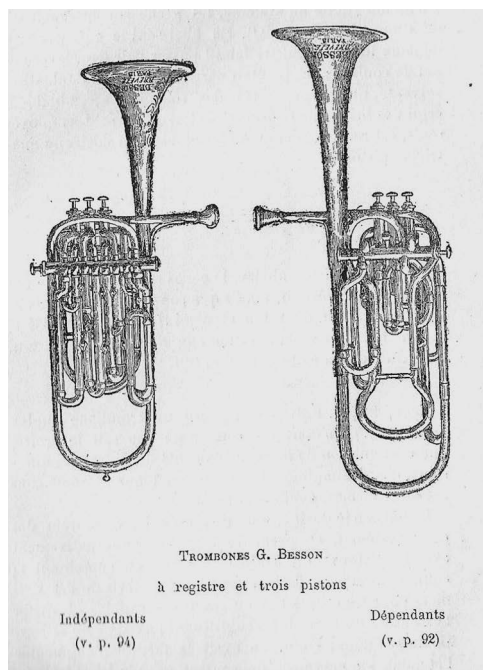


**FIGURE 9** A Thibouville  
saxhorn with one corrective key.  
Source: Collection Camboulive

**Cousin** On 17 February 1873, Jean Léon Cousin patented the instruments à cinq pistons (5-valve brasswinds, Figure 10). The aim is the same as Sax's, namely to avoid combinations of valves. However, the use of dependent, standard Perinet valves allows one to keep the same fingering for the first three valves, avoiding the task of learning a new fingering. The number of semitones lowered is 2, 1, 3, 5 and 4 in succession. This idea is still used on French saxhorns with five valves.



**FIGURE 10** Constant Pierre: *La facture instrumentale à l'exposition universelle de 1889, Paris 1890, p. 139*



**FIGURE 11** Pierre: *La facture instrumentale, p. 93*

**Besson** After Sax's invention of the trombone with independent valves, Besson proposed his *registre*, which was adapted to valve slides to obtain new notes (Figure 11). The fourth valve *registre* lowers the pitch by 2 tones. It crosses the valve slides of the other valves to add a new length in combination with these valves. The same idea would later be used for horns by Wunderlich, where 24 tubes are connected to the register.

**Conclusion** After a detailed survey of French patents registered by different makers for brass instruments, it is clear that Sax's ideas were not completely new, for the same device was also patented by other French makers, in some cases before Sax.

Sax's main invention is the saxhorn/saxotromba, which is not so different from the *ophicléide à pistons*, but was built as a complete family of instruments with the same bore proportions and fingerings, and using a Berlin valve instead of the Staelzel valve.

For brasswind instruments, Sax's legacy is primarily that he rationalised existing ideas and built high-quality instruments, rather than having invented anything really new, as he did with the saxophone.



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## DAS SAXHORN

Adolphe Sax' Blechblasinstrumente im Kontext ihrer  
Zeit. Romantic Brass Symposium 3 • Herausgegeben von  
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MUSIKFORSCHUNG DER  
HOCHSCHULE DER KÜNSTE BERN

Herausgegeben von Martin Skamletz  
und Thomas Gartmann

Band 13



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