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 19th 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. 1ère: 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.”

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 trombonne 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”.

“This valve trombone has the same shape as the slide trombone, and the bore is close to that of the “clavicor” 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 ophicléide 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
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."³

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 modify-
ing 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 pavil-
lons 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 con-
ductrices 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."⁴

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 E₃ (equivalent
to an alto or quinticlaive), with crooks for C and B. The bore is rather big and conical, but

³ Brevet d’invention Jacques Couturier (1852), INPI, IB814657, 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 E₄ (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”.⁵

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 19th 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,⁶ but the following table lists the main inventions for each patent:⁷

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

⁵ “[A] brass instrument called Clavicor, which can replace the alto ophicleide advantageously”. Brevet d’invention Jean-Auguste Guichard (1838), INPI, IBG768, p. 1.


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/](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)
09/06/1857 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 Pénet 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 8 New design for saxhorns with bell and mouthpipe on opposite sides
65313 01/12/1864 Compensating valve (“équitonique”) for 5 valves (3 rows of additional tubing)
05/07/1865 Compensating valve (“équitonique”), new applications
25/10/1865 Compensating valve (“équitonique”), 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 clave 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.
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.
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 ophidèle 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 Stoelzel 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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