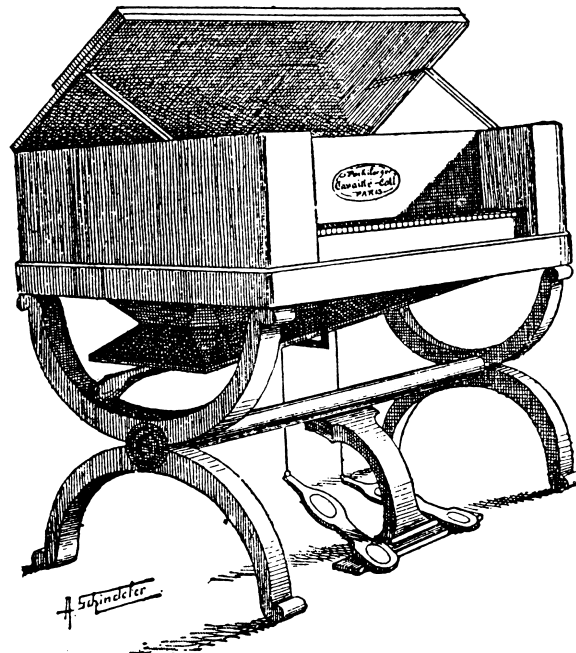


CAVAILLÉ-COLL'S POIKILORGUE: A PRECURSOR OF THE HARMONIUM

The poikilorgue, a predecessor of the harmonium, was a keyboard instrument using free reeds which was built in the 1830s by Aristide Cavaillé-Coll, later famous as an organ builder. Production was limited to only a few dozen. Although there are few extant instruments, the renown of Cavaillé-Coll and the fact that the earliest French method for an instrument of the harmonium family was written for the poikilorgue justify a closer investigation of the history of this instrument.

Fig. 1 Poikilorgue¹



Wind for the poikilorgue is provided by a feeder regulated by a pedal for the left foot and by a reservoir that is kept filled by a second pedal for the right foot. The instrument has a single manual with a compass of five octaves. By controlling the right pedal, it is possible to regulate the dynamics or expression. This possibility explains the name: *poikilos* in Greek means varied (and, in a later sense, also difficult). Thus far, no monograph on the instrument has been published. The most recent article is by Michel Dieterlen,² president of the *Association pour la Sauvegarde de l'Harmonium* in Paris.³

1 In Joseph Guédon, "L'Harmonium," in *Nouveau Manuel complet du facteur d'orgues, 3ème partie* (Paris: L. Mulo, 1903), 247.

HISTORY

The first poikilorgue was presumably built in 1831.⁴ In his handbook for organists, Joseph Guédon writes:

In 1831 we find him [Cavaillé-Coll] in Toulouse, where he is busy building his expressive organs in the style of Grenié, the mechanism of which he wanted to study and perfect (Poikilongue) [sic].⁵

This reference is inaccurate in several respects: the name of the instrument is incorrectly spelled, and Guédon confuses the construction principle used by Grenié with that of the poikilorgue. However, later in the same volume⁶ in the chapter on the harmonium, the poikilorgue is described correctly, including an illustration. (This drawing was taken from Mustel, however without credit to the original source.⁷)

In his discussion of the evolution of the organ and related instruments after the French revolution, Fenner Douglass gives additional information about the history of the poikilorgue.⁸ At a production of Meyerbeer's *Robert le Diable* in Toulouse, a poikilorgue was used since no organ was available. Rossini, who was returning to Paris in September 1832, was so impressed by the instrument that he urged Cavaillé-Coll to go to Paris, instead of wasting his talents in the provinces. The question asked by Douglass, "Is it possible that Rossini had never before heard a harmonium?" should certainly be answered yes, since the harmonium *stricto sensu* did not yet exist, and it is highly unlikely that Rossini knew any of the other prototypes.

Douglass also quotes a description by James Jeans of the type of harmonium which, in his opinion, was known to Cavaillé-Coll.⁹ I cannot, however, readily accept these findings since the instrument described by Jeans and Douglass matches the description of the Debain model, which was only built after 1840.

The date of the invention of the poikilorgue is uncertain. The earliest reference to a specific year is found in a letter from Cavaillé-Coll to a M. Bosquillon of the Conservatoire d'Arts et Métiers on September 30, 1845, discussing the wind supply:

2 Michel Dieterlen, "Poikilorgue d'Aristide Cavaillé-Coll," *L'Harmonium – Cahiers Européens*, no. 7 (1997; without page numbers). Dieterlen also devotes a chapter to the poikilorgue in his doctoral dissertation, *L'Harmonium* (Villeneuve d'Ascq: Septentrion, 1996), 92–97. See also Jean Mons, "Quelques notes sur le Poikilorgue," *Jeunesse et Orgue*, no. 50 (1982): 10–12.

3 "Association for the Preservation of the Harmonium."

4 P. de Fleury, "Cavaillé-Coll", in *Dictionnaire Biographique des Facteurs d'Orgues nés ou ayant travaillé en France* (Paris: Société Française de Musicologie, 1926); quoted in Dieterlen, "Poikilorgue."

5 Joseph Guédon, *Nouveau manuel de l'organiste* (Paris: Mulo, 1903; facs. ed. Paris: Léonce Laget, 1978), 101; quoted in Dieterlen, "Poikilorgue."

6 Guédon, 246.

7 Alphonse Mustel, *L'Orgue-Expressif ou Harmonium*, vol. 1 (Paris: Mustel Père et Fils, 1903), 31.

8 Fenner Douglass, *Cavaillé-Coll and the Musicians* (Raleigh: At the Sunbury, 1980), 3–5.

9 Sir James Jeans, *Science and Music* (Cambridge: Cambridge University Press, 1937), 142–3; quoted in Douglass, 4.

... [it] is only an application of your regulating apparatus to a pedal by which the foot can compress, more or less, the air that escapes from your apparatus. This idea does not seem novel to me, even when applied to the reed stops. Grenier [sic] has already used it in his *orgue expressif*, patented in 1814 or 1816. I myself used it in 1829 in my organs with free reeds called Poïkilorgues. All builders of instruments with free reeds have, after all, used pedals to compress the air and give expression to their instruments. I cannot find, in my opinion, anything novel in this regulatory principle, which, by its very nature, is applicable to all kinds of pressure that one would wish to get from it, and consequently to the expression in free reed stops.¹⁰

However, in another letter, dated June 30, 1857, and addressed to Messrs. Alexandre, Père et Fils, Cavaillé-Coll gives a different year:

Dear Sirs, I have the honor to reply to the questions you have put before me in your letter of the 26th inst.

1. It is quite true that I have not patented the inventions and improvements I have made in the manufacture of pipe organs.
2. It is also quite true that the *Poïkilorgue* that I constructed at Toulouse in 1832 and brought to Paris towards the end of 1833 was an improved member belonging to the family of *orgues expressives*.
3. Finally, I also agree with you that despite the variety of names given to various free-reed instruments that have appeared since that time, all the instruments are the offspring of the family of *orgues expressives*. The origin of the *orgue expressif* goes back to the accordion, unless we give the credit to Grincé [sic], who took out a patent in 1856, [recte 1816] or Chinese who are said to have used the free reed since time immemorial. Despite this common origin, however, I cannot fail to recognize the right of others to obtain patents. There are few original inventions, but since improving is easier than creating – you know this better than I – the *orgue expressif* has been the subject of many patents and improvements, whose value I cannot dispute. It is for the courts to judge the validity of these patents when the question is brought before them.¹¹

Douglass gives 1831 as the year the poïkilorgue was invented,¹² which contradicts Cavaillé-Coll's reference to 1829 in his letter of 1845 but which may be consistent with the letter of 1857, if one assumes that the invention preceded the beginning of actual production by one year. At any rate, it seems that Cavaillé-Coll himself did not much care about the precise date.

An immediate cause for the invention of the poïkilorgue is, according to de Fleury, a lack of jobs for organ builders.¹³ In this period, few organs were built, and the demand for maintenance work on existing instruments was also limited.

¹⁰ Douglass, 533–4. Douglass gives the full text of the French original (translated here).

¹¹ Translated in Douglass, 365; the original French text is found in Douglass, 983. Jacob Alexandre (1804–1876) and his son Edouard (d. 1888) were makers of fine harmoniums, some 20,000 having been built by 1860.

¹² Douglass, 9. Although Douglass includes both letters in the section on sources in his book, he does not discuss the disparate dates given by Cavaillé-Coll.

¹³ De Fleury, article "Cavaillé-Coll (Aristide)" in *Dictionnaire des facteurs d'orgues nés ou ayant travaillé en France* (Paris: Société Française de Musicologie, 1926), quoted in Dieterlen.

This lack of work gave the Cavallé father and son ample time to develop the new instrument. The choice of an expressive and relatively small instrument was perhaps motivated by the potential market. The demand for furniture and anything else that might enhance middle-class salons was growing, although the demand for instruments in churches had slumped.

The first official document about the poïkilorgue is, according to Cellier,¹⁴ a report for the Toulouse Academy in 1833. This report, however, has not been discovered. A fairly accurate description of the poïkilorgue was given in 1837:

The poïkilorgue has a keyboard and free reeds, yet it differs from all other instruments that have been built according to the same principle of sonority (such as Phitz-harmoniques¹⁵ [sic!]), pianos with bellows,¹⁶ in the power of its sound, which, especially in the bass, has an imposing quality, and which can be adapted to the most variable expression by being decreased and increased at will. The case has the shape of a very small square piano, about three and a half feet wide and three feet deep, mounted on X-shaped supports. Its small size, ease of transport, and powerful sounds make this instrument appropriate for use in churches to accompany choirs, in theatres, and in salons. The simplicity of its mechanism and its precision of execution guarantee the endurance of the instrument, and the mathematical exactness with which the proportions of the reeds have been determined guarantee that the instrument will stay in tune for several years. The poïkilorgue has been the subject of several favorable reports, including one by the Institut Royal de France.¹⁷

THE POÏKILORGUE AND THE PIANO

In a contemporary treatise on instrumentation,¹⁸ the poïkilorgue is only mentioned as an attachment to the piano. The author, Georges Kastner, emphasizes that the addition does not change the outward appearance of the piano or its sound. By means of stop buttons, the player can select one of three options: piano only over the entire compass, or poïkilorgue in the treble and piano in the bass, or piano together with poïkilorgue in the treble and piano only in the bass. So, we may conclude that experiments were made combining harmonium and piano from the very beginning of production of harmonium-type instruments, not only in Austria (instruments by Stein¹⁹) but also in France. These experiments ultimately led to Liszt's harmonium-grand piano combination and also to the harmoni-corde.²⁰

14 Alexandre Cellier, *L'Orgue* (Paris: Delagrave, 1933), 108.

15 Physharmonika is the German name for the first keyboard instrument using free reeds.

16 *Pianos à soufflets* These were probably small pianos, usually square, with a small built-in Physharmonika or *orgue expressif*.

17 Edouard Planque, "Poïkilorgue," in *Agenda musical pour l'année 1837* (Paris: Librairie Musicale Duverger, 1837), 120; quoted in Dieterlen, "Poïkilorgue."

18 Georges Kastner, *Traité général d'instrumentation* (Paris: Prilip et Cie, 1839), 29; quoted in Dieterlen, "Poïkilorgue."

19 A *claviorgano* (combination of clavichord and organ) by the Viennese instrument builder Johann Andreas Stein is preserved in the collection of keyboard instruments found in the Göteborg City Museum, Sweden.

20 The harmoni-corde is a combination of harmonium and pianino (one manual, one string per key).

Although no direct contacts between Cavaillé-Coll and any piano builders are known, Dieterlen mentions a source that suggests that such contacts took place: the intriguing description by Adrien de la Fage, who in 1855 maintains that “[for] quite some years now M. Cavaillé-Coll has adapted in his instruments the series of reed that constituted his poïkilorgue, to an Erard piano, without, however, pursuing this idea to the end.”²¹ Twelve years later, Adolphe de Pontécoulant uses almost the same terms, stating that at the Exposition of 1840, there was a table piano including a series of reeds, the chest of which opened like a book. And he adds that the idea of bringing reeds and strings together, thus improving both instruments, had already been tried by Cavaillé-Coll, who “adapted for an Erard piano the series of reeds that constituted his poïkilorgue, but did not continue this experiment.”²² It is remarkable that, although three independent sources mention cooperation between Cavaillé and Erard, no traces of the instrument they describe can be found.

PRESERVED INSTRUMENTS

In 1899, a poïkilorgue was exhibited in the historical section of the International Exposition.²³ This instrument, built in 1834, was part of Cavaillé-Coll’s private collection. In 1900 another instrument was exhibited at the International Exposition in Paris. This instrument was the property of Charles Mutin, who took over the firm after Cavaillé-Coll’s death.²⁴

No precise production figures for numbers of instruments built are available. Due to the high level of craftsmanship and the short period during which production took place, only a few instruments were built and preserved. Dieterlen documents the existence of seven poïkilorgues:

- two in the collection of the museum of the Paris Conservatory²⁵
- one in the Musée des Arts et Techniques in Paris²⁶
- one in the Brussels Museum of Musical Instruments
- three in private collections.²⁷

Still another instrument, of which Dieterlen apparently was not aware, has been preserved in the private collection of a German organ builder who does not wish his name to be known. This instrument has been immaculately restored and I have had the opportunity to play it extensively.

My practical acquaintance with this well-restored instrument led to a number of conclusions about the playing technique peculiar to the poïkilorgue. Pedaling

21 Adrien de la Fage, *Quinze visites à l’Exposition Universelle de 1855* (Paris: Tardif, 1856), 62.

22 Adolphe de Pontécoulant, *La musique à l’Exposition Universelle de 1867* (Paris: Au Bureau du Journal de l’Art Musical, 1868), 196 and 48.

23 *Catalogue Général Officiel, Exposition Universelle Internationale de 1899 à Paris* (Lille: Danel, 1899), 77; quoted in Dieterlen, “Poïkilorgue.”

24 Dieterlen, “Poïkilorgue.”

25 Due to the extended relocation of the museum, these instruments are not available, and serious doubts exist as to whether any of them will ever be part of the exhibition.

26 At the time of writing, this museum was closed due to renovation.

27 Recently, another instrument was sold to a private collector at an auction in Lyon.

can be mastered fairly quickly and most efficiently with the aid of the only tutor specifically intended for this instrument, the *Méthode théorique et pratique pour le Poïkilorgue*, published in 1839, by Louis-James-Alfred Lefébure-Wely (1812–1869).²⁸ The ease of pedaling contradicts the common notion, which I had also shared, that the poïkilorgue is extremely difficult to play. This reputation for difficulty stems from the poor condition of the wind supply in the extant instruments. The restored specimen, however, allows perfect control of the reservoir. The asymmetry in movement between the left and the right foot is quickly mastered, and, if the reservoir is in good condition, keeping it filled presents no problem. The only problem that I encountered was due to the difference in size between people of 1830 and those of 1990; because of the shortness of the instrument, I found it impossible to play in the posture prescribed by Lefébure-Wely, with the knees placed under the instrument, thus allowing some support from the knee, which is especially important for maintaining control of the right pedal. As a consequence, clear signs of fatigue appeared after an hour and a half. These were, of course, reinforced by the rounded sitting position, which is far from comfortable.²⁹ Players of average height are forced to sit a long way back from the keyboard since the knees should be in front of the instrument, and the arms must be stretched out to reach the keys. We assume, however, that these problems did not occur with players of average nineteenth-century stature.

The loudness of the sound and the dynamic range of expression in the poïkilorgue are not as great as those of the harmonium. The presence of only one row of reeds and the lack of secondary stops limit nuances in timbre to either opening or closing the cover valve.

TUNING AND TEMPERAMENT

The tuning of the instrument has been a subject of much debate. An article on this topic was published in 1984 in the journal of the Association A. Cavallé-Coll.³⁰ The poïkilorgue they examined, in the possession of Dr. Gaudichard, uses a tuning described as an “unequal temperament, akin to the meantone described by Dom Bédos.” Castellengo and Dieterlen’s position on temperament has been criticized on the grounds that the present tuning of the instrument is not original. The reeds of the poïkilorgue, in contrast to those of the harmonium, are not fixed by rivets. They are fastened by sliding them under a screw. It has been argued that the pitch could be changed by a slight shift in the placement of the tongue.

This line of thought may be true for beating reeds but not for free reeds. A shift of the reed in relation to the frame normally mutes the tone. Indeed, the air flow between the reed and frame is changed. There are only two possibilities if a well-

28 *Méthode Théorique et Pratique pour le Poïkilorgue (Orgue expressif) suivie de plusieurs morceaux appropriés à toutes les ressources de l'instrument par A. Lefébure-Wély, Organiste de Saint Roch* (Paris: Canaux & Nicou-Choron, 1839).

29 A similar problem is posed by harmoniums that have knee and heel stops, like those made by Mustel.

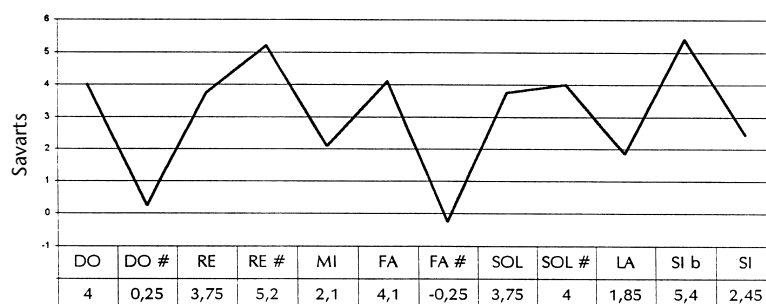
30 Michèle Castellengo, “Un témoin insoupçonné du tempérament chez Cavallé-Coll,” [with an introduction by Michel Dieterlen], *La Flûte Harmonique*, no. 30 (1984): 12–22

tuned reed is shifted from its place: either it hits the frame or so much space is created between the reed and frame that the reed does not vibrate at all or does so too slowly to sound. Practically speaking, it is impossible to tune a free reed by changing its length. The use of screws, furthermore, is quite common in this period, in Austrian as well as in French instruments.. The technique of riveting reeds was not yet known, but fixing them with a screw was simple and allowed for the replacement of reeds. This technique is clearly described by Johann Promberger in 1830:

In case the instrument goes out of tune, one should take out the bad note with its holder ... with the help of the screwdriver that comes with every instrument, place the so-called Messingspachtel [brass spatula] under the reed, and with a very fine file scrape away the surface of the reed toward the back if the tone is too high ...; is the tone is too low, however, this filing is done on the opposite end of the reed ... but always very carefully so that the reed does not move out of place.³¹

Replacing a reed was very rarely necessary, especially in the instruments of Cavaillé-Coll, whose quality is proverbial; however, the screw is not used for tuning. According to Promberger, tuning is done by filing the reed, as is always done with harmoniums. Moreover he clearly warns against any change in the position of the reed. One can, therefore, take for granted that the temperament of the instrument in the private German collection is more or less equivalent to the original.

Fig. 2 Temperament of the Gaudichard poikilorgue, according to Castellengo's measurements.³²



This tuning is quite clearly an example of unequal temperament with some good thirds and less good fifths.

I have also had the opportunity to investigate closely the temperament of the above-mentioned poikilorgue, owned by the anonymous German organbuilder. I

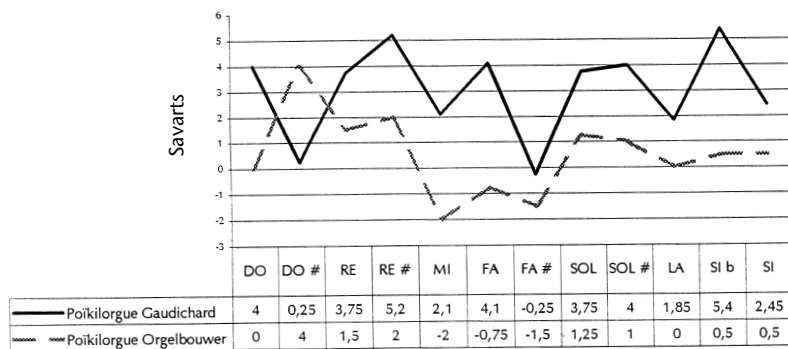
³¹ Johann Promberger, *Theoretisch-practische Anleitung zur Kenntnis und Behandlung der Physharmonica* (Vienna: Diabelli und Comp., 1830), 12.

³² Castellengo, 14–15. The measuring unit used by Castellengo (and also in Fig. 3 in this article) is the savart (1 savart = 4 cents). Thanks are due to Peter Strauven, Leuven, for the drawings in this article.

measured the pitch of each note between C and a''. To obtain results as objectively as possible, all measurements were made without using the expression pedal since the lowering in pitch with increasing wind pressure can be slightly less than ten acoustical cents in the bass. In computing the results, all greatly deviant figures were disregarded. In such cases, the results were assumed to be false, a result of oxidation, internal cracks, or pollution.

I compared the frequency of each note with the corresponding figure for equal temperament, as is usual in such measurements. The divergence is significant and cannot be solely attributed to the instrument's advanced age, since each octave shows a similar pattern. The divergences found are the same as those found by Castellengo.

Fig. 3 Pitch measurements of the poikilorgues "Gaudichard" and "German organbuilder".



We can see that the tuning pattern of the instrument under investigation almost exactly parallels the one documented by Castellengo, with one exception: C# in the German instrument is higher. The difference from Castellengo's measurement is more than ten cents, which is perhaps not a coincidence. All of my four measurements for C# fall between +6 and +15 cents; even the lowest of these values is above the mean of the instrument described by Castellengo. At any rate, each set of measurements was made independently, warranting the conclusion that at least some poikilorgues had unequal temperament. Cavallé-Coll's use of unequal temperament in the 1830s is confirmed by the tuning of his earlier organs, notably the organ in Saint-Denis near Paris.

General characteristics are as follows: good major thirds are C-E, D-F#, A-C# (as found by Castellengo), F-A, Eb-G, and Bb-D. The other major thirds, G-B, B-D#, and E-G#, are bad because they are too large for pure tuning. The fifth D-A is bad, very small, whereas C-G and G-D are reasonably pure.

The meantone-like tuning of the poikilorgue appears strange when one takes into account some of the original compositions written specifically for this instrument:

- The fantasy on La Norma, an original composition for poïkilorgue by Lefébure-Wély, contains a series of variations in A major, parts in Ab major, as well as harmonies on F#, B, and other keys.
- In his method Lefébure gives exercises “to transpose them [a major and a minor scale] to all other major and minor keys.”³³ The method also contains pieces with harmonies in all keys. How to reconcile the evidence of the tuning with the keys of the pieces written for the instrument is far from clear at the moment.

PLAYING TECHNIQUE

The already mentioned *Méthode* by Lefébure-Wély is of immense value: in addition to its full coverage of playing technique, it also contains a short technical manual written by Cavaillé-Coll himself, the only known systematic description of the instrument. In order to provide more insight into the special playing technique used for the poïkilorgue, a summary of Lefébure-Wély's method, including Cavaillé-Coll's contribution, is given here.³⁴

Pedal technique (Article I and II, p. 2): The wind is supplied by two pedals, one to serve the feeder and thus bring the air into the reservoir, the other to control the pressure in the reservoir to increase or decrease the loudness at will. In order to use the wind system properly and at the same time avoid unnecessary effort, one would do well to be sure that the feet are completely on the pedals. The knees are placed somewhat below the keyboard. This posture supports the knees, and thus, the resistance of the pedals can be overcome effortlessly.

The left pedal, the one controlling the feeder, is continuously moved up and down with the tip of the foot in order to deliver enough air to the reservoir. Using only this pedal, without the right one, allows playing the instrument at a constant loudness, i.e., without expression, like an ordinary organ.

The right pedal controls the expression. Depressing the pedal with the tip of the right foot increases the sound; pressing it with the heel decreases it. It is not necessary to change the position of the foot itself to bring the pedal into the desired position. This position has the great advantage of enabling the player to change the loudness from soft to loud either suddenly or gradually and in this way to employ all expressive nuances of musical art.

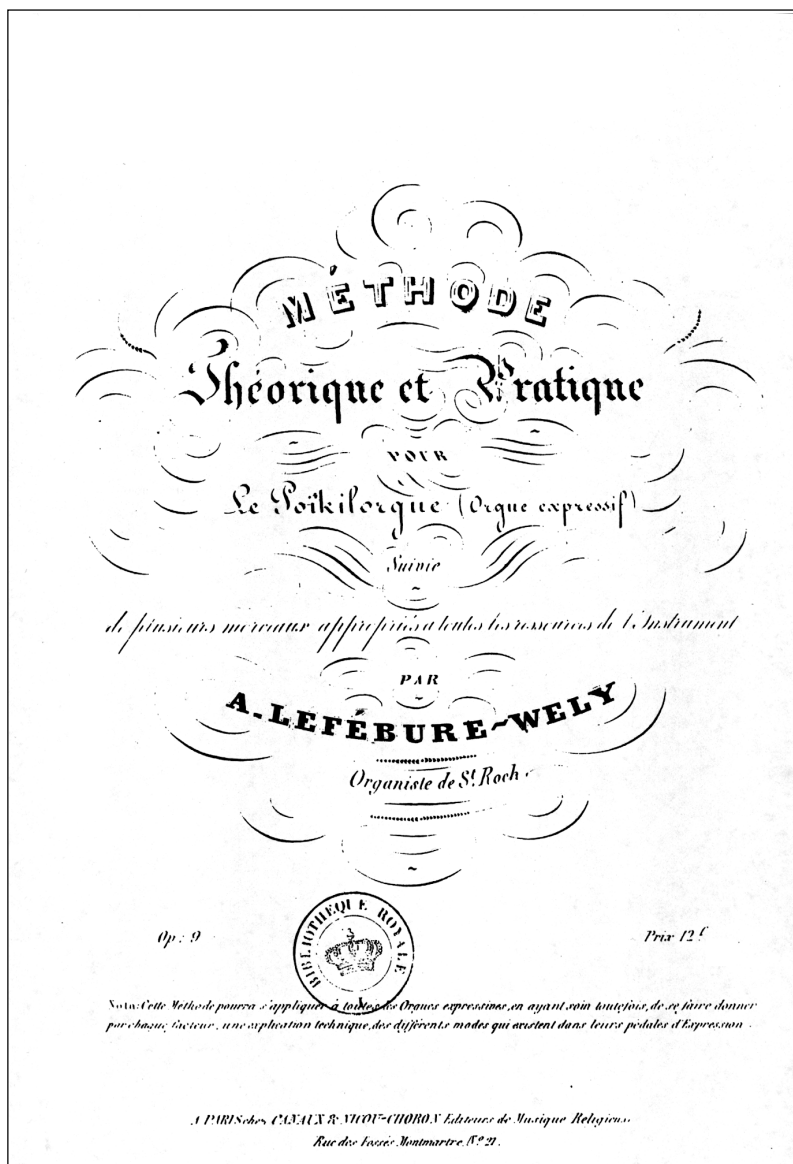
A complete knowledge of how the pedals function is of utmost importance for this instrument. To master this function, it is recommended that at first the left pedal be used exclusively. One can then begin to learn how to shape the tones with the help of the right pedal.³⁵ Thus, the technique can be learned without too

³³ Lefébure-Wély, 10.

³⁴ The complete text on the title page of Lefébure-Wély's work reads: *Méthode / Théorique et Pratique / pour / le Poïkilorgue (Orgue expressif) / suivie / de plusieurs morceaux appropriés à toutes les ressources de l'instrument / par / A. Lefébure-Wély / Organiste de Saint Roch / op 9 Prix 12 f / Nota: Cette Méthode pourra s'appliquer à toutes les Orgues expressives, en ayant soin toutefois, de se faire donner par chaque facteur, une explication technique, des différents modes qui existent dans leurs Pédales d'Expression. / à Paris chez Canaux & Nicou-Choron Editeurs de Musique Religieuse / Rue des Fossés Montmartre 21.*

much trouble, and it will be possible to achieve all dynamic effects expected from a wind instrument such as the oboe, French horn, or bassoon.

Fig. 4 Facsimile of title page.



35 Lefebure-Wély here uses the typical expression *filer les sons*, for which it is difficult to find a good translation. The Dutch *aanhouden* and the English *sustain* lack dynamism; they are much more static than the French *filer*. A possibility could be *draw out*.

Touch (Article III, p. 2). The manner of striking the keys is different from that used on a piano. It is not necessary to hit the keys with force; it suffices to depress them lightly to make them sound. The strength and charm of the tone are achieved with the help of the right pedal.

Adapting piano music (Article IV). The instrument is best used in simple and religious music, although it is possible to play it allegro if one has mastered the technique well. If piano music is played on it, one must take care to thin out some of the chords in the bass. Simple octaves are better than chords in the lower range; such chords are, furthermore, a sin against harmony, committed in piano music only to strengthen the bass of this instrument.

Articulation (Article V). Legato melodies give a better result than staccato; it is, however, possible to play staccato very well if one presses the keys down firmly; this is the whole secret. To bring out a melody, it is sometimes necessary to adapt the accompaniment, so as not to overpower the melody.

Effects (Article VI, p. 2). A melody in the bass which sounds like a bassoon gives a very nice result. With the right foot, one can imitate the tremolando of a cello. Many effects are possible, and the list is far too long to enumerate them all. Getting thoroughly acquainted with the instrument is a far better way to discover these than reading a description.

Remedies for possible defects (p. 3, signed "CAVAILLÉ-COLL"). Sometimes a key may produce sound without being depressed. The reason for this is a speck of dirt on the valve, which allows the air to escape, making the note sound. To remedy this problem, one must loosen the screws of the "soundboard,"³⁶ the cover plate of cedar wood above the valves. When the key in question has been found, it will be quite easy to identify the valve that has to be cleaned.

Sometimes a note may have a metallic sound with an irritating background vibration. Proceed as follows: take off the front panel and move the copper button on the left to the right to open the chest. The upper part of the chest opens on hinges. Then one can see all the reeds. It is easy to find the reeds in question since they are all marked. Since the vibration can only be caused by a reed that is not in the correct position, the faulty reed must be brought into place with the aid of a small knife or other sharp object. To function properly, the reeds should never touch the copper frame.

If the instrument is kept in a humid place, it sometimes happens that a key becomes stuck. It is easy to remedy this problem: open the chest and take out the sticking key. With a file, smooth the place that caused the sticking.

³⁶ The original French *table d'harmonie* is somewhat misleading; it is quite different from the soundboard of a piano. In the poikilorgue, it is a wooden panel creating a kind of resonating box.

Besides these inconveniences, which occur only very rarely, given the perfection with which the Poïkilorgues are assembled, the only thing that can go wrong is the development of a squeaking sound in the pedals. The solution is simple: place a small drop of olive oil on the pivot point. (The tenor of Cavallé-Coll's contribution is remarkable, to say the least. In later years it would have been unimaginable for Cavallé-Coll even to hint at the possibility that one of his instruments could become technically imperfect. The inclusion of this page in the method was undoubtedly necessary, however, not because the instruments were poorly constructed but because of the limited means of communication in the 1830s.)

Playing technique (pp. 4–5) The first exercises are meant to teach control over the air flow: in order to play a chord fortissimo, pianissimo, or crescendo-diminuendo. Next there is a series of 22 short exercises with precise dynamic indications for developing independence of the fingers.

Special effects (pp. 6–7): *vibrato* on one note (with the remark that this should not be overused, but also that it can be used to great effect in melodies in the bass range); exercises for *trills* for left and right hands; *echo* effects; an exercise to create *accents* on a sustained chord (“to mark the beats in a chord with the expression pedal without using the hands”); an exercise to *go suddenly from forte to piano* within a sustained chord (here Lefébure stresses the fact that the effect should be instantaneous, without diminuendo or crescendo between forte and piano); an exercise “to imitate thunder” (the standard effect of a cluster of low bass notes with crescendo and diminuendo); an exercise “to learn to play softly for a long time without hearing the beat of the valves” (the inclusion of this exercise shows that the expressive capabilities of the poïkilorgue make it difficult to play in a non-expressive manner; according to Lefébure-Wély, the difficulty consists in the need to supply the reservoir with air at the moment one feels the right pedal sag; as the player pushes down the left pedal, he should at the same time control the right pedal in such a way as to avoid increasing the loudness); and an exercise in playing *repeated notes*, which, according to Lefébure-Wély, do not produce a pleasant effect in the bass, except when imitating the *tambour*. The author concludes this section by stating, “These are, I think, all the effects one can produce on this instrument.”

Fingering (p. 8). Lefébure-Wély says on this subject, “Good fingering is the most important thing in order to play correctly.” These pages are important, not only for the poïkilorgue but also for harmonium manual technique.

THE DECLINE OF THE POÏKILORGUE

No single reason can be pinpointed why Cavallé-Coll did not continue the development of the poïkilorgue. Perhaps there was a combination of several factors. Debain's invention of the true harmonium, as described in his patent of 1840, no doubt played an important part. The expressive capabilities of this instru-

ment are far greater than those of the poïkilorgue, both for dynamics and timbre. The wind supply in the harmonium is much more powerful since it has two pumps instead of one, and the pumps are larger. The same sort of improvement also applies to the reservoir. The control a player can have over the pressure is much greater, although it takes much longer to learn the technique on the harmonium. The harmonium also offers greater coloristic possibilities through the variety of stops – four rows of reeds as opposed to only one in the poïkilorgue – and through the division in bass and treble. All these factors made it difficult for the poïkilorgue to compete with Debain's instrument. Add to this, the increasing amount of time Cavaillé-Coll required for work on the Saint-Denis organ, completed in 1841, and other organ-building projects, and it becomes understandable why he lost interest in his new instrument.

A clear sign of the decline of the poïkilorgue is the publication of a new method for *orgue expressif* by Lefébure-Wely, in which there is no mention of the instrument.³⁷ Too few instruments had been built to make the sale of a method for the poïkilorgue profitable. Instead, the new method covers several new instrument types developed around 1840.

There can be no doubt that Cavaillé-Coll was, from the beginning, more interested in the organ. The great technical developments, such as the invention of the Barker machine and the Cummings bellows, required all the attention of his company, which had taken up the challenge of building large modern organs. It is evident from the correspondence of the firm that it expected far less from the harmonium than from the organ. A letter dated 1846 gives us more information about Cavaillé-Coll's attitude towards the harmonium.

In my opinion, the free reed is still in its infancy. It lacks volume and fullness of tone, even when it is fitted with a pipe. Also, this quality, so essential in a good instrument, is completely lacking when the free reed is deprived of a resonator. Monsieur Duvivier is probably thinking of an instrument similar to those produced recently by two distinguished builders, Messrs. Debain and Fourneaux. Each of these artists modified the sound quality of the free-reed by baffling the sound of the tongue with tiers of little boxes which filter the sound, so to speak, through small sound-boards, as I myself had begun to do in the *Poïkilorgue*. These modifications are obtained, however, only at the expense of intensity and volume; and moreover, in spite of the power of the stops they used (more varied in name than in timbre), and in spite of using two keyboards as in a conventional organ, they simply created a kazoo band. Everything in it is small, thin, and puny, like the instrument itself; and in spite of the low pitch of their *Bourdons*, *Cors*, and *Bassons*, it is only a poor miniature version of the orchestra, without basses or double-basses.³⁸

37 Louis-James-Alfred Lefébure-Wely, *Méthode Théorique et Pratique pour Orgue Expressif suivie de plusieurs morceaux appropriés à toutes les ressources de l'instrument* (Paris: Canaux et Nicou-Choron, 1841).

38 Letter to a M. Tastu in Paris, dated [June]19 and 23, 1846; translation in Douglass, 220–221; original French text in Douglass, 545. Tastu obviously wrote to Cavaillé-Coll on behalf of a M. Duvivier, who was interested in having a free-reed instrument built for him.

Another letter, dealing with the placement of a new organ in a chapel with instructions from an architect, was possibly a result of a mixture of aesthetic and commercial considerations:

According to the architect's notes, the organ would have to fit in a very small space and have a very powerful sound: he is of the opinion that a reed organ would meet these two conditions. We are not in agreement on these two points. Of course a so-called harmonium takes very little space, but the tone of the instrument reflects the limited size, and the sound quality tends to be cheap and harsh, offending the ear but failing to accompany the voice. In these instruments, the sound is produced by small vibrating metal blades, and there is no comparison with organ pipes. For these reasons, we do not think it appropriate to place such an instrument in the Royal Chapel.³⁹

CAVAILLÉ-COLL AND FREE-REED INSTRUMENTS

Much evidence shows us that Cavaillé-Coll's attitude towards what is generally known as the harmonium changed over the years. In the beginning, he was clearly interested in the development of an instrument with new aesthetics, new technical devices, and new construction methods. From the 1840s onwards, however, Cavaillé-Coll distanced himself from instruments of the harmonium family because the musical and commercial results were not satisfactory. Also, the artistic and commercial success of his organ-building activities forced him to concentrate on organs. This decision does not mean that he had no connections with harmonium builders. He kept in touch with, among others, Mustel and Alexandre, and in 1864 Cavaillé-Coll organized a harmonium concert in his workshop.⁴⁰

On one occasion, Cavaillé-Coll even installed a harmonium stop in an organ. This organ, now in the church of Asnières, was built in the 1860s for a church in Alsace, which explains the presence of German elements in the instrument, such as the names of the stops.⁴¹ The organ is the first by Cavaillé-Coll with two swell boxes, one for the *Récit* (swell organ) and one for the *Positif* (choir organ). The importance of the possibilities for expression is further confirmed by the presence of a *Physharmonica*, following German models. This stop is dynamically controlled by a third pedal between those for the *Récit* and the *Positif*. Regrettably, the action was dismantled in the course of a rebuilding, so we have no idea of the effect that was produced. In general, however, Cavaillé-Coll did not integrate the harmonium into his organ building; the Asnières organ is an exception.

Cavaillé-Coll's *poikilorgue* is a product of the fascinating period predating the invention of the harmonium. It is important mostly for its mechanical principles and the technical improvements, which led to the invention of the harmonium.

39 Letter to the Chevalier de Ribiero, Paris, dated February 9, 1858; translation in Douglass, 370–1; original French text in Douglass, 1001–2.

40 *Gazette et Revue Musicale*, 1864, quoted by Joël-Marie Fauquet in his lecture "La vie musicale à Paris au temps de Lemmens," in the Lemmens-Symposium, Westerlo, Belgium, 22–23 October, 1994.

41 This was normal procedure for Cavaillé-Coll, who used the accepted Spanish names for the stops of his Spanish instruments, although the names do not influence the voicing.

In spite of the limited production and use of this precursor of the harmonium, the builder's name enhances interest in the instrument. The playing technique of the poïkilorgue is historically significant, since the method developed by Lefébure-Wely for the poïkilorgue became the starting point for all succeeding methods for harmonium in France.

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