Principles of Reed Voicing – Reiner Janke

Prerequisite for the voicing of a tongue is always that the shallot is ground perfectly flat and fits tightly in the block. The tongue curve must not have suffered any deformation due to cutting and should not be twisted in the longitudinal axis.

For a good sound and also for the "functioning" of a tongue, the scales with all detail dimensions is of much greater importance than in labial pipes. In particular, the proportions of resonator diameter to resonator tip and resonator diameter to the internal diameter of the shallot should be roughly based on the proportions of Cavaillé-Coll. 1/8 for resonator / tip, and 1/11 for resonator / shallot inside diameter.

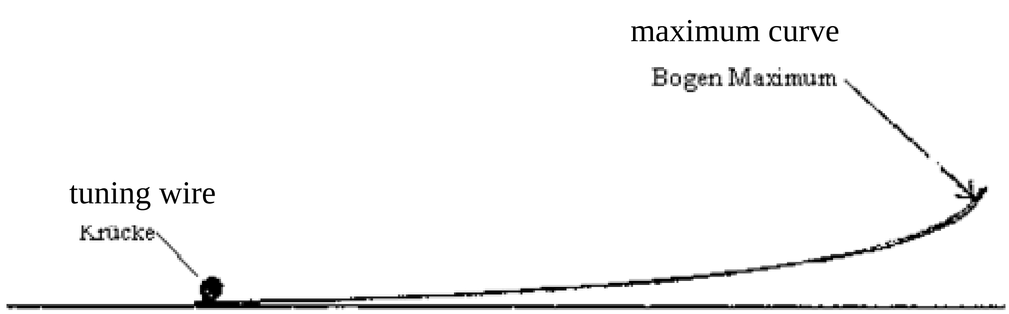
By the term "front" is meant the end of the tongue where the curve is highest.
The starting point for this example description is c1 (2’ pipe) of a trumpet tone with average scale and open parallel shallot slot.
The dimensions are approximately the following:

Resonator diameter inside: 70 mm
Resonator tip inside: 9 mm
Shallot inside diameter: 6.5 mm

Curve of the tongue

For the curve there are countless possibilities. However, two basic types can be determined. Because they are closely related to the associated scale and a typical sound, you can also speak of the German and French curve.

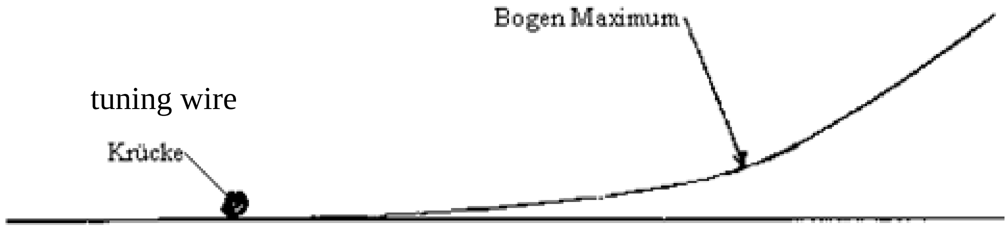
The German curve basically follows an exponential course. The curvature of the tongue begins very gradually at the point of support of the spring and reaches the strongest curve at the end of the tongue blade



The French curve begins in the same way, but reaches the maximum of the curvature in the range of half to the front third of the oscillating part of the reed. Then the curve decreases exponentially.

maximum curve

tuning wire



There are many techniques for creating a tongue curve, and none are the most beneficial in all cases. However, common to all techniques should be a goal. The tongue must be deformed evenly during bending over the entire width and the sheet should, when you press it down at the front, continuously roll. However, this theoretically clear and plausible goal is very difficult to achieve in every case in practice.

Whether a tongue is evenly bent over its entire width can best be checked by the reflection of a point light source on the convex back side of the tongue. A polished tongue shows a bright line across the width of the tongue. If it is not perpendicular to the axis of the tongue, the curve is unevenly distributed across the width. If the light band is thicker, the curve is too weak at this point (i.e., the tongue tends towards a flat). With an optimally curved tongue, the band of light runs at right angles over the entire length of the oscillating part and changes its thickness little.

Whether a tongue unrolls continuously, is determined by holding the tongue with your left finger on the point where the tuning wire rests on a flat wooden block and slowly press down the front end with your right finger. If the gap between the tongue and the block suddenly closes over a longer distance when pressed down continuously, the tongue is too strong in front of this point and too weakly bent in the region of this distance (it has a flat). If the tongue is pressed down completely at the front and rises again in the middle area, the tongue is too strongly curved in the front area and too weakly curved in the middle. With a well-balanced tongue, the gap closes continuously and the back pressure on the finger feels even.

Determination of the Bourdon point

To check the voicing of a tongue, it is first necessary to tune it to the so-called Bourdon point (also known as the “flip point”). For this purpose, the tongue tone is first tuned a few notes higher than its normal pitch (it may overblow to the octave). Then you tune flatter and the sound suddenly flips to the fundamental pitch. The last strokes on the spring before the pitch flips should be done very carefully. If the tongue is optimally bent, the sound is now very primeval without too much buzz, as if a Bourdon of the same pitch sounded with it. If the tongue tone behaves differently than just described, then usually the tongue is not curved correctly.

If one tunes the sound deeper and deeper, it brightens more and more and gradually the fundamental disappears (the Bourdon). At a certain point (about a semitone) the timbre changes suddenly. The point just before reaching this change is called a brilliant point.

A tongue tone should never be tuned higher than the Bourdon point, otherwise there is a risk that it will tip over when the room temperature gets a few degrees colder. Whether a note is tuned higher than the Bourdon point can easily be checked by closing the resonator by hand and then opening it again. When closing it should tip over to a higher octave and then open again to the correct octave. If the sound continues to overblow, the resonator is too long or the tongue is curved too high.

Changes and reactions

Higher curve to the tongue:
louder, heavier, slower speech
The sound jumps earlier into the Bourdon point, then sounds softer and is more stable.

Lower curve to the tongue:
quieter, more overtones, faster response
The sound jumps later into the Bourdon point, then sounds sharper and is more unstable.

Closer to the Bourdon point:
softer, heavier, quieter
The tongue is very dampened by the effect of the resonator. As a result, flaws in the curve of the tongue are not so noticeable, and the pitch changes less with a change in temperature compared to the labial pipes.

The tongue tone is determined more by the resonator.

Closer to the brilliant point:
sharper, more overtones, louder
The tongue is only very weakly damped by the resonance of the resonator. For a good-sounding tone, the reed must be bent correctly, otherwise it will have a metallic harshness. Due to the weaker influence of the resonator, the pitch changes significantly compared to the Labial pipes with temperature changes.

The tongue tone is determined more by the tongue itself.

Function of the tongue

Since there are no scientific studies on the function of the tongues, here are some considerations that result from my practical work.

Since a tongue tone, unlike a labial pipe, may sound quite loud even without a resonator, it is not necessarily dependent on a resonator. With the various forms of resonators, it is perhaps best to design a basic model of damping and gain.

Starting from a uniformly curved tongue (radially bent like a circle cutout) I would first like to list a few damping and gain factors.

For More Damping:

Exponential tongue curve (German curve)
Reduce the opening of the slot on the shallot
Reduce hardness of the shallot face (e.g., by leather)
Narrow the shallot diameter

- <u>If there is a resonator:</u>
- Narrow the resonator tip
- Tune closer to the Bourdon point
- Reduce the resonator diameter
- Close resonator opening (e.g., flaps, or caps with tone emanating from the tuning slot)

For More Gain:

Tongue curved flatter at the front (French curve)
Increase the opening of the slot on the shallot
Increase the shallot diameter

- <u>If there is a resonator</u>:
- Expand the resonator tip
- Tune closer to the brilliant point
- Increase the resonator diameter

All listed parameters affect the strength of the tongue impact. With high damping, the tongue strikes only with very little force or it is even no longer making contact with the shallot face at the front. This leads to a very soft tone. At high gain the tongue beats with great energy on the shallot. This sounds very bright.

The behavior of a tongue's timbre around the Bourdon point seems to me the most interesting and important. Similar to the blowing (of higher pressure) on of a labial pipe, it gives the most information about the condition of a tongue tone.

That the Bourdon point sounds so soft and full, I explain by the interaction between the natural resonance frequency of the resonator and the tongue frequency. If the tongue frequency is slightly higher than the resonator resonant frequency, the striking tongue hits the incoming reflected sound wave of the resonator. This dampens the resonator wave and the sound is soft and muffled. If the tongue frequency is slightly lower than the resonator resonant frequency, the striking tongue is additionally sucked in by the returning sound wave of the resonator. This sounds much harder and sharper.

A well-sounding tongue, especially in the deeper pitches, is always a successful balance between damping by the curve of the tongue and the resonance of the resonator.

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