

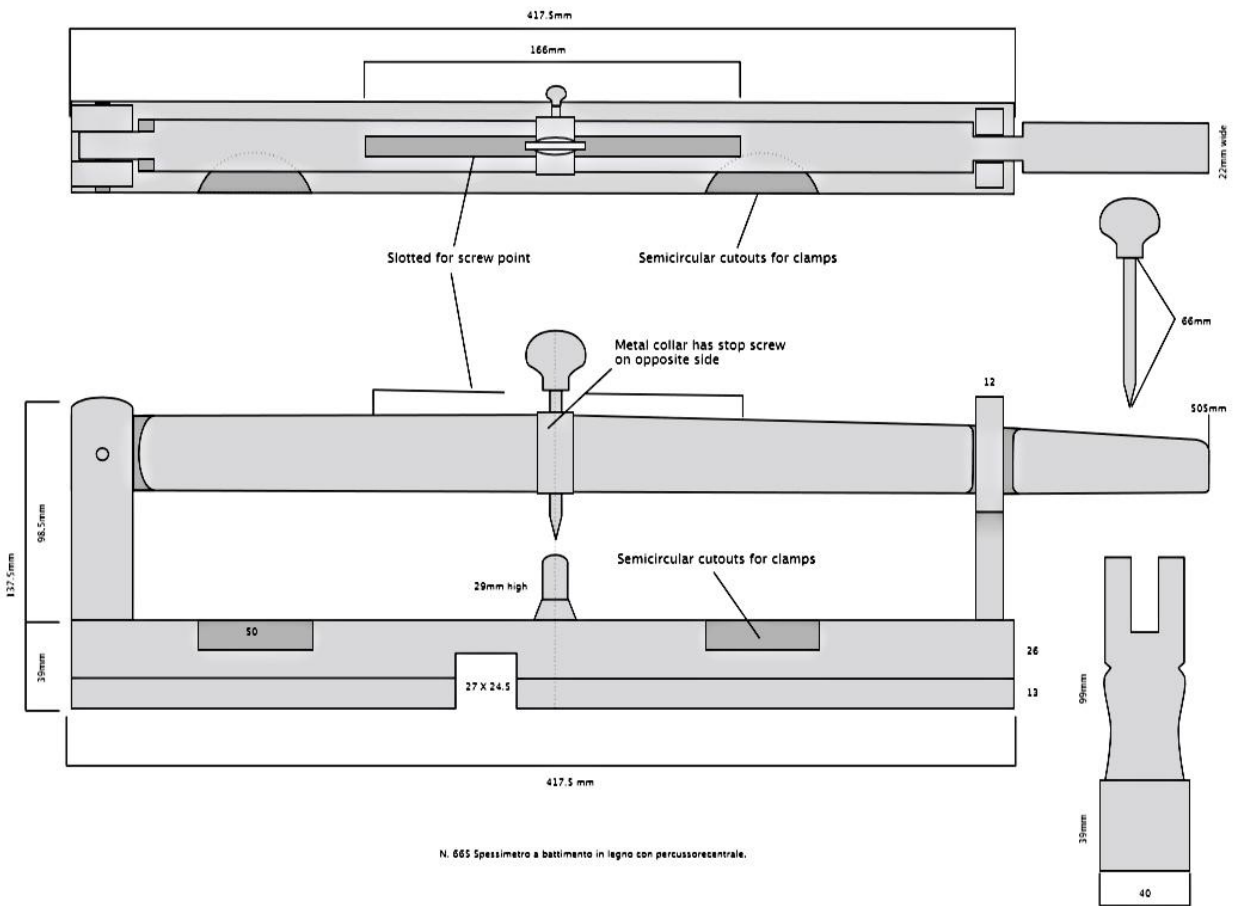
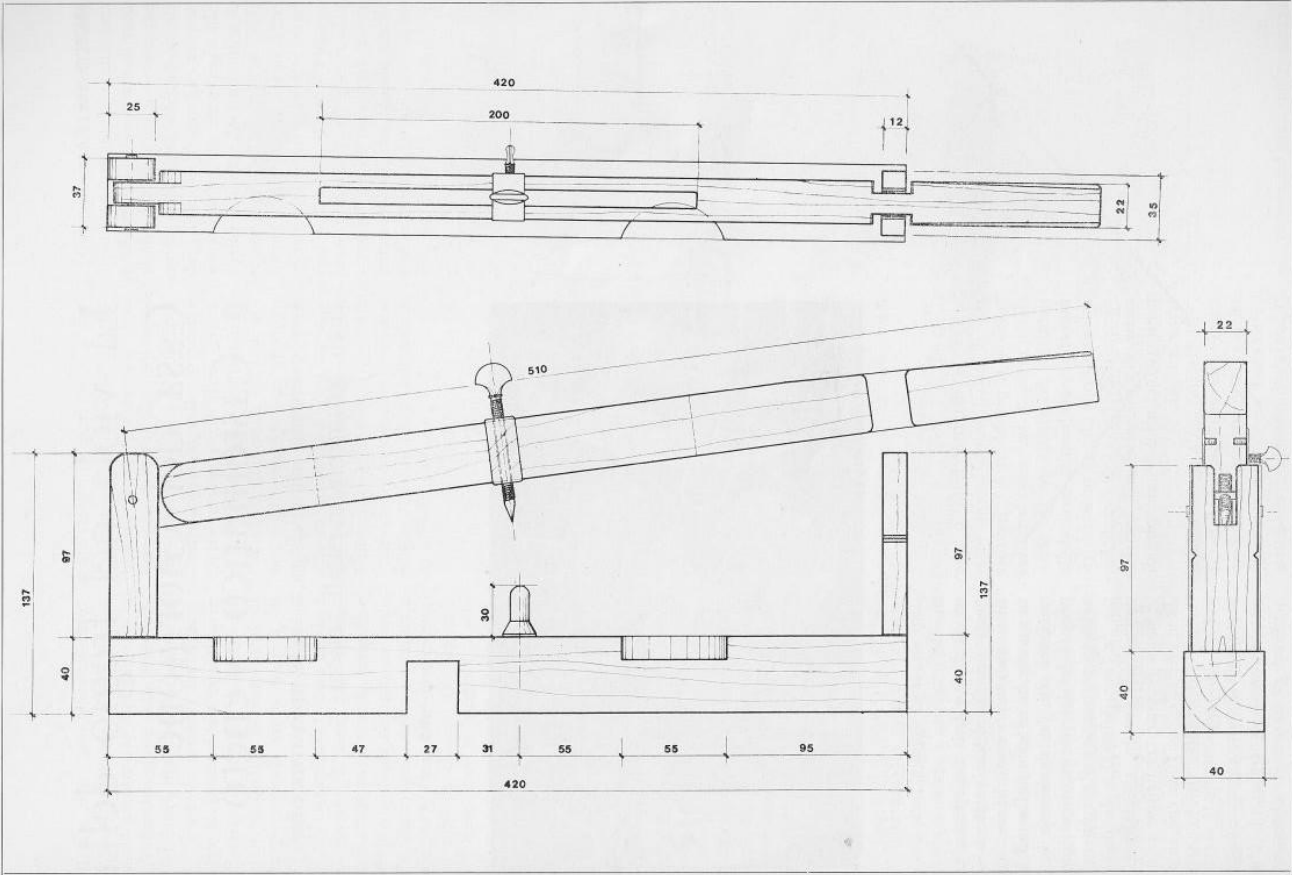
Davide Sora

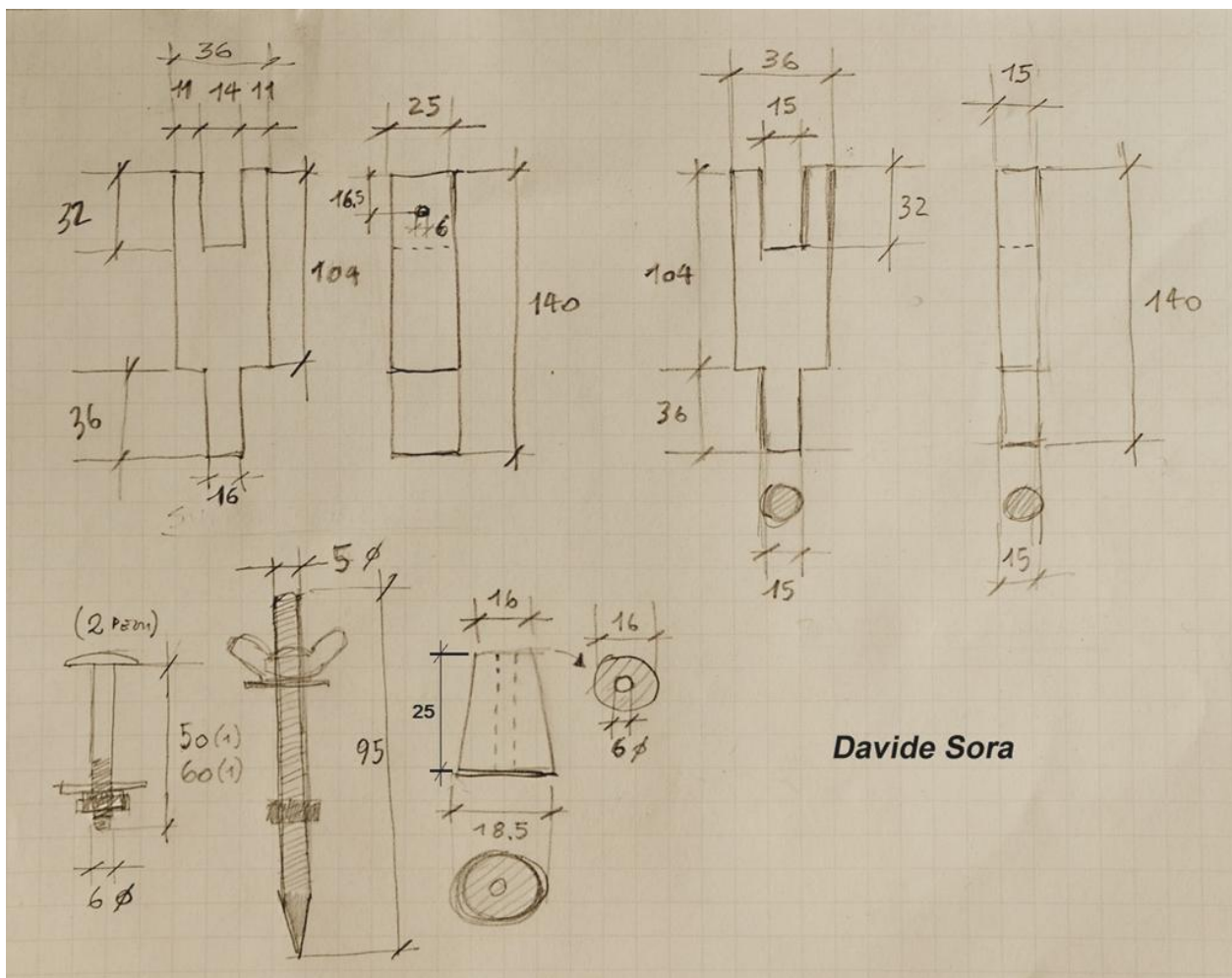
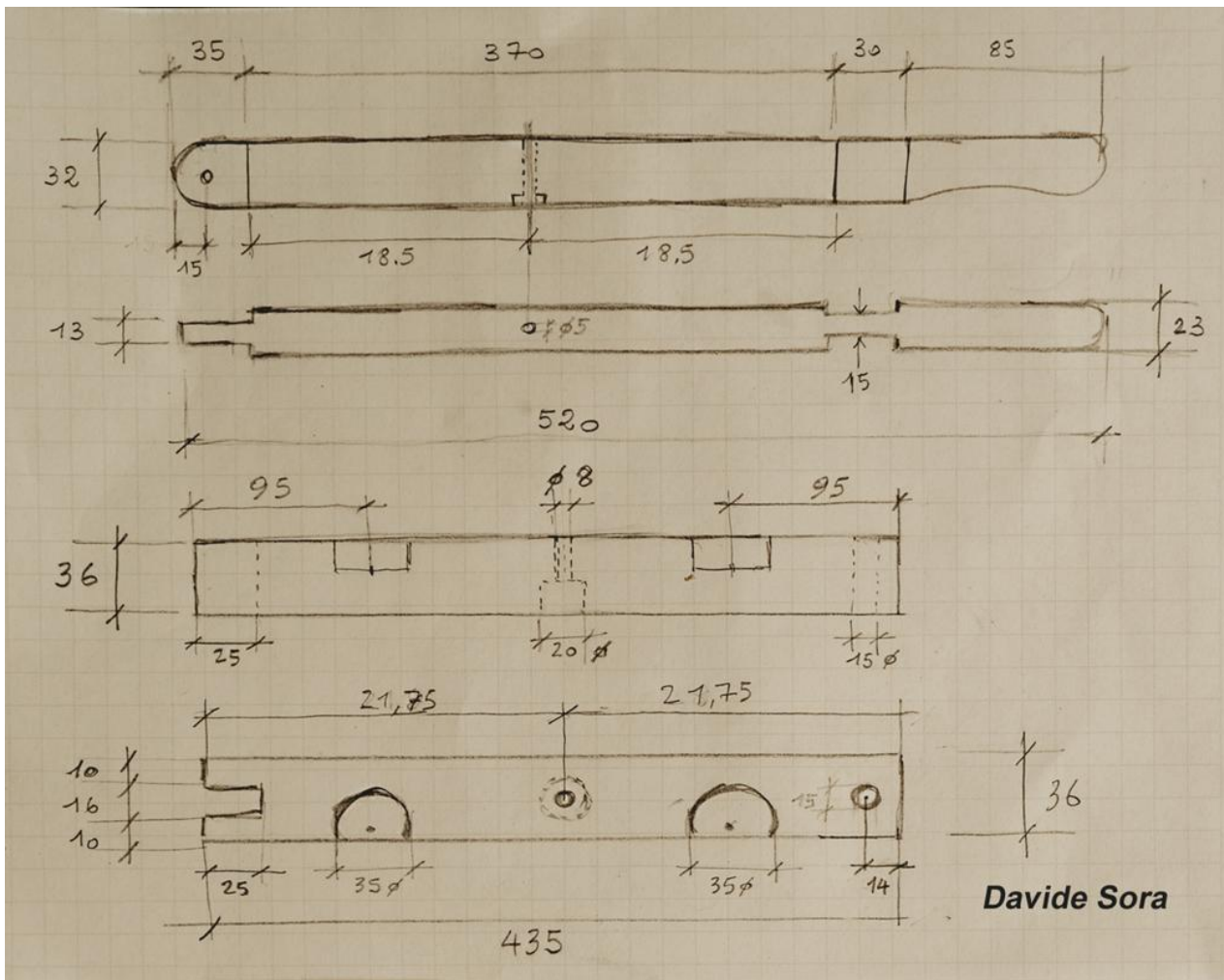
## Thickening punch

Despite its extreme simplicity, the thickening punch still represents a useful and efficient working tool for hollowing the inside part of the violin plates to create the thicknesses. In the collection of Stradivarian finds at the Museo del Violino in Cremona there is a thickness gauge of this type (MS 665) for many years attributed to the workshop of Stradivari: although the results of the latest research belie this thesis, attributing it more probably to the workshop of Ceruti, it is however possible that it came to him from Stradivari's workshop through his heirs and it is absolutely probable that all the ancient luthiers used something similar precisely because of its intrinsic practicality, simplicity, and efficiency.



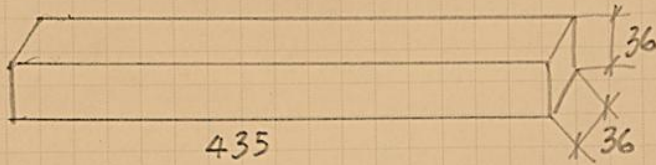
Building one is not difficult, but since it is a "precision" tool it will be necessary to build it with great care and attention to avoid too much clearance in the moving arm that would lead to misalignments of the punch, which would make it inaccurate and completely unusable. The measures that I used for its reconstruction derive directly from the original of the museum with particular attention to those of the inner work space which are crucial to understand how it could be used in the time of Stradivari making it interesting also to obtain information about the working systems of the ancient Cremonese luthiers. For everything else it will not be strictly necessary to replicate the exact measurements, trying where possible to improve their functionality and durability, for example by using metal pins to hinge the mobile arm and to make the position of the central support pillar adjustable and improving the locking system of the punch. The measurements shown in the first illustration are those of the original thickness gauge taken from an article published in the magazine "Liuteria" n.2 of August 1981, written by Maestro Gio Batta Morassi during the period in which he was my teacher at the school of violin making in Cremona. In the second illustration, other measurements of the original taken by Maestro Torbjorn Zethelius appear, while the other handwritten illustrations show the measurements I used for my reconstruction



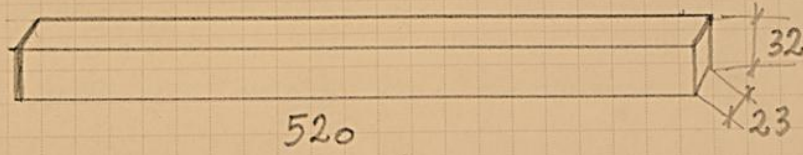




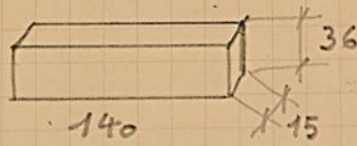
PEZZI GREZZI



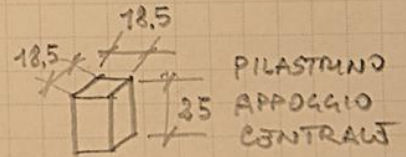
BASE



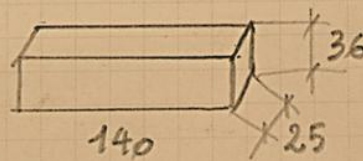
BRACCIO



BATTUTA

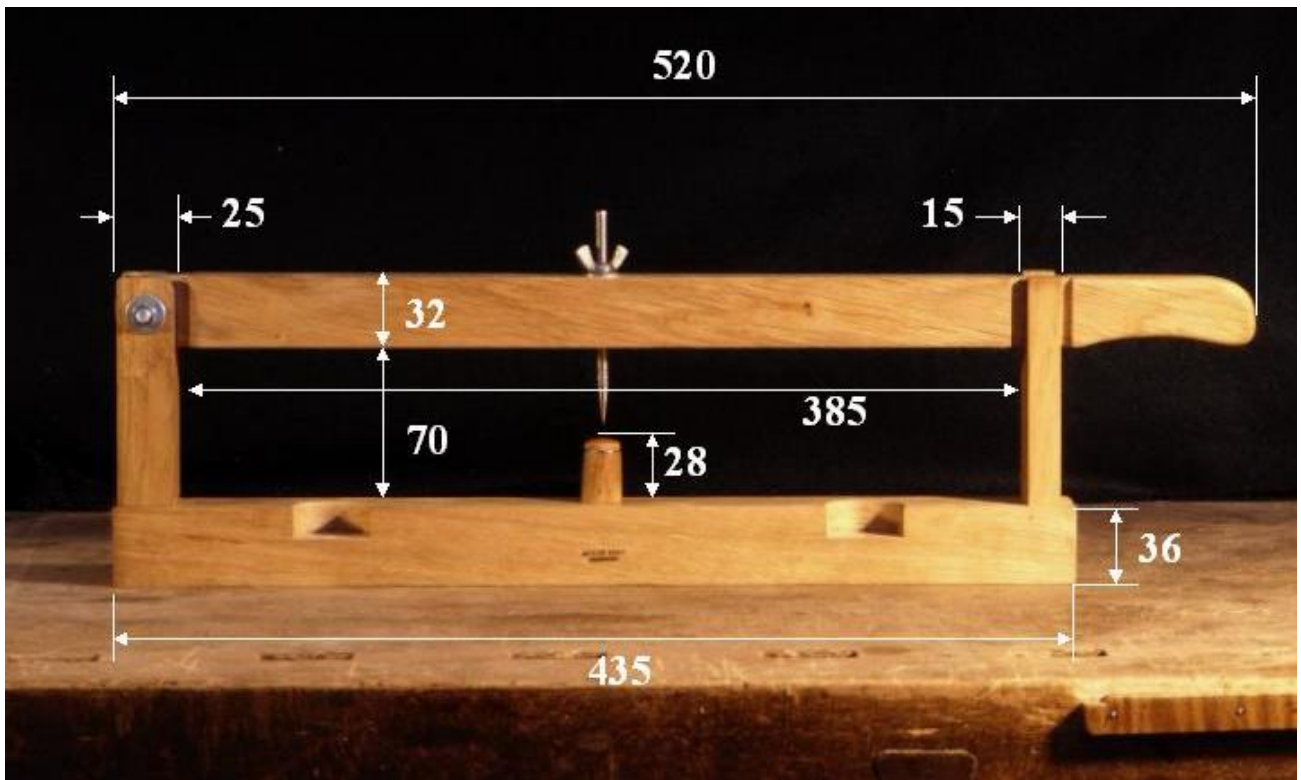


PILASTRINO  
APPOGGIO  
CENTRALE



SUPPORTO BRACCIO

Davide Sora



## Making the thickening punch

You will need to use hard and seasoned wood to ensure wear resistance and avoid warping that would cause parts to misalign. The original is pear, but walnut, maple, or beech will also be fine, I used oak wood which is very hard and stable. We start by preparing four pieces with all sides perfectly squared: the base, the movable arm, the support of the movable arm, and the stop piece where the movable arm will beat. In my thickness gauge the measurements of these pieces are respectively 435 x 36 x 36 mm, 520 x 32 x 23 mm, 140 x 36 x 25 mm and 140 x 36 x 15 mm. Once the pieces have been prepared, the housing seats and the positions of the various necessary holes will be traced (see measurements drawings). At this point all the necessary holes (of the appropriate diameters) must be made using a drill press and only then will the various housings be cut with a saw. Then, using rasps and chisels, the housings of the various pieces to be assembled will be finished and adapted, taking care to keep the pieces of support and stop of the mobile arm squared with respect to the base piece, periodically carrying out dry assembly tests to check correct alignment. A small 18.5 x 18.5 x 25 mm block will also be prepared, with a 6 mm through hole in the center, which will then be rounded to create the central support pillar. For the metal parts, two 6 mm diameter bolts will be required, one 50 mm long to hinge the mobile arm and the other 60 mm long for the support point of the plates (central pillar). The punch will be made with a 5 mm diameter threaded bar, taking care to leave the tip slightly flattened for better visibility of the holes and to limit the "splitting" effect of the wood.

### **Squared, drilled and sawn pieces**

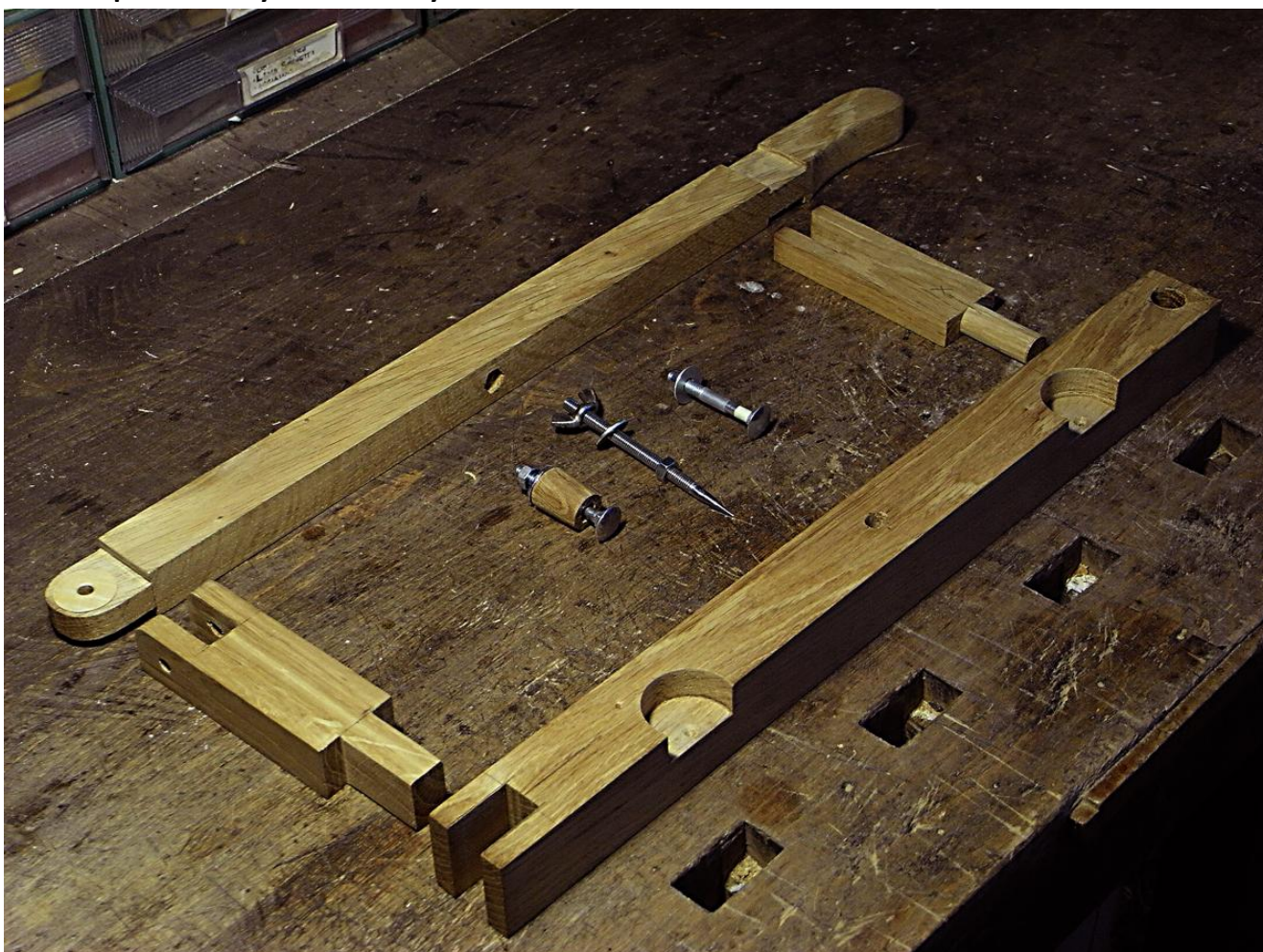




**Metal parts: pin, punch and central pillar**



**Finished pieces ready for assembly**





## Assembly

Once the pieces have been adapted in the dry tests by making sure that the arm rotates freely on the pin and enters the stop piece with little play but without getting stuck, you can proceed with the assembly. Join the movable arm to its support using the metal pin (50 mm long bolt) taking care to insert a piece of plastic tube on the pin to adapt it perfectly to the diameter of the arm hole so that there is no play, rubbing with some paraffin all the parts in contact to lubricate them and allow a smooth movement. Insert the punch in the movable arm and the central pillar in the base (bolt 60 mm long) and carry out a dry assembly test by inserting the arm support and the stop piece in their seats, checking the correct alignment between the punch and the central pillar. The housing hole of the central pillar has a larger diameter than the shaft of the bolt to allow it to be moved and centered with the punch tip. Then proceed with the final gluing of the parts starting from the stop piece, glue also the arm support, check the correct alignment again, and only then tighten the gluing between the arm support and the base with a clamp. Do not use clamps for gluing the stop piece to avoid jeopardizing its alignment. Once the glue has dried (wait a few hours) the thickness gauge will be ready to be used. Also glue a piece of leather on the support point of the plates on the central pillar to avoid leaving compression marks on the outside of the arching.

### **Leather disc on the support point of the plates**





### **Adjustment and use of the thickness gauge**

To set the measurement on the thickness gauge, you can use a hard wood wedge with the measurements of the various thicknesses marked, to be inserted between the punch and the support point (leather) of the central pillar. You will loosen the wing screw of the punch to unlock it and unscrew or screw the punch to change the measure, locking it with the wing screw once you have set the necessary thickness to prevent it from moving during use. A complete turn of the punch corresponds to a variation of approximately 1 mm (metric thread). Instead of the graduated wooden wedge you can use the rods of common drill bits of the desired size, to be interposed between the tip and the support leather. The tip of the punch must be smooth and sprinkled with paraffin or soap to avoid as much as possible that it grips the wood, remaining stuck and causing the plate to lift with each movement. The use is extremely simple: with the thickness gauge firmly fixed to the bench with two clamps, just lift the movable arm, insert the plate keeping it well in contact with the support point on the central pillar (leather) keeping the inside surface perpendicular to the punch, repeatedly lower and raise the movable arm by sticking the tip into the wood, moving the plate a little with each beat until the affected area is covered with a series of very close holes. Removing all these holes with a gouge or fingerplane will allow you to quickly reach the set thickness, keeping it uniform over the entire area concerned. However, it is necessary to be very careful not to exaggerate with the penetration of the tip and with the depth of the holes, in order not to risk a "wedge effect" that could split the wood along the fiber. Proceed gradually, varying the measurement by 0.3 / 0.5 mm at a time, at a maximum of 1 mm in the initial roughing phases when the plates are still very thick. Strike firmly but always delicately, avoiding putting too much force into the beat also not to mark the outside of the boards with the compression on the support point.



**Punch tip**



**Detail of the flattened tip**



Fixing to the workbench with clamps



Inserting the plate





**Beating with insertion of the tip into the wood and marking of the thickness**



**Always be careful to maintain the perpendicularity between the punch and the surface of the wood**





The typical holes left by the tip of the punch



Compression marks left on the outside of a Stradivari cello (photo M. Darnton)





Tip marks (holes) visible inside a Stradivari top plate (photo M. Darnton)

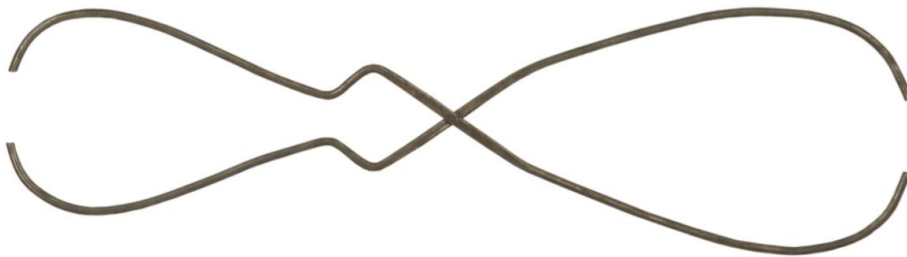


## Checking the thickness

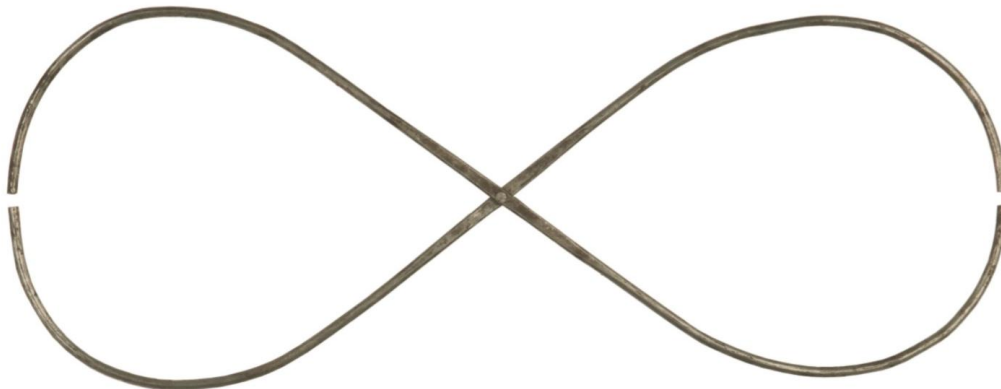
When you remove all the small holes left by the punch with the gouge or the fingerplane, you will necessarily arrive at a thickness slightly lower than that set on the thickness gauge, and sometimes (as shown in the photo) it may be necessary not to completely remove the holes to preserve the strength of the wood in some areas. Before proceeding with the complete elimination of the holes, it is therefore advisable to try in a small peripheral area and check the thickness achieved using a thickness gauge with a clock (decimal comparator). In ancient times this measurement was carried out with scissor feeler gauges as can be deduced from the originals kept at the Museo del Violino in Cremona (see photo).

The operation is very simple, on one side the wood is clamped by the "scissor" gauge measuring the thickness, inserting a graduated wedge on the opposite side (the same used to set the thickness gauge) to assess the extent of the actual thickness.

MS661



MS662



MS666

