The Japanese Clavichord

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What exactly is a clavichord, and how is it constructed? More to the point, how is it constructed on the floor of a Japanese room, with a few hand tools, a couple of clamps, and a lot of time? What types of tools were used? How much time did it take to make one?

Using mathematical ratios, the proportions can be worked out. All hand tools were used to construct this. Holes were drilled with an egg-beater drill and sharp bits. Using a mirror helped to line the drill for straight holes.

The main tools were hand chisels, hand planes, and Japanese saws.

To level your work, the plane touches in three points. To smooth a surface, the plane touches in two points: the front and at the plane blade, not at the back. A mortising chisel squishes the wood. If you look closely at the original hole you can see a little swelling, but it is subtle. The brass tangents are pounded in without drilling. First clamp the key together so the wood doesn't split out. Another way to make a mortise is to drill a hole down, then put a button on top for drilling. A mortising chisel bit clears the middle out, but the corners of the square hole result from the mortise.

These instruments are made without workbenches, between the main room and the hall. The craftsmen work on the home and fit them to the house they are working with. Most of the materials are long and narrow. Place a beam in a bipod and plane one side of it flat. Set one end of the beam in the notch of the bipod and nail the other end on a short post. Japanese tools are pull tools because they are used while sitting on the floor. One had rests on the front and the other on the back. A shooting board holds the work off the surface so you can plane all the way across. Shooting boards are the most accurate way to make miters – better than with power tools. A shooting board has a fence on the end to keep your work from sliding off. When free-handing end-grain, use a very small low-angle block plane and hold it on a skew so it won't ski[p. Don't do end grain off the corner of the wood or the corner will chip right off. Plane towards the middle or pre-cut a champfer, or use a shooting board.

There are three ways to rest the wood being worked on: on a bipod support, on a vertical "horse<" or on the floor. Thin stock must be flat and braced against something or the plane cuts will conform to the shape of the resting surface. The Japanese often step or sit on the wood being worked in order to clamp it. This is actually quicker than clamping. They sit on a floor cushion and wrap their legs around or on top of the wood. Japanese saws are very thin and straight and can be quite accurate.

A water stone for sharpening cycles is an hour-glass shape. Most water stones are man-made. The natural ones are expensive. The lubricant is water, not oil, and it wears extremely fast. It becomes hollow very quickly and needs to be flattened frequently. To make a stone stand, press the stone into wax on a wood base.

Clavichord and harpsichord pins are tapered, so as they get loose they are pounded in. When tuning, they need to be pushed down or they will pop out during turning. This is the original use of the tuning hammer. The spruce soundboard is less than $1/8^{th}$ of an inch thick. Along the grain Sitka spruce is stiff, but across the grain is flops more. Bridges were made with walnut. Todd used beech. Where the ribs cross the bridge there will be a change in impact sound.

To make the soundboard, place pressure on top while pressing the sides together. The tension of the springs will actual slightly potato-chips the instrument. Some models have braces.

To lay out the key board, lay out the number of pieces to achieve the basic area. Mark out the keyboard where the leversa and ckeyheads are, nail it to the clavichord, Then drill through to line up the keys, pins and strings. The type of temperament affects the type of key level because of the option of multiple strikes on the same strings. Calculate the tangent of the bridge to the key levers in order to calculate the way to allow room for the keys. The overall scaling is important. All C's and F's are set and listed in the original models. Set those and fill in the rest. Otherwise, differences in the scaling can make the tension higher or lower to achieve a given pitch. Figure out the scale, mark them, cut them out and then set them aside. After being cut, they could warp, so give them a period to adjust to being cut out.

Laying out the string span, divide out the space to the number of strings. Hold a ruler up to check that the spacing of the variety of widths is divided into equal spots.

To lay out the key For each natural, clamp each natural key top, clamp them with tiny bamboo go-bars. Pinch the heads in. Then scrape the ends off and butt the tails tightly into the backs of the heads. The other way to do key tops in professional shops is to take a large sheet of key top materials. This is glued on and then marked and cut out. Finally, scribe the design onto the fronts of the keys. Don't round the key tops all the way back. They are only rounded up to the first scribe line. The corners are square, and then are rounded down. Then smooth out with sand paper.

To make the string coils, use a hook. To make a string loop, hook the T-shaped coil maker between the tuning pin and the end to be cut off. Twirl it into a hitch pin loop. Since this takes three hands, clamp one end of wire to the table with a felt clamp. Another way is to wrap one end around a nail in the table or a clamped wood block. There is a book on harpsichord repair, but there is nothing on clavichords.

Raising or lowering the tangent changes the key dip. The tangent can either be pounded in, or pulled up and shimmed. The wires go from .001 to 0024 in the bass. Traditional an archade is cut by a spade bit like a circular molding for the key front. Take two strips of wood, drill with the archage bit into the line between the two pieces of wood. Then cut them apart and you have two half-circles.