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Violin and Cello Bridges

By R. W. Parr

MANY peculiar things are shown in the writings of violin critics and violin makers of the present day. And one of the oddest is the fact that they dismiss the bridge with "Stradivarius perfected the bridge."

As to the bass bar, the average violin maker will tell how the present high pitch necessitated lengthening it. As a matter of fact, by raising the tailpiece saddle, more can he accomplished to relieve the pressure on the bridge than was ever accomplished by substituting longer bars.
Early instruments were provided with very crude bridges; the Amati's must have done much experimenting with the bridge, for we find the incisions much the same as Stradivarius adopted, but sadly lacking in balance.

Savage made some crude experiments, thus using a solid piece of maple for the bridge. By cutting away the solid wood, leaving two feet, he noted an improvement. By making a couple of incisions, more improvements were noted; then by making the incisions as Stradivarius made them, the best results were obtained. Strad simply gave results, not scientific reasons. Real science is required to make a good bridge.

First and most important is the size of a bridge. High fiddles, flat fiddles, broad fiddles, and slim fiddles, are indiscriminately fitted with bridges, the same width from ankle to ankle (the small part just above the foot connecting the foot to the body of the bridge).

The bridge of today is generally too wide between the feet for the average violin. In fact the Strad violin of the middle period was a very wide violin, hence the bridge he designed for his instruments was a trifle wide. The distance across the violin where the bridge sets should regulate the width of the bridge. In "Violin Making as it Was and Is," Mr. Heron Allen states that a bridge should be half as thick at the top as it is at the bottom. This is about correct; but he does not give any thickness for the feet.

The bridge is generally made of maple; and maple being a heavier wood than spruce (the wood in the top of the average violin is spruce) the bridge should be graduated at the feet to correspond in weight to the thickness of the top under its feet.

The correct height of a bridge is governed by the distance from center to center of the ankles of bridge. If this distance is one and one-fourth the height from the top of violin at foot of bridge to the G string should be one and one-fourth inches.
Some violins require higher and some lower bridges than this, but such a divergence is caused by faulty construction of the violin.
Let us next consider the incisions in a violin bridge. What are they for? Some claim to lighten the bridge.

Take a violin well mounted with a good bridge, and just back of the bridge place a small hairpin against either foot and against the D string. You will note that at no place could the vibrations from the string pass directly to the foot of the bridge. This rule works on all four strings to either foot. Regulating this is important in overcoming any unevenness in the strings or instrument.
By breaking up the vibrations from the string before they reach the top of the violin a much more even compass on all four strings is sure to occur.

However, this is not the most most important result from cutting incisions in the bridge. If five men with hammers strike a stone separately, the stone may easily withstand their onslaughts. But if all five strike the stone at the same instant, It may easily be broken. It is this principle that makes large bodies of men break step when crossing a long bridge, for the united step of all causes a vibration that may prove disastrous to the structure.

In a direct line the G string is much closer to the foot of the bridge than is the D string. The vibrations from the D string can flow in almost a direct line in the wood, while the vibrations from the G string must circle around the incision before reaching the foot. Here is the scientific principle. The distance each vibration must travel to reach the foot of bridge from both G and D must be the same, so when both strings are vibrated together, the vibrations enter the top of the violin at precisely the same instant. The G string is further from the foot of the bridge over the soundpost than is the D string. But here the order is reversed; the vibrations from the G string can flow through the wood in almost a straight line, while the vibrations from the D string must follow around the center incision (sometimes called the heart incision), of the bridge, and should travel just as far as the vibrations from the G string, entering the top of violin over the soundpost at precisely the same moment. This principle works as well on the A and E strings. If a bridge is scientifically constructed and is the right height according to the width, and the incisions are placed right, and the strings spaced correctly, it will be the same distance from any string to either foot of the bridge.

After a bridge has been trimmed to the right dimensions the amount of wood over the heart incision and between the heart incision and the side incisions, the wood in the ankles should all be equal. The bridge over the heart incision being half the thickness of the ankles it would be twice as wide. Many bridges are ruined by having the wood trimmed over the heart incision leaving insufficient wood to take care of the string vibrations.

Another mistake is the habit of trimming the bridge more under the A and E strings, which places them closer to the top of the violin, thus destroying the unit of vibrations to the feet of the bridge. In the light of what we have discussed, let us now consider the cello bridge. We frequently find the width at the ankles two and one-half inches. but three and one-fourth inches in height. I find from either foot it is two and three-fourths inches to the top of the heart incision; also that the legs of the cello bridge are almost two-fifths of the bridge, and so slim that on a test on a cello with a full narrow breast the legs spread one-sixteenth of an inch, and the entire feet were trimmed away on the inside in an effort to fit the feet to the top.

No great progress can be made until bridge manufacturers work out a system of bridges of right heights and widths with a fine mark on the feet showing where to cease trimming the feet to fit the violin. Then when the right bridge is found by testing, always order than number of bridge for that particular violin.

Bridges of many designs are on the market today, but I will consider but two. The first we will class as the "Strad" model. In this style of bridge the side incisions follow the grain of wood, and run horizontal with the bridge. By deepening the two side incisions, the vibrations from the G and E strings to the feet of the bridge are lengthened and by widening the heart incision, the vibrations from the D and A strings are lengthened.

If the heart incision is designed correctly by slightly lowering the side incisions they may be deepened without sacrificing the amount of wood between the side and heart incision and preserving the balance in the bridge.

The other is called the "French" design and differs from the "Strad" model in that the two side incisions point upward toward the heart incision. Two defects from this are inevitable. First by deepening the side incisions to adjust the length of vibrations ,the wood between the side and heart incisions is reduced—impairing balances; second, this design in the cello bridge produces longer legs, greatly reducing the strength of the bridge. Most of the cello bridges of today are cut on the "French" design. The height is much greater than the width, and they have neither strength, balance, nor unity in the vibrations from the strings. Any cello so equipped is certainly greatly handicapped in producing the tone of which the body of the instrument is capable.

Mr. O. S. McLay, commercial artist and amateur musician, leading cellist of the Business Men's Orchestra of Chicago, has outlined the drawing below by Mr. Parr. We are very much interested in the remark he has made that the Jones bridge obviates the difficulties outlined by Mr. Parr to considerable extent, for the feet are deeper than the generally accepted design of cello bridges. Mr. McLay gave a good trial to the Jones' bridge at the public concerts during the Convention of American Violin Makers in Chicago, June, 1925; and has used that bridge ever since. He finds that the tone of his cello is much more free, the vibrations seem to carry more quickly and unimpeded. —A. E. T.