Small Shop - Big Results

Refinishing Sharps – Part 3: Concerning the Nature of Ebony

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Central Iowa Chapter

Ignorance is bliss. Or, at least, so I've been told.

Heading into this series on refinishing sharps, I figured I knew as much as the next technician about of ebony. However, when I sat down to write a segment focusing on the topic, I realized that I didn't know much at all beyond the simple fact that ebony is a very dark and dense wood. Certainly not enough that I could write an article about it.

I therefore decided that digging in and learning some things would be the order of the day. I needed to get my hands on some ebony to see what makes so unique.

The first learning experience of an eye-opening nature came early on at my local woodworking store. Ebony, as it turns out, is both rare and very expensive. The store had one rather small board of Gaboon ebony, the variety I was most interested in. They were asking what seemed to me to be a king's ransom for it – its price calculated at a rate of $75 a board foot. Yikes! To the amusement of the sales person I asked if I might purchase a 3" segment. "Going all out, are we?" was his only comment. Droll. Very droll.

After returning home with my purchase of several varieties of wood (feeling a new kinship with the lunar astronauts who brought their moon rocks back to earth), I began my research. Essentially, what I wanted to know more about were the intrinsic qualities of ebony which makes it such a natural choice for the production of sharp keys.

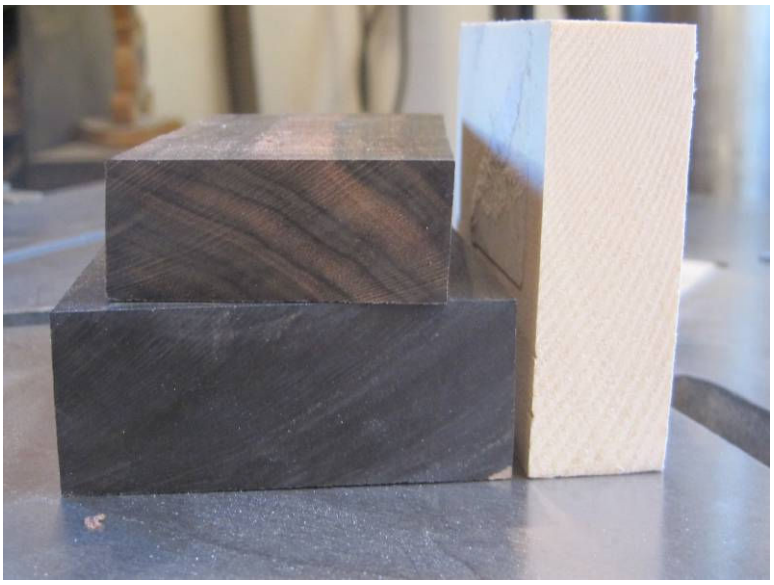

Photo 2: Black, white and in between.

Most obvious would be its color. Ebony is the very darkest of woods; with the heartwood of Gaboon ebony being nearly jet black. Other types of ebony, such as Ceylon, Macassar, and Madagascar tend to be dark, dark browns or reddish browns, but not pure black. The advantage making a sharp key using a black or very dark material is that as there is no chance of wearing through to a significantly lighter color. Ebony is

black, or at least very dark, all the way through. Photo 2 compares cross-sections of two samples of ebony (Macassar [top left] and Gaboon [bottom left]) to a sample of ordinary basswood. There would be no wearing through to a lighter wood with the Gaboon ebony!

A second factor which makes ebony an ideal wood for use in sharps is its density. Greater density equals less wear and tear, and ebony as it turns out is one of the very densest of woods, due to its high content of silica. It is considerably harder than most types of white wood which are often used for sharps in lower quality pianos. To understand how hard ebony really is I conducted a little experimentation in my shop. The scientific test used to measure the hardness of wood (I discovered) is known as the Janka Hardness test. In this test, the amount of force required to push a steel ball with a diameter of .444" halfway into a sample piece of wood is measured. Basswood, a lightweight yet tough wood, has a Janka rating of 410 lbs. It would therefore take a force of 410 pounds to push a .444" steel ball halfway into a basswood board. Yellow pine has a rating of 870, white oak is 1360 and hard maple is 1450. In contrast, depending on the exact species being tested, ebony has ratings ranging from 3220 to 3692 lbs!

To illustrate this more precisely, consider that a Steinway 'D' grand piano has a weight of 990 pounds. Imagine stacking three such pianos, each contained within a 240 shipping crate, on top of each other and then strapping them all together so that they might be lifted with a crane. Then, finish by lowering all of that enormous weight on one small steel ball perched on top of a piece of the densest ebony wood. That crushing weight would be what it would take to drive the steel ball halfway into the ebony!

Wanting to try this out for myself, I made use of what resources I have in my own shop. Sadly, I don't have 3 Steinway D's conveniently stacked up in a corner of my shop, but I do have a drill press capable of exerting pressure. I sensed a possibility there, if I could only procure a .444" steel ball. After scouring local hardware stores in vain, I thought of using one of the ball bearings from my Rockler 3-row ball bearing stand. Nearly perfect! Just a bit big (5/8"), but my interest was more in a comparison of the density of ebony to a typical whitewood, than in an exacting measurement of force.

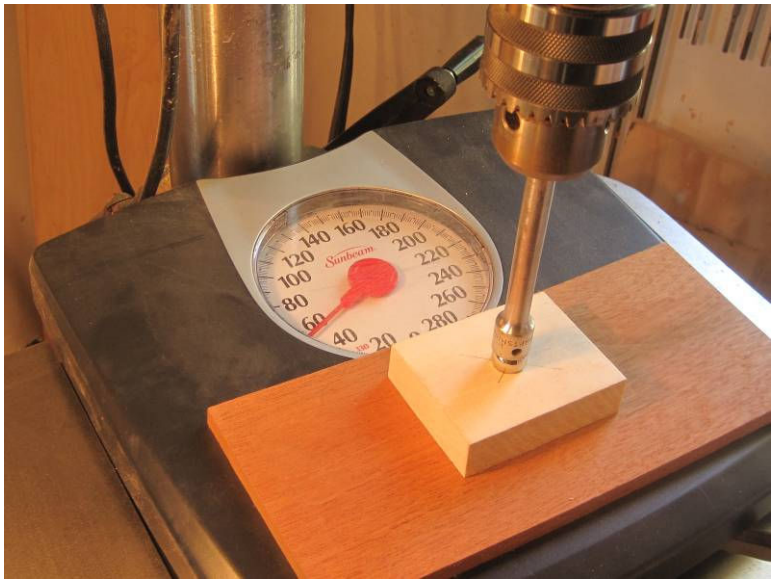

Photo 3: I'm telling all my friends I can press 360 lbs!

I chucked up a socket wrench extension into my Delta drill press and put a bathroom scale on the drill press table. I centered a sample piece of basswood on a larger piece of mahogany (to spread the weight around and avoid damaging the scale), raised the table so that the ball was firmly fixed between the socket wrench extension and the wood. I turned the handle on the drill press, and the indicator on the dial made a full circle to 300 pounds, then advanced more slowly, topping out at 360. I could feel and hear the basswood give way as the steel ball dug in.

Letting the pressure off, I removed the ball from the depression made. The halfway mark would be indicated by a measurement of 5/8" from side to side. The actual measurement across the span was right at 1/2", which seemed about right, since I produced 50 lbs. of pressure less than basswood's published Janka rating of 410 lbs.

Next, I tried the sample of ebony. Quite a different feel. What impressed me was that there was no discernable give at all, even though I again achieved 360 lbs. of pressure. It felt as if I was dealing with a block of marble or steel instead of a piece of wood. (Indeed, when you hold a piece of ebony in your hand, the weight alone is enough to give you the impression that you're holding a slab of polished stone, and not wood.)

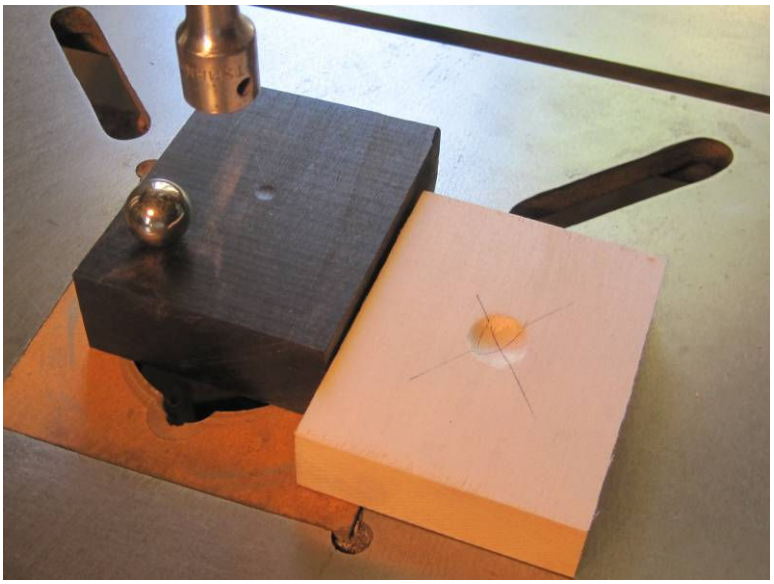

Photo 4: Same procedure, different results.

Photo 4 shows the difference in results. What produced a bowl-shaped depression in the basswood resulted in a mere dimple in the ebony.

How much effect does greater or lesser hardness have on a key's durability?

To answer that question I set about devising a test that would illustrate the difference in wear and tear on samples of various woods might be used in the production of sharp keys. In looking about the shop for a method to simulate the type of wear that the wood used for a sharp key would be subjected to, I came up with the idea of trying a cotton buffing wheel loaded with an abrasive polish.

Trying the buffer on a piece of scrap basswood, I found that several minutes of holding the edge of the wood against the wheel was enough to show appreciable wear when a bar polish was used as an abrasive.

In order to standardize the procedure so that different types of woods could be subjected to identical conditions for comparison of wear, I built a jig to hold a miniature flitch of wood at a 45 degree angle against the face of the buffing wheel (Photo 5). I tried various running times, and found that 3 minutes of the buffing wheel running on a high speed was enough to produce discernable results.

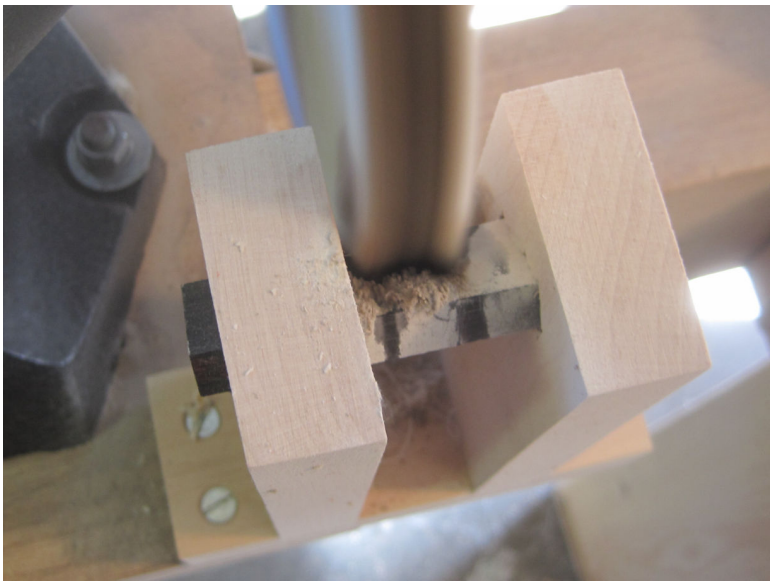

Photo 5: Years of wear and tear compressed into 3 minutes.

The experiment was run on eleven different samples of wood (Photo 6). Placed in order of amount of wear and tear incurred, basswood, yellow pine and white pine (with wear outlined with pencil) did the worst. Gaboon ebony (with the worn area painted white to stand out) did the best. Macassar ebony, birch and maple also fared well.

Photo 6: Test results.

It seems certain that over decades of use sharp keys that are as resistant to wear as the above sample of Gaboon ebony would fare much better than sharp keys produced from woods such as the whitewood samples on the left.

A third consideration which should be mentioned in a discussion of the relevant properties of ebony is its high specific gravity, or weight per unit of volume. Specific gravity is calculated by comparing the weight of a cubic volume of a material compared to the weight of an equal volume of water. The lower the weight of the material, the lower its specific gravity will be. Water has a specific gravity of 1.

Ebony has a specific gravity of approximately 1.12, meaning it is heavier than water, and one of the few woods that will actually sink when placed in a container of water (Photo 7). Yellow pine by comparison has a specific gravity of .54, and will float.

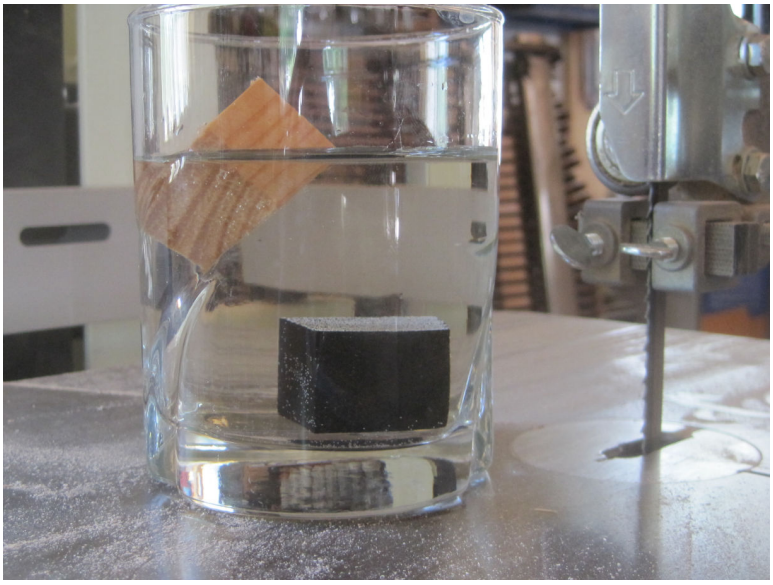

Photo 7: The ebony sinks like a rock.

Why is this important? When it comes to the material chosen for the sharps, ebony keys will be heavier than either whitewood or plastic sharps. This will have ramifications when it comes to adjusting the keys for touchweight.

A final note to this is the fact that sharps made from very black ebony wood require no opaque top coat – just a stain (to eliminate any light streaks) and a polish are all that are really needed. For the sensitive pianist, the touch of natural wood thus obtained may be desirable to the feel of plastic or paint. Simple can at times be best.

What conclusions have I drawn from all of this? I understand now why new ebony sharps from supply houses are 1000% more expensive than plastic (my trip to the woodworking store answered that question in my mind!). I also understand that ebony is truly desirable for use as sharp keys for several very legitimate reasons. Finally, I am more convinced than ever that a set of ebony sharps in decent condition on an older piano should be stripped and refinished instead of replaced with plastic.

Next month I will begin giving detailed results of the testing which I have been conducting on recommended products and procedures for refinishing sharps. Until then, the coffee pot's on. Stop by anytime.

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