A radial drill press made from spare parts

by threesixesinarow on April 4, 2008

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intro: A radial drill press made from spare parts

My radial drill press cost about the same in materials as small, cheap ones you can buy, and it isn't much bigger or stiffer than those, but it has more freedom of motion than some more expensive machines. It's made from some parts I found and other parts I made. It ended up so the maximum extension is about 73cm - I guess this makes the swing 57" - and the head has about 28cm vertical travel, and it can swivel, rotate, and pivot 360°; it has a 3/8" chuck, the quill travel is up to 8cm, and with the temporary "Hi-Power" gearmotor runs at something like 1000rpm with no load.

Even with more reasonable torque it probably wouldn't make a great everyday drill press, it takes a lot of room and it's difficult adjusting it to drill square, but it's great for drilling series of consistent angled holes in wide pieces of wood. It can drill straight out and even upwards and still is light enough to carry.

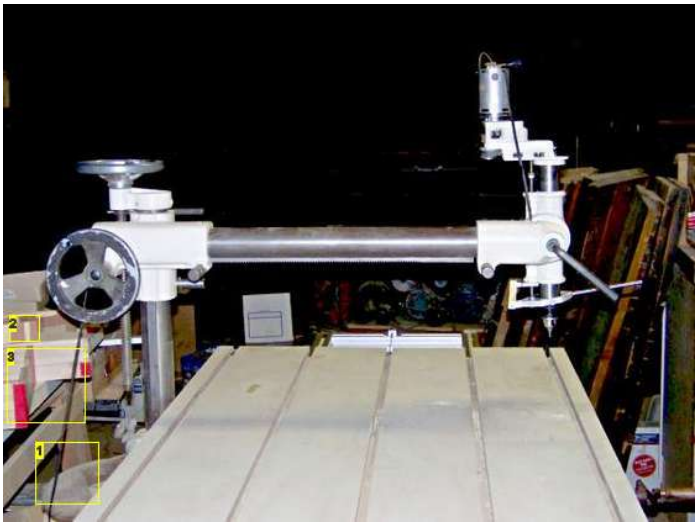


Image Notes
1. you can have enough clamps - this one works as a weight to make the base steadier.
2. juniperus virginiana
3. drawers from a Sjoberg Nordic Plus workbench - these are way overpriced, at least in America

Image Notes
1. 6.3 amps!
2. same size quill
3. My normal auxiliary table register size, http://flickr.com/photos/mireut/sets/72057594128119055/
4. There's a step in the bore for the column so the height of the head is fixed. I'm trading it for a newer Delta the same size that doesn't have this limit but has a dead 2 amp motor instead.

Image Notes
1. Thanks, Cesar!

step 1: Parts

The base, column and ram are parts from a power feeder made in Italy that someone got rid of because it has a 550-volt three-phase motor. It came bolted to a 14" tilting top table saw with similar power requirements, but it usually was in my way and anyways one of the wheels was wrecked. It took up even more space when I removed it.

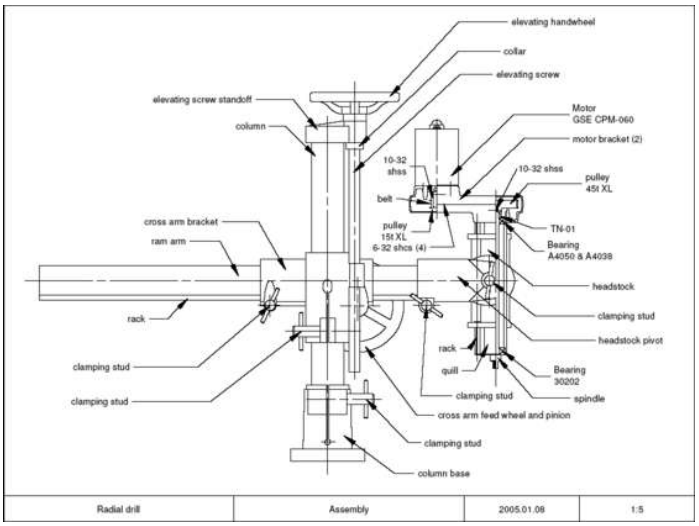
The head is from a hydraulic door closer I found in a pile of them at work. It might have been made by Ilco and it had green wrinkle finish, almost the same color as the feeder but that was something more like hammerite.

The quill is made from a 10.5" long piece of 1 5/8" 1/4" wall 1026 cold roll steel DOM seamless tube I bought from Metal Express, the current price is about $18.

The spindle might be a guide rail from a printer, I found a bunch of them loose in a dumpster, 14, 18 and 20mm diameter, hard outside with different amounts of rusty spots. I think the 30202 and A4050/A4038 tapered roller bearings I bought from a local bearing store were less than $20 each, now they're $25 and $27 from McMaster-Carr. Ball bearings would have been much more appropriate and easier to deal with, and probably cheaper. I used a TCM 20x35x7TC spring loaded double lip seal on the bottom, maybe $7, and just a piece of turned scrap UHMW-PE at the top, held in place with a TN-01 bearing nut, maybe $3.

A little $6 flea market universal motor electric drill drives it, but it would be nice to replace it with a 250 watt variable speed motor. It runs from a 52-tooth XL timing belt with two 15 tooth pullies. I might have got them from SDP/SI, $6 for the belt and $10 each for the pullies. They're a little small.

The feed yoke is a cutoff piece of aluminum bar bent into shape, pinned with pointed 1/4"-28 set screws to a split collar made from steel plate. The handle is a piece of 1/4" rod attached with a 10-32 button head cap screw, and the connecting rod is a piece of brass bar from a player piano exhauster pedal, held on with a couple dowel pins. I modified a 1/2" button head screw to clamp the steel toggle plate to the casting. The feed stop is a piece of leftover 5/16"-18 threaded rod with a couple hex nuts to jam against each other.



File Downloads

radrassy.pdf ((612x792) 19 KB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'radrassy.pdf']

step 2: Headstock

The power feeder used a right angle piece between the motor and the castings so the head could be positioned according to the size and shape of different boards, but in order to rotate in two directions I figured the headstock could just attach directly to the socket at the end of the ram.

I sawed off the part of the door closer casting that had the mounting flange and enclosed the crank mechanism. The bearing assembly for the crank arm was tightly screwed on and firmly seated to the casting with a big, fine thread. The power feeder used bolts to draw tapers together to clamp things in place and all I had to do to combine the two pieces was make a piece threaded for the door closer with a taper to match the power feeder castings on the other end, and tap a hole for a clamping bolt.

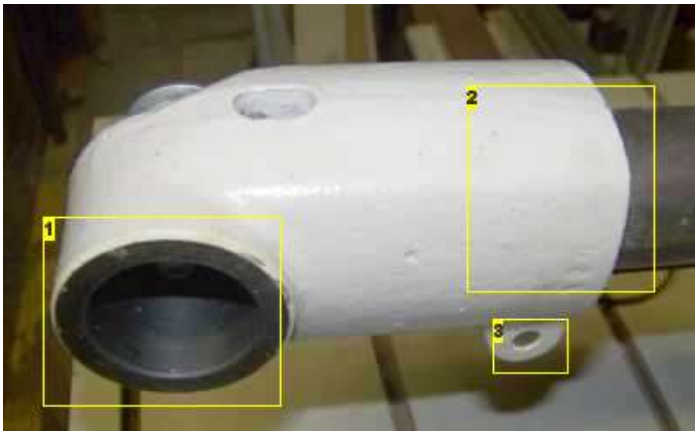
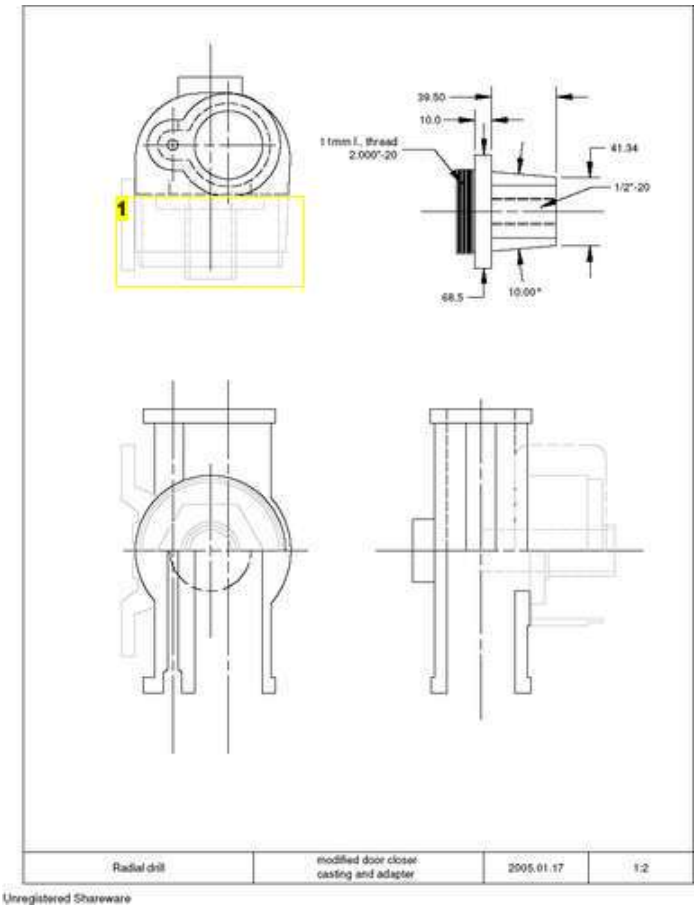


Image Notes
1. This socket is for the nodding or toeing direction
2. headstocks for most light weight radial drills attach here so they can tilt left and right
3. threaded lug for clamping



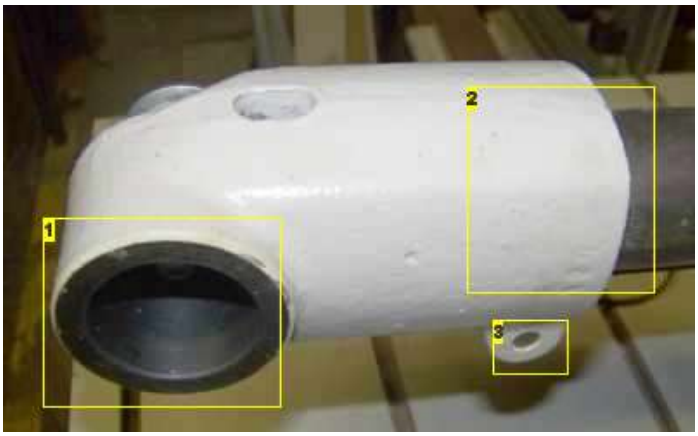


Image Notes
1. cut off the gray colored parts

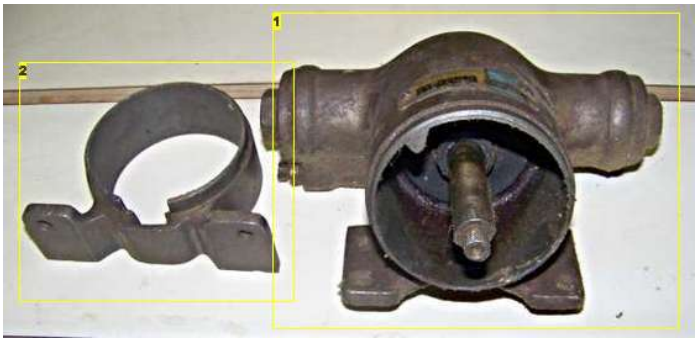


Image Notes
1. Different model, the piston is smaller and the crank is fastened differently
2. the sawed off part

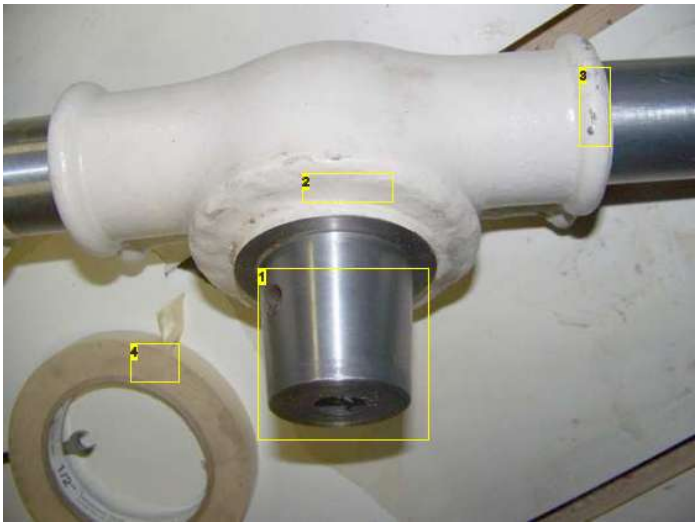


Image Notes
1. New adapter for socket, I made the tapered part separate so I could trim it to the right length before pressing it onto the threaded part
2. epoxy filler
3. crappy paint, expensive too - the color is Benjamin Moore AC-31
4. crappy masking tape

File Downloads

radrheads.pdf ((612x792) 15 KB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'radrheads.pdf']

step 3: Spindle

The spindle is a piece of scrap 20mm steel rod. It was very straight and had been ground and plated, it was rusty in spots but I only needed it to be clean a couple places.

My lathe isn't big enough to turn the whole thing between centers so I used a four-jaw chuck and a sensitive indicator to make things as accurate as I could. I probably used a steady rest as well.

The nose is threaded for ordinary drill chucks. I left a clean bit of the original outer surface for the seal in front of the seat for the lower bearing. The upper bearing has a slightly looser fit on the spindle and has a smaller diameter, and it is held in place with the homemade seal and store-bought bearing nut. The smallest diameter is at the end for the pulley.

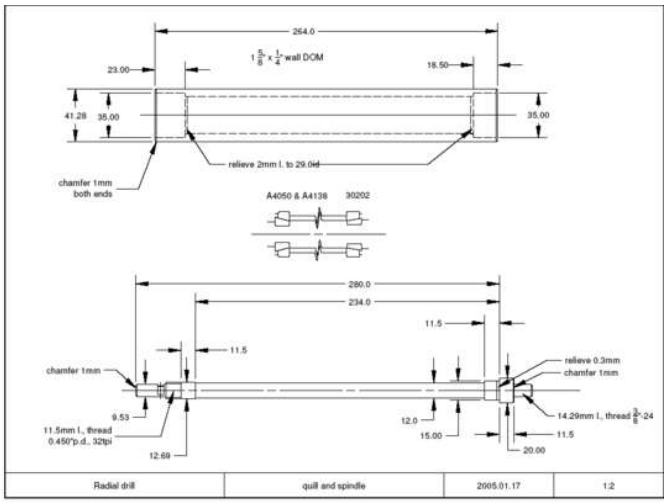


Image Notes
1. The cheapest chuck I have

File Downloads

radrqands.pdf ((612x792) 12 KB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'radrqands.pdf']

step 4: Quill

The bore for the piston of the door closer is round and very straight and smooth, so I bought a piece of round seamless steel tube for the quill. It came very smooth inside, and a little oversize outside. It probably could have a smaller wall with depending on the bearings.

I faced and bored each end separately, using a four jaw chuck and steady rest. I had to remove the leadscrew so I could move the carriage back far enough and it helped that I had installed a carriage rack that's longer than normal. I was going to have the quill ground at a machine shop but I wound up honing it by hand on my wood lathe.

Image Notes
1. quill for something else

step 5: Drive

I made a pattern to cast the drive housing in aluminum or zinc alloy but meanwhile I made a crude functional one from scrap Delignit, which is kind of beech plywood used for different piano parts, foundry patterns and bulletproof doors. To get the machine working I just used an old electric drill for power, so it has some non-standard parts but a small treadmill motor will probably work with regular ones.

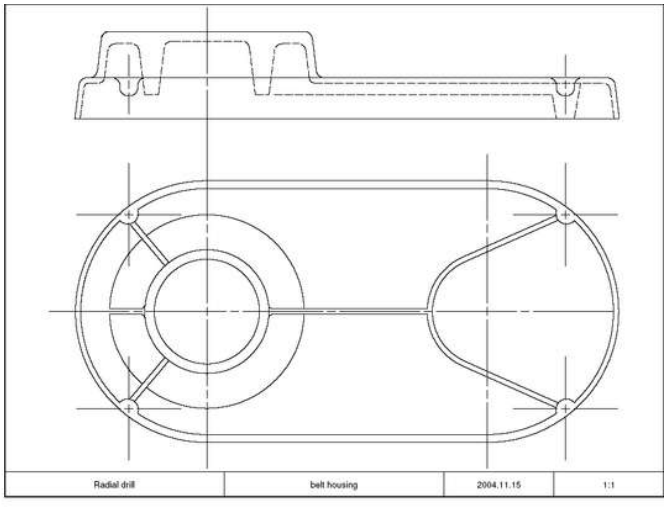


Image Notes
1. chalk filled shellac

Image Notes
1. 8-32 fillister head, slotted doesn't fill up with crap like socket head ones

File Downloads

rdrmotrm.pdf ((612x792) 12 KB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'rdrmotrm.pdf']

step 6: Feed

This feed mechanism is a three-link toggle mechanism used in some lathes and at least one drill. It's all scrap, and I didn't really work it out in advance. It reduces the throw in a couple ways and I made some of the parts the wrong size but nothing else had to be modified.

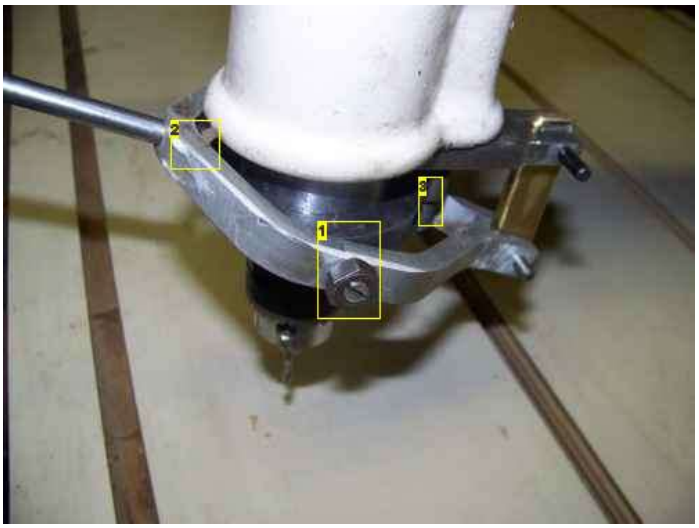
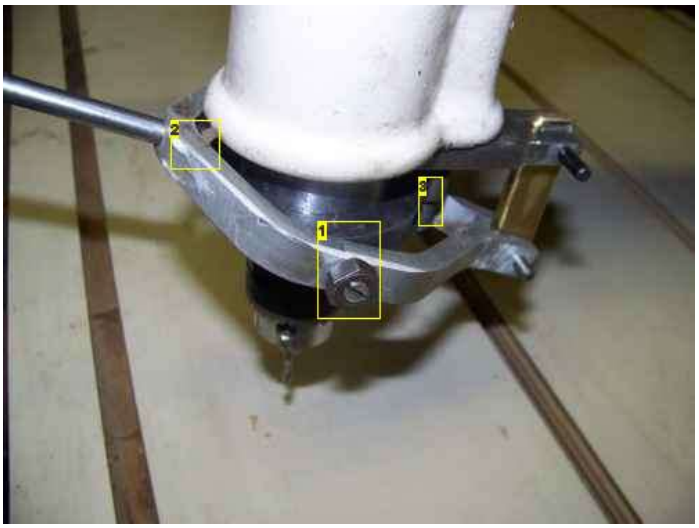
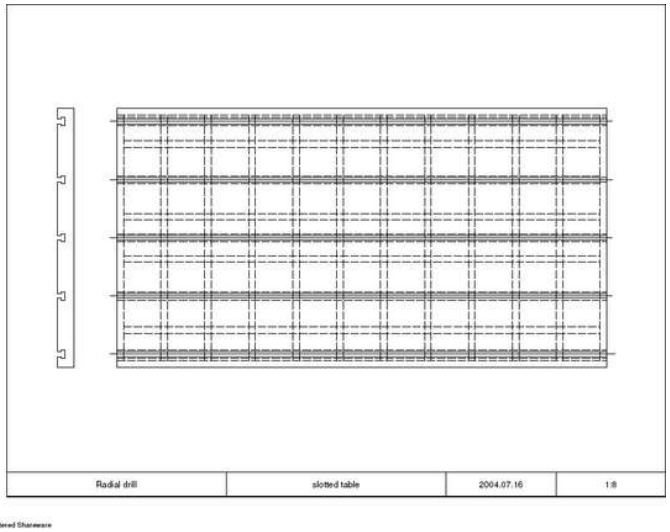


Image Notes
1. pointed set-screw
2. button-head capscrew
3. threaded rod depth stop



step 7: Table

The table is separate from the drill but I made it so I could use them together. It's a torsion box made from plywood and beech scraps; it's 150x80cm with five standard 1/2" t-slots and sets with four homemade plain linear bearings on rails made from Bosch Rexroth extruded aluminum structural rails that I found. A crank at the front turns a pulley wrapped with cable to move the table sideways.



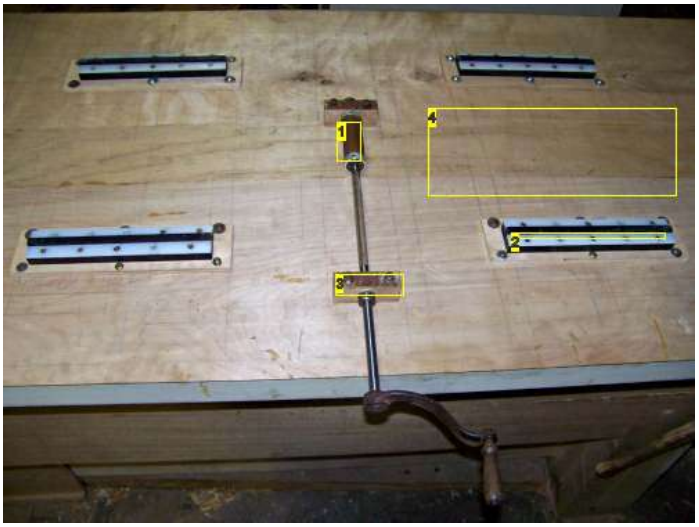


Image Notes
1. compreg pulley
2. UHMW-PE bearing
3. Delignit pillow block
4. three scrap pieces

Im
1.
2.

File Downloads

kbstable.pdf ((612x792) 15 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'kbstable.pdf']

step 8: Use

It doesn't work much different than a manual pillar drill press - angled holes in wood work best with a bradpoint bit without spurs, and through holes need a sacrificial layer above the table. Handwheels control the height and extension of the head, and angles have to be set by hand. Each adjustment on the drill can be locked in place, including the depth stop which is just a couple jamnuts.

It still needs wipers, it could use a return spring, and vernier protractors for the different pivoting parts would be easy to make and might improve it. The table feed isn't positive, but there's about a meter of cable wound on the pulley to reduce slipping. I might make a vernier for the front, and will probably need to make a brake and way covers for it sometime.

Drilling speed depends entirely on the combination of material, bit size and feed rate, the feedback is kind of helpful but I ordered some surplus permanent magnet treadmill motors that might work better.

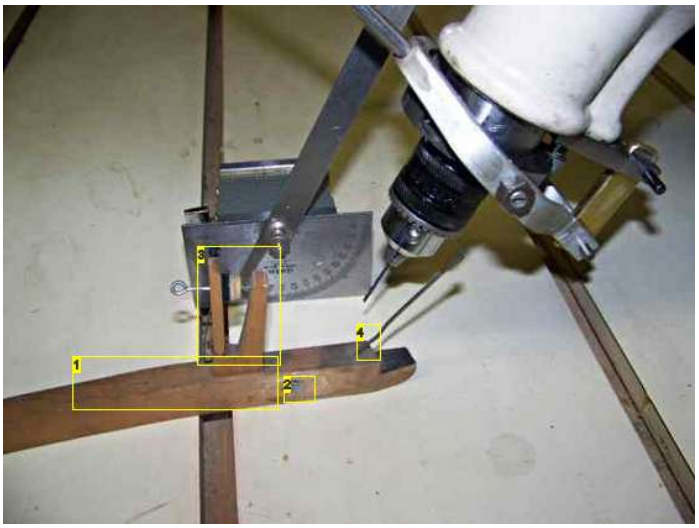


Image Notes
1. piano keys are sawn from wide planks after drilling at least four rows of with at least two holes per key
2. these holes are drilled after sawing the keys apart
3. hopper - step 1 of http://www.instructables.com/id/How-to-Make-a-Pianoforte-part-5-by-W.-H.-Davies/
4. backcheck used in squares and grands, it makes a fifth row of holes