

# *Drawer Making Notes*

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## *Introduction*

This article discusses some techniques I've used and studied for making drawers in furniture that I've either made, repaired or restored during my time in the industry. It is not a comprehensive or definitive text on the subject, and nor does it describe the tools and techniques used to saw and chisel the joint. Rather, it presents a snapshot of some common and well established practices and techniques. For example, in setting out the spacing and proportions for a drawer's corner dovetails and the corresponding pins the method illustrated at figure 14 uses a rule and lines drawn obliquely across the face of the dovetailed part to establish the number of tails and the pins between them. Valid alternative methods exist to determine tail sizes and spacing, such as using dividers to step out an arrangement, but that's a method I simply don't use.

## *Simple Drawers*

Drawers range in their construction from very basic to highly complex. The least complicated might be four pieces of 12 mm or 15 mm (1/2" or 5/8") thick plywood cut to length and width and glued and nailed together similar to the example in figures 1, 2, and 3. Prior to assembly a groove is worked on all the inside faces of the sides, back and front some way up from the bottom edge to carry a plywood base which is trapped in place during assembly. The drawer shown here has a narrower back: it's sized to fit between the top edge of the side and the top edge of the groove worked in the side for the bottom. The drawer bottom here is slipped in after assembly. This drawer also has a small rebate (rabbet) worked at either end of the sides to accurately locate the back and front. Typically this type of



**Figure 1. Simple plywood drawer with screwed on planted plywood front.**

drawer has a separately made 'planted' front as shown, sized and adjusted as necessary and fixed to the front with screws driven into it from inside the drawer box. Starting with full size sheets of board materials it should take about two hours to make and install one drawer of this pattern which includes making and fitting the planted front, and about an hour to 1-1/4 hours per drawer to make a batch of ten or more. The general appearance is somewhat inelegant - certainly the internal box is (even if it's faced with an impressive looking drawer front.) In addition to the rather unrefined construction they are usually suspended on proprietary side mounted metal drawer slides, which are efficient but in some cases somewhat unattractive. Generally neater are drawers suspended on undermount



**Figure 2. View of underside of drawer showing slides and 6 mm (1/4") plywood bottom held in grooves worked in drawer sides and front.**



**Figure 3. Front view of planted drawer front. Note plywood is lipped with an edging to hide veneer core.**

drawer slides which are largely hidden from view. Drawers of this type are well suited to economy items or workshop tool cabinets, and they are the right choice for much built in furniture of higher quality such as kitchens, good quality residential furniture and commercial cabinetry with life expectancies varying from about ten years to several decades. The example shown in these images are from a workshop cabinet I inherited but it's remarkable how many drawers similar to this one in quality with elaborate planted fronts and pulls find their way into cabinetry installed in prestigious high traffic reception and entertainment areas of expensive homes and business premises.

## More Refined

At the other end of the scale, drawers are made with traditional cabinetmaker's hand skills using all solid timber, figures 4 and 5. Sides and backs are usually of a durable hardwood, such as oak, mahogany, ash, sycamore, or maple, some 6 - 11 mm (5/16" to 3/8") thick and joined with hand cut through dovetails at the corners where the sides and backs meet, figures 6 and 7. The back is usually set a little below the height of the sides so that air has a place to escape as the drawer is closed- in a cabinet with a well executed nest of empty drawers if one drawer is pushed home quickly you'll sometimes see other drawers in the stack pop out. The front is between 18- 22 mm (3/4" to 7/8") thick and attached directly to the

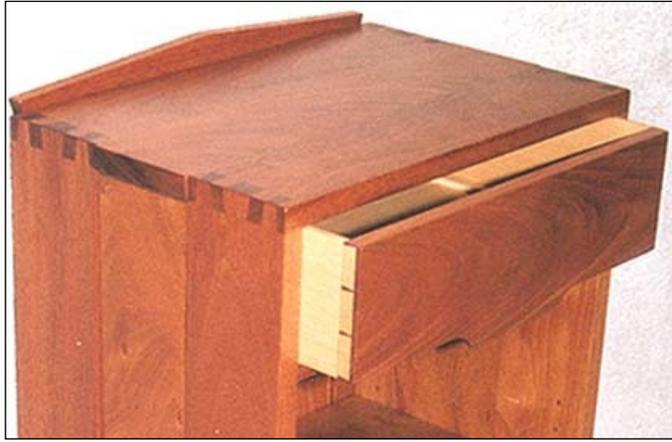
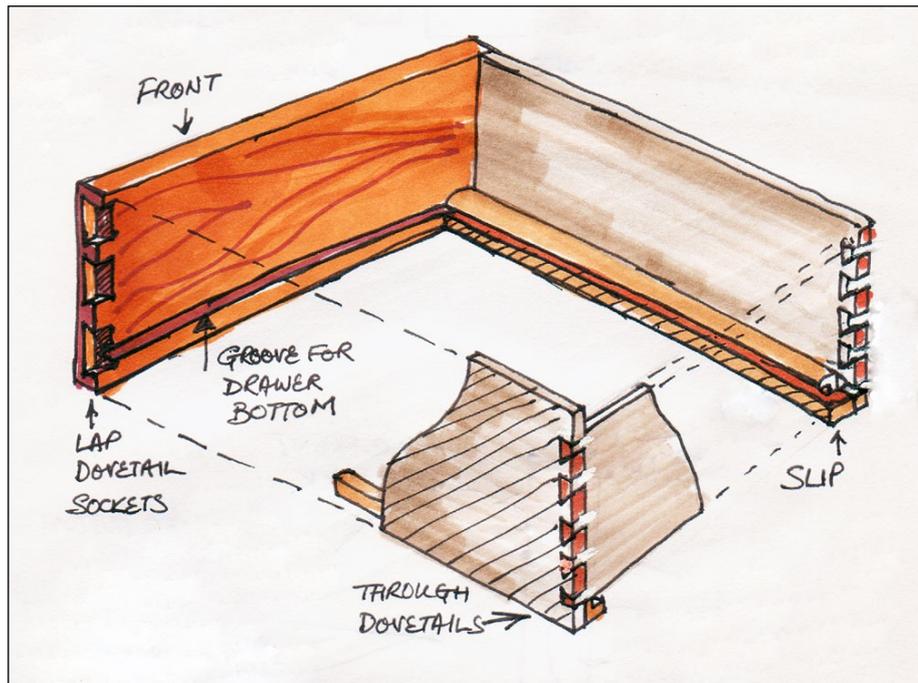


Figure 4. Cabinet with traditional drawer partially extended.



Figure 5. Drawer removed from cabinet at Figure 4. Close up of side dovetails.

Figure 6. A typical traditional drawer configuration with 'quadrant' slips sized and grooved for a bottom approximately 6 mm thick. Cut away view from the rear.



sides with hand cut lap (half blind) dovetails. Bottoms are carried in grooved slips at the side and a matching groove worked in the drawer front, figure 8. The bottom slides in from the back after assembly, figures 9 and 10.

Drawers most commonly run on horizontal wooden frames, (sometimes known as drawer blades) and better quality frames incorporate dust panels.

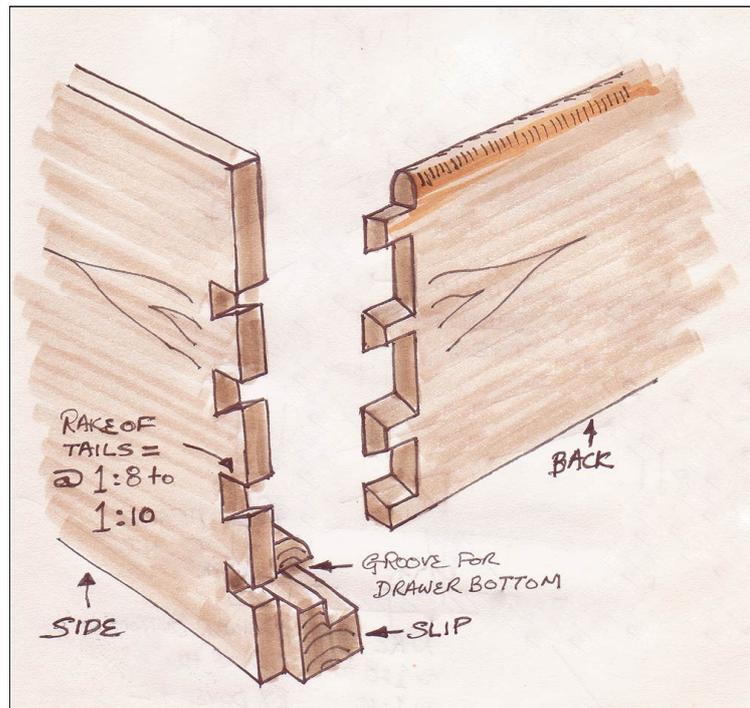
Sometimes the drawers run on horizontal shelf-like wooden dividers built into the carcass.

The upper face of the frame or divider carrying the drawer bottom is known as the runner, and the face above that engages with the top edge of the drawer side is known as the kicker.

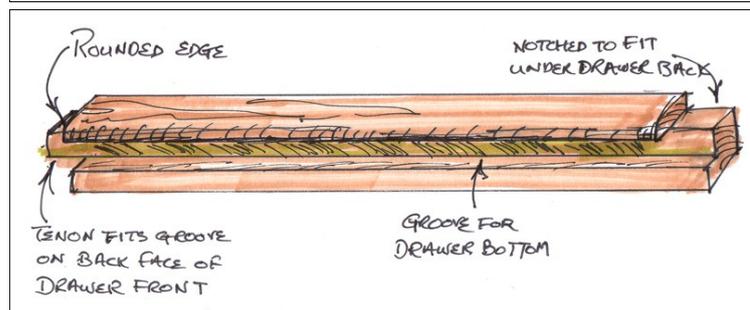
Intermediate dividers in a stack of drawers are therefore both

runners and kickers. To increase the wearing life of the bottom edge of the drawer sides, slips as described earlier, are frequently added to the inside face. Slips are considered maintenance items like brake pads in a car, and need renewal and replacement from time to time over the expected life of a good quality cabinet which might reasonably be 100- 250 years. The runners usually need attention too, and to a lesser extent so do the kickers and the top edge of the drawer side.

An alternative method for carrying drawers in traditional construction are wooden runners, aka slides attached to the inside of the carcass which engage in channels worked



**Figure 7. Hand cut dovetail layout at rear of drawer, also showing rear end of the quadrant slip. Note top of drawer back is set lower than the side, and usually slightly rounded over.**



**Figure 8. A typical 'quadrant' drawer slip showing half round moulding, groove, and locating tenon at the front and notched rear end.**

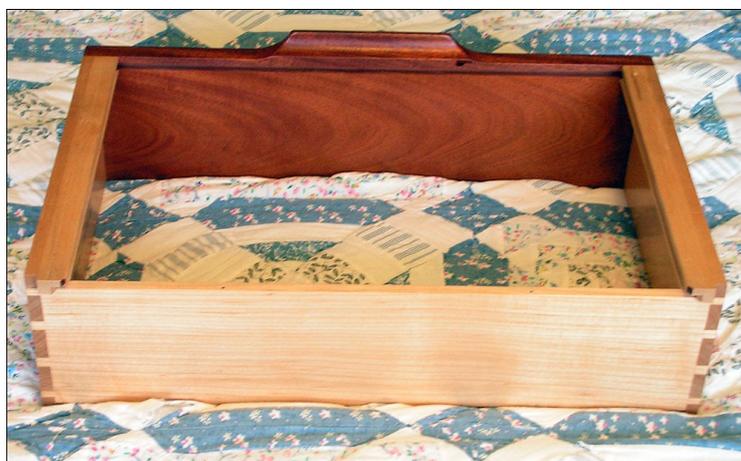
along the length of the outside face of the drawer side. If this method is used the drawer sides are usually somewhat thicker (~10–15 mm [ $\sim 3/8'' - 9/16''$ ]) to accommodate the channel.

The generally accepted modern convention in western style hand working of show dovetails is to make the tails fairly wide and the pins comparatively narrow, figures 4 and 5. Most workers typically cut the through dovetails at the back of a drawer rather coarser than they cut the lap (US half blind) dovetails at the front, see figure 14. The traditional drawer bottom is of solid timber and between about 6 mm and 12 mm ( $\sim 1/4'' - 1/2''$ ) thick, depending upon the

configuration of the parts, including the type of slip if these are incorporated, with the long grain running side to side to accommodate movement in the width in service. The bottom slides in from the rear, underneath the back, and is carried in grooves worked in the slips and in the drawer front. It is locked in place with screws driven through it and up into the bottom edge of the drawer back, although small nails, brads or pins are sometimes used. Slotted screw clearance holes are commonly worked across the grain front to back in the drawer bottom and are meant to allow for movement in service: the usefulness of this strategy is questionable because it's quite likely any shrinkage that occurs will result in the bottom's tongue at the front moving outwards from its groove in the rear face of the drawer front.

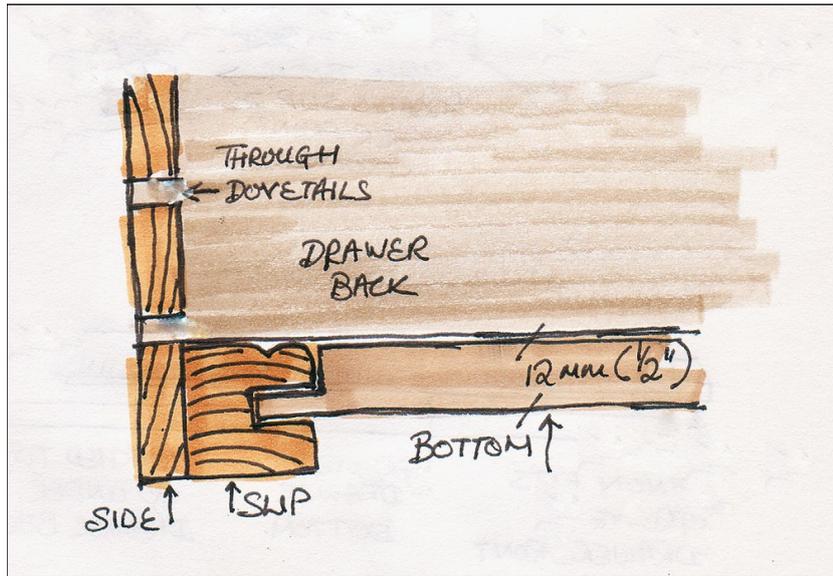


**Figure 9. Close up of underside of a traditional drawer with base partially removed from the grooved slips at left and right. The slips are notched at the rear end to fit under the drawer back.**



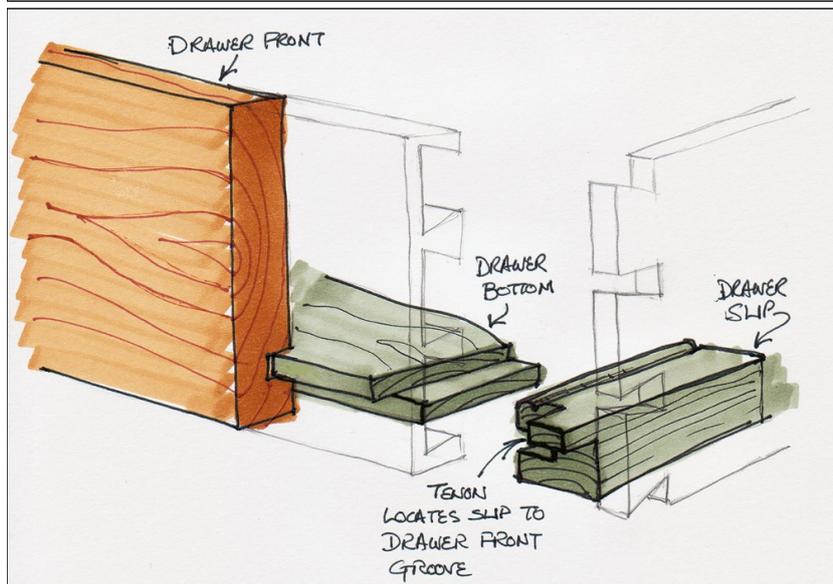
**Figure 10. The drawer as at figure 9 with bottom removed.**

An alternative drawer slip, commonly known as a flush slip, and bottom arrangement is illustrated at figures 11 and 12. In this instance a drawer bottom needs to be about 9- 12 mm (3/8" - 1/2") thick. The bottom's top face is rebated (US rabbeted) at either end to fit the groove in the slip; conversely, at the front it is the underside of the bottom which is rebated to fit into the offset groove worked in the slip; see figure 12. This prevents a gap showing inside the drawer at the front if the bottom shrinks in its width, i.e., front to back. The advantage of this arrangement is that the drawer bottom's interior (upper) face is completely flat, except for the optional



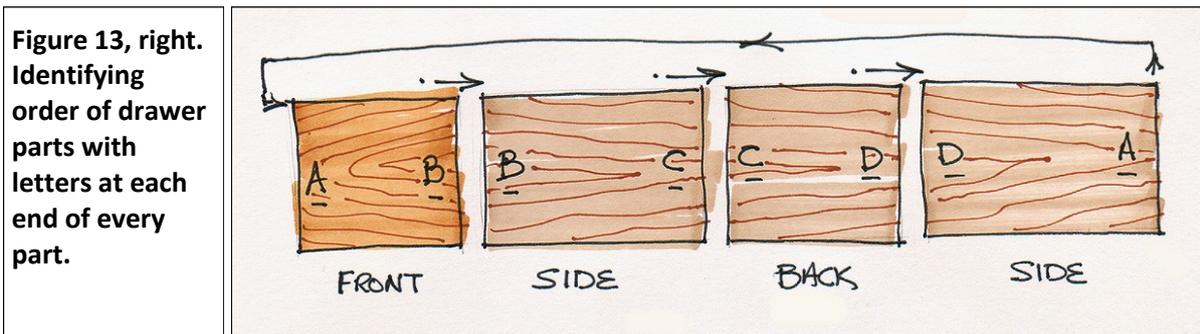
**Figure 11. Alternative 'flush' drawer slip and drawer bottom arrangement with bead and quirk moulding worked in the slip. Viewed from back.**

moulding, e.g., a bead and quirk as sketched, worked in the slip. To locate the slip accurately a small tenon is cut at the front end to fit into the drawer front groove. All slips should include this tenon, although its position at the front end of the slip varies to suit the type of drawer construction, i.e., whether or not a groove to carry the bottom is worked directly on the inside face of the drawer sides, or if it includes a slip, and if so, the type of slip. A drawer of this general pattern can take a maker, starting only with the basically over length but squared parts anywhere up to eight hours to make, install, and fit



**Figure 12. Alternative drawer slip viewed from front with cut away drawer front and side missing.**

hardware, e.g., pulls and lock, all depending on the drawer's complexity, the maker's skill level and familiarity with the procedure developed through repetition and practice.



At the beginning of the drawer making process the sides, back and front parts are cut to length and the ends shot square with a hand plane on a shooting board if required. The dimensioned parts of each drawer are laid out in order and each piece lettered on the outside face at both ends as illustrated in Figure 13. This system of lettering, numbering or an equivalent means of keeping track of the drawer part's order makes finding each half of any corner easy, and as the letters face upwards the top edge of each part is readily identifiable. The sides are usually cut barely wider than the cabinet opening, perhaps a half mm oversized and they are trimmed to a slight taper front to back allowing them to nearly, but not quite, slide all the way in. The drawer front is also made just a hair too long and wide for the opening, and the back of the top edge is slightly bevelled by  $1^\circ$  or  $2^\circ$  so that it jams in the opening leaving about an eighth or a quarter of the thickness protruding. At installation the slight bevel on the top edge of the front and tapered sides are removed during the final shooting in with hand planes. A groove is worked in the drawer front to carry the drawer bottom, and this is followed by marking and cutting the dovetails. The slips are moulded and worked, cut to length and glued in, and the drawer bottom cut to size, the lower face bevelled or moulded to suit the groove and slipped in. If multiples of similar drawers are made, the time element can often be brought down to about 6-1/2 hours per drawer.

Up to an hour should be allowed for marking and fitting pulls and locks, keeps and escutcheons, and about another hour for staining and polishing procedures. Drawers with veneered and/or marquetry fronts, and other complicating features like cockbeads take longer again, and the skills and patience required to build such drawers are quite

advanced. It can be seen that a very fine and complex drawer might take close to sixteen hours to make.

In between these two extremes there are a plethora of options that might include a man-made board or solid wooden box joined at the corners with a tongue and housing (dado) biscuits, dowels, locking mitre joints, proprietary locking metal or plastic knock down (KD) joints, and various versions of machine cut dovetails and finger joints. In addition, solid wood drawer bottoms can be replaced with man-made board, e.g., plywood or MDF, both of which may be attractively veneered, or not, which can save considerable time and effort required to machine up and make solid wood bottoms. All these techniques keep production time and costs down because relatively expensive skilled hand work is reduced in the process.

### ***Handcut Drawer Dovetail Marking Tips***

Different cabinetmakers prefer different orders of work. Some mark and cut the tails first and others execute the pins to begin with. In both cases the second part of the joint to be executed is marked directly from the part first cut. With through and lap (half blind) dovetails I always set out and cut the tails first; it's the way I was taught, I'm used to it and it suits me. This order of work also facilitates cutting both sets of dovetails in a pair of drawer sides (and other mirrored parts of boxes or cabinets) at the same time by ganging and clamping the two sides together in a vise. Outwith the scope of this discussion therefore are dovetail types where the pins must be worked first, i.e., secret mitre and secret lap dovetailing where, should you attempt this form tails first the retained timber of the secret lap or mitre left after sawing and chiseling tails makes it impossible to mark pins.

As a rule of thumb, most through dovetails at the back of the drawer are set out where the tails at their widest part are approximately twice that of the pins: it's not a hard and fast rule, but it's a useful guide. Referring to figure 14, provision has to be allowed for the back being narrower than the side. The bottom edge of the back sits in line with the top edge of the drawer bottom groove. This groove is either formed directly in the side, but where a slip is included the position of the groove's top edge is simply projected inward at the

same height as a groove worked directly in the side. The top edge of the back usually has a half round profile and sits a little below the top edge of the side.

All the marking is set out on the outside face of the drawer side. Start by setting a cutting gauge barely less than the thickness of the side, a whisker, perhaps 0.1, or 0.2 mm less. Once this is set use the stock of the gauge against the end grain of the drawer back to cut a shoulder line on both faces and across the top edge. If the sides are the same thickness as

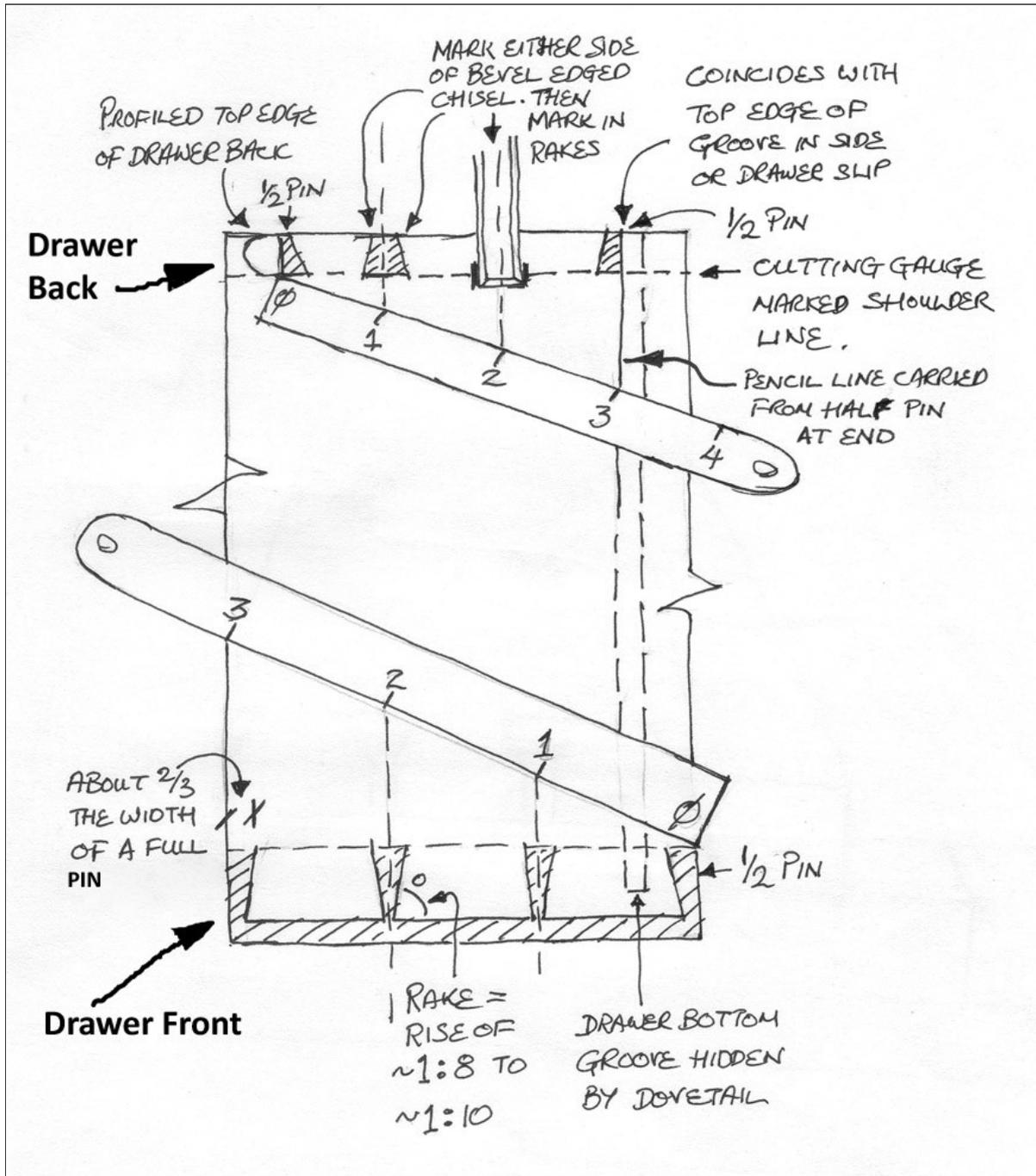


Figure 14. Marking or setting out dovetails at the front and back of drawer sides.

the back use the same cutting gauge setting to mark a shoulder line on both of its faces – if the back is thinner than the sides the gauge must be reset to a whisker less than the thickness of the back. I avoid using a marking gauge for this task with its round point because it creates a torn, ragged line. The settings suggested will result in the assembled tails and pins barely brushing the outside faces of the drawer box therefore softening blocks used at assembly for hammering or cramping won't bottom out on pins coming through. Next, the position of each half pin must be established at each edge of the side. They are called half pins because only the part nearest the centre is raked to match the tail – the outer part of the pin is parallel with edge of the side. Set a marking gauge to pick up the distance between the bottom edge of the side and the top edge of the drawer bottom groove where the outer straight part of the backs' half pin comes through: mark this on the outside face of the drawer side and across the end grain. Set another marking gauge to scribe the straight side of the half pin at the top edge of the drawer back, and mark this: the half pin at the top edge of the back has a small shoulder above it to accommodate the round profile on the back's top edge.

Next select a suitable width of bevel edged chisel, and in rear through dovetails this is likely to be a 9 mm or 12 mm chisel (3/8" or 1/2") and decide how many pins and tails are required using the 'tails-twice-as-wide-as-pins-rule' given earlier, see figure 14. Mark the width of the 'half' pins measuring in from the just scribed marking gauge lines along the shoulder line marked with the cutting gauge earlier. I've always preferred to make half pins a little bigger than half the width of the full pins between the tails, i.e., if the full width pins are 9 mm wide make the half pins 5–6 mm wide or, for a 3/8" wide full pin, aim for perhaps a 7/32"+ wide half pin. Mark the rake of the two half pins to the end of the side with an adjustable bevel gauge, or dovetail template. Carry the line that forms the outermost point of a half pin with a pencil along the side parallel with the long edge. In this example I used the pin nearest the bottom edge of the side. Find an equal spacing between the half pins by laying a rule obliquely across the side with zero lined up with the outside point of the opposite (i.e., the top) half pin until a convenient number of equal divisions is found on the 'carried line'. Mark along the edge of the rule with a pencil, and 'tick' or 'check' the convenient divisions as indicated. Transfer these 'ticks' to the end of the side with a pencil and a set square – this establishes the centre point of the full dovetails. By eye, hold the blade of the selected chisel to equally span this centre line or

position, and mark either side of the chisel at the shoulder line. Now complete marking in the rakes of the tails. For fine work rakes are set between about 1 in 8 and 1 in 10.

Marking the lap or half blind dovetails at the front of the sides follows a similar procedure, but the bottom dovetail must span the width of the groove in the drawer front so that it's hidden after assembly. Set a cutting gauge to mark the length of the dovetails at the front end of the drawer sides. The tail length is less than the drawer front thickness, perhaps 15-16 mm when using an 18 mm thick drawer front (~5/8" in a 3/4" thick drawer front.) Set another cutting gauge to mark the thickness of the drawer side on the inside face of the drawer front. Select a chisel suitable for the full pin or pins, and mark out a half pin at each edge as before, then repeat the routine to find the centre point of each pin by angling the rule across the face of the side and complete the marking.

Three tails in a side about 150 mm (6") wide is a reasonable compromise between strength and aesthetic considerations – this results in two full pins between the three tails, and a half pin at each edge, therefore four in total. There is no prescriptive number of tails and pins that are 'right' for the construction of a box's corner, so the balance between aesthetics and strength is largely down to the maker's or designer's discretion. The choice of gap between tails at their widest point, i.e., at the cutting gauge scribed shoulder line of the drawer box side, for full pins is usually decided by a standard available chisel width. This means a single pass with that chisel will fully clean out the last of the waste between tails. Typically, what are commonly thought of as show drawer front dovetail pin widths (gaps between tails) are relatively small at their widest part, e.g., ~ 6 - 12 mm (~1/4" - 1/2") depending on the size of the drawer, with the configuration at the rear being much less dainty or delicate. In truth, makers have devised a variety of dovetail configurations for dovetailing box corners, whether for drawer boxes or other elements of cabinetry, for a mixture of structural and aesthetic reasons. This includes, on one or more corners of a box, varying the size of the dovetails and pins between them across the width of the mating boards, 'hounds-tooth' dovetails, and so on.