Pantograph notes for Alex
For engraving matrices & punches

Artwork, Master & Working patterns

To make it simple: if you are doing a face, the best thing to do is work backwards with the math. If you are cutting 18 point, figure on cutting the mats at a 10 to1 ratio. That means that your metal (or polymer) working patterns will be ten times the type size, or 180 point.

Once that has been decided on the paper patterns can be cut at two or three times the 180 point. I cut my paper patterns at 2-1, so 2x180 = 360 points, which comes out to 30 picas tall. If you work at a 3-1 ratio with the paper patterns, they are going to be awfully big (45 picas). I prefer 2-1 on the paper (master) to lead working pattern. And 10-1 is a comfy ratio to engrave at. With that ratio you have lots of flexibility between the stylus and the cutter.

Once you have decided that the paper patterns are going to be 360 point (30 picas) you should leave a bit of space on the extremes with ascending and descending letters. On a 30 pica pattern I leave about 3/16" at the bottom of a "p" and the same at the top of "h" etc.

This seems like a hell of a lot, but in the 18 point type it will come out to 1/20th of that much; about .006".

Remember, you can scale your pantograph to whatever working ratio you want. Just keep in mind it's best to cut the mats at a decent rate of reduction: at least 8-1 or 10-1, something like that. When you have figured out which is best, then you can plan the size of the paper master patterns.

On my Ogata the reductions of 5 to 1 and lower have division marks between the full number ratios. So at 5 to 1 there are sub divisions at every tenth. On the lager numbers they are at only every fifth. When the reduction gets bigger the marks are only on the full reductions since there is no room on the bars for sub divisions. So I try to keep the reduction on the marks that are the easiest to set and re-set to. When I did 24 point Deunsing Titling, I had to set the Ogata to 7-1/2 to 1, and since there was no marking for the half, I had to guess where the half would be, and in doing this, it's never halfway between the 7 and the 8 marks. It's just a weird math thing. If I were an educated man I'd be able to figure out the math on this. Goudy simply went with the nearest greater reduction mark on the arms of the panto. So his 10 point might be a little smaller than the usual 10 point. I guess he figured "who is going to know this other than he".

That's the reason I'm planning a 9 point Duensing Titling, rather than 8 point. No markings for that size, so I'd have to make another set of lead working patterns.

Set Widths, etc.

For stylistic reasons you can make your characters whatever widths suits a new design.

The Monotype flat mats were done in groupings because I think Lanston had a method that they followed, and groupings made it easier on the caster to complete a font casting. And it probably made less guess work in the drawing room at Lanston if they had standards to follow, even in the case of display type. Certainly things were very regimented as far as UNIT values in making Comp mats. Units don't come into making flat mats because there is no need to be able to compute the widths as is done in the Composition system.

I think you know how the flat mat widths are shown. But in case: if a mats is stamped 10 - 4 that means that the letter will be 10 &1/2 points wide. The second letter in the corner of each mats is done in increments of 2, each two meaning 1/4 point. So you add the 2's to the first number: 10+4 = 10-1/2 points. All you have to do on the caster, though, is set the wedges and cast. I'm only passing this info on to you so that you will know how to mark your own mats when you make them.

Matrice Blanks

Make all blanks the same thickness. This makes it easier to engrave the correct depth on the pantograph.

Mats should be engraved in "half-hard brass".

Mark the top left corner of the mat so it will be easy to register again after removing it from the machine.

Use the smoothest side to engrave the work.

Engrave to .051 - .052" depth, then dress to type height during trial casting.

If you cut the mat blanks on your saw to 5 picas and two points by seven and a half picas you will have lots of allowance for trimming the blanks to slightly larger than a display mat, and this will give you dressing allowance for the alignment and setwise fit later. The finished mats need to be 4 and a half by seven. You can measure a flat mat to confirm this size.

I've found it's better to make the rough blanks generously oversize, particularly to allow for squaring the head and foot of the mat.

The reason for making the mat blanks all the same thickness is so that all of your mats will come out to the same depth on the pantograph settings. I used to be sloppy about this part and I was always having to go back and deepen some mats and to trim off the extra depth on others. Even if you make them all over depth in the final cutting, at least they will be consistant when you come to dressing the mats for .918 height.

The metal you need to get from Rustan Metals is 1/8" x 1-1/2" Half Hard Brass. Sometimes called "free machining brass".

It's about $55 for a 12 foot bar. I get them to whack it up into 4 foot lengths to make it easier to handle on the bandsaw. If you bring it out here you can cut it all up to a little larger than the size you need for the printer's saw. This makes a double trim but you won't waste all that much. It's difficult to trim accurately on the bandsaw so that's why I cut it up larger.

Spent part of yesterday preparing the brass blanks to engrave. It takes more than a day to cut, trim, sides and finish the engraving surface and the backs of enough blanks to make a font. If you take the time to make all the blanks exactly the same thickness it saves a lot of time in the engraving because you know that once the finishing cut depth is set, you can simply substitute each blank for the finished ones, if the cutter doesn't break. That way you save a lot of time in setting the down-feed for the finish cut.

Position of the image on the mat

You're smart. You'll figure it out.

Monotype mat geometry

You know where to look

Setting up the pantograph, checking dimensions, etc.

That manual you got is good.

Steel Punches

Punches need to be driven into a soft red brass or aluminum, or copper.

Cutter Grinding

On a 3 sided cutter the face angle +100% equals the angle of occlusion: for instance a cutter ground at 8 degrees will leave an occluded angle of 16 degrees. On a 4 sided cutter the face angle +50% is the occluded angle: for instance a cutter ground at 8 degrees will leave an occluded angle of 12 degrees.

I at first used a 4 sided cutter ground to 8 degrees. Ludlow used a 3 sided cutter ground to 6.5 degrees with a special back grind near the point. I am currently using a 6 degree angle 4 side cutter.

After sharpening the cutter point it is advisable to gently rub the striations off the face as these create lines where the cutter may break, much like a score does on glass.

The cutting point must be taken off at an angle of about 5 degrees with a fine stone; this creates a rake on the leading edge to cut into the work.

A feeler gauge viewed edge-on through a glass or microscope is an excellent way to judge the width of a cutter point down to .001”.

Pantograph Tips

Slowly lower the cutter into the work while gently oscillating the stylus in the pattern within an area to be engraved. This procedure relieves an area for the cutter to enter the work and prevents binding and breaking fine points. If the cutter is dropped into the work too quickly, or dropped into the work without gently oscillating the stylus the point will be broken.

Always start at the bottom of the pattern (the edge closest to you) and work away from you. Due to the rotation of the spindle that is the direction the cutter prefers to travel.

Work on the Pattern table is reversed on the cutting table; the head of the pattern faces away from the operator, but on the cutting table the head is towards the operator.

Holding a trace paper slip under the cutter, or chalking the work with soft lead pencil will allow the operator to see when the cutter touches the surface of the work. Then the feed table dial is set to zero, and the depth of cut can be set, and table locked.

Type matrices cast better when they have a counter step engraved half the depth of the final drive. This allows metal to flow freely into the mat and fill the face. Examine foundry type for examples.

Cutters are all sharpened at the same angle. The points vary from the wider, stronger roughing cutter to the delicate finishing cutter. As the depth of engraving increases the width of the engraved area increases, eliminating terraced sidewalls.

Cutter blanks

Carbide is good for many things, but on the fine tips on what we use, they are too fragile and break right off the bat. This is what I've heard.

Just plain old High speed steel is the best. It's hard, holds an edge and is less prone to breaking.

I'm not certain how your Gorton P1-2 engraver and grinder work together, but if the collet from the grinder moves back and forth between in and the engraver, then you need only one; right?

With my stuff, the grinder and the engraver each have their own collets, and although there is room for a little drift between the two collets, it has been no problem in the case of my two machines.

If you only get one midget chuck I'd hold out for the 1/8" that Famco will make for you.

I suspect if you go for the 1/10" one, you will get a lot of overheating when grinding the cutters, because of the lesser amount of steel there is to absorb heat. I found this between the 3/16" and the 1/8" cutters. The 3/16 stays cooler in the grinding, but there is a lot of metal to take away to get to the finished size. Once you burn a cutter blue it's no good unless you grind it down further to get into the good metal.

When grinding a new point, or in facing up a one that you have been using, you can still only feed the cutter into the grinder at a rate of .001" at a time or it overheats and goes blue. Touching a damp rag to the cutter helps keep it cool.

Jim Rimmer

Alex,

The taper in your Gorton should be cleaned and dry and also the taper hole in the spindle of both the panto and the cutter grinder. It is pressed in firmly or tapped in gently with a little block of brass or lead. Once it's seated it should stay in place forever, or until you want to take it out for any reason.

My Ogata has two size collets: 1/8" and 1/4" inner bores, and both have a tapered shank that is drawn in with a big collar-nut that keeps it in place. To get them out to change (rarely) I tap them out by gripping the collet with a pair of plies and then tap on the pliers. This sounds drastic, but it's the instructions that are with the Ogata. And the tap is very gentle.

With my Ogata, once the collet is in place it is left in for the whole project. Unless I need to switch to the 1/4" collet, I leave the 1/8 one in and never need to remove it to replace with a sharpened cutter.

In the case of my Ogata, I just need to loosen the nut and grip the cutter with the pliers and tap it out. The new sharpened cutter is slipped in and the nut tightened. The collet gets snugged up and the cutter will never slip or move.

The most acute angle I've been able to grind is with a grinder setting of 5 degrees for four sided cutters. This gives a cutting angle of about 6 1/4 degrees; pretty good for close fitting type.

Changing cutters is not all that tedious. I do three depths of cut:

1. Down to .025" with a roughing cutter (about .010") tip. This cut is a silhouette which makes the counter step, but doesn’t trace the shape of the character. This one can stay in for all the characters in the suite of mats, because it’s a big tip and will stand up to all the rough cuts. I just do all the rough cuts without removing this big cutter, and the mats can go back in for the 2nd cut. That saves a lot of unnecessary cutter changing.

2. Down to .045" with a smaller cutter (about /005" tip that is tiny enough to cut the shape of the letter, but leaves enough to cut a new path for the finishing cutter.

3. Down to the finished depth of .051. This is one thou over depth to allow for hand rubbing to .050" accurate depth. This cutter is about '002" flat tip, depending on the scale of reduction I am using. I have about 50 tracers (styli) that I use that are in increments of .025", so at a scale of 10 or

15 to one I can tweak the relationship of the stylus to the cutter to get the proper weight of the character.

If you need a range of styli, I can make them for you.

I notice on the internet chat rooms, that all the guys who have Gortons are working with very basic cutter geometry. They mostly cut dentist signs and the like, using a single lip split cutter.

I used to use a three-side cutter, but have found that the four-sided cutter cuts smoother, is stronger, and gives a more vertical angle. It's easy to grind and hand tip and the results are smoother on the side wall and the floor of the mat.

It might be a good idea to print this out and keep it in your notebook.

If you can't get your stuff up and running before you are down here again, you could consider spending a day with me and cutting something on my machine. That way you can compare it to your's as far as function goes, and you will know ahead of time what you need to do to yours. It might save you some of the aggravation and process of discovery that I had to go through over a one-year period. I sure could have used Paul here when I was doing all the experimenting.

Have fun. You'll enjoy having this to do during those long Winter evenings.

Jim