

## CHAPTER XXIII

### TRIMMING KNIVES

#### Setting the Side Knives

EVERETT SHAFFSTALL in *Printing Equipment Engineer*: There are a number of factors to check before attempting to do a thorough job of setting the side knives. Of course these may not be necessary where you are just closing up one end or opening up the other a little, but in any such operation as installing new or sharpened knives, these factors must be considered, and in any situation where there is repeated trouble getting and holding a good trim.

The disk should have just enough room to turn freely. The guide or guides should be set up to it. Excessive looseness, especially in the mold disk hub, will cause a varying trim and also damage to the molds, which will appear as a slight score across the back of a mold 14 picas from the right end, caused by the back knife as the slug is ejected from the opposite mold.

#### Loose Mold Disk Hub

LOOMIS: On old style (small hub) Linotypes you use a feeler gauge at the back, and cut a brass shim about half the thickness of the indicated play.

On the modern large hub (Linotype), you can take off enough material from the hub by rubbing it on emery cloth laid on a makeup table or stone. Be careful. If you take too much, you will have to shim.

On the Intertype you can remove metal from the back shoulder of the stud. (LOOMIS: For the country m-o, I think a shim might work out better, although a really first grade machine shop man can of course do a good and permanent job. This kind of work has its difficulties, however; turning a couple of thousandths from the end of such a stud, and keeping it even, involves absolute squaring up of the stud in the chuck in the lathe — and this is tricky work.)

#### Preparations

*Mold disk locking studs and blocks* must be in good shape to get a good trim. This is essential. (See *Replacing the Mold Disk Locking Studs and Blocks*, page 136.)

*Molds should be cleaned.* If any metal adheres to the back, remove it. Clean the liners thoroughly.

Put 30-pica liners in all molds. Remove old knives and clean the vise casting. Put on the left-hand knife and insert the pressure spring with the two ends

against the knife. If you have not moved the two knife-adjusting screws, this left-hand knife should be somewhere near the right spot. Try a slug. Then use a slug as a feeler to set the right-hand knife 10 points from the left-hand knife.

Set the left-hand knife so that it does not gouge. It should scrape the slug in streaks evenly all the way across; it should trim off any overhang at the top, but it should not "shave" the slug. This setting is done with the right-hand knife two points open. (Loomis: I have trouble when I open the right-hand knife. I generally keep it right up in place, even adjusting it roughly if it gets too far off, because on old machines (not the kind Shaffstall has) which have not been well maintained you must keep your right-hand knife in place or you won't be able to hold the setting.)

A good slug is parallel — the same thickness at both ends and the middle, and not tapered from top to bottom.

### **Slugs Thinner in the Middle**

If 30-pica and two-column slugs are square but the one-column slugs are thinner on the left end, and if all molds are alike, it may be the knife. Use a  $\frac{1}{4}$ " square by 3" long stone, held flat against the inside of the right-hand knife, to hone down the surface of the knife for about an inch, being extremely careful not to round the cutting edge. Check frequently.

This trouble also arises from a mold that has been much used on short measure and is actually worn down on that end, or from a warped mold cap.

Usually these two latter causes are present on only one mold, while the other molds are all right. If the base of the mold is worn down, there's not much you can do with it. The cap, whether worn or warped, can be reground by the Company.

### **To Cure Slugs Tapered From Top to Bottom**

Where you have constant trouble with slugs that taper smaller toward the bottom, sometimes it will help to hone a small flat or reverse rake or bevel on the left side of the cutting edge of the right-hand knife. The depth of this bevel should be very slight — the stone being held almost parallel with the knife — and the width of the cut about  $1/32$ ", but carried from one end of the knife to the other.

If this does not do the job, then talk to your local grinding machine man. Ask him to lay the knife against a magnetic block with the base (which normally fastens down against the machine) against the vertical surface of the block (toward the rear or front of the grinder), and the cutting edge up. Now we assume the base of the knife is perpendicular with the table of the grinder and with the shaft of the grinding wheel. So we throw it out of perpendicular by dropping a shim .006" thick and  $\frac{1}{4}$ " wide between the knife and the magnetic block, all along the bottom, at the corner diagonally opposite the cutting corner. This of

course throws the knife out of square by .006", which is all you want. Now grind a reverse rake along the edge of the blade, about 1/32" wide. This small cut can be very effective. Needless to say, such things can be done by hand with a hone, but it is easy to get too much angle.

There are times when even these alterations don't work. If the ejector lever has been used constantly over the years to hammer out slugs, the molds may be out of square. These have been repaired, but its value is doubtful.

**HARDING:** The old narrow-type mold cap end guides warp sometimes, allowing undue opening at the top of the mold and producing excessive body taper. Measure this by measuring the slug between the ribs. Be sure the back of the slug isn't gouged by the left-hand knife. The factory taper is about .0025".

#### **A Minus Reading in Center Portion of 30-Pica Slug**

This can often be corrected by honing the negative rake bevel in the area involved.

#### **Knives Should Be of Equal Height**

They should be ground in pairs and always equal in height.

#### **Don't Forget the Sector Screws**

Remember, when you get the knives parallel on a Linotype, by use of the sector screws you can secure an exact point-size setting for each thickness of slug without affecting parallelism.

#### **Hump at Bottom of Ribs**

**LOOMS:** This may be caused by several things, but first be sure the hump changes the parallelism of the slug. Measure at the hump and at the top of the slug. Sometimes it comes out just right; other times it doesn't.

It may be caused by knives being too low, requiring the slug to make too big a jump from the mold.

Mold banking blocks may be worn down or gone, depriving the mold of needed steadiness during ejection.

The forward thrust of the mold slide may be away off, allowing the disk to jump forward when the ejector blade hits the slug. Also there may be too much play in the mold slide.

At ejection the disk should come up firmly against the banking blocks and should stay there, not moving until ejection is completed.

**HARDING:** Sometimes you have only to set the left-hand knife closer to the slug.

**Why Does One Mold Trim Perfectly, While Another Does Not?**

**QUESTION:** Our straight-matter mold trims perfectly, while the 10-point is away off on 30 pices. Can you tell us how to fix this? I have to keep the 12-pica slug straight, but I'd like to satisfy the jobman too. — T.S.T., Jennings, La.

**LOOMIS:** I think so. If you have a consistent difference between two molds, you are in for a mold-shimming job. However, there are some things to check first.

If the disk is much more than .005" out of true, you may need to replace that. If your mold locking studs or blocks are worn, you will need to replace those. If your vise locking screws, especially the right one, moves the vise as it locks up, likewise. There is the possibility of the knife's getting temperamental on certain molds, but that is fairly remote.

With a single-mold disk, you are all right. The knives can be adjusted to fit. With a two-mold disk it isn't as easy, but still it can be done. With a four-mold disk — tsk, tsk. Quick, Henry, the shims.

**Shimming the Molds**

**LOOMIS:** For this job you will need a big screwdriver with a perfect blade for the big mold screws, and a smaller ditto for the mold cap screws. You will need also several sheets of paper, from 9-pound onion skin (or tissue) which will measure about .0015" to oiled tympan paper which mikes about .006"; 20-pound bond hits about .004"; 16-pound, .003" or .0035". But mike them; they vary. 13-pound should hit .002" or .0025", but for some reason it often doesn't. Anyway, it's hard to find.

Be sure the backs of the molds are clean.

Cast 30-pica slugs from all molds. Line them up and have a look at the backs only — the flat side. The one with the least trim will be used as a guide, for it is the farthest away — and it is ten times easier to shim than to file pockets, and I don't like to file pockets anyway. I go around with my eyes downcast for a week after a job like that.

Observe the backs at length. Now set the left-hand knife to trim properly the one least trimmed. A proper left-hand knife means it just touches in streaks all the way across, and leaves no overhang of letters at the flat side. You may have to pull in or push out the right-hand knife somewhat as you do this, to avoid extremely uneven pressure on the right — which can make a difference. You needn't mike it; go by the looks of the ribs. The back of the slug should not show any noticeable solid areas of trim; a perfect mold should not show any. But some molds are not perfect and you cannot avoid a little along the top for an inch or two — but no more. When you get it so the streaks are about even all the way across — these are caused by irregularities or tiny defections in the cutting edge of the knife itself — tighten the two bolts — extreme upper and lower



— firmly, and try it again. Set the right-hand knife now. On old molds you will have to set it about .002" fat, but be sure the liners and mold do not have flakes of metal around them. Newer molds are made a few thousandths undersize to allow for trimming right down to size — .014" to the point.

Now cast a whole new set of slugs. Assuming your pet is still good, observe the backs of the others. They will now be more gouged than before, and the object is to shim them up between the mold seat and the mold (on the narrow edge) until they are the same. This may take a slight amount of doing and practically unlimited patience.

Let's say a slug is gouged on one end, about 2" long and about 1/4" down from the top. This would indicate a piece of newsprint under that end (about .003"). I always put oil on the paper so it will stick where it is put. Work on this one until it is right. If unfortunately you find the letters hang over on the other end without trimming, you will then, I am sad to say, have to move in that end of the left-hand knife, and then re-shim the first mold. This does not happen often, but its frequency is quite enough.

Now, having gotten the first mold still farther away, tackle the second one again, and get it as close as you can. It is not necessary to split thousandths.

Take the third one and the fourth. Be sure you put oil on all the strips.

Do not forget that every time you replace a mold you have to go through the routine: push mold to the right; tighten 4, tighten 3; loosen 4, tighten 4; loosen 3, tighten 3. You cannot get a comparable trim otherwise.

When you get all through, your slugs should measure pretty uniform. If the big ones are off a thousandth or two, forget it unless you have unusual work where you use a lot of such slugs in one spot.

Now put in your straight-matter liner in the first mold. (By the way, this should have been the best mold. I hope you read this far before going through the routine.) Here I don't depend on a mike. Only a very experienced machinist can interpret the readings of a mike at top and bottom of every rib — and he misses about half the time. Ribs vary considerably, and you have to think about where the rib is on the slug, what kind of form it will be used in, etc.

Variation in ribs can be eliminated by long, tedious and careful work with a hone on the inner surfaces of the knives, but I doubt that it's worth it. Also, some machinists with extraordinary equipment and experience have honed knives and even molds to make short slugs trim exactly the same as long slugs from the same mold, but this is unbelievably complicated — and you probably will wind up buying a new mold anyway.

Cast twenty straight-matter slugs; let them cool a minute; then mix them up so all the hot ones won't be on one side; split them into two equal piles. All right, so you had one left over; send it to me. Put these two piles end to end, and use your fingernail. They should be even; if there is any question, cast twenty more and try the two piles together; you won't go wrong with this many.

Try the other ends together also. Be sure you are not fooled by a nick in one end where the slug slides down the chute and hits the Galley Slug Buffer—or any other unusual bulge. Sometimes the knife wiper drags across the top and causes a ridge.

Are they off a little? Set the right-hand knife and make them right. *Do not touch the left-hand knife ever again until you replace it or make repairs.*

Now on an Intertype, if you have set your first slug to trim the proper point size, all other slugs will trim their correct point size. On a Linotype they are set individually. Set your knife, say, for 10-point, the 8-point having been the first one set. Open the vise and loosen the set screw that holds the individual point size screw, which is then reached through a hole in the right-hand frame of the knife block. This does not affect the parallelism of the knives; it changes only the amount of the opening on that size only.

#### **Why Are Slugs off Their Feet?**

**QUESTION:** Our slugs are straight from end to end, but off their feet. A column bows up in the middle when we lock up. — F.T., Jr., Batesville, Ark.

**HARDING** in the *Graphic Arts Monthly*: This could result from molds out of square, but in this case it's nothing but slugs trimmed too fat. The ribs on universal molds are tapered the same as the bodies on all molds. You can set them about .002" fat, but these are .005" fat, and when you have that much you will have slugs off their feet.

Sometimes this is caused by an overhang at the top, which means the left-hand knife is not trimming enough.

#### **Knife Trims Fine on All but 6-Point**

**LOOMIS:** This is a puzzler that I ran into in western Minnesota. The answer was: slight wear in the knife block gibs, which were seldom set on 6-point. Eventually there was a hump at the 8-point, and when the knife block went over that it canted the knife. Remedy: Very carefully hone the gibs to smoothness.

#### **Adjusting Linotype Knife Block Gibs**

**LOOMIS:** First see that they are smooth on the sliding surface; oil them. Turn down the two adjusting screws at the top of the knife. Turn down the left one until it just binds the knife and won't allow it to slide back to smaller point-size; then back it off just enough to release the block. Do the same with the right-hand screw. Try the left one again. These seldom need adjustment once they are set.

These gibs should be oiled occasionally. Later blocks have two oil holes, but the older ones do not have them.

### To Set Side Knives Without a Micrometer

See *Shimming the Molds*, page 214, the paragraph near the end starting, "Cast twenty straight matter slugs."

### Miscellaneous Causes of Bad Trim

Warped mold; vise locking stud or screw loose or worn; metal in the right-hand locking stud block; worn locking stud and blocks; the disk loose on the stud; the tie rod loose at the back; anything that interferes with justification of the line; a warped mold; mold disk guides not bearing properly; worn mold disk stud.

### Setting the Back Knife

**LOOMIS:** Knives are just about my favorite subject, and the back knife the most so. We'll need a new knife for this job.

Take off the old back knife. Clean out the seat. (I assume the mold disk is out far enough for you to get at it.) Set in the new knife. Be sure you have the right one. The Linotype knife point makes an angle of  $40^\circ$  and must be used on Linotypes only, while the Intertype knife is  $30^\circ$  and may be used on either.

With the disk pulled out and the guides properly set as described above, all metal cleaned out from behind the disk (spin it to see if it is free), put the new back knife in place. Often you have to lower the screws, for you want the new knife to slide down until it is backed away from the mold.

Now turn the screws up evenly. Use a light. You can use red lead or tissue paper for a test. I use my eyes. When the blade seems to be touching, I try the mold disk carefully. If it goes all the way around without rubbing, well and good. I know then it will trim about .925".

Now make a cast from each mold, using only capital letters — those unused as much as possible — the last two rows. Let the slugs cool thoroughly by laying them flat side down on the magazine. Mike them.

Take the tallest one. (If you have seated the molds as instructed, this mold is the one to which you will have to build out the rest, for you cannot push this one in.)

(Correction: Yes, you *can* push it in by peening the surface of the disk against which the mold fits, but this is work for an experienced man. Let's make it easier by building out the others to fit this one.)

Mike this tallest slug on the ends and in the middle. If one end is .925" and the other .924", put a cigarette paper under the .924" end. Always observe the tightening ritual.

(HARDING: Sometimes when a 30-pica slug trims high on the right end only, the mold disk guides are not set close enough to the mold disk.)

Now it comes out even on the ends but it measures .923" in the middle. That's easy. The screws that hold the knife to the frame are fairly tight — not good and tight. (I hope you ordered new screws with the new knife; the large-headed ones are convenient.) The adjusting screws are 21 threads to the inch. One full revolution would make .041". Therefore turn the *inside screw* anti-clockwise a little than one fourth of a quarter turn. Take an old screwdriver with steel all the way through. Put the blade in the slot in the knife (that's what it's for) and give it a smart tap down. If the screws are reasonably tight they will hold it down. Now try another slug.

In testing for type-high, it is best to cast three slugs every time, and use the third one. Sometimes the first one or two will pull back a tiny bit. Let them cool to room temperature before measuring them.

Now we've got the tallest one even, and the work begins. Measure the others and shim them out to the first one. Suppose a slug measures .920" on both ends. Put a sheet of tissue paper clear across the front. Etc., etc., etc. When you get them all alike, turn your screws up a little at a time until you get about .919" all the way across. .918" is perfect, but don't go under. .920" is acceptable. A difference of .002" cannot be seen on enameled stock on ordinary presses. This I have proved.

I aim at .918", and accept anything between .918" and .919".

Tighten the holding screws carefully and firmly.

Remember that a poor mouthpiece lockup will cause your type-height to be off.

*Famous last words:* Never again touch the adjusting screws as long as that knife is on. In a small country shop it should last from two to three years. When the slug gets up to about .922", you will notice it. *Do not under any circumstances try to set up the same knife.* The cutting edge is gone. You will only push the heel of the knife against the disk and scrape off the bottom of the slug, along with a certain amount of the mold. Get a new or sharpened knife. I will not turn up or re-install a knife that has been used. It is time wasted.

EVERETT SHAFFSTALL in *Printing Equipment Engineer*:

*Mold disk guides* must be set to just contact the front of the disk. The back knife should be removed before this adjustment is made.

*Mold slide and vise* should be aligned as told in *To Adjust the Mold Disk Lockup*, page 124, by shims.

*Pot lockup* can affect the height of the slug, the same as lack of alignment between mold slide and vise.

**Why Does Metal Gather Under Back Knife?**

**QUESTION:** Metal gathers on the under side of the back knife and binds the mold. How can this be stopped? — W.B.A., Pitman, N. J.

**LOOMIS:** Fundamentally this indicates an improper grinding job. There may be other causes, but I don't know them. I never grind a back knife by hand unless it is an absolute emergency. Keep two knives, and when you take one off, send it in promptly for sharpening. If the knife is not ground at the proper angle, or if the bottom surface is unusually rough, metal will adhere. I repeat: have your knives ground professionally.

**To Avoid Variation in Height**

**QUESTION:** We cannot get a consistent bottom trim on our slugs. They will vary as much as .003". — L.T.M., Chepachet, R. I.

**LOOMIS:** It sounds to me like a worn mold disk stud. That's the big, short shaft that goes through the middle. On either Linotype old style or Intertype, try feelers in the space at the back end, between the frame and the flange (or the nut) on the shaft. I'll give you a tip. It may look like a lot of space, but divide it by two when you cut your shim. Usually .002" is plenty, but I have used up to .005". Carefully cut a single-piece round shim from unwrinkled shim stock, then carefully smooth out the edges; I have used a makeup rule. Use dividers to mark the right size for both inside and outside diameter. Install it at the back, with plenty of oil. I have had only one of these come out in many years.

When you get it tightened up (all the guides are off, of course) try the disk around and around for bind. Then try it back and forth for shake. There should be no shake and no bind. If there is bind, your shim will soon come out. Now set your guides to just touch the disk at its high point. Some disks will vibrate, and you have to back off the guide a thousandth or so.

**First Few Slugs Have Slick Bottom**

**HARDING:** Many machines do this, the slick bottom disappearing after a number of slugs are cast. This is due to the fact that the slug is slightly pulled back into the mold on the breakaway, which happens sometimes when the parts are cold and the metal solidifies well.

**Sharpening Knives at Home**

**QUESTION:** I am told there is equipment for sharpening side knives at home. Can you tell me where to get this? — S.R.P., Middleboro, Mass.

**LOOMAS:** Nix. Lay off. You won't sharpen a pair of side knives more than half a dozen times in your life. I see the 1934 catalog still lists a lapping block, but the block and the knife support together now catalog \$44.65, and that will

pay for a lot of grinding at \$3.50 each. You can get a loaner set of knives from any printers' supply company that grinds these knives. Besides, grinding is tedious and requires considerable technique; also, you will have to grind your lapping block occasionally to maintain a flat surface. It isn't worth it.

The companies grind these by machine and do a better job than can be done by hand. I have known m-o's who would take a back knife over to a grind wheel and grind away a relief, then try to square it up on the side of the wheel. Then they wonder why their back knife is hard to set, or why it gathers metal behind the disk. Grinding by hand is no longer economical.

#### **How Often Do You Sharpen the Knives?**

LOOMIS: There are various schools of thought on this. Some say the side knives should be sharpened once a year, but I do not hold with this. Once in five years is plenty, to my notion, and one in ten years on a country machine, unless there are nicks, etc. I doubt very much that the knives, even "dull," offer as much resistance as supposed. This is no reflection on competent men who think otherwise.

As to back knives, in the plant where I have taken care of two machines that get hard use, up to two shifts a day, I find a back knife properly set will last about eighteen months.

I once saw, in a small town in southwestern Minnesota, a machine with side knives and back knife that had been untouched for *eighteen years!* The same operator was there who had been present when the machine was installed. The back knife was pretty well chewed up, but it had only recently begun to give trouble. The side knives we changed on principle.

#### **When Are Side Knives Worn Out?**

LOOMIS: When there is too bad a nick in them to be ground out, or when the grinding brings the height of the knife below  $\frac{3}{4}$ " on the top end and  $\frac{7}{8}$ " on the bottom end. At this point the knife sits too far from the mold for a dependable trim.

Such old knives can be used, however, by underlaying them with 6-point brass rule — though most service companies refuse to sharpen them until especially requested to.

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# LINECASTING OPERATOR-MACHINIST

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