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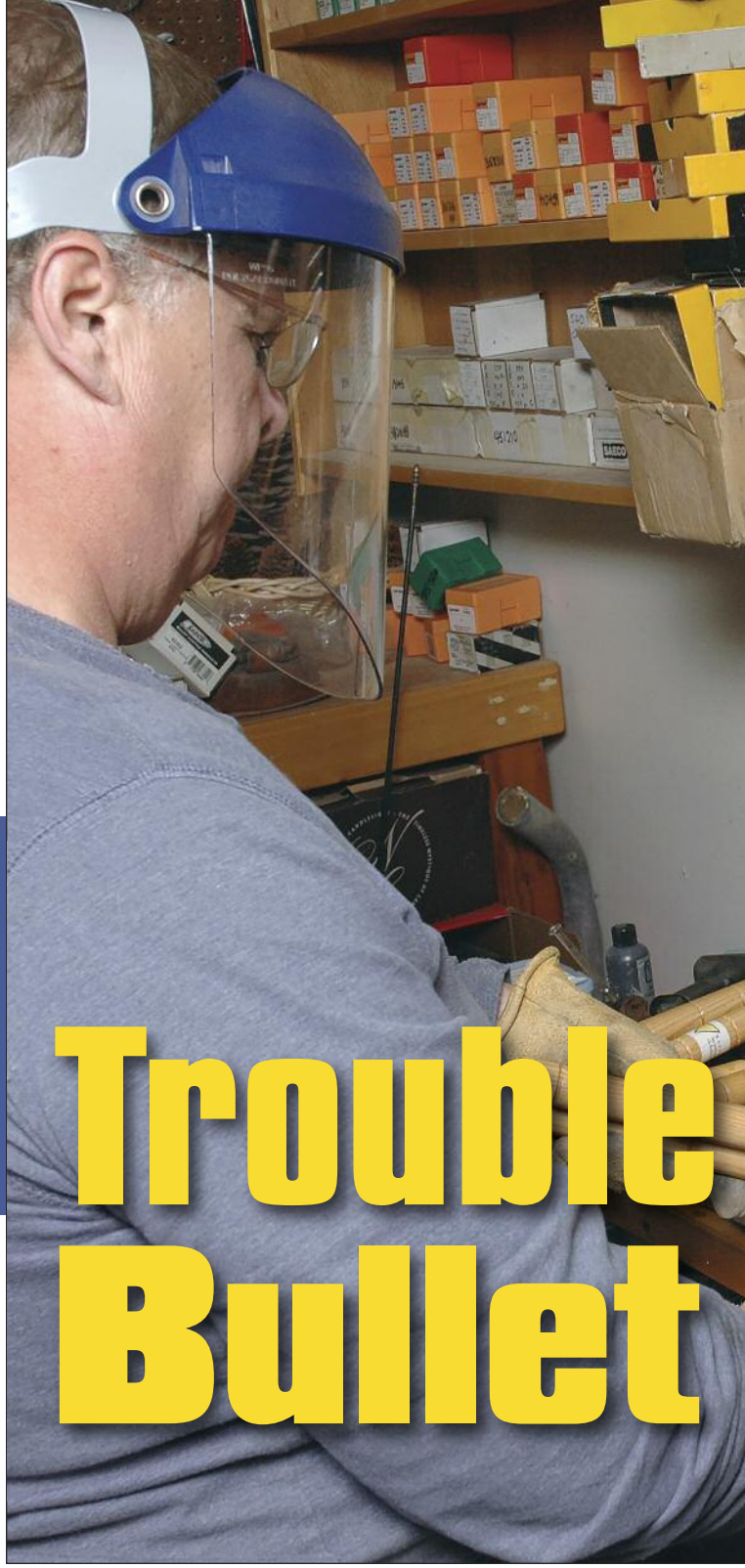
Photos by Yvonne Venturino

The week before Christmas 1966, I cast my first bullet. In the ensuing years, I've made perhaps a million or so bullets, ranging in size from .22 to .58 for rifles and .32 to .45 for handguns. My best guess is that I've owned 400 to 500 bullet moulds, collectively made of iron, brass and aluminum cut with one cavity up to six. At this writing there are about 150 moulds on the shelves above my casting area.

Trouble Bullet

Advice Nearly 50 Years in the Making



With that sort of background, readers might be forgiven for assuming that there is nothing new for me to encounter in regard to casting problems. Yet last weekend at a shooting match, another enthusiastic bullet caster related a mould problem that baffles me. He said he owns a double-cavity, iron mould for a lightweight, .45-caliber rifle bullet that will never drop two good bullets simultaneously. If he fills the front cavity first, the rear one will not fill; but if he fills the rear cavity first, the front one will not fill. Logic says the problem must lie with the vent lines between the cavities. Otherwise, I am clueless as to a remedy.

On the surface, bullet casting is a relatively simple operation. It only requires that a molten, lead-based alloy be poured into a mould of the proper shape and size. Then the mould's sprue plate is whacked out of the way and the mould opened so the new bullet will fall on something soft. Simple as that, yet the operation is fraught with all sorts of problem areas.

The cavities might not fill completely, or they might fill completely but all edges of the bullets are rounded with a multitude of wrinkles. Perhaps there are no wrinkles, but the bullets' edges are still rounded. One side of the bullet might have perfectly filled edges, but the other side is rounded. Or the bullet has "whiskers" sticking out from one side's seam or both. There can also be flashing at the seams or on the bullets' bases. The bullets' bases are not level, or they might have tiny studs that cause them to sit tilted on a surface. What causes divots on bullets' bases when sprues are cut? Why won't bullets fall from mould cavities? Why does lead alloy smear atop a mould and under the sprue

shooting Casting

Left, Mike's casting area includes an exhaust fan and a small manicurist's fan (to his left) for cooling sprues. Above, bullet moulds are preheated atop the lead furnace. The same goes for the ladle.

plate? Can you see light between the mould blocks when they're tightly closed? Why won't a mould open after cutting the sprue?

These are just the most notable of the problems I've encountered in 47 years of casting rifle and handgun bullets. Some of the problems are caused by novices mishandling moulds. Others are caused by mould manufacturers' quality control, or lack thereof. Some problems stem from poor alloys or poor heating source for the alloy. Solutions are sometimes elementary, such as using a consistent technique for pouring alloy into mould cavities or using a proper alloy and even cutting the sprue properly.

Other problems are mysterious, such as one mould that dropped bullets with one side filled perfectly and the other side with all bands and edges rounded. The reason for that I never did figure out; the custom mould manufacturer took it back and replaced it with an identical one that gave no problem. His response was, "It happens sometimes. It's easier to just replace the mould rather than chase the cause."

Perhaps the easiest problem to deal with is wrinkled bullets with rounded bases. Generally speaking, this is caused by low temperature of either the alloy or mould. My moulds are preheated by setting them atop the lead furnace when it is plugged in. When pouring starts with match grade BPCR bullets, 15 are cast without a pinch of attention as to their looks. By that time the mould will be up to temperature, so the next 100 are kept. Rarely will there be a rounded base upon cutting the sprue, which is mostly caused by a bobble in my casting technique – usually from not holding the ladle

to the mould long enough. Some of my friends in the BPCR Silhouette game give great credit to lead thermometers. I never bother with one. Instead, my dedicated lead furnace for 1-20 alloy was experimented with until the thermostat setting was perfect for my casting technique. It has never been changed since.

Another reason for poorly formed or wrinkled bullets is contaminated alloy. This is a factor encountered today, because that old-time favorite most casters have used for a basic alloy – wheelweights – now might contain any sort of metal. After firing away literally tons of wheelweights in the past, it is avoided totally now. Instead, for BPCRs and revolvers, foundry 1-20 (tin-to-lead) alloy is used. For autoloading pistols and my bolt-action military rifle collection, only Linotype is used. Certainly costs are higher than with scrap, but free time is at a premium now more than ever.

When flashing forms atop a bullet mould, it is a sign of a too-loose sprue plate.

Other common problems are uneven bullet bases, studs sticking out from the center of the sprue cut and flashing around the base of the bullet. Those factors are caused by a loose or warped sprue plate. Novice casters often think that tightening the sprue plate makes perfect bases. It does not ensure such. If the sprue plate is warped or the top of the mould blocks are not perfectly flat, the sprue plate can tilt upward. It is not common to encounter mould blocks with uneven surfaces, but it happens. More common are warped sprue plates, which can be easily caused by not striking it at a 90-degree angle. Hitting a very hot sprue plate sharply from above or below can warp it.

Several mould manufacturers' information sheets say the sprue plate should swing freely of its own weight. Maybe. However, the mould should be held upside down and examined when the sprue plate swings so freely. If it hangs away from the blocks a discernible amount, it is too loose. With a hard alloy such as Linotype, the sprue plate can then slide upward as it is cut, resulting in the dreaded stud at the bullet base. Also, if too loose, the result can be flashing around the bullet base.

This Minié-ball mould has two problems. The lead speck to the right of the cavity will not allow the mould blocks to close properly. Rust has formed inside the blocks and should be removed with a cotton swab and rust remover.

My moulds' sprue plates are adjusted so there is a very slight bit of friction if the empty mould is given a wrist flip. Here's a tip: Don't try to adjust a mould's sprue plate to perfection when it is cold.

Above, when a mould does not close properly, there will be flashing all around the freshly poured bullet. Below, the mould pin alignment hole on the right can be seen to be slightly peened. That mould is not going to close properly and drop its best bullets until fixed.

Above, to remove lead smears from atop a set of mould blocks, Mike ladles molten alloy on it until the smear turns shiny. Then it too is molten and can be rubbed off with a piece of cloth. Right, perhaps the most common problem besetting bullet casters is lead smears across the top of moulds. They must be removed for a bullet's base to be perfectly flat.

It will likely bind as it heats to proper casting temperature. Bring it to casting temperature first and then adjust the sprue plate. With some moulds it is difficult to get the sprue plate screw bound by its locking screw to the point that it won't move along with the rotating sprue plate. An easy remedy is to mark a sprue plate screw's head in line with the locking screw, *when the mould is casting properly*. Then take out the sprue plate screw and file or grind a flat on it in line with that mark. When returned to the mould, the sprue plate screw now has a flat onto which the locking screw can press. It should never come loose again.

Alloy buildup on top of mould blocks and beneath the sprue plate are most assuredly caused by poor casting technique – mainly cutting the sprue before it has cooled sufficiently. Casters often get their priorities confused by going for quantity instead of quality. I have been guilty of that so much that I had to devise a method by removing those lead smears as well as developing a technique to prevent the problem in the first place.

Let's look at that latter point first. To get the sprue cooled sufficiently before cutting, I set the filled mould in front of a high-speed manicurist's fan for a few seconds. A lady's fingernail polish needs to cool quickly just as a bullet caster's sprues must when time saving is a factor. A little experience will show just how long the mould must sit about six inches in front of the fan before the sprue hardens enough to cut.

A good question here would be: "How do you know when it is hardened enough?" My non-scientific method is this: If the sprue cuts with virtually no resistance, the alloy has not cooled enough. This will cause lead smearing to begin. If more than one sharp blow with a one-pound, lead filled rubber hammer is needed to cut it, too much cooling has occurred. Ideally, one blow that meets with a bit of resistance cuts the sprue cleanly.

Some casters tell me they cut the sprue with the palm of their hand covered by a heavy glove. I've tried that and came to this conclusion: If the sprue has hardened enough that it won't smear, then it's too hard to cut comfortably over a protracted casting session with one's hand, even wearing a glove.

The first time I determined to remove lead smears from a mould, a hand-held propane torch was used. In an empty fireplace, the

Troubleshooting Bullet Casting

The bullet at far right is simply the result of the mould and/or alloy being too cool. Conversely, the three bullets at left have been poured with a contaminated alloy that does not allow bands and edges to fill out perfectly.

torch was propped so its flame hit the affected part of the mould. That was working well until I walked away and got completely engrossed with some other chore. Sidetracked, about an hour later I returned and by then the entire mould was almost red hot. The lead smears were gone, and I cannot determine that the mould was damaged at all. Still, that method could conceivably have adverse effects from ruining the mould to burning down a dwelling.

Thereafter, my method for removing lead smears is one that requires my continued attention. The affected part of the mould is held tilted about 45 degrees over an old stainless mess kit half. Then molten alloy is ladled over the offending spot until the smear shines, which means it also is molten. A quick brush with a folded piece of Lyman's Turbo Polishing Cloth will take the alloy right off. (It should *if* the smear is hot enough. If it does not remove it completely, repeat for a longer time until it does.)

Several friends and acquaintances have related how they "scraped" off the alloy buildup with a razor or an Exacto-knife. That idea gives me the "willies," because bringing any sort of hardened metal into contact with my soft iron or softer brass or aluminum mould blocks is a quick path to ruin. In fact, the same fellow who related his problem with the double-cavity mould that would not drop two good bullets at a time recently ruined a $200 custom mould. After casting with that mould for a bit, he decided the mating surfaces of its blocks looked "scuzzy." So

The bullet at left has a perfectly cut base. The other shows a slight divot where the sprue was cut so was probably cut slightly too soon. Mike still considers the bullet usable for competition.

This Linotype alloy bullet was allowed to cool too much and therefore required several blows from the sprue cutting mallet to sever it. Note the small semicircles leading up to the final cut.

The Lyman 358430 bullet (left) is perfectly formed. The loaded bullet in .38 S&W (right) has some minor wrinkles in its nose that will not be a detriment to accuracy.

he polished them with some sort of space-age fabric. Whereas that fine quality mould had dropped perfect bullets with just a hint of a seam, now those seams are prominent. No matter what treatment tried, it will not return to its excellent casting qualities.

So what if tiny bits of alloy get splashed between mould block halves? First of all, don't fill the mould over the lead pot or cut the sprue over it so it falls back into the pot. Splashing molten alloy does nothing beneficial for you or the mould. A better idea is to fill the mould over that mess kit half and cut the sprue over it too. If a bit of alloy does get between the mating surfaces of my moulds, I remove it by the method described above.

When casting BPCR bullets for competition, I strive for the most perfect bullet possible. They are necessary to deliver precision out to 500 meters or 1,000 yards. Conversely, for handgun bullets or even rifle bullets for my large assortment of World War II bolt actions, I'm not as picky. I know for a fact – from machine rest handgun testing – that minor wrinkles and blemishes affect the bullet not a whit.

Mike uses only 1-to-20 (tin-to-lead) foundry alloy for revolver bullets and BPCR bullets (left). For modern rifle bullets and autoloading pistol bullets (right), he uses only Linotype.

Lastly here is a bit of heartfelt advice: Regardless of what sort of bullet I'm making, I do not make a marathon out of it. Instead, it is sort of enforced relaxation. If time is not available so that casting can be made enjoyable, then I don't do it. Neither is it done to the point of exhaustion, for that will make it dreadful the next time bullets are needed. I listen to audio books or music and look forward to the time I can allow from a busy schedule for bullet casting. •