## SWAGING IN THE RELOADING PRESS

If your reloading press accepts standard 7/8-14 TPI dies and its ram will take regular RCBS button-type shell holders, then you can use it for swaging certain calibers and kinds of bullets with Corbin reloading press swage dies. A heavy-duty press makes the work easier, but any modern press capable of resizing a .30-06 case is strong enough for bullet swaging in the styles and calibers we offer.

There are limits to the pressure you can safely apply to the soft screw-stock rams used in nearly all current reloading presses. The size of the frame or leverage of the press has nothing to do with this. A massive press like the RCBS Big Max still has a four-inch stroke, to get a magnum rifle case in and out. Small arms bullets, on the other hand, need only about two inches of stroke in order to be successfully swaged. This wastes half the leverage in a reloading press.

Single station, ram-type presses are the only kind currently supported by swaging equipment. Presses with turrets, rotating shell holder plates, aluminum frames, mechanical type shell holders that adjust to different size cartridge heads, progressive loaders, and bar-type rams used in H-frame presses all have features that make some swaging operations difficult or impossible. Standard swage dies for reloading presses do not require a massive press, but they do work best in a simple, single-station conventional round-ram press.

A special swaging press like the Corbin Mity Mite (CSP-1) or a combination reloading and swaging press like the Corbin Mega Mite (CSP-2) has the capability to more than double the leverage in a reloading press design. It does this by cutting the stroke in half. The same effort that moves a reloading press ram four inches is now put to work moving the ram only two inches. The effort is converted into higher pressure within the die.

Such presses have many special features designed to allow higher stresses, equalize the torque on the ram, align the die and punch more precisely, and provide for automatic ejection of the bullet on the back stroke. The die can be designed to withstand higher pressure, since it doesn't have to fit into the constraint of a standard reloading press dimension.

In these presses, any caliber from .14 to .458 rifle bullets with tubing jackets as thick as 30 thousandths of an inch are perfectly feasible. In a conventional reloading press, you are limited to the .224, .243, and .257 rifle calibers, and the .25 ACP, .30-32 Handgun and carbine (130 grains or less, no spitzer rifle shapes), 9mm and .357/.38 Handgun calibers. Within those calibers, there is considerable latitude for weight and style variation.

Regardless of the press or system, you can make lead bullets or gas-checked bullets in any die capable of jacketed bullet swaging. And, you can use longer or shorter jackets in the same set of dies. There are some dies made just for lead bullets, combining the steps of core swaging and core seating so that you can make a lead bullet in one quick stroke, and these special (model LSWC-1) dies are not generally suited for use with more than a half-jacket. These dies are not made for the reloading press, in any case, since they require bleed holes in the die wall.

Core swage dies and other lead-forming dies that have extrusion holes through their walls to let you automatically adjust the lead core weight on each stroke (instead of just using whatever weight of core you happen to put into the die) need room around the side of the die for the lead to come out. In a reloading press, the die is put into the head of the press. Because of the length and top position of the ram in a reloading press, the die has to be located so its walls are surrounded by the threads of the press. This doesn't leave room for correctly located bleed holes.

In order to do it right, core swaging and lead semi-wadcutter dies that adjust the core as they form the bullet are made only for the special swaging presses, and not for use in reloading presses. You can still make lead bullets of equal quality in a reloading press, but to get there, you must be more careful about how you cut or cast the cores. What you put into the die is what you get out, in regard to weight control. This is a major advantage of the special swaging press systems, and is one of the things that makes it difficult to "convert" or adapt many of the advanced kinds of dies for use in ordinary reloading presses.

Reloading press swage dies are made with a UNIVERSAL ADAPTER BODY, which is the same for all styles and calibers of dies. This component holds the actual die "insert" and internal punch together in the proper relationship, and fits into the 7/8-14 TPI threads of your reloading press. All adjustment for different weights and styles of bullets is made by turning the whole die, universal adapter and all, up and down in the threads of the press like a big micrometer thimble.

There are two punches in every swage die. The INTERNAL PUNCH stays inside the die. It is held there by two restraints: the punch has a head on the top that won't let it fall through the die on the "downstroke", or ejection cycle, and the universal adapter body only lets the punch head slide up a certain distance before it strikes the top of the hole machined in the adapter. The EXTERNAL PUNCH fits into the slot in the press ram, just like a shell holder. It can easily be removed and changed. Most people own several external punches for each of their die sets.

A small hole goes all the way through the top of the adapter. It is .257 inches in diameter, and takes a quarter-inch diameter KNOCK-OUT ROD (also called the ejector rod or simply K.O. rod). The Knock-Out rod is long enough so that it can push the internal punch down nearly the same distance as the die is long. That pushes the bullet out the die mouth. On one end of the Knock-Out rod is a knurled head, big enough to give you a good target to tap with a plastic mallet or a piece of wood. This drives the bullet back out of the die after swaging.

The ejector rod comes completely out of the die, so you can use it on any of your reloadin press swage dies. Another way to eject bullets -- one with a little more sophistocation -- is to slip a Corbin POWER EJECTOR UNIT over the top of the die and fasten the three set-screws into the ring machined around each of the universal adapter bodies, right below the knurled part.

The power ejector is an optional accessory item. It speeds up the operation by eliminating the need to pick up a mallet and tap the ejector. Instead of using the regular ejector, you install a straight piece of quarter-inch diameter steel rod, supplied with the PE-1 ejector. Following the instructions that come with this tool, adjust its ram so that all the free play is taken up when you have a bullet in the die, ready to be ejected. From this point on, your swaging operation is reduced to two levers: the press handle swages the bullet, and the power ejector handle gently but firmly pushes it out of the die.

The internal punch in your reloading press swage die can be removed easily. Identify the die insert itself. This is the super-hard high-carbide alloy steel cylinder at the very bottom of the whole die assembly, just protruding from the adapter about a quarter inch. Most of the die insert is up inside the adapter body, which is machined to accept the 5/8-24 TPI threads on the other end of the die. To remove the die, grasp the small protruding surface with pair of pliers and unscrew it. (Don't worry about marring the die -- it is so much harder and tougher than your pliers that you can't hurt it this way. On the other hand, don't grasp the oxide-blued adapter body with pliers: it isn't very hard, and you can damage the threads. Just hold it in your hand.)

There are basically three dies available for the reloading press that are swage dies, and several kinds of draw dies. The swage dies are:

(1) The CORE SEATER
(2) The POINT FORMER

## (3) The LEAD TIP DIE

The core seater (CS-1-R designation, in the reloading press system) can perform two different jobs. It can be used by itself to make any kind of bullet that has straight, parallel sides, a small shoulder, and a lead nose from the shoulder up. The whole bullet can be lead, or any amount of it can be covered by a jacket right up to that shoulder. Think of a Keith handgun bullet with a jacket coming right up to the semi-wadcutter shoulder and then stopping. Right up to this point, the bullet is straight. The jacket can't be curved past this point in this kind of die alone.

However, the nose can be any shape you like. The nose is formed by letting the lead core flow down into a cavity machined in the end of the external punch. You can make a round nose, a Keith nose, a wadcutter (very little cavity, if any, in the external punch tip!), a conical nose like a pencil point, or anything else including fancy multi-cavity hollow points (instead of just a cavity, there is also a probe or rod in the end of the punch to make these). The point is, while you can just change the punch to whatever the lead core flow down into a cavity machined in the end of the external punch. You can make a round nose, a Keith nose, a wadcutter (very little cavity, if any, in the external punch tip!), a conical nose like a pencil point, or anything else including fancy multi-cavity hollow points (instead of just a cavity, there is also a probe or rod in the end of the punch to make these). The point is, while you can just change the punch to whatever thickness to its edge, or it would quickly crumble away. A 0.015 to 0.025 edge thickness is standard. This small edge comes up against the jacket in our example, and presses hard on the thin jacket material. One of them has to buckle and fold. Usually it is the jacket.

If you try to make a semi-wadcutter bullet, and the jacket comes out with radial folds, much as if someone sat on your top hat, then see if you have enough lead sticking out the jacket to completely fill up the cavity in the punch you selected. If not, that's the problem, and the solution is to use a heavier core, a shorter jacket, or a punch with less of a cavity. Another solution is to use a hollow point punch first, moving lead up and out of the jacket, and then form your nose using the extra amount of lead displaced from inside the jacket.

Let's back up a minute in case anyone is lost at this point. We are talking about the most basic kind of swage die, the core seating die. It is called a core seating die because it can be used to seat or press the core down into a jacket, expanding the core and the jacket together until they contact the walls of the die. The internal pressure becomes uniform as soon as the jacket is pushed out against the die walls evenly, and the base of the jacket comes hard against the internal punch face. This uniform internal pressure can exceed 20,000 psi (and usually does).

Compressed oxygen gas in a welding tank is in the 2,000 to 3,000 psi range. Compressed air in your car tires is usually 35 to 45 psi. When you fire a typical rifle, pressures momentarily peak at levels that reach 25,000 to 55,000 psi typically. The average pressure over a second of time is vastly lower. The swage die must be able to sustain anywhere from 20,000 to 50,000 psi constantly, year after year, without change in its diameter, roundness, straightness. It can't develop a barrel shape inside, nor can it grow with the continued stress.

Tolerances in a casting mould usually are held to 0.003 to 0.001 inches, plus or minus. Tolerances in the core seating die are usually held to better than 0.00005 inches, plus or minus! Your bullet doesn't need to be within that tolerance of some arbitrary standard diameter, of course, but it is nice to know that whatever diameter it comes out, it is repeatable to such high precision. The typical absolute diameter tolerance on the bullet diameter is normally 0.0005 inches plus or minus, although this has long been proven of little importance, as long as the variance is held to high precision tolerances.

In other words, if you have a .308 rifle, and you know for sure that your barrel has a .3000 bore, with all grooves at exactly 0.0040 inch depth, it still doesn't matter nearly as much whether you shoot a .3079 bullet or a .3090 bullet down that barrel, compared to whether your bullets vary from one to the next as you try to put them into one hole. Many competitive shooters find a bullet with nearly 0.001 inch larger than nominal diameter shoots better at long range than a conventional "correct" diameter bullet.

In any case, the core seating die is a straight hole die. If you take it out of the adapter body and pull out the internal punch, you will be able to see straight through it. The hole is round, straight, and highly finished. The internal punch is a very close sliding fit. The external punch can fit the die bore, for making those semi-wadcutter and wadcutter type bullets, or it can fit inside the jacket for making rifle-style bullets.

Let me make a definition of these two general kinds of bullets. It's important to understand what I'm talking about so you can make proper and cost-effective decisions later on. There are semi-wadcutter styles, and rifle styles of bullets, relative to the kind of equipment needed. When a swage die-maker talks about a semi-wadcutter (or wadcutter) style, it isn't just a specific nose shape. In regard to the kind of equipment required, it means any bullet that is made with a lead nose, ending at a small shoulder, and having the jacket at full bore diameter all the way to the base (if there is any jacket).

This kind of bullet can be made in a single core seating die in one stroke of the press. One pass -- all done. No lubricating, no sizing. Just load it and enjoy shooting it. Lead bullets are swaged with a film of flexible, hard wax bonded to them under swaging pressure. This is accomplished by dipping the core in a liquid "Dip Lube", which some people call "liquid jacket", just prior to swaging. The film evenly covers the bullet, making it usable to speeds of 1,200 fps with no grooves, no separate lubricating steps.

Cup bases? Hollow bases? No problem -- just remove that flat ended internal punch, and install an optional internal punch with a probe shaped like the cavity you want to form. Both the nose and base are formed at the same time, by pressing against the two punches. Unlke a mould, there is no conflict between hollow bases and hollow points. They are independent of each other and can be mixed or matched any way you like. In fact, you can turn the swaged bullet over and swage it the other direction, perhaps using a little higher setting of the die to get slightly less penetration of the punch. This gives you shapes that neither of the punches has by itself, and demonstrates one of the more powerful experimental features of swaging equipment.

We mentioned seating the core inside the jacket. If you wanted to, you could select an external punch (the one that slips into the slotted ram like a shell holder) with a small enough diameter to fit right inside the jacket. Jackets usually have some taper in the wall thickness to control expansion. The punch will contact the jacket wall at some point if it is a close fit. Obviously there are some limits as to the depth of insertion of any given diameter punch, and to the range of weights of cores that you could seat with each punch.

If the punch is too small, lead will spurt out around it and you may not be able to build enough pressure inside the jacket to expand it properly. This produces undersized and tapered bullets. If the punch is too large, it may not go into the jacket at all, or it may plow up jacket material as it presses down. This isn't always bad -- it can be used to thin the front of the jacket, or to help lock the core into place. Usually, though, the jacket and punch need to be made for each other to avoid this. Fortunately, Corbin is the world's largest supplier of bullet jackets of all types, and can provide the right punches for any jacket or core weight, as well as the jackets to match.

The reason for seating a core inside the jacket is to make that second kind of bullet, the rifle-style bullet having the jacket curved around the ogive, with an open tip. Let's define open tip and hollow point for bullet swagers. An open tip bullet has the core seated below the end of the jacket. The jacket extends forward, past the core. This leaves an opening or an area devoid of lead just below the tip. A hollow point, on the other hand, is made by pressing a punch with a projection or probe machined on the end into the core. The hole or cavity thus formed in the core is further shaped when the ogive is made. The result is a bullet with a hollow area in the point, formed in the lead itself.

A hollow point bullet can have a lead tip, or it can have the core seated down inside the jacket. Usually, it has a lead tip exposed beyond the end of the jacket. But an open tip bullet can't, by definition, have a lead tip. The reason to be clear about these terms is so that when you order tools and punches, everyone will be talking about the same thing. It makes a big difference whether you can make what you want once you get the tools. A hollow point is made with an optional punch, during the core seating stage. An open tip is made by using a punch that pushes the core down inside the jacket. It is the standard, "default" design for any regular set of dies that includes more than a core swage and core seating die. And a lead tip bullet takes a lead tip forming die in rifle styles, but seldom requires anything special in the blunt, wide-tip handgun styles.

To make that second kind of bullet, the rifle-style bullet, you still need the straight-walled core seater. The uniform pressure that this die produces is necessary to expand the jacket to correct diameter, mate the core and jacket perfectly, and produce the straight and round tolerances in the jacket. But with the core seated down inside the jacket, all you have now is a very accurately formed cylinder!

To put the ogive (that's OH-JIVE, by the way, like "Oh, don't gimme no jive, man!") on the bullet, we'll use the second kind of swage die, the point forming die (designated PF-1-R for reloading press dies). Now, the term "point" is often confused with the term "tip". Again, it's nice to talk the same language when ordering parts over the phone. A point on a bullet refers to anything past the shank or straight part. A point is the same thing as a nose. The tip, on the other hand, is just the very end of the point. It is the part that ends, technically, after the meplat, and begins at some arbitrary place on the ogive curve that is close enough to the meplat so that it can have a different curve and not affect the over-all bullet outline significantly.

Simply put, the tip is the very end of the bullet's nose. The point is everything from the tip to the start of the straight part (shank) and the point is the same thing as the nose. To add confusion, some people even call the point the ogive, so really the terms point, ogive, and nose all refer to the same thing in general sales talk. But tip is different.

The ogive is formed by pushing the straight cylinder you made in the core seating die into the point forming die. It goes in nose first. If you want the nose to be made on the open end of the jacket, then the open end goes in first. You can make a solid nose, or full metal jacket (FMJ, as it is called, though strictly speaking, the open tip also is a full metal jacket bullet) design by pushing the seated core and jacket into the point forming die base first. Special notes on this technique can be found in Corbin technical papers and books.

The point forming die has the actual shape of your bullet frozen in tough die steel, diamond lapped to extremely fine finish and tolerance by skilled die-makers. It is a hand-made die, produced by craftsmen with years of experience. It isn't much like a punch press die or a plastic moulding die, and people who have skills in those fields usually can't produce good point forming dies without a great deal more training.

To make this die, both reamers and laps have to be cut to precisely the right shape and diameter for your desired bullet. In reloading press equipment, the great attraction is the lower cost since you can use an existing press. If your main goal is economy, then it doesn't help that goal to increase the cost of the dies by adding extra labor, so we manufacture only standard shapes and offer no custom work in the reloading press line. By doing this, we have been able to produce swage dies superior to those costing ten times as much, that are made to special order. Corbin makes the only serious attempt at mass production of hand-crafted swage dies: by eliminating all the stages of custom fitting and tooling, we've been able to bring swaging equipment of high quality to every corner of the earth, and introduce thousands of people to swaging who could not otherwise afford to try it.

If you want custom shapes and diameter, on the other hand, then we do have another system set up to handle it at reasonable cost. In fact, this system is designed on two levels: semi-custom and fully custom work using the same basic equipment. The advantage is that we can use all standard blanks, that fit into standard presses and use the same general parts. Your cost is lower, your replacements or repairs are much simpler, and the whole system is so well proven it has become the world's defacto standard for swaging. It's called the Mity Mite system, and we'll discuss it shortly. Semi-custom outfits can be obtained by selecting from the wide variety of off-the-shelf components kept in moderate supply for immediate delivery. Fully custom outfits can be produced, subject to the usual waiting list.

In the reloading press, the point forming die is built very much like the core seating die. It fits the same universal adapter body, so both dies look almost identical from the outside. The difference is easy to tell: push on the ejector rod. The core seating die has no internal spring. The ejector rod will slide the internal punch down and you'll see it at the mouth of the die. The point forming die has a small (0.080") spring-steel wire pin passing through the tip of the cavity. This pin is a press fit into a steel button "head". The head is machined to go into one end of a coil spring.

The spring presses between the top of the die and the head of the ejection pin. We call the internal punch an ejection pin. The heavy rod that pushes on it is called the ejection rod, you'll recall. If you order a new ejection rod, you'll get this quarter-inch diameter rod with the knurled head. If you order a new ejection pin, we'll want to know the diameter of wire, or at least what caliber of die it fits.

The reason for having a spring in this die is to hold the pin out of the main part of the die cavity during bullet swaging. The only purpose of the ejection pin is to push the bullet out of the die by its nose. If the pin were down in the cavity, the bullet would form up around the pin, and then it would be stuck in the bullet. This is exactly what happens if you forget to use lubricant. Now it's time to mention a very important part of swaging: the correct lube.

For lead bullets, you have seen that a wax solution called Dip Lube can be applied before swaging the core. For jacketed bullets, a different kind of lube, serving a totally different purpose, is required. Swage lube is made to stand up to extreme pressures without losing its protective film -- a barrier between the smoothly finished die wall and the moving jacket material. Ordinary case lubes are useless. Don't try them. Swage lube is a little more expensive, but it goes a long way and it works. Your dies will last virtually forever if you use the right lube and clean materials.

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You simply press the seated core in (using proper lube), and eject the final bullet out. The bullet goes in nose first, pressed in with an external punch that is as big as the bullet base. It comes out base first, pressed out by a tiny ejection pin that bears on the tip of the bullet. The reason you cannot form the complete bullet in one stroke in this die is that the pressure required to expand the jacket uniformly is not present in this kind of die. There are two exceptions. You can make a full metal jacket bullet in this die alone. And you can make a lead bullet.

The techniques for FMJ styles are discussed in other books. Lead bullets are simply a matter of shoving the lead into the die. It has to be smaller than the die cavity, naturally. Everything about swaging assumes you know better than to push a larger component into a smaller die cavity. The match between core seating die and point forming die is very good. For many years, bullet makers thought that it was necessary and desirable to have a slight pressure ring at the bottom of the bullet. This "pressure ring", as it was called, was promoted as increasing accuracy by many die-makers of the 1950's. It may not hurt accuracy at all, and it could help in some cases.

In reality, though, the story is a little different. Most die-makers of the past worked at home or in very small shops, and didn't have the money for really expensive, high-precision instruments to measure the bore sizes of the dies as they were being produced. As a result, a match of 0.002 to 0.0008 inches between core seat and point form die cavities was about all the die-makers could manage. Even today, that is typical of the best amateur work and is seen in some of the higher priced benchrest dies as well.

Because of this difference, the seated core and jacket always went into the point forming die considerably under final diameter. The pressure of swaging the point expanded the jacket slightly, but most of the expansion took place at the base. These bullets won a lot of matches, but they still had a bit of taper and a bulge at the base.

The die-makers, not knowing how to get rid of it, and noticing that even with this defect, the bullets still outshot most factory slugs, started hinting that maybe this was really a design feature put in by plan, instead of something they hadn't yet acquired the tools to eliminate.

Today, we still run into a number of precision shooters who read the old literature and come to believe that a "pressure ring" is necessary for good shooting. I don't think that having a 0.001-inch larger base is harmful to accuracy, but I don't think it necessarily does anything valuable. On the other hand, a bullet that is up to 0.001-inch larger than standard size, and straight, is probably going to be a good shooter and it won't expand the case neck as it is seated, then leave the case somewhat loose on the forward part of the bullet. With much taper on the bullet, the act of feeding the round can push the bullet back into the powder, and I know that won't help accuracy.

We can make bullets tapered, straight, or with a pressure ring. In the reloading press, we don't offer a choice. In general, it is one of those features that is best left to the die-maker, since specification of too many "nit-picking" details only runs up your cost for special charges on the die-maker's labor, and doesn't give you any more accurate bullet one way or the other. But, if you need something very special in this regard, it is one more thing that has been pinned down and can be offered to anyone who feels it is worth the extra expense.

The core seating die has made us some semi-wadcutters and seated some cores for rifle-style bullets (I say rifle style because they could just as well be .32 handgun bullets or .243 rifle bullets -- it is exactly the same process, same kind of die, and the only difference is the size of the hole and the size of the components going into it). We have used the point forming die to shape the rifle-style bullet by forming the ogive, and in two steps we have made nice open tip bullets.

What about lead tips and hollow points? The hollow point is made by seating the core with a hollow point punch, then forming the ogive. If the hollow point is also a lead tip, then the lead is longer than the jacket. Trying to eject this bullet may cause some deformation of the tip, since the ejection pin has to push on the tip with some force. The third die we mentioned (lead tip die) is made to finish off the tip so it looks as good as or better than factory bullets.

The lead tip die (designated LT-1-R for the reloading press) is much like the core seating die, except that it has a slightly larger bore size, and the internal punch has a cavity that matches the ogive in the point form die. The deformed lead tip fits up inside this cavity. Applying gentle pressure reshapes the lead tip, shears off any surplus lead, and leaves a fine looking lead tip that can be flat, sharp, or radiused. The lead tip die is a nice addition to any set, giving you the ability to reform the tips and even to close the open tip more tightly than you can do it in the point forming die alone.

The smallest tip opening is the same diameter as the ejection pin in the point form die. This ejection pin has to be strong enough to push the bullet out of your die, or you will be constantly replacing the ejection pins and having stuck bullets. So, a diameter of about 0.080-inch is used in reloading press sets. This is a good compromise between design strenght and appearance. You can close the tip even further by using the lead tip die carefully. This takes a little practice to avoid pressing a little shoulder in the ogive, but once you figure it out, it is easily repeated.

How do you know how hard to push on the handle? Just push a little bit, very lightly. See if the jacket and core remain in the core seating die, or if they come back with the punch. Normally, the correct pressure just expands the jacket enough so that it stays up in the die. In point forming, use just enough pressure to form the bullet until you start to get a parallel pipe of jacket or lead on the tip (pushing the bullet material up into the ejection pin hole). That is as far as you can expect to go. Back off slightly on the die adjustment by raising it higher a half turn or so in the press, and you can then use the full ram stroke to set your insertion depth each time.

One key to uniform swaging in the reloading press is to use the top of the stroke, so that each time you move the press handle, you are using the physical limit of the press to control how far the punch inserts into the die. This controls amount of hollow cavity, the degree to which you reshape a bullet, the amount of tip closure on your ogive, and whether or not you are going to get a good lead tip. Everything depends on uniform stroke, uniform insertion of the punch. And that is most easily set by raising the die, so that the ram goes as far up as it can. Then lower the die, to obtain the desired shape or insertion.

The right pressure should be about like sizing a case. The larger the caliber, the more pressure you will feel on the handle. In no case is it necessary to throw your weight on the handle, or break your loading bench, or use a cheater bar. Doing these things will quickly make the die-makers more wealthy, because you will soon break your die and mash your punches into pancakes, requiring that you replace them. If you feel generous toward die-makers this week, by all means jump up and down on the press handle a few times. Otherwise, a mild one-hand force is quite enough.

Another point in regard to destruction of parts: always try a punch by hand first. If it won't fit, wipe it off several times with a clean cloth, oil it lightly, and try again. If it still won't fit, make sure that you have the right punch! Punches must fit closely but with relative ease into the dies. Keith nose punches, and others with deep cavities, expand slightly and may not fit easily by hand after they have been used. But they do fit, given a little oil and a little gentle pressure. I have seen .242-inch diameter rifle punches (for the 6mm point forming die) pushed into a .2238-inch diameter hole in the

.22 core seating die. "I thought it went in a little hard," the bullet-maker said. Yes, I guess it might. Comes out a little hard, too. Try it by hand first.

The slot in the reloading press ram collects primer residue and metal shavings. Take a cotton swab or a wood pick and scrape it out before installing your bullet swage punch. The material stuck in the slot can tip the punch, causing it to ram into the die at an angle and tear a nasty gouge all down the side of the punch. Again, be gentle when you first start out. Don't use speed or force on the first stroke, but instead, gently guide things together and notice how they fit. Then go after it, once you know everything is lined up.

Making .22 caliber bullets out of rimfire cases is one of the most popular swaging activities today for a reloading press bullet-maker. It has been so for twenty years. The process takes three steps. Draw the jackets, seat the cores, and form the points. Lead tip bullets add a further step of forming the tips. Detailed instructions come with the die sets, and further information is found in the various technical bulletins and text books we publish.

The photos in this book will give you a good idea of how the process works. The most questions are about annealing and cleaning .22 cases. First, annealing is usually done after boiling in hot soapy water and vinegar (to clean and shine the brass). Annealing is only so that the ogive will form without any folding. If you make a big lead tip, you probably can avoid annealing. There are several ways to go about it. Putting a group of clean cases in a tuna can, inside a lead pot, and letting them turn dark brown (15 minutes, usually) will do it. Using a toaster oven on high, or putting a pan of cases in a self-cleaning oven for the duration of the self-clean cycle is also good. Using a propane torch or electric heat gun (Corbin FHG-1) is also good, primarily for smaller lots.

The older books suggested 600 to 650 degrees F. I have found that modern cases take 800 to 900 degrees F., and that a standard electric oven doesn't usually get hot enough. We do make excellent quality heat treatment furnaces, but for the hobbyist they are too expensive. The time and quench after heating are not critical. Quenching has no effect on the hardness. It merely helps to knock of any scale that might have formed. If you use the right temperature, you won't get any scale, and you can forget about any quench. Just let the cases air cool. Use swage lube on the punch when you draw the jackets. Just slip them over the long, 0.2-inch diameter punch and push them into the die, following instructions provided with the tool.

Rimfire cases are good to about 3,000 or 3,200 fps before they start to come apart. Actual speed depends on rifling depth and sharpness. They force you to load a .22-250 down to .222 Mag velocity, but on the other hand, they also make you save powder, barrel, and cost nothing for material. When they hit, you'd swear they were going over 4,000 fps compared to a factory bullet performance. And there is no problem with barrel fouling or wear: if anything, the thinner jackets are easier on your gun than a standard bullet. Try it! You will be surprised at the accuracy.