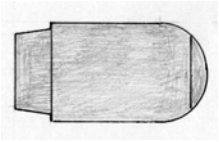
- ***Chapter Three: Lead Bullets***

The easiest, least demanding, and lowest cost bullet to make both, in terms of the cost per bullet and tooling costs, is the all lead bullet. Lead bullets can be made of pure lead or an alloy. They can be short, fat bullets or they can be long and pointy. Lead bullets can be of the semi-wadcutter style (SWC) that has a small step where the bearing of the bullet and the nose of the bullet meet or they can be the smooth ogive style that doesn't have a step.

The ogive or nose of the bullet can be just about anything imaginable but some styles tend to work better than others. It is possible to make an all lead bullet with a long spitzer ogive but it has been well demonstrated that a lead bullet of this type generally will not shoot well. The problem is that the lead bullet needs a long bearing to keep it stable in the barrel and to engage the rifling well. If a long spitzer ogive is used the bearing may not be long enough to support the bullet in the barrel. One cure for this problem is to make the bullet heavier which will increase the length of the bearing but there are limits to this which are quickly reached.

In order to keep the weight of the bullet within reason and keep the bearing long enough, a shorter ogive is needed. This is why most lead bullets will have a round nose, round nose flat point, or a blunt spitzer ogive. Lead handgun bullets will usually use the same nose shapes as jacketed pistol bullets.

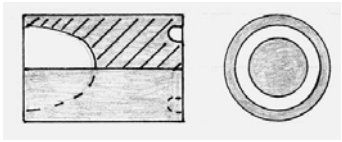
The base of the bullet can be anything from a flat base to a rebated boattail but the most common styles are the flat base, cup base, and the hollow base. Other base styles less often used are the dish base, the heel base, and the rebated boattail. Bevel base bullets are possible as well but making them requires an extra die.



The rebated boattail isn't especially successful with a lead bullet unless a fairly hard alloy is used. Even then there may be problems with set-back and deformation of the boattail on firing. A very short rebated boattail can be of use when the bullet is used in a muzzloader sabot. Most sabots have a small radius at the bottom of the cup and the short boattail will raise the bullet up enough in the sabot to clear the radius.

The rebated boattail (RBT) is made by using a punch that has the RBT shape machined into it. This punch may be the internal punch in the case of a SWC die or it would be the external punch if a point forming die is used to make a smooth ogive bullet.

If a hardened lead alloy is used it might be necessary to form the RBT is a special rebated boattail die.



Hollow base bullets are of use with very light powder charges and are used to insure that the bullet will fill the barrel to properly seal the bore and take the rifling well. One example of the hollow base bullet is the hollow base target wadcutter.

It is commonly thought that the hollow base makes for a more accurate bullet by making the bullet nose heavy like a badminton birdie or shuttlecock. In fact the hollow base design is one of the worst for accuracy except when the range is close and light powder charges are used.

Early pistol ammunition was made the same as today's .22 Long Rifle cartridges. The bullet was outside lubricated and had a heel base that fit inside of the cartridge case. The bullet collected dirt and grit so it wasn't a terrific arrangement. Some bright person decided to put the bullet inside of the case so that the lube would be protected and the bullets would remain clean. When new cartridges were introduced the barrel dimensions were reduced to match the smaller diameter of the "inside lubricated" bullets. Unfortunately the ammo for older guns was also changed to the new, smaller inside lubed bullet.

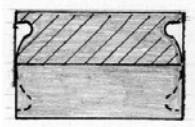
The undersized bullets sort of rattled down the old barrels and accuracy was unacceptable. The cure for this problem was the old hollow base. If it worked for the Minie Ball why not for revolver ammo? And it did work. The undersized bullets with a hollow base shot pretty well in the old guns.

Shooters liked the improved accuracy hollow base bullets gave to the old cartridges and modern Bullseye target shooters use hollow base bullets, therefore the hollow base bullet is an accurate bullet. It's good sounding reasoning but the reason the hollow base bullets shoot well is because the hollow cavity allows the bullet to expand in the barrel so that it seals the bore as well as engaging the rifling better. But this accuracy is only at close range because the unbalanced bullets will begin to tumble at longer ranges. If medium to heavy powder charges are used the hollow base bullet will often be blown apart by the muzzle blast.

One serious danger with hollow base bullets is that the bullet can damage the forcing cone in a revolver if a heavy powder charge is used. The bullet's base will expand as it leaves the cylinder, will have to be resized by the forcing cone in the rear of the barrel, and the result can be a split barrel.

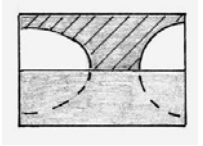
Hollow base bullets do have their place but usually only at short range and with light powder charges. An interesting short range defense bullet can be made by turning the hollow base around so that the cavity becomes a huge hollow point. The bullet used in this manner makes a very effective load for a belly gun.

The hollow base bullet is made by using a lead bullet die and punches. The die and internal punch are placed in the press ram. The internal punch usually forms the hollow cavity. The external punch forms the nose of the bullet. Each press stroke makes a bullet that is ready to use. Excess lead is bled off through a hole in the side of the die to control the bullet weight.

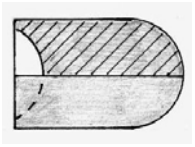


For use in progressive loading machines the hollow base is not used and the internal punch is the same as the external punch. This way a double ended wadcutter is produced so that it doesn't matter which end of the bullet goes into the cartridge case.

An interesting variation of the hollow base bullet is the Webley Man Stopper. This bullet has a normal hollow base and has a flat face with a shallow cup in it. It would be an effective close range bullet and was loaded in the .455 Webley . The bullet is easily made by using an internal and external hollow base punch with a lead bullet die.



The cup base is often used when making paper patched rifle bullets as the shallow cup provides a place to tuck the tail of the paper patch into. Without the cup the patch tail might be driven into the base of the bullet, distorting the base and harming accuracy. Many shooters use a flat base and either form the patch without a tail or cut the tail off of the patch.

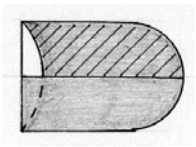


A cup base is sometimes used with pistol bullets or shotgun slugs to move the weight of the bullet forward a little. This can easily be overdone so that the bullet is unstable in flight but it can be helpful sometimes.

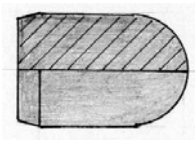
When making shotgun slugs the cup base or a hollow base is used to lengthen the slug to gain stability in the barrel without increasing the weight of the slug. Because of their large diameter and low weight most shotgun slugs are very short and anything that can be done to stretch them out will help improve accuracy.

The cavity in the base of the bullet is spherical but does not extend all of the way to the edge of the bullet. The cup base is usually about 3/32" of an inch deep although it can be deeper as the bullet diameter exceeds one-half of an inch. Usually there will be a flat rim between .050" to .075" around the base of the bullet.

The dish base is not a particularly useful design but it is used at times. Like the cup base it is spherical but the cavity extends to the edge of the bullet. It is easy to damage the base of this type of bullet and since it has no advantage compared to a dish base there is little reason to use it.

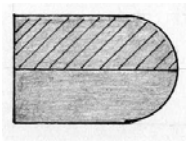


A bevel base bullet is sometimes used when loading quantities of ammunition with a progressive loading machine. The bevel helps to start the bullet into the cartridge case and reduces the chance of "shaving" the bullet. It is a useful design when loading a lot of ammo in a hurry.

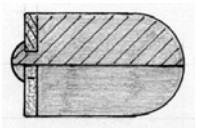


It has been suggested that the bevel base can increase gas cutting and leading. This is unproven to my knowledge but it is possible. The bevel base cannot be formed by simply using a punch that has a cavity in it. The punch will leave a ring or ridge around the base of the bullet, defeating the purpose of the bevel. If the punch is brought to a feather thin edge to reduce the step on the base of the bullet it isn't likely that the punch will last very long. So the only good way to make the bullet is to use a special base forming die similar to a point form die. This makes the bevel base bullet more expensive to make because of the extra die.

The flat base is the workhorse of the bullet world. It undoubtedly is the most used and most common base style. It offers the benefits of good obturation in the barrel, it's easy to make, it is less subject to damage in handling the bullet, and accuracy is usually good with most loads. It isn't high tech or very exciting but it usually gets the job done.



Variations on the flat base include the Base Protector and the gas check. Gas checks can be swaged onto lead bullets without any special tooling. The Base Protector is a copper disk with a small hole in the center of it. When the bullet is swaged the lead will flow through the hole in the disk and a rivet head is formed on the other side to secure the disk to the bullet. A special punch is needed to use the Base Protector. Both the gas check and the Base Protector will reduce leading by reducing gas cutting and improve accuracy by preventing damage to the base by the powder granules. Neither are a cure all for leading problems but improvement can be reasonably expected.



Zinc base bullets are just another variation on the flat base bullet but over the years there has been some interest in them. Usually they are promoted by someone who just happens to be selling the zinc washers or they are rediscovered by a new shooter who has been reading old firearms books. The zinc washer is swaged onto the base of the bullet in a similar manner to the Base Protector.

The Zinc base bullet was developed by Jim Harvey who made and sold Prot-X-Bore bullets. He also sold the Harvey Jugular bullet for handguns. Harvey was an outdoorsman, experimenter, and a well known and well liked "gun nut". He made some pretty big claims for the zinc base bullets, claims that didn't pan out when tested in independent studies.

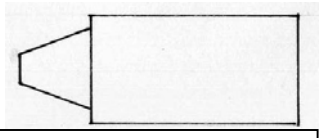
Possibly some of the problem is that the zinc washers that I've seen and used were considerably undersized for the caliber used and were not exactly round. This tended to keep the washers from performing their assigned task of reducing or preventing leading. There were claims made that the zinc wash in the barrel would prevent leading but this was never proven.

Hollow point bullets are one of those things that capture the imagination of shooters and non-shooters alike. Non-shooters often claim that hollow points are brutal, unnecessarily harmful, and should be banned. Shooters claim that hollow points contributed to clean kills on game and provide an edge should they ever be used in defense.

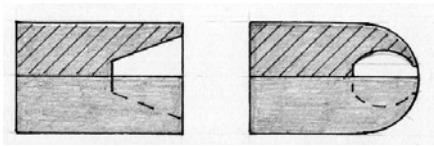
The reality is that hollow point bullets do help the bullet to expand faster, more completely, and more fully-if everything works the way it is intended to. But more often the hollow point cavity simply fills up with foreign matter such as wall board, cloth from clothing, or fur from an animal. Then the hollow point fails to do anything other than act just like a normal solid nose bullet.

The best hollow point bullet combine a wide meplat with the hollow cavity. When the bullet fails to expand the large flat nose of the bullet still gives a large permanent wound channel and the bullet is effective because of that.

Hollow points can be formed in two ways. One way is to form a sizeable cavity in the lead core. The bullet is then swaged again in the lead bullet die to make a SWC with a hollow cavity or the bullet can be pointed up in a point form die. The opening in the tip of the bullet will close up considerably as the bullet is swaged the second time but the cavity in the bullet will remain. If the bullet is sectioned the cavity will be seen as being pear shaped. The pear shaped cavity weakens the nose of the bullet so that even if the tip opening is small the bullet will collapse on impact and mushroom.

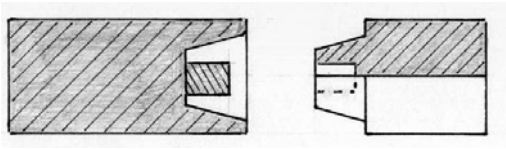


Hollow point external punch



Cavity in lead core & finished bullet.

The second way to make the hollow point is to put the hollow point pin in the nose forming punch. This results in a straight cavity with a wider tip opening than the first method. Generally the depth of the cavity can't be quite as much as with the first method because the hollow point pin can't be as large in diameter and a pin that is too long will buckle and cause the bullet to stick on the pin. The cavity can't be as large in diameter as with the first method because the pin has to fit inside the nose forming punch. But the second method is a faster way to make the bullets and that may be of more importance at times.



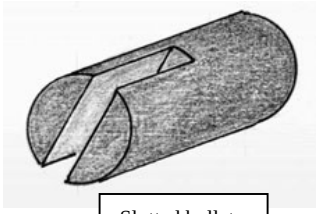
Combined nose and hollow point punch. Finished bullet

The shape of the hollow point is usually round but it can be made square, hexagon, star shaped, or just about anything else. Since the cavity is formed by a punch the punch can be machined to produce about any cavity shape wanted.

One odd combination is the hollow point that has a post in the center of the hollow cavity. This design has been around for many years and was sold under the name, Scorpion. The Scorpion bullet was in production by small bullet makers, off and on, long before Federal came out with their HydraShock. The Scorpion works best if a harder lead alloy is used but pure lead can be used. To make the Scorpion a hollow point punch is used that has a hole in the center of the punch. The hole forms the post in the hollow cavity. If a point form die is used with this hollow point design it usually works best to have the die made with an extra large ejection pin. This way the pin will push on the outside of the bullet to eject it from the die and not on the post in the cavity.

Fragmenting bullets are interesting designs and are not especially difficult to make. Fragmenting bullets are most often used for defensive purposes but they can be useful to reduce ricochets on target ranges as well.

One curious defense bullet is the "screwdriver slot" bullet. The front end of the bullet is flat, there is no ogive or nose to the bullet, and there is a deep slot from one side of the bullet to the other. The width of the slot varies according to the caliber but a 44 bullet would typically have a slot that is 1/8" wide and perhaps 3/8" to ½" deep. The purpose of the slot is to cause the bullet to spread apart on impact due to the twisting of the bullet on the target.



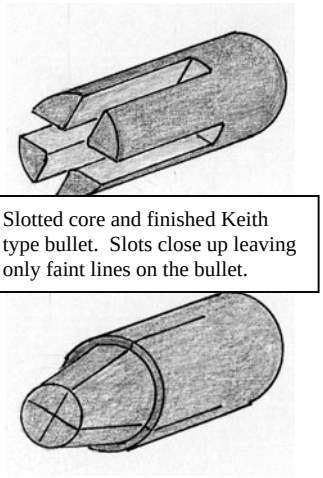
Slotted bullet

All that is needed to make the bullet is an external punch that has a blade like end, much like a screwdriver. The blade of the punch needs to have a little taper and be well polished to keep it from sticking in the bullet. The punch could be used with either a lead bullet die or a core seating die.

Variations on this idea are the Y and the plus sign slots. The Y has three slots meeting in the center of the bullet and the plus sign has four slots that meet in the center. Like the screwdriver slot bullet these bullets are easily formed using a special punch that has three or four blades. The bullets can be used as is but, more often, they are reformed using a nose punch.

The lead core is first swaged in a lead bullet or a core seat die using the blade punch. Then the bullets are dusted with fine graphite or moly powder making sure the slots are evenly and lightly coated with the powder. A nose forming punch of some type replaces the blade punch and the bullet is swaged once more. The slots in the bullet are closed up so tightly that only a close examination of the bullet will reveal their presence.

On impact the slots, if deep enough, will cause the bullet to break into four pieces or if the slots are shallow will cause the bullet to mushroom quickly.



Slotted core and finished Keith type bullet. Slots close up leaving only faint lines on the bullet.

Swaged Shot bullets are an odd and sometimes frustrating thing to make. The swaged shot bullet is swaged from small diameter lead shot or lead powder. If powder is used it is better to use a coarse grind about the size of table salt. Extremely fine lead powder is very difficult to work with and tends to get all over everything. It's a real mess.

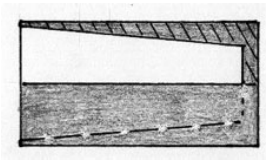
The shot is first cleaned well and degreased with acetone or similar solvent that won't leave any oil or residue on the shot. If it can be found use shot that isn't graphite coated. A quantity of shot is weighed and placed into the die. It's better to use a core seat type of die for this but a lead bullet die can be used. The shot is swaged as if it were solid lead but, because most shot contains antimony, more pressure is usually needed to compact the shot and produce a uniform bullet. Since the core seat die doesn't have a bleed hole it is easier to apply the necessary pressure to the bullet.

The bullets made in this manner will look almost like a solid lead bullet but a close examination will reveal the individual shot pellets. If the preparation has been done well and the shot is swaged with enough force the bullets will tolerate normal handling and loading. Shorter nose shapes and shapes that have rounded corners are better than long ogives and sharp corners. When the bullet is fired it will break into many pieces preventing ricochets and "shoot through" problems. But the swaged shot bullet is fragile making other designs more practical.

Shot filled bullets are another way to make frangible bullets. The bullet can be made in a couple of ways. One method is to make a lead shell, fill it with shot and then swage a nose on the shell using a lead bullet die and a suitable nose forming punch. This make a semi-wadcutter type of bullet such as a Keith style, conical, round nose, or any other that has a step where the bullet's bearing and nose meet.

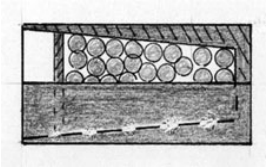
The other way is to make the lead shell, fill it with shot, and then finish the bullet in a point forming die. The bullet made using the point forming die is generally better for use in autoloading guns because it does not have the step where the ogive and bearing meet thus making feeding more reliable.

The first step to making either bullet is to make a lead shell. This is done by swaging a pure lead or lightly alloyed lead core in a core swage die. This produces a uniform slug of the correct weight. The lead slug is then swaged in a core seat die using a hollow cavity punch with a large tip. The slug is made into a shell with the desired length and wall thickness. The shell is then filled with small lead shot. Number 7 ½ or smaller will work best. The lead shot can be lightly seated in the shell but it usually isn't.



Swaged lead shell.

Then an external punch that has the desired nose cavity is used with the core seat die to finish the bullet. If the bullet is made with a small tip opening the shot will stay in the bullet but if the tip opening is large there may be some problems with some of the shot coming loose and falling out of the bullet. The easy way to deal with this is to put a drop of hot melt glue in the tip of the bullet or a little silicone sealant can be used to hold the shot in place.

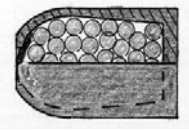


Shot filled shell with disc to hold shot in.

The second type of bullet is made in the same way as the first except a point forming die will be used to finish the bullet. The first steps in making the bullet are the same as for the SWC type bullet. But there is a little trouble when it comes to finishing the bullet. Gravity rears its head and causes problems. When a point form die is used the bullet is turned upside down so that what will become the point of the bullet is down, facing the die. Since there is nothing to hold the shot in the lead shell the shot will simply spill out and make a mess.

There are several ways to deal with this problem. The easiest is to simply mount the swaging press upside down. The press handle will have to be removed and mounted on the opposite side of the press toggle but, other than looking odd, it works quite well. The shot filled lead shell will now be facing up as it goes into the die so the shot will stay in place.

Another way is to make a disk out of thin lead, thin cardboard, or even copper sheet. The disk needs to be a snug fit to the inside of the lead shell. The disk is pressed snugly down on top of the shot and the bullets are ready to be pointed up.



Finished bullet. Disc closes tip opening and holds shot in.

A mix of beeswax and Naphtha can be prepared and the shot can be mixed in with the beeswax paste. The mix is then placed into the lead shell and left to harden in place as the naphtha evaporates. This usually takes a day, so by the next morning the lead shells are ready to be finished. Even with the beeswax binder the shot will break up and scatter on impact.

Hydraulic bullets are another odd design that may or may not live up to claims made for it. This bullet is made by first forming a large, deep cavity in the core. The bullet is partially pointed up using a nose forming punch in the lead bullet die or it can be partly formed in a point form die. If it is swaged in the point form die a special extra long ejection pin will likely be needed to be able to eject the bullet. The

ejection pin will push on the bottom of the cavity in the bullet and the pin may not have enough length to fully eject the bullet from the die.

When the bullet is partly formed the cavity in the bullet is filled most of the way with grease or a thick oil. A lead shot, steel bearing ball, or plastic ball is placed in the cavity to seal the cavity and the bullet is swaged once more to secure the sealing ball.

Another way to seal the oil filled cavity is to cut out a disk from thin stained glass copper foil. The foil usually comes with an adhesive back. The tip of the bullet is degreased and the foil is placed on the bullet. The foil sticks to the bullet and seals the oil in the cavity.

On impact the oil or grease in the cavity is supposed to be compressed forcing the bullet to expand. Whether this actually works is questionable but making these bullets is more fun than pulling weeds in the garden.

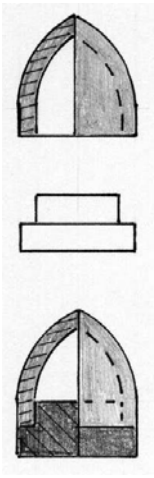
Special lead bullets

In addition to the ho-hum bullets described earlier here are some special purpose bullets that can be made with a little inventiveness and a bit of custom tooling.

When white hunters and adventurers began to explore Darkest Africa they quickly encountered game that would fight back. In many cases the animals hunted turned the tables and the hunters became the hunted. More powerful guns were needed as well as special bullets. In the old days of blackpowder the only way to increase stopping power was to use larger cartridges and bigger, heavier bullets. Even today an eight bore rifle shooting a massive lead slug is serious medicine for big game.

Most rifled double guns shot a solid cast or swaged projectile but this often didn't kill quickly enough when a lion or tiger was encountered face to face. Even though the hunter delivered a well placed shot from a heavy rifle the large cat would often maul the shooter before dying. There are a number of accounts of hunters being killed in this way.

The exploding shell or projectile was developed to better deal with this unpleasant problem. Exploding bullets were nothing new. In the American Civil War both sides used these bullets against each others troops. However the exploding African shell was somewhat different from the exploding musket ball.



Exploding shell. Nose piece, base piece, and assembled shell

The exploding shell used in big bore double rifles usually was made in two pieces. The two pieces were cast and then swaged together. The nose piece was made with a hollow cavity that could be filled with explosive powder. The base piece was made with two diameters. The larger was sized to fit the groove diameter of the rifle while the smaller diameter fit snugly into the cavity in the nose piece. The cavity was filled with powder and the two pieces were put together. The final step was to push the assembled shell through a sizer swage that both sized the projectile and locked the pieces together. Once assembled it was nearly impossible to tell the explosive shell from a solid projectile.

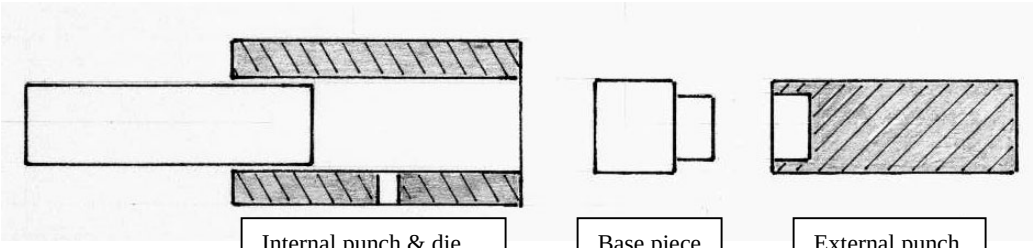
The explosive compound was made up of two chemicals that were mixed together to make Forysthe's priming compound. Kept separate, the chemicals were safe to carry but once mixed they were capable of being detonated on impact. Interestingly there are no accounts of these shells giving any trouble when carried in the field or on being fired. Most accounts of these shells were very favorable. Hunters often used them on thin skinned but dangerous game and considered them to be reliable life insurance. The priming compound

would detonate on impact but the exploding shell would be carried into the animal where it would cause massive damage.

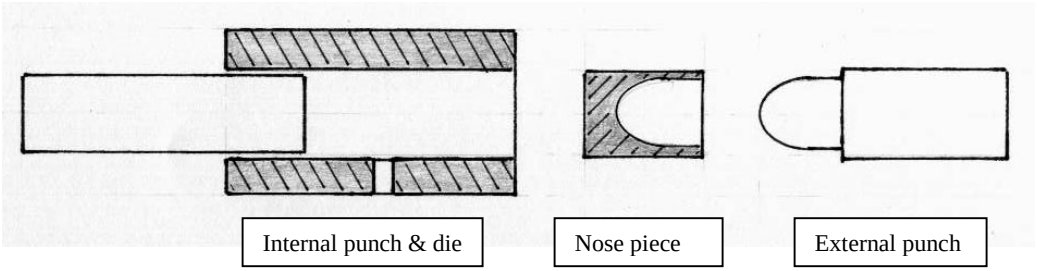
Today it sounds a bit unsportsmanlike but perhaps it was better than being on the losing end of a fight with a tiger.

Explosive bullets are not legal today and there is little need for them, but such bullets are not hard to make. The cavity can be filled with talcum powder to give a satisfying puff on impact or secret messages can be sent in them. You'll have to furnish your own decoder ring.

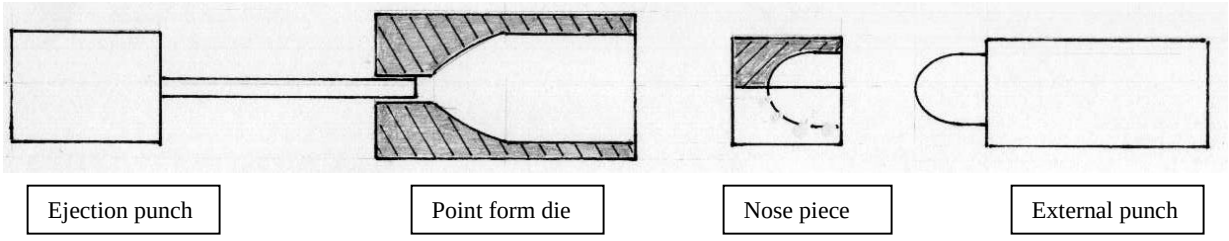
The shell is easily made in the Walnut Hill press or one of the hydraulic presses. The first step is to cut or cast lead cores for the base and nose pieces. Once that's done the base piece is formed in a core forming (core swage) die. The external punch will have a cavity that forms the smaller diameter step on the base while the internal punch can be either a flat base or a cup base. Either base type will work well.



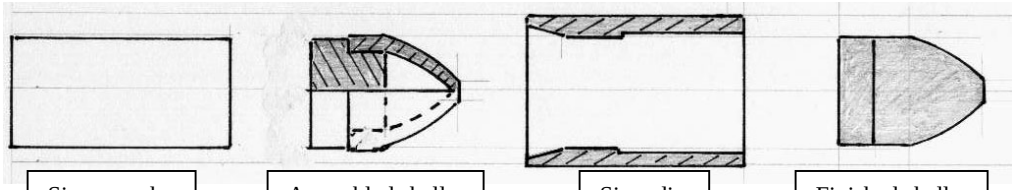
Once the base pieces are made they are set aside and a preform for the nose piece is made. The core forming die is again used to make the preform, however, the external punch with the cavity in it is replaced with a hollow cavity forming punch. The preform is now a flat ended cylinder with a hollow cavity.



This is now placed into a point forming die and the preform is given a bullet shape. Both the base piece and the nose piece are cleaned with acetone and dried. The nose piece is filled with talcum powder leaving room for the base piece to be pressed in.



Once the two pieces are assembled they are pushed through a sizer die that corrects the diameter of the shell and locks the two pieces together. This step is needed because the nose piece is made slightly oversize and tapered toward the bottom end. This insures that the two pieces will be firmly swaged together when they are pushed through the sizer die.

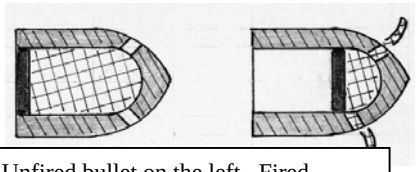


There are some practical limits as to how small a bullet can be made in this way. In theory just about any bullet could be so made. But in practice there is little point to making, say a .224 bullet, like this. Practical sizes start at .40 caliber and go up. Most of the old African guns that employed this shell were double rifles in twelve to four bore.

The exploding shell is an interesting old design that has little value today but it's definitely something not everyone will have.

There is one place where this type of bullet without the explosive has some merit. That is in rifled shotguns. The African shell makes a very good shotgun slug when paper patched or used as a full diameter slug. The shell provides an aerodynamic projectile yet keeps the slug weight within the normal weight range for shotgun slugs. It would not be too different from the windscreens attached to large artillery shells.

The inside lubricating bullet or self-lubricating bullet is another interesting bullet that was once popular with handgun target shooters. The use of the word, lubricating, is correct. This special bullet was not inside lubricated, that is, it did not have grooves filled with lubricant that were covered by the cartridge case. It had a soft lubricant that filled a tube pressed into the inside of the bullet. On being fired a plug in the back of the tube was forced into the tube and applied pressure to the lube. The lube was forced through small holes just forward of the bearing of the bullet and onto the outside of the bullet and the barrel. In this way lube was placed in front of the bullet as it traveled down the barrel.



Unfired bullet on the left. Fired bullet on the right with lube extruded through holes in the bullet's ogive.

D.B. Wesson's patent of 1893 described a bullet that had a brass tube insert that was filled with lubricant and a lead plug was used as a plunger in the tube. Some versions of the bullet had a steel tube instead of the brass one.

Probably the most popular cartridge that was loaded with this unique bullet was the little .38 S&W cartridge. This is not the .38 Special but is a little short cartridge that was quite popular for defense and especially popular for target work. The .38 S&W was known for being very accurate and recoil was quite mild. Other cartridges that were made using this bullet design included the .32 S&W, .32 S.&W. Long, .38 Special, .44 Russian, and the .38-44. An experimental .41 S&W cartridge was also loaded with this bullet.

Chambered in a high quality top break revolver this round made an ideal target cartridge and even today would be able to hold its own in traditional bulls eye competition. If you've never owned a good top break revolver you don't know what you've missed. Most of us have owned or shot a cheaply made top break that were often chambered in .32 New Police or the .38 S&W but these are like comparing an East German Wartburg to a Rolls Silver Shadow. It's really too bad the high quality top break guns are gone. They won't hold up to the pressure of a .454 Casull and they don't shoot eighty-seven rounds without reloading but they were smooth operating, finely tuned, elegant firearms made for a time when men

showed up for a shoot wearing polished shoes, vest, and tie and the women wore their best dress. Perhaps America could still benefit from a good top break revolver and polished shoes.

This type of bullet isn't too difficult to make but does require a little extra in the way of tools. A small drill press is needed although it might be possible to use a hand drill if extra care is taken.

The first step, as usual, is to cut or cast some lead cores. The cores are then swaged in the core swage die to get the weight correct and squish out defects such as wrinkles. The cores should be lightly lubricated with Bullet Maker's Lube. The internal core swage punch will form the hollow cavity in what will become the base of the bullet. The other end of the core will be flat faced.

One limitation to this bullet is that the bullet design dictates the weight of the bullet. However, different weights can be made by using different length hollow base forming punches.

Once the cores have been made, a point form die with the proper cavity shape is placed in the press ram. A hollow base punch that matches the hollow base internal core swage punch is placed in the punch holder. The punch holder is adjusted up or down and the lead cores are turned into bullets. But these bullets have a very deep hollow cavity.

Next the drill press and special fixture will be used to put three holes in the bullet for the lube to extrude through. The drill fixture holds the bullet at the correct angle under the drill spindle so that the holes will be just forward of the beginning of the bullet's ogive and will angle back to the front of the cavity in the bullet. The drill fixture also provides an index feature that allows the holes to be evenly spaced. Generally a slow twist, polished drill bit is best but a parabolic drill bit also works well. When all of the bullets have been drilled it is time to fill the cavity with lube.

Most bullet lubes will be too hard to use in this bullet. A hard lube can be melted and softened by adding petroleum jelly, Vaseline, or a soft lube can be purchased. The lube will need to be about as soft as toothpaste in order for it to flow through the holes in the bullet. Once the lube seems correct it is melted and poured into the cavity in the bullet. A wood or aluminum block with a number of holes drilled in it can be used to hold the bullets base up. A small cartridge case or bullet jacket soldered to a wire makes a good dipper for filling the cavity in the bullet.

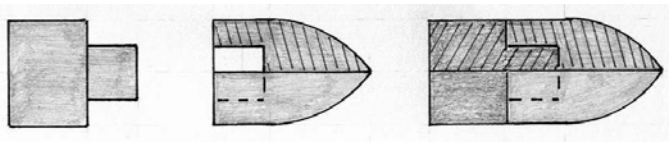
The cavity is filled almost all of the way leaving a little space for a sealing disk.

The sealing disk can be a gas check if one of the proper diameter is available, a copper disk, or a card wad. The card wad is the least costly and works well. The wads can be cut from vegetable fiber gasket stock using a sharpened cartridge case or a piece of sharpened steel or brass tubing. The fastest way is to use a card cutting die in the swaging press.

Once the cards are cut they are lightly pressed into the cavity in the bullet. A short piece of dowel turned or sanded to a diameter just smaller than the cavity is useful for pressing the cards into the bullet. Once the wads are pressed in the bullets are ready to be loaded. No special loading technique is needed but there is a small possibility that the soften lube could seep through the card wad and affect the powder charge. Probably the ammo should be used within a week or so of being loaded. On firing the card wad is pushed into the lube filled cavity in the bullet, lube is extruded through the holes in the bullet, and deposited in the barrel in front of the bullet where the lube can do the most good.

Remember that this bullet, as with all hollow base bullets, should only be used with light to medium pressure loads. There is always the possibility of splitting the barrel if high pressure loads are used with a hollow base bullet in a revolver.

The two piece bullet was used for muzzleloaders and cartridge guns for many years and is still a useful enough design to make it worth the trouble of making them. It can be of use even in pistol ammo where a hard base section is desired to reduce leading while the soft nose part aids with expansion.



Base piece Nose piece Assembled bullet

The idea is simple enough, part of the bullet is made from soft lead and part is made from harder lead. The two pieces are assembled and swaged together.

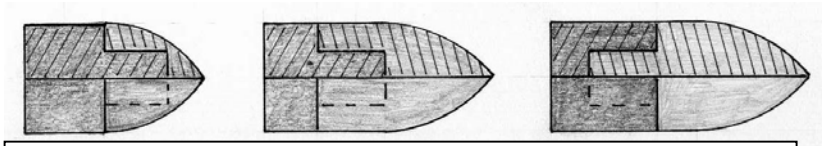
For the big game hunter the two piece bullet has some very real advantages over the one piece slug. Here it is assumed that either in a muzzleloader or in a cartridge gun the velocities are going to be pushed to higher levels than might normally be used for target work. Because of this, slugging of the bullet and stripping the rifling can be real problems. With the two piece bullet the base section of the bullet can be made of a hard lead alloy to better withstand the heavy charges often used, while the front section of the bullet can be made from pure lead to insure expansion on game.

This very idea is used in some metal jacketed hunting bullets today where a hard lead core is used in the lower part of the jacketed bullet to insure penetration and a soft lead core is used to improve expansion. We can do the metal jacketed bullet one better and use a paper patch on the two piece slug.

For target work and some muzzleloaders, the idea is reversed. The base is made of pure lead while the forward section is hard lead. With the muzzleloader the hard lead nose is not distorted by the ram rod when the bullet is seated in the barrel and the soft lead base expands reliably to fill the grooves in the barrel.

In cartridge guns having the base soft and the nose hard works well at moderate pressures and velocities and the hard nose withstands handling better than a soft bullet.

Making the two piece bullet is not especially difficult but it does require a little more time because there are more steps required than for a one piece bullet. The first step is to decide whether the tang should be on the nose piece or on the base piece of the bullet. If the bullet will have a very short nose section and perhaps a hollow point, the tang should be on the nose piece and the socket in the base.



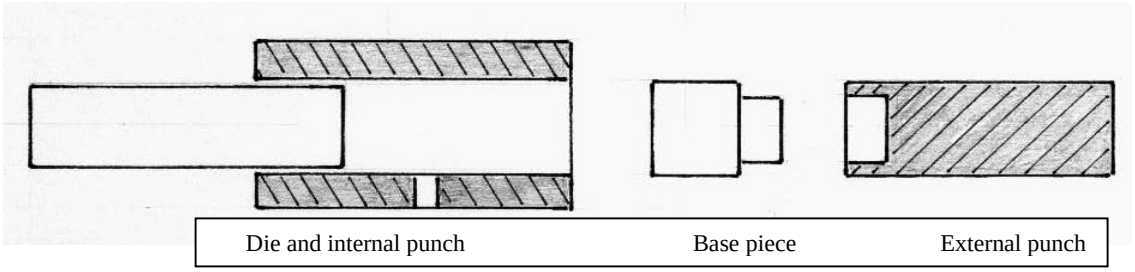
Socket in nose piece with short ogive. Socket in nose piece with long ogive. Socket in base piece.

Beyond that it doesn't seem to really matter too much which piece the socket and tang are on, although it is a topic of much discussion and strong opinions. There may be some advantage in having the socket in the softer piece.

The first step is to make up some cores for both the front and back sections. Once the cores are swaged to weight they are then ready to be formed into the base and nose sections. This will require the use of a core seating die and several punches. The core seating die is a little larger than the core swage die so that the cores can be easily placed into the die without damaging them.

For this discussion it will be assumed that the base part will be made from harder lead and will have a tang on it. This is easily changed by how the die and punches are used. This bullet will be a flat base but a cup base is as easily formed.

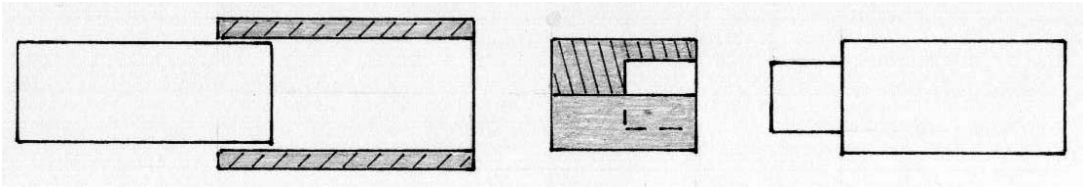
To make the base section the core seat die is placed in the press ram along with a flat faced internal punch. The external punch will have a cavity in it that has a slight taper and will form the tang on the base piece. A core of the correct weight is placed into the die and the press ram is raised to swage the part. As always the punch holder must be adjusted up or down so that the part is completely formed with the least effort. Try to do as much of the swaging work at the end of the press stroke where the press has the most leverage. A little lube is needed on the part, but avoid excess lube as it can build up in the cavity in the external punch and keep the tang from forming completely. Sometimes it may be necessary to use a cotton swab to clean the cavity in the punch.



Die and internal punch | Base piece | External punch

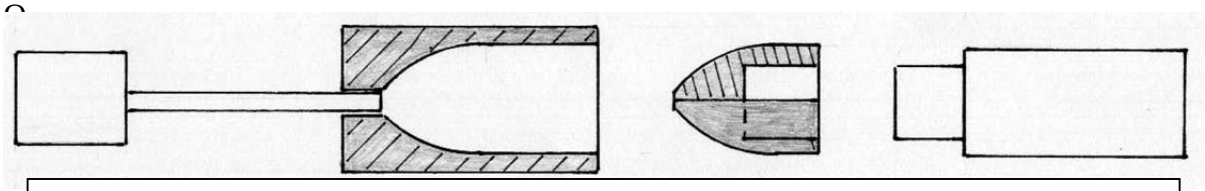
When all of the base pieces are made, they are set aside and the nose pieces are made. The bullet can be a semi-wadcutter type or a smooth ogive type. For handgun or plinker loads the SWC type of bullet works well. But for serious hunting and target bullets the smooth ogive bullet is better. The smooth ogive type of bullet is shown here.

The core seat die is used once more along with the flat faced internal punch. The external punch is exchanged for an external punch that has a tang on it. This punch will form the socket in the nose piece of the bullet. The cores are lightly lubricated and swaged. The nose pieces are ready to be formed into a smooth ogive bullet.



Die and internal punch | Nose piece | External punch

The core seat die is removed from the press and a point form die is placed in the press ram. The point form die is slightly larger than the core seat die so that the nose piece will easily fit into the die. Because of this the external punch is replaced with a little larger punch with a tang on it. The nose piece is placed in the die, swaged, and ejected from the die. The nose piece now looks like a bullet that has a straight, hollow cavity in its base.

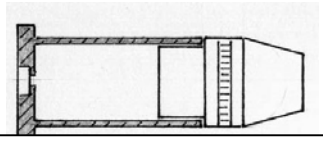


Ejection punch and point form die | Swaged nose piece | External punch

Once all of the nose and base pieces are formed the parts are cleaned with acetone, MEK, or other solvent to remove any lube on the parts. It is sometimes necessary to lightly roughen the tang on the part using a side cutter or pliers to insure the two pieces stay together after the final swaging, but usually this isn't needed.

When the pieces are clean and dry it is time to assemble them. The pieces are lightly pressed together and are swaged a final time in the point form die. The external punch with the tang is replaced with a flat faced punch or with a punch that matches the base on the bullet. Only a little pressure is needed to swage the pieces together. The bullet is ejected and it is ready to be loaded.

The heel base bullet goes back to what is probably the earliest cartridge still in production today, the .22 Short. This bullet has a groove diameter body but has a reduced rear section that fits into the cartridge case. Anyone who has ever pulled the bullet out of any .22 rim fire ammo, other than the .22 magnum, has seen a heel base bullet.



Cartridge loaded with a heel base bullet. The cannelure outside of the ctg. case held lube.

This type of bullet is actually pretty easy to make and many old time handguns and rifles can be made much better shooters with a correctly made bullet.

There is also some use for the heel base bullet for cap and ball revolvers. With this type of handgun the powder charges are placed in the chambers in the cylinder and then, most often, a round ball is pressed into the chamber. A heel base bullet that is made with a short heel that just slips into the chamber will guide a conical bullet concentrically into the chamber and the larger body of the bullet will tightly seal the chamber. This improves accuracy, eliminates "flash over", and may even increase the power of the pistol a little.

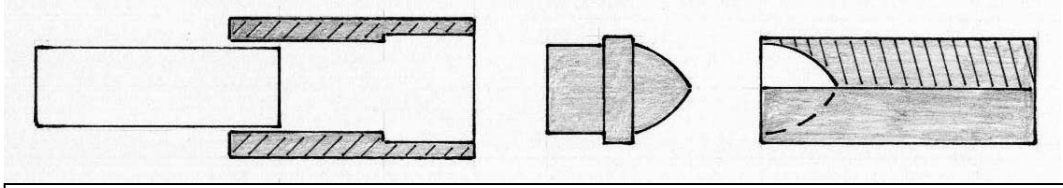
A major problem with the heel base bullet is that the bullets were outside lubricated. Usually a hard lube covered the large diameter and ogive of the bullet to reduce leading and fouling. The lubricant naturally picked up all sorts of dirt and grit which was not especially good for the barrel. Many of the old time pip-squeak cartridges were greatly feared for their killing ability. Not that someone shot by a 41 rimfire would instantly be facing Saint Peter but instead would suffer a lingering demise due to the bacteria carried into the wound by the grime on the bullet. Clearly a better bullet was needed and so the inside lubricated bullet was developed. Bullet diameters were reduced to fit inside of the cartridge case, lubricant was put into grooves on the bullet that were covered by the case, and everyone declared this to be a great improvement, except for those who still carried and used the older cartridges and now found that they couldn't get the obsolete ammo. Accuracy with the new ammo in the older guns was dismal and most of the old timers were retired. But the old guns can be given new life by swaging the old style bullets.

First, cores must be made. Cores can be cast or cut from lead wire in the usual manner. They are swaged to control the bullet weight or they can be swaged in a lead bullet die to make a finished bullet.

If a lead bullet die is used to make a semi-wadcutter type of bullet only one swaging operation is needed. Each press stroke makes a finished bullet ready to be loaded. The lead bullet die is place into the press ram along with the internal punch. The punch can be a hollow base, cup base, or flat base. Most often a flat base is used.

The external punch will form the nose of the bullet and the nose can be just about anything wanted. Usually heel base bullets are not especially heavy for the caliber so a shorter nose is often better. Generally a short round nose, a flat tipped short spitzer, or a round nose flat tip works well. A shortened Keith style is also good.

The external punch is placed in the punch holder, the core is dropped into the die, and swaged. The excess lead is extruded through the hole in the side of the die and the bullet is done.



Two diameter swage die and internal punch Heel base bullet External nose forming punch

The one problem with this type of setup is that the length of the heel cannot be changed. This is usually not a problem unless the bullet maker wants to experiment with different lengths, or bullets are to be made for different cartridges that require various heel lengths.

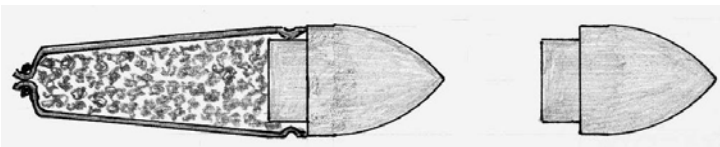
To make a smooth ogive bullet that does not have the step where the ogive and bearing meet the cores are made and then swaged in a core swage die. This makes a dense, uniform core of the correct weight. The point form die is placed in the press and the external punch is placed in the punch holder. The punch holder is adjusted as needed and the bullet is swaged. This results in a full diameter bullet.

The next step is to form the heel on the bullet. To do this a dual diameter sizer die is placed in the press ram along with its internal punch. An external punch that matches the nose of the bullet is placed in the punch holder. With this die the length of the heel is adjustable. The bullet is pushed into the die as far as needed to make the heel the proper length. The punch holder is moved up or down and locknut on the holder is snugged up once the correct setting is found. Then all of the bullets are swaged and they are ready to use.

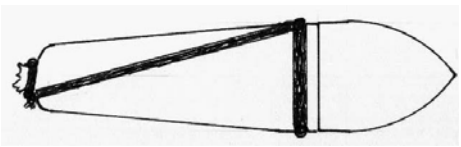
To lubricate the bullets, yellow beeswax can be softened using V&PM Naptha. Dissolve the beeswax in the naptha until it is of the desired thickness. The bullet in the loaded cartridge can be dipped in the beeswax and set aside to dry. Naptha has a very small molecule and will evaporate through many plastic jars so keeping the solution in a metal can or glass jar works best. Keep the glass jar where it won't be broken and remember that, like many solvents, naphtha vapors are flammable.

Other spray on or dip lubes can also be used. The lead cores can also be tumbled in graphite or moly powder and then swaged. The powder will be pressed into the surface of the bullet to provide a degree of lubrication. It's a messy but somewhat effective way to lube the bullets.

The heel base bullet was also used in the American Civil War and afterwards when paper cartridges were used. A nitrated paper was rolled into a tube and then glued or tied to the heel of the bullet. The charge of powder was placed into the paper tube and the end of the tube was twisted or tied closed. When it was time to load the rifle the end of the tube would be torn off, the powder dumped into the barrel, and the paper and bullet were rammed down on top of the powder charge.



Sectioned paper cartridge and heel base bullet



Paper cartridge tied with string

The Civil War Sharps used a linen cartridge that was loaded into the breech of the rifle. When the breech block was closed, it cut off the end of the cartridge exposing the powder charge to the flash of the percussion cap. Modern hunters can benefit from this one hundred fifty year old idea. Paper cartridges holding the powder and bullet and waterproofed will allow a quick reload in the field and perhaps a second shot if needed.

Created 06-2006
Updated 11-06