.45-70 Paper Patched Bullet Cartridges 101

The following is an introduction to building .45-70 paper patched bullet (PPB) cartridges, using real black powder and a bore riding PPB. This article is intended for shooters who are currently loading lubed bullets with either black powder, black powder substitute, or smokeless powder, and would like more of an understanding about PPB cartridges and real black powder. As with most things in life, guns and cartridges abound in some measures of subjectivity. The following methods and procedures are but one that allows for building good PPB cartridges.

During the heyday of the 19th century buffalo runners, most of the rifles were chambered specifically for PPB cartridges. These were rather tight chambers, with little or no freebore. After a cartridge was fired, it was reloaded as is – no brass sizing required, and no dies or presses or scales were used or needed, only simple hand tools. The components were brass, primer, powder, wads (cardboard and grease), paper patch and slick bullet. A steel punch and hammer was used to deprime/prime the case, a scoop for the black powder charge, a hole punch to make wads, and a marked wood dowel for compression. Such cartridges and their rifles were quite accurate for hunting game way out to 400 yards or beyond.

Most of today's replica guns are factory chambered for lubed (grease grooved) bullets. PPB cartridges will work just fine in most larger, lubed bullet chambers. In the 19th century, PPB cartridges were built with "grease cookies". That is, just above the initial compressed powder and wad, a layer of barrel/bullet lubricant ("grease") was added, and then another wad over that layer of grease, creating the wad/grease/wad "cookie'. The grease cookies role was to soften the black powder residue in the barrel, after a shot was taken, and typically allowed multiple firings without bore cleaning. This was part of "fouling control", because that residue will affect consistent accuracy, and the loading of cartridges.

Adding a grease cookie takes up case powder capacity. Most black powder cartridge rifle (BPCR) target shooters of today do not use grease cookies. For the intended focus of this PPB primer, the simpler powder/wad/PPB cartridge will be the object, and not grease cookie PPB cartridges.

A 3/16" lube ("grease cookie") and a pair of .025" milk carton wad ends.

Building the .45-70 PPB Cartridge

If the .45-70 brass is new, or has been resized, the first step is to parallel expand the case mouth, in order to simulate a fire formed case. The case mouth must be opened to allow a PPB to easily slip in. Most case mouth expansion dies are tapered, and a straight, parallel sided expander better simulates fire formed brass. Straight expansion plugs are not commonly found in the marketplace. For a .45-70 case, a .460" diameter expansion plug will fit into a Lyman "M" die body, and both can be had from Buffalo Arms Company in Idaho.

Or, the clean brass can have been already fire formed in the gun that it will be reloaded for, and has not been resized or worked in any manner, and therefore the case mouth is already properly expanded to accept a slipped in PPB.

Once the new brass has either been expanded or had been previously fire formed, it's checked for length and trimmed if necessary. Brass must chamber easily in the gun it's intended to be used for PPB cartridge building. In particular, the case must be clean inside so as to not give detonated black powder purchase to lengthen the case. Brass is primed with a standard or magnum large rifle primer.

The current premier black powder for .45-70 target shooting is either Swiss or Olde Eynesford in 1-1/2F granulation. However, GOEX in 1F or 1-1/2F or 2F will work well. The main thing is that it's Real Black Powder.

The primed case is slipped under a typically 24” to 30” drop tube and 70 to 80 scale weighed grains of black powder are trickled through the tube’s funnel and into the case, compacting (not compressing) the powder granules.

This drop tube is made from an aluminum funnel taped on to an aluminum arrow shaft.

The end of the drop tube can be slip fitted with a “washer” made from a rubber foam computer mouse pad, to keep granules of black powder from bouncing out of the case.

A simple .025” to .060” thick wad is pushed into the case using a piece of 7/16” or 3/8” dowel, without compressing the powder, just seating the wad on top of the powder column. Initially, .460” diameter wads can be punched out from milk or juice cartons (about .025” In thickness) or bought as “veggie wads”. It doesn’t much matter – this article is about building a good starter PPB cartridge load and lots of development with components and processes can be done later. This is all about learning the basics of PPB cartridge building.

A .45-70 primed case has been drop filled with 80 grains of Swiss 1-1/2F black powder, compacting the powder. A .025” milk carton wad is pushed into the case mouth,

Should the case powder be compressed or not? Initially, yes. At least a tad to insure there is no air space in the loaded brass. Perhaps 1/32” or 1/16”. This is just a starter load, and many other load parameters can always be tested out later. Most compression is methodically done using a compression plug set inside a Lyman “M” die body. However, using a dowel that’s marked where the wad just rests on the powder, can be further marked 1/8” or so to push down the wad, and the powder, for a bit of compression, and no press is needed.

A 7/16” dowel is pushed in to compress the wad and powder to the dowel’s 1/8” mark. The same process can be a more consistently accomplished with a .45 compression plug in a Lyman “M” die body. On the right, powder and wad have been 1/8” compressed.

How much case room will there be for the PPB? After the powder, wad, and any compression are accomplished, the space between the wad and the mouth of the case could be anywhere between 1/10” and 1/2”. A good compromise might be 1/8” or 3/16”. There are lots of considerations, too, such as creating a lighter recoil load (less powder and/or more wads), or attempting to get a slick as far into the rifling as possible (more powder). Initially, all of this is not critical, and can be another area for future experimentation.

And lastly comes the PPB itself, which needs to measure slightly under the diameter of the rifle’s bore. A good starting cast alloy is 1:20 tin:lead, but pure lead or harder alloys can be used. The bullet sides should be parallel and with no grease grooves (called a “slick”). If the bore of the rifle is .450”, it will require a slick that’s under bore size that when paper patched will become somewhere between .448” and .449” in diameter. At detonation, the PPB will obturate (bump up) to fill the bore. Since the PPB is a “bore rider” (slips easily into the bore), there is no concern over the cartridge’s OAL - the PPB cartridge can be any length.

However, with greaser chambers and their inherent freebore, the optimum PPB cartridge might have the bullet set in no more than 1/8” so that most of the bullet’s bearing surface length is inside the barrel’s rifling - particularly if the slick’s bearing surface is a short one of less than 3/4” in length. If a .45-70 rifle has a bore that measures .450”, it will typically use a slick that will have a diameter of between .440” and .443”, weigh between 400 and 500 grains, and be 1.0” to 1.3” in length for 1:18 twist .45-70 rifle barrels.

There is a direct relationship between the bullet casting alloy, the final diameter of the cast slick bullet, the thickness of the patching paper, and how the paper is wrapped on the bullet. The diameter of the cast slick and the thickness of the patching paper are at least a bit critical. Any under bore variance can usually be compromised by changing the paper to a different thickness. If a cast slick drops at .443”, and after wrapping with paper the PPB diameter is too thick to chamber the cartridge, where the PPB refused to easily slip into the rifling, use thinner paper and/or resize the slick to .442”. This is true no matter what is the cast PPB diameter. It’s a PPB diameter balancing act that once achieved is good to go. If possible, acquiring slicks in various diameters for testing can save mould money and time. One source is the Buffalo Arms Company.

A good starter bullet is the Accurate Molds 45-480P in .443” diameter. Its length is 1.20” with a .90” bearing surface, a .187” meplat, and drops at approximately 480 grains with 1:20 alloy. It can also be had in other weight models such as 45-490P and 45-405P.

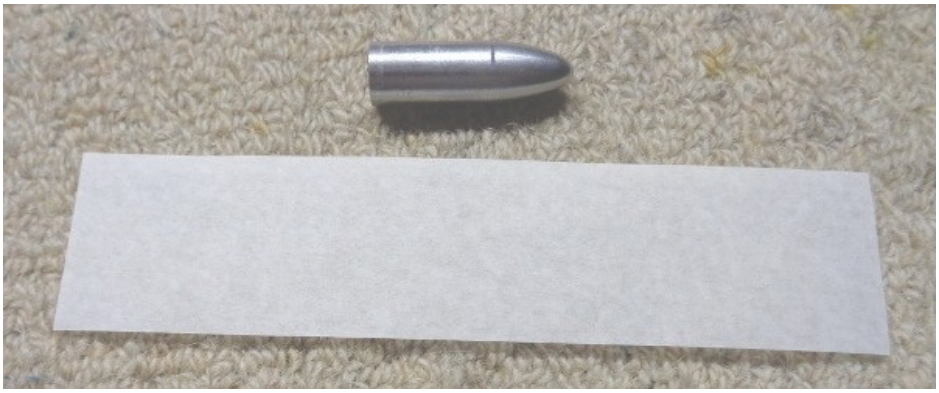
A a simple jig/template is used to pencil mark the slick where the paper wrap starts.

The Patching Process

Making the paper patch starts with the paper selection. There are any number of good wrapping papers, including the Fidelity 9lb onion paper that's used for this article. There is no standard patch paper template because the slick length, and diameter, and paper thickness can vary a bunch. The way to determine patch length is to wrap 3 layers of paper on the intended slick, use a razor blade or xacto to cut a small slit through the paper and slick, (as shown in the image group below) unfold the paper and the slick's start length is the distance between the two outer slices, minus 1/32" (again, the image group below). Whether wrapping dry or wet, and the amount of wrapping paper tension can change the patch length. This is all unique to one slick and one paper type/brand. The width of the paper should be exactly at, or about 1/10" beyond the bullet's ogive, to about 1/8" beyond the bullet base - this allows about a third of the bullet base to be covered with paper at the maximum. The entire base is never fully covered.

When the wrapping paper's length and width is calculated and tested, the paper ends are cut at an angle of between 40* and 60*. This article used a 50* patch angle. Patch dimensions can be finely drawn on the patch paper and cut out using a steel ruler and single edged razor blade, or even a paper cutter.

Start with a long, rectangular piece of patch paper. Notice the small pencil mark on the slick at 90* to its length that defines the start of the ogive and where the paper gets wrapped.



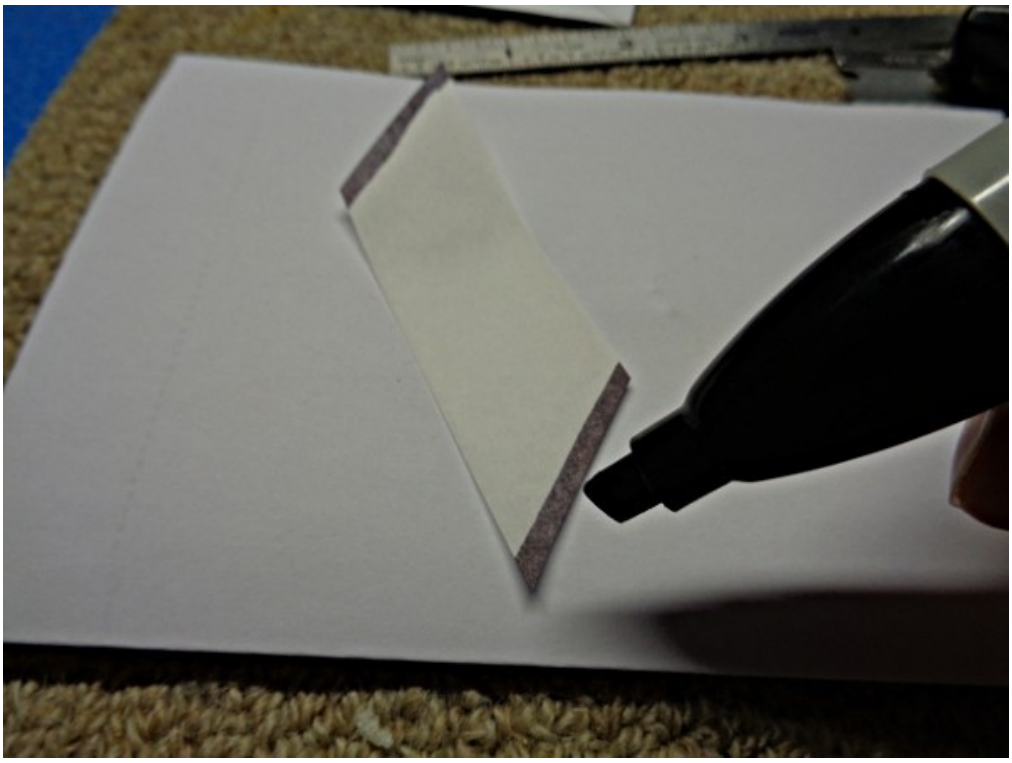
The paper is wrapped 3 times around the slick, starting at the penciled ogive mark, and a tiny slice cuts through all layers, at the ogive location.

The start patch length will be the distance between the two outer cuts, minus about 1/32”.

Patch width is the distance from the ogive of the slick to about 1/8” past the bullet base.

The patch ends were angled at 50* to create the rhomboid shape.

To test a patch design to see if it will wrap twice around the slick with its ends barely meeting or as far away as 3/32”, color the ends of the paper with a black sharpie.



Adjust the patch length so that those ends don’t overlap and aren’t more than about 3/32” apart. A fine white patch line can be seen on this PPB, between the dark black of the finished patch end and the black shadow of the underlying patch start end.

The paper would be best wrapped on dry, not wet. This will further insure the patch will leave the bullet at the instant the bullet leaves the barrel muzzle. If need be, water resistance can be added by rubbing the PPB with a cake of beeswax, while it’s in the completed PPB cartridge.

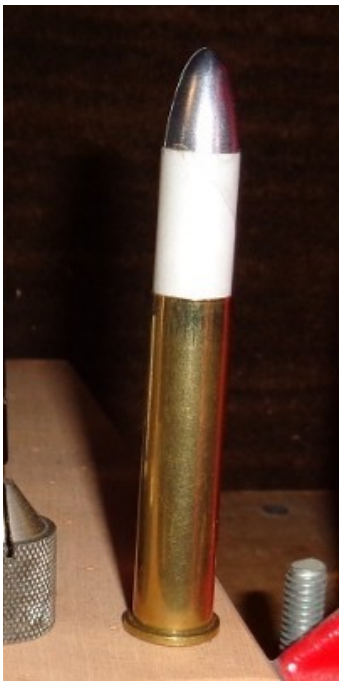
According to PPB expert Paul Mathews, “Whether the direction of the wrap makes all that much difference today is debatable. The common notion is that the patch paper should be wrapped onto the slick in the opposite direction of the barrel rifling, to better unwrap off the slick as it exits the muzzle.”

For target use, a PPB is wrapped and left dry. For hunting, a PPB cartridge can have its paper patching rubbed with beeswax for water resistance.

528 grain elliptical slicks and 404 grain flat nosed slicks. The 528 grain is getting two wraps of Fidelity 9lb onion paper. After wrapping, the 1/8” excess is folded over the slick’s base.

The PPB is inserted into a case that has had its mouth lightly inside chamfered. Push in and twist, keeping the wrap tight to the slick. The inserted PPB will more than likely be loose and even wobble. A .45-70 taper or sizing die is used to apply a very slight amount of mouth taper crimp, in order to keep the bullet from falling out of the case. Adjust the crimp die so that the PPB will not fall out, will freely turn, is easily removed from the case with fingers, and will not tear the paper patching.

Press mounted .45-70 taper crimp die, set for a marginally small amount of case mouth crimp. The completed PPB cartridge – 528 grain slick over 80 grains of 1-1/2F black powder. Cartridges shown are the 528 grain Buffalo Arms Company Jim443530E PPB cartridge and the 404 grain Accurate Molds 45-405P PPB cartridge. Both are 1:20 alloy.



A good PPB cartridge should chamber easily. There should be no need to force the cartridge into the barrel's chamber. After ignition, as the wrapped slick exits the muzzle, the patching paper should get sliced by the rifling and spin off as confetti.

Paper patch "confetti".

Addendum

PPB Cartridges need to be handled by their case because the PPB is barely inside the case and barely crimped in the case mouth. They also need to be transported upright in cases and very carefully removed by their PPB from such ammo cases.

Special tall ammo boxes by Berry's.

Most greaser shooters use a blow tube, or a blow tube along with wiping the bore. PPB cartridges without grease cookies must have shot fouling controlled by wiping only. A water or water plus soluble oil wet patch followed by a dry patch is all that's needed. That's at least two passes of the cleaning rod. The use of a bore wiper, where the forward part of the wiper is wet, followed by an "O" ring squeegee and a separate dry patch accomplishes the same task, only faster with one pass of the cleaning rod.

Buffalo Arms special bore wipers with dual felts and "O" ring seals.

A better type of bore wiper is the Brent Bore Gopher shown below with all it’s components and their sources.

It also can help to “orient” the brass in the barrel chamber – that is, to insure that any chamber inconsistency is taken into consideration when the brass is blown to fill out the chamber. Usually, brass is oriented by either marking the head with a scratch or simply using the head stamp lettering as an orientation indicator. If the brass has already been fire formed, no press is required.

A .45-70 PPB cartridge inserted into a rolling block rifle chamber with the Starline brass head stamp’s twin logo stars aligned upright at 12 o’clock.

Thank you – and do enjoy!

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