

A PRIMER ON BULLET CASTING COMPONENTS AND SUPPLIERS

By Wayne McLerran

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Introduction:

First, a short comment on abbreviations, since the subject of this primer is cast bullets I will use the abbreviations CB or CBs to mean cast bullet or cast bullets through out the text.

An avid reloader for many years, I had already made the switched from jacketed bullets to commercial CBs to reduce reloading costs for several calibers of handguns and black powder cartridge rifles. I'd been toying with the idea of casting my own bullets for some time when a large quantity of casting alloy became available at a very low price. After hauling the stuff home I decided to become familiar with the basics of bullet casting before purchasing the necessary equipment. This primer is a result of my research and reflects some of my experiences and knowledge gained from actually casting bullets. I have attempted to update the information as new suppliers and components are introduced to the market. Just be aware that some of the data may be "dated" as companies go out of business, move, add or remove products from the market. Although I have cast thousands of bullets, I do not consider myself an expert on the subject. Most of the following information has been obtained from much more knowledgeable sources than I.

As with most technical processes one must first acquire a fundamental understanding of the terminology and techniques employed. Bullet casting is no exception. I'd read several reference books and manuals on the subject. The literature provided valuable advice and guidelines on the casting process. What it lacked was a comprehensive reference on sources of equipment, components, and raw materials. To insure I was well informed prior to buying the necessary equipment and supplies, I decided to further research the industry and the casting process. I have found no better way to fully understand a subject then to document it in writing. I hope the information will save you time locating sources of equipment and supplies, and shed some light on the role played by specific components in producing a CB. But my real ulterior motive is to interest newcomers to the hobby by making it a little easier to understand and less intimidating to those not familiar with the process. I will not cover the details of the actual casting process, but have included comments and discussions to explain some of the basic fundamentals and concerns. There is plenty of excellent literature already written on the step-by-step process of bullet casting. I hope you find the time reading this primer to be well spent.

I've included an extensive list of casting and related equipment sources including casting moulds, casting alloys, and bullet lubricants. I will not address the entire reloading process and associated components, but I have included a list of manufacturers of gas checks, over-powder wads, and wad punches. The list is short for suppliers of over-powder wads and wad punches, and sources may be hard to identify for the novice bullet caster. You will also find a section discussing bullet lubricants and a list of lead alloy characteristics to use as a reference when buying or mixing casting metals. It is to your benefit to further research and read all you can find on the subject prior to purchasing equipment. You are likely reading this because you are new to bullet casting. I therefore recommend you start with basic, lower-priced, "standard" equipment. For many decades excellent bullets were made with a cast iron pot over an open fire, a hand ladle, and a simple mould. Don't make the costly mistake of buying expensive equipment before you have a better idea of the level of commitment you're prepared to make.

Should you desire to extend your knowledge on casting bullets, there are many fine books, pamphlets and periodicals available that cover the subject in various levels of detail. See the section on [Books, Periodicals, Reference Material](#). For those interested in casting bullets for black powder cartridge rifle (BPCR) shooting, I've listed several books and periodicals that I highly recommend. Regardless of your specific area of interest, you should consider joining the Cast Bullet Association, Inc. (CBA). The CBA is a world-wide organization of approximately 2000 shooters who cast and shoot their own lead alloy bullets for hunting and target shooting. The CBA publishes a semi-monthly journal called *The Fouling Shot* that is filled with articles on casting techniques, loads for CBs, and experiments with CBs. It also contains advertisements that will hook you up with custom mould makers and others who supply products for the CB shooter. See the section on [Affiliated Associations](#).

Once you've grasped the basic process and fundamentals, there is no substitute for first-hand experience. I assure you there is absolutely no way to acquire the knowledge and experience without actually jumping into the casting process and making the many mistakes we have all made as novices to this hobby. Just remember, you are working with a high temperature molten metal. Imagine having your casting pot full of 800 degree lead alloy explode, while standing over it, because you were not paying attention, or failed to follow good safety practices and somehow let moisture get into the lead alloy. Bullet casting can be a safe and very enjoyable experience as long as you take the necessary precautions, use common sense, and insure safety is priority number one. As you read further you'll quickly come to the realization that it is certainly not an exact science and leaves plenty of room for experimentation. If you'd like to add another very enjoyable dimension to the sport of reloading and shooting, customize your loads, and save some money to boot, bullet casting is for you. [Return to Contents](#)

Background Information:

Let's discuss hard CBs or "hard cast" a little. If you're a hunter, paper target shooter, metal silhouette shooters, or just "plinking" at tin cans, accuracy is the one common requirement. The rifle and cartridge combination is expected to perform accurately over relatively long distances. One way to reduce the external conditions that affect accuracy (wind, temperature, gravitational pull, etc.) is to speed up the bullet. Thereby allowing less time for the external conditions to change the bullet path. But with CBs, higher velocities might increase lead fouling in the bore, commonly referred to as bore leading or leading. Leading has a negative affect on accuracy. One of the most common remedies to reduce leading is to make the bullets harder. But leading concerns is not why most suppliers prefer hard cast.

CB companies have to ship their product through various delivery services. Harder bullets are less prone to damage, as is the hard lubricant used by most manufacturers. Harder bullets are easier to cast with fewer rejects, thereby reducing manufacturing costs. Also, the lead alloy used in hard bullets can be less expensive if it comes from a foundry using reclaimed materials rather than virgin metals. These comments are not intended to discourage you from using commercial CBs, or making your own hard CBs. All the CB suppliers I have purchased from make excellent bullets, and hard CBs generally work well in most cases. But their bullets may not fit your shooting requirements, and will certainly cost you more than casting your own.

And don't forget shipping charges, which, considering the weight of lead, can add a significant cost. If you purchase CBs, uniformity and hardness are areas you should consider checking on to determine the type and quality of bullets you receive. If you plan on casting your own, several techniques can be used to control the hardness and reduce bore leading, just one of the many advantages of casting your own. If you've been satisfied with commercial hard CBs and your main objective is to save some money, then, by all means, stay with what works and make you own hard CBs.

Can a bullet be too hard? The quick answer is yes. So what are the tradeoffs? Although hard cast may work fine for paper target shooting, hunters have additional requirements leading to a compromise in hardness, or the need for special processing. To efficiently kill game the bullet must penetrate deeply and sufficiently expand while retaining most of its weight. If the bullet is too brittle it may fracture or breakup prematurely upon impact when striking a bone or other hard material. If too soft, it could expand prematurely and fail to penetrate deeply enough. This presents a significant challenge for the hunter who is striving for maximum velocities resulting in increased leading unless very hard bullets or other techniques are used. Also, metal silhouette shooters would be at a distinct disadvantage if the bullet shattered or bounced off on impact and failed to transfer sufficient energy to knock over the silhouette. Making the decision to cast your own opens up several options which you can take advantage of. One option is to make softer bullets, which may be better suited for your needs.

Earlier I mentioned that higher velocities might accelerate bore leading. The key word here is might. I believe that the main cause of bore leading is dimensional mismatches between the bullet and the bore. Bullets should be sized to measure .001" to .002" over groove diameter. If smaller, leading will result due to hot gasses and vaporized lead leaking past the side of the projectile, unless the bullet base quickly and fully expands (obturate or "bumps up") and seals the bore. The hot vaporized lead either condenses on the bore or is smeared on bore by the projectile, or both. One solution is to increasing bore pressures, which will bump up a bullet faster and reduce leading. Another method is to use a softer alloy. $1,440 \times \text{BHN} = \text{chamber pressure}$, is a well-known "rule-of-thumb" formula which defines the minimum chamber pressure required for bumping up bullets of a given hardness. BHN (Brinell Hardness Number) is discussed later in the section on bullet hardness.

Conversely, if the bullet diameter is correct, increasing velocities may cause leading due to inadequate lead hardness. If the bullet is too soft, friction between the bullet and bore will cause leading, especially with poor or insufficient lubrication. Leading close to the breech and progressing down the bore could be caused by several problems: the bullet does not fit properly, the lead alloy is too hard or too soft, the lubricant is inadequate, or a combination of problems. Leading close to the muzzle is a sign the bullet lubricant is not adequate for the pressure and velocity conditions, or is not of sufficient amount to lubricate the entire bore. A bullet, significantly oversized to an extent that the lube grooves are badly deformed, will run out of lube quickly and lead the muzzle portion of the bore. Gas checks, and over-powder wads are used to help in sealing the bore. Bullet lubricants (discussed later) may also help. Their effectiveness is limited if the CB alloy is incorrect or the bullet is not dimensionally correct.

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Casting Alloys and Bullet Hardness:

Common bullet casting materials are pure lead; alloys of tin and lead, or of tin, antimony, and lead. The common methods of hardening bullets are: increasing the percentage of antimony, which results in a harder bullet but also increases the "brittleness", and two types of tempering or heat treatments. Tempering consists of quenching the hot bullet in cool water as it is dropped from the mould, or heating the bullets in an oven for an hour or so at elevated temperatures, then quenching in water. Either technique is used with low-antimony alloy to yield much harder bullets without the increase in brittleness associated with higher concentrations of antimony.

Depending on the type of alloy and processing, the hardness of a CB can change in either direction over time. Bullets with high tin-to-antimony content will age-soften significantly over many months, even if

tempered. To stop or slow down softening, manufacturers adhere to a “rule-of-thumb” of limiting the tin content to no more than the percentage of antimony. High antimony CBs can be annealed (heated and cooled slowly) to reduce their hardness. But given enough time the bullet will eventually revert back to its original hardness. If you cast your own bullets, freeze storage in your home freezer is one trick used to virtually eliminate age-softening or age-hardening.

Contrary to popular belief tin is not added to harden lead alloy. Although increasing the tin content does slightly increase the alloy hardness, its main function is to improve the “castability” (sometimes referred to as fluidity, flowability, or pourability) of the molten metal. Concentration of at least 2% improves the alloy flow characteristics and allows it to fill all corners and grooves of the mould. Tin is expensive, so manufacturers generally use no more than necessary. Castability is not a concern with swaged bullets (refer to section on paper-patch bullets). Therefore the extruded lead alloy wire used in the swaging process does not normally contain tin.

BHN stands for the Brinell Hardness Number (incorrectly spelled Brinnell by some). BHN is a measure of the hardness of a metal or alloy at ambient temperature. Pure lead has a BHN of 4 to 5. The hardest CBs have a BHN in the range of 22 to 25, and can be made even harder using heat treatment techniques. Pure copper has a BHN of 40. Widely used on castings and forgings, the Brinell test method applies a predetermined test force to a carbide ball of fixed diameter, which is held for a predetermined time and then removed. The diameter of the indentation width is measured and used in a formula to convert the measurement to a Brinell hardness number.

For those interested in measuring or verifying the hardness of CBs, Redding/SAECO, 1089 Starr Rd, Cortland, NY 13045, Ph: (607) 753-3331, a manufacturer of reloading equipment, sells a bullet hardness gage based on a “relative” scale commonly referred to as the SAECO scale. The SAECO scale is from 0 to 10, where 0 to 1 is equal to a BHN of 4 to 5 (pure lead) and 10 is equal to a BHN of 22 (linotype). The SAECO gage can be purchased where reloading and shooting supplies are sold. Lead Bullet Technology (LBT), a company no longer in business, made a bullet hardness gage based directly on the Brinell scale. The LBT gage measures BHN hardness over a range of 5 to 40. It’s worth searching the web or checking with reloading suppliers to find one of these fine gages. Jim Cornaggia (www.castingstuff.com) sells an excellent lead hardness tester, which can also be converted to test case and case neck concentricity, neck thickness, and bullet run out.

Linotype alloy, a mixture of approximately 4% tin, 12% antimony, and 84% lead, originated in the printing industry in the 1880’s. It was used in Linotype brand linecaster printing machines as a reusable alloy for casting single-line units of metal type. Because linotype was readily available, prior to more recent advances in printing technology, it became the alloy of choice for hard CBs and the standard against which the hardest CBs were measured. It was therefore chosen as the reference for the top-end of the SAECO scale. Linotype measures around 22 on the BHN scale.

A reference on common lead alloys mixtures and hardness can be found under the heading [Characteristics of Bullet Casting Materials and Alloys](#). I’ve also included a listing of many suppliers of pure lead, lead alloys, casting lead additives under the heading [Sources of Casting Metals and Alloys](#). [Return to Contents](#)

Bullet Lubricants:

Unless you are shooting paper-patched lead bullets (discussed later), bullet lubricants are required with CBs to achieve reasonable accuracy. Numerous commercial lubes are available, and homemade recipes published for the bullet caster to experiment with. You should find the following discussion on lubricants to be interesting, especially the comments and recipes on homemade lubricants found under the heading [Homemade Lube Formulas and Notes](#). I also included a list of lube suppliers under the heading [Bullet Lubricant Suppliers](#).

When a CB cartridge is fired in a firearm the bullet lubricants are expected to serve several roles. It should help in sealing the bore to reduce gas blow-by, prevent vaporized lead from adhering to the bore, lubricate the bore to reduce the effects of friction, and reduce the negative effects on accuracy caused by

accumulated fouling. It should be of adequate consistency to stay in the bullet lube grooves and not create a sticky mess during handling and reloading, but soft enough to do its job. Earlier I discussed leading caused by incorrect bullet dimensions or hardness, which starts close to the breech and progresses down the bore. Leading starting close to the muzzle is a sure sign that the lubricant is failing. The bullet may not hold sufficient lube or the ingredients may not be adequate for the job, or of the correct consistency. Due to differing requirements, bullet lubes for CBs are roughly grouped into two categories: lubes for smokeless powder shooters and lubes for black powder users.

The smokeless powder shooter is usually striving for high velocities and therefore is highly dependent on good bullet lubricants. CBs fired at high pressures and high velocities, devoid of the proper lube, would cause significant leading. Since smokeless powder is very clean burning and leaves little fouling in the bore, leading is the main contributor to reduced accuracy. There is more than one school of thought on the cause of leading. One "smokeless experts" definition of the role of bullet lubricants: "Bullet lubricants are really not a lubricant in the sense of a bearing lube. The lube prevents vaporized lead from tinning or sticking to the steel barrel. The properties of the lube therefore must be opposite that of a tinning flux. It also must help seal the projectile to the barrel either as a solid or a semi-solid under heat and pressure." Another "smokeless expert" disagrees with the above definition. He says, if the bullet fits tightly from the instant it begins forward motion until it exits the muzzle then, "bore leading is caused from nothing other than friction between the bore and bullet. Severe and rapid heat from friction against the bore melts the skin of the bullet surface, smearing it directly onto the bore." Therefore the correct lubricant is one that simply eliminates or reduces friction. I tend to agree with the latter definition, but both of these experts may be correct in that leading may be caused by a combination of effects.

Leading is also a concern to black powder muzzleloaders or cartridge shooters, but less so due to the inherent lower pressures and velocities. Black powder shooters have an additional factor to contend with. Black powder residue fouls the bore much more than smokeless powders. The fouling is formed from a combination of residues from the burning powder, bullet material, and lubricant. A buildup of hard fouling leads to poor accuracy. Therefore lubes for black powder are also designed to keep the fouling soft. An old trick of black powder shooters is to blow in the barrel after each shot. This introduces moisture into the fouling, thereby keeping it soft between shots. Soft fouling has less of an effect on accuracy. For this reason black powder lubes tend to be much softer than lubes for smokeless cartridges. There are numerous formulas for black powder lube. An idea lube should include ingredients to keep the lube soft, but also ingredients to lubricate the bore and reduce leading caused by friction and heat.

Conventional bullet lubricants are generally available in three forms -- hard lubes, soft lubes, or as a liquid. Also available are several so-called "high-tech" bullet coatings/lubricants. These are usually molybdenum disulfide ("moly" or MoS_2) based lubricants, and have recently captured the interest of bullet manufacturers and reloaders. If you desire to make your own "homemade" lube, there are many recipes available.

Hard lubes (usually a paraffin and beeswax mix), which work fine in smokeless reloading, were originally developed for use in commercial lubricator/sizers (lubrisizer) that utilize a heating element. Hard lube allows the commercial manufacturer to handle and ship bullets without concerns of damage. They melt at higher temperatures than soft lubes and require heating of the lubrisizer so the lube will flow into the bullet lube grooves. The lube then quickly cools to room temperature to a hard non-sticky consistency. Low-cost heaters are now available to home reloaders who want to take advantages of hard lubes. They attach to lubricator/lubrisizer sold by reloading equipment suppliers. Lube manufacturers employ several methods to control the melting temperature of hard lubes. One method is to vary the percentage of paraffin in the mix; the higher the percentage of paraffin, the higher the melting temperature. Another method uses jojoba oil. Jojoba oil (actually a liquid wax that is well known in the cosmetic industry) is a "secret" ingredient in several commercial bullet lubes. Varying the amount of jojoba oil will change the consistency or melting temperature of the lube.

Several soft lube mixtures are available. Some are an Alox* and beeswax mix. Others use ingredients that are proprietary to the manufacturer. They work easily through a lubrisizer or can be applied using “pan lubing” (discussed later). Soft lubes are sticky and normally require special packaging of the lubed bullets until ready for loading. One trick to reduce “stickyness” is to dust the bullets with a dry mica lubricant available from reloading suppliers.

Liquid lubes (usually Alox*-based) are poured on a batch of bullets. The bullets are then tumbled or shaken together sufficiently long enough to insure good coverage, then allowed to dry (usually overnight) to a soft, varnish-like finish.

Molybdenum disulfide based coatings are sold through several companies. KG Products has sold moly coatings for over 40 years for industrial and military applications. They also sell kits for bullet coating. KG provides “private labeled” product to Midway and others. Precision Bullets sells CBs with a special black polymer-based dry lubricant coating that reportedly seals the bullets to reduce harmful gasses and leading up to 2000 fps (likely a moly-based product). NECO sells a moly and carnauba wax coating/lubricating process for both jacketed and CBs that reportedly eliminates barrel leading, significantly reduces bore fouling, and even increases the ballistic coefficients of bullets. Midway sells a moly application kit and Moly Bore Prep (KG private label). Ms. Moly sells an aerosol spray moly coating (also sold through Cabela’s and Sinclair International). Cabela’s also sells “Bullet Slide” moly lube in paste form. Green Bay Bullets sells a MoS₂-based lube in stick form. Lyman’s high-temperature Super Moly and Black Powder Gold stick bullet lubes contain moly. Lyman also sells moly kits for tumblers, moly spray, and moly bore cream. Lee Shaver Gunsmith offers a moly-based lube in stick form. Moly-Bore offers web-based ordering of dry moly powder lubricant kits. Moly “application kits” are also available from other distributors and mail order retailers. MoS₂ sprays in aerosol cans are available at well-stocked hardware stores, some parts stores, and W.W. Grainger catalog order (part #5E202)

* See comments under Alox Corporation found under the heading [Bullet Lubricant Suppliers](#).
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Paper-Patched Bullets:

And finally, this primer would not be complete without a few comments on paper-patched bullets. If you saw the movie *Quigley Down Under*, you may remember the opening scene where Matthew Quigley (Tom Selleck) is filling his cartridge belt. If not, I’ll bet you remember the later scene where Matthew describes his Sharps rifle, the cartridge, and then proceeds to amaze you with his shooting ability. Looking closely, you will notice the white paper wrapped around the bullet. These are paper-patched bullets. The paper serves the same purpose as the wax-based lubricant used with conventional CBs. By the way, Matthew describes the cartridge as a “45 caliber 110 grain metal cartridge” using a 540 grain paper-patched bullet. Actually it is a 2 & 7/8” brass cartridge filled with 110 grains of black powder behind a .45 caliber, 540 grain bullet. This cartridge is commonly referred to as a .45-110 Sharps Straight.

Mark Hilliard points out in his book, The Making and Loading of Paper Patch Bullets, “It has been estimated that 6 to 24 million buffalo were killed in the 1870’s hide business. The majority of the hunters used single shot 40, 45 and 50 caliber paper patch bullets.” Paper-patched bullets offer a couple of advantages over CBs with lube grooves. They usually have a higher ballistic coefficient (less air friction), but more importantly provide a means for the hunter to shoot soft lead (usually pure lead) bullets at high velocities. The soft bullet will expand or “mushroom”, resulting in a larger wound channel. If properly applied the paper patch builds up the diameter of the bullet to prevent gas leakage and barrel leading. The major drawback, causing most CB shooters to loose interest, is the work-intensive paper wrapping and reloading process. Paper-patched black powder cartridges lack sufficient lube to keep the powder fouling soft unless a “grease cookie” is used between the bullet and powder. A “grease cookie” is simply a layer of bullet lubricant between two thin layers of non-lube-absorbing material (wax paper is ideal), which insures the lubricant does not migrate into the powder. The use of a grease cookie further complicates the reloading process. Without the cookie frequent cleaning is

required for competitive “match” accuracy. But this is not an issue in typical hunting situations where the rifle shoots better than the hunter can hold on target, and one or two shots is the norm. Another drawback is in the bullet-seating step where special dies are required to keep from damaging the soft bullet nose.

Paper patching can be used with cast or swaged bullets. Although grooveless or smooth-sided soft CBs can certainly be used, most paper-patched bullets use swaged. Swaged bullets can be made by starting with cast, soft lead cores, but are typically made from extruded pure lead wire “swaged” or pressed under high pressure in a swaging press. Home swaging equipment is available, but is more expensive than casting equipment. Also, pure lead wire is more expensive than used wheel weights or other sources of lead alloys used in casting. I have not used paper-patched bullets, and swaged bullets are not the subject of this primer, therefore paper-patched bullets will not be discussed further. If paper-patched bullets interest you, another book, [The Paper Jacket](#) by Paul Matthews, is considered by many as “the bible on paper patching”. There is also plenty of information on the Web.

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Gas Checks and Over-Powder Wads:

Gas checks and wads are used with CBs to reduce bore leading and increase accuracy at higher pressures, temperatures, and velocities. Gas checks are copper, copper alloy, or gilded metal cups, which are crimped on or otherwise attached to the base or heel of hard CBs designed with a “gas check shank”. Gas checks are meant to stay attached to the bullet through out its flight down range. Gas checks are thought to provide two key advantages over “plain-base” bullets. Bore leading is reduced and distortion or erosion of the base of the bullet is eliminated, resulting in increased accuracy. To date no one has hard scientific evidence on how gas checks actually work. They may also seal the base of the bullet from high-pressure gas blow-by and subsequent vaporization of the lead; or act as a scrapper, removing lead deposits from the previous shot. Regardless of the process, there is plenty of evidence that gas checks, if installed correctly, do reduce bore leading and enhance accuracy at high velocities. I personally believe that if an ideal CB (correct dimensions, hardness, and lube) is loaded perfectly to match the firearm, gas checks are not required. But due to the many, many variable and tradeoffs associated with reloading CBs, gas checks minimize the effects of accuracy robbing mismatches in the reloading process. Gas checks are installed during the resizing and lubing process using the same tool that “resizes” and/or applies lubricant to the CB. The tool is commonly referred to as a lubrisizer.

Wads may also reduce gas blow-by but are primarily used to protect the bullet base from the effects of high-pressure gasses. A wad is simply a relatively thin layer of material inserted between the powder and bullet to protect the bullet base and possibly help in reducing gas blow-by. They can be purchased for various calibers and in a variety of thicknesses, or made from common materials. Most of the commercial wads currently available are cut from a vegetable fiber material. Hand gasket punches, available from many sources, or custom made reloading press punches can easily cut out wads from thin soft metals, cardboard tablet backing, milk cartons, thin plastics, and similar materials. The wad is placed over the powder prior to inserting the CB, hence the term “over-powder wad”. If the bullet base is cleaned prior to reloading, the wad will properly separate from the bullet as soon as it exists the bore and will not affect the bullet flight or accuracy. See the list of sources under the heading [Sources of Gas Checks, Wads, and Wad Punches](#).

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Casting Equipment Manufacturers and Suppliers:

The equipment from most of the following manufacturers is available through local retailers, catalog retailers, and national full-line distributors of firearms, reloading and shooting supplies.

Ballisti-Cast, Box 383, Parshall, ND 58770

Ph: (701) 862-3324

Comments: One of only two manufacturers of automatic bullet casting machines in the USA. These are used by commercial reloaders. The other is Magma Engineering Co. Manufactures two levels of hand casting machines, one fully automatic high-volume casting machine, and an automatic luber/sizer with M-A Systems collator. Machines are supplied with Hensley & Gibbs moulds, although most other moulds can be adapted.

Brass & Bullet Metals, P.O. Box 1238, 340 N. Lenzner Ave., Sierra Vista, AZ 85636

Ph: (520) 458-5321, Fax: (520) 458-9125

Comments: Supplier of brass, lead casting supplies, casting thermometers, fluxes, pots, ladles, lead and lead alloys. Owner is William Ferguson who is a metallurgist and has been selling lead and lead alloys for many years. Bought the casting portion of Leading Edge Tool Service (LETS) in 1993.

Lead Bullets Technology (LBT), Moyie Springs, ID

Comments: LBT is no longer in business. While in business owner Veral Smith sold, among other casting supplies, a nice casting alloy hardness tester that measured the true Brinell Hardness Number (BHN). Veral was also the author of a fine book on bullet casting called Jacketed Performance with Cast Bullets.

Lee Precision Inc., 4275 Hwy. U, Hartford, WI 53027

Ph: (414) 673-3075 Fax: (414) 673-9273

Comments: A well-known low-cost manufacturer of casting equipment, moulds, bullet lubricants, and reloading equipment.

Lyman Products Corporation, 475 Smith Street, Middletown, CT 06457

Ph: (800) 225-9626, (203) 349-3421

Comments: A well-known manufacturer of casting equipment, moulds, bullet lubricants, and reloading equipment. Also supplies small selection of CBs for BPCR and cowboy action shooting. Also sells a fixed wattage lubricator heater (may be able to vary wattage using a light dimmer - see note under LBT above).

Note: Lyman & RCBS top punches & sizer dies or bullet sizer/lubricator/Lube-A-Matic are interchangeable.

M-A Systems, Inc., P.O. Box 1143 Chouteau, Oklahoma 74337

Ph: (918) 479-6378, Fax: (918) 479-6665

Comments: Make's bullet collators that are used by Magma Engineering Co. and Ballisti-Cast on their automatic bullet lubing and sizing machines. Also makes collators for other applications.

Magma Engineering Co., P.O. Box 161, Queen Creek, AZ 85242

Ph: (602) 987-9008, Fax: (602) 987-0148

Comments: Manufacturer of a manually operated high-volume (500 - 800 bullets per hour) casting machine for the person that wishes to move up a step from hand casting. Magma is also one of only two manufacturers of automatic very high-volume bullet casting machines for the commercial caster. The other one is Ballisti-Cast. In addition Magma manufactures moulds, lubing machines, bullet lube, and associated supplies. In late 1997 Magma purchased Star Machine Works and now manufactures and sells the Star brand hand bullet luber and resizer. Star is considered by some to be the best in the industry. Note, the Star unit does not provide an easy method to attach gas checks, but will resize the bullet after the gas check is installed. Sizer and lubricator dies for Star units are also available through Robert Stillwell, 421 Judith Ann Dr., Schertz, TX 78154, Ph: (210) 658-0112.

Midway, 5875 W. Van Horn Tavern Rd., Columbia, MO 65203

Ph: (800) 243-3220, Fax: (314) 446-1018

Comments: Full-line wholesale distributor and catalog retailer of casting, reloading, and shooting supplies. Listed here since they also sell a thermostatically controlled lubricator heater.

Rapine Bullet Mould Mfg. Co., 9503 Landis Lane, East Greenville, PA 18041

Ph: (215) 679-5413, Fax: (215) 679-6442

Comments: Sells casting equipment including a stainless steel variable wattage casting pot. Also sells aluminum alloy moulds in either single or double cavity and loading dies for hundreds of obsolete, antique and wildcat calibers. Moulds come complete with handles.

RCBS, (a division of Blount, Inc.), 605 Oro Dam Blvd., Oroville, CA 95965

Ph: (800) 533-5000

Comments: A well-known manufacturer of casting equipment, moulds, bullet lubricants, and reloading equipment. Note: Lyman & RCBS top punches & sizer dies or bullet sizer/lubricator/Lube-A-Matic are interchangeable.

Redding/SAECO, 1089 Starr Rd, Cortland, NY 13045

Ph: (607) 753-3331, Fax: (607) 756-8445

Comments: A well-known manufacturer of casting equipment, moulds, bullet lubricants, and reloading equipment. Also sells a casting alloy hardness tester based on a "relative" hardness scale (does not measure the true Brinell Hardness Number). See Lead Bullet Technology for another casting alloy hardness tester. Note: SAECO top punches & sizer dies work only in SAECO lubrisizers.

Star Machine Works (See Magma Engineering Co.)

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Mould Manufacturers:

Accurate Bullet Co., 159 Creek Road, Glen Mills, PA 19342

Ph: (610) 399-6584, Fax: ?

Comments: CBs, moulds, brass, casting alloys, lube and other reloading supplies.

Ballard Rifle & Cartridge LLC, 113W Yellowstone, Cody WY

Ph: (307) 587-4914, Fax: ?

Comments: Late 1999 Ron Long's business (Long's Locks) merged with Ballard. Ron manufactured bullet moulds, BPCR barrels and sights. Ballard's main business is BPC rifles and cartridges. Steve Garbe is President of Ballard.

Barnett's (Jerry R. Barnett), 1262 Thompson, Emporia, KS 66801-6072

Ph: (316) 342-6034 days, (316) 342-7257 nights

Comments: Custom lathe bored out of cold roll steel; single cavity, base pour, plain base.

Colorado Shooter's Supply, P.O. Box 132, 1163 W. Paradise Way, Fruita, CO 81521

Ph: (970) 858-9191

Comments: Owner Dave Farmer makes' Hoch custom lathe bored moulds. He is the only mould manufacturer of nose pour rifle moulds for BPCR. Made of meehanite (cast iron or extruded iron).

Hensley & Gibbs, P.O. Box 10, Murphy, OR 97533

Ph: (503) 862-2341

Comments: Multiple-cavity (2, 4 or 6 cavity), mostly for handguns and .45-70. Come with handles. Supplies moulds to Ballisti-Cast (one of only two manufacturers of automatic bullet casting machines in the USA)

Hoch Custom Bullet Moulds

Comments: See Colorado Shooter's Supply above.

Lee Precision Inc., 4275 Hwy. U, Hartford, WI 53027

Ph: (414) 673-3075, Fax: (414) 673-9273

Comments: Moulds and casting supplies are available through local retailers, catalog retailers, and national full-line distributors of firearms, reloading and shooting supplies. Moulds are milled from aluminum blocks. Also sells bullet lubricants.

Long's Locks (Ron Long), See Ballard Rifle & Cartridge LLC**Lyman Products Corp.,** 475 Smith St., Middletown, CT 06457

Ph: (860) 632-2020, Fax: (860) 632-1699

Comments: A well-known manufacturer of casting equipment, moulds, bullet lubricants, and reloading equipment. Also supplies small selection of CBs for BPCR, cowboy action shooting, and muzzleloading. Moulds and casting supplies are available through local retailers, catalog retailers, and national full-line distributors of firearms, reloading and shooting supplies. Moulds are milled from cold-rolled steel blocks.

Magma Engineering Co., P.O. Box 161, Queen Creek, AZ 85242

Ph: (602) 987-9008, Fax: (602) 987-0148

Comments: Manufacturer of automated bullet casting machines, moulds, lubing machines, bullet lube, Star brand hand bullet luber and resizer, and associated supplies. Magma is one of only two manufacturers of automatic bullet casting machines in the USA. The other one is Ballisti-Cast. Magma supplies their machines with their own moulds, but other moulds can be adapted such as Saeco, Lyman, RCBS, NEI and Hensley & Gibbs.

NEI Handtools, Inc., 51583 Columbia River Hwy., Scappoose, OR 97056

Ph: (503) 543-6776, Fax: (503) 543-6799

Comments: Aluminum and meehanite (cast-iron) mould in single, double or four cavities. Offers nose-pour moulds. Also make's hand tools for the sporting industries.

Old West Bullet Moulds, C/O Ken Chapman, P.O. Box 519, Flora Vista, NM 87415

Ph: No number in literature.

Comments: All moulds made of brass with a steel sprue cut-off plate.

Paul Jones Moulds, 4901 Telegraph Road, Los Angeles, CA 90022

Ph: (213) 262-1510

Comments: Cast-iron single cavity, lathe bored, moulds.

Pioneer Products, 254 Brookville-Johnsville Rd., Brookville, OH 45309

Ph: (937) 833-2865

Comments: Owner Fred Leeth. Sells cast-iron and aluminum moulds (special order).

Rapine Bullet Mould Mfg. Co., 9503 Landis Lane, East Greenville, PA 18041

Ph: (215) 679-5413, Fax: (215) 679-6442

Comments: Aluminum alloy moulds in either single or double cavity. Comes complete with handles. Also offers loading dies for hundreds of obsolete, antique and wildcat caliber's. Also sells casting equipment including a stainless steel variable wattage casting pot.

RCBS, (a division of Blount, Inc.), 605 Oro Dam Blvd., Oroville, CA 95965

Ph: (800) 533-5000

Comments: Moulds and casting supplies are available through local retailers, catalog retailers, and national full-line distributors of firearms, reloading and shooting supplies. Moulds are milled from cast-iron blocks with lifetime warranty. Also sells bullet lubricants.

Redding/SAECO, 1089 Starr Rd, Cortland, NY 13045

Ph: (607) 753-3331, Fax: (607) 756-8445

Comments: Moulds and casting supplies are available through local retailers, catalog retailers, and national full-line distributors of firearms, reloading and shooting supplies. Moulds are made from "Copper alloyed pearlitic" cast-iron. Also sells a casting alloy hardness tester based on a "relative" hardness scale (does not measure the true Brinell Hardness Number).

Steve Brooks, P.O. Box 105, Big Timber, MT 59011

Ph: (406) 932-5114

Comments: Maker of Tru-Bore bullet single cavity, lathe boring, cast-iron moulds.

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Characteristics of Casting Materials and Alloys:

<u>Composition/mixture (%) - See note below</u>	<u>Brinell Hardness</u>	<u>Shrinkage (relative</u>	
<u>tin (Sn):antimony(Sb):lead (Pb)</u>	<u>Number (BHN)</u>	<u>to linotype) (b)</u>	
0:0:100	Pure lead	5 (a,d)	-.002"
2.5:0:97.5	1 part tin to 40 parts lead	8.5 (e)	?
0.5:4:95.5	Wheel weights - See note below	9 (c,d,e)	-.001"
3:0:97	1 part tin to 30 parts lead	9 (e)	?
5:0:95	1 part tin to 20 parts lead	10 (a,e)	-.0015"
6:0:94	1 part tin to 16 parts lead	11 (e)	?
9:0:91	1 part tin to 10 parts lead	11.5 (d,e)	?
3:2.5:94.5	Electrotype	12	?
5:5:90	Lyman #2 alloy - See note below	15 (a,d,e)	-.0005"
2:6:92	1 part lead to 1 part linotype	15 (e)	?
2:6:92	Taracorp's magnum alloy	15 (e)	?
2:6:92	"DB" alloy	16 (c)	?
2:6:92	Taracorp's magnum alloy	16 to 17 (a)	?
2:7:91	Used by National Bullet Co.	18	?
2:7.5:90.5	Used by Ballistic Advantage	18	?
3:8:89	"SB" alloy	19 (c)	?
4:12:84	Linotype	22 (c,e)	?
5:10:85	Linotype	22 (a)	?
3:11:86	Linotype	22 (d)	?
5:12:83	Linotype	? (b)	.0000"
6:14:80	Stereotype	23 (e)	?
9:19:72	Monotype	28 (e)	?

a) From the Redding catalog, b) Hensley and Gibbs mould brochure, c) Action Bullets Inc. casting alloys, d) Lyman Cast Bullet Handbook, e) Lyman #47 Reloading Handbook

Notes:

- Tin (Sn) does make lead a little harder but its main function is to give it “fluidity”, i.e., it allows the alloy to flow properly and fill all corners and grooves of the mould.
- Antimony (Sb) greatly increases the hardness of the tin/lead mixture.
- Depending on the manufacturer, wheel weights will vary in composition, and in hardness from BHN of 8 to 13.
- Lyman #2 alloy formulas (also known as Ideal #2 alloy): 9 lb. of wheel weights and 1 lb. Of 50/50 solder (50% tin - 50% lead); or 4 lb. of pure lead, 5 lb. of wheel weights, and 1 lb. of 50/50 solder.
- Most lead alloys contain less than 1% of trace elements of one or more of the following: copper, zinc, iron, and arsenic.

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Sources of Casting Metals and Alloys:

As previously noted, one source of low-cost casting lead alloy is used wheel weights. I called several tire stores in my hometown. Most were willing to sell their used wheel weights. The chain stores usually ship it back to their main warehouse and would sell to me to avoid the hassle. Another source of alloying material is 50/50 solder (50% tin/50% lead). Dealers of hardware and plumbing supplies usually keep some on hand. I found if I bought at least 20 to 25 1-lb rolls from a plumbing supply house I could get up to a 45% discount from the single roll price. Due to the discounted price I paid less for the tin content than buying pure tin bars through the mail, and the lead came as a bonus. Local gun and reloading shops will usually keep a supply of lead ingots. Plumbing supply houses may also be a source of pure lead ingots. A local plumbing supplier ordered lead ingots slightly cheaper than I could mail order from the closest lead foundry. One plumbing supplier had ¼” lead sheets in 4-ft. by 20-ft. rolls, and would cut off what you needed. Another excellent source of pure lead is X-ray shielding companies. These can be found in or close to large cities, and will sell scrap pure lead at very attractive prices. If you’re fortunate to live close to a lead foundry you have a cheap and ready source, but may have to purchase a minimum amount. Some foundries will also ship smaller quantities, i.e., 50 to 100 lbs. Note, the UPS rates are much higher for packages over 50 lbs. And don’t forget metal scrap yards. Ask for scrap sheet lead from old x-ray equipment. Spend some time on the phone checking out local companies. You’ll be surprised at the wide range of prices and number of sources.

Accurate Bullet Co., 159 Creek Road, Glen Mills, PA 19342

Ph: (610) 399-6584, Fax: ?

Comments: CBs, moulds, brass, casting alloys, lube and other reloading supplies.

Action Bullets Inc., 1811 West 13th Avenue, Denver, Colorado 80204

Ph: (303) 595-9636, Fax: (303) 595-4413

Comments: Sells casting metals and alloys. Also sells CBs for handguns and black powder, and bullet lubricants.

Art (Arthur) S. Green, M. A., 485 South Robertson Blvd., Beverly Hills, CA 90211

Ph: (310) 274-1283 (work), (213) 651-0675 (residence)

Comments: Supplier of casting metals and information on casting.

Brass & Bullet Metals, P.O. Box 1238, 340 N. Lenzner Ave., Sierra Vista, AZ 85636

Ph: (520) 458-5321, Fax: (520) 458-1421

Comments: Supplier of brass, lead casting supplies, lead, tin, linotype, and antimony. Owner is William (Bill) Ferguson who is a metallurgist and has been selling brass, lead, and lead alloys for many years. Bought the casting portion of Leading Edge Tool Service (LETS) in 1993.

The BulletWorks, Breckenridge, TX
 Ph: (254) 559-155, Email: mitch5@kroo.com
 Comments: Sells lead alloys

C. J. Ballistics, Inc., P. O. Box 132, Acme, WA 98220
 Ph: (206) 595-5001, Fax: (206) 595-6023
 Comments: Sells casting alloys. Also supplies cast pistol and rifle bullets and CBs for black powder.

Douglas Lead, 2519 Winnequah, Dallas, TX
 Ph: (214) 637-0843
 Comments: Business is radiation shielding products and services. Will sell scrap pure sheet lead. Located at Loop 12 and Interstate 30, about 8 miles west of Dallas

GAR, 590 McBride Ave., West Paterson, NJ 07424
 Ph: (201) 754-1114, (201) 742-2897
 Comments: Sells bullet casting metal, fluxes, casting thermometers, bullet lubes, general reloading supplies, and bullet moulds from Lyman and SAECO.

Holt Precision, 3206 Main St. #103, Rowlette, TX 75088
 Ph: (214) 475-4176
 Comments: Sells tin ingots and lead sheets.

John Walters, 500 N. Avery, Moore, OK 73160
 Ph: (405) 799-0376
 Comments: Sells lead alloys and pure tin in one lb bars.

Meister Bullets Inc., 4112 E. Winslow Ave., Phoenix, AZ 85040-1742
 Ph: (602) 470-1880, Fax: (602) 470-0494
 Comments: 2:6:92 alloy ingots for hand casting. Also sells cast pistol and .45-70 bullets.

Midway, 5875 W. Van Horn Tavern Rd., Columbia, MO 65203
 Ph: (800) 243-3220, (800) 243-2506, Fax: (314) 446-1018
 Comments: Sells 2:6:92 casting alloy ingots. Midway is a national wholesale full-line distributor and catalog retailer of shooting and reloading supplies.

MI-TE Bullets, 1396 Ave. K, Ellsworth, KS 67439
 Ph: (785) 472-4575, Fax: (785) 472-5579
 Comments: Sells casting alloys, limited cast pistol and 45cal rifle bullets, and SPG lubricant.

NELCO (New England Lead Burning Company, Inc.), 4600 Homestead Rd., Houston, TX 77028
 Ph: (713) 675-3266
 Comments: Business is radiation shielding products and services

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Sources of Gas Checks, Wads, and Wad Punches:

Buffalo Arms Co., 99 Raven Ridge, Sandpoint, ID 83864
 Ph: (208) 263-6953, Fax: (208) 265-2096, Web: <http://www.buffaloarms.com/>

Comments: Supplier of casting and reloading and shooting products. Main focus is on black powder and BPCR. Good supplier to order from if into BPCR shooting or competition. Source of Fred Cornell wad punches, John Walters' and King vegetable fiber wads. Also sells the Rand Elite shoulder recoil pad.

Fred Cornell Custom Shooting Accessories, RD #2-14 Stover Acres, Sayre, PA 18840

Ph: (570) 888-9236

Comments: Makes precision wad punches that are threaded to fit standard reloading presses. Also sells paper patch tail cutters and special BPCR cartridge cases. Punches are also sold through Buffalo Arms.

Gunpowder Enterprises, 4314 Dale Williamson Rd., Union, KY 41091

Ph/Fax: (859) 689-5100, Web: www.circlefly.com

Comments: Larry Smith, owner of Gunpowder Enterprises and Circle Fly. Supplies **Circle Fly** brand over-powder pre-cut vegetable fiber wads for various calibers and a variety of thicknesses.

Hornady Manufacturing Co., P.O. Box 1848, Grand Island, Nebraska, 68802-1848

Ph: (800) 338-3220, (308) 382-1390

Comments: Hornady is a full-line manufacturer of reloading equipment, bullets, and cartridges. Gas checks for various calibers are sold through retail stores, wholesale distributors, and catalog retailers of reloading supplies.

John Walters, 500 N. Avery, Moore, OK 73160

Ph: (405) 799-0376

Comments: Sells Walter pre-cut vegetable fiber wads (any caliber, any thickness). Also sold through Buffalo Arms. Also sells lead alloys and pure tin.

King Machine Service, P. O. Box 368, Kila, Montana 59920

Ph: (406) 755-5352

Comments: Owner John King is a custom BPCR gunsmith. He also sells King wads and LDPE and Vegetable Fiber wad material in .03 and .060 thickness in caliber .38, .40, and .45. Also sold through Buffalo Arms.

RCBS, (a division of Blount, Inc.), 605 Oro Dam Blvd., Oroville, CA 95965

Ph: (800) 533-5000

Comments: A well-known manufacturer of casting equipment, moulds, bullet lubricants, and reloading equipment. Gas checks for various calibers are sold through retail stores, wholesale distributors, and catalog retailers of reloading supplies.

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Bullet Lubricant Suppliers:

Note: The following list includes manufacturers, distributors and mail order retailers of bullet lubricants. Most full-line distributors and retailers of shooting, reloading, and casting equipment also sell bullet lubricants.

Action Bullets Inc., 1811 West 13th Avenue, Denver, Colorado 80204

Ph: (303) 595-9636, Fax: (303) 595-4413

Comments: Supplies Whiteman's high temperature solid and hollow stick lubricant (45% commercial beeswax, 45% Paraffin, 10% Action Bullet Formula). Also sells pure lead, tin, linotype and casting alloys plus CBs for handguns and black powder.

Alox Corporation, P.O. Box 517, Niagara Falls, NY 14303

Ph: (716) 282-1295, Fax: (716) 282-2289

Comments: Alox Corp. main business is in the production of commercial rust preventatives. Alox produces Alox 2138F (solid) and Alox 606-55 (liquid), among other products. Several years ago the NRA experimented with bullet lubricants and determined that a 50/50 mix of Alox 2138F and pure beeswax made an excellent lubricant. This is referred to as made “to the NRA formula”. Some consider it the best high-velocity bullet lubricant available today (good up to 3000 fps). Alox also sells Alox 606-55 that originated as and is still sold as a protective metal surface coating or rust preventative. Alox 606-55 contains 55% Alox 606 (solid) and 45% mineral spirits. Alox 606-55, sold by Lee Precision Inc. and Lyman Product Corp., is a liquid that leaves a soft, varnish-like lubricating film on the bullet after drying.

American Bullet Co., (previously called the Accurate Bullet Co. 12/96),

159 Creek Road, Glen Mills, PA 19342, Ph: (610) 399-6584, Fax: ?

Comments: Specializes in bullets for black powder shooting. Supplies bullet lube: SPG in sticks, Drop Kick Bullet Lube (DBL). Also supplies paraffin or beeswax wad material, casting flux, and mould prep.

Brownells, Inc., 200 South Front Street, Montezuma, IO 50171

Ph: (515) 623-5401, Fax: (515) 623-3896

Comments: Catalog wholesale and retail sales of gunsmithing and shooting supplies. Also sells Javelina brand “super lube” and NECO moly (molybdenum disulfide based) dry powder lubricant kit.

Cabela’s, One Cabela Drive, Sidney, Nebraska 69160

Ph: (800) 237-4444, Fax:

Comments: Catalog retailer of casting, reloading, and shooting supplies. Sells several brands of lubes including Bullet Slide (moly - molybdenum disulfide based) and Ms. Moly aerosol moly spray, all Lyman’s, and SPG.

GAR, 590 McBride Ave., West Paterson, NJ 07424

Ph: (201) 754-1114, (201) 742-2897

Comments: Sells bullet lubes (probably from a specialized lube supplier). Also sells bullet moulds, bullet-casting metals, casting thermometers, and general reloading supplies.

Green Bay Bullets, P.O. Box 10446, Green Bay, WI 54307

Ph: (414) 490-8986, Fax: (414) 490-9653

Comments: Sells a MoS₂-based (Molybdenum Disulfide) lube in 1? x 4? solid sticks. Also sells hand cast pistol, rifle and black powder bullets.

Javelina Lube Products, P.O. Box 337, San Bernadino, CA 92402

Ph: (909) 350-9556

Comments: NRA formula of 50% Alox 2138F and 50% pure yellow beeswax soft lube in solid or hollow sticks. Also sold through Brownells’ gunsmithing and shooting supply catalog and Mount Baldy Bullets, Inc.

KG Products, 537 Louis Dr., Newbury Park, CA 91320

Ph: (800) 348-9558 Fax: (805) 499-4372 Web: www.kgproducts.net/bulkote.htm

Comments: KG Products, selling moly coatings for over 40 years for industrial and military applications, offers coating and kits for bullet coating. KG provides “private labeled” product to Midway and others. Products are: Bullet Kote to moly coat bullets using a dipped or spray process (can be baked for a harder coating); KG-7 powder to coat bullets using vibrating impact techniques; KG-6 Moly Bore Prep using a patch to apply to gun bores. Also available are a Bullet Kote Pro Starter Kit and a “Pill Box” tumbler kit (to eliminate having to dedicate a tumbler bowl for moly coating).

Knoell BPBL-3 (Douglas L. Knoell), 9737 McCardle Way, Santee, CA 92071

Ph: (619) 449-5189 (Mon. thru Fri. after 7:00 pm Pacific time)

Comments: BPBL-3 has been used by the '98 Raton winner, and used by the 2nd place winners in '96 and '97.

Lee Precision Inc., 4275 Hwy. U, Hartford, WI 53027

Ph: (414) 673-3075, Fax: (414) 673-9273

Comment: 4 oz bottle of liquid Alox. NRA formula soft Alox beeswax mix in hollow sticks.

Lee Shaver Gunsmith, 559 NW 7th Rd., Iantha, MO 64759

Ph: (417) 682-3330

Web Site: www.egunsmith.com

Comment: Black powder Moly Lube in stick or bulk form. Sells services, supplies, and parts for black powder cartridge rifles. I spoke with Lee on 7/9/99. He said that Lyman's B-P moly lube had much more moly and was messier than his. Also his produced better results. Also sold by Mid-Kansas Cast Bullets.

Liberty Shooting Supplies / Liberty Bullets, P.O. Box 357, Hillsboro, OR 97123

Ph: (503) 640-5518

Comments: Small 2-person company (Patrick and Victoria Gilbert) using single-mould manual machines or hand casting pistol and rifle bullets with emphasize on quality. Also bullet lubes.

Lyman Products Corp., 475 Smith St., Middletown, CT 06457

Ph: (860) 632-2020, Fax: (860) 632-1699

Comment: Super Moly soft lube and Black Powder Gold moly (molybdenum disulfide based) bullet lubes. Orange Magic hard lube - Alox and Ideal soft lube, and a 4 oz bottle of liquid Alox. Hard and soft lubes come in 1&1/4 oz. hollow sticks. Moly tumbler kits, moly spray, and moly bore cream. Lyman also sells a fixed wattage lubricator heater (may be able to vary wattage using a light dimmer - see note under LBT above); sizer/lubricator, sizer dies, and top punches. Sizer dies and top punches also fit RCBS lubricator.

Magma Engineering Co., P.O. Box 161, Queen Creek, AZ 85242

Ph: (602) 987-9008, Fax: (602) 987-0148

Comments: Manufacturer of solid, hard, wax-based bullet lube in red, blue or green color. Also sells automated bullet casting machines, moulds, lubing machines, Star brand hand bullet lube and resizer, and associated supplies.

Mid-Kansas Cast Bullets, PO Box 455, Great Bend, Kansas 67530

Ph: (316) 792-4658, Fax: (316) 792-3373, Web: www.mkcb.com

Comments: Supplier of a wide variety of CBs for smokeless and BPCR, and several lubes including SPG, Shaver's Black Powder Moly, and 4 types of Thompson lubes.

Midway, 5875 W. Van Horn Tavern Rd., Columbia, MO 65203

Ph: (800) 243-3220, Fax: (314) 446-1018

Comments: Full-line wholesale distributor and catalog retailer of casting, reloading, and shooting supplies. Sells several brands of lubes including a moly powder application kit (this moly powder is the cheapest I've found) and Moly Bore Prep. Reportedly sells Ms. Moly brand aerosol moly spray. Also sells a thermostatically controlled lubricator heater.

MI-TE Bullets, 1396 Ave. K, Ellsworth, KS 67439

Ph: (913) 472-4575, Fax: (913) 472-5579

Comments: Sells SPG lubricant, casting alloys, limited cast pistol and 45cal rifle bullets.

Moly-Bore

Ph: (888) 400-6659, Web: www.molybore.com

Comments: Moly (molybdenum disulfide based) dry powder lubricant kits for bullets.

Montana Armory,

Ph: (406) 932-4353

Comments: Black powder cartridge lube (BPCL). Also sold by Montana Precision Swaging (See cast/swaged bullet list).

Ms. Moly, Box 275, Burlington, WI 53105

Ph: (800) 264-4140, (909) 346-2304

Comments: Sells Ms. Moly (molybdenum disulfide based) spray coating/lube in a 16 oz. aerosol can. Also sells a kit with two cans and applicator hardware. Says they sell to Midway and Sinclair International.

NECO (Nostalgia Enterprises Co.), 1316 67th St., Emeryville, CA 94608

Ph: (510) 450-0420, Fax: (510) 450-0421

Comments: Has a large supply of Taurak (old NEI Hawkeye) hard lube in hollow or solid stick. Also sells a bullet molybdenum disulfide ("moly" or MoS₂) and carnauba wax coating/lubricating process that can be used with jacketed or CBs. The lubricant is applied using a cartridge tumbler employing hardened steel shot as a medium to "impact plate" the moly coating onto the surface of cast or jacketed bullets. NECO also sells barrel fire lapping kits; reloading components and other lubricants.

Precision Bullets, 1922 C. West Pioneer Parkway, Arlington, TX 76013

Ph: (817) 469-8893

Comments: Listed here because they sell CBs with a special black polymer-based dry lube, which reportedly will not burn off and the bullets do not smoke when fired, or lead the barrel. The coating melts at 2700 degrees. Precision claims that since the coating does not burn off there are no lead vapors to be inhaled when the gun is fired. The coating also eliminates any possibility of lead absorption through the skin while handling the bullets. The coating material is not available as a separate item and my guess is it's a moly (molybdenum disulfide based) lubricant coating.

RCBS, (a division of Blount, Inc.), 605 Oro Dam Blvd., Oroville, CA 95965

Ph: (800) 533-5000

Comment: Soft rifle and pistol lubes in stick form are a blend of Alox and beeswax. Also makes the Lube-A-Matic-2 sizer/lubricator, sizer dies, and top punches. Sizer dies and top punches also fit Lyman's lubricator.

Redding/SAECO, 1089 Starr Rd, Cortland, NY 13045

Ph: (607) 753-3331, Fax: (607) 756-8445

Comments: Gold soft pistol and rifle lube (no Alox). Traditional soft rifle lube of Alox and beeswax mix. Green rifle and pistol lube slightly harder than gold and traditional. All lubes are available in solid or hollow sticks. Also sells a lubrisizer, sizing dies, top punch's, SPG PS Black Powder lube -- see comments under SPG Lubricants.

Rooster Laboratories, P.O. Box 412514, Kansas City, MO 64141

Ph: (816) 474-1622

Comments: Zambini Red hard (220°F) commercial, softer but still hard HVR (220°F) high-velocity pistol and rifle lube solid or hollow sticks that melt at 220°F; Rooster Jacket liquid pistol lube that dries to a clear, hard

waterproof film; other black powder and cartridge case lubes; brass cartridge polish that sounds like the stuff that Midway sells. Note, also sells a lube-sizer heater with adjustable thermostat with lifetime warranty.

Sinclair International, Inc., 2330 Wayne Haven St., Fort Wayne, Indiana, 46803

Ph: (291) 493-1858 Fax: (219) 493-2530

Comments: Reloading and shooting products for the precision shooter. Reportedly sells Ms. Moly brand aerosol moly spray.

SPG Lubricants Inc., P.O. Box 761, Livingston, MT 59047

Ph/Fax: (406) 222-8416

Comments: SPG lube is primarily intended for black powder cartridge shooting. It is the standard that other black powder lubes are compared to. More matches have been won with SPG than any other lube. It can be purchased from SPG directly or from Redding/SAECO, Old Western Scrounger (full-line distributor), Montana Precision Swaging, and Mount Baldy Bullets, Inc. (See cast/swaged bullet list). Cast Performance Bullet Co. indicated that SPG tends to start leading the bore around 1400 fps. Can also order the **SPG Lubricants BP Cartridge Reloading Primer** by Mike Venturino and Steve Garbe.

Tamarack Products Inc., Box 625, Wauconda, IL 60084

Ph: (847) 526-9333, Fax: (847) 526-9353

Comments: Sells a lube consisting of 50% Alox 2138-F & 50% hi-temp wax with melting points up to 200°F. Also sells the "NRA" formula of 50% alox 2138-F with 50% commercial A-1 beeswax. Available in hollow sticks, solid sticks, 12 oz. tubs, and in bulk cans of 4 lbs. and 30 lbs.

Thompson Bullet Lube Co., P.O. Box 472343, Garland, TX 75047-2343

Ph: (972) 271-8063, Fax: (972) 840-6743

Comments: Line of hard stick lubes: Bear Lube Cold - 90°, Bear Lube Heat - 110°, Blue Angle - 125°, Red Angel - 145°, and PS Black Powder Cartridge Lube (Soft stick lube). Also sells a black-powder patch lube and plans on offering prelubed patches for black powder shooters. Owner is Dave Thompson. Also sold through Mount Baldy Bullets, Inc., (See cast/swaged bullet list).

Western Bullet Co., PO Box 998, Missoula, MT 59806-0998

Ph: Fax: Web: <http://missoula.bigsky.net/western/index.htm>

Comments: Main business is cowboy revolver and rifle CBs. Also Sells bullet lubes from Rooster Labs., Lyman, and SPG.

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Sources of Beeswax:

Kevin Miller

Web: <http://hometown.aol.com/kmiller170/myhomepage/business.html>

Comments: Click on the above address and send Kevin Miller an email indicating how much you need. I believe he is a beekeeper since you can also order honey. Click on the "send me an email" in the bottom right hand portion of the AOL screen. His email is kmiller170@aol.com.

Dadant & Sons Inc., 51 South 2nd, Hamilton, Illinois, 62341.

Ph: (800) 637-7468, (214) 847-3324, Fax: (217) 847-3660, Web: <http://www.dadant.com/>

Comments: Dadant is a well-known supplier of beekeeping products. They also sell bulk beeswax. I could not find it in their web site, so I called for prices and confirmed availability.

Web-based listing:

Web: <http://www.honeyonlin.com/>

Comments: web site with links for beeswax suppliers by state.

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Homemade Lube Formulas and Notes:

If you are considering experimenting with home made bullet lubes you should have a copy of Ralph Schneider's 28 page paper Cast Bullet Lubricants, covering lube formulas and ingredients. Ralph's thorough research will help you avoid wasting time on recipes and formulas, which do not work, and save you additional time researching the subject. Send \$3.00 to Ralph Schneider, S. 15200 County Rd. FF, Eleva, WI 54738 or download his article via the internet for \$5.00 at

<http://www.hanned.com/~hanned/webc.cgi/~hanned/download.html>.

Lubing tips:

- When applying lube in cold weather, keep bullets warm (about 70? - 85?F) so the lube can bond to the lead before it hardens. Bullets must be clean and dry. Silicon, oil or grease on the surface will prevent the lube from bonding.
- Try "pan lubing" using homemade lubes. Stand bullets in a shallow pan and pore melted lube around then up to height of the lube grooves. Put the pan in the oven for a few minutes at 200 degrees to insure the bullets and lube are at the same temperature. Allow lube to harden, then turn pan upside down and the whole mess will come out like a layer cake. Punch bullets out with thumb. Lubricant will remain in grooves. See homemade lube formulas on following pages.

From the Hoch custom bullet moulds catalog:

- Buck Emmert's Lube Formula (makes 1/2 lb. of lube)
 - 1750 grains of processed beeswax*
 - 1368 grains of Crisco shortening (White -- do not use butter flavor)
 - 328 grains of Crisco oil (100% soybean) or Wesson vegetable oil
- Barry Darr's Lube Formula - A great lube for pan lubing bullets. See modified version below.
 - 1 lb. paraffin, 1 lb. Vaseline, 2 tbsp. RCBS case lube (may also use STP)

From Barnett's bullet mould catalog:

- Dean Miller Lube (Dean Miller of Miller Arms, Onge, SD)
 - 1/2 lb. of beef tallow
 - 1/2 lb. processed beeswax*
 - 1 tbsp. of high sulfur cutting oil. The oil is used by plumbers, is black in color and stinks.
- Modified Darr lube- Excellent results up to 1500 fps, and near 90? temperature, with the only problem being that it melts in the sun or hot weather.
 - 4-1/2 oz. paraffin, 4-1/2 oz. Vaseline, 2 oz. (2 tbsp.) RCBS case lube (can also use STP)

The following formula is from one of Paul A. Matthews' book, How-To's for the Black Powder Cartridge Rifle Shooter. He says it gives excellent results. Paul says "It will not melt in the sun, yet continues to give good performance when freezing temperatures are in the single digits. It is very soft and sticky and has a bad habit of sticking to your fingers instead of the bullet when you seat the bullet in the cartridge case. It also turns dark with exposure, but this in no way impairs its effectiveness. For my money, despite these few minor faults, it is one superb bullet lubricant for use in the black powder cartridge rifle." This lubricant works great in a

lubrizer. It is not suitable for pan lubing. Probably the simplest way to make the lube is to mix an 8-ounce batch in a microwave oven.

Basic recipe:

Yellow beeswax	2 parts (ounces avdp.)
Pure neatsfoot oil	1 part (fluid ounces)
Murphy's Oil Soap	1 part (fluid ounces)

1. Fully melt 4 ounces of beeswax in a Pyrex measuring cup.
2. Thoroughly stir in 2 fluid ounces of pure neatsfoot oil until there are no lumps. **Do not use neatsfoot compound.**
3. Add 2 fluid ounces of Murphy's Oil Soap and continue to stir until all lumps are gone.
4. Pour into container and allow to harden.
5. For 8 lbs. of lubricant use 4 lbs. of beeswax, 1 qt. each of Neatsfoot oil and Murphy's Oil Soap.

Note: You may notice that as soon as the Murphy's Oil Soap is added, the mixture turns a light cream color. It may also boil up violently when the soap is first added. This is caused by a chemical reaction of caustic soda in the soap, an action known as saponification, which significantly raises the melting point of the mixture and gives it a smooth, soapy texture. There are several other recipes that use soap such as Kirk's Castile

***REMOVING IMPURITIES FROM RAW OR NATURAL BEESWAX:**

Raw, natural or unprocessed beeswax has impurities in it such as rosin, sugar (honey), dirt, etc., which must be carefully removed by straining and/or other methods. "Pure" beeswax, also referred to as processed beeswax or food-grade beeswax, has rosin and other impurities removed. Sometimes it is also referred to as commercial A-1 beeswax. Pure beeswax is a mixture of about 80% true wax; the balance is free fatty acids and alcohols.

Straining: Proper straining removes the majority of impurities. To strain raw beeswax, melt and pour it through fine woven cheesecloth type material or T-shirt material (if not woven too tightly to prevent wax from passing through).

Precipitation process: Additional impurities, too fine for straining to eliminate, can be removed using a precipitation process. After straining natural beeswax, but before using it to make lube, melt it in a pan of water (10% to 20% water) and add 2 tbsp. or so of vinegar per quart. Stir, cover, and allow to cool slowly. After it cools, run a knife around the top edges between the wax and pan. If you then refrigerate the wax, it will separate from the edge of the pan for easy removal. Remove and scrape off the crud from the bottom of the cake. Repeat if necessary to remove additional impurities.

Combining straining and precipitation: Another method is to combine the straining and precipitation process. Line the pan with the straining cloth before adding the raw wax. Add water and heat till wax is melted. Add 2 tbsp. or so of vinegar per quart and stir. Slowly lift and remove the straining cloth, allowing the hot wax solution to pass through it. Let the wax cool slowly and follow the rest of the steps in the precipitation process above.

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Affiliated Associations:

Cast Bullet Association, Inc., 203 E. 2nd Street, Muscatine, IA 52761-4006

Ph: (309) 537-3662 (Ronald Klerk De Reus)

Web: <http://www.castbulletassoc.org/>

Comments: The CBA is a worldwide organization of approximately 2000 shooters who cast and shoot their own lead alloy bullets for hunting and target shooting. They publish a semi-monthly journal called The Fouling Shot.

The CBA address and phone number will change as the membership officer changes. It is usually his/her home address. Ronald Klerk De Reus is the current Membership Officer.

Lead Industries Association Inc., 13 Main Street, Sparta New Jersey 07871

Ph: 1-800-922-LEAD, (973) 726-5323, Fax: (973) 726-4484

Contact: Jeff Miller

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Books, Periodicals, Reference Material:

Jacketed Performance with Cast Bullets by Veral Smith.

Comment: The book may be hard to find since Veral is no longer in the CB business.

Lyman Products Corp, 475 Smith St., Middlefield, CT 06457

Ph: (800) 225-9626

Comments: **Cast Bullet Handbook, Reloading Handbook**, Also available through book suppliers and local firearm and reloading retailers.

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BPCR Reference Material:

The Single Shot Exchange, 67 North Congress St., York, SC 29745

Ph: (803) 628-5326. Email: singleshotex@earthlink.net

Comments: **The Single Shot Exchange** magazine is a monthly journal and emporium devoted to antique and classic firearms.

SPG Lubricants Inc., P.O. Box 761, Livingston, MT 59047

Ph/Fax: (406) 222-8416, www.blackpowderspg.com, spg@cody.wtp.net

Comments: **SPG Lubricants BP Cartridge Reloading Primer** by Mike Venturino and Steve Garbe.

Published by Cal Graf, P.O. Box 306, Big Timber, MT 59011, and the **Black Powder Cartridge News**, published four times per year with excellent articles on BPCR.

Wolf Publishing Co., 6471 Airpark Dr., Prescott, AZ 86301

Web: <http://www.riflemagazine.com/>

Comments: The following books by Paul A. Matthews: **How-To's for the Black Powder Cartridge Rifle Shooter, Cast Bullets for the Black Powder Cartridge Rifle**, and **Forty Years with the .45-70**

Wolf Western Traders, 40 E. Works, #3F, Sheridan, WY 82801

Ph: (307) 674-5352

Comments: **Loading Cartridges for the Original .45-70 Springfield Rifle and Carbine**, 2nd edition, by J. S. and Pat Wolf

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Paper-Patched Bullet Reference Material:

Bruin Bullets, 3712 Main St., Box 410, Walworth, NY 14568

Ph: (315) 986-8811

Comments: **The Making and Loading of Paper Patch Bullets** by Mark Hilliard. Mark is the owner of Bruin Bullets.

Wolf Publishing Co., 6471 Airpark Dr., Prescott, AZ 86301

Web: <http://www.riflemagazine.com/>

Comments: **The Paper Jacket** by Paul A. Matthews

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