Gun Digest®

BIG FAT BOOK of the .45 ACP

Patrick Sweeney

Gun Digest®

BIG FAT BOOK of the .45 ACP

Patrick Sweeney

Gun Digest® Books
An imprint of F+W Media, Inc.
700 East State Street • Iola, WI 54990-0001
715-445-2214 • 888-457-2873
www.gundigestbooks.com

Our toll-free number to place an order or obtain
a free catalog is (800) 258-0929.

Library of Congress Control Number: 2009923228

ISBN-13: 978-1-4402-0219-3
ISBN-10: 1-4402-0219-2

Designed by Dustin Reid
Edited by Dan Shideler

Printed in the United States of America

DEDICATION

As always, to Felicia. You can thank her for my meager skills at writing and the fact that my spell-checker and grammar software does not explode before my editor gets this.

To Dan Shideler, who goes through the text and makes sure I don't repeat my jokes too often and that the package arrives on time.

And to two fellows with unending interest: Charley and Oberon. From the amount of talking I've done while walking them, on this and other books, you'd think they would understand it by now. But they don't, they just wag their tails and look longingly at the squirrels I won't let them chase.

CONTENTS

ACKNOWLEDGMENTS

The firearms industry, except where the people in charge aren't really firearms people, is surprisingly free and easy with information. You can ask a question of someone in the biz, and unless what you asked concerns a proprietary process that the maker spent a lot of money to figure out, you'll usually get an answer. If it's something that a real goof could get himself in trouble knowing or attempting, the engineer, ballistician or a PR guy might remain a bit closed-mouth about it.

But a whole lot is out there to be known, if you just ask.

In the course of writing this book I worked with many in the ammunition and firearms manufacturing industries. Among them, Jason Nash at ATK, Steve Johnson at Hornady, Ken Alexander, Fernando Coelho now of Eotac gear, Peter Pi and Mike Shovel of Cor-bon and Hunter Pilant of Starline as well as his dad, Carroll Pilant, from Sierra.

I'd also like to thank the folks at both Lapua and Sako for giving me a tour of their ammo-making plants while on vacation in Finland. The very idea of allowing a technically-educated person loose in a manufacturing plant with camera and notebook strikes fear in the hearts of many an American MBA or business consultant. But the Finns are made of sterner stuff. (Just ask the Soviets.)

I'm sure there are technical details that I've left out, at least "left out" where the desires of some readers are concerned. For instance, the subject of cast lead bullets and what they should be for various applications is quite useful—and more than this book was meant to be or could be. If you want the lowdown on that particular subject, you can either read Veral Smith's Jacketed Performance with Cast Bullets or wait until I do the planned handgun reloading book.

If you want to know just what the pressure limits are for the .45 ACP, so you can "take advantage" of all the "unused pressure capacity" of the .45, you really ought to lie down with a cold compress on your forehead. You won't find out how to magnum-ize the .45 here. Nor will you find it in the handgun reloading title to come. Some things are perfect as they are, and attempts to make them more are fraught with peril should be avoided.

An example comes to mind: I once met a fellow shooter who was inordinately proud of his truck. He had taken his beaten-up, high-mileage Ranger, and managed to wrestle a V-8 engine into it—a 351 Cleveland as I recall. He had shoehorned it into the engine compartment. "Yes, I had to trim the radiator and ducting, reroute the wiring, it needed bigger shocks and springs and the transmission had to be rebuilt. But boy does it run," he told me. And every time he goosed the throttle, the whole truck tipped and twisted on its suspension as the torque increased.

No, if you want that kind of performance, you should go to a different vehicle, be that vehicle a .44 Magnum or an F-150.

I did not begin my shooting and reloading with a .45 ACP. I started with a .38 Special and then branched over to the .357 Magnum before I owned my first 1911A1. But once I went to the big bore, I didn't look back for a long time. So thank you, gentlemen at Frankford Arsenal and John Moses Browning. If not for you, we'd all be the poorer.

INTRODUCTION

The Beginnings

There is a building in Rome called the Pantheon. I risk over-using the word "unique" (which doesn't seem to bother a whole lot of people these days) but it is unique in a whole host of aspects. First, it is perhaps the oldest building that has been in continuous use since it was constructed. Erected (actually re-built, but let's not quibble) in 125 A.D. by the Emperor Hadrian, it was built to house all the gods. Latin is a grand language, and much of English is based upon it. Many words we use today are recognizable Latin. Not that Julius Caesar would recognize what we speak, but many of the words remain the same.

Pantheon is a word derived from Greek, and in Latin means "of all the gods." The idea was to assemble shrines for all the gods into one building, instead of having each in their own temple scattered across Rome. There, the one-stop shopper could visit as many gods as needed to solve their particular problem. Not that the old temples were abandoned or torn down, no sirree. The others continued in use, but the Pantheon was meant to be a place for all of them.

The building itself is a construction and architectural marvel. It is a dome 142 feet across, made of cast concrete. Imagine a sphere with a diameter of 142 feet. Now, take the equator of that sphere and turn it into a cylinder, extending to the ground. That is the shape of the Pantheon. It is what architects call a "pure" building. You don't see many buildings shaped as cubes, nor rectangles of the golden proportion, but the Pantheon is a sphere perched on a cylinder. When it was made, it was the largest domed building made. Since then, there have not been a whole lot of domes built bigger. Five hundred years later, the church of Hagia Sophia was constructed in Constantinople. While taller, at 182 feet above floor level, its dome is smaller in circumference at 102 feet. It is bigger?

Some will argue yes, others no. In Florence in 1296, the city fathers began work on their magnificent new cathedral. By 1419 they had finished all but the dome, 42 meters in diameter (same as the Pantheon) over the otherwise finished building. Fillipo Brunelleschi won the competition to build a dome on the cathedral. Why did it take so long? Because at that time, no one had figured out how to make a dome that large. Brunelleschi solved the problem, but his dome isn't a dome like the Pantheon. It is actually eight arches leaning in on each other. Still, it is big, as wide as and taller than the Pantheon.

In 1547, Michelangelo took over work on the barely begun St. Peter's Basilica in Rome. When he was done, the dome design was finalized. It measures 136 feet in diameter, a few feet less than the Pantheon. It is much higher, however, as it rests on four immense pillars, such that the crest of the dome is 448 feet above the floor. It took almost 1,400 years to beat the Pantheon. I can't help but point out that the St. Peter's dome is not just a series of arches tipped in on each other like Brunelleschi's, but is actually a dome within a dome. Yes, Michelangelo cheated, making two domes in one to save weight. Yet, the Pantheon remains the largest spherical, cast concrete dome in the world. And it is not likely to be surpassed as other construction methods are less expensive and less massive.

The Pantheon exists, essentially unchanged since its creation, for a simple set of reasons. First, when Rome fell, the massive building was turned into a church. As such, it was exempt from the "salvaging" that took place in Rome (and across the Roman Empire) for a thousand years afterwards. The salvagers took blocks, marble and statues from existing, abandoned, pagan buildings, to build new structures. Palaces and churches all over Rome and elsewhere exist because they were put together from old Roman buildings. Also, the unitized construction of the Pantheon defied salvaging. The dome was and remains one large piece. You can't steal building materials from it. Since you can't disassemble the dome, you can't take anything out from underneath it. The statues, sure. They are gone. The floor suffered from the ravages of time and the great oculus., wich is a circular hole in the dome measuring 30 feet across. It lets in air and light, and also rain. The drains the Romans installed in the building obviously didn't get the maintenance they needed, and the floor had to be replaced over time

What has all this to do with the .45 ACP? Or anything firearms-related for that matter? Words mean things, and they have history. Have you ever heard someone (besides me) use the phrase "the whole pantheon?" That's where it comes from. Or maybe you've heard the usage "panoply?" Again, it is derived from Greek and Latin. In the shooting world, we have a whole panoply of cartridges. You can get a "bullet board" or "cartridge board" of all the calibers a maker offers. That is a panoply. It is the whole pantheon. Also, some things, once made, are difficult to improve upon, even over large expanses of time. Can you really improve on the .45 ACP?

Before you answer that, consider what it is and what function it serves. And then, calculate carefully the cost of any "improvement." Changes, if any, have come slowly, because the original design is so perfect, so exacting, so suited to the use for which it was intended, that it is hard to make improvements that are actual upgrades. Refinements? Sure. Details that proved troublesome over time and had to be corrected, you bet. But has there been an overhaul of the basic design? Nope.

What obscures all that is the sheer ubiquity of the .45 ACP. It can be found everywhere: pistols and revolvers, derringers, rifles of all types, self-loaders, bolt guns and I'm sure there was a pump-action rifle somewhere along the way. Submachine guns are famous for being chambered in .45 ACP. Like central heating, the .45 ACP is such a common feature of modern life (at least among the firearms-aware) that we take it for granted.

In the following tome we'll cover all the essentials, and let you in on the aspects of the .45 ACP that you might not have known. Having read this book I can't guarantee that you'll be a walking, talking encyclopedia of things .45 ACP, but if you aren't, it won't be my fault.

You will be able to go toe-to-toe with the .44 Special cognoscenti and the .44 Magnum diehards. The 9mm fans won't stand a chance, and reloaders all over town will be calling you up for advice. So, pour a cold, frosty root beer, settle in and get to work.

CHAPTER 1

In The Beginning...

To understand the context of the .45 ACP, you have to have a grasp of what was going on the time some refer to as “the good old days.” Let us hark back to the nostalgic days of the year 1900: no penicillin, no central heating, and no paved roads to speak of except in the biggest cities (and then most likely they were brick or cut stone), no radio, television, and no aircraft. By 1900 medical advances had progressed to the point where hospitals were actually places where one could expect to recover rather than simply a place to go die. But that doesn’t mean you’d enjoy a stay there any more than you’d enjoy a stay at a hospital today. Dentistry? Trust me, you don’t want to know. In the 1880s, George Eastman had begun selling cameras with roll film so glass plate technology was on the outs but still going strong. In 1900 the first Brownie camera appeared and sold for the affordable sum of one dollar. Adjusted for inflation, that comes to just over $24.50 in today’s dollars. Film (roll size 117) was manufactured for that Brownie until 1949.

John Moses *Browning's prototype Model 1905. That's right, he made them with a concealed hammer, for better weather-proofing. The Army wanted a hammer they could see.*

Movies were black-and-white, silent and not very common. (Not surprisingly, one of the most rapid adoptions of movie technology was to produce risqué movies. However, what was risqué in 1900 would be yawned at on network TV today.) Sigmund Freud published *The Interpretation of Dreams*, setting us on a century-long course of faddist psychology that lurched from one extreme to another, eventually producing whole battalions of "self-help" gurus to fleece the unwary. In 1900, Queen Victoria still sat on the throne of Britain. William II of Germany, the Czar of Russia (or, more exactly, Nicholas II, Emperor and Autocrat of all the Russians), the emperors of China and Japan and a whole slew of kings, dukes and random assorted nobles sat on various thrones in charge of pretty much the majority of the people on earth at the time. The Boxer Rebellion in China marked the high point of imperialist power in Asia, and from there it was all downhill. The world population (estimated, as there were still places no one who spoke a "civilized" language had gotten to) was 1.65 billion.

Smokeless powder had been in common use for less than a gen-

The 1905 prototype *that the Army gave the nod to, and which went on to become the 1911 we all know. Notice the lack of a thumb safety, a later addition requested by the Army.*

eration. The Winchester Model 1894, in .30-30, was all the rage, and the hot new .38 Special cartridge "greatly" improved on the ballistics of the "anemic" old .38 Colt. It upped the same round-nose lead bullet from 150 to 158 grains and its velocity from 700 to 850 fps. Automobiles were toys. They were ferociously expensive, not reliable and offered few advantages over horses. Nor were they easy to operate.

In 1900, a hurricane slammed through Galveston, Texas, leaving as many as 8,000 people dead. The Fauvist painting movement was begun by Henri Matisse. The Eiffel Tower was still brand-new, having been built in 1890, the same year Vincent Van Gogh committed suicide. (His brother was by 1900 having better luck selling Vincent's paintings than Vincent had been while alive, a phenomenon rediscovered much later by dissolute rock and roll singers.) Steamers were unloading thousands of immigrants a week at Ellis Island, opened in 1892. Having handed the Russians (and the Chinese) their heads in the 1895 war, the Japanese were aggressively building their fleet and Army, and doing their best to industrialize

The Radom P-35. *Despite the 1911 being around through the Great war, and for 20+ years, the Poles wanted a 9mm Parabellum pistol. They did, however, crib many ideas from Browning pistols.*

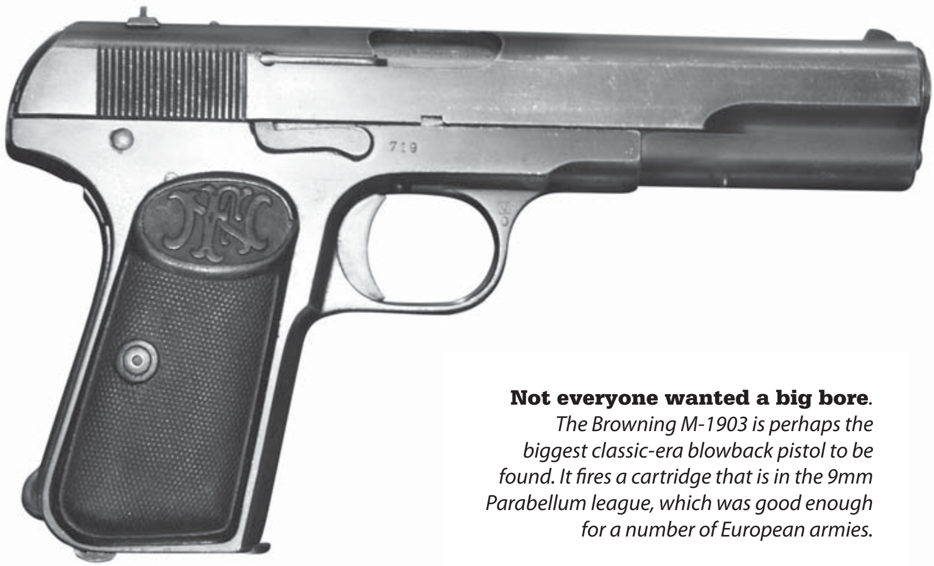
an island that had little coal or steel, no oil and no existing industrial base at the time. It would take nearly half a century more before that chapter of their history was fully played out.

In 1900, the last black member of the House of Representatives had lost his bid for re-election. George H. White served to the end of the 56th Congress, March of 1901. There was not another African-American in the building except as a waiter until Oscar DePriest began serving in the 71st Congress in 1929. (They were both Republicans, by the way.)

The U.S. Army was exasperated following their brief experiment with the .38 Colt and wanted something more. Having defeated the Spanish in 1898, the United States found that the occupants of their new possession wanted not just new landlords, but freedom. The Cubans acquiesced rather quickly to the new guys in charge, but not the Filipinos. The Philippine Insurrection was still going on in 1900, and still seemed hot to those involved. My grandfather was there, in the U.S. Army Medical Corp (called the Sanitation Corps back then) dealing with the effects of tropical diseases on his charges and no doubt the occasional combat wound. The Moros, as legend has it,

Instead of a handgun, *a PDW (Personal Defense Weapon) is to be the comfort at your side.*

Modern ideas *(at least NATO ideas) on defensive firearms have been changing. Now, troops are expected to depend on .20 caliber mini-rifle rounds, instead of something robust like a .45. Or will be soon, once the bureaucrats make up their minds.*



Not everyone wanted a big bore. *The Browning M-1903 is perhaps the biggest classic-era blowback pistol to be found. It fires a cartridge that is in the 9mm Parabellum league, which was good enough for a number of European armies.*

were able to soak up repeated hits from the new .38 handguns and the also-new .30-caliber U.S. Army Krag rifles, and kept on coming. What they couldn't take were impacts from the hurriedly reissued Colt revolvers in .45 and 12-gauge loads of buckshot, in many instances launched not from issued weapons but personally-owned Colt revolvers and Winchester shotguns. (Ah, for the good old days when at least officers could improve upon the inadequate tools issued them by the Army.) The realists in the Army wanted something that could actually get the job done in a pinch, something like the rifles that they had in .45 caliber. The dreamers wanted pistols, and pistols in .45 would be a real bonus.

No problem, you say, the arms world was replete with big-bore guns, right? Well, yes, if you were willing to stick with a Colt SAA. The problems there were many and well-known in 1900: it was only a five-shooter, it took a long time to reload and it had a bunch of small parts prone to breaking. Surely there were more options than that? Well, there was the Schofield, another single-action revolver, but at least one that was a bit faster to reload. There was the new British Webley. It was introduced in 1887, and by 1900 it had been improved to the Mk IV model. It was a robust gun and delivered a solid blow, though it was a tad "soft" in hitting power compared to what the U.S. Army already had. The .455 Eley cartridge booted a

265-grain bullet out the muzzle at a sedate 600 fps, compared to the .45 Colt and its 255-grain bullet at nearly 900 fps.

Which brings us to the real crux of the matter—the state of the military in most countries. Cavalry was the dominant force. Infantry did the work, artillery made noise, but it was the view of all that the cavalry won battles and wars. Cavalry could move fast, could beat anyone else and, by God, if they could teach horses to swim fast enough, even the Navy would have to admit that cavalry was superior. The commanding officers of most armies and many of the staff officers would have been cavalry officers. Offices in barracks and headquarters around the world would be decorated with stirring paintings of cavalry charges that won this or that battle. The main lesson everyone harped on was if you want to stop the cavalry, you have to stop the mounts. That means, unless you enjoy the prospect of being ridden down by a cavalry or lancer charge, you had better be packing something that will stop horses.

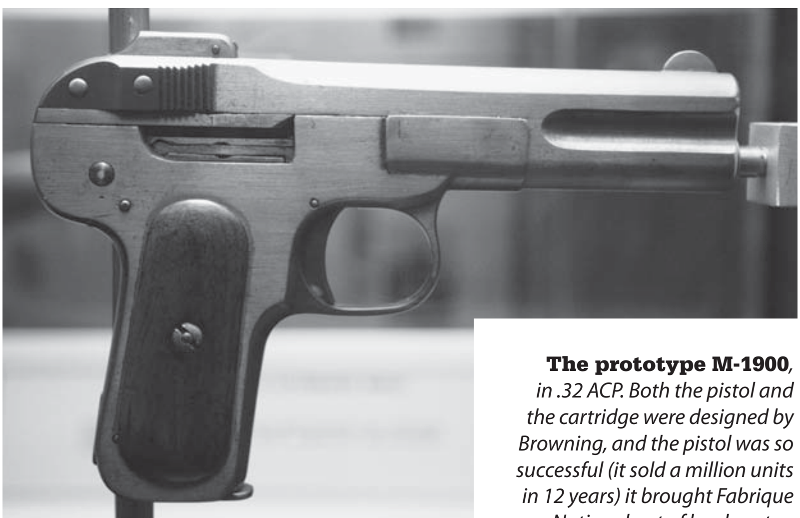
The typical European attitude *towards sidearms was that they were a badge of office. You did what the guy packing the pistol said to do. Fight with it? You've got to be kidding.*

One early contender *for cartridges was the pinfire (left). Imagine trying to design a self-loading pistol that used this ignition system.*

On the civilian side of things, the matter was viewed entirely differently. By 1900, the then-Governor of New York and soon-to-be Vice President Theodore Roosevelt had become famous. Yes, there was San Juan Hill and all that, but he had become famous before all of that when as the NYPD Police commissioner in 1896, he promptly started kicking butt and cleaning up the streets. Before, NYPD had been little more than an organized protection racket. There had been little training, supervision or oversight. But Roosevelt knocked heads, insisted on standards, faced down the corrupt and got the NYPD ready for the 20th century. Then he armed them.

Previously, officers bought their own sidearms, and there was no standard. He had the city purchase Colt revolvers, and that became the issue pistol. The Colt New Police wasn't a powerhouse, being chambered in .32 Colt Long. But it was a double-action revolver, and it was state-of-the-art at the time. The cartridge, however, was not exactly a magnum. At its best, it featured an 80-grain bullet launched at a vigorous 800 fps. Of course, in those pre-penicillin days, being shot was a likely source of infection, which would kill you dead after a long and painful "rest" if the bullet hadn't done so on impact. So, no one really wanted to get shot, though a lot did. However, many still recovered. Lest you think that the NYPD of the time were a bunch of Nancy Boys, the three most-common chambering of the Colt SAA were the .45 Colt, .44-40 (also known as the .44 WCF) and .32-20. That's right; a whole lot of cowboys packed .32 revolvers. The .32-20 wasn't exactly an engine of destruction either. It usually produced its 100-grain bullet at just under 1,000 fps. Out of a carbine it could be counted on for a blistering 1,200 fps.

Why the big differences? Again, time. In a "civilized" setting the criminal knows getting shot is probably going to be a painful way to die. And once wounded, he has to seek medical attention, something that is likely to get him arrested. Back then, there were no show up, get patched up and walk out emergency rooms. Go to a hospital or a local doctor with a bullet wound back then, and the police would surely hear of it. In fact, if a person showed up looking like a shifty character with a bullet wound, the doctor was apt to put you under until the police arrived and could slap the cuffs on. Then, on the ride or walk back to the station, the police circa 1900 were apt to beat



The prototype M-1900, *in .32 ACP. Both the pistol and the cartridge were designed by Browning, and the pistol was so successful (it sold a million units in 12 years) it brought Fabrique National out of bankruptcy.*

The Nambu Type 14, *with its under-powered 8mm cartridge and a safety you needed both hands to move.*

a confession out of you. Consider that, the next time you visit a hospital.

In a military engagement, time mattered a lot more. Stop the charge (mounted or dismounted) and your unit survived. Fail to stop the charge and you got overwhelmed. Hence, military calibers tended to be big, and mostly stayed that way for a little while at least.

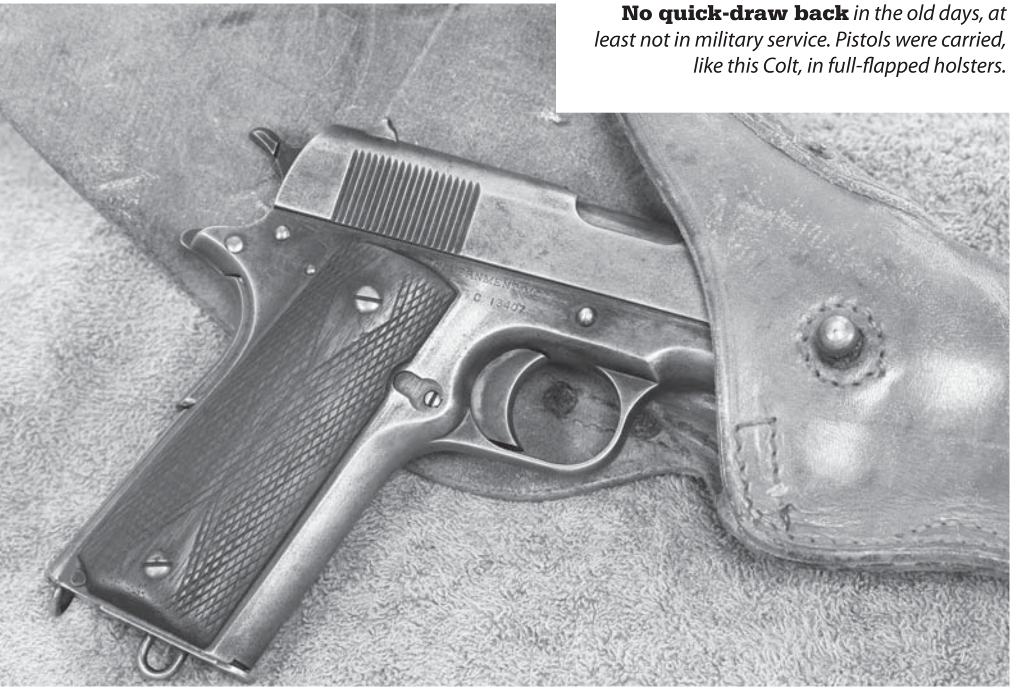
But some interesting things were causing change around the turn of the last century. Introduced in 1893, the Borchardt pistol had not been a commercial success. Partly, the less-than-stellar ballistics of the cartridge it used were to blame. It fired the 7.63 Borchardt, dimensionally the same as the later 7.63 Mauser, but the 86-grain bullet was delivered at a lower velocity out of the Borchardt. The big "B" was fragile, awkward and expensive and made in limited numbers, so it never caught on. However, the experience produced two that did: the C96 Mauser, and the Luger.

The Mauser approach was to ditch the toggle lock (which mechanically, works exactly as your knee does) for a less delicate and easier to make locking system, and to boost the bullet velocity.

Mauser used the same cartridge case, but called it by their name, for much the same reason a company might do so today—branding and patents. If Mauser simply chambered their new pistol in 7.63 Borchardt, they'd have to both get permission from Ludwig Lowe (the maker of the Borchardt pistol) and pay royalties. But by calling it by a different name, they avoided both problems. Georg Luger had been involved in the design and manufacture of the Borchardt pistol. Seeing the market change (the C96 Mauser was an instant success) he went about improving the Borchardt design. Luger figured a way to make the toggle lock more compact, which made the pistol more ergonomic and reliable. He shortened the cartridge to make the grip easier to grasp, and thus produced the .30 Luger. The 7.62 Mauser and .30 Luger (aka: 7.65 Luger or 7.65X21) both used 86-grain bullets of the same diameter. They were roughly .308 inch to .311 inch. The difference was in velocity. The Mauser zipped its bullet out at 1,400 fps versus the .30 Luger at 1,200 fps. (The 7.62 Tokarev later bested both, chambered in the TT-33. There, the bullet could be boosted past 1,500 fps.)

You ever wonder *why Colt pistols, and Browning designs, were so copied? This is a Nambu Type 94, which is just a clunky to use as its appearance would lead you to believe.*

No quick-draw back *in the old days, at least not in military service. Pistols were carried, like this Colt, in full-flapped holsters.*



An early Browning/Colt pistol, *the Model 1902 Military. This is a later version, with the cocking serrations at the rear.*

This M-1902 Military Model *is an early one, as you can tell by the checkering on the front of the slide. (Everything old is new again.)*

The speed was impressive, but the bullet weight was still lacking.

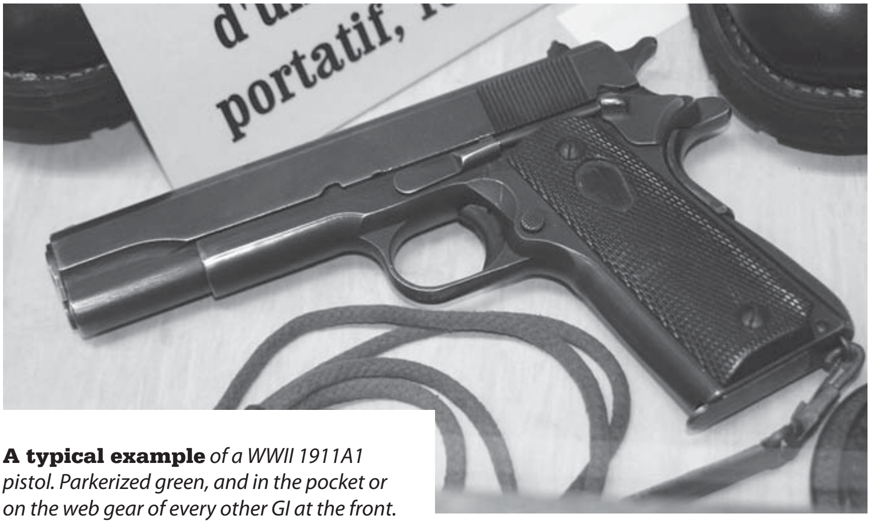
Prior to 1900, those were your choices in pistol cartridges. Oh, there were really strange pistols like the Bergman 1896, with its 6.5mm cartridge, along with no end of oddball 44-caliber revolvers, but there really wasn't much there for the military. That didn't keep the Swiss from adopting the Luger Model 1900 in .30 Luger. But leave it to that crafty Mormon in Utah to throw it all upside down. In 1900, John Moses Browning had not one, but two pistols introduced that made heads spin. First was the Browning/FN Model 1900 in .32 ACP. A seven-shot magazine-fed self-loading pistol, the gun he introduced had a number of innovations—not all of which were ever used again.

First, the recoil spring was above the barrel, and the same spring both operated the slide and powered the striker. With models still in existence, the striker hammers the primers so hard that I sometimes wonder if the heat from the friction of impact might set off a cartridge even if the primer is dead. At the time, the magazine-in-the-grip design wasn't new, but his simplistic magazine catch system was: The catch simply caught the bottom edge of the magazine. No extra latches, springs, buttons, levers, just an unobtrusive catch at the bottom of the frame.

The Thompson *on top is in .45 ACP, and were it not locked in a museum would be a most excellent 230 grain bullet launcher. (Bonus points to those who can identify the bottom one without a Google search.)*


P.M. Thompson
UNITED DEFENSE MODÈLE 42

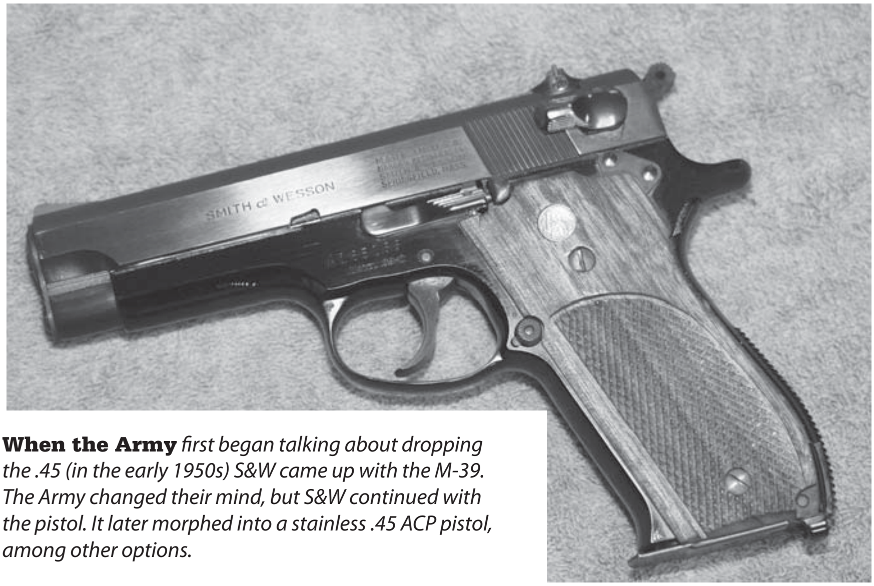
When Colt *could not make enough 1911s, they and S&W began making revolvers. Curiously, both Colt and S&W models were called "M-1917." Go figure.*



A typical example *of a WWII 1911A1 pistol. Parkerized green, and in the pocket or on the web gear of every other GI at the front.*

The M-3 submachinegun, *aka the Grease Gun. In use in the US Army (at the end only in tanks) through the 1970s. Indestructible, and with a slow (300-400rps) rate of fire.*

Of course, shooters being shooters (even back then), simple was good. That is, except when it got in the way of shooting. And when being shot at, a fresh magazine is very important. So while the heel-clip magazine latch went on in many other designs, Browning himself dropped it in short order. The cartridge was perfectly in keeping with the idea of a "civilized" cartridge of the times: a 71-grain FMJ trundling along at 800 fps or so. Compared to the then-new Borchardt, Mauser and Luger cartridges, it wasn't all that stout. It was not that big, either. An M-1900 could be slipped into a gentleman's suit-coat pocket. It would get lost in an overcoat pocket. Those other pistols required a holster. Browning invented the .32 ACP, a cartridge still in use today, and quite popular for much the same reason as then: it could be had in compact pistols, it didn't hammer the shooter and it didn't cost a lot for ammo. Yes, the specs all list ammo at 900 fps or more, but if you buy vanilla-plain 71-grain FMJ, it's going to go closer to 800 fps than 900, at least out of any compact pistol. I once acquired



When the Army *first began talking about dropping the .45 (in the early 1950s) S&W came up with the M-39. The Army changed their mind, but S&W continued with the pistol. It later morphed into a stainless .45 ACP pistol, among other options.*

a box of Sako .32 ACP ammo where the printed specs listed it as a 71-grain bullet at 1,999 fps. "Yowza!" I thought. Alas, it delivered a generous but not spectacular 909 fps. I can only conclude that the 1,999 fps was either a printer's typo or a conversion error from meters-per-second.

What Browning's .32 ACP creations did have that was new was an enclosed design. None of the operating parts could be seen on the outside. The Luger is the most famous of an unnoticed example of this, as is the infamous example of the Nambu Type 94. Both have part of their sear bar exterior to the frame. In both cases, you can fire the pistol by depressing the sear bar with a finger, not touching the trigger. The Browning/FN M-1900 had all its parts on the inside. The .32 ACP proved so popular that when Colt asked Browning to design a pocket pistol for them (the Colt M-1903 or Model M) they asked for it in .32 ACP. Fifteen years later, heavily-engaged in The Great War, France found they could not manufacture pistols fast enough. They gave large contracts to Spanish pistol manufacturers for compact, durable pistols, chambered in (you guessed it) .32 ACP.

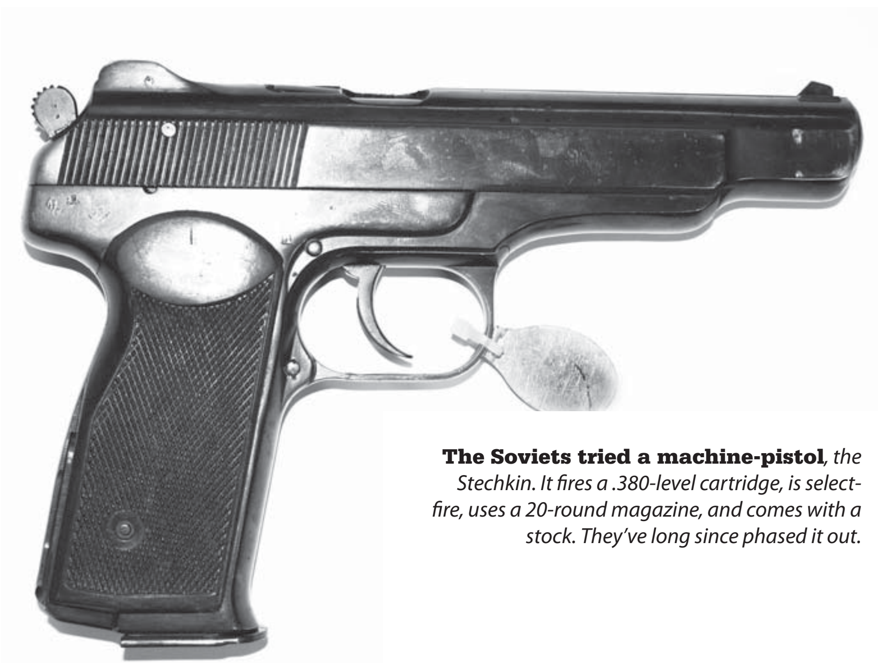
The other 1900 pistol by Browning was even more revolutionary. The Colt M-1900 was much like the FN. It had a heel-clip magazine

The FN FiveseveN pistol, *which fires a .22 centerfire cartridge, and is meant to replace other handguns in military use. The advantages? Low recoil and body armor penetration.*

catch, enclosed working parts and was magazine-fed, but it added a few extra improvements. Mainly, it was a locked-breech design where the FN was a straight blowback. And, it needed the locked breech, for its new (and again, designed by Browning) cartridge: the .38 ACP. You could write a book on the various .30/.32 caliber and .38 caliber/9mm handgun cartridges that were developed in the two decades from 1890 to 1910. In fact, it would be a field fertile enough for a master's thesis.

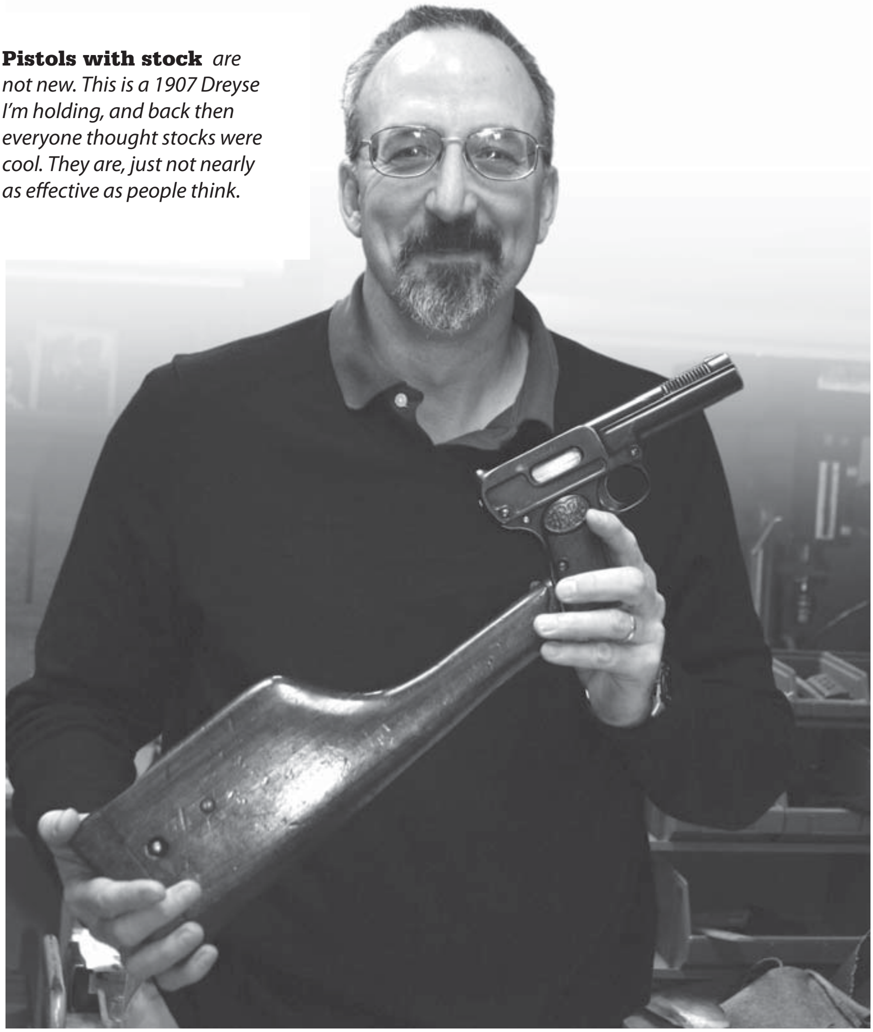
The .38 ACP (or .38 Colt Automatic, .38 Automatic Colt Pistol, 9X23 SR) was every bit as good as any 9mm cartridge of the time and could have been better. It hurled a 125-grain bullet at 1,100 fps, fully the equal of the later 9mm Parabellum. But it had one drawback: too many parts. Those of you familiar with the 1911, think of or look at the barrel and its link. Now, imagine the same barrel, but with two sets of links, one in the rear and one at the muzzle. Like a parallel ruler, the barrel on the 1900 linked down level. It didn't tilt.

The most inexpensive .45 pistol *ever made, the "Liberator" was made in WWII for less than $2 each. It was to be dropped to guerrillas for use in killing guards and stealing their rifles. They now sell for several thousand dollars each.*



The Soviets tried a machine-pistol*, the Stechkin. It fires a .380-level cartridge, is select-fire, uses a 20-round magazine, and comes with a stock. They've long since phased it out.*

That made feeding easy. The bullets would slide (they still do) easily up the barrel and its integral ramp from the magazine in a straight line. However, that parallel down-link at the front meant that to get the gun apart, Browning had to use a cross-wedge at the muzzle. That was a weak point. He couldn't make the .38 ACP any stronger without risk of slides breaking and coming off, *a la* the Beretta M-92 ca. 1986. Had he made the M-1900 using a single link as on the later M-1910 Trials guns, the .38 Super (introduced in 1929 in the 1911) might have gone on to become our official military pistol cartridge.



Pistols with stock *are not new. This is a 1907 Dreyse I'm holding, and back then everyone thought stocks were cool. They are, just not nearly as effective as people think.*

The small and medium cartridges *that were common while the .45 was being developed, and had reasonably good "res": .32-20, .32 S&W, 7.63 Mauser, 9X19, .38 S&W, .38 Special.*

Hmm, imagine that: an amalgamation of the 1900 and 1911. Browning could have easily boosted the 125-grain bullet to 1,300-plus fps in a 1911 with an integral-ramp barrel, and a .38 Super nine-shot pistol would have found a lot of buyers. The military being the military, they might even have insisted on 10-shot magazines and special military loadings of 150-grain flat-nosed bullets at 1,250 fps. As powders improved, that “1911 .38 ACP” could have evolved into the .38 ACP+P, with 125-grain bullets at over 1,400 fps and the military load of 150’s at 1,350 fps. With something like that, even the Cavalry would have given up on their .45-caliber fixation, and, ultimately, this book would not exist.

But things didn’t stop there. Being the enterprising designer that he was, Browning made whatever the customer demanded. Many European armies wanted modern pistols, but they didn’t want a “lowly” .32. So they asked for, and got, yet another Browning invention: the Browning M-1903. Not to be confused with the Colt M-1903, the Browning was larger, almost the size of the later 1911 pistol. Still a blowback, it tested the limits of that technology. The 9mm Browning Long (also known as the 9X20SR) used a semi-rimmed case .800 inch long and fired a 9mm bullet of 110 grains at approximately 1,100 fps. That is just about as robust as anyone would care to get in a straight blowback pistol—even one with the durability of JMB’s designs. To go any stronger you really need a

The big bores *common and available in 1911: .38-40, .41 Long Colt, .44 Special, .455 MkII, .45 Colt, .45 ACP.*

locked-breech design. Still, the pistol, introduced in 1903, was sold in encouraging numbers to various military organizations of the world. One in particular was the Husqvarna M-1907, a license-built Browning M-1903. Due to the odd chances of life, a bunch of them survived to be imported to the United States where the importer took to installing a bushing to make the chamber "suitable" for the .380 Auto, aka 9X17. The recoil springs were left alone, so owners found the guns over-sprung. After all, you were asking an 80-grain bullet at 850-950 fps to do the work of a 110 at 1,100.

Just to add to the confusion, Colt made two different pistols called the M-1903: the Model M, in .32 ACP, and the successor to the 1900, in .38 ACP, both of which have been referred to as "pocket" models.

The U.S. Army explored the possibility of these new cartridges. They tested both the .30 Luger and the M-1900 in their respective pistols and found them wanting. That didn't stop other armies of the world from adopting the Luger, which became quite popular. The Luger as we know it didn't come about until a few years after 1900. The .30 Luger was interesting, but many wanted more. Georg Luger looked at his design, took the .30 Luger case and expanded it to hold a 9mm bullet. With a bit of fiddling of dimensions, he was able to come up with a 9mm version of his pistol and by 1902 had a version ready to go. In 1904 the German Navy adopted the Luger, and in 1908 the Army followed suit, thus giving us the P.08 Luger and the 9mm Parabellum. From the Latin phrase Si vic pacem, para bellum came parabellum. Translated it means "If you desire peace, prepare for war." Of course, in 1902 Smith & Wesson introduced the smokeless cartridge .38 S&W Special, setting off a debate that would rage for most of the 20th century: pistol or revolver?

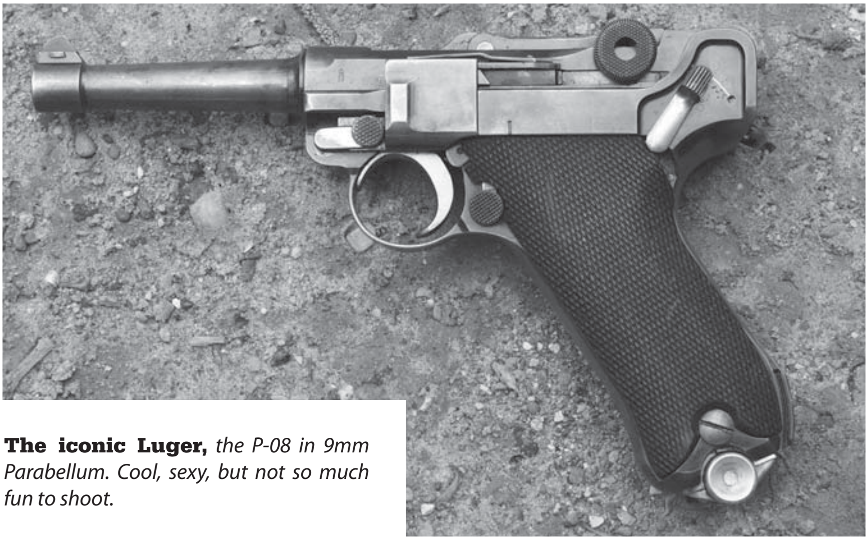
To understand why all this wrangling over cartridges, you have to get a bit of background on what handguns were used for in the military. Basically, they fell into two uses: combat and authority. The combat side of things would seem simple: you use it as a main arm (cavalry) or as a backup (artillery, engineers, etc.) to shoot opposing soldiers or their mounts. However, it was complicated in the latter part of the 19th century by the differing backgrounds and needs of the various forces. Many European armies had their officers drawn from what had been in an earlier era the landed gentry—the nobility.

OK, this empty *is too far gone to reload. But were it not so heavily corroded, its age alone would not make it unsuited for use.*

On the left a .38 Colt Short*, a round with a decent "rep" in the first decade of the 20th century. Next to it, a .45 ACP manufactured before Prohibition was enacted.*

As a tradition carried on from earlier times, a sidearm was similar to a sword. It was the physical and obvious evidence of the officer's ability and authority to enforce orders. Enforce them even with violence and death if need be. To serve the same purpose, an officer in a European army did not need a cannon. A small-caliber pistol was sufficient. This carried on for a long time. Through WWII, German (and other) officers carried .32- and even .25-caliber pistols. They didn't need rifles, because their job was to direct men, not shoot. If they were looking over sights they were not able to give the unit's needs their full attention.

In Japan, swords were real officers' weapons and pistols were adjuncts. Since officers had to purchase their own, whatever filled the holster was often "good enough." Russia issued pistols, but had much the same mindset as European armies, which Russia emulated. Britain was a bit different. Officers had to purchase their own weapons, but the British Army had a different job than many others. Unlike, say, Austria (just to pick one) the British Army wherever it was had a lot of territory to cover. And it could often count on many "uncivilized" foes in a fracas. North to South, the Austrian Army needed to travel 150 miles or so to get from one border to another. A British Cavalry patrol in India might cover 150 miles in a differ-



The iconic Luger, *the P-08 in 9mm Parabellum. Cool, sexy, but not so much fun to shoot.*

ent direction each week. An Austrian officer would be facing potential foes from France, Italy, Hungary, Germany or the Balkans. If things got tough and he surrendered, the Austrian officer might face a board of inquiry after he was released from captivity. The British patrol might find themselves set upon by hordes of locals from any of a hundred different oppressed groups. If he surrendered, the British officer could count on his "board of inquiry" being conducted by St. Peter at the pearly gates after a rousing and vastly entertaining bout of torture supervised by his captors, most likely.

The Austrian officer had to worry about holding his flank while waiting for the supporting unit to get their lazy asses into position. A British officer on the flanks was there with his men and all the enemies they could wish for. When faced with a swarm of spear-wielding locals, a sword and the skill to use it were good. But a pistol was better. One can well imagine the advice a new subaltern might receive in the Officers Club: "It's all well and good to have the finest Sheffield with you, chap. But dash it, the fuzzies don't take turns. You need a big-bore pistol to keep them off you and your men until the sergeant can send a detail to assist." (Back then, all handguns were pistols.) A big-bore pistol thus was seen as a necessity, not an indulgence. Samuel Colt sold a lot of Single Action Army pistols through the London office, and British makers concentrated on single- and double-action revolvers in .44 and .45.

In the United States, the American Army evolved (or devolved, depending on your outlook) from the Civil War and its huge infantry units to a patrolling cavalry organization that covered large areas. There, they faced the best light cavalry in the world and adapted themselves to the needs of that struggle. There, if you stopped the mount, you stopped the man, at least as far as chasing or being chased were concerned. Firepower was important (just ask Custer), but power meant more. Thus the focus on .45-caliber handguns in U.S. service. Mounted, they had little need of a compact or short-barreled sidearm, thus the 7.5 inches of barrel the government-issue Colt had. When re-built for Artillery use, the barrels were trimmed to 5.5 inches. (I think less for handiness and more to salvage worn or damaged barrels, rather than go to the expense of purchasing new ones from Colt.)

That was the environment that the U.S. Army was in, trying to figure out if one of these new-fangled self-loading pistols would work for them. As you can tell, they did manage to make it work, and we have reaped the benefits ever since. That did not keep them from wandering in the wilderness with the 9mm cartridge, but hey, no one is perfect. Just because the Army went from the .45 to the 9mm didn't mean that the rest of us had to. And we didn't, improving and refining the .45 since then. If, in 1985 when the U.S. Army switched to the Beretta M9 and the 9mm cartridge, you had predicted that not only would the .45 (and the 1911) be bigger than ever, but that we'd have ammo that was just below a tactical nuke in effectiveness, you'd have been dismissed as a crank.

Yet, here we are, in the first decade of the 21st century, with not only the .45 bigger than ever, but the various services making noises about going back. As for that, believe the quote from Bette Davis in *All About Eve*: "Fasten your seatbelts; it's going to be a bumpy night."

CHAPTER 2

What To Shoot

You'd think the question of what type of .45-caliber handgun you should use would have an easy answer, right? After all, the 1911 was developed for the .45 ACP and vice-versa, so who would search any further? You've got a lot to learn. First, shooters are incorrigible. Give them a pile of ammo (or even the promise of a pile of ammo) and they will figure out just how many firearms they can use it in, as well as in as many settings and competitive venues as they can imagine. As an aside and demonstration, there used to be a bowling pin match by the name of Second Chance. One event at that match was the 9-Pin event, where you had to hose down nine (you guessed it, right?) bowling pins at warp speed. The pins stood at the back edge of the tables, so you didn't need any more than 9mm Parabellum to tip them over. Anything .380 Auto and larger was allowed. A friend of mine built a tricked-out Makarov to shoot the event with…well, at least to practice with.

As a competition caliber, the 9X18 Makarov and the pistols for it were completely unsuited to the 9-Pin event. The "Mak" is or was basically a Walther PPK clone, and the ammo was only available in full metal jacket, round-nose designs pushing a 90-grain bullet at a modest 1,000 fps. At least, that's what the books all said. I'd bet the bullets were close to 90 grains, and the velocity was not much more than 900 and change. The magazines only held eight rounds, so with one in the chamber you had just enough if you didn't miss. So why go to the trouble? Practice. At the time, you could buy a case of Chinese-made ammo, all 1,600 rounds of it, for less than $100. If you bought in bulk and looked for suppliers buried under inventory, you could get it for even less. At the peak of the Chinese ammo import tsunami, ammo was selling at gun shows for $69 a case, no limits on volume, all you could carry out. As I said, it was for practice.

Doublestar, *the AR-15 makers, jumped into 1911 making, and their first offering is a full-sized pistol with a light rail.*

You wonder why *the Army doesn't think much of handguns? When you're launching 40mm grenades, any handgun will seem puny. Yes, that is a pump-action, 40mm grenade launcher.*

You can do a lot of practicing for $69/1,600 rounds of ammo. So Ned built a special gun (he was and is a gunsmith after all) to feed it dirt-cheap ammo in volume. He was plenty good enough at both gunsmithing and shooting to win the 9-Pin event a couple of times.

So, for a long time .45 ACP ammo was pretty common. After all, it was the standard-issue caliber for sidearms in the U.S. military, and we had made literal trainloads of hardball ammo in two wars, a couple of police actions and for practice in-between. Target shooters used it, and reloaders found it was so forgiving of reloading sloppiness that they risked learning bad habits that would "bite" them on other calibers. So, we have everything from pistols and revolvers, to rifles and submachineguns chambered in .45 ACP. Let's get started, because we have a lot of options to discuss.

Charles Daly *makes a single stack 1911A1 that is as modern as tomorrow.*

Basic and Not-So-Basic 1911s

This includes all the major derivatives of the 1911 in size and design, starting with the full-sized government model and including the commander and officer versions. Variants, where a manufacturer will put an officer's-length slide and barrel onto a regular-sized frame, producing a short barrel and full-size magazine, are also included in this category. You can have yours by any number of makers since the March day in 1911 when the 1911 pistol was announced as the new sidearm.

Colt

Colt models are an obvious choice, though sometimes I have to sigh when I think of them. For the company that started all of this, and who for many years was the exemplar of 1911 and .45 manufacturing, they ran themselves completely off the rails a couple of decades ago. They'd been veering off before then, but in the early 1980s they completely lost the market. No, I have to correct myself: not lost, they gave it up. Now, they make 1911s sometimes, and when they do, they sell all they make. But I have to wonder to whom? I mean, gunsmiths many times prefer to work on a Colt to other brands, but they also like to complain about how much work it takes to get a Colt "blueprinted." I guess if you're going to go to all that effort, you'd want it to be on a name everyone knows.

Generally, older is better, but older guns can also be variable in the temper of their steel and the dimensions to which Colt made them.

There are nine SMGs *on this table, and only two are in .45 ACP. Historically, most SMGs have been chambered for 9mm.*

USGI

In an effort to produce enough guns for the war effort (WWI and WWII) the government issued contracts to other companies to make 1911 and 1911A1 pistols. You'll most likely find them as Remington-Rand and Ithaca models, as those are common. Well, relatively common, as time has taken its toll and none of them are truly common any more. In fact, the collectors have bid up the prices of clean USGI pistols to the point where it is just not feasible to buy one to use as a shooter.

Gnash your teeth, *rend your clothes, this is not for sale. A scarce 1911A1 model; only the ones made by Singer are rarer. Picked up from a battlefield in Europe, it now rests in a museum vault in Belgium.*

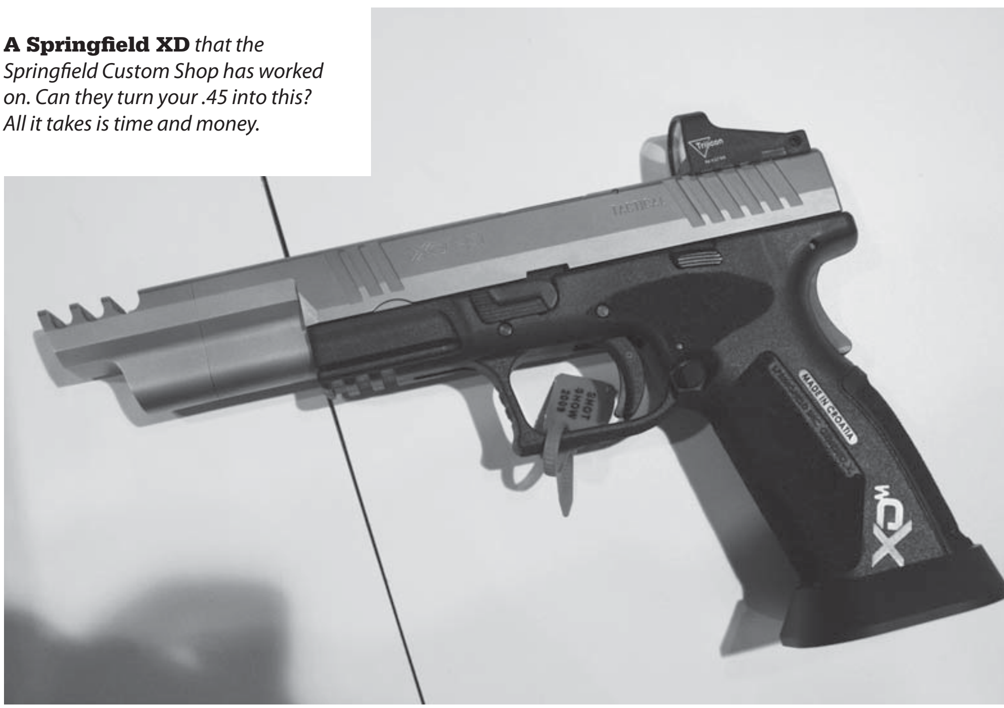
As an example, I bought my first 1911A1 in 1978 for $198. Adjusted for inflation, that is just about $650 now. With clean, not pristine, R-R and Ithaca pistols going for a grand, and the rarer ones for twice that, you don't buy a surplus 1911 as a cheap way to get into shooting.

Oh, and if you do go to shoot them, be gentle. You see, in WWII, we needed a whole lot of guns. Unlike modern wars where politicians are reluctant to actually treat war as something serious (God forbid people should have to forego something to aid the war effort), back then they pulled out all the stops. To increase production rates of slides, the manufacturers used "induction hardening" to make the slides hard enough. Induction is a method using a looped electrode (a coil around the object with a huge electrical charge pumped through it) to heat it. The resistance of the electrode to the electrical flow creates heat. Yes, it is just like having the slide stuck in the coils of an electric light.

The advantages are many: It is fast, efficient and it heats only the area needed, thus reducing warping. You can harden many slides that way. The disadvantages are that only the heated area is hardened, and the hardness achieved is not as great as using different alloys and quench-hardening the whole slide.

USGI guns, fired a lot, tend to peen the locking lugs on the slide. If you let the peening get too bad, the battered slide then begins to "eat" the barrel. Left alone long enough, the pistol stops working, and you'll need a new slide and barrel. If you stop soon enough, you'll just need a new slide. The government solved that problem after the war by buying new slides as needed. Today, a new slide alone is an appreciable cost of a new, plain jane 1911A1.

If you have a USGI pistol, shoot it little, care for it and save it as an heirloom or collector piece. If you plan to do a lot of shooting, buy a new pistol.



A Springfield XD *that the Springfield Custom Shop has worked on. Can they turn your .45 into this? All it takes is time and money.*

Springfield Armory

Springfield Armory makes a slew of 1911s, from compact to full-size and from bare to tricked-out. They have this competition shooter you might have heard of, Rob Leatham, who has been using their guns for over two decades now. More than anyone, Springfield was the one who stuck it to Colt. While Colt was looking the other way, Springfield stepped in with a quality product at a good price and responded to what customers said they wanted.

Springfield is so highly thought of that the FBI bought Springfield custom guns as standard issue for their SWAT teams.

Kimber

Kimber is relatively new, but they make more models than you can shake a stick at. They make so many models that even poring through the catalog becomes work, unless you really like 1911s. (Of course, I do.) Small, large, simple, loaded, with or without light rails, Kimber makes a 1911 for your tastes. One prominent model is the SIS. The Special Investigation Squad in LAPD is a small unit of senior detectives in the Robbery/Homicide Division who are tasked with finding the worst of the worst. When they get word of a bad guy on the street who is setting a new standard for being bad and who has demonstrated that he has committed the same serious crimes as before and will continue to do so in the future, they track him down.

Once they find him, they follow him until he commits another crime. He is then arrested and will (we fervently hope) spend the rest of his days behind bars. Many times they do not go gentle into that good custody. Surprisingly to some, SIS finds itself involved in gunfights. They had Kimber design and build a special model for them, and it comes in four versions, from small to large. To give you an idea of just how prized these guns are by the squad, consider this:

The Kimber SIS, *made for the LAPD investigative squad that chases people you won't ever want to meet.*

They have to buy their own guns. When the model was first offered, the SIS—20 detectives and their commanding officer—bought 125 pistols in the line. That's a difficult endorsement to top.

The ultra compact *Kimber with a Crimson Trace set of laser grips on it. That's a 25-yard group. Don't let people tell you small guns don't shoot.*

Dan Wesson

A relatively new maker of 1911s is Dan Wesson. Yes, the revolver maker of the 1970s and 1980s, but now making 1911s in a number of configurations. The brand is owned by CZ, so when Dan Wesson was bought, the first thing CZ did was swoop in and make sure everything was built to their exacting, old-world standards. I've had people turn their noses up at Dan Wessons in the past, but the new ones? You should not pass one up.

Primarily stainless, the Dan Wesson models come in full and commander size, and even offer 10mm as an option for those heretics among you who are not satisfied with .45 ACP.

Para USA

The big slam against the 1911 was capacity: it didn't hold as much as the "new" Browning, the Hi-Power, and it certainly didn't hold as much as the later "wonder-nine" pistols like the S&W 59,

Dan Wesson *makes excellent 1911s, and they offer several models as well as other calibers.*

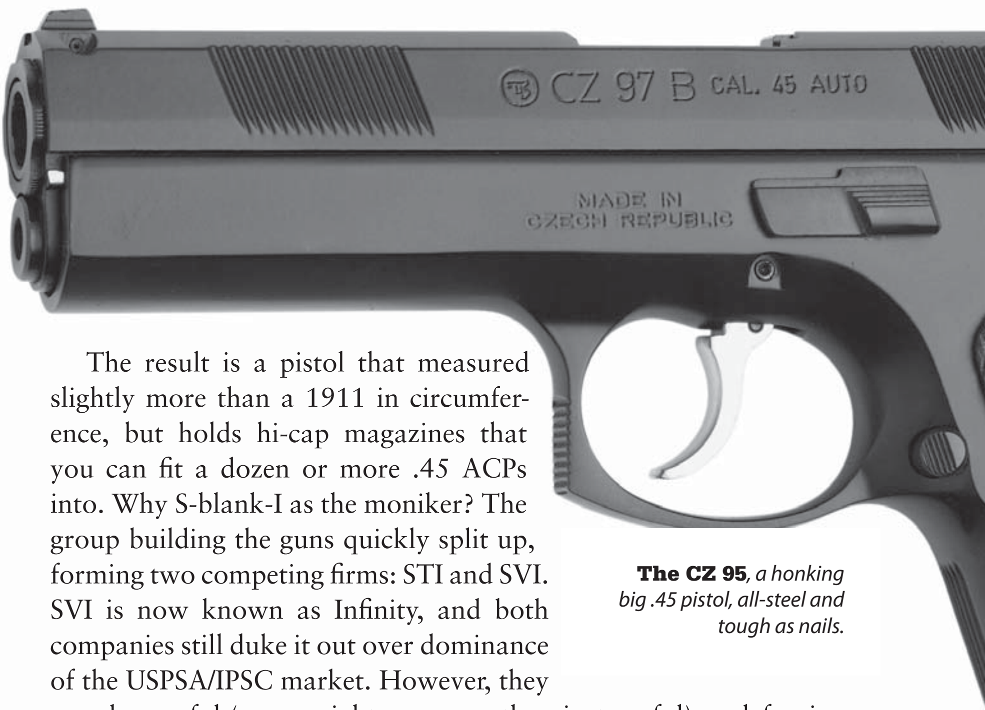
Glock, et al. Well, that isn't a problem any more.

Para USA (formerly Para Ordnance) started making 1911s in 1988 with their kit frame hi-capacity model. I was at the SHOT Show that year, an industry trade show where manufacturers annually roll out their new products, and saw the demo frames. I ordered one right away, and after building it into a pistol, I shot it a bit in competition. However, the first frame had a minor problem: It was aluminum. For a carry gun, aluminum is a good thing. For a competition gun, not so much. Well, Para took care of that problem, they offered steel frames, and then whole guns, until they now have a lineup that would make anyone jealous. From ultra-compact carry guns of six shots to hi-cap competition guns with 14 rounds in a mag, you can get a Para for any use.

The company also offers a change from the usual 1911 trigger. If you are not so hot on the cocked-and-locked carry method, Para offers the LDA, the Light Double Action trigger. Basically, it is a trigger-cocking mechanism, and you treat the Para with an LDA trigger as if it were a revolver that feeds from a box magazine instead of a cylinder.

S_I: STI and SVI

Another approach to hi-cap .45s is to go with one of the S_I or Infinity guns. Back in the early 1990s, Chip McCormick was an energetic promoter of things IPSC. He was the one who brought the hi-cap S_I guns to us. The concept is simple: machine the rails, hammer, sear and other working parts and such out of metal. Then bolt a super-strong polymer lower to it, the polymer part to act as the magazine as well. That way, you would not need a frame for the magazine with grip panels over the frame. The polymer mag well is both grips and frame.



The CZ 95, *a honking big .45 pistol, all-steel and tough as nails.*

The result is a pistol that measured slightly more than a 1911 in circumference, but holds hi-cap magazines that you can fit a dozen or more .45 ACPs into. Why S-blank-I as the moniker? The group building the guns quickly split up, forming two competing firms: STI and SVI. SVI is now known as Infinity, and both companies still duke it out over dominance of the USPSA/IPSC market. However, they are also useful (some might say more than just useful) as defensive guns. They are available in other calibers as well.

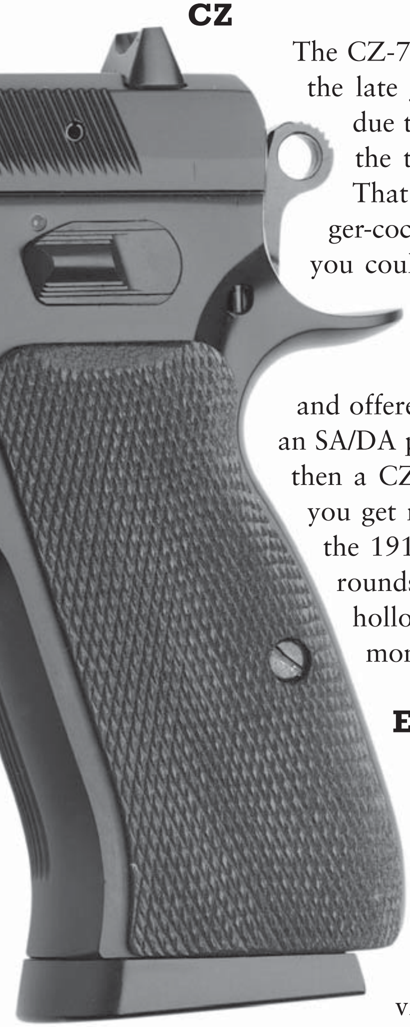
Don't think they make just hi-caps, as both also make single-stack pistols as well. STI offers specific models, and there are more than you can keep track of. Infinity only does custom-order guns, with the customer selecting from a list of options. In either case you get what you want, and you get something useful on the range, in daily carry or just for showing off.

The Others

It seems that we've barely scratched the surface of 1911 makers, but it would take another book of this size to discuss every company, domestic and offshore, who makes a 1911 or 1911 components. Auto Ordnance, Doublestar, BUL and other makers produce a number of very nice 1911-based pistols, and we hope to discuss them at length in a further volume.

Non-1911s

CZ



The CZ-75 is and was legendary – the only 9mm that the late Jeff Cooper found even remotely agreeable due to its really sexy grip shape and the fact that the trigger was both single and double action. That is, you could use it as a hammer-down, trigger-cocked on the first shot double-action pistol. Or you could cock the hammer and put the safety on. Unlike most DA 9mm pistols of the time, the hammer would stay cocked like a 1911.

In the mid-1990s, CZ reproportioned it and offered it in .45 ACP as the CZ-97B. If you want an SA/DA pistol, and you want something really tough, then a CZ-97B could be just the thing for you. Plus, you get more than just the seven or eight rounds of the 1911. You get the stacked CZ mag holding 10 rounds of .45, plus the mags can be extended with hollow base pads to hold more. (Not an uncommon trick in gaining extra shots.)

EAA

Until the fall of the Berlin Wall, the Iron Curtain and the collapse of the Soviet Union, Czech firearms were unimportable into the United States. The few CZ-75 pistols that made it stateside were first brought into Canada, and then one by one brought here. (This was back when such things were viewed as minor dalliances to get around idiotic import restrictions and not evidence of ties to Al Qaeda.) With many wanting and few available, someone had to step in. So the Italians did. They went a few steps further, however. The first ones were brought in, in 9mm, by Springfield Armory (yes, those 1911 folks) and rebuilt as hi-cap competition guns.

The Italians took things further in metallurgy and alloying. They quickened the manufacturing pace by making the slide and frames from castings, hard alloy castings. They were so hard that gunsmiths quickly learned they needed to anneal the slide before machining them for rear sights, and when it came time to install red-dot optics, they had to anneal the frames to drill and tap them for scope mounts.

So hard and tough were the slides and frames, that even loaded to 9mm Major (at that time, a 115-grain bullet at a minimum of 1,522 fps) what broke under extensive use wasn't the frame, slide or barrel, but the slide stop.

EAA makes *a number of pistols, and this one in .45 is an example of their Stock category models.*

S&W 1911. *This one is Doug Koenig's personal pistol.*

The sudden dominance of these guns in competition in the very late 1980s and early 1990s are what caused the S_I guns, and the Para factory guns, to come into being.

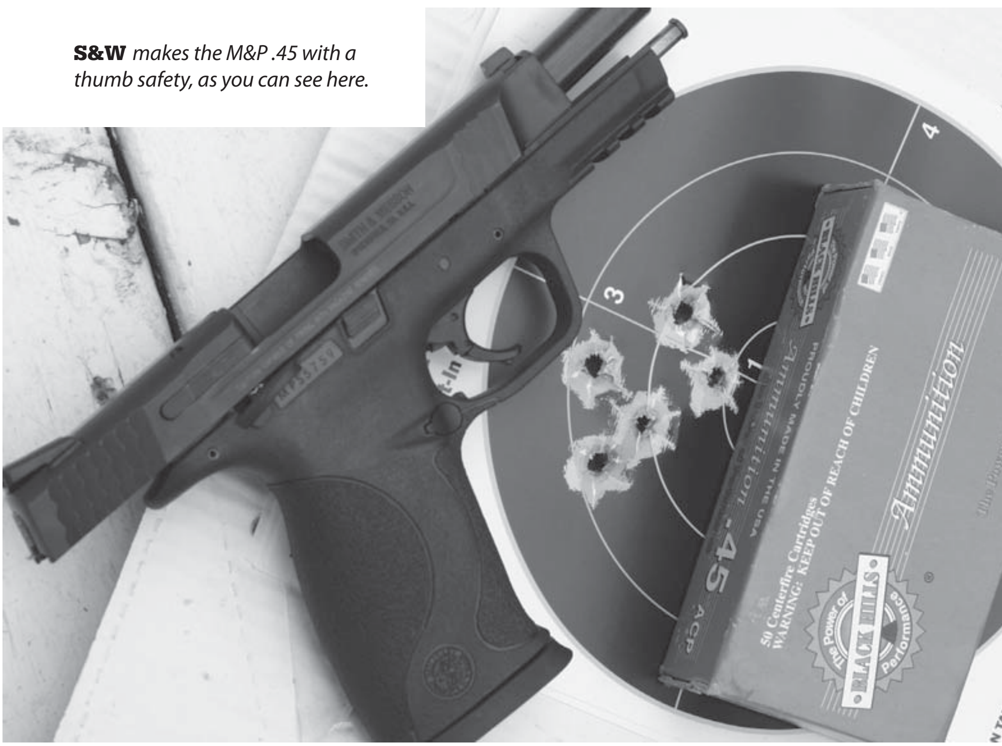
The 9mm guns are known as "small frame" guns. The large frame was made for the .38 Super but is also offered in .45 ACP. As there were not a lot of custom gunsmiths in Europe then, EAA (European American Armory) offered 9mm and still does factory-made, ready-to-go comp guns and pistols with the frames already drilled and tapped for scope mounts.

Oh, one thing we found back then: Don't bother with adjustable sights on an EAA/CZ-75 clone. Back then, Brian Enos was a full-time sponsored competition shooter, and he shot EAA guns. What he found with the .40s was that he had to get the pistol, check for function and zero and then weld the adjustable sight into a single mass. Otherwise it would soon break and he'd be shooting a gun without a rear sight—that or just use a fixed rear sight. I'm sure rear sights are a lot tougher now than then, but don't be surprised if your rear sight flies off anyway.

S&W

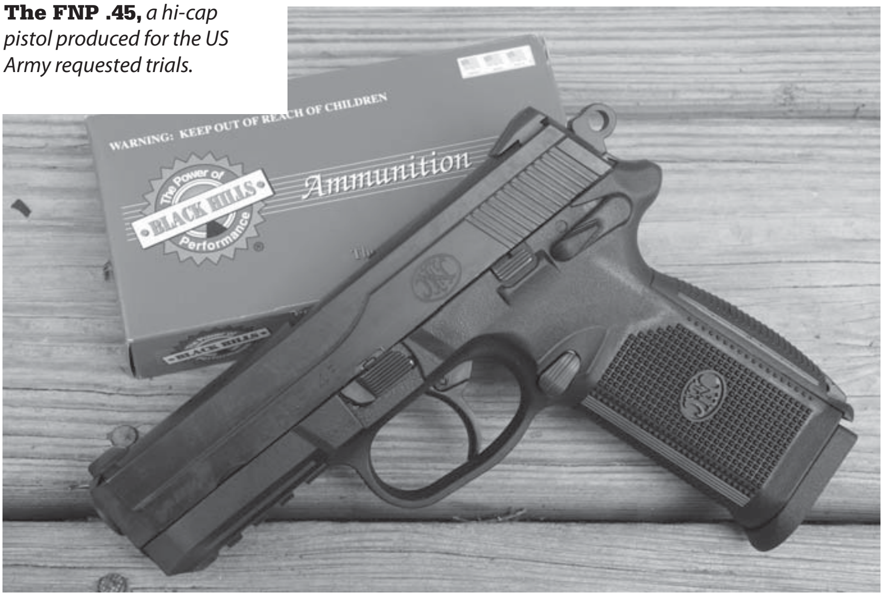
When S&W was making hi-cap pistols, the whole idea was to make them in 9mm for lots and lots of bullets. Still there were those who did not want a 9mm regardless of how many bullets it held, and for them S&W made .45 pistols. (This was long before the 40 was invented, at least the production version.) They have been making .45 pistols ever since. The older ones are the 4506 and its descendants, traditional double-action pistols. They make them in full size and (relatively) compact versions, as well as the compact Chiefs Model. They still offer a descendant of those early 4506s in the 4513, 4563 and 4566, as well as the 457.

The newest .45 pistol is the M&P, which is a striker-fired model with a polymer frame, replacement backstraps (to allow you to make it fit your hand) and your choice of external thumb safety. The .45 M&P came about because of the on-again/off-again U.S. Army search for a new pistol to replace the Beretta M9. In typical Army fashion, they want something that will do everything; be



S&W *makes the M&P .45 with a thumb safety, as you can see here.*

The FNP .45, *a hi-cap pistol produced for the US Army requested trials.*



indestructible in every environment including nuclear, chemical and biological warfare; and shoot ammunition that will not only puree an opponent, but destroy the tank he is riding in. (I exaggerate only mildly.)

Oh, and they want it to be safe. Safe enough to be issued to troops with no training in handguns, who will tear open the storage pouch and use the pistol only in the direst of emergencies. (Again, only a mild exaggeration.)

The Army has turned down all models offered to it, sometimes turning them down even before they have been offered. However, that means good things for us.

The last models S&W offers in .45 are their revolvers. Yup, revolvers in .45 ACP. The oldest are the M-1917 and the 1935 Brazilian contract guns, now quite aged and better used as the center of a collection. Yes, they are good guns, but unlike cheese, steel does not get stronger with age. Older steel is not as good, generally speaking, as newer steel. So treat the old ones gently. The new ones? Stoke them up. The oldest new one is the Target Model of 1955, also known as the M-25-2. The "dash two" is a 6.5-inch barreled revolver in blue steel and is the centerpiece of many an old-time IPSC or bowling pin shooters' armory. They have a reputation of being somewhat touchy about the bullets they shot well with. Once you find what yours likes, stick with it.

The newer version of that is the 625 with many "dash" versions. The 625 is stainless with a full-lugged barrel that is 4 or 5 inches long. The 4-inch version is popular in IDPA, where the 5-inch model is simply not allowed.

The newest one is the Model 22, a 4-inch fixed-sight blued steel revolver like the old M-1917s. Those had 5-inch barrels, but who's complaining? If you're looking for a .45 revolver for carry or defense, these are great.

If you want something lighter in weight for defense, then the ultimate .45 wheel gun is one of the Nightguard series. S&W learned of the benefits of Scandium and employed it in the manufacture of alloy frames. By including a pinch of Scandium in an aluminum alloy, S&W can double the strength of the resulting parts. The result is five-shot alloy .357 Magnums and six-shot alloy .44 Magnums. As an extra benefit the frames that can withstand a .44 Magnum find a .45 ACP a piece of cake. Which, I might add, is not the case with recoil. Firing a full-house .357 or .44 Magnum out of one of the air weight models can bring literal tears to the eyes of a full-grown man. It is tolerable in .45 ACP, but it is work in the magnums.

And yes, S&W does make several very nice versions of the 1911.

The FNP .45 *is entirely suitable for competition and defensive use, and here I'm using it in the CMMG 3-gun match.*

FNH-USA

Another manufacturer who sought the U.S. Army contracts, FN took their traditional double-action models and scaled them up to .45 ACP. They also tried several versions of the thumb safety so you have your choice of cocked and locked, hammer-dropping, etc. Unlike a lot of designs, which use a gentle taper to bring the double stack to a single feed position, FN just buckled down and did the testing and computer simulation to determine the exact best angle. As a result, the FNH .45 has a blunter taper to the magazine top and holds mote rounds as a result. The magazines hold 14 or 15 rounds, depending on which base plate you have installed. This is compared to other hi-caps that hold 10 or 12 rounds.

I used one in a 3-gun match, along with an FNH-SCAR and an FNH self-loading shotgun and it did not fail me once in several days of running, gunning, heat and rain. (I was one of the first to shoot a 3-gun match with all FN products, including the SCAR.)

The grip is a bit blocky at the upper rear, but unless you have small hands you will find it not a problem. Just something different from your basic 1911 or slim-line 9mm pistol.

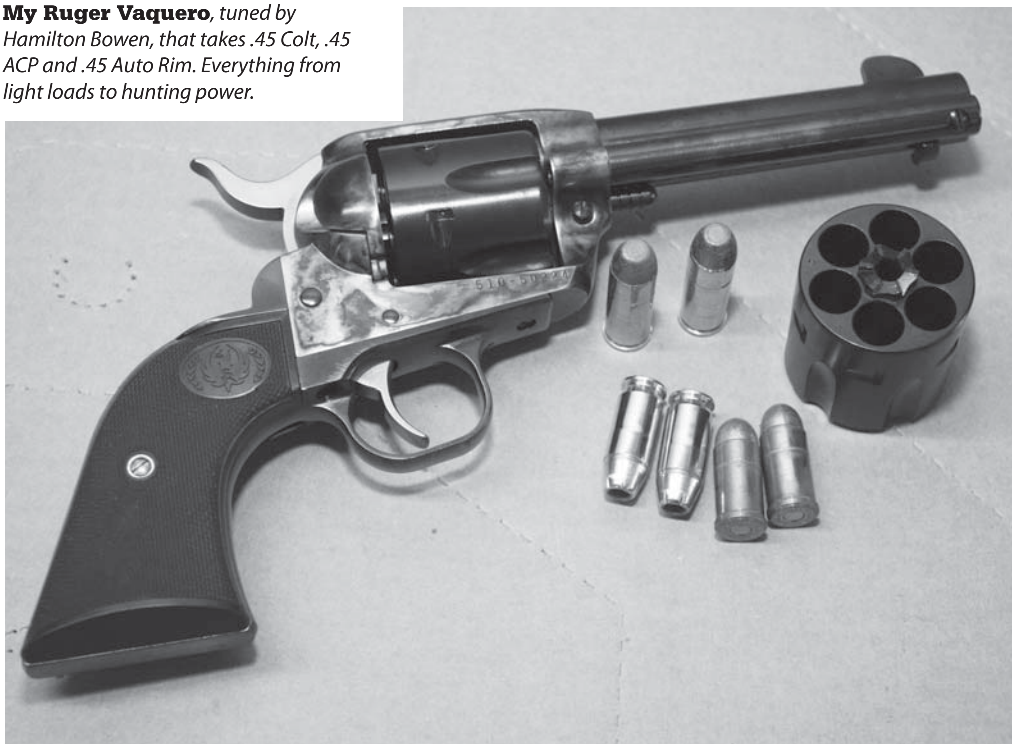
Ruger finally made *a non-bricklike pistol, and when they did, it was (lucky for us) a .45.*

Ruger

Ruger offers two .45 pistols—the 345 and the 90. The P-90 is the older of the two, and it shows. It is the exemplar of the old Ruger design imperative: make it durable, and make it easy to make. If you want an indestructible .45 pistol, it would be hard to beat the P-90. No, I mean it literally; it would be hard to beat it. I'm not sure you could hurt it, except for cracking the grips even if you trashed it with a baseball bat. For that durability, you have to be willing to accept a certain utilitarian appearance to the P-90. OK, it is not handsome.

If you want handsome, turn to the P-345. There, Ruger designed grips that look good, a slide sculpture that looks good and a combo that, while it won't get you "Wow!" reactions, will at least not get you pitied. The P-345 is offered with a light rail, something the P-90 has not been.

My Ruger Vaquero, *tuned by Hamilton Bowen, that takes .45 Colt, .45 ACP and .45 Auto Rim. Everything from light loads to hunting power.*



Ruger also makes a .45 revolver. The choice is simple: You can have any .45 ACP Ruger revolver you want, so long as it is the blued Blackhawk with matching .45 Colt cylinder. Yup, the convertible. A single-action revolver is easy to fit and switch cylinders, so Ruger simply makes one frame with two cylinders: .45 ACP and .45 Colt.

If you want something else, you have to take extra measures. What I did was acquire a Ruger Vaquero in .45 Colt. I then shipped it off to Hamilton Bowen, who took a spare cylinder he had on hand (He has a bunch of them, so you can get this done, too) and worked his magic. He fitted the new cylinder, then rechambered it to .45 ACP. As a final touch, he faced off the rear of the new cylinder so I could also use .45 Auto Rim cases as well.

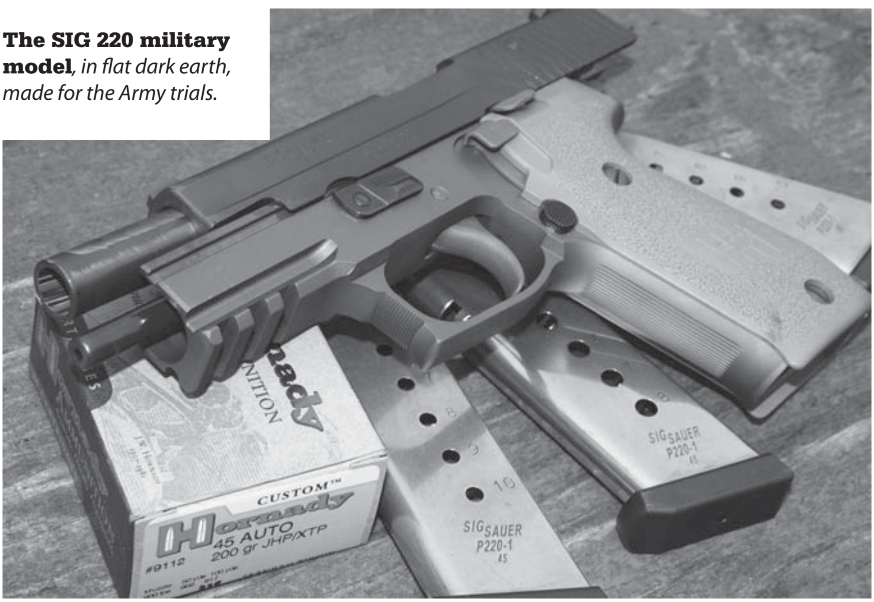
Fitting and timing the new cylinder also necessitated getting the action properly timed, so I now have a slicked-up Ruger that will use any of four cartridges—.45 ACP, .45 Auto Rim, .45 Colt and .45 Schofield. Do I have buckets of .45 Schofield lying around? No, but I have a cubic foot of .45 AR ammo and brass on hand. And it is a very slick, neat, custom gun.

How picky *is SIG about QC? The tag reads “Rejected: rear dovetail too large.” Send them my way, SIG, I’ll fix them.*

Taurus

Taurus offers both a 1911 clone and a polymer-frame striker-fired pistol in the 24/7 model line. The 1911 was quite the surprise when I first fired one. I was at a law enforcement class as an instructor, and someone had just acquired a Taurus. I figured, "Ho-hum, so what?" as I was aiming in on a steel plate downrange. Boom-tink. Hmm, that was big and close, what about the far ones? Boom—tink. I missed the 70-yard plates only a couple of times in three magazines. It has a nice trigger, it was reliable, and obviously it was accurate, so one would have to be grumpy to turn down a Taurus at a good price. Oh wait, all Taurus firearms are priced "good." Good thing I already had a couple of shelves full of 1911 pistols, or I would have had to have ordered a Taurus for myself.

The 24/7 was the Taurus entry to the U.S. Army trials, or rather, the trials-to-be that never happened. It is a hi-cap (12+1) striker fired pistol with an external safety. To choose between them all, you really should get your hands on them, as the grip shapes of the various polymer guns can vary greatly. Unlike other models, the 24/7 offers a "double strike" capability, that is, if the primer fails to go off, stroking the trigger gets you another hit. In other designs, if it fails to go off your only choice is to rack the slide and get back to work.



The SIG 220 military model, *in flat dark earth, made for the Army trials.*

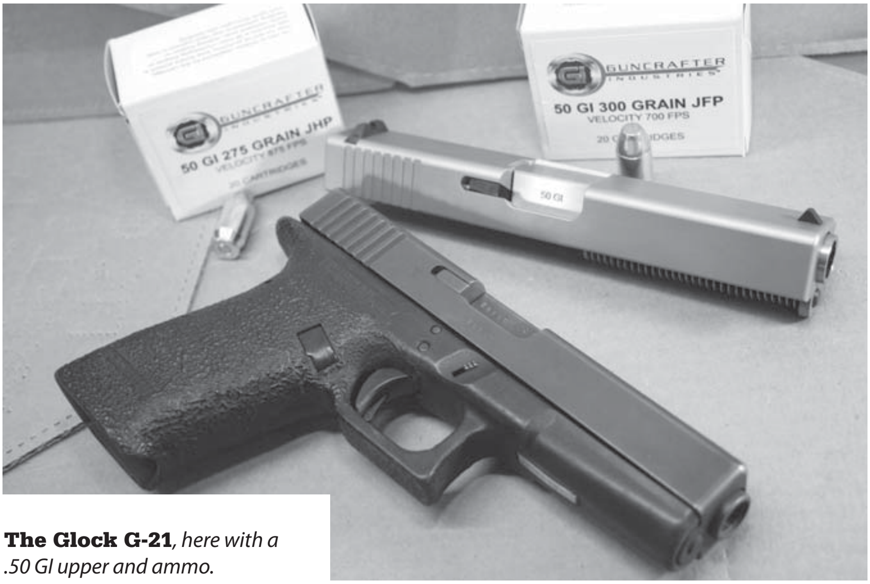
Also, the 24/7 has a 5.25-inch long barrel, getting the maximum potential velocity you're going to get out of any .45 ACP load.

SIG

SIG, based in New Hampshire, offers three models in .45 ACP: the GSR, the 220 and the 250. The GSR is the SIG take on the 1911. It is a bank-vault like pistol with an external extractor (something SIG is very familiar with) and the slide is sculpted to appear similar to the older SIG pistols. You can currently get the GSR in nineteen variants, from large to small, with or without light rails, and with stainless or Nitron finishes on them.

The older .45 is the 220. A single stack double action with a hammer-dropping safety, it was their first attempt at a .45 for the American market using their then-current designs. The safety is a lever on the left side of the frame, above and behind the magazine release button. When you swipe the lever down, it safely de-cocks the hammer, and when you release the lever it pops back up, out of the way. When first imported it was brought in by Browning, and you may have seen some back in the 1980s with Browning markings on them. It is solid, dependable and Swiss-made.

The SIG 250 *comes apart easily, and the internal chassis is the actual firearm, not the plastic shell the magazine goes into.*



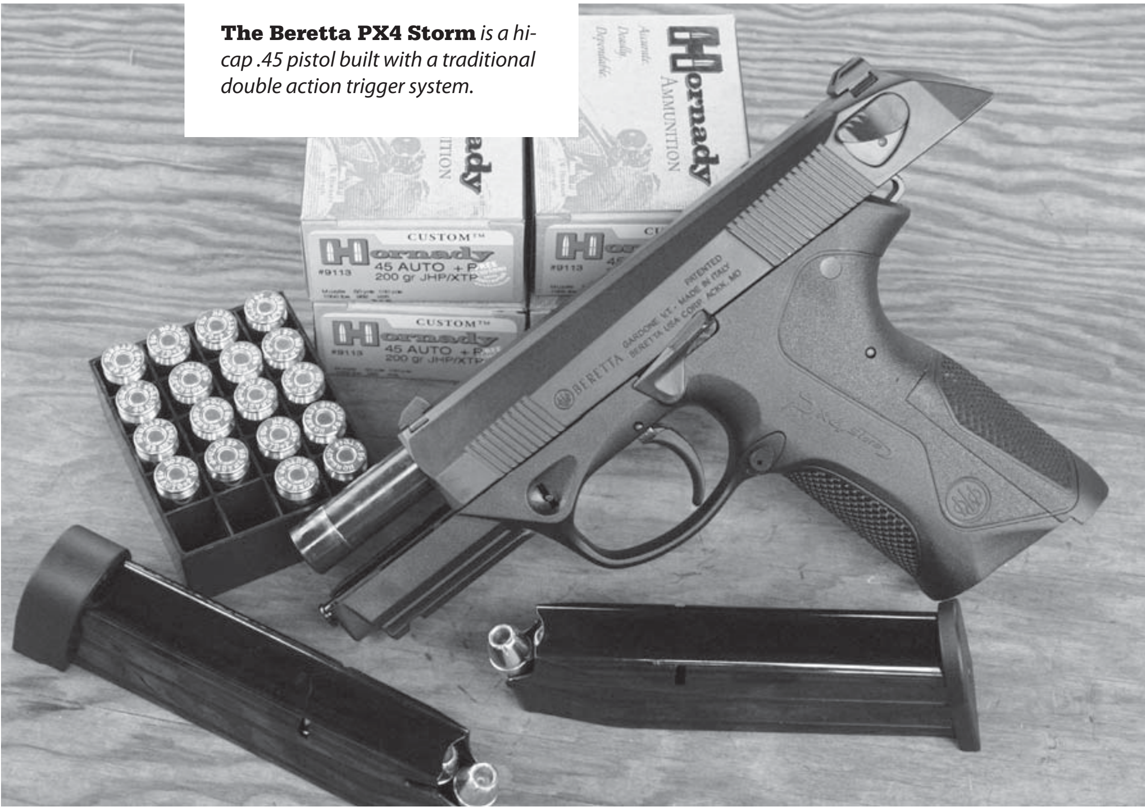
The Glock G-21, *here with a .50 GI upper and ammo.*

The latest is the 250, which is a radical departure from the original designs by SIG. Instead of a frame with parts in it, the 250 is a Spartan chassis, containing all the working parts. The chassis is simply locked into the magwell-shell with a couple of cross-parts, and the chassis is the firearm, according to BATFE regs. If you want a shorter grip, remove the chassis from the shell, replace it with a smaller shell and you're done. It actually fits a descriptor over-used in business school: modular. The 250 is full-time DAO, and the trigger simply works the hammer. If you haven't stroked the trigger almost all the way back, the hammer is not cocked. (Think: double-action revolver with the single-action notch and parts removed.)

The advantage to us is that you can have full-sized and compact shells (and mags to match) for competition and carry, for the cost of not much more than one gun.

Glock

When it comes to the .45 ACP, you can have one (or all) of four Glock models: the 21, 21SF, 30 and 36. The first, the 21, is the biggest. Introduced in 1991, along with a 10mm version, the Glock in .45 had to be scaled up quite a bit from the 9mm model, the G-17. That made the slim Glock grip rather large. Rather than make a



The Beretta PX4 Storm *is a hi-cap .45 pistol built with a traditional double action trigger system.*

"single stack" Glock with eight to 10 rounds, and a more 1911-like grip, Glock simply scaled up the design to take the bigger .45 ACP rounds.

However, the grip was just too big for a lot of shooters. So, it didn't take long for experimenters to figure out just what formulas of polymer, epoxy and fillers would bond to the Glock frame. They then would fill the hollow space in the back of the frame and sculpt it down to a more manageable size.

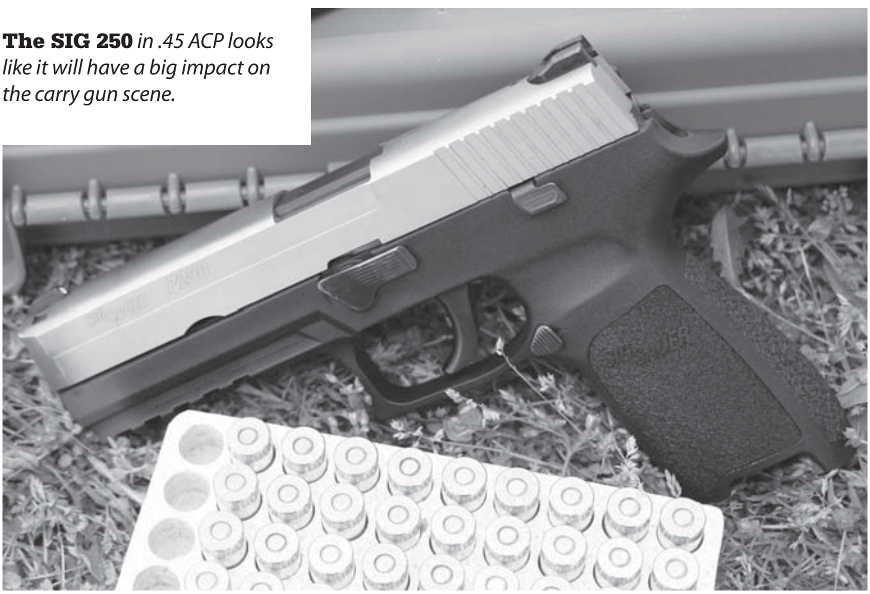
One of the companies doing it is Robar. I happened to be at the Robar booth at the SHOT Show when Gaston Glock came down the aisle. The boss of Robar, Robbie Barrkman, was talking to a couple of Special Forces E-7s. Herr Glock veered out of the aisle and into the booth where he tore into Robbie.

"Why do you modify my pistols?" he shouted. There was a lot more, but that was the gist of it. Then, Herr Glock stormed off.

Robbie looked at us and remarked (he had remained silent through the whole experience), "Because people pay me to."

I guess the idea of Robbie getting money that could go to Glock was eventually enough, for seven years later, Glock announced the 21 SF. No, not "Special Forces" but Small Frame. Glock did go one better in the SF as they also modified the ejector housing, allowing them to make the frame smaller even than the custom grip-reduction people had been able to make. The 21SF also has an ambidextrous magazine release, something the earlier models did not have.

The 30 is simply a smaller version of the 21. It holds nine or 10 rounds compared to the 13 of the full-sized 21, although it can use the big mags of the 21. They just stick out of the frame a bit is all. The 36, however, is another beast entirely. It is a compact, single-stack pistol. Rather than try to make the hi-cap mag tube even shorter, Glock made a new, single-stack magazine that holds six rounds. It does not accept any other magazine made by Glock, so you can't use, for instance, G-21 mags as reloads like you could if you were packing a G-30. Also, the cost of such a compact pistol is obvious: at 3.78 inches, the barrel is not going to give you full velocity out of any .45 load. At 27 ounces, such a small package is going to have robust recoil as well.



The SIG 250 *in .45 ACP looks like it will have a big impact on the carry gun scene.*

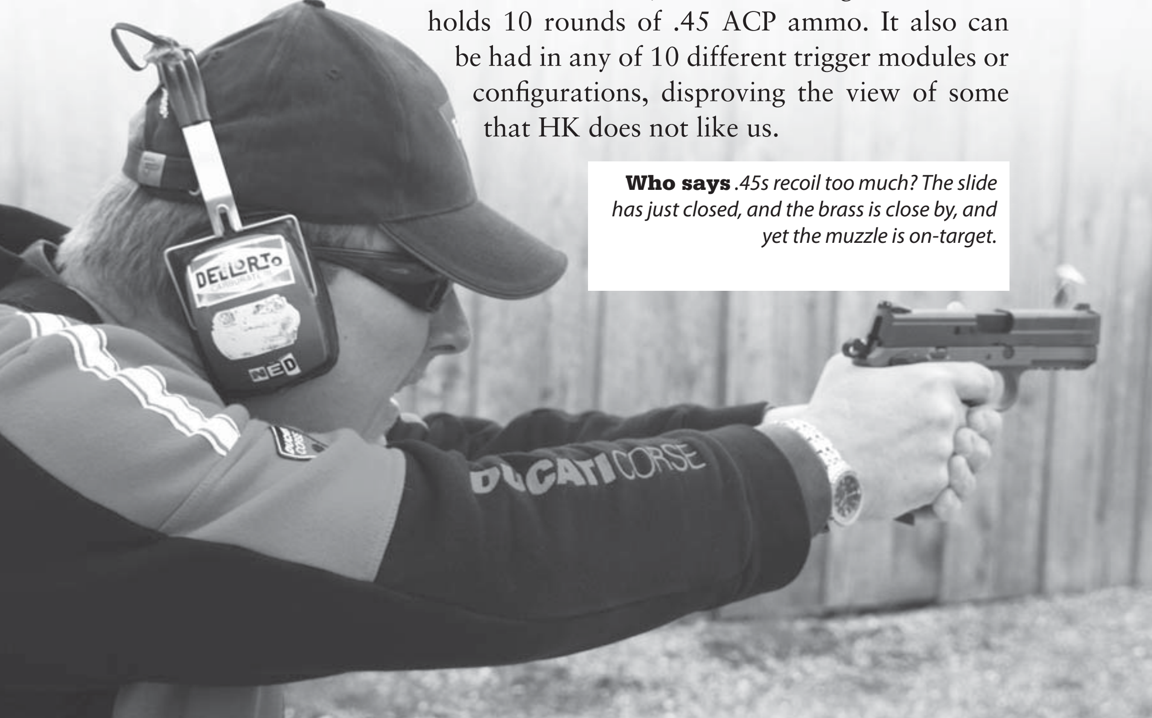
H&K

Heckler & Koch has made a number of .45 pistols through the years, starting with the P9S, a beautifully-engineered pistol that had two amazing advances for the 1970s: a double action trigger that you could actually shoot well in competition, and a stamped-steel slide. Famed gun writer Mas Ayoob had one he used to bring to the Second Chance bowling pin shoot, a pistol I envied mightily. But alas, the cost back then was more than I could entertain.

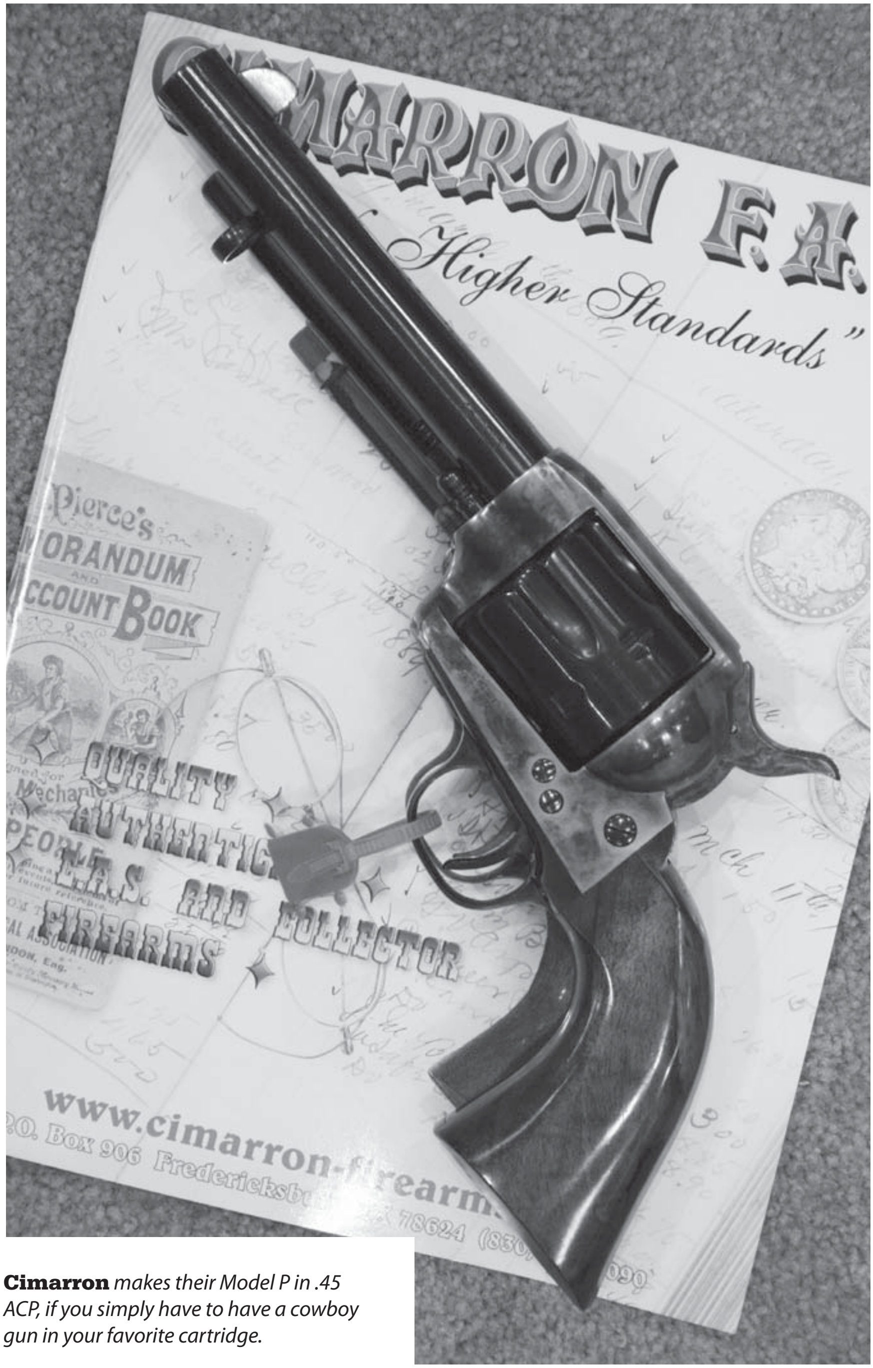
Later came the Mk 23, a pistol built for SOCOM. Many like to deride it as the "world's only crew-served pistol," which I think is unfair. The Desert Eagle deserves that moniker, and HK only built what SOCOM asked for. What SOCOM wanted was a cross between a Mercedes taxi and a main battle tank. What they got was a pistol so large that many find it a bit bulky to handle. It is also a pistol so durable that it may well be the 22nd century before the last one is truly worn out.

The USP Tactical and Expert are more human-sized pistols in .45, and you could do a lot worse than spend your time learning to run one of them. The USP and USP Compact also are available in .45, and are more along the size you'd want as a daily carry gun.

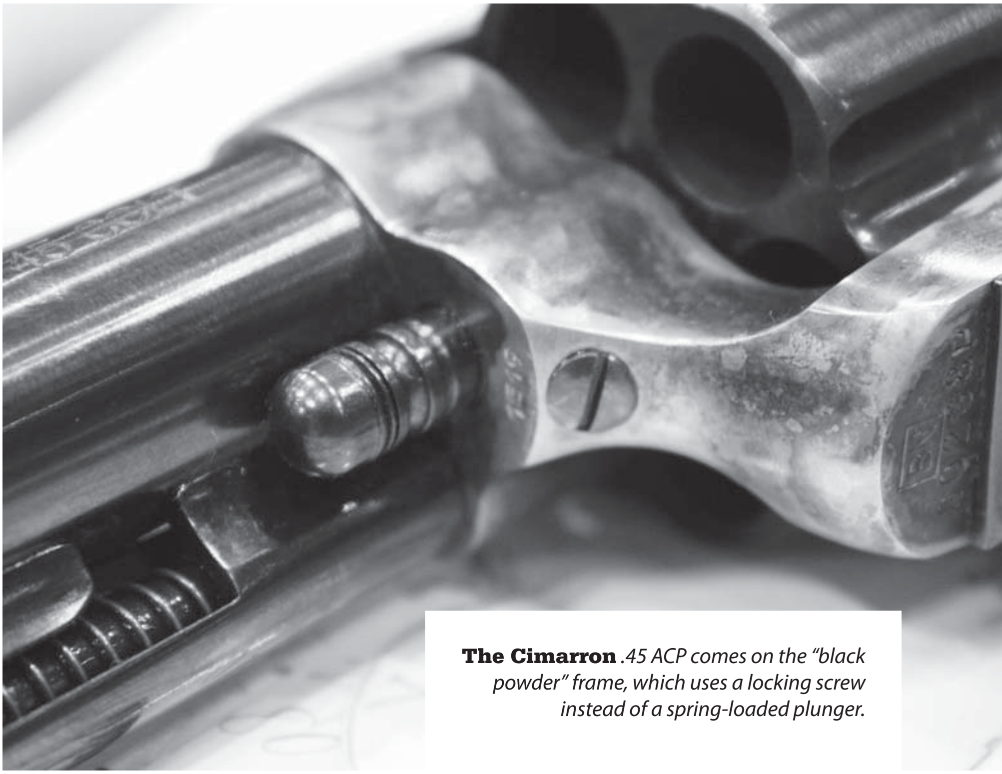
Last is the HK entry into the Army trials I've mentioned. The HK45 is an evolved USP, with better ergonomics and holds 10 rounds of .45 ACP ammo. It also can be had in any of 10 different trigger modules or configurations, disproving the view of some that HK does not like us.



Who says *.45s recoil too much? The slide has just closed, and the brass is close by, and yet the muzzle is on-target.*



Cimarron *makes their Model P in .45 ACP, if you simply have to have a cowboy gun in your favorite cartridge.*



The Cimarron *.45 ACP comes on the "black powder" frame, which uses a locking screw instead of a spring-loaded plunger.*

Springfield XD

The Springfield XD hails from Croatia by way of Geneseo, Illinois. It is a solid, polymer-framed pistol with a striker, but it has a few twists: first, it has a grip safety. Yep, a grip safety on a polymer pistol. Now your 1911 friends don't have to worry about the lack of a thumb safety. You can also get yours in any of their 19 versions with either 4-inch or 5-inch barrels, frames in black, tan or OD green and slides in black or stainless. The full-sized guns hold 13 rounds in a magazine, the compacts hold 10, but the compacts can use the full-sized magazines if you want.

As if all that isn't enough, you can send your XD through the Springfield Custom shop, and have them do things like install adjustable sights, night sights and put a tang on the rear of the frame.

If the colors are not enough for you, they can even do a custom finish in colors, patterns, etc.

Single Action Revolvers – Cimarron

There is no reason the original Colt could not be made in .45 ACP. Indeed, the Colt records indicate that a couple of dozen SAA revolvers were made in .45 ACP, not many (collectors are drooling just at the thought of finding one) but enough. Why so few, when the .45 ACP is such a fine cartridge? Because, for the revolver shooters, the .45 Colt was as good or better. The Colt cartridge could be had in heavier bullets, lead instead of full metal jacket, and had a real revolver rim, not the “mere” extractor groove of the .45 ACP.

However, it is easy enough to make a single-action in .45 ACP now that the bore dimensions have been harmonized. You see, it was customary for many decades (prior to WWII) to make the .45 Colt barrels with a groove diameter of .454 inch and the 1911 pistol barrels with a groove diameter of .451 inch. Simply slapping a .45 ACP cylinder into a .45 Colt revolver back then would have been less than satisfactory. The 230-grain, .451-inch jacketed bullet, skidding down a barrel of .454-inch groove diameter, would not have been a stellar producer in the accuracy department.

Now, all .45 handgun barrels are made to a nominal .451-inch groove diameter. Cimarron takes advantage of that for us and produces their Model P in .45 ACP. The frame is the style known as the “blackpowder” type as the centerpin is retained by a wedge screw instead of a spring-loaded cross plunger. You’ll need a screwdriver to remove the pin and to clean the revolver. It’s no big deal, as long as you remember.

Custom 1911s

For some people, many people, a common, just-like-everyone-else’s handgun just won’t do. They have to have something better. Something more. For them, a whole industry of custom pistols, parts for them and even holsters, has sprung up.

It’s entirely possible to buy a clean, 100 percent functional 1911 handgun, new, for less than $500. It is also possible to spend $4,000 on custom work having one built to your specifications. Some people have to have a different car, some people have to have a different handgun. So, between those extremes are manufacturers who build semi-custom guns. Some do it as a production line item, others do it alongside their full-house custom work.

A custom 1911 *from Stan Chen. Fitted case, tested and numbered magazines, a spare extractor, tools – this gun simply drips cool.*

Wilson Combat

Bill Wilson was one of the early successful IPSC competitors. He went on to expand his gunsmithing business into a gunsmithing powerhouse, and was one of the first to offer custom, user-installed parts and accessories. He recognized that while one could make a living as a gunsmith, one could get rich selling improved parts and tools to gunsmiths.

The anchor of his custom guns is the CQB. I have one that I have put over 30,000 rounds through for an embarrassingly small number of malfunctions. That is as in three or four, all attributable to the non-Wilson magazines I happened to be using in it that day. Yes, Bill also designed improved magazines and found a magazine maker who would make them to his specs. They were not the usual crappy "good enough for the surplus crowd" specs they were used to.

My CQB has been fired underwater, buried and dug up, swished around in silty water to clean it up, and it worked through all that. I visited Wilson's and the inspection tech who looked at my CQB (I figured it might need some work) asked as his first question, "When did you bend the front sight?"

"Ah, I don't know."

I passed inspection, except for the front sight and worn finish, and still shot accurately enough to make the pass/fail test fire target. You'll spend a bunch of money buying Wilson, but it is hard to imagine regretting it afterwards.

Ed Brown

Ed Brown makes 1911s and bolt-action rifles. He makes unadorned high-class 1911s, and he makes big-bore rifles suitable for shooting things that will hurt you if you don't shoot well. (Which, come to think of it, describes his 1911s, too.) Like Bill Wilson, Ed Brown got into making parts for much the same reason: He couldn't

This Wilson Carry *Comp is accurate, and with the built-in compensator is softer in recoil than it would otherwise be.*

An Ed Brown Kobra*, with five-shot groups fired at 25 yards. Good looks and accuracy. And you don't own one? Shame on you.*

find a source of good-enough parts, so he made them himself. The biggest item of 1911s, the one for which he'll be remembered for a long time, is his grip safety. Previous designs had spread the recoil over a larger portion of the web of your hand, but hadn't changed the location.

The Ed Brown grip safety allows your hand to ride higher on the frame, thus reducing the leverage of the slide on recoil.

Les Baer

Les makes 1911s and AR-15s, a combination that a generation ago would have been seen as heresy. Today, the AR is the common defensive rifle with the .30-caliber battle rifles rendered mere dinosaurs—big, lumbering, hard-kicking denizens of the past.

Here I am, *putting ammo downrange through an HK UMP. This one is a select-fire, LEO-only version, and yes, it is as much fun as it appears to be.*

Nighthawk

Nighthawk is the other custom gunmaker firm in Arkansas, and they produce only the top end of custom work. Their pistols have a distinctive look, and models such as the T3 cannot be mistaken for anything else. As custom guns you can have what you want. Also, as custom guns, you'll pay for it. Some might protest at the "cost" of a $2,000 or more 1911. Given the number of people walking around wearing $1,000-plus wristwatches, driving $40,000 SUVs and $30,000 trucks towing $45,000 bass boats on them, I have to wonder.

Me, I figure a custom gun that will last a literal lifetime is an investment, not an expense.

Carbines

Pistol-caliber carbines have always been popular. During the latter part of the 19th century, much of the West was populated and settled by people packing rifles chambered in handgun calibers. The Winchester 66, 73 and 92 were all had in handgun calibers only. Packing something that held more than five shots (the Colt SAA

An AR in .45? *You bet, they've been made by a number of companies.*

The K.R.I.S.S. *is a modern .45 ACP SMG that's offered as a semi-auto carbine.*

was only safely carried with five rounds in it) was easier to shoot and more accurate, which made a lot of sense. That ammo could be found everywhere made it even more of a bargain.

Today, a handgun-calibered carbine for defense, plinking and, yes, competition, has a lot to recommend it. That there aren't more in .45 ACP is a shame.

AR-15

I owned one, sold it and regret it still. It used .45 ACP UZI magazines and an adapter block. It only held 15 rounds in a magazine, a slight drawback, but not such a big one. Today, Olympic Arms makes .45 ACP AR-15 models, using modified magazines. No more adapter blocks: each magazine works with its own block attached.

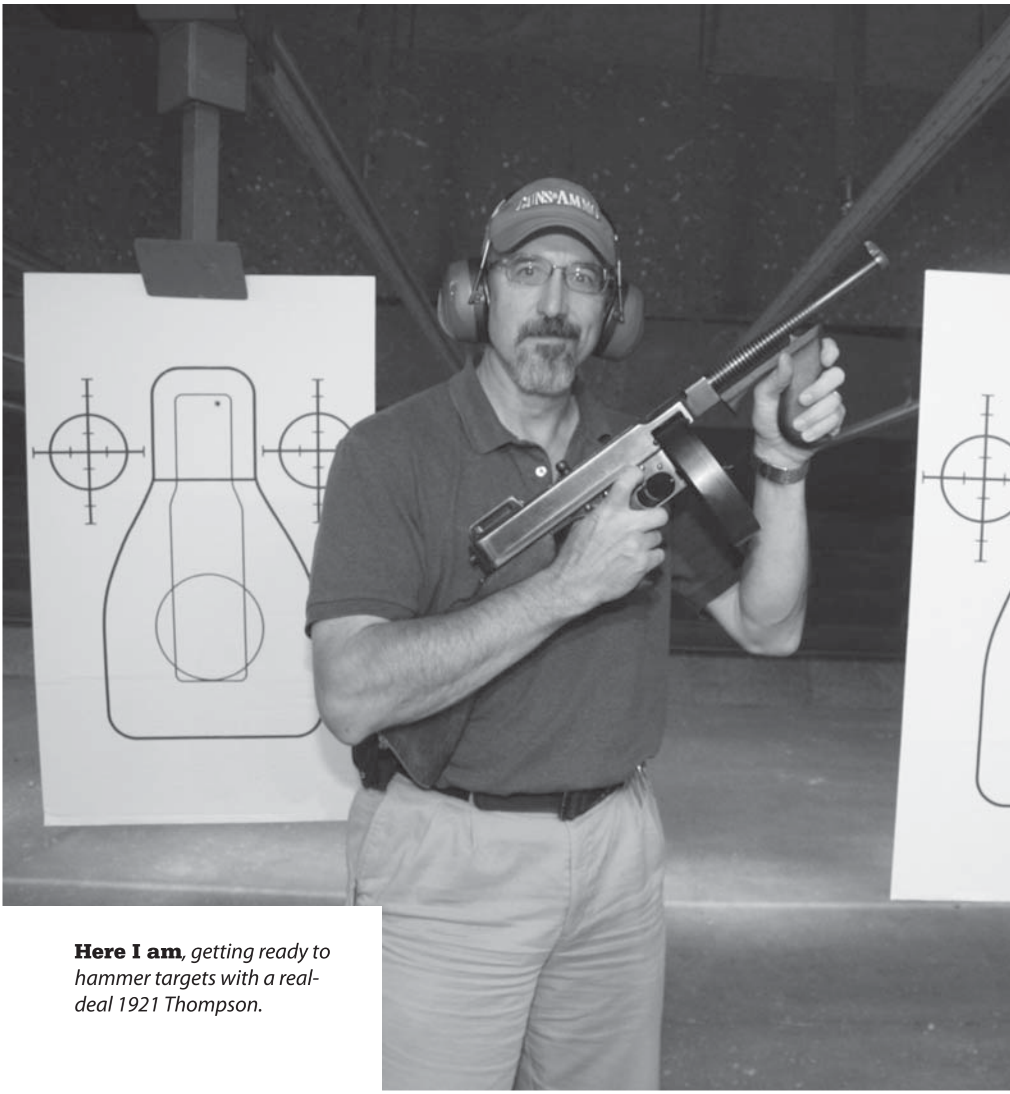
An AR in .45 is going to be a blowback, with just the mass of the bolt, carrier, buffer and buffer spring to keep it closed. As such

The M-3 Grease Gun *worked in 1944-45 for my father, and this one still works today.*

things go, no big deal, although you might be surprised at the recoil of such an arrangement. Were I reworking the setup, I think I'd investigate the use of the heaviest buffer weight I could manage to fit in it and add weight to the carrier as well.

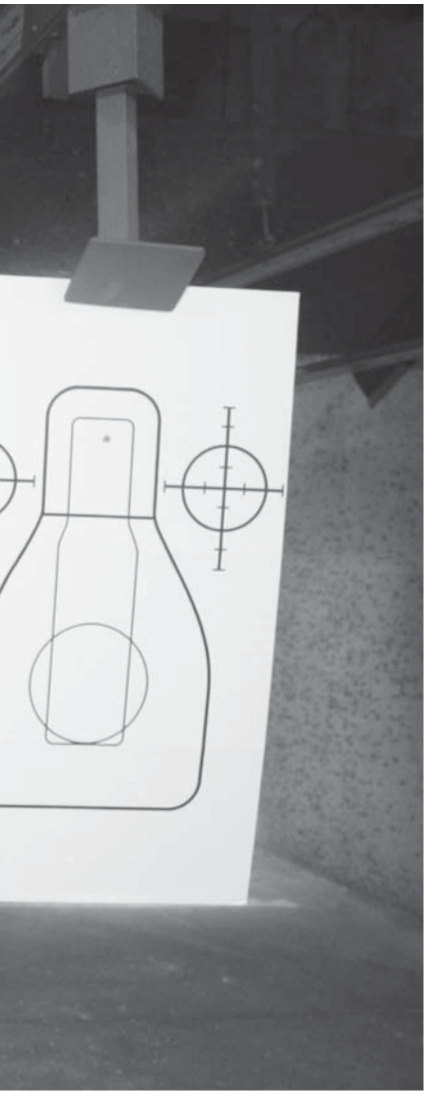
Marlin Camp Carbine

Now discontinued, the Camp Carbine uses 1911 magazines, so



Here I am, *getting ready to hammer targets with a real-deal 1921 Thompson.*

you're going to have an eight- or 10-shot carbine. But the magazines are ubiquitous, durable and you can own lots of them. Handier and less menacing than an AR, the Camp Carbine suffered from one main drawback: ejection. It was relatively under-sprung, and the bolt speed was quite high. Those who shot them at the club could never find their brass. Some shooters experimented with shortening the ejector and had success in taming the low-earth-orbit ejection.



Auto Ordnance

Now owned by Kahr, Auto Ordnance was the last producer of the Thompson M1928 and M1A1 submachineguns. Though A-O doesn't make full-auto Thompsons any more, they do offer a number of semi-auto versions of the old tommyguns, including a pistolized version with horizontal forend. The 1927 versions accept 10-, 50- and 100-round drums, all of which are also produced by A-O. These guns are fairly popular among those who appreciate the lines of the Thompson but don't care to monkey with the paperwork and cost that ownership of the pre-1986 full-auto models entail.

KRISS

At the 2008 SHOT Show, TDI introduced the KRISS CRB/SO, a 16-inch-barreled semi-auto carbine chambered in – what else? – .45 ACP. The CRB/SO is a civilian-friendly version of the KRISS full-auto submachinegun, which was developed for military applications and was notable for being the first original .45 ACP SMG developed in quite some time. If nothing else, the KRISS certainly has a unique appearance.

H&K

The H&K USC is the non-selective model of the UMP submachinegun. Its strong points are the reliability, accuracy and stable aiming platform. Its drawbacks are the cost ($1,500 retail if you can find one), the sights (the front sight appears about as wide as your thumb) and the polymer construction (the stock flexes every shot). But for those who have to have H&K, the USC is the premier .45 launching platform.

A Thompson *on loan, a 50-round drum filled with free ammo, and no one else on the range. Does it get any better than this?*

Lever-Actions

You'd think, what with the cowboy action shooters making lever guns popular again, and the large volume of defensive ammo available in .45 ACP, that the two would be a normal combination. Alas, it is not so. The problems swirl around mechanical and safety concerns. Mechanically, it would be easy to make a lever-action rifle feed .45 ACP ammo. Marlin for one makes many rifles in .35 Remington, a rimless cartridge.

The mechanical problem isn't in feeding, but in loading. As in: How many customers are going to stuff stubby little .45 ACP rounds into the tube backwards? Apparently, a lot.

There is also the matter of the round nose, especially in full metal jacket. The curved nose of each round would be resting directly on the primer of the round ahead of it in the tube, all the way to the front. That is why almost all ammunition dedicated to use in lever-actions has a flat nose. Think about it: Have you ever seen factory .30-30 ammo loaded with a spitzer bullet? (At least not until the Hornady LeveRevolution, that is.) Pointed tips, resting on primers? Bad combination. Enough lever guns have had the ammo in their magazines detonate to prove it is a bad idea. Now, some ammo for those guns is loaded with round noses—round noses of lead that is.

So, we won't be seeing lever guns in .45 ACP.

Carbine Defense

You can count on a couple of things with a carbine for defense: You'll be able to aim better, and you'll get more velocity. The aiming part is due to a longer sight radius and the aid of the stock. The extra velocity is due to the longer barrel. You're going to have a 16-inch barrel compared to the 5-inch of a government model 1911. Extra velocity is not needed, so you do not have to seek out the fastest bullets.

As an example, a Cor-bon 165-grain JHP goes 1,175 fps or so out of a 5-inch handgun. That is as much as the bullet can stand. Any more velocity and the bullet will break up, decreasing penetration and terminal ballistics. So, go with a reliably-feeding hollowpoint of full weight and don't worry about velocity.

Competition and Practice

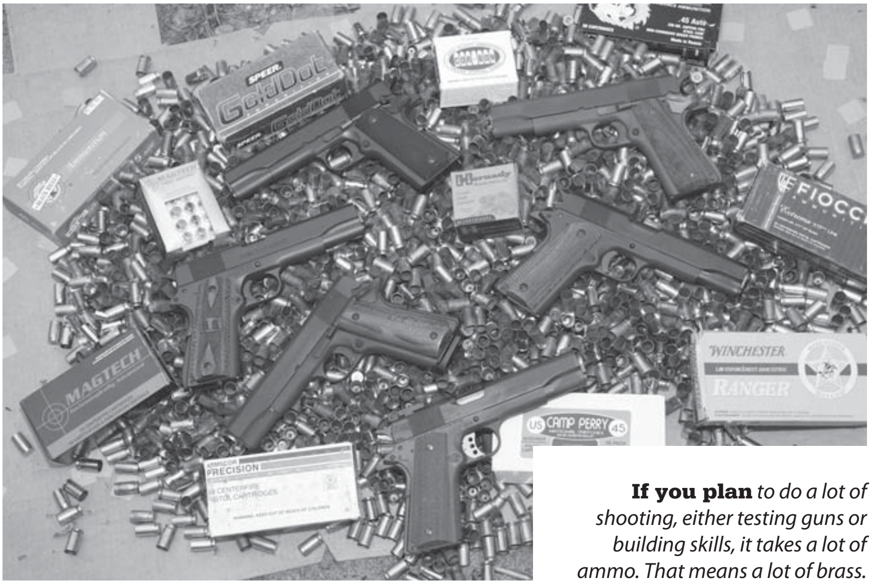
If you find your local USPSA club, you'll get lots of opportunities to practice with your .45 handguns. Some clubs will offer additional practice, too. A Division called Pistol Caliber Carbine is shot at some clubs. Basically, you shoot handgun stages but using your carbine, in this case a .45 carbine. If you plan on using your .45 carbine for home defense, getting it out on the range and testing its function, accuracy and your skills are a good thing.

Don't worry about your score; just have fun and learn skills.

CHAPTER 3

The Case of Brass

Let's start this chapter off on a pedantic note. (I can hear some of you out there, "What does he mean start?" Hey, I'm not pedantic, I'm conversational.) Since this is the technical chapter, we should endeavor to be precise and technical. The SAAMI designation for this cartridge is .45 Auto, not .45 ACP. The Sporting Arms and Ammunition Manufacturers' Institute is a group of manufacturers who have gotten together to define cartridges. The group sets the parameters for case and chamber dimensions, operating pressure, bullet diameters and the like. Not all extant cartridges are SAAMI-approved or accepted. Those not so-defined are known as "proprietary" cartridges.



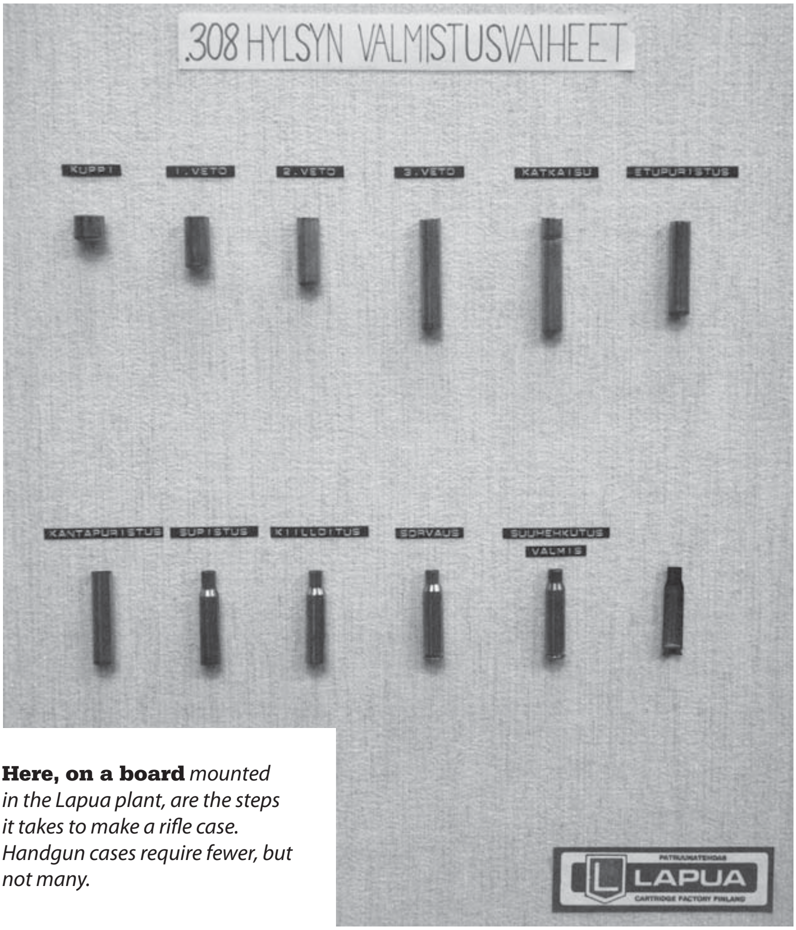
If you plan *to do a lot of shooting, either testing guns or building skills, it takes a lot of ammo. That means a lot of brass.*

I'm sure there are some who view it as just another big boys group to quash the endeavors of the little man, and exclude promising ideas that don't happen to come from the entrenched monopoly of big interests. Oh, yawn. As if. The idea is simple. They get together and cooperatively determine just what the manufacturing tolerances of ammunition and firearms are, so anyone who wants to make the stuff can be working from a common set of drawings.

SAAMI (pronounced "Sammy") simply lays out the cartridge case and chamber dimensions of the cartridges they have accepted. It is from SAAMI that we get the commonly-accepted definition of headspace as the .006-inch allowed gap between brass length and chamber length. Rifle shooters obsess over it, handgun reloaders and shooters not so much. You can make something new in the way of cartridge design if you want, but without SAAMI drawings to work from, a firearms or ammunition manufacturer is going to be very careful in trying out your idea. Now that won't stop an ammunition manufacturer from making a particular case or cartridge that isn't SAAMI-approved. They'll do it, for a fee and a minimum order. So, if you've always wanted to have a cartridge named after yourself and have designed just the thing: the .410 Smith Zap-Magnum, you can probably have someone make it for you. Just be prepared to pay for all the setup charges and accept delivery of a minimum run of oh, say, 10,000 rounds. At full materials price plus markup, plus labor, plus legal expenses. If you can get it made for less than $5 a pop, let us know. Legal expenses? You get to pay for the costs of drawing up a contract that absolves them from any and every problem their attorney can dream up, plus a few that you'd never have even dreamed of.

SAAMI calls the cartridge we all know and love as .45 ACP, by the official name of .45 Auto or technically, the .45 Automatic. Which, come to think of it, explains a lot – like some handgun manufacturers not being too keen on putting their competitor's name (the competitor who dreamed up the cartridge) on their pistol.

Brass *has not always been the only case material. Aluminum, steel, and here, plastic. This is a "tround" that went into the Dardick revolver. You've never seen one, because the handgun never became popular.*



Here, on a board *mounted in the Lapua plant, are the steps it takes to make a rifle case. Handgun cases require fewer, but not many.*

Were I a pedant, I would refer to the cartridge from this point on as the .45 Auto. But I'm not, and I won't. No, we've known it as the .45 ACP for decades (nearly a century, and probably for a full century by the time you're reading this) and I find some habits just too hard to break. Plus, I'm something of a curmudgeon, and I like the idea of being in the past. So, .45 ACP it is and will be. That will get me in some hot water with some of the engineers and production people in the ammo plants. They got and keep their jobs because they are precise about details. Had I their jobs, I would be too. But I'm not, I'm a writer. Were this my Master's thesis for a degree in mechanical engineering, production engineering or any other real degree, I'd be as detailed and precise as the ammo people. No,

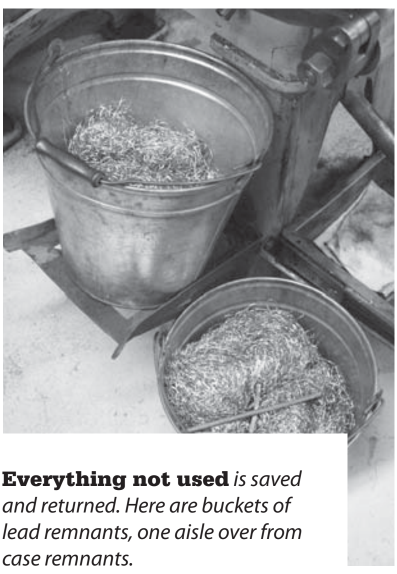
Drawn rifle *(and handgun, too) cases have to be trimmed to final length. That brass gets sent back to the mill.*

I'm a writer, and I write to both entertain and inform. I've grown up knowing it as the .45 ACP, and a change SAAMI made (before WWII no less) is going to be hard to for me to adjust to.

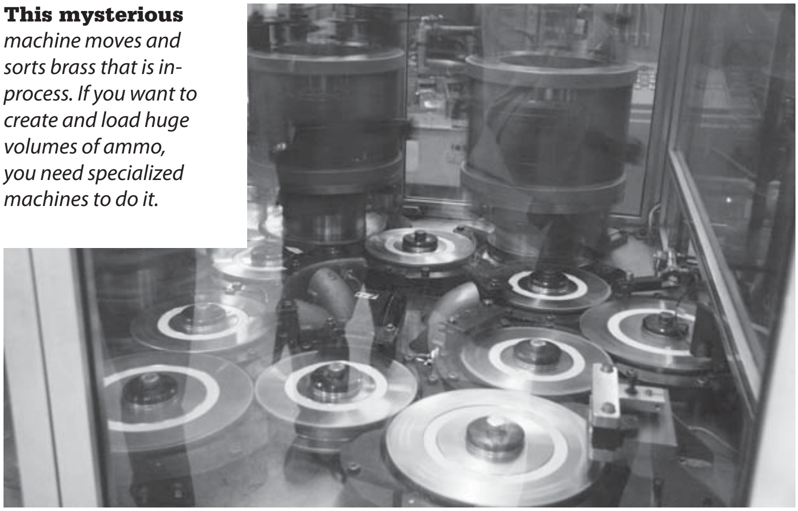
I discussed this with a former ammo manufacturer. His company had a fresh new look on things and came out with ammo that the other companies had not. I asked him about the name, and he replied with this: "The .45 Automatic name change happened some time before WWII. SAAMI wasn't formed until 1926. Before that, the only ammo specifications body was C.I.P., the European governing body. They were formed in 1914. Before all that, John Moses Browning had a hand in designing the cartridge and the pistol. He called it the .45 ACP. I think I'd go with that."

If you've got an empty .45 ACP case lying about, pick it up. Look closely. You're seeing a marvel of design and engineering that has had a century of production effort and genius to bring to the level you now see. Consider it: a small cup of brass that will, once made, go into a round of ammo. That round of ammo may be fired days after being made, or it may sit on a shelf for a century or more before being fired. And the person using it has a full and understandable expectation that when called on, it will work.

The brass of the case you're holding is actually an alloy of copper and zinc, 70 percent copper and 30 percent zinc known as Alloy 260. Bullet jackets use "gilding metal" that is 95 percent copper and 5 percent tin, and both can have minute amounts of other materials to ease machining, forming and corrosion resistance, or because it is just too expensive to remove the extraneous stuff. (This "stuff" makes no real difference in the final product in many instances.) The case you are holding has gone through a huge number of manufacturing steps before it even had a chance to get



Everything not used *is saved and returned. Here are buckets of lead remnants, one aisle over from case remnants.*



This mysterious *machine moves and sorts brass that is in-process. If you want to create and load huge volumes of ammo, you need specialized machines to do it.*

into your hands. The rim is tough enough to hold an appreciable amount of your body weight (unless you're Haystack Calhoun or Andre the Giant) and not bend or break. The case mouth is only ten thousandths of an inch thick, but will when properly sized, clamp securely to a bullet inserted into the case. The seal will be good enough to resist moisture, although a dunk under water for a couple of years will make some small percentage of cases leak. The primer pocket similarly seals the contents against moisture, and primers are another whole subject that we depend on to a degree that would be a subject of amazement to earlier cultures.

The case will function even after it has been exposed to the elements and allowed to oxidize to a deep chocolate brown color. In fact, they can still be reloaded in such a condition, although most fussy reloaders ditch them at that point. A little bit of green, crusty corrosion on the case is not enough to keep a good pistol from functioning, although you really should consider such stuff last-ditch, hold-for-the-emergency ammo.

The case is marked by the manufacturer. On the base, around the primer pocket, you can see the stamping of who made it, the caliber it is and any other pertinent information the maker wanted (or was required) to put there. Early on, military requirements called for the date of manufacture to be marked on the cases. They went so far in the early days of even marking the month of manufacture.

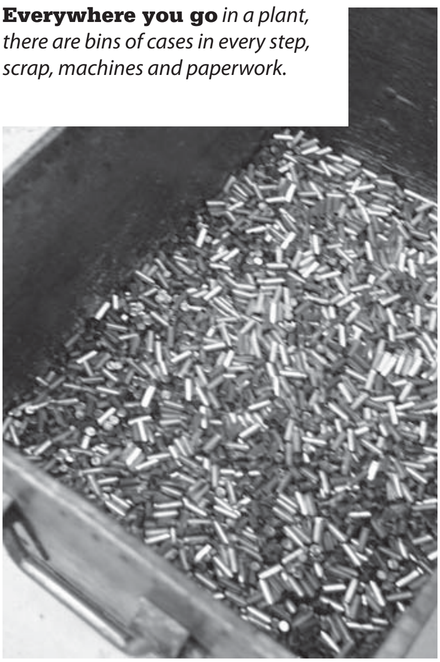
Of course, in those parsimonious days before WWI, ammo might not have been made under contract for the military month in and month out.

All this for a small brass jewel that costs you, brand new, all of 14 cents each. The final product is so inexpensive that a lot of shooters don't even bother to pick up their empties after shooting. So much the better for the rest of us.

Now put the brass down, you're starting to look just a bit silly, turning it over in your fingers and admiring it.

How did the empty you just put down find its way to you? We'll skip all the preliminaries about the ore dug out of the ground, the shipping and smelting, chemical analysis and alloying, etc. That is except for one anecdote. If you ever find yourself driving through Arizona, try to avoid the Arizona copper-mining towns like Globe, Morenci and others east of Phoenix. For decades some of the towns pulled ore out of the ground and did a bit or a lot of refining before shipping the product off to smelters. In some locations, you can see where the town, in a valley, has had much of the valley floor devoted to tailings piles. It's smelly when it's damp, which in Arizona isn't often. I drove through one such town right after a brief rain, and oh my God! It gave me an appreciation for the aftermath of mining, and environmental concerns. I'm not ready to live in a grass hut and eat nuts and berries, but I can see where keeping an eye on mining companies is something we should do.

Everywhere you go *in a plant, there are bins of cases in every step, scrap, machines and paperwork.*

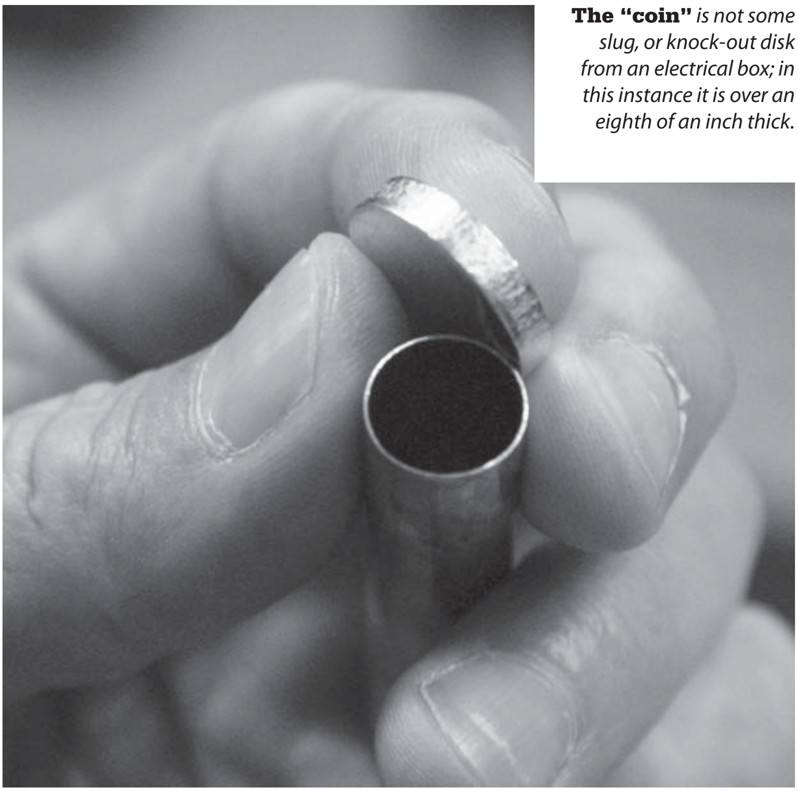


But I digress. The brass that is your empty .45 ACP case leaves the foundry in coils. The coils are specified as to thickness and width,

This is a bin *(one ton, near as I could decipher) of trimmed-off drawn cases. In a good plant, all this is accounted for, returned, and the money spent on more materials or better tools.*

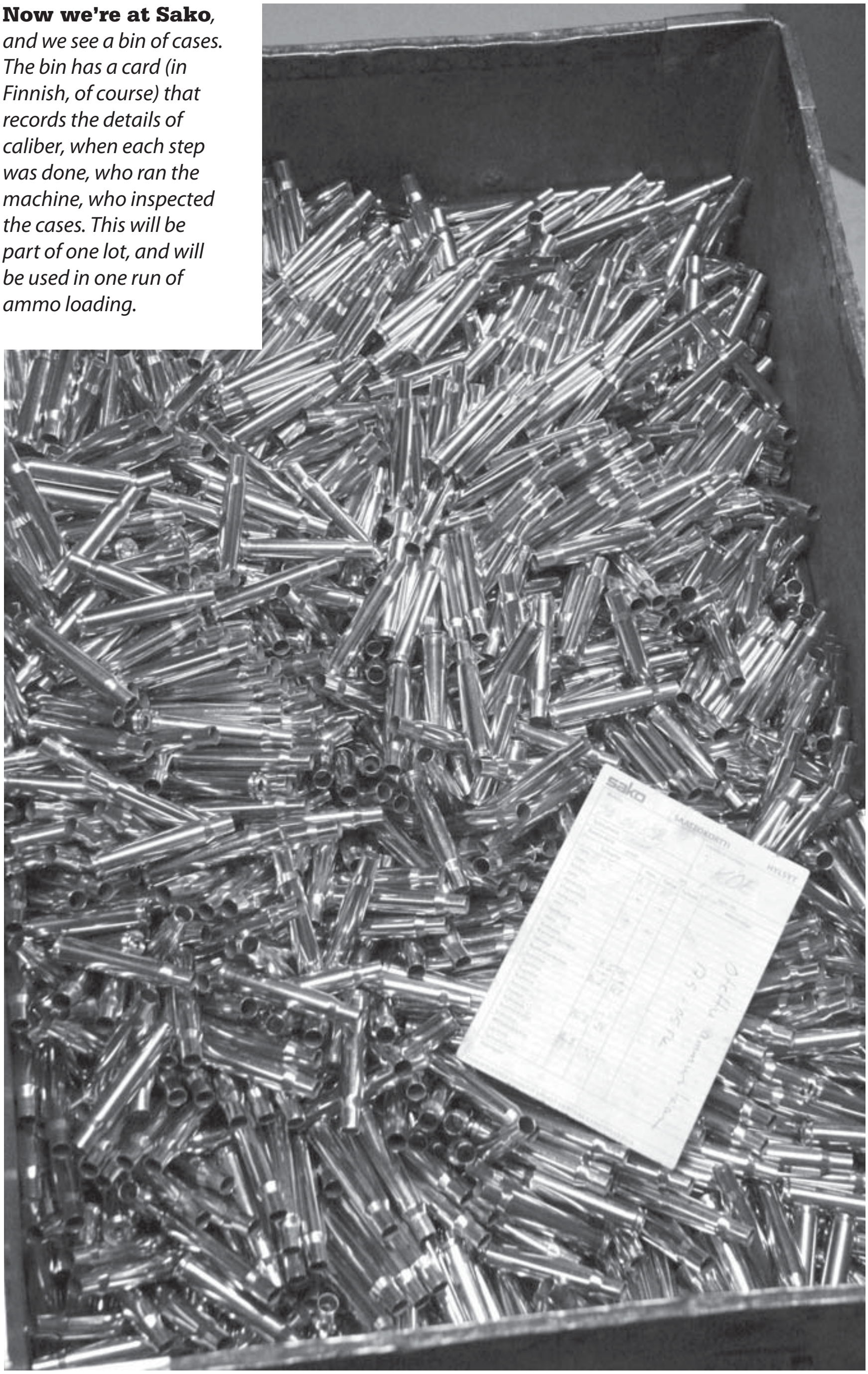
purity and length, hardness and surface finish, depending on what cartridge is to be produced. For the .45 it is about 1/8-inch thick. Different cartridge cases require different thicknesses of coiled brass, as you'll see. The cupping presses of the shell case maker can only handle certain widths of coil, so the buyer specifies what they require. (Too wide and there is too much scrap. Too narrow and you lose potential cases from "nicked" brass coins.) How much does that coil cost? It depends on the commodity (metals market) price of copper and zinc, dimensional tolerances required and just how big a coil the shell case presses can handle.

The first thing that happens is the cartridge case maker inspects, measures and assesses the brass. If it is all as ordered, it goes into inventory to be used to make shell cases. In use, each coil is mounted in a holding rack, and the brass is unwound and fed into the coining machines. There the machine punches out a brass disk. The disks, or coins, are closely inspected to ensure they meet the maker's needs. Also, if the brass is not within specifications, this is the first step that shows (or potentially shows) that something is wrong. The coins then get sent to the first cupping machine. There, the machine takes each one and holds it over an open-faced die, where a ram slams the disk down into the die, forming a little brass cup. The resulting cup is the first thing that looks like a cartridge case. In most instances, the coining and cupping happen within minutes of each other, even seconds, in the same machine or sequential machine setup. There are some companies that do nothing but make cups and sell them to ammo companies who then go on to make the brass. Why? Speed and hydraulics. It takes a big, powerful machine to precisely blank a coin and to form that first, thick-walled cup. If you do not make enough brass cases to keep such a machine working 40 hours a week, why buy it?



The "coin" *is not some slug, or knock-out disk from an electrical box; in this instance it is over an eighth of an inch thick.*

Now we're at Sako, *and we see a bin of cases. The bin has a card (in Finnish, of course) that records the details of caliber, when each step was done, who ran the machine, who inspected the cases. This will be part of one lot, and will be used in one run of ammo loading.*



Here a worker *is inspecting. Each will be placed on the holding rack, rotated and visually inspected. If any fail, it gets ditched. If too many fail, the whole lot goes to scrap.*

Each individual case design requires its own series of steps. Obviously the maker can‘t slam it all into a case in one step. (Or maybe not obviously.) A big, long case like a .375 H&H might require almost a dozen forming steps. A smaller case like the .45 ACP might only take three or four. However, it is not all forming. To keep the coins and cups from galling, that is, tearing and being marred by the experience, they have to be lubricated. Also, when you cold-work metal, it experiences a process known as "work-hardening." If you take a paper clip (the softest of soft steels) and bend it back and forth, you will eventually break it. It breaks because it becomes brittle from work-hardening and fails from that brittleness. Brass cups, as do all metals, work-harden as they are formed. If they become too hard, they can't be properly formed in subsequent steps. A brittle cup, when drawn again, would form stress risers, locations that would quickly crack. The cups have to be unhardened between steps.

To soften a metal is a process known as "annealing," a procedure where you heat the metal up to a given temperature and then allow it to cool slowly. If you heat and then cool quickly, that process is known as "quenching" and actually makes metals harder. That is except for copper alloys, which do not quench-harden. 'Tis true, you can quench-harden steel, you can quench-harden lead alloys, but you can't quench-harden copper alloys. So your handmade replacement parts can be heat-treated, and your wheelweight alloy cast bullets can be hardened, but you can't quench-harden cartridge cases. You can only soften them. The temperature you need to achieve, and the time the metal must spend there is different for each alloy, item size and the degree of annealing you desire. Another process that requires technical knowledge, education and a grasp of mathematics.

So the cartridge case manufacturers have each worked out to their satisfaction how much work they can do, how often they have to anneal and the ancillary steps both require to efficiently and economically produce shell cases. You see, to anneal you have to have clean metal so the forming lube has to be washed off. Otherwise the burnt lube will clog or even mar the next forming die. When you anneal, the heated metal forms oxidation on its surface, which must be cleaned off. Cleaning off the lube is as simple as using soapy water, but the oxidation requires acid. Getting the annealing oxides off the surface is a process known as "pickling," which requires acid. The best type for the process is a dilute solution of sulphuric acid, but the handling and disposal requirements make it problematic. I have to assume each maker has figured out a process that works for them, and is rightly close-lipped about it, as the pickling represents a real cost in manufacturing. Then again, none of this is cheap. The acid provides a bright, clean surface. So, from coil to case, each brass lump has to be punched, lubed, cupped, drawn, cleaned, pickled, drawn, etc. And it still is not done.

Here the rack *is being scanned. Good lighting, and want to bet she has her glasses and eyes checked on a regular basis?*

Here at the Sako plant, *we see drums of cups. Each of these is 660 pounds worth of once-drawn cups, ready to go on to a specific caliber process.*

A foil-cutter, *to clip the little foil disks that go into primers.*

The cups, when brought to their final drawn shape, still need work. The headstamp and primer pocket must be formed, and these steps fall under the "Heading" operation department. The bunter die has the shape of the primer pocket machined on it (the die is hardened steel or even tungsten carbine, while the cup is much softer brass) and it also has the headstamp marking engraved on the bunter. When the bunter slams into each case, it creates both the primer pocket and the headstamp markings. Some calibers get a preliminary, primer-pocket-only bunting, then a finishing with a headstamp bunting to follow. Others can get it all at once. Finally, the almost-finished shell cases are fed into an automated lathe. There, the extractor rim is cut. Yes, cut. How else do you think they can create that nice, clean, smooth groove?

The heading process does three things: it creates the primer pocket (but there is still not a flash hole yet), it marks the case as to caliber and maker and it work-hardens the head and rim of the case, hardening it to just the right degree for the task to come—being a cartridge case. What about the flash hole? That is either punched

At Sierra, *an automated brass inspecting and sorting machine.*

or drilled as the last step. The lathe cut has to be done as a final step (before or after the flash hole doesn't matter, except that the case-handling machinery design may dictate where the step happens) otherwise the bunter will deform the rim, and the rim will also remain too soft, not having taken the full impact of the bunter.

An interesting detail: some calibers have more elaborate heading dies than others. For instance, the bunter slams into the supported shell case of a copper blob intended to be a rimmed case, think .30-30. The heading die will have a recess machined into it, a place for excess brass to flow in order to form the rim. Military brass like 5.56 will have such a recess, not for a rim but to make absolutely sure there is brass for the extractor rim, so there is no chance of a weak rim creating a problem in combat.

All hammering and machining done, the case is now almost ready. Once this far, it still has to have a few more steps, depending on the caliber. Rifles get the body annealed, then the neck and shoulder are

The US made *steel cases during WWII and Korea. Here's a round loaded in 1954 (right), as good as the day it was made.*

formed. There is another annealing, pickling and cleaning routine, the case is trimmed to final length and then it is inspected. Military rifle cases don't get the last pickle and clean and are left with the visible bluish-black oxidation as visible evidence of the final anneal step. Handgun cases get a final neck-shaping, trim and then sent off for piercing. If it goes straight to ammo loading, the piercing is the first step to priming, otherwise piercing is the last step.

Now it can be fed into the brass maker's ammunition loading process, or it can be shipped off to the client who will do their loading or it can be boxed or bagged up and sent to you, the consumer.

The Sierra shipping *department, with pallets of cartridge cases ready to go out.*


DO NOT
DOUBLE
STACK
SIERRA
The Bulletsmiths
SIERRA
The Bulletsmiths

Think you have *a lot of brass on hand? This woman has already sorted and inspected six drums worth of brass.*

Now, if you really want to see where headaches can come into things, imagine it is the early days of WWII. Critical metals are in short supply. The government asks a seemingly innocuous question, "Can you make cartridge cases out of something cheaper than copper?" Like, steel? Steel differs in almost every regard. It is harder and more abrasive on dies. It work-hardens, but it also quench-hardens as we discussed. So your annealing steps have to be redesigned. You have to coat it somehow or store the unfinished product swimming in oil or the oxidation forming on steel will ruin dies. You know, that rust stuff. Bunters wear faster, dies wear faster, you need a different lubricant, you have to alter the anneal process, it is all different. The miracle is not that we had so much ammo at all, but that how much of the WWII production was steel-cased ammo. Not only .45, but .30 Carbine as well. Today? Not a chance. The operations costs, plus the machinery and process changeover costs would require such a disparity between brass and steel costs that none of us could afford to shoot.

No, the manufacturing process is now finely-tuned and the costs are so well known that changing to another metal (except for aluminum, which we'll get into in a short bit) would be prohibitive.

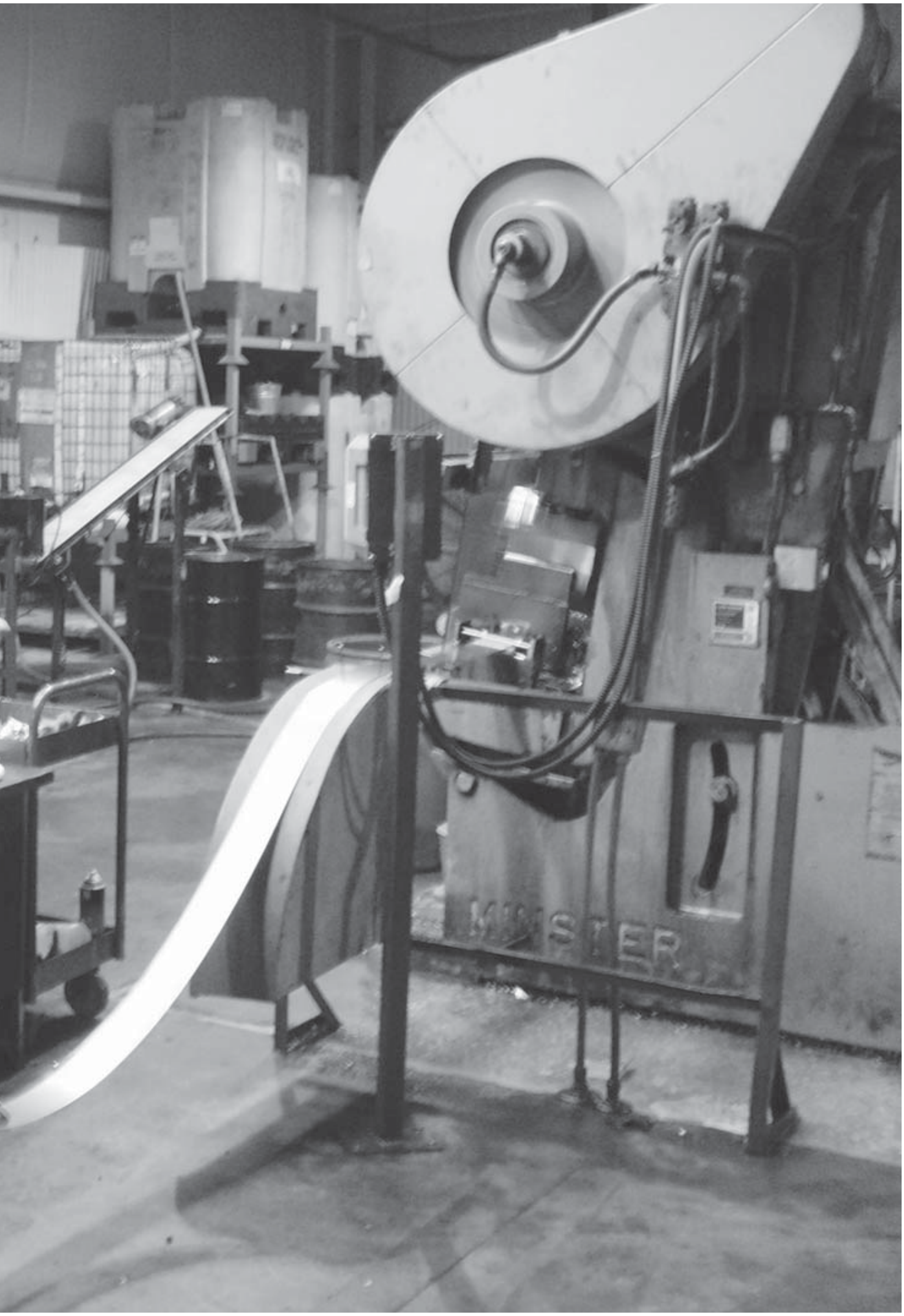
Mathematics informs all of the steps in any manufacturing process, not just ammunition, and the process as a whole. In mathematics there is a peculiar curve known as a "Cauchy Sequence." Named after Augustin Cauchy, a French mathematician, it describes a dampened curve over time. Mathematicians who read this will howl in outrage.

"No, it is a sequence of numbers where the axial displacement of each integer…." Oh God. I had a college class in my last semester

Here are cups *coming out of the annealing oven, headed for a drum.*

that brings back similar nightmares. The class was the culmination of the mathematics, electrical, chemical and physics curricula and it was taught by the then-Vice President of the college and later President, Dr. Marburger. If you wanted to graduate with a degree in any of those, you had to pass his class. (For some strange reason the mechanical, civil and other engineers got to graduate without it. Wimps.) The textbook was one of those 5-inch by 8-inch books that had hard covers and perhaps 75 pages in between. The first page had a line of text: "As seen in this equation" followed by an equation. Underneath that was a line of text: "As one can readily derive" followed by another equation. There was a short paragraph and a third equation. We had all gone through four semesters of calculus, followed by differential equations, partial differentials and had been immersed by that time for two full years in mathematics from pure to applied. We were mostly lost by page 3.

Brass coils, *being fed into a coining machine, where they will be cut into disks, the first step to becoming cases.*

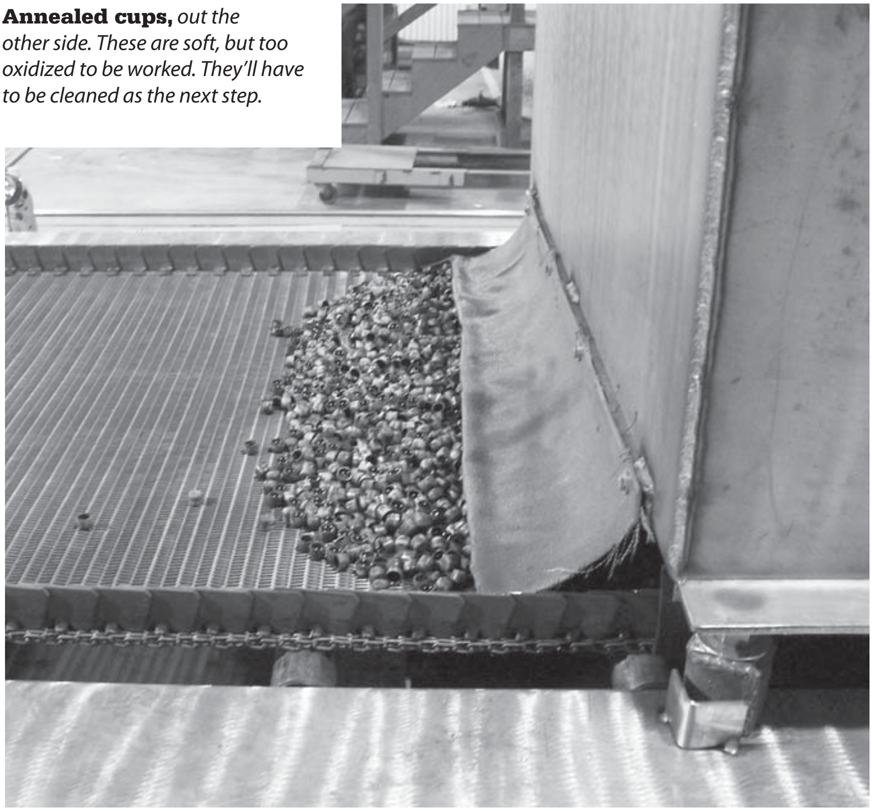

MINSTER

Fresh, clean, just-formed cup, *being fed into the annealing machine. Right now they are too hard to be worked again.*

So when someone who is intensely interested in mathematics says, "No, that isn't right," I wonder if it makes a difference in the real world. Here's the real-world demonstration of a Cauchy sequence. Strike a bell. Hear the gong? The note descends in volume over time. That measure of sound volume is a Cauchy sequence. Unlike that bell, a Cauchy sequence approaches but does not dampen down to zero. It will decrease, but the decrease may be so small that no amount of time will bring it to zero. The shock absorbers on your car take the Cauchy sequence of the wheel vibration and force it down to zero faster than the normal time the forces would take. The mathematicians among you will be fuming at this point. "As long as the Cauchy sequence trends towards zero, the amount of time it takes to reach it doesn't matter. If it fails to trend, it is some other sequence," they will say.

What does this mean for us? It allows us to describe the world as

Annealed cups, *out the other side. These are soft, but too oxidized to be worked. They'll have to be cleaned as the next step.*



we see it. Some sequences are Cauchy sequences, and they will normally dampen to smaller and smaller (although not all will dampen to zero) levels. Some are non-Cauchy sequences, and they will build until they fall apart. You know them as positive and negative feedback.

When measured in a manufacturing environment, many variables go through a Cauchy sequence. For instance: The managers estimate how much it will cost to make some new item of stuff. They find out their estimates of cost are too high, they adjust and find out they are too low. They adjust again, each time getting closer and closer to the true cost of making a product. The production engineers estimate scrappage and get it wrong, adjust, etc, etc. You get the point. They figure what it takes to stay within the manufacturing tolerances of the product, err, adjust and move on.

What really screws things up is when an anointed MBA rolls into

Racks of copper reels, *ready to be coined into case or bullet cups.*

the plant, assuming because he has a diploma from a prestigious school that he knows all, overrides managers and production decisions and then insists the quarterly reports are glowing in terms of goals met. (I assume from that that the reader can deduce my lack of an MBA.) Left to the normal forces and variables of a system, any production line, product or process will undergo a Cauchy sequence. So what does all this mean for us?

Simple, you, the consumer, are the recipient of a century of Cauchy sequence corrections in production, dimensions, design and quality control. The humble .45 ACP case you hold in your hand (you couldn't help yourself, could you?) is an item held to tolerances NASA would be proud of, if NASA made anything by the

billion besides report copies. The shell cases you use are so uniform, over such a span of manufacturing time and locations, that you really don't give the headstamp on any particular case a second thought, do you? It may have been made before you were born, heck, before your parents were born, and you have every expectation that it will work as it is supposed to. And you are right to make that assumption. .45 ACP brass has been so refined over the decades that it is rare to hear even a whisper of problems with it. In other calibers you can have warnings of the brass in general (".38-40 and .44-40 necks are thin and prone to buckling") or some batches in particular ("early .40 S&W brass has a weak base, or a certain brand of 9mm brass sucks") that reloaders sometimes sort their brass looking for the problem children. Not so with the .45 ACP, where reloaders have loaded individual cases so many times the headstamp is obscured from ejector hits and hundreds of firings.

In all fairness, I have to tell you about another manufacturing method. This one is called extrusion, or impact extrusion in the cartridge case world. In the traditional method, the coins are hammered in closed-end dies and formed into cups. Well, extrusion differs in that the forming dies are not always open, and when they are closed the closed end can also move. The customary form of extrusion is familiar to us all in the form of toothpaste. Toothpaste extrudes from the tube (which is itself formed via the extrusion process) and you get a cylindrical column of paste.

Impact extrusion simply uses rams and hydraulically-worked dies to shape a cup and then a shell case. The advocate of the process in the firearms field is CCI, who first developed it to form Blazer cases made of aluminum. The idea of aluminum as a cartridge case came about during the Vietnam War. Before WWII, aluminum had been too expensive to even think of using as a replacement for brass.

After the war, its primary use was in aircraft. During Vietnam, the huge amounts of small arms brass being used and abandoned were significant. So the Department of Defense tried to get ammo makers to explore the use of aluminum. It didn't work so well, primarily due to the high pressures of rifle cartridges. Decades later, CCI/Speer looked into it, developed a process to form shell cases and produced ammo. How does it differ from the traditional method? CCI/Speer spent a lot of money and elbow grease developing the process. They don't talk about it. But it does produce shell cases that are entirely suitable for ammunition. What they aren't is reloadable.

Aluminum is not so forgiving of the expansion and resizing that any reloaded cartridge case undergoes. To prevent customers from being disappointed in the short service life of aluminum cases as reloadable products, CCI/Speer produces the cases with Berdan primers and an odd-sized primer pocket. They can't be reloaded, because only CCI/Speer makes the primers, and the Blazer primer pockets don't fit the two standard Boxer primers. I did have one guy, years ago, who exclaimed it was all a conspiracy: The government was going to mandate aluminum cases, Berdan primers and thus we all would be dependent on factory ammo. As with such schemes, the detailed intricacies required soon drove me to a headache and out of the gun show. Now, I'm not saying the case is completely unreloadable. I'm sure, with a jeweler's lathe, enough hard work and planning and some really involved work you could reload a Blazer case. But why? For the same work you could probably reload a hundred regular cases. And since the whole point of the aluminum, and Blazer, ammo is the low cost, what are you screwing around for?

So let's move on, and look at the details of the case we are all so enamored of.

Case Dimensions

The .45 ACP case is supposed to be a maximum of .898 inch long. You could sit down with dial calipers and a 55-gallon bucket of cases and not find one that long. In fact, you'd be hard-pressed to find one that was much over .890 inch long. The chamber is supposed to be a minimum of .898 inch deep. (I think you can see where this is going.) You would be hard-pressed to find one that comes close to that. So, with a chamber .900 inch or .905 inch deep, and brass that is .890 at most, where are we supposed to find that magical .006-inch allowance for headspace? We aren't. There isn't any. The 1911 probably uses the extractor to wrangle the case into position well enough for the firing pin to strike it. Even if it didn't, the firing pin on the 1911 has so much excess travel that it can actually get shooters in trouble. The 10mm and the .40 S&W are the same diameter, and use the same bullets. If you feed a .40 into a 10mm, it should be too far from the firing pin to discharge. In a 1911, the firing pin can reach, leading to a pierced primer. But we digress. The chamber is short enough, and the disparity between ideal and real length small enough, that the "problem" isn't one.

In some reloading applications, case length is a big deal. In high-pressure rifle cases, brass flow lengthens cases, and at the operating pressures they run at, letting the case mouth grow too long is a serious concern. If it gets out far enough that it extends past the reamed part of the chamber made for it, pressures can spike radically.

Rifle shooters measure and trim brass.

The guys (and gals) who shoot big magnum handguns have to worry about bullet pull from recoil. They also have to worry about the bullet moving too soon, at the start of pressure, and the powder not reaching full burning pressure. They'll apply a heavy crimp on the case, a crimp so heavy it requires cases of a known and uniform length. They'll measure and trim brass.

So what about us fans of the .45? I cannot convey to you just how much of a waste of time, a colossal expenditure of effort that could be put to better use, measuring and trimming .45 ACP brass. Except for one time, some 30 years ago when I measured a couple of fistfuls to satisfy my curiosity, dial calipers of mine have not measured the length of .45 ACP brass since.

As for the matter of diameter, you're cool there. Unlike the 9mm Parabellum, which has been made all over the place (and it might seem as if made by people who could not comprehend the use of measuring tools), the .45 ACP has been made pretty much just in places with top-notch quality control and standards. Since the .45 is such an American-centric caliber, it has been made pretty much just by Americans and those who wish to sell things to Americans. Unlike 9mm, where you might find the arsenal of South Carjackistan making ammo under contract for the Princedom of the Inundate Archipelago, .45 ammo was made to be sold to us.

As a result, the likelihood of finding off-dimension brass is pretty slim. Not impossible, but slim. You can search and find lists of all manner of suspect 9mm brass. I sometimes wonder who has occasion to find out that so many particular headstamps of 9mm don't work.

Now, in reading this over and making sure it is correct, I happened to recall one particular batch of .45 ammo that wasn't so good. I never really understood the old adage "The exception proves the rule" since it seemed to me that if there was an exception, then there wasn't a rule. But hey, some of these adages come to us from several centuries ago or more when it was pretty common for anyone and everyone who could lift a glass to get good and roaring drunk.

Anyway, this .45 ammo was French. If you ever see it, you'll recognize it. It came in cute little 25-round pasteboard boxes with a green label. The stuff was made with Berdan-primed cases, and is corrosive as all get-out. Compared to American-made ammo using corrosive primers, this stuff was like flesh-eating bacteria. There was a big shipment of it in the early 1970s, and when I began gunsmithing late that same decade, we had almost seen the last of the ammo—but not the rusted bores it brought on. So be aware that there is some stuff, but nothing like the mountains of wretched 9mm ammo the world has seen.

So, if it is American-made, commercial or military headstamped and it is marked as ".45 Auto" or the like, you can use it. Unless of course, it is cracked. That happens.

Inspect your brass, make sure it isn't cracked and that it is marked .45 Auto or has military headstamps, and that there is nothing living inside the case. Clean it, load it and get to practicing.

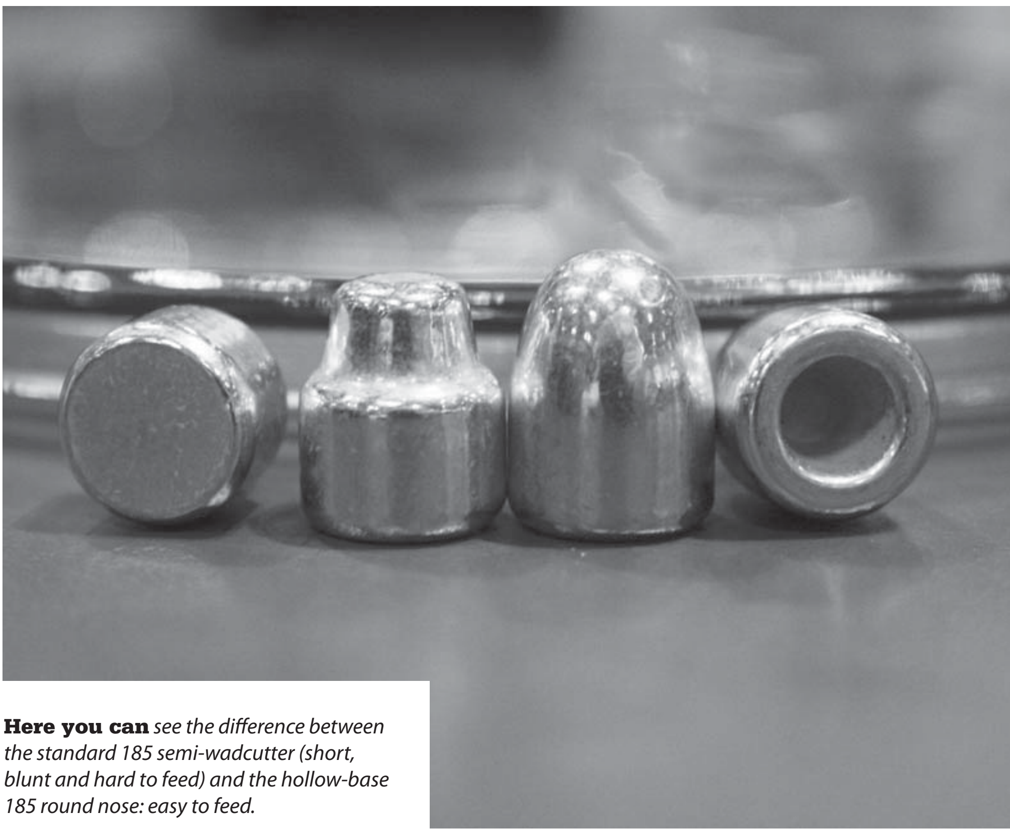
CHAPTER 4

Bullets

Bullets would seem to be a pretty simple item, right? Well, yes and no. Remember the blow-by-blow description we just went through in Chapter 3 on how the cartridge case was made? That pretty much sums up the original way bullets were made. At the time of the .45 ACP being developed, revolvers ruled the roost. After all, they were really the only choice for that uncertain area between impact and cutting weapons, and rifles and shotguns. Pistols were in their infancy. Revolvers worked just fine with lead bullets, and that was the standard. After all, there was no real need to develop any kind of a jacketed bullet for revolvers.

The hollow base *of Berry's Bullets 185 FMJ acts much like that of a Minie ball.*

Each round of revolver ammunition did not have to be mechanically fed into the chamber, as a pistol has to. They did not achieve the kind of velocities that rifles did (even the pre-smokeless high speed black powder rifles) and thus has no need for a jacket. Now, a generation before the development of the reliable self-loading pistol, rifles had undergone a revolution. The initial steps towards high velocity used compressed charges of black powder in bottlenecked cases and hardened lead bullets. Even at that, the result was a rifle that delivered a bullet at less than 2,000 fps muzzle velocity. However, with the invention of *poudre blanc* by the French, the first useful smokeless rifle powder, the game was changed. They quickly introduced a rifle cartridge that launched its bullet at a significant step above 2,000 fps. Additionally, the round did not produce billows of smoke when fired.



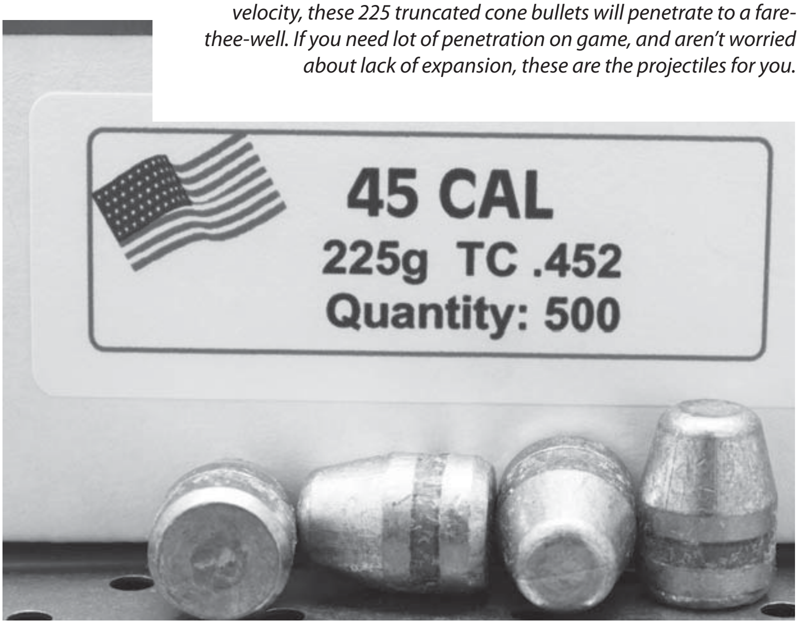
Here you can *see the difference between the standard 185 semi-wadcutter (short, blunt and hard to feed) and the hollow-base 185 round nose: easy to feed.*

Lead ingots. *Not all lead comes into Sierra as wire.*


¼ TON

The result of bullet making: *more bullets than even I could load and shoot. Love to try, though.*


100 RIFLE BULLETS
SIERRA MatchKing

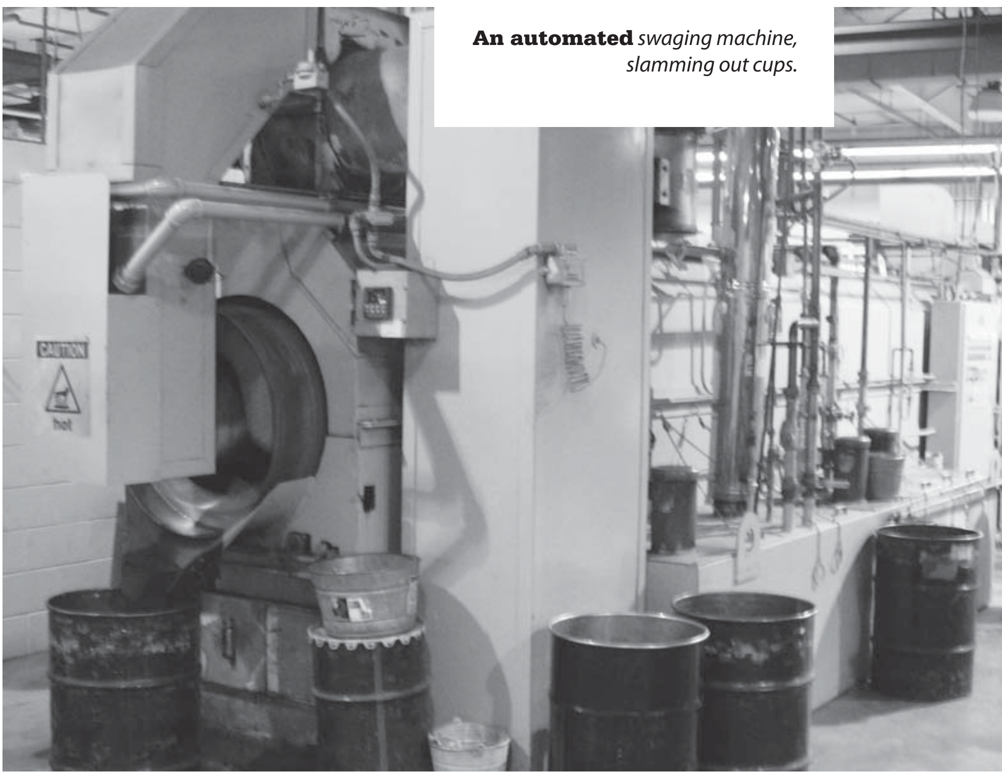


Cast hard, *as these Laser-Cast bullets are, and driven at full velocity, these 225 truncated cone bullets will penetrate to a fare-thee-well. If you need lot of penetration on game, and aren't worried about lack of expansion, these are the projectiles for you.*

Every Army around the world had to change or be hopelessly obsolete. Everyone who has paid attention in history class knows of the charge by Teddy Roosevelt and the Rough Riders up San Juan Hill. (That is at least in schools that still teach both history and the history of dead, white European males.) What you don't get are the important details, such as the Rough Riders were armed with single-shot black powder Trapdoor Springfield rifles. The Spanish troops they faced were armed with Mauser bolt-action rifles in 7X57 and could reload them with stripper clips. With even a bit of practice, a Spanish soldier could maintain a rate of fire of close to ten shots a minute until he either ran out of ammo or his rifle became too hot to hold. And his cartridges produced little or no smoke.

The Rough Riders' Springfields could be counted on for three or four shots, each with a huge cloud of white smoke, and if he had packed extra ammo it might not do him much good. The Springfield would quickly heat up, and it was then a race to see if it would become too hot to hold before the overheated chamber seized with a fired case in place, taking the rifle out of action. That the Rough Riders not only charged and took the hill, but then used the Spanish guns to drive a Spanish force off the adjacent hill, was cause for acclaim.

The prospect of facing a repeating rifle-armed opponent, who used smokeless powder, while using obsolete single-shot or repeating black powder cartridge rifles, was not something any Army officer looked on with any enthusiasm. So, rifles and their ammunition were quickly improved. One improvement that bears on our subject is bullets. Lead bullets, no matter how they are alloyed, cannot withstand the velocities and pressures of smokeless powders. Especially the early powders, which were hot, fast-burning and abrasive. In fact, the early loadings of the U.S. .30-03 and .30-06 were so ferocious that barrel life on the new Springfield 1903 rifle was an unacceptable less than 1,000 rounds. And that, with the Army willing to accept "minute of soldier" accuracy near the end of barrel life. No, bullets had to have a harder cover than lead. While many materials seemed acceptable, in the end gilding metal bullets became the norm. Yes, the same alloy as our cartridge cases.

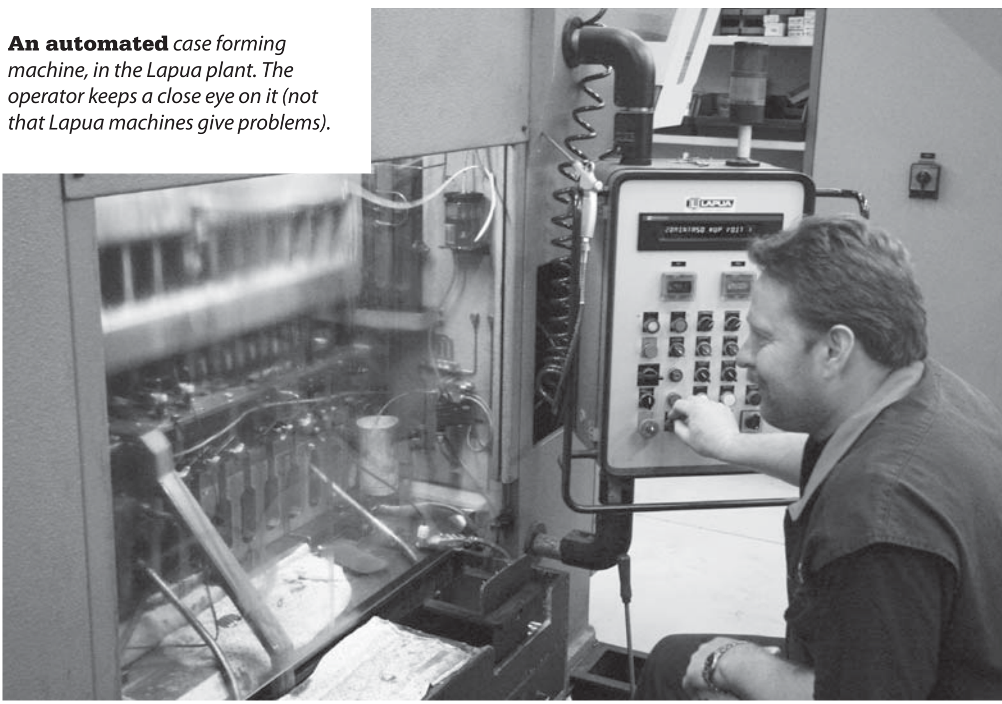


An automated *swaging machine, slamming out cups.*

Lead ingots at Lapua. *Each is bar-coded with the lot, hardness, alloy type, etc. In Finnish, of course.*

One early choice, cupro-nickel, was found to have a particularly unacceptable drawback: fouling that didn't behave. Where gilding metal fouls the bore with thin sheets, cupro-nickel built up its fouling in chunks. A barrel fed gilding-metal bullets maintained acceptable accuracy until the fouling had built up too much, and then accuracy tailed off. Even when fouled it delivered reasonably acceptable accuracy for combat uses. Cupro-nickel, on the other hand, building its fouling in chunks, had good accuracy right up to the point where accuracy simply disappeared. Shoot the rifle too much without cleaning (as in really thorough, scrubbing all the fouling out cleaning) and you couldn't hit the broadside of a barn.

One other metal used is steel. While mild steel is softer than barrel steel, it is still harder than any copper alloy. Military organizations a century ago didn't have a lot of money. A quick test and some number crunching, and they all came to the same conclusion: The cost savings of using steel-jacketed bullets was more than offset by the reduced service life of barrels. Save a buck on bullets, and you ended up spending two bucks on barrels.



An automated *case forming machine, in the Lapua plant. The operator keeps a close eye on it (not that Lapua machines give problems).*

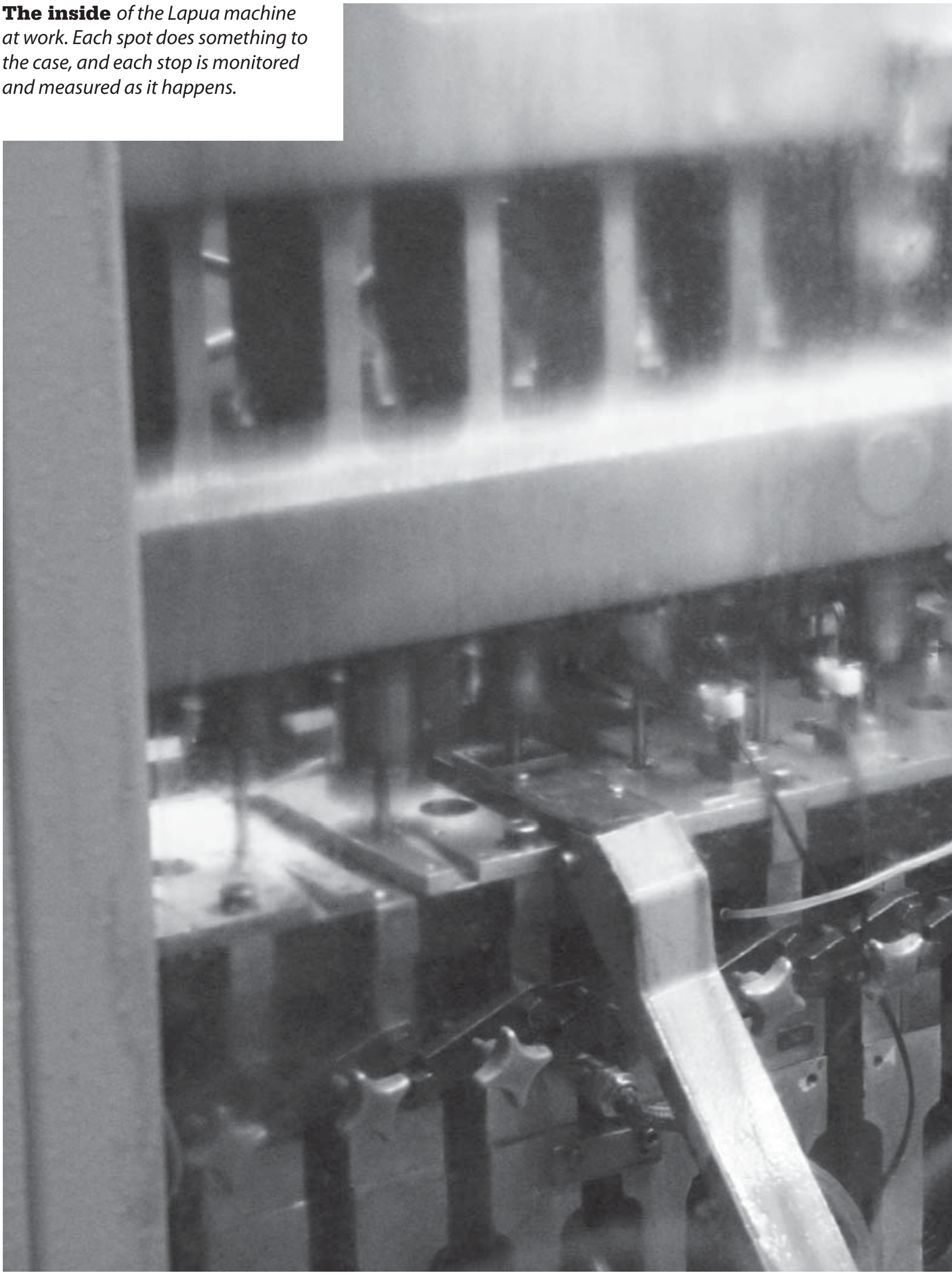
So we entered the 20th century with jacketed rifle bullets and lead bullets in revolvers. The lead bullets used in factory ammo were made by a simple process: swaging. Swaging is a simple, fast and economical manufacturing method still in use today. The bullet maker receives lead alloy (not pure lead, but as pure as can be inexpensively made) as wire on large spools. The spool gets mounted on a frame, and the wire is unwound into the cutting and swaging machine. The machine chops the wire into bullet-weight sections. Each section is fed into the swaging machine where the lead section goes into a die. The ram on the swaging machine slams down into the die, forcing the soft lead into a bullet shape. That's pretty much it. The bullet can then get some sort of lubricant applied (to prevent lead deposits in the barrel when fired) and or some sort of protective coating.

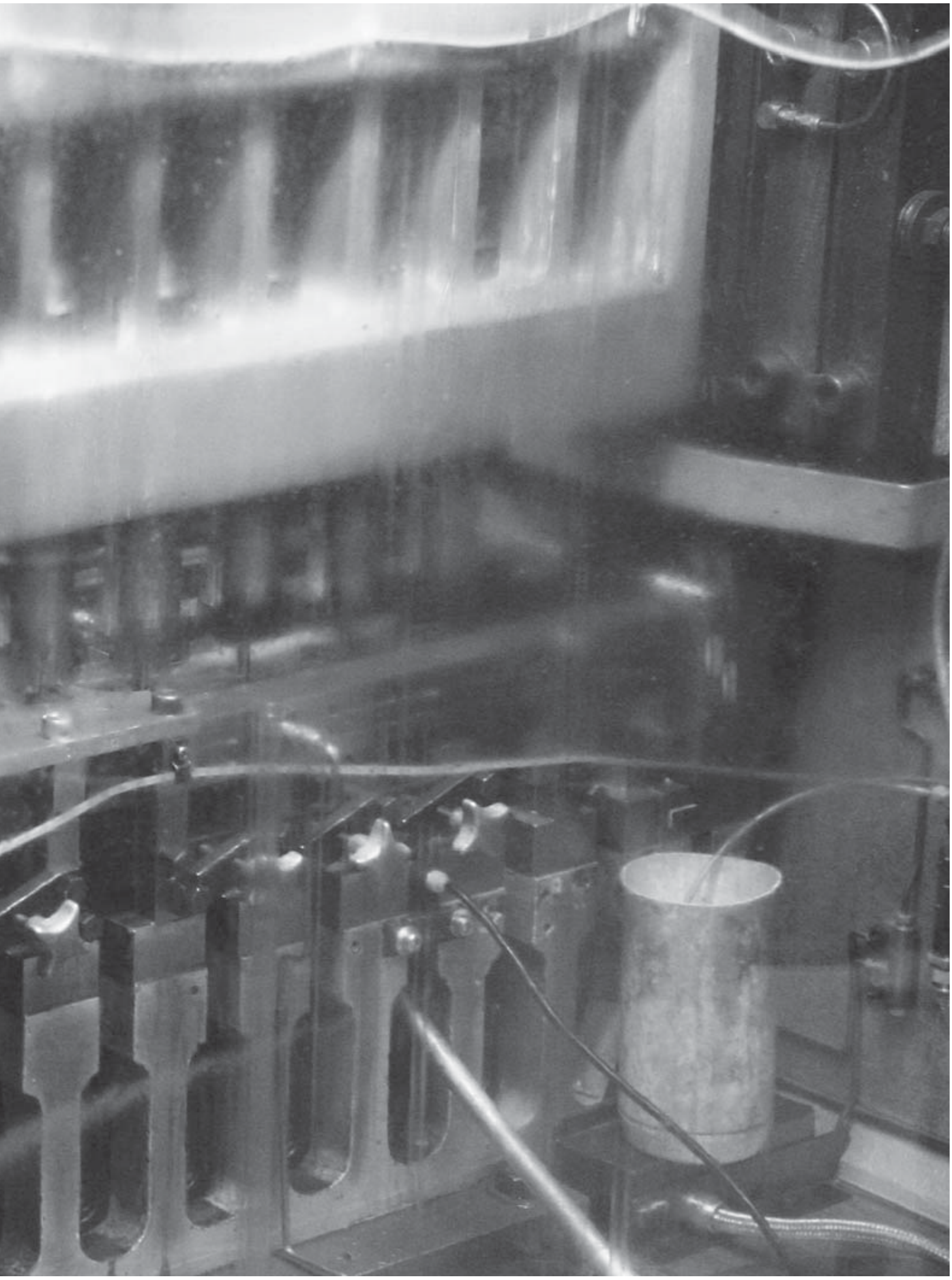
That is the way all .22 LR bullets are made, and many of the lead factory ammunition you see, in all handgun calibers, is made by the swaging process.

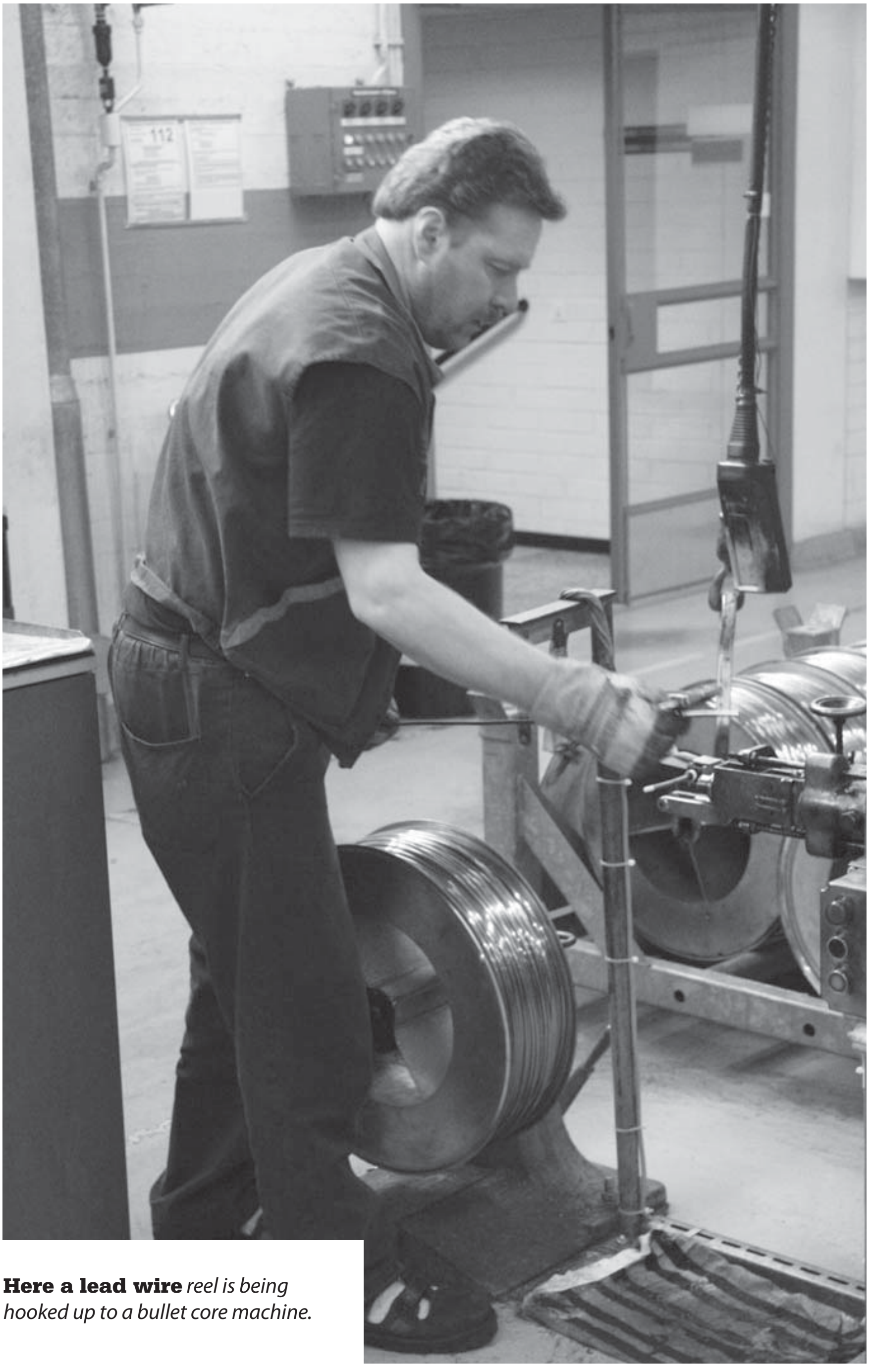
The heavyweights *for normal .45 ACP loads. On the left a Laser-Cast 225, center a 230 round nose, and on the right a plated 255 truncated cone from Berry's Bullets. These will give you the full measure of "oomph" that a .45 can deliver.*

A brief aside is in order here: Any metal that is not pure is lumped in the general category of "alloy." We tend to think of alloying metals as something that hardens a metal, as in alloyed steel. However, alloying does not always harden a metal. Sometimes it softens it, and in many instances it has no real effect on hardness. The real difference is that in an alloy, we've put the extra elements in there on purpose. The impurities in our lead bullets (which is what they really are, as they are not there deliberately) have no effect on hardness. If they did, the bullet maker would tell the foundry to make sure and leave them out. So, you can have a small amount of trace metals: antimony, silver, copper, maybe even a detectable amount of iron. It all depends on how much scrap lead was included in the foundry batch made, called a "pour." For a long time, the FBI asserted that they could link recovered bullets to ammunition found in suspects by matching the amounts of trace impurities in the two batches of bullets. When I first had that process described to me, I took about 10 seconds to calculate the probabilities and declared it to be BS.

The inside *of the Lapua machine at work. Each spot does something to the case, and each stop is monitored and measured as it happens.*







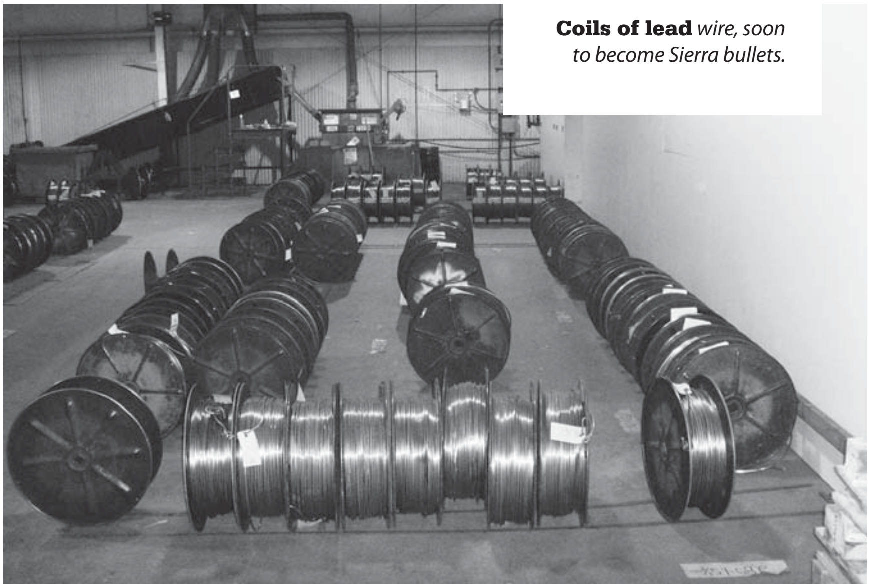
Here a lead wire *reel is being hooked up to a bullet core machine.*

The senior FBI agent who had proudly told me about it remarked that I didn't know what I was talking about, the FBI had researched it and they had proved it in court. Since he had a law degree, and I had a chemistry degree, he was obviously correct. It wasn't until years later when the National Academy of Sciences had a chance to look at the situation that I was vindicated. (Well, not me personally, but the scientific position I was defending.) How? The foundry mixes a batch of lead and pours the mix out to be made into bullets. Let's call it a small pour, "only" 10 tons. Those 10 tons represent 88,000 .38 Special bullets or 350,000 .22 LR bullets. Those are big numbers to use, and to say you've "matched" the recovered bullets at a crime scene to the bullets found on the suspect using a chemical assay as a match is a stretch.

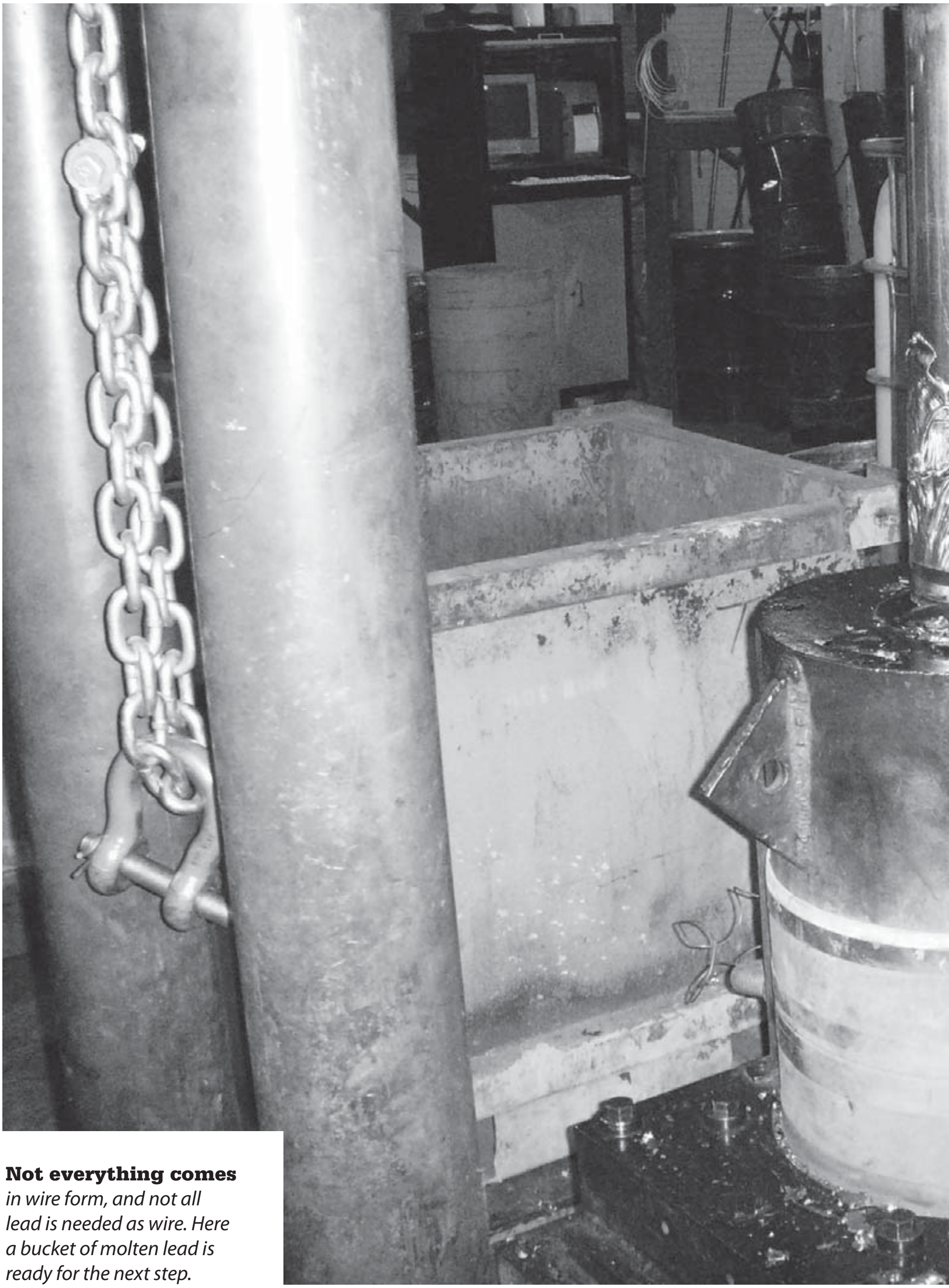
The result of *the wire reel feeding into the machine is this: cores ready to get cleaned and stuffed into jackets.*

Core, cores, plenty of cores. *The shape: to allow feeding in the next machine.*

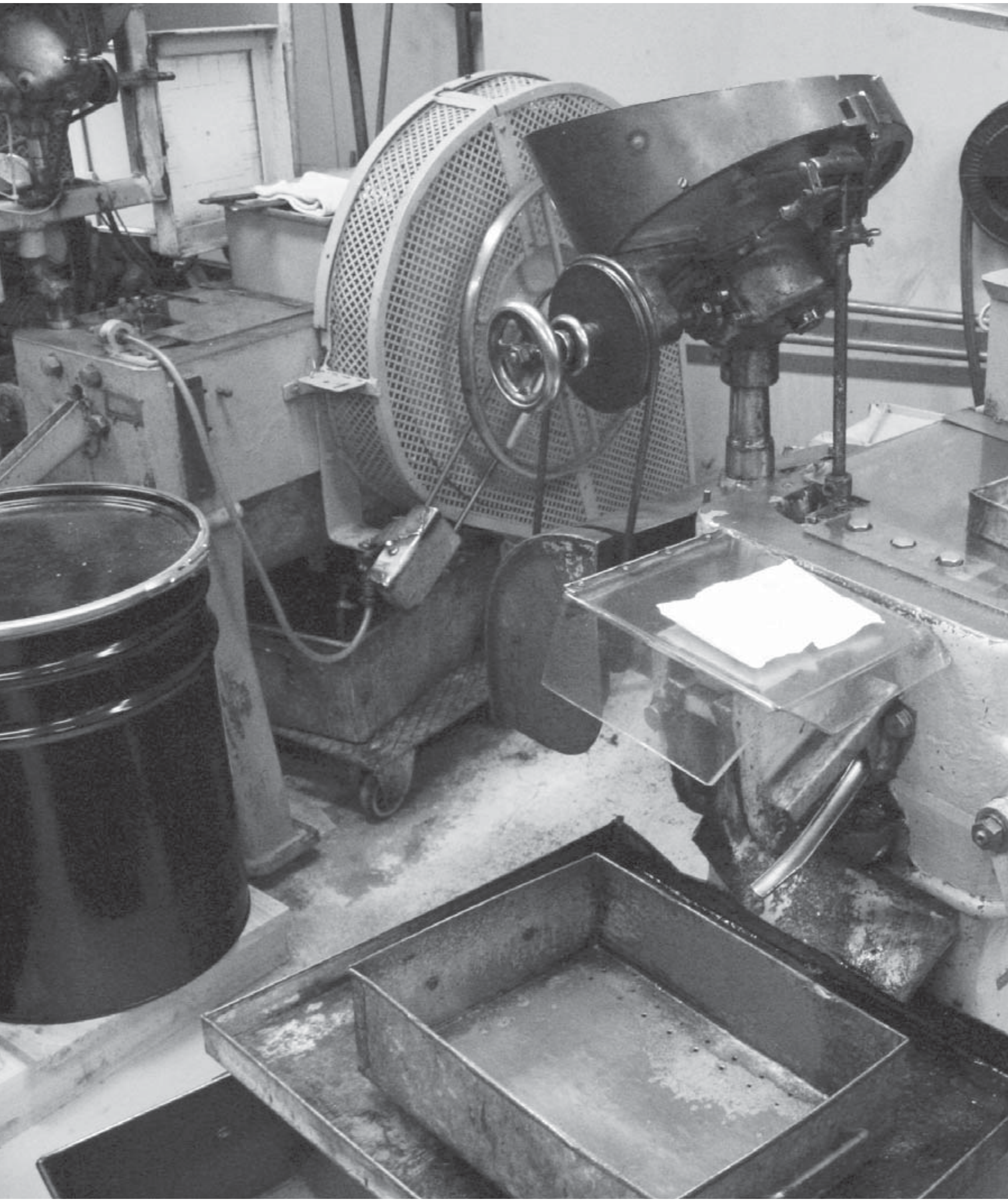
The number and amounts of impurities are very limited. Basically, in "pure" lead you have trace amounts of arsenic, calcium, tin, copper and silver. If it has been hardened at any time, or comes from hardened scrap, it will have some small amounts of antimony in it. But none will be as much as 1 percent, and likely the total of all will be less than 2 percent. So, with even just two or three impurities, each at very small levels, you might have anywhere from one in five to one in 20 pours produce identical chemical assays. Remember, the chemical assay is not going to produce a figure like ".75 percent of calcium," it is going to come back as "less than 1 percent calcium" so any and all bullets with less than 1 percent will be the same in all assays. It would take an excruciating analysis to determine that it was .75 percent plus or minus .05 percent. Not only does that recovered 158-grain bullet sitting on an evidence room shelf have 88,000 other bullets just like it out there from its pour, but maybe as many as 20 percent of all 158-grain bullets ever made will assay so close in impurities that an honest chemist could not say they were different. Indeed, lead wire used in swaging bullets at the individual level, such as with a swaging press to make them one at a time, is listed as "99.5 percent pure," which really cuts down the possible combinations.

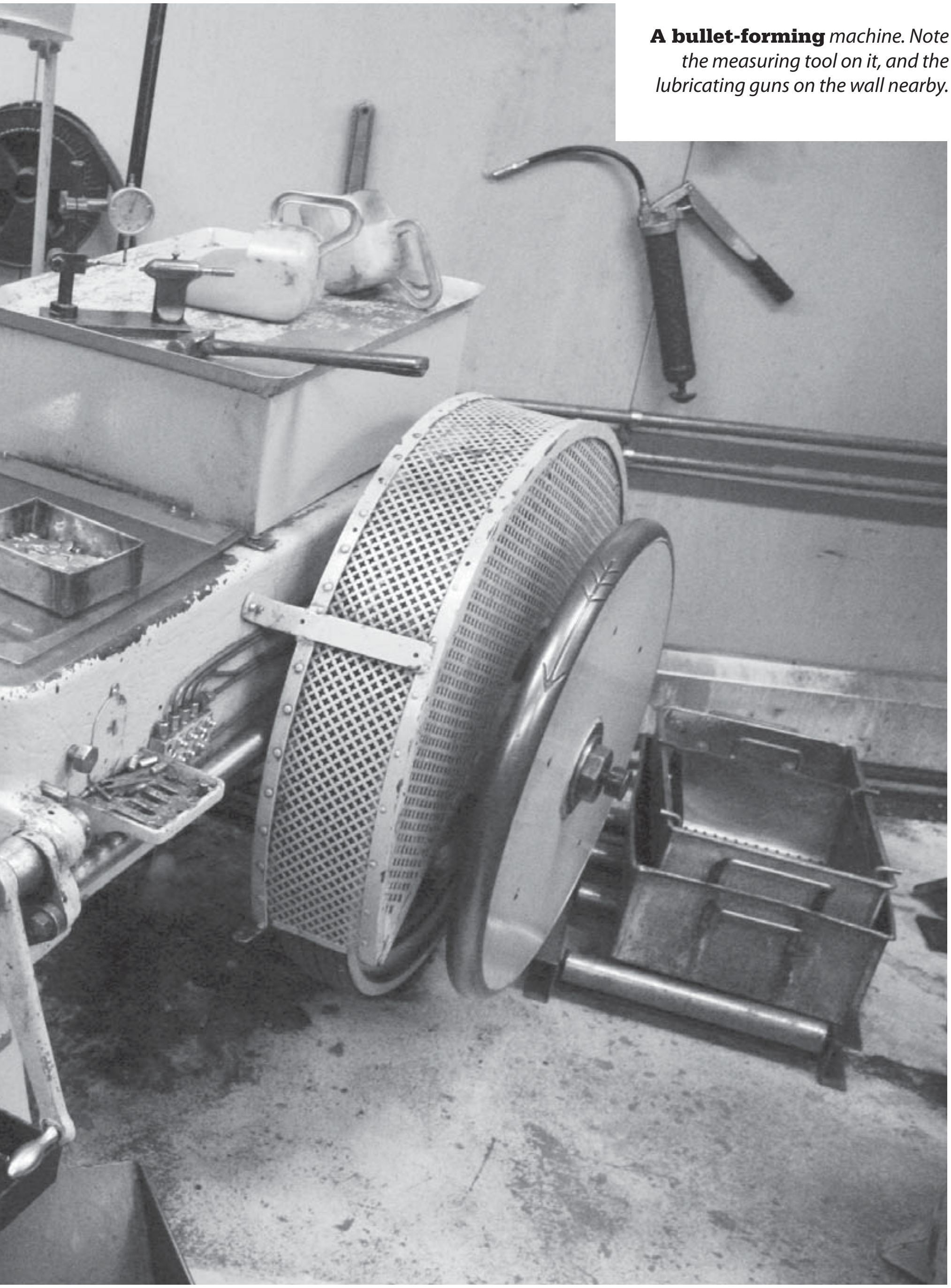


Coils of lead *wire, soon to become Sierra bullets.*



Not everything comes *in wire form, and not all lead is needed as wire. Here a bucket of molten lead is ready for the next step.*





A bullet-forming *machine. Note the measuring tool on it, and the lubricating guns on the wall nearby.*

To come back to our bullets, at the chemical level the difference between one swaged bullet and another is very small from one batch and from one manufacturer to another. The lubricant the manufacturer uses matters more than small variances in the alloy. And the alloy is as inexpensive as it possibly can be, even back in the early days of pistols. Inexpensive, in lead terms, means soft. Early pistols had, absolutely had, to have jacketed bullets if they were going to have any chance of being reliable enough to become an alternative to revolvers.

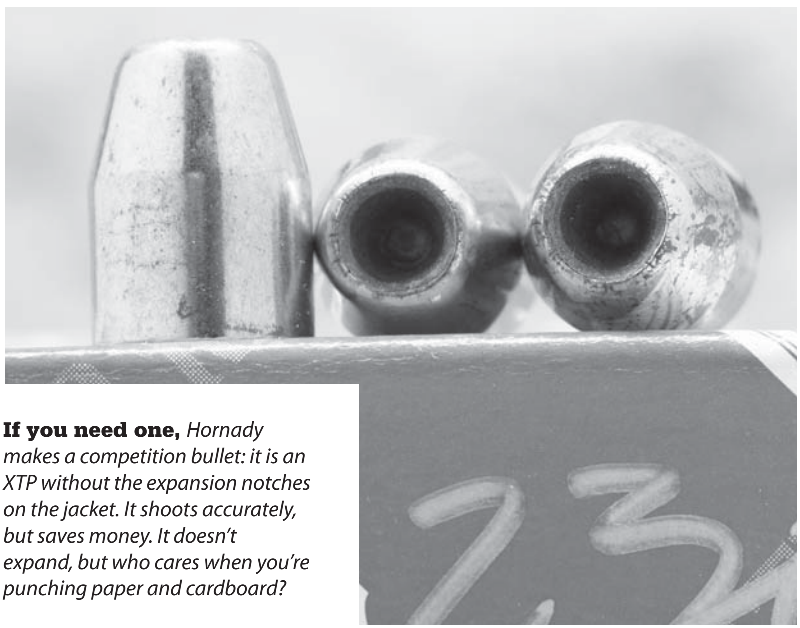
The primary source of lead ore is a mineral known as galena, as in Galena, Montana, and Galena, Kansas, cities in locales with lead ore deposits. It is pretty common and is found in quite useful levels of purity. It does, however, come with a bunch of other elements, and for our purposes most of them are impurities. Chief among the extras (in no particular order of availability) are zinc, cadmium, antimony, silver, bismuth and arsenic. Those have to be stripped out in order to make the lead useful in industrial or chemical processes.

If you need *a bullet for indoor ranges, with no exposed lead, Speer makes one. This 200 gr LWC has no exposed lead anywhere.*

This Hornady bullet *is not all-copper, but a lead core complete covered. It is another option for indoor use, to keep lead exposure down. Of course, washing your hands works, too.*

Happily, many of them are useful in their own right. One interesting note is that silver ore also often has a high percentage of lead in it, so much so that silver mines can make a good amount of their expenses back by selling the extracted lead from their silver ore. Before you go thinking of trying to get the silver out of your lead bullets, do the math. The current market price for lead is 48 cents per pound: 48 cents. Every percentage point of silver in that pound of lead has a market value of 14 cents. How much work are you willing to do for 14 cents?

Lead is a soft, dense metal, with the symbol of Pb on the periodic table. As in *plumbum* and yes, it is Latin and the source of the word plumbing. The Romans used it for pipes for water and sewers and to caulk the joints in aqueducts. They also, where it was available, used it as the payload for their slingers. The more cheeky legions would have the balls cast with the legion number on it, so you would have no doubt just who it was who was about to kick your ass, own your land and marry your daughters. (The Romans had a quirky sense of humor.) With a density of 11.35 g/cc (708 pounds per cubic foot) lead is almost the densest metal to be found. With a melting point in its pure state of 600 degrees (just in case you're



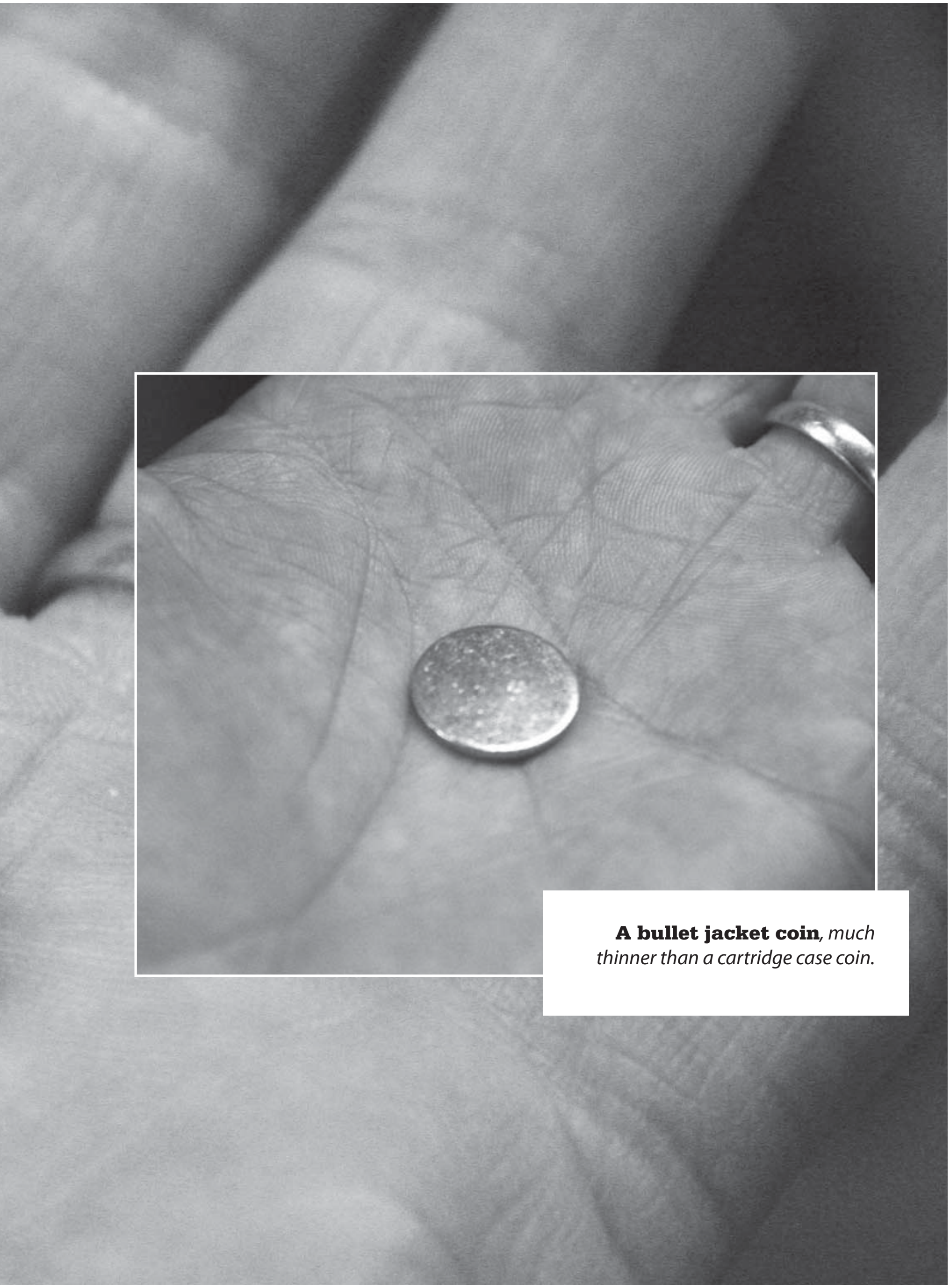
If you need one, *Hornady makes a competition bullet: it is an XTP without the expansion notches on the jacket. It shoots accurately, but saves money. It doesn't expand, but who cares when you're punching paper and cardboard?*

curious, it boils at 2,013 degrees) lead is easily shaped. All of which explains why it has been known in all metal-forming cultures since antiquity.

One of lead's useful attributes is its ductility. Metals can be measured not just by their hardness, easily done with a thumbnail in the case of lead, but also their malleability and their ductility. Hardness simply means the surface resistance to impression. Malleability is its ability to be formed with impacts, and ductility is its ability to be formed by slow, steady pressure. They are not all the same. Steel can be hard, but malleable, or hard and not malleable. There are companies that will form steel sheets by pressing them (as in automobile parts) and others who will form it by exploding a charge next to it. Mechanical engineers spend a lot of time in class learning the useful properties of materials and their alloys. For instance, the malleable cast iron in the engine of your car was selected for its machinability, so the engine maker could ream the cylinder bores to a precise diameter. It's easy to shape and low-cost to finish. To make the same part from tool steel would be horrifically and needlessly expensive.

Here is one spectacular bullet: *it shoots like a Bullseye shooter's dream, but expands like there's no tomorrow.*

A jacket coin *next to a typical bullet it will be formed into.*



A bullet jacket coin, *much thinner than a cartridge case coin.*

Yes, you could swage bullets from a very hard alloy like linotype, but why would you want to? You'd need huge, stupendously powerful machines just to shape something that is better shaped either another way or of another alloy.

Lead easily alloys with other metals. The most common in the firearms business are antimony and tin. Tin is expensive (current metal market price: $4.95 a pound), so it is good that it only requires a small amount to harden lead. Known commonly as linotype, it was used in the printing industry for decades to set type. The linotype machine is itself a fascinating gizmo. In the earliest type of printing, setters would select individual letters from an array of boxes and lock each line into the plate. The linotype machine was a lead-casting typewriter, one that would select letters as the operator typed them. Once he had a line of type (there were few or no women typesetters back then) the machine would cast, cool and eject the type, ready to be set into the plate for printing.

The alloy had to fill the finely-engraved letter moulds very fast. Thus, it was supremely suited to bullet casting, if a bit hard. Hard, as in no expansion on impact.

Antimony is a lot cheaper. (Metals market price: $2.80 per pound.) It is used in the most common alloy used by private bullet casters: wheel weights. The amount of alloying antimony varies, as the manufacturers of those weights are interested in two things: low cost and durability. If they are "hard enough," they are hard enough.

Alloys of lead that contain more than trace amounts of either tin or antimony are unsuited for use in swaging. They are either too hard to begin with or work-harden so quickly as to make them impossible to fully form.

One lead contaminant is zinc. In high enough concentrations, zinc makes lead unsuited to bullet casting. It turns the melted alloy into a slushy compound that does not pour well, does not fill moulds and bonds too well to the mould, cutting plate and anything else it touches. For a time, back in the 1970s, there was an experimenter who was pushing zinc washers for lead bullets. The washer would be riveted to the base of the bullet, between the bullet and the powder charge, and when fired, the hard zinc washer would scrape the bore clean of lead deposits. I can't imagine indoor range operators being too fond of those bullets, as I couldn't have taken too much to contaminate their scrap lead and render it useless for recycling and casting. To a caster, such lead would require a quick assay to determine the amount of zinc present. If low enough, the contaminated melt could be diluted with cleaner scrap lead. If too high, it would be trucked off to a landfill. (I imagine some unscrupulous scrap dealers would pour it into billets and sell if off to some unsuspecting third-world dealer.)

The earliest method of making jacketed bullets is still with us. Called the "cup-and-core" method, it combines two processes we have already gone over—cartridge cases and swaged bullets. The jackets are made as cases are made, where coils of copper alloy are coined, cupped and formed into jackets. Since the jacket can be thinner than a cartridge case, or softer, the strips need not be as thick, and the number of draws are not as great. The jackets still have to be annealed, cleaned, lubed, pickled, etc., just as cartridge cases have to be. But the number of steps and the details of the steps differ. On cases, the open end of the cup is the mouth of the case. On traditional full metal jacket bullets, the open end is the base of the bullet. The lead, as with swaged bullets, arrives in coils, which are fed into the cutting machine, the cut sections are placed in the open cups of the bullet jacket and then the swaging slams the lead into the jacket, forming it to the interior shape of the jacket.

The forming can require several steps, depending on the size of jacket and core, final detail touches like having the open end of the jacket folded in on the core, locking it in place and dimensional finishing. For instance, having shaped the bullet, a manufacturer might then take each completed slug and run it through another swaging machine, to make sure the dimensions are exact. A match bullet will receive greater attention than a non-match bullet, for instance. The velocity a bullet is to be propelled at also matters. For instance, a low-velocity hollow point bullet that is expected to expand can have a jacket thickness of .010 inch or up to .015 inch. While a bullet meant to be used in a high-velocity round (think .45 Win. Mag. or .454 Casull) might need a jacket of .050 inch thickness just to withstand the forces of firing. Bullet jackets, too, have changed over time and from need. It is not uncommon to find surplus bullets with copper-plated steel jacketed bullets using lead cores. Steel is easy to shape, forgiving of small manufacturing variances (at least in the context of handgun bullets) and cheap. As I pointed out in my AK book, the Soviets made rifles and ammunition from steel only because they couldn't make them out of concrete.

So, you take a gilding metal "coin" and slap it into a machine that cups it in a round-nose shape, you drop in a lead pellet, and swage the two together. Then you fold the open ends over a bit to lock the core in and give the bullet a couple more finishing hydraulic experiences to finish-form the nose and true the bullet diameter. The last kiss is a bump on the base. Why that? All materials, when pressed into shape, spring back a bit. Lead and copper retract differing amounts. If the last pass is to squeeze the jacket, the lead compresses but does not spring back as much as the jacket. You might end up with gaps. You'll certainly have a less secure bond. So, you bump the base to squeeze the lead back out to full contact with the jacket and at full pressure. That "plain" 230 FMJ bullet you're holding is the result of yet another set of finely-tuned manufacturing processes that have gone on for a century.

In the end, for our subject we have a completed bullet: a 230-grain round-nosed full metal jacket bullet. Why that? Remember the early pistols that used a jacketed bullet for feeding. The new rifle cartridges were all about velocity. The pistol designers obviously wanted to take advantage of those sales efforts and the obvious customer acceptance. If faster was better in rifles, then it had to be better in handguns, too, right? So, you had rifles in .45 with heavy, slow bullets being replaced by lighter, smaller, faster ones. The .45-70 with a 500-grain bullet at 1,300 fps was being replaced by the .30 Krag, with a 220-grain bullet at 2,100 fps. And then, by the .30-03, with a 220 at 2,300 fps. So, why not take a .44-caliber revolver with a 240-grain bullet at 700 fps and replace it with an 86-grain, .30 caliber handgun bullet at 1,600 fps? That was exactly the direction the early European pistol designers went. The Mauser and the Luger both went this way. Americans were not so impressed, and the desire was for big bores. Why 230 grains? Think about it: If you take the .45 Colt, which the U.S. Army was familiar and comfortable with, you have a 255-grain lead bullet. Reshape the nose so it is round for better feeding, keep it the same diameter, but replace enough of the exterior lead with copper to provide a hard surface for proper feeding, and you come up with a bullet that weighs just about 230 grains. I can even imagine a Cavalry officer holding the two, side-by-side, and declaring it "good enough, it will do."

The traditional, classic name for the 230 JRN is "Hardball." Ball ammo, in the military parlance, is ammunition that does not have any other attribute. It isn't armor-piercing, it isn't a tracer, it isn't incendiary, it is just a lead core and copper jacket. It isn't supposed to deform on impact, and in the case of our .45, that goes in spades. The jacket thickness, compared to the size of the bullet and the velocity it travels makes for a spectacularly solid bullet. I have picked up 230 JRN bullets fired into a hillside that except for the rifling marks of the previous firing could be reloaded and fired again. (Now wouldn't *that* be an interesting detail in a murder mystery.)

Short of slamming them sideways through a railroad tie or launching them at some fraction of the speed of light, you can't easily get a 230 .45 ACP bullet to significantly deform. Oh, they'll get dinged up some, from what they've gone through or stopped in, but they won't mash into unrecognizable blobs of lead and copper.

In fact, that lack of deformation was considered an attribute in military use, and can be a hindrance today. Remember, the handgun was primarily a cavalry sidearm. If you want to stop a horse with a handgun (I know, all my horse-loving readers cringe every time I bring this up) you have to get the bullet deep enough to hit something vital. For a big cavalry mount, you could be talking well over three-quarters of a ton of animal. Today, that much penetration can be a problem. I've read analyses of FMJ pistol bullets that report between 80 percent and 90 percent of bullets fired created perforating wounds. That is, they exited the far side of subject. You, as a law-abiding citizen, will be held accountable for every shot fired in an armed encounter. If you have to reach into a vehicle to tag the miscreant inside, penetration is good. But, if he's standing in the open, and your shots pass through him, you own – morally, and in many instances legally – what you hit after your bullets pass through him.

When the subject comes to FMJ vs. hollow points, you usually get the uninformed talking about "the Geneva convention," and "dum-dum bullets." The Geneva Convention deals with prisoners and their treatment. The agreements covering bullets are in the

Everything, *once made, is visually inspected. Sierra does it; they all do it.*

Hague Accords, and they really aren't much. They prohibit small-caliber bullets that are designed to increase suffering or unnecessary wounding. For instance, you can't use explosive bullets in direct-fire weapons, aiming at troops. You can, however, aim at the vehicles they are standing next to, and in that case, the difference to those troops would be academic, I'm sure. It also only comes into effect between signatories, in a declared conflict. So, unless your local drug gang is willing to both sign the Geneva Conventions and the Hague Accords, and then declare an open conflict, can they call on those protections. (Of course, if they do, the other aspect also kicks in: You can fire on opposing troops on sight, without warning and once captured you can detain them for the duration of the conflict. They may not like those so much.) Dum-dum comes to us from the

British Army in India. Having switched to the .303 British, they found that it didn't have the stopping power of the old .45 rifles. So, the arsenal at Dum-Dum, India, experimented with leaving the jacket open at the tip. (The first experiments involved simply grinding or filing the jacket open.)

The result was a noticeable increase in stopping effect. It was just such experiments that propelled the European powers to formulate and sign the Geneva and Hague agreements. However, those didn't restrict the colonial powers from using such ammo in local conflicts. They just couldn't use it against each other.

So, when a local politician or activist starts blathering on about "inhumane bullets, banned by the Geneva Convention" you know they don't know what they are talking about. Enough soapbox.

How much can this matter? The FBI ammunition performance tests call for a 12-inch minimum penetration in ballistic gelatin. They want as much as they can get, up to 18 inches, more than which is excessive. Gelatin blocks are commonly produced for tests in rectangles that are 18 inches long. I have fired .45 230-grain RN-FMJ bullets that required a third block to capture them. That's right, in excess of 36 inches of penetration. (Depending on how much velocity there was, they usually stopped between 40 and 50 inches.)

When the NYPD first began issuing or allowing for purchase 9mm pistols, they insisted on FMJ ammunition. I don't know if they asked him or not, but Mas Ayoob advised them against the choice. Fixated on the political dynamic of "Geneva Convention: FMJ good, Dum-dums bad," NYPD stuck with FMJs. Well, they stuck with them until the reality of it became apparent: If you use over-penetrating bullets in a crowded urban environment, you're going to have problems. The figure I heard was that NYPD had 17 shootings where over-penetrating bullets, after passing through bad guys, hit bystanders. No one was killed, but it was only going to be a matter of time. I'd love to give you all the details, but just before the change to 9mm pistols happened, the city administration stopped providing even the annual summary reports of NYPD shootings. Since the embargo, information is hard to come by, and sources have to be protected.

That's not to say FMJ is bad, and hollow points are good. They both have their uses; you simply have to be aware of their advantages, disadvantages, strengths and weaknesses.

It wasn't until the 1970s that real efforts were turned to making effective hollow point ammo. Before then, attempts at making hollow point or soft-point ammunition for handguns was cursory, simplistic, barely-tested and largely ineffective. Part of that was due to the lack of any effective, consistent test media. In the early days, experimenters would use whatever they had at hand such as bars of soap, drums or plastic jugs of water, even elaborate boxes to hold newspapers. The boxes had to be elaborate, because to get any semblance of realistic performance out of newspapers they had to be sopping wet. Wet newsprint is heavy. It wasn't that people didn't try, and the early efforts that had some success came mostly from the Super-Vel corporation. Using lighter than normal bullets, at higher than normal velocities, Super-Vel was able to get some expansion. The basic problem was the jacket itself. Up until then, all engineering that went into the jacket was to make it easy to fabricate. To expand, a jacket has to be at the correct level of hardness for its impact velocity. If the jacket is too hard, or the velocity too low, there is no expansion. If the jacket is too soft or the velocity too high, the jacket doesn't peel back, it shreds.

Worse yet, the cup-and-core process is designed to keep an FMJ bullet together. If you turn the bullet around and make the open end a hollow or soft point, there is nothing but the mechanical bond to keep the jacket and core together. If they separate once they impact, bullet performance suffers. Rifle bullets avoided that problem (there had been effectively-expanding bullets for decades for rifles, before there were the same for handguns) simply due to length: a rifle bullet can be four or five diameters long, where a handgun bullet is hard-pressed to be two diameters long. A longer bullet has more surface between core and jacket, resisting separation.

However, there have been a lot of advances since those early days. You can now fabricate the bullets you want, by swaging them or swaging cores into cups. A company by the name of Corbin offers the tools, expertise and guidance to make swaged lead and jacketed bullets of any size, shape or weight you can desire.

It was not until Dr. Martin Fackler pioneered the use of ballistic gelatin that experimenters had a consistent, repeatable test media for bullet expansion. Ballistic gelatin is formulated to simulate pig muscle tissue. Pigs have the unfortunate luck to be very similar to people in many respects. This makes them suitable for medical uses. (I'm sure the pigs see it from another perspective. Too bad for them; they don't get to vote.) When testing to see what produced similar wounds on people, experimenters found pig muscle to be quite close in effect and results. Ballistic gelatin is not perfect. It is, after all, only a "tissue simulant" and not tissue itself. But it has the attribute highly desired in anything grounded in the scientific method: repeatability. It is essential in any scientific endeavor that two researchers, conducting the same experiment, produce the same results, even if separated by thousands of miles or decades of time.

There's a great and probably apocryphal joke on this subject: It seems, back in the 1950s, that jet aircraft were at that time going fast enough in flight that hitting a bird could be a problem. So the U.S. Air Force built a "chicken cannon." It could launch chickens, ducks, geese or other fowls at flight speeds, to test the impact-resistance of aircraft canopies, as well as the results of engine strikes. (This, decades before the Airbus landing in the Hudson River.) The British heard of this and built their own. On the first test they were horrified to see the fired fryer crash through the canopy, test dummy, headrest and cockpit bulkhead behind. They asked the U.S. Air Force the 1950s British equivalent of "What's up?"

The Air Force told the British to send all their data, and they'd figure things out. Shortly after, the Air Force sent back a terse reply, "Defrost the chicken." It is vital, if scientific research is to have any relevance, that everyone knows exactly all the variables. So, if all researchers are using ballistic gelatin, they can report their test results, and everyone involved knows that lab/tester "A" testing 9mm is producing results that can be compared to lab/tester "B," who is doing .38 Special tests. Without a repeatable, common media, both labs would have to do both tests and then figure a way to translate one lab's results to the others. That doesn't make ballistic gel perfect, nor the tests absolute. That they are not perfect or absolute does not negate the data generated. Simply that we have to keep in mind that what we're using is a simulation.

What the earliest testers found was that some, a lot, of the bullets then in use didn't expand at all. So the ballistic engineers started working on the bullets they had and began making some progress. Then, to confound us all, the FBI went and got themselves involved in a gunfight. The April 1986 Miami gunfight is a pivotal event in defensive knowledge and training. What happened, basically, was that decades of FBI (and to be fair, law enforcement as a whole) inertia and lack of initiative ran squarely into reality in the form of a dedicated combatant who was motivated to prevail. He had also practiced and gotten training equal to or better than that of the FBI agents involved in the fight. He also came to the gunfight properly prepared.

Michael Platt (the active gunman in the fight) fought with a Ruger Mini-14. He went up against eight FBI agents armed with .38 and 9mm handguns. The agents were looking for two bad guys, one of whom was Platt, the other William Matix. The two were being sought for a series of violent armored car and bank robberies. As for the agents, where was their body armor? It was in the back seats of their cars. Shotguns? Ditto. Platt received a non-survivable wound in the opening moments of the fight, a 9mm bullet that stopped just short of his heart. Had he at that moment stopped fighting, been slapped on a gurney and into an ambulance and driven to a hospital, it is unlikely surgeons could have saved him. However, he chose to go out fighting. When the fight was over, the score was staggering: two bad guys dead, two FBI agents dead, and five of the other six wounded. If the second gunman hadn't been stunned at the moment of impact (the cars crashed to a halt in some poor unfortunate soul's front yard) he would have joined the fight and things would have been much worse.

The FBI had already been forced to improve its firearms training. As a result of a lawsuit brought by a failed (in the firearms section) FBI recruit (*Christine Hansen*, et. al *vs. FBI*) the FBI had begun the process of being dragged, kicking and screaming, into the first half of the 1970s as far as firearms technique were concerned. Their next step was to decide on ditching the "useless" 9mm and going with something that would work better, in this case the 10mm. That long,

Bullets require *many steps, and they get inspected at every point. A bullet that has gotten this far has had a couple of dozen inspections.*

sorry tale lead from the early efforts (Ever try and get a bunch of accountants and lawyers to qualify on any firearms course with a 10mm, firing a 200-grain bullet at 1,200 fps?) of heavy guns and hot loads to the so-much-reduced 10mm load that became the .40 S&W.

The other step was to look into bullet effectiveness. The FBI wanted a bullet that did it all: penetrated bad guys well enough that they wouldn't stop short, expanded and did so even when traversing intermediate obstacles. You know, the stuff we shoot through all the time: light and heavy clothing, sheet metal, auto glass, plywood.

When they tested on those, they found some interesting things. First, most bullets didn't do well. They shed jackets, they fragmented, they veered off-course. Second, one of the bullets that did well in the early days was the despised 9mm, specifically a subsonic 9mm weighing 147 grains. We had come full circle, from the traditional .38 Special hurling a 158-grain round-nosed lead bullet to a 9mm launching a 147-grain JHP. Of course, the 9mm expanded, and there could be as many as 14 of them in a sidearm versus the .38, which didn't expand and held only six.

You might ask, where was the .45 in all this? It was ignored. The .45 and 9mm each had camps of advocates in the FBI, and neither wanted to cede anything to the other. The 9mm was wimpy, the .45 too much recoil. So the 10mm was going to solve all the problems by being the compromise both sides could settle on. As with so many things, the FBI efforts conform to the old adage, "Life is what happens to you when you have other plans." You see, the 10mm had too much recoil and ended up being the .40 S&W. The 9mm and .45 were the two calibers easiest to get through the new test protocols for various reasons. So, the FBI, having claimed the future as a 10mm agency, found themselves using 9mm and .45 handguns until they could switch over to .40s that could be fed ammo that passed the tests.

The new tests were very hard on bullets. Standard cup and core construction bullets failed miserably when required to pass through things like sheet metal and auto glass. That required new bullet construction, bullets with bonded cores. The first of these used a simple method of bonding jackets and cores together. They soldered them.

Solder is lead or a lead alloy. You coat the two surfaces you want soldered with flux, which protects the surface from oxidation. You them place them together, heat and once hot enough, introduce solder. The solder wicks to the unoxidized areas, and if everything is correct, bonds the parts. In the bullet manufacturing method, you take jackets, coat the inside with flux, heat, introduce the lead, which is solder and "other parts" in one, and you have a jacket that is bonded to the core. In a production process, you'd lock open, ready jackets in a fixture, spray flux, heat the jackets and fixture, and then squirt in molten lead. Once cooled, you do the finish steps of forming the nose and hollow point, clean, box and load. I'm sure some bullets are still made this way. (Bullet makers are notoriously close-mouthed about this sort of thing. It cost a lot of money to develop the process and make the machinery, and they don't want their competitors catching up.)

Bonded bullets perform very well in the FBI tests. The jacket supports the core, while the core still expands. You have a controlled and limited opening of the bullet on impact, and you get amazing performance that seems contradictory: bullets that will stop in 14 inches to 16 inches of gelatin, and yet still hold together after going through glass, cloth, metal and cardboard. I've recovered bonded-core bullets that I've fired into car windshields. They went through the windshield, the cardboard target I had as a witness board, the front seat, the back seat, the partition between the seat and trunk and two of the three were in the trunk. They were still warm from being fired. The third? A new hole in the rear of the Chevy Caprice trunk tells me it disappeared into the underbrush. Yet those same bullets will stop at an average of 15 inches of gelatin.

If bonded is what you want, for hunting and defense (although most experts will advise against the use of handloads for defensive shooting) you can, again, go to Corbin. They offer tools, supplies and guidance to swage cores into jackets and bond the two together.

There's now a new way developed by some ammo makers to make bonded bullets. CCI/Speer makes Gold Dots via a process that seems slapdash, but ends up being stellar in performance. Remember back in chemistry class when the teacher first showed you how electro-plating worked? No? (What kind of a junior high did you go to?) If you immerse an object in a chemical solution along with a sacrificial rod and pump a large electrical current through them, you can plate the rod onto the object.

The Berry's Bullets *185 hollow-base round nose. I wonder if the inventor of the Shouboe ever thought of this, rather than a wooden core?*

Of course, the devil is in the details: what solution, what object, what rod, how much electricity, etc.? What CCI does is precision-swage lead cores. They then electro-plate copper onto the lead cores. I can only imagine (because they won't show me, or anyone else) the process: a big tub full of lead cores and a copper anode sticking in it. The tub rotates or vibrates to keep the cores in motion (otherwise they'd all be electroplated into one big lump) and after enough time, you have copper-plated lead slugs.

OK, you say. So what, they have a vaguely bullet-shaped lead lump, coated in copper. Ah, but they aren't done. The plated cores next get swaged to diameter and base shape. Then they get pierced for a hollow point, and the nose is then shaped. All this swaging work hardens the jacket and the core near it, while leaving the center soft. The result is a bonded-core bullet that can be precisely shaped, adjusted and worked.

Now, a lot of other bullet makers do much the same thing. Berry's has been making bullets this way for some time. They are called plated bullets, and the reason Berry's makes them that way is cost. You see, if you forego the extra steps of making the hollow point, you can fabricate bullets at less cost than traditional methods. What Berry's does is shape the cores, plate and then swage in several steps—called "double-strike" to shape the bullet—base and work-harden the plating. The result is a less-expensive bullet that is plenty good enough for practice, target and competition, but is not made for (nor priced at) the task of expanding in anything, let alone ballistic gelatin after glass, metal, plywood and other chance objects. What plated bullets do is allow you to reload and shoot more for less than factory. It also allows you to sidestep the hassles (or at least, perceived by some as hassles) of shooting lead bullets.

Which leads us to the last form of bullet you have to consider; cast lead. Casting is simple in theory and difficult in practice. In theory, you take a mould of a certain shape, pour molten lead into it and produce a shiny bullet that you can load. In practice, it takes a bit more than that. First, is the alloy. That linotype we talked about? That's been gone as scrap for a decade or more, now. Yes, it fills a mould beautifully. It's easy to heat, easy to flux (more on that in a bit) and wondrous to shoot. And, at today's metals prices, it's like shooting little dimes. At a dollar a pound for linotype, the bullet material cost is only three and a half cents. But add in the time, effort, lube and tools, and you're shooting little dimes.

Let's back up a step, and go through the process, blow-by-blow, to cast bullets and produce loading-press-ready projectiles. You need a mould, a smelter, a lubricator-sizer, a sizing insert, mould prep and fluxing materials. You also need either a source of heat or electricity and good ventilation. Gloves and glasses would be good, and you need a healthy sense of self-preservation. Sort the lead, either ingots or scrap. If scrap, smelt it down, flux it, pour into ingots and mix the ingots when you go to cast. You want all the bits and pieces of the scrap to be well-mixed. Fluxing is something you'll also do when you cast, so here it goes: Lead will have all kinds of impurities on it. Lead oxides, dirt, bugs, etc. You want that out of the molten mix, along with other junk called dross in the casting industry. You might ask, "Why not wash the lead beforehand?" Oh, dear God. Lead melts, as we recall, at 600 degrees. Water turns to steam at 212. That means that lead, having 11 times the density of water, has plenty of heat potential. If there is the slightest bit of moisture on any piece of lead, you will produce steam, steam at 400 degrees hotter than water's boiling point. Carried below the surface by the mass of the lead you just tossed in, the steam will create an explosion of molten lead. Trust me, that is even more exciting and painful in the actuality than it sounds in the writing. I've not done it, but I've seen the results of it happening. Can you imagine lead splattered on the ceiling, walls, face-shield and clothing of the unfortunate person to whom it happened?

Good. So, you want bone-dry lead going into your smelter. You flux it and skim off the dross. Flux can be as simple as a bit of candle wax or specific chemical compounds formulated for the task. Warm up your mould. A cold mould does not fill, as the lead chills before it fills. There are chemicals you can coat your mould with, to help it fill quickly and properly. Once you reach a steady casting rate, you want to keep the mould hot enough, but not too hot. If it gets too hot, the bullets are not properly formed. Experienced casters often use two or three moulds of the same weight bullet to keep their rhythm going.

Once cast, you let them cool and then sort. Rejects go back to be remelted. Then they are run (individually) through a lubrisizer. This gizmo sizes them down to a uniform diameter and applies a lubricant into the "grease grooves" of the bullet. The lubricant keeps the lead from soldering itself to your bore when you shoot the bullet.

Cast, sorted, sized and lubed, your bullets are now ready to be loaded.

If linotype is too expensive, what do casters use? The black-powder shooters use a very soft alloy. The rest of us use the easily acquired wheel weights. Wheel weights have a number of shortcomings, however, in that they have little steel clips cast into them. They are antimony, and often too little, so they are not hard enough, and don't fill moulds well. They often have sand and grit impregnated in their surfaces and create large (relatively speaking) amounts of dross that has to be cleaned out of the mix. They do have two positives though. They are relatively cheap, and they are ubiquitous. Tire stores have to recycle them, because if they are caught simply dumping used (they get used once, and are not re-used on a wheel) wheel weights, they'll get big fines. If you cozy up to a few tire stores, and offer them a price that makes it attractive to them to sell to you rather than the recycler, then you can get a ton of lead cheap. You, however, must turn the wheel weights into ingots before you can do any useful bullet casting.

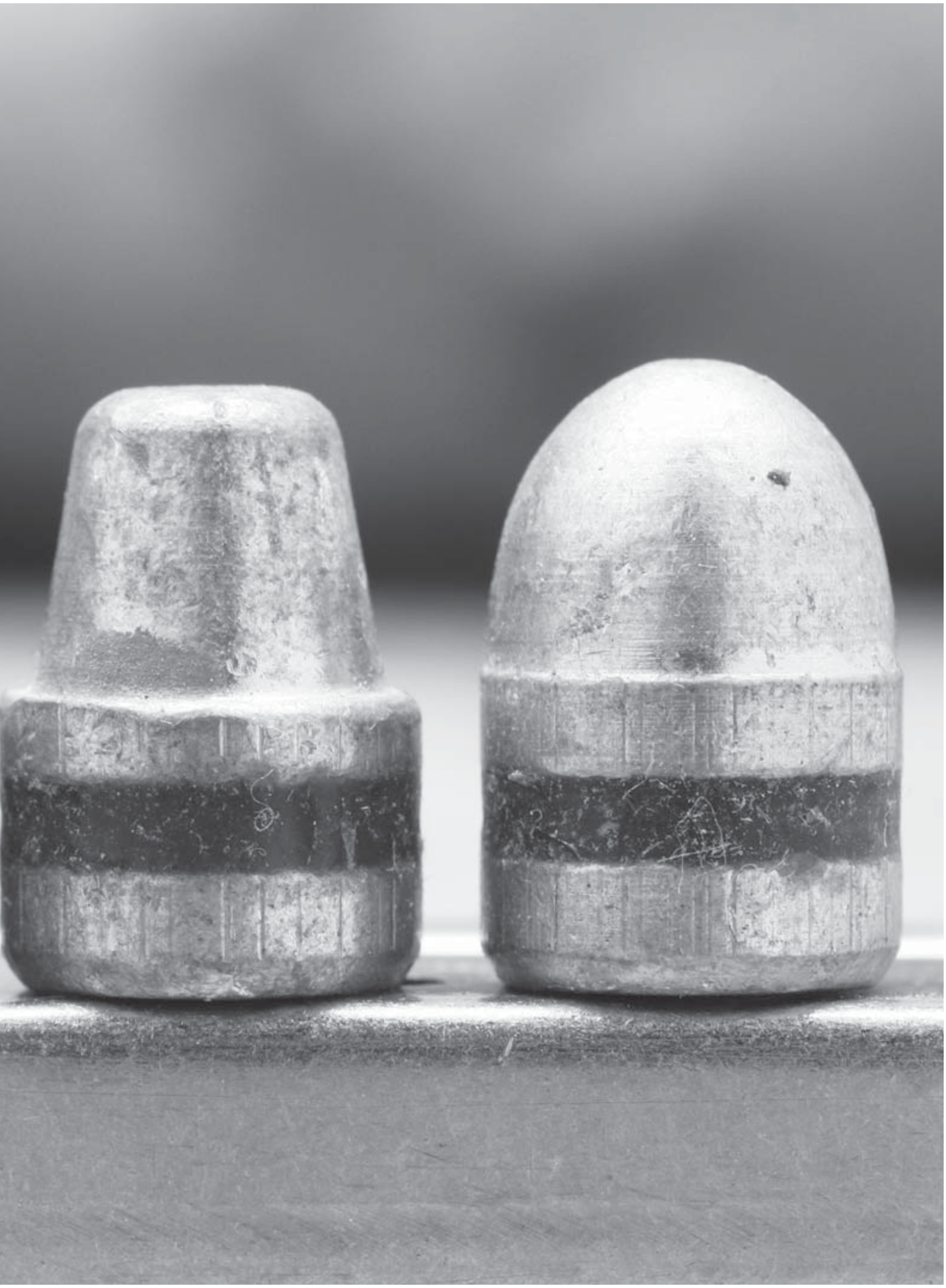
I did that on many occasions, but the most memorable was an expedition with one of the guys at the gun club. I was the president, Bob was the vice-president and we lucked into a huge supply of wheel weights. We modified a steel, 30-gallon drum to be used as an upright furnace with an exit/spout hole on the side. We built a steel mesh holder inside and a trough to a spout. We built a hot fire inside of firewood. (The club is on 33 wooded acres, and downed trees were a ready source of firewood. We also did this in the middle of winter.) We fabricated the mesh and spout as a unit, and could lift it out as needed. Once the fire was going, we put the mesh/spout inside, and dropped in fistfuls of wheel weights. Soon we had a steady stream of molten lead. We had such a steady stream that our ingot moulds overheated and would not cool quickly enough to keep up. So we backed off on feeding in lead and searched out anything that could be used as an ingot mould.

In a couple of these sessions we had melted a couple of tons of lead and then some and were set pretty much for life. A ton of lead produces 70,000 200-grain .45 bullets, or 93,333 150- grain .38 Super bullets. For those thinking of duplicating this, let me hit the high points—winter, tons of lead, free firewood, a skill at making steel components, a shooting range where lead is common (no cleanup, except ashes and scrap steel drum) and a willingness to work hard. If you want to replicate this experiment, remember hot ingot moulds don't cool, and you want to keep them out of the snow. Stock up on useful casting recipients, things you'll not ever use for anything but lead, ever again.

In researching lead bullets, I was surprised to discover that there are two types of wheel weights: clip-on and stick-on. I should have figured someone would scheme up a cheaper method of attachment. The stick-on ones simply use a strong glue, and then they get slapped onto your wheel. I can't imagine how well they stick, but there they are. They use a different alloy than clip-ons. Clips ons are supposed to be 95.25 percent lead with four percent antimony and half a percent each of tin and arsenic. The stick-ons? Pure lead.

The lead alloys you'll run into constitute quite a range. At the soft end are those stick-on wheel weights, which are essentially pure lead. Also a pure lead (or as close as assaying and economics can make it) is plumbers lead, the stuff used to "wipe" joints back when all plumbing was done with metal pipes of one kind or another. Then there's range scrap, which could be and probably is, a bit of everything, including the late Jimmy Hoffa. Linotype is 84 percent lead, 12 percent antimony and four percent tin. Monotype (which was used to "refresh" linotype in printing presses for newspapers) is 72 percent lead, 19 percent antimony and 9 percent tin. In fluxing the linotype, a small amount of the antimony and tin will get skimmed out along with the dross. Printers would refresh their linotype by adding small amounts of monotype to it. A common (at least in the old days) casting alloy for bullets is Lyman #2, which is 90 percent lead, five percent antimony and five percent tin. At the top of the heap is foundry lead, which is 62 percent lead, 23 percent antimony and 15 percent tin.

The standard hard-cast lead bullets: *left to right, a 155, 185, 200 and 230 round-nose. We used to load the 155s to Major, when we were trying to avoid building a .38 Super comp gun in the early 1980s. Now they get used to load Steel Challenge loads, soft in recoil but not slow.*



With foundry lead you could make anything else by adding pure lead or tin or antimony.

I ran into some bullets cast of super-hard materials back at Second Chance. Bruce Piatt, multiple winner of the Bianchi Cup, was an avid bowling pin shooter. (You'd have been avid too, if you'd won as much loot as he had.) He showed up with bullets one year that were harder than sin. Also, as 185-grain-profile bullets, they weighed a lot less. Bruce wasn't too forthcoming with details, but apparently if you are willing to experiment with fluxes and temperatures, you can cast bullets of lead-like alloys (foundry lead might have filled the bill; it would take a 185-grain mould and produce a roughly 150-grain bullet) but that's a lot of work to make a 9-pin load for a .45 handgun. It's much easier (at least at the match) to just build a new gun in 9mm or .38 Super instead of experimenting with alloys, loads and recoil springs.

If you do not want to cast your own, you can buy them cast. One source is Oregon Trail, makers of the original silver bullet. The other is San Juan Range, the source of Colorado Cast Bullets. Oregon Trail is not kidding, they have actual silver in the alloy. Why? Remember what I mentioned earlier, about silver ore containing lead? What do you do with the lead you get out of silver ore? You make bullets.

The alloying of cast lead matters for a number of reasons. One is velocity, the other pressure. The two are not entirely linked. It's possible to have a sharp, high-pressure start to a relatively low-velocity load. Using a fast powder, for instance, can produce maximum pressures (at least maximum for the .45 ACP) while only producing normal or slightly-fast velocities. Conversely, you can use a slow-burning powder to produce extreme velocity without exceeding normal pressures. So, you want to match the bullet diameter to the bore and the bullet hardness to the peak pressure. This is more of a concern to magnum shooters than it is to us, but it is still useful information to know.

Lead alloys are denominated by one of two methods, either by a colloquial name or a percentage list. A colloquial name would be "20-1" or "30-1" or "Lyman #2 alloy." In the first two, they indicate the ratio of lead to tin. The last, because it was an alloy developed by the Lyman company, acquired the name. It is also a percentage list, being 90 percent lead, 5 percent tin and 5 percent antimony. Commercial casters will tell you how hard their bullets are, and sometimes be forthcoming about some of the constituents, but they will usually not give you a chemical assay listing of their alloy. They worked hard to determine what works, and they don't want their competitors knowing it for free.

One interesting bit of alloying info: While both tin and antimony harden lead, they differ in how they do it and the results afterwards. How is a matter of crystalline structure, which you really need to be sitting in a materials class to get the full understanding. However, what matters afterwards is simple. Lead-antimony alloys can be further hardened, while lead-tin cannot. Called quenching, it simply involves dropping the freshly-cast bullets out of a mould and into water. The more antimony, the better. Now, don't get me wrong, lead-tin will quench-harden. It just softens again in time, too quickly for most of us, who load a batch and then spend months shooting it. If you load and shoot within weeks you might not have a problem with a tin alloy. On the other hand, a lead-antimony alloy will quench-harden to full hardness in between a couple of days to a couple of weeks and, more importantly, stay that way.

So, what are we looking for? In diameter, we want a cast or swaged bullet to be .4520 inch in diameter, and a jacketed one to be .4510 inch in diameter. Since these have been the accepted diameters from the beginning, basically carved in stone, you really have no worries about wrong bullet diameter. Not like those poor cowboy action shooters, having to put up with (in some calibers) wildly varying bore, chamber and bullet diameters. In hardness, that depends on what you're looking for. For most instances, harder is better until it drives up cost. For practice and competition, where expansion matters not a whit, a hard bullet works just fine. If you're looking for expansion, then you want something softer. For accuracy over velocity, then a soft swaged bullet can do well. But it may not be any better than a hard bullet that properly fits the bore.

In all instances, the gun will tell you what it likes.

Last up are the non-lead bullets. Here we have two types: monolithic and composite. The monolithic bullets are single lumps of copper. However, it is not just any copper. In one of the more hare-brained laws passed, it is unlawful for you to manufacture or sell "armor-piercing" handgun ammunition. Being the good lawyers that they are, and figuring they are smarter than those of us who fiddle with guns and ammo all the time, our loopy Federal legislators crafted a law that does not define "AP" bullets by the armor they pierce, but by the metals they are made of. According to the Federal law defining them, The Gun Control Act of 1968, 18 USC, Section 921(a)(17)(B), an "armor-piercing handgun bullet" is

(i)A projectile or projectile core which may be used in a handgun and which is constructed entirely (excluding the presence of traces of other substances) from one or a combination of tungsten alloys, steel, iron, brass, bronze, beryllium copper or depleted uranium; or,

(ii)a fully jacketed projectile larger than .22 caliber designed or intended for use in a handgun and whose jacket has a weight of more than 25 percent of total weight of the projectile.

Which is perfectly clear, no? The upshot is that you could be the greatest metallurgist of the 21st century and figure out an alloy composed of depleted uranium, beryllium copper and steel that is as soft as butter. Too bad, for if you make it into handgun bullets you've made an armor-piercing bullet under the law. It doesn't matter that a bullet so soft would fail to penetrate toilet paper. The law doesn't care. So how is it that solid copper handgun bullets pass muster under the law? Simple, they are not bronze or beryllium copper, that's how. Why does it matter? Because manufacturers have made all-copper hollow points that expand well, penetrate well and do not break apart. They also satisfy the no-lead requirements for hunting in some areas, areas that are bound to expand over time unless the anti-gun people are required to use real science instead of Chicken Little scare tactics when proposing laws or regulations. (I don't sound too bitter here, do I? Unlike most who propose "good ideas," I actually have a real degree in the subject, and thus have some grounding for my position. But I digress.) The law, in that particular detail, happens to be so rational and technically correct that I can't help but suspect that someone with actual knowledge of firearms was involved. Shocking, I know, but it must be true.

Solid copper bullets, like those from Magtech, pass muster under the law (at least as it is currently written) and can be spectacular performers. If that is the case, why the other bullets?

In training methods of the past, shooters would line up on a firing line, shoot the targets as presented, in the timeframe given and shoot paper or cardboard targets. Their scores would be recorded, and everyone was happy. But times change. Now, a lot of shooting is done on reactive steel plates. They fall or ring, and the shooters time is the score. Shoot as fast as you can to get the hits you need, instead of "six, reload and six in twenty seconds" as a routine. Shooters will go through specially-constructed buildings made of concrete or dirt-stuffed tires piled as walls and engage targets as they encounter them.

In those situations, two things become more of a hazard than before. They are lead exposure and bounce-backs. Indoors, lead can be a hazard. (More on that in the Reloading chapter.) Shooting objects, especially hard objects, at close range means you can be within the bounce-back or splatter radius. To mitigate both those concerns, many ranges use special training rounds known as frangibles. The bullet is composed of metal powder, and they break apart readily on steel plates and on indoor backstops.

You can make frangible bullets one of two ways, either with sintered metal bullets or sintered metal cores in lightweight jackets. (I don't think anyone has figured out a way to electroplate sintered-metal cores, and I don't think anyone ever will.) Sintering is a manufacturing process where metal powder is pressed or heated or heated and pressed, into a form. It is useful in a lot of applications in metal working. Sintered bronze bushing or bearings have an open porosity, allowing lubricant to flow and be retained. Forming complex shapes is easier than forging and machining. In its extreme state, it is a process known as MIM, or metal injection molding. There, parts are formed from a slurry of metal and a binder. The parts are then heated in a furnace where the binder burns away and the powder bonds into a single part.

In bullets, the powder is copper or copper alloys, pressed together along with a binder. The result is a bullet that is hard and tough enough to be fired, but too brittle to withstand impact. On a hard surface it turns into the powder it began the process as.

However, getting bullets just hard enough, but not too hard, is not an easy task. It is not unusual for frangible bullets to break apart as they are fed through the mechanism. That creates an entirely new training opportunity: how to clear a malfunction. To prevent that, some makers use very thin jackets and then press the sintered copper alloy in as the core. The jacket is tough enough to prevent malfunctions from feeding, but too weak to do anything but shatter on impact.

They are still bullets, however. Some, who have not grasped the essential details of these, have thought of them as "safe" on body armor. Not so. In fact, if anything, they do better on body armor (and by better I mean get through) than regular bullets. The fabric cannot permit the spread of the fragmenting bullet, and so the bullet acts like a more-or-less solid copper bullet, and penetrates many more layers of otherwise bullet-proof fabric than other bullets would. These are not toys, nor "safety" bullets in any sense except on the exact surfaces they were designed for, which is steel plates at close range. Anyone who disagrees with you is wrong and should be avoided. Alas, I've had law enforcement officers suggest that the "training" ammo they use, ammo clearly "frangible," was safe for use in force-on-force training. Anyone who tells you this should be corrected, and if not corrected, avoided. Someday you'll read about them in a "tragedy" that could have been avoided. It would be best if you were not involved in that tragedy. (I use tragedy in quotation marks simply because while it is tragic for those harmed, it is not a tragedy in the true sense of the word. It is really negligence, and someone will pay a lot of money for it.)

I guess the only thing left to discuss in bullets are the mystery writer favorites—wooden and ice. Wood bullets were used early in the 20th century in a .45-caliber handgun called the Schouboe. It used a jacketed wood-core bullet, with the idea being that the "extreme" velocity would stop bad guys while allowing for low recoil. Oh, it was also a blowback design, so there was no locking system at all to make it lighter to carry. It did not sell well (no great surprise there) and is now a rare collectible. The ammo is probably even rarer. As for ice, get real. Are you going to keep your frozen bullets in the freezer until you need them? And how long do you expect them to last, once you remove them from next to the frozen peas?

CHAPTER 5

Powders

The .45 ACP was developed when there weren't a huge number of powders available for handguns. Heck, the whole idea of smokeless powder was just a bit more than a generation old. As a result, the .45 was designed to be a low-pressure cartridge. That, and making a handgun that could handle both a big-bore and a high-pressure cartridge, were not possible given the technology of the time. Well, there was the Gabbet-Fairfax Mars pistol, but pardon my French: Holy Frakking Cow, who in the 19-aughts wanted to shoot a monster like that? Offered in 8.5mm, 9mm and .45 Regular and Long, it had ballistics like a 230 at 1,250 fps. One tester, reporting for the British Army, commented, "No one, having fired it, would willingly do so again." It was partly due to the ferocious recoil, but it was also because of the design flaw of straight-back ejection, which often struck shooters in the face with hot empties. It didn't help that the Gabbet-Fairfax (That was the name of the gent who designed it. He lost a ton of money trying to sell the British Army on its merits) was as big as an anvil and ugly as a pig with lipstick.

A chronograph *is your best friend – at least when you plan to do any reloading. Without it, you don't know what you have.*

We forget, sometimes, just how fraught with experiment and dead-end developments the earliest efforts in self-loading pistols were. How experimental any efforts at all were, and forget there was a time before "everyone did it the Browning way."

So, in the first decade of the 20th century, what powders were available to the ammunition makers? Pretty much Bullseye, the fastest-burning powder (although some argue that Vhitavouri N-310 is faster) available then and now. Fast-burning means it is efficient, as in not needing a lot of powder to get the pressure and velocity you want. But it also means the powder does not have a lot of "forgiveness" to it. When you reach the limits of pressure, pressure ceases to be "linear" as engineers use the term. In a linear system, if you add 10 percent more of something, you get 10 percent more out of the process. In a non-linear system, adding 10 percent will get you 15 to 20 to 30 percent more of something.

In the reloading (or loading) process, once you reach the peak normal operating pressure of a powder, it ceases to be a linear system. Adding 10 percent more powder will get you more than 10 percent extra pressure. Which, in a firearm, can be both un-fun and unsafe. We never want to exceed the normal operating pressure of a cartridge.

So, how did the developers deal with that? Simple, they made the case bigger than it had to be. You don't think the .45 ACP case needs all that space just for a pinch of Bullseye, do you? No, by making the dead-air space, or case capacity, bigger than it needed to be (speaking of it simply as a bullet-launching system) the developers gave themselves a cushion for loading variances, errors in the loading process and the inevitable changes in powder to meet the needs of war-time production. That extra space serves us well, a century later and a hundred possible powders later.

You see, the ammo company and powder company chemists have developed slower-burning powders, powders called "progressive" burning that extend the curve down the bore to a greater extent. Those of you who have sat through engineering classes will remember the description "work is area under the curve." The higher the curve, the more area. However, if you have an upper limit, then the only way to increase area under the curve (and thus work) is to stretch the curve to the right. Progressive powders (unlike progressive politicians) stretch things to the right, and thus create more work in the same time/space.

More work means more velocity without more pressure. It does not, however, mean more work for nothing at all. Everything costs something. Increased velocity means increased recoil. Not just from the faster bullet, but also from the extra powder. You see, the jet of burned powder (known in the trade as "gas") is also part of the recoil calculation. Generally, venting gas is deemed to have an average velocity of about 4,000 fps. So, to jump ahead, if you boost a 200 grain JHP bullet's velocity from 850 fps (5.2 grains of Titegroup) to 1,000 fps (9.8 grains of HS-6) you have two components to the increased recoil. In the first case, your bullet generates a power factor of 170, which is major. However, you experience a recoil effect (call it Recoil Power Factor, or RPF) of 191 – that is, 200 grains of bullet at 850 fps, plus 5.2 grains of combusted powder gases at 4,000 fps.

The second load, at the match, generates a PF of 200, i.e., its bullet weight times velocity: 200 grains at 1,000 fps. You experience, however, an RPF of 239! 200 grains of bullet at 1,000 fps, plus 9.8 grains of powder at 4,000 fps. Yowch! No wonder the comp works so well, and you have to wear both plugs and muffs just to shoot it.

Additionally, since the powder in use (HS-6) is a progressive powder, it has pushed the curve to the right. That means at its exit, it's at a higher pressure than the Titegroup would be. Which translates to a louder muzzle blast.

At one of the annual Second Chance matches, I happened to be shooting on a three-man team. I was on the line with Bruce Britt and Bob Rosenberger. I'm 6 feet, 4 inches and was then 205 pounds. Both of those gentlemen were taller and heavier. They were shooting shotguns, and I was using a comped .45 1911, shooting a load pretty much like the one I described above. After one run, Bob looked at me and remarked, "That thing sure is loud." When a guy taller and heavier than you are, shooting buckshot out of a 12-gauge shotgun, comments on how loud your handgun is, then it is loud!

You can't get something for nothing. You (and I) increased the velocity and the down-range PF by 14 percent, but we increased the recoil we experienced as well—increasing the RPF by 25 percent. Ouch. So keep that in mind when you look at loading data and decide that what you really want to do is boost the performance of the .45 ACP. And please, don't use any of the hackneyed phrases or superlatives currently in vogue: a quantum leap, an order of magnitude or exponentially. You aren't doing any of those, so dial back the rhetoric and settle for, "I boosted it to the mild magnum level." Which is what the .45 ACP is capable of, unless you want to start boosting pressures, too. For that, go to the "Other Chamberings" chapter and do some studying.

(A quantum leap is to move from one state to another without passing through the intermediate state. You didn't. An order of magnitude is to add a zero to the end of the thing being measured. You most certainly did not go from a 200 PF to a 2,000 PF. And exponentially means to follow an exponential power, for instance if you double something every time you cycle through it. If you bet "double or nothing," you have exponentially increased your wager. If you boost your powder charge by 10 percent, you have not.)

In the *Hornady Handbook of Cartridge Reloading*, Sixth Edition, it lists 122 powders on a chart, ranked by their relative burn rates. Relative, because the actual observed burn rates depend on the pressure at which they burn. If you use as a test burn pressure something too far from what the powder was designed to burn at, you'll record a different burn rate than others would. Testers do their best, and they still come up with relative rankings that differ. There is also the matter of how much they differ. For instance, you may look at two powders, separated by eight or 10 others and not know just how much they differ. Maybe the eight or 10 in-between are almost identical in burn rate. And the two outliers are then different by a mere 5 percent in rates.

Or, perhaps somewhere in the middle there was a big shift in rates, and the two outliers are actually more like 30 percent different in rates. You don't know, which is why you work from established data. So don't stray too far from those.

Here's a demonstration using another caliber: I had a customer come to me with a 10mm problem. He'd blown a case. He'd been using a S&W 1026, the very definition of a tough gun. His load was not an attempt to make it into a magnum, but just to make IPSC Major. What he'd done was look at the powder loadings for 10mm and compare them to the powders he had on hand. Pay close attention, because this is where he got into trouble:

He did not have the powders listed in the manual he was using, but he had a powder "in-between" them in burn rate. So, he made a guess. Actually, what he did was a multi-variable interpolation. Time out for tech-speak.

If you project a process past the known data using the known data as a calculation rate, that is an extrapolation. If you figure, "If I save twenty bucks a week, by the end of the year I'll have enough to go shoot in the state championship," that is an extrapolation. If the government figures they'll trim a program by some amount, and they raise a particular tax, the change in the budget numbers for the next year is an extrapolation. (Often times, in political situations it is pure fantasy, but we'll ignore that for the moment.)

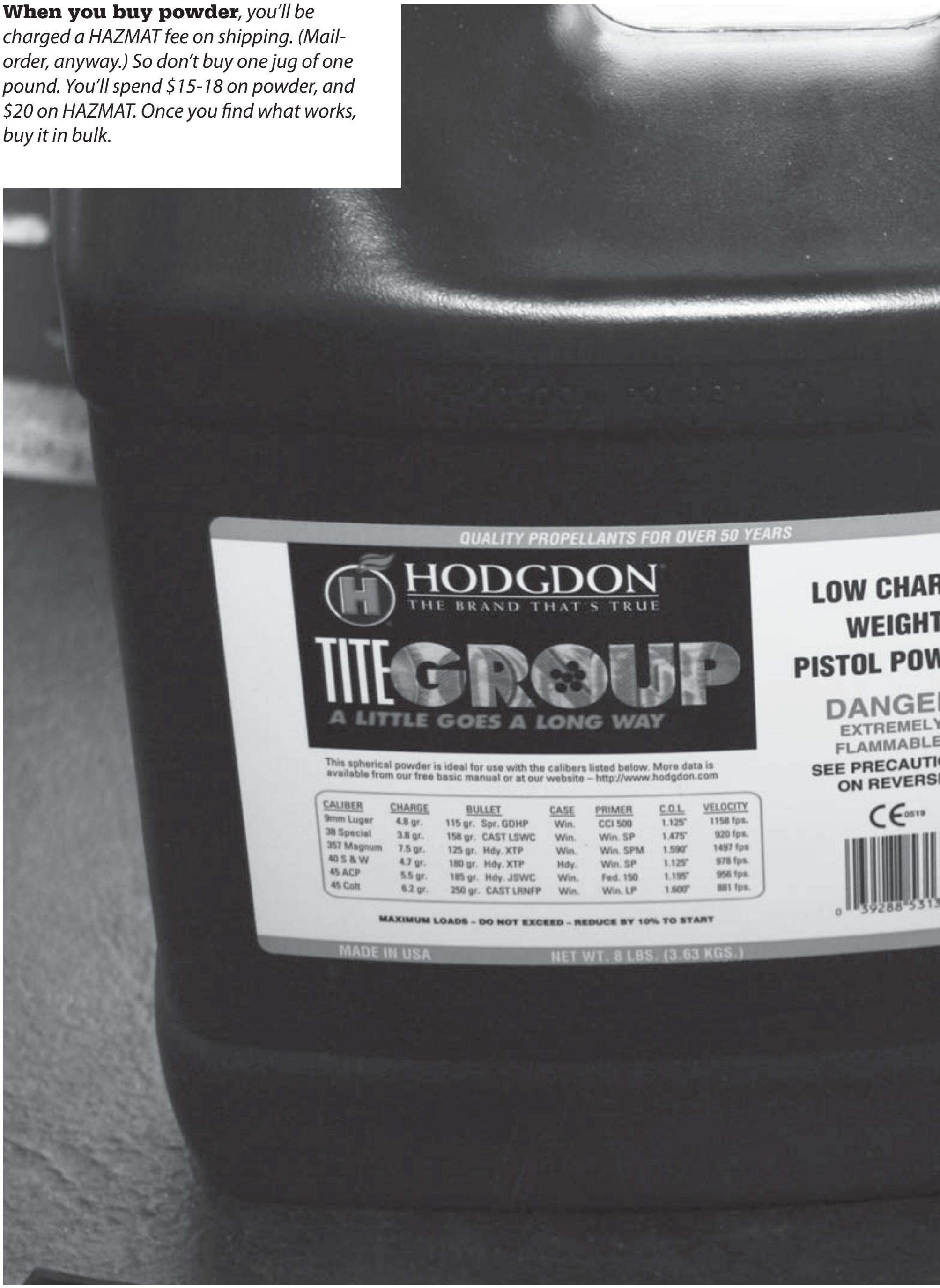
Interpolation is where you calculate a new midway data point from the existing data. If you look at loading data and determine that 5 grains of a powder gets you 800 fps, and 6 gets you 1,000 fps, then figuring that 5.5 grains will get you 900 fps is an interpolation.

Now here's the tricky part: you can only do these for one variable at a time. You cannot extrapolate or interpolate juggling two variables. The margin of error becomes greater than the "group size" of the results.

What my customer had done was interpolate across powder weights AND across burn rates. He was too cheap to buy the powder he needed, and that got him into trouble. Oh, and there was a big, fat clue staring him in the face as he did all this: the powder manufacturer did not list this particular powder for use in the 10mm.

The weight marked in his loading data appeared correct for a powder in that burn rate, and I pulled a bullet to check his loading. The weight was as-marked. So I did what I was supposed to

When you buy powder, *you'll be charged a HAZMAT fee on shipping. (Mail-order, anyway.) So don't buy one jug of one pound. You'll spend $15-18 on powder, and $20 on HAZMAT. Once you find what works, buy it in bulk.*




1 lb N 330
SAVUTONTA RUUTIA
VIHTAVUORI OY
SMOKELESS POWDER

do back in those dark days, I tested it. Yup, blew a case. I then loaded the same load on my own press, weighing the charge instead of simply depending on the powder measure to throw the correct volume. I blew a case.

So, I did what I should have done in the first place (and what you should do if you find yourself in such an impasse), I called the powder maker. I started to describe the situation to the ballistician on the phone, and he interrupted me.

"You were using [name of powder] weren't you?"

"Why, yes I was."

"There's a reason we don't list that powder for use in the 10mm."

So, we have as a further addition to the compilation of laws; Sweeney's Loading Dicta: manual editors are not lazy. Pay attention to who wrote the manual you are using. For instance, as I type this I have a copy of the Hornady Sixth Edition on the desk in front of me. You can bet that every application Hornady could think of for their bullets, they list. They do not fail to list (for example) any .308-inch bullet for the .30-06. From 110 grains to 220, they list them all. They do not, however, list those bullets for all powders. They can't. They also do not list the 220s for the .308 Winchester, .30 Carbine, etc. Those are unsuited applications. If Hornady does not mention using one of their bullets in a particular caliber, there is a reason. Probably a good reason.

Now, let's switch to Hodgdon. Every safe load, or ones that conform to the specifications laid down by SAAMI that involves their powder, you know they are going to list. They cannot load for every bullet that exists, but they can develop a load using a common bullet for each of their powders that are suitable. If they do not list a particular powder for a particular caliber or bullet, again, there is a reason.

And in no case will the reason be laziness.

So, you go cruising the loading data, looking for a suitable load for your .45. You've got XYZ powder, and you have 230 FMJ bullets. You peruse several loading manuals, but don't see your powder listed. Are they bullet makers' manuals? Then XYZ powder just might not be common enough to list. Or, it might be unsuited. Find, and follow, the loading manual produced by the maker of XYZ powder. They don't list the powder in a .45 load? Then don't use it for that. Buy and use something else. (Remember what my parsimonious customer got: blown cases and a big gunsmithing bill for my R&D work.) What if the powder company does not list loading data? You've got to ask yourself just how much of a bargain that powder was.

Now, in the Hornady manual, they list 10 powders for use in the .45 ACP. That does not mean that those 10 are the only suitable powders. Far from it, as the various loading manuals list nearly 30 powders:

VV-310	**Bullseye**
Red Dot	**AA#2**
Clays	**700X**
Titegroup	**VV-320**
Green Dot	**International**
WW-231	**Green Dot**
HP-38	**VV-330**
PB	**AA-5**
Unique	**WW-WSL**
Power Pistol	**Solo 1250**
Universal	**800X**
HS-6	**VV-340**
WW-WSF	

Beyond these it gets pretty specialized. Even among these, you will have to follow loading data to get best results. As a slower powder example, I have known a number of bowling pin shooters who used Blue Dot as part of their loading formula. They used it with a lead 200- or 215-grain semi-wadcutter, they fed it only in comped pistols to take advantage of the oppressive muzzle blast (feeding the comp with more, higher-pressure gases) and they inspected and gauged each round.

With the powders listed, you are not going to have much joy loading Bullseye or Titegroup under 185-grain JHPs looking for the max velocity. You're going to come up against the pressure ceiling before you get much in the way of velocities. As an example, the Hornady manual (6th Ed.) lists the max velocity using Titegroup as "only" 900 fps. By going to a slower powder (they suggest AA#5 you can boost that to 1,050 fps. Of course to do that you're using literally twice as much powder, but that is part of the cost we mentioned earlier.

So, you have to consider the use you are putting your ammo and handgun to. Are you in need of a specific velocity figure to make a power factor? Or are you interested in economy and want the smallest powder charge possible? Economy is not to be discounted. The economy load of Titegroup, 4.9 grains that gets you 900 fps, gets you 1,428 loadings from a pound of powder. The AA#5 load, at 10.4 grains each, gets you only 673 loadings per pound of powder. At $18 a pound, that can add up.

At the other extreme, if you wanted to load AA#5 economically, you really can't. (Not to pick on Accurate Arms powders, but any slow-burning powder will deliver the same results.) First, the lowest charge Hornady lists is 8.7 grains for 850 fps. Second, that charge will burn inefficiently. As in dirty, smoky and leaving lots of powder residue. It is meant to burn at a relatively high pressure and burning it at a lower pressure makes for inefficient combustion.

You want cheap? Buy fast-burning powders and use a pinch of them. You want max velocity, buy a slow-burning powder and resign yourself to having to use dollops of it. There is no such thing as a powder that does it all: None can be both economical and high-velocity.

What's the best way to select a powder? Consult several different reloading manuals. Ask the shooters at your club who reload. When you ask, you'll likely be showered with the praises of this or that powder, and how it cures inaccuracy, balding and other more-delicate problems. Just take note that it is used, and don't fall for the snake-oil sales pitch. When you find that a number of shooters at your club use the same powder or the same two or three powders, then you can start doing some loading development of your own. That they all use the same powder might be for reasons not always ballistics related. It might be a locally common powder, and thus cheap. The best shooter at the club might use it, and others simply use what he uses. It might have found early use and then been widely adopted. Do those reasons really matter? No. What matters is that it works in your gun and for your application.

Again, keep your powders in their original containers, and do not use remarked containers. In the early days of reloading, you could buy 30- or 50-gallon fiberboard drums of surplus powder—delivered to your door and with no HazMat fee, either. If you have only the one powder, you don't have to worry about getting things mixed up. These days, the biggest container you can buy is 8 pounds, and it comes marked as to its contents. Do not, and I mean it, DO NOT think of "making it easy on yourself" by pouring some into a smaller container so it will be "easier to pour into the powder measure." I've known reloaders who had to dump out pounds of powder that was in unmarked containers because they couldn't remember what it was. And no, you can't tell what it is just by looking at it, and you don't want to mess around with unknown powders or worse yet, mixtures of powders.

Keep your powder in its original container, and dump the powder measure back into the one container you pulled out for reloading, when you're done.

Oh, and remember that powder is flammable, not explosive. It is marked as a low-grade explosive for shipping reasons, as well as due to fire regulations. You can get a low-grade explosion if you lock the powder in a sealed container and heat it enough. Beyond that it simply makes for a very hot fire. I store one-gallon jugs of water on the shelves with my powder. I figure if the fire gets hot enough to melt plastic, it will melt the thinner plastic of the water jug before it does the thicker plastic of the powder jugs. The fire will then have to heat up first the water, then a wet slurry of powder to do any more damage.

You should also check the fire regulations of your jurisdiction. It may well be that you have to have particular storage containers, such as a cabinet with solid wood walls and doors one-inch thick in which to store your powder should you have more than a certain amount.

I'll leave you with an example (albeit a deliberately vague one) of just how forgiving the .45 ACP can be in reloading. The U.S. Army, in earlier versions of its insurgency warfare manuals (the ones where we were aiding insurgents against a big, awful enemy) detailed means of reloading .45 ACP cases using a variety of combustible household items. The idea wasn't to create match ammo, but a cartridge that could be made to go "bang" when you shoved it into a sentry's kidney, and thus kill him and take his rifle. Even I, an avid reader with a chemistry degree, was impressed by their ingenuity. Don't take that as an invitation to go out and experiment, nor to get sloppy in your reloading or powder selection. Just realize that you are the inheritor of a fabulous cartridge, system and – not coincidentally – way of life.

Keep your powder dry.

CHAPTER 6

Primers

Primers are a cartridge's sparkplug, and we could not do what we do without them. As with autoloading pistols, the first attempts at manufacturing primers were odd, even bizarre, to modern eyes. The concept is simple: You have an intermediate, small, extremely-sensitive charge that when initiated, ignites the larger charge. The use of blasting caps with high explosives is similar.

You can set a large charge or train of explosives (quarry work, tunneling, demolition, etc.) by setting out the main charges, composed of relatively insensitive substances. For instance, you can burn C-4. Flames or physical impacts will not detonate it, but blasting caps will. Imagine the difficulty of setting out the explosives if the main charges were as sensitive as the detonator. In the movie *The War Wagon*, the explosives expert is rigging the bridge, to bring it down and foil pursuit. He's using nitroglycerin. "Nitro" is NOT insensitive. Too much vibration, heat or static electricity, and it will go off. The assistant asks him if he knows what he's doing. "I've got all my fingers and I don't talk in a high voice. I know what I'm doing, leave me alone," the expert asserts.

The top primer *is horribly over-pressure, and not a sign that the reloader is "slightly" out of the ballpark. He's in dangerous territory.*

Insensitive high explosives were a great step forward in heavy construction, land-moving, etc. Relatively insensitive smokeless powder was also a big move forward. You see, unless it is confined, smokeless powder simply burns. It burns hot and fast, but it doesn't explode like black powder. However, the compounds in primers can explode.

So, the first rule, and one of the iron-clad rules of reloading is that you keep primers in their original packaging until you need them. You don't, for God's sake, do as one old-timer did. He was tired of the bulk of the packaging and had poured his primers into a glass jar. (I could not get out of that room fast enough.) One wrong anything, and the primers could go off. In the sleeves (that's the little plastic and cardboard thingy they're packaged in) they are relatively safe. The Federal primers, with their bigger sleeves, are even safer.

A friend of mine had a house fire, burning up the house and contents. His reloading bench had "modern sculpture" of melted Federal plastic primer sleeves, with charred cardboard and trapped, undetonated primers caught in it. The plastic had melted, as designed, and kept the primers from going off.

One more scary story. This one is from *Hatcher's Notebook*. It seems that early in the 20th century, a workman at an ammo plant was transporting primers from one location to another. He liked the clink-clink sound of the mound of primers in his bucket, so he'd jostle the bucket as he carried them around. One day, he no longer worked there. It seems he disappeared—in a loud bang and flash of light and smoke. The primer bucket, because of his jostling, had accumulated (or so the theory goes; no one was willing to duplicate his efforts) a bit of priming compound dust. One primer got set off, ignited the dust and then set all the primers off, pretty much at once.

They may be small, but primers are not toys. They are perhaps the most hazardous things you will work with in your time as a reloader and shooter. Treat them with the respect they are due, and you'll be safe. If not, expect the rest of us to divvy up whatever gear of yours is left after your demise.

Primer Construction

Boxer-style primers (the only ones we care about for this book) are really pretty simple: take a small cylindrical cup of soft metal, brass or iron, and press into it a small dab of an impact-sensitive compound. Seal the compound into the cup by means of a layer of foil covering, glued around the edges. Then, press into the center of the cup a three-lobed gizmo called an anvil. The finished product is now ready to be inserted into the primer pocket of a cartridge case.

The primer pocket is designed for a snug fit, enough of a friction fit that it won't fall out but not so much that it will cause problems on insertion. Once in place and properly packed, the anvil will be pressed against the pellet of priming compound with enough force to make it fully sensitive, but not so much as to break the pellet. Broken pellets are less-sensitive and may cause unreliable or even non-ignition.

You won't see much of it in .45 ACP cases, but in other calibers, especially rifle calibers loaded for military use, the primer pocket may be crimped. In military use, a crimped primer pocket has the outside perimeter of the pocket whacked with a ring-shaped tool that swages a lip of brass up over the edges of the primer. It locks the primer in place. It also, in combination with lacquer, seals the primer against moisture. Why does the military do this? In rifles, the ammo may end up in machineguns, and they want the primer locked-in so it can't fall out and tie up a gun when it is needed most. In handgun calibers, it was meant to do the same thing for submachine guns. However, it has been a long time since the military used .45 ACP subguns, and even the use of 9mm subguns is extremely limited. You'll still see a lot more 9mm primers crimped than those of the .45.

Once properly seated, a primer is sensitive to the impact of the firing pin and relatively safe from moisture. That does not keep some shooters from making the primers a bit more sensitive.

Let's take a moment to discuss primer sensitivity as a general thing. When primers are made, each production lot is tested for sensitivity. A production lot is a batch of primers that have all been made from single sources of materials. That is, a lot will all have cups stamped from the same strip or strips of alloy, obtained from the same suppliers at the same time. Ditto the foil and the anvils. They have all come from one batch of materials. The priming pellet has been made from one source of chemicals. If any of them have to be changed (supply miscounted and you ran out of cups for instance) then the ones made with the different cups are a different batch.

That way, if you find out after the fact that your supplier made a mistake, you know which primers in your inventory were affected and may have to be scrapped.

Random samples from production are selected in each lot and tested. The test rig is simple: a steel ball held by a magnet, that when released, drops onto a primer held in a fixture. There is a minimum and a maximum requirement. At a certain height, 100 percent of all tested primers must ignite. If they do not, the lot is scrapped. Below a certain height, none of them must go off. Again, failure means scrappage.

As long as a lot meets those tests, it passes. A particular lot may be more or less sensitive than another, but it doesn't matter. However, some brands are viewed as being more or less sensitive than others. For most of our uses, again, the differences don't matter. A 1911, Glock, etc. are going to set them all off, and nothing you do will change the primer's performance.

Interestingly, it can matter with revolvers. If you have an expert gunsmith smooth and lighten the trigger pull of a double-action revolver, it can have a hammerfall that comes down to the sensitivity level of a primer. If you are shooting a revolver and have had a gunsmith work on the trigger, you will find, as most shooters have, that CCI primers are the least sensitive, Federal the most and everybody else somewhere in between. High-end competition shooters usually run Federal primers. However, specifically selecting Federal primers for their sensitivity is a waste of time when shooting a pistol. Pistols don't care. The hammer fall is not related to the trigger pull.

The differences are small, but competition shooters thrive on small differences. And when the differences can be made even smaller, they'll do it. The sensitivity of a primer depends on the pre-stressing of the pellet by compressing the anvil into it. Ammunition manufacturers balance speed of production with sensitivity and moisture-proofing. Handloaders are not that concerned about speed. As a result, some revolver shooters will hand-seat primers before they load the ammo.

I repeat, they "hand-seat the primers before they load the ammo." Clean and size/deprime and then hand-seat. Place it back into the press for powder, bullet and crimp. Why do this as a separate step? Because you're hand-pressing primers in place using a small tool you compress with your bare hands. Too much compression can lead to primer ignition. Now, is it a pandemic, sweeping the reloading ranks? No. Is it a bad thing when it happens? You bet. The bullet will not reach anything like full velocity (not that I have or have any plans to chronograph them), but let's just assume for the sake of argument that the bullet reaches a couple of hundred feet per second. That's a 230 grain FMJ stepping out at 200 fps. As the observation goes, "That's gonna leave a mark." In fact, it could kill you, or more likely, the person standing in front of you.

How sensitive are primers so-treated? My friend Brian Enos, winner of the Bianchi Cup, the Steel Challenge, The Masters, Second Chance and who basically dominated the practical shooting sports from the early 1980s to the mid-1990s, had a canvas bag with ammo in it, ammo he had loaded and hand-seated the primers for maximum sensitivity. He dropped the bag a foot or so onto the range, a gravel-covered range, and heard a "pop." He had set off a primer, just from the impact of dropping a bag of ammo from less than knee-high. That's how sensitive primers can be when they are ready to go.

And that's why you treat ammo kindly. "I never treated ammo that way again," he says. Brian shot more ammo than almost any of us back in the days when huge ammo consumption was the norm. After that day, he was a lot kinder to his ammo, as well as his primers.

Sizes

So, what primers do you use? The answer is simple: large pistol. Can you use large pistol magnum primers? Yes, but why would you? You'd gain a small increase in velocity and a commensurate-and-then-some increase in pressure. Large pistol magnum primers are meant for calibers and powder charges like the .44 Magnum, where you may be igniting 12-15-17 grains of powder, and medium-burn rate powder at that. No, igniting five grains of a fast-burning powder doesn't require something like a magnum primer.


FEDERAL
45 AUTO

You want primers? *The "primer" on a 40mm grenade is a .38 Special short case, primed and inserted in the 40mm case base.*

What about other options? For instance, in a pinch, can you use large rifle or large rifle magnum primers? Definitely not.

Look at it this way: The large pistol primers are meant to start five grains of powder. The large pistol magnums, 15 to 20 grains. A rifle powder? It's designed to get 35-45-55 grains of powder going. The rifle magnums? That's for the really capacious cases, where you will have 60+ grains of powder. Do you really want that brisk of a primer igniting your measly five grains of powder? No. Now, if the Stazi were going door-to-door, yanking gun owners out of their houses, and all I had to load into the .45 ammo I would need in the next five minutes were rifle primers, would I? Yes. Anything short of that? No.

So don't let temporary primer shortages or perceived expedience lead you to do something stupid.

Now, on the other side of the ledger, we have the exception to loading with large pistol primers: the cases that take small pistol primers. Some are understandable. The .450 SMC from the late Triton Cartridge Company, is/was a high-pressure .45 ACP case. It was meant to stretch the performance of the .45 by running at significantly higher pressures (up to 26,000 to 27,000 psi) and in such uses a small pistol primer it is a good idea. It gets more brass in the case head, and it limits the amount of leverage the case pressure has in slamming the primer backwards out of the primer pocket.

However, there is another use for small pistol sized primers—to get rid of lead. The pellet in primers contains a smidge of lead styphnate. It is stable, easy to work with and it produces residue that is neither hygroscopic (attracting moisture) nor acidic. It is non-corrosive. It has, however, the mortal sin of the modern age: It contains lead. (Ahhhh! Flee the building! Gather the children and run for the hills! Leaaaaaad!) OK, I make fun of it at every opportunity, but while lead can be a hazard in extreme instances, for most uses it is not that big a deal, if it is any deal at all.

However, it can be a big deal. On an indoor, poorly ventilated range, it's possible to get exposed to enough lead to be a problem. However, run through those variables again: poor ventilation, lead primers, long periods of exposure and insufficient hygiene. If you're not there all the time, or the range is well-ventilated, or you wash your hands, shower and launder your clothes, you won't be exposed to lead enough to be a problem. However, the easiest way for some to "solve" the problem and to "prove" that they've solved the problem, is to remove the lead from the primer. They feel that way about bullets, too, but that's a different chapter.

So, police agencies started demanding non-lead ammo. "Non-toxic" it is called by some. The new compounds the chemists developed had some problems: first, the new ones had a higher brisance. Brisance is the forcefulness and violence with which a compound ignites or detonates. The new compounds, fitted in the standard primer cups, caused headaches. If you used the normal amounts (which the primer-making machines were all set up for) you'd have a stronger primer. The stronger primers would actually, when discharging, try to hammer the primer cup backwards out of the primer pocket.

That's not so good. So the ammo companies drilled/punched the flash hole in the primer pocket bigger. That solved the problem, but it still didn't make things right. The greater brisance of the new primers changed the loading parameters of the ammo. A stronger, harsher primer ignites powder differently, and that throws decades of loading data a-kilter.

So, they loaded the priming compound into small primer cups, and all was good. Good at least until reloaders started encountering the cases. A small primer-pocket case in a stream of large primer pocket brass and being fed large primers brings a reloading press to a screeching halt. Not good.

So reloaders across the land now have to sort their brass by large and small primer pockets. Not that this was the first time. Back in 1935, when the .357 Magnum was developed, it was made with large pistol primer pockets. No kidding. It didn't last long, as everyone realized that many shooters and reloaders would be using .38 Special ammunition and cases in their guns, and there was no good reason to have two different sized primers for a long and short cartridge.

Alas, until the police departments across the land are required to install showers and laundry machines, and the eco-crazies are forced to give up their irrational fear of mineralogical items, we're going to be stuck with two different sized primers for our .45 ACP cases.

You need large pistol, *standard primers. The brand doesn't matter much, if at all, but you do not need magnums, and you don't need rifle primers. Only if you load cases with small primer pockets will you need small pistol primers.*


WINCHESTER
Primers
LARGE PISTOL
FOR STANDARD OR
MAGNUM PISTOL LOADS
No. WLP
1000 PRIMERS
1000 AMORCES
Remington.
MADE IN THE U.S.A.
1000—10 BOXES OF 100 EACH
No. 2½ Large Pistol
Primers
FOR CENTERFIRE CARTRIDGES
CCI
300 LARGE PISTOL
PRIMERS
1000

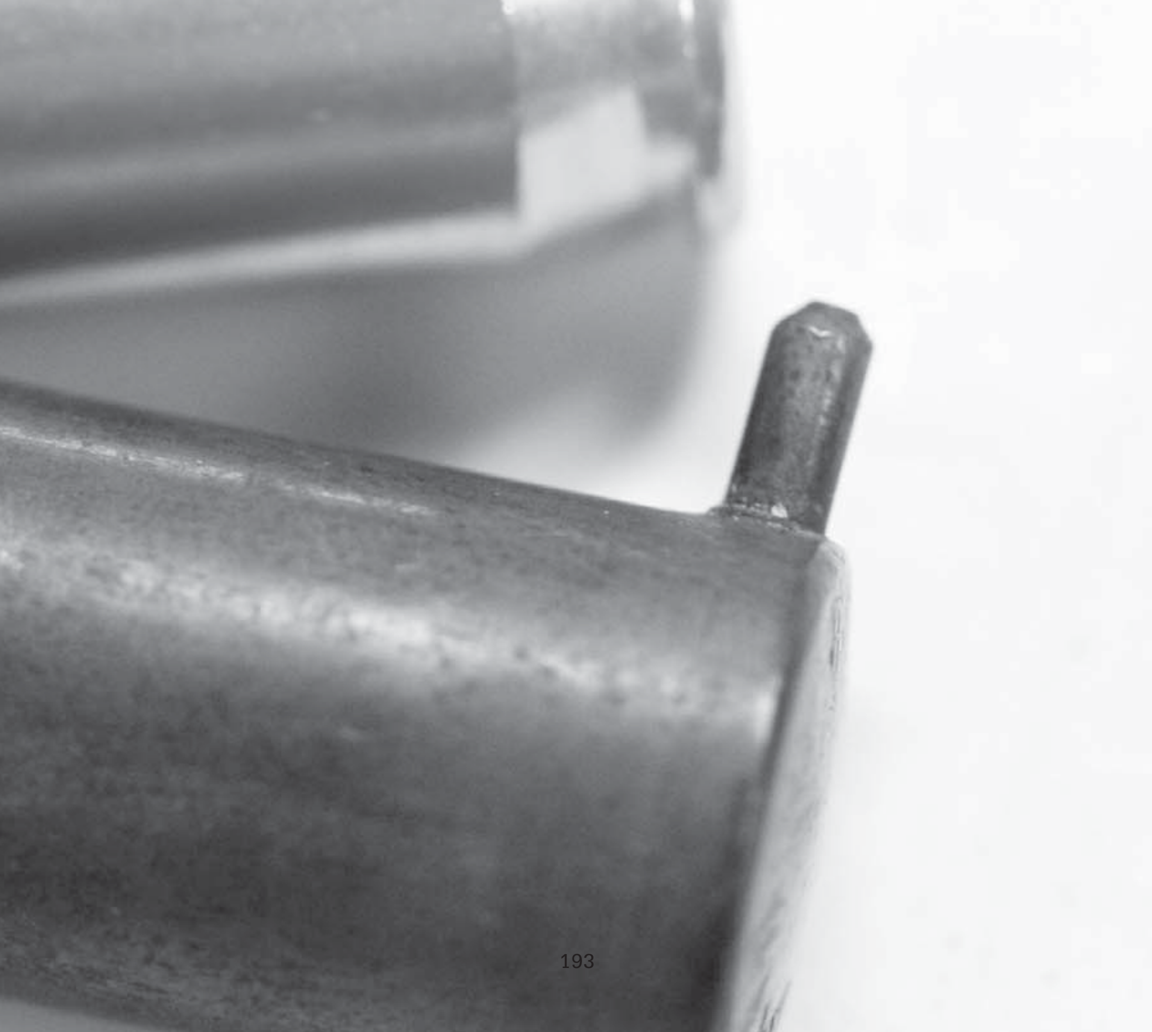
History

For those who have to know all the details, and for those who love to shake their heads at "what might have been," I'll give you a bit of info on some early approaches. The first priming system for cartridges seems to have been the "pinfire" system. There, each cartridge has its own firing pin, sticking out of the side of the base of the cartridge. This works fine in single and double-barrel shotguns. The pins stick up out of the standing breech, and the hammer comes down and ignites the cartridge. Inside the case, the pin rests against a priming compound pellet on the far side of the inside.

The first primed *self-contained cartridges were pinfires. This works just fine in a single-barrel or side-by-side shotgun. OK, in a revolver, too. In a self-loading pistol it is a definite non-starter.*

I can't imagine what dropping one of them might have done. As for dropping a box of them…well perhaps we should just draw the veil at this moment and move on.

Next came internal primers. The case looked like a rimfire case (think a .22LR scaled up to .44 or .45) and it had a cannelure low on the case wall. The cannelure locked in the case the primer plate. The plate was a domed plate that had a hole in the middle with the primer pellet caught between the case head and the internal plate. The external firing pin slammed into the center of the case head and ignited the primer pellet. The drawbacks to this were several. The case had to be soft, or the firing pin couldn't crunch the primer pellet hard enough to ignite it. Also, the big plate had to be firmly locked to the case, or the round wouldn't fire.



The other priming system that survived to today is the Berdan. Curiously, the Berdan system was designed by an American and adopted by most of the rest of the world, while the Boxer system was designed by an Englishman and adopted here in America.

In the Berdan system, the primer cup is just that: a cup with the priming pellet and foil and nothing else. The Berdan case contains a small lump in the middle of the primer pocket, and that lump is the anvil the priming pellet is pinched against when fired. Since the Berdan has the anvil as part of the case, the flash hole cannot be central and is instead two or three smaller holes arrayed around the anvil. You cannot de-prime a Berdan case by means of a center-post depriming pin. For those who reload, de-capping a Berdan case is done hydraulically. You fill the case with water, insert a tight-fitting ram and when you strike the ram, the water pressure drives the primer out. It also sprays the room with water jetting up out of the case around the ram. Berdan-primed cases have to be really rare or really expensive to go to that much trouble.

So, be glad we went with the easy-to-reload priming system, or else we'd be in the same situation as many other countries, where factory ammo is the only option.

CHAPTER 7

Fun With the .45 ACP

One of the other interesting attributes of the .45 is that you can actually see the bullets in flight. Really. It's not like "seeing" rifle bullets, where what you're seeing is the wake created by the bullet. In some conditions, you can see (with a pair of binoculars or spotting scope) the wake of a rifle bullet traveling out to a target some distance, like 300 yards and out. I teach law enforcement patrol rifle, and we have the classes spend some time on a National Guard base when we can. There, we shoot the computer-controlled pop-up targets. They range from 50 to 300 meters. Now, I'll be the first to tell you that I don't want your average police officer shooting at bad guys from 300 meters away, especially with iron sights on an AR. But as a training exercise and a confidence-builder, it is great.

The shooters fire from concrete "foxholes" and it's possible to sit in the gravel right behind them and watch the target from just over their heads. With a good pair of binos, you can see the bullet's wake, up, out and down. You can see hits and misses. If someone is not hitting well past 100 yards, watching a few shots provides me with the info. They can't see the misses, so they don't know if the shot missed high or low, left or right, by an inch or three feet.

I watch the wake, tell them to make some basic sight adjustments and to stop holding high on the far targets. The next time I walk by, they give me that look that says, “How does he know this stuff?”

Handgun bullets are different. Here you can see the actual bullet.

The first time, I was shooting my 1911A1 in the early days of IPSC. The club match was held on a metallic silhouette range. Once we were done, we plinked at the steel targets left up from the M-S match the day before. The setting sun was right behind us. I was firing jacketed bullets that day (I’d run out of lead-bullet reloads) and I could see the bullets flying toward the targets. Each brass base glowed like a tracer round as it zipped downrange. It took just a few shots, and I had the range for the 200 meter rams. At that distance the .45 lacked the oomph to reliably shove them off their bases, so I’d get a lot of satisfying tinks before one would topple. Alas, the sun set, I ran out of ammo and the experience was not to be repeated. Finding a range with a westerly exposure open enough to catch the setting sun, distance enough to see the bullets in flight and no one to hassle you? Sigh.

The next time, I was at my home range. I had been doing an awful lot of shooting, and on that day it was bright overcast. I was shooting (again with the sun behind me) into a sandy bank, and on follow-through I could see each shot streaking out to the 100-yard berm. Each one was a blurry little black object zipping along. I knew I wasn’t hallucinating, for each shot corresponded to an impact on the hill. For a while, I was able to see my shots on every practice session. But I then switched to a .38 Super (much faster and smaller) and then soon after practiced a bit less.

So, the key here seems to be that you have the light behind you while you fire away from it. You follow through and keep your eyes open so you can see what is before you. Also, you need either a clear backdrop, like a sandy hill or a vision-enhancing boost like jacketed bullets and a clean-burning load. And it takes lots and lots of practice.

Now, there have been other times that I’ve seen bullets in flight. One, some shooting friends were experimenting before Second Chance. Regular readers will know of it, but for those who haven't, it was the premier bowling pin match. The format was simple: stand bowling pins on a steel table 25 feet away in whatever the event array called for. Shoot them off the table against the clock. The fastest shooter wins. A handgun in .44 or .45 was common. Bowling pins need some oomph to shove them off the table, and just tipping them over doesn't stop the clock. Bruce and Gary had decided that heavier was better, and had worked up to 300-grain .452-inch hard-cast bullets. Yes, 300 grains. They'd worked up a load that seemed strong enough without abusing the gun and decided to try some on pins.

I arrived as they were testing the load on pins on one of our practice tables. On one shot we saw the pin fly off the table, as well as a flash of something arcing back towards us. It landed in the grass at our feet. It was a still-warm, 300-grain .45 bullet, bright from firing and coming off the bowling pin. We looked at each other, at the bullet and imagined the effect of that bullet coming back some 3 feet higher. No more 300-grain bullet experimentation went on after that. At least none that I know about.

I've also seen bullet fragments splashing off of steel plates, but those are benign. They travel perpendicular to the face of the plate, and unless you arrange something to create a double-bank shot a-la billiards, the fragments simply zoom off a few feet and drop to the ground.

Not all of this is fun and games. Back in the late 1970s and early 1980s, Smith & Wesson offered a line of ammunition. Word was they had ended up with a couple of truckloads of commercial reloading equipment. One rumor was they took it to settle a debt. Others were that it was intended to load S&W-branded ammo for an exporting ammo and gun contract, and some explanations were even weirder for the times. The boxes, if you ever see one, were white and dark blue. The 230 FMJ load was stout, and I used it from time to time when I knew the club I was going to have "heavy" poppers. Until the late 70s and early 80s, my chronograph was ancient. It used plastic sheets with printed-on electrical tape. When the tape was shot, the electrical current was broken, and you could then "read" the velocity. "Reading" involved rotating a knob to different points of the compass and reading the plus-or-minus or red or blue, or whatever limited number of choices it offered. (My memories are mercifully vague on this gizmo for it was truly excruciating to work with.) Once I had the readout, I then consulted the handbook that came with it, and by translating the code I could then get a velocity.

As you can imagine, I did not chronograph every load I loaded, nor all the factory ammo I shot. I had my match load, which I knew made Major, for competition use, and everything else was good enough. Such were the habits of shooting in the "good old days." So, I get a modern, proper, easy-to-use chronograph, and first I check my match load. The results are proper, so I figure this thing is useful after all. I then started to routinely check everything else that came along. What did I find when I test the S&W ammo? Holy cow, it fired a 230 at 999 fps. That's right, 999 fps, which adds up to a power factor of 229. No wonder it felt stout and steel went down with alacrity. And what about their .357 Magnum loading featuring the 95-grain JSP? You don't want to know.

Fast forward some 10 years, and another club member is practicing with his new custom 1911. It is a full-house stock (no comp, no optics) single stack, and he's going to use it at Second Chance. He's breaking it in on the 100-yard range, plinking at the odd lumps of dirt down there. The recoil seems stout.

"Yes, I'm loading hard-cast 265s, and I loaded them up until the pins went off the way I like," he told me.

Say, maybe you'd like to run a few rounds over my chrono and see just what they're doing. Hmm, no surprise there. It fired 265s at 898 fps. That's a 238 PF. Yes, he leaned out the mix before the Second Chance shoot and settled for 265s at just over 800 fps.

The .45, as I've said, is very forgiving, and the 1911 will stand up to a lot. Our old range was an open area in a landfill next to an airport. We got chased off one field as they were going to turn it into an open pit, so we moved to another. There, they had pulled up the stumps of trees. These had been century-old elms that had died from Dutch Elm disease and been yanked out to make room for another pit. They were lined up in two rows on the field we had, so we incorporated them into stage design. On one match, a shooter ran through the "Hall of Stumps," merrily whacking targets, when her 1911 made a particularly loud noise, and the magazine fell out. She stopped and inspected it, and we found that she had blown a case. The result was a lost stage and magazine, and nothing else. The gun was fine, her hands were fine; the magazine was toast, but hey, magazines are cheap.

A friend of mine decided to go into commercial reloading. He had a shiny new Dillon 1050, a lot of shooters who had less time than they wanted for shooting and reloading, and he had contacts for components. So he bid on and won drums of once-fired brass from area police departments. That's great, except a 50-gallon plastic drum of .45 ACP empties is more than one man can wrestle downstairs. (Note to would-be reloaders: Set up your commercial tools in a garage or workshop at ground level.) After a couple of trips carrying buckets of brass down the stairs, he decided "the heck with it," and tipped the drum over the stairway. I asked him later, "Paul, did you put on hearing protection before you did this?"

"No," came his answer, "and the sound seemed like it would never stop." It was loud. And brass went everywhere. Years later, cleaning out the house to move, he was still finding brass in that basement. Think about it: 50 gallons is nearly seven cubic feet of brass, one quarter of a construction yard. In fact, it's almost 200 pounds of brass. That's a lot of empties.

And speaking of empties, one last Second Chance story. Ammunition consumption there could be measured by the cubic foot. It was possible to shoot in as many as 18 different events. Not all could be fired with a .45 ACP as some, like the 9-pin, were better-suited to 9mm. But you could in many. Some it was simply not possible, as shooting a .45 ACP in the rifle or shotgun events was just a non-starter. To give you an idea, the last two days were mostly team events. On an all-team day, the 30 tables would have between 20 and 30 shooters on them. If it was all 3-man teams, each "turn" or rotation of the tables produced 160 empty shotgun shells and 80 handgun empties. The line would fire every couple of minutes. If we calculate two minutes per turn, that is 30 turns an hour for eight hours. That makes for 38,400 shotgun empties and 19,200 handgun empties. During the rest of the nine days of competition, the line churned out handgun empties even faster than those totals. We'd have been knee-deep in brass, plastic and paper by the second day.

To alleviate that, the head honcho hired the kids of the shooters as well as local kids as "brass rats" to scavenge the brass while the match went on. While the pins were being reset, and the shooters were shuffling in and out, the brass rats were picking stuff up. It was magnificently organized chaos.

At the end of one match, as we were packing up to go home, I overheard one family talking.

"So, did you have fun?" the dad asked.

His son in his early teens replied, "Yes, the timers and pinsetters are cute, I know what to practice for next year and I'm not picking up any brass ever again."

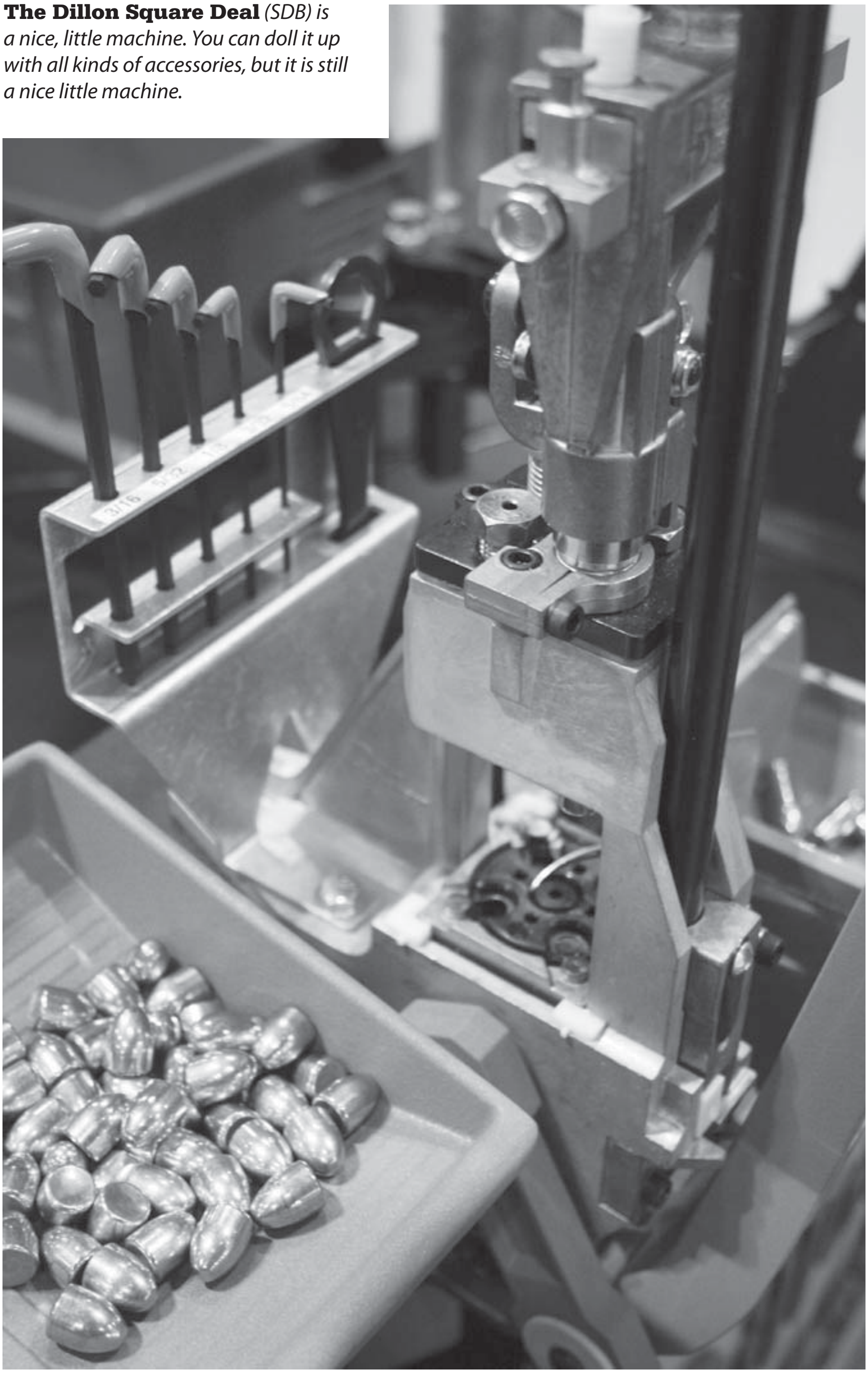
My bet is, as soon as he found out what the cost of new was, he got over the "trauma" of being a brass rat very quickly.

Ah, those were the days.

CHAPTER 8

Reloading the .45 ACP

If there was a contest or a poll with the question, “What is the easiest caliber to reload?” the answer would be a tie—the .38 Special and the .45 ACP. They have many of the same attributes such as they are relatively low-pressure rounds, they are short and stout and they have been around a long time. Since this is a book on the .45 ACP and not the .38 Special, we’ll leave that other classic cartridge for another volume.



The Dillon Square Deal *(SDB) is a nice, little machine. You can doll it up with all kinds of accessories, but it is still a nice little machine.*

What makes the .45 ACP so easy and forgiving to reload? The first thing is its size. The case is big enough that you can handle it without fumbling or having to be fussy and particular about how you wrestle cases into and out of your loading press. They are easy to find at the range, so you don't lose a lot of them. Since it operates at such a low standard pressure, they are not often hurled great distances when fired, nor mangled or abused during ejection. The low operating pressure also makes resizing (a process we'll get into in just a bit) a lot easier. The .44 Magnum is a very versatile cartridge. But its operating pressure is great enough that when fired with the hottest loads you nearly have to stand on your reloading press' handle to get cases resized. Not so with the .45 ACP. The case uses large pistol primers, large enough to not be "fiddly" to handle and load with. The bullets are large, so you have less hassle handling them and getting them in place on each empty case when it comes to bullet seating. The very attributes of the .45 ACP that make it so easy can lead you to sloppy reloading practices, practices that will not serve you in good stead should you take up reloading a more-particular cartridge.

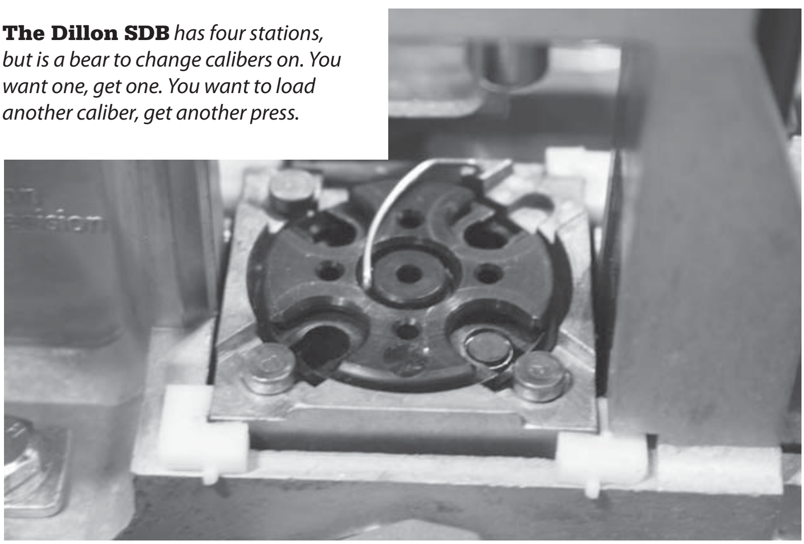
How so? In reloading ammo, you have to go through a series of steps. The steps are, in order: pick up and sort, clean, size, deprime, reprime, expand the neck and mouth bell, drop the powder, seat the bullet and crimp the bell. In all of those steps, the .45 ACP is so forgiving that anything "close" is close enough. Sizing brass to fit a casually large chamber is no great task. The case has enough bullet inside of it that anything close enough to the correct neck-expansion diameter will do. Powder? You can just about load with any powder taken at random off the shelf, and some load will work well enough. All of which can get you in trouble when you move to a more persnickety cartridge like the 9mm or the .357 Magnum.

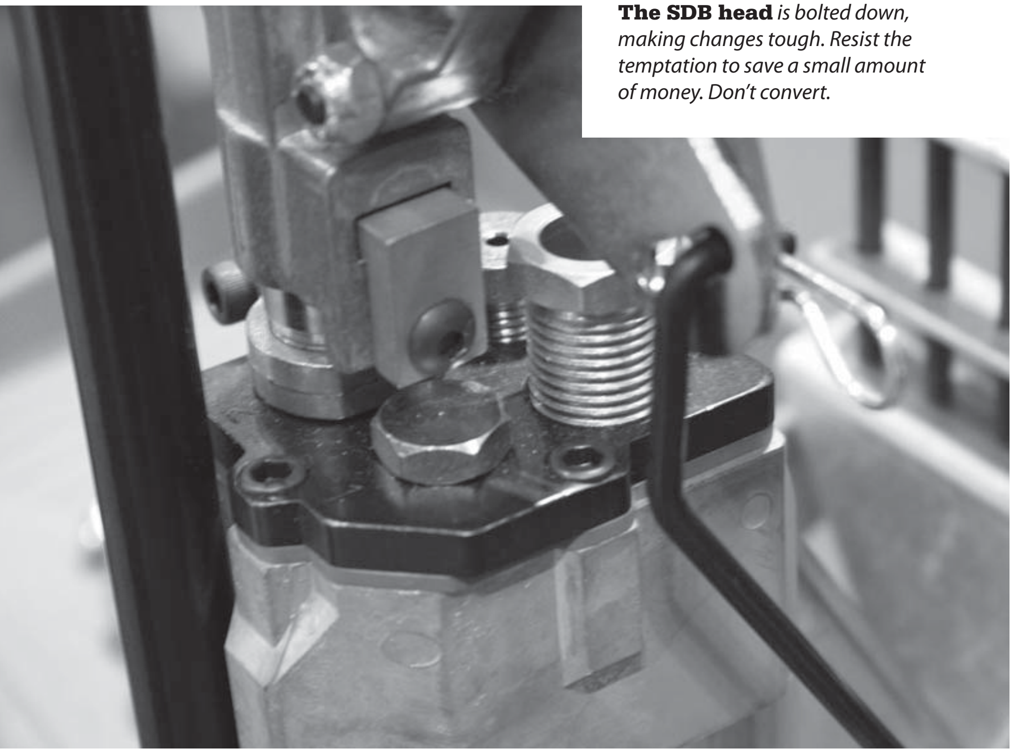
Second in making the .45 Auto a cinch to reload is something few think of, because it has been a given for so long: it uses a straight-walled case. There is no bottleneck or shoulder like the earliest pistol cartridges. The 7.62 Borchardt and the 7.65 Luger use a 9mm size case necked down to .30 caliber. If you reload something like that, you have a number of problems to deal with just starting with sizing back to shape from the pressure of firing. As a result, sizing dies for the .45 are simple. There is a ring of steel (in the old days) or carbide or tungsten carbide that squeezes the case down to the proper size. That alone makes the .45 so much easier to reload that I thought of listing it first. When the .45 was being developed, from 1904 to 1911, the idea of a dead-straight cylinder as a case shape was rare, almost radical. After all, you "had" to have some taper to the case just to be sure of reliable feeding, right? Not to John Moses Browning. Once done, it need not be redone, and we, as a result, have benefitted from his foresight and genius.

Sorting

You want .45 ACP and only .45 ACP brass. A lot comes close, so you want to eyeball and hand-sort (assuming you simply vacuum up brass left behind at the gun club) out the .40 S&W, 10mm, .45 GAP, .45 Super, .450 SMC and that wretched .45 NT stuff. Also, sort out the aluminum Blazer ammo made by CCI/Speer. I love those guys, but both of those last two really make for headaches. The NT brass is normal .45 ACP brass save for one difference, it has small primer pockets. Why? Because it's "nontoxic," that's why. The fear of lead (and other heavy metals) has gotten so hysterical in some quarters that the ammunition manufacturers have had to develop new primer formulas that do not use the good old standard compounds, basically lead styphnate. Now, in some instances that

The Dillon SDB *has four stations, but is a bear to change calibers on. You want one, get one. You want to load another caliber, get another press.*



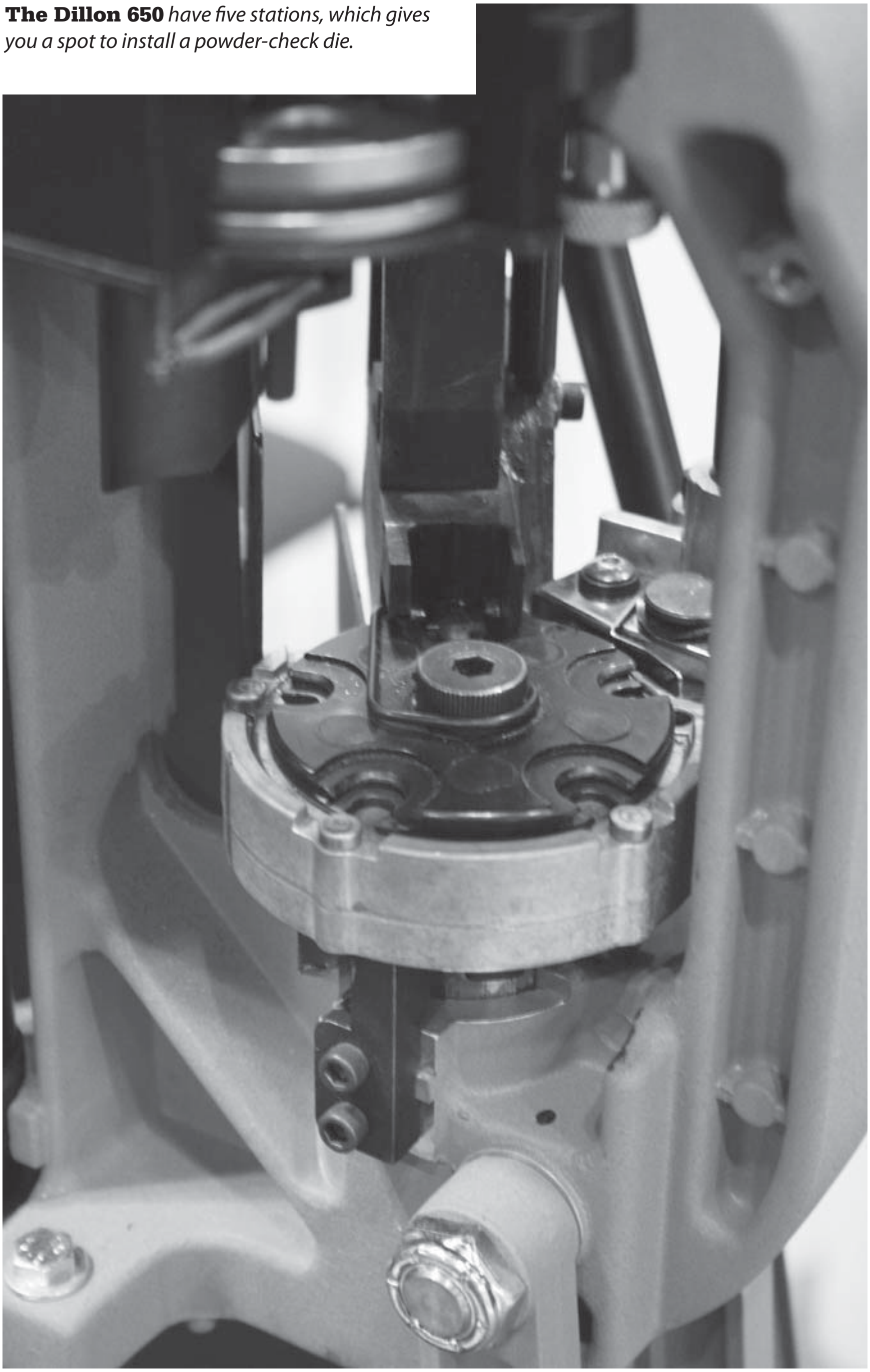


The SDB head *is bolted down, making changes tough. Resist the temptation to save a small amount of money. Don't convert.*

may (and I stress "may") be a desirable thing. A police range officer who works eight hours a day on an indoor range training police officers might be exposed to a lot of lead. I'd be more worried about keeping my hearing than about lead that I can simply wash off at the end of each day. But nobody asked me since I lack the essential items necessary to be taken seriously at the top levels of government. I lack both a degree from Harvard and an MBA, although having looked at both, I don't recall any classes for either that had anything to do with firearms, lead exposure, training standards or real-world people management. Simply having a degree in chemistry and decades of experience shooting and reloading is apparently insufficient. But that's enough grumpiness.

The problem with the new primer formula compounds was that they had greater brisance. Brisance is the violence quotient of the burning rate of a compound. The flammability of a substance can be measured in a number of ways such as how hot it is at its peak burn, how much heat it releases per unit weight, the flashpoint or

The Dillon 650 *have five stations, which gives you a spot to install a powder-check die.*



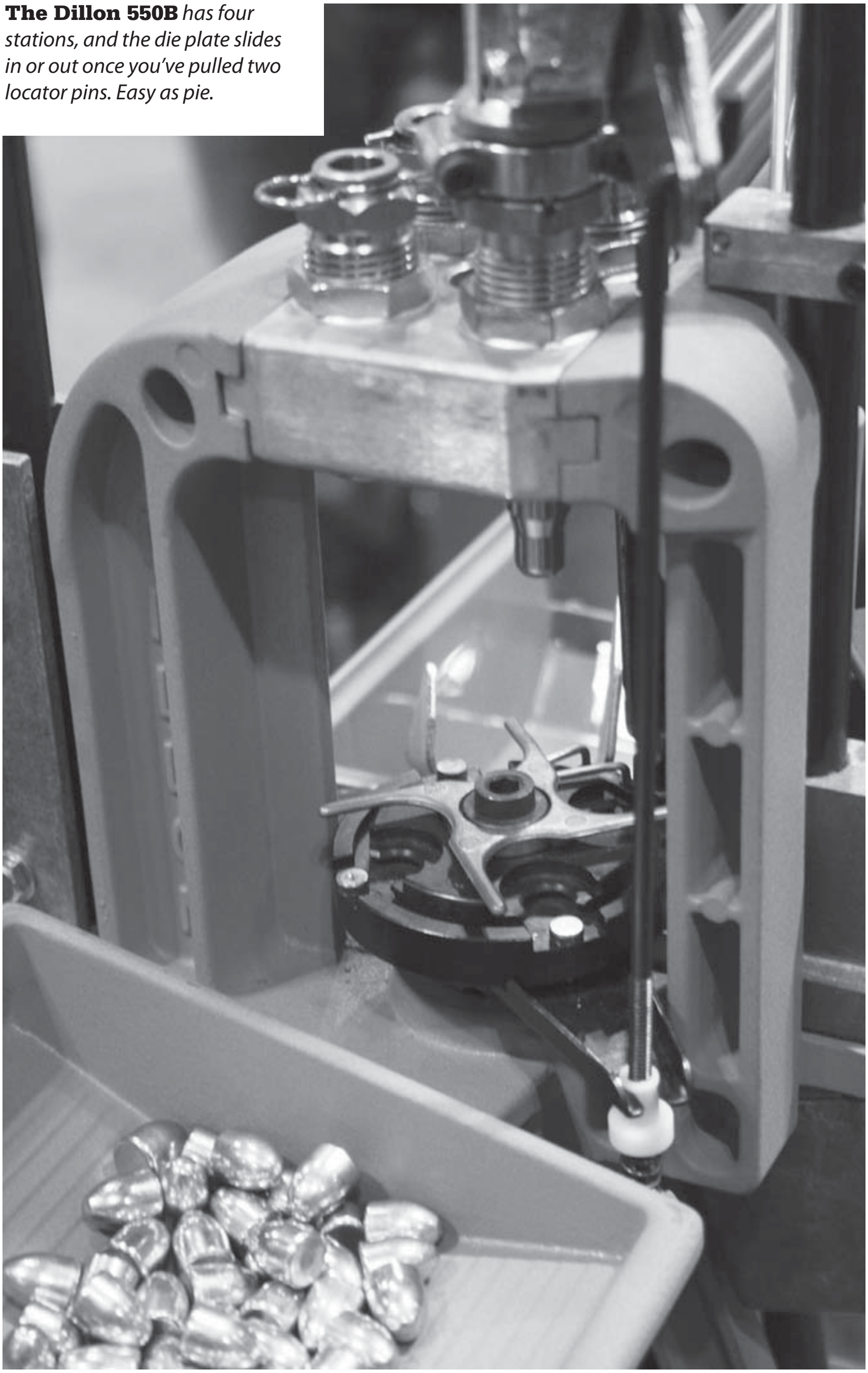
the lowest temperature at which it will burst into flame, which is the same as measuring its brisance. In other words, how quickly does it burn once ignited. A similar rating is used for explosives, which is called the propagation rate. (Priming compound can be considered a low-grade explosive or perhaps even a medium-grade one.) Explosives are rated by their "burn speed" or propagation rate. A typical high explosive will have a propagation rate of 3,500 to 4,000 feet per second. That is a rate, by the way, that is far outside the desired range for primers.

So let's get started describing the steps you need to take and the limits you want to remain within. After all, there's no point in building habits if they are sloppy habits, right?

The primer cups and primer pockets and flash holes of the old cases when loaded with the new nontoxic (a phrase only a government bureaucrat could use with a straight face) compounds were too strong. Primers backed out or cratered. Manufacturers found they could decrease the incidence of the problem by increasing the flash-hole size. If you happen to have a case made in the transition period, you can see that the normally small flash hole is whopping big. The larger hole reduces the backpressure of the nontoxic primer, limiting or preventing the problem. The better solution at the time was to make cases with small pistol primer pockets. The smaller primer used less of the new compound and eliminated the backing-out or cratering problem. Of course, it threw the problem squarely onto our shoulders. If you are loading brass with large pistol primers, and a case with a small pistol primer pocket happens to find its way into your reloading system, the reloading process will come to a sudden halt when the large primer fails to seat in the small pocket. So, in sorting you must look at the primer pockets. Once you see one, you will be able to spot the difference right away.

The RCBS *case feeder works on their presses, and works well. I'm not sure you could re-fit it to work on another brand press.*

The Dillon 550B *has four stations, and the die plate slides in or out once you've pulled two locator pins. Easy as pie.*



The .45 ACP NT cases are reloadable, you simply have to load them in a separate process using small pistol primers instead of large ones.

In the early days of the .357 Magnum, the cases were made with large pistol primer pockets. I guess the idea was since they were igniting such huge charges of powder (don't laugh, in 1935 the .357 Magnum was the hottest thing in handguns) they needed such a big primer. Fortunately, rational thought quickly prevailed, and it was changed to the small pistol primer, just like the .38 Special, the case from which it was derived.

The brass of the .45 ACP is still made with large pistol primer pockets. It's the stuff marketed as lead-free that sports the smaller primer pockets.

The Blazer? It's made of aluminum and the primers are Berdan, not the Boxer design. The two designs differ in a way that makes them noncompatible. The Boxer design is a cup of brass with a smidge of priming compound that then has a small angular piece of copper inserted into the primer on assembly called an anvil. When the firing pin strikes the primer, it pinches the priming compound between the anvil and the crushed shell of the primer setting off the compound. In Berdan primers, the primer cup is just that; a cup with priming compound in it. The cartridge case itself has the anvil built into the primer pocket. Thus, a Boxer primer inserted into a Berdan-primed case would ignite the primer, having two anvils in it. The Berdan primer in a Boxer case (if it even fit) would not discharge at all, as the priming compound would not be pinched. To avoid confusion, Berdan and Boxer primer manufacturers long-ago settled on different primer diameters so you can't get them confused or insert them into each other's cases.

Well, mostly. The Blazer cases are aluminum and use Berdan primers. However, a friend of mine, while loading with an ADP progressive machine long since out of production, managed to miss a Blazer case in his sorting. The ADP was built to be the *Koenigstiger* of reloading presses. And boy, did it rock. It had lots of leverage, the action was smoother than smooth and it ran like a dream. That is except for the one problem that it didn't handle primers so well. The primer feed system was so frustrating that he'd have to clear a jam once in 100 rounds, and it wasn't a simple thing like flicking the mangled primer out of the way. No, it was an allen-wrench-and-disassemble kind of task. My friend struggled with the press for a couple of years until he finally gave up in disgust and sold it to another member of the gun club. That member rebuilt the machine to simply process .223 brass. He would size, deprime, trim to length and deburr .223 brass on that machine, then load it into ammo on another machine. Anyway, the Blazer case got missed in my friend's reloading stream, and the ADP press had so much leverage that my friend didn't notice that the depriming and repriming steps knocked out the Berdan primer and inserted a Boxer primer. He caught the round in his post-loading inspection and left it on his loading bench as a reminder. Of course, he never fired it.

The 550B *has four stations, plenty to reload ammo. It is also very easy to change calibers on a 550.*

Cleaning

So, you've got your brass sorted. Now you need to clean it. Here I will mention a name you most certainly have heard or read about a lot, and that is Dillon. Dillon pioneered the reliable, inexpensive progressive press, such that all shooters who do any volume load on a progressive model now. In the early days of IPSC shooting, progressives were expensive. You could buy a single-stage press and all the gear you needed for maybe a couple of hundred Carter-era dollars. That setup got you ammo at maybe 50 rounds per hour output. It was entirely possible that you'd spend several evenings in the basement during a workweek, prepping and loading ammo, only to shoot it all in an hour of practice on the weekend. As for progressives, you could buy mechanical machines like a Star, which cost $1,000 bare. Or you could purchase hydraulically run ones like the Camdex that cost even more. Those churned out ammo by the hundreds or even thousands an hour. The latest model, the Camdex 2100, is rated at 4,400 rounds of fully-automated production an hour! You simply have to keep up with bullets, cases, powder and primers. And for that my friend, you pay. The last older model I saw, lacking the automatic bullet and case feeders (it has manually-turned drop tubes), was listed for sale at $5,000. If you really need that kind of output, give Camdex a call, and they'll be happy to quote you on a new machine with a full warranty.

Two things spurred the growth of IPSC, and as a result, other practical shooting endeavors. First was Jeff Cooper advocating for it. Secondly was Dillon making presses that could load lots of practice ammo. For $500 rather than $5,000, you could produce ammo at the rate of 400 rounds an hour instead of 50. It suddenly became possible to have enough ammo available to really practice rather than simply try to practice.

I was at the 1982 US IPSC Nationals in Milan, Illinois. At one point, I was standing under a tree, listening as the "big dogs" talked. Shooters are quite egalitarian and care only about performance. If you can shoot well, people will listen. If you ask a top shooter something, they'll give you an answer. I was getting good at that point and loading and shooting a lot. I was, however, shooting a "mere" 10,000 rounds a year, a paltry amount for that crowd. Ross Seyfried and Bill Wilson were among the group, and Ross had just won the World Shoot the year before.


ROCK RIVER
Dillon Precision Products, Inc.
Dillon Precision Products, Inc.

A basic press *(on the left) lets you load quickly. The additions of a case feeder and bullet feeder let you load quickly for a longer time period.*

He was complaining about beavertails and was wondering if anyone made one that didn't chew the web of your hand. (Someday I'll check the timeline and see if there were some changes in Wilson products after that match.) He made this comment as a shooter whom no one knew walked up.

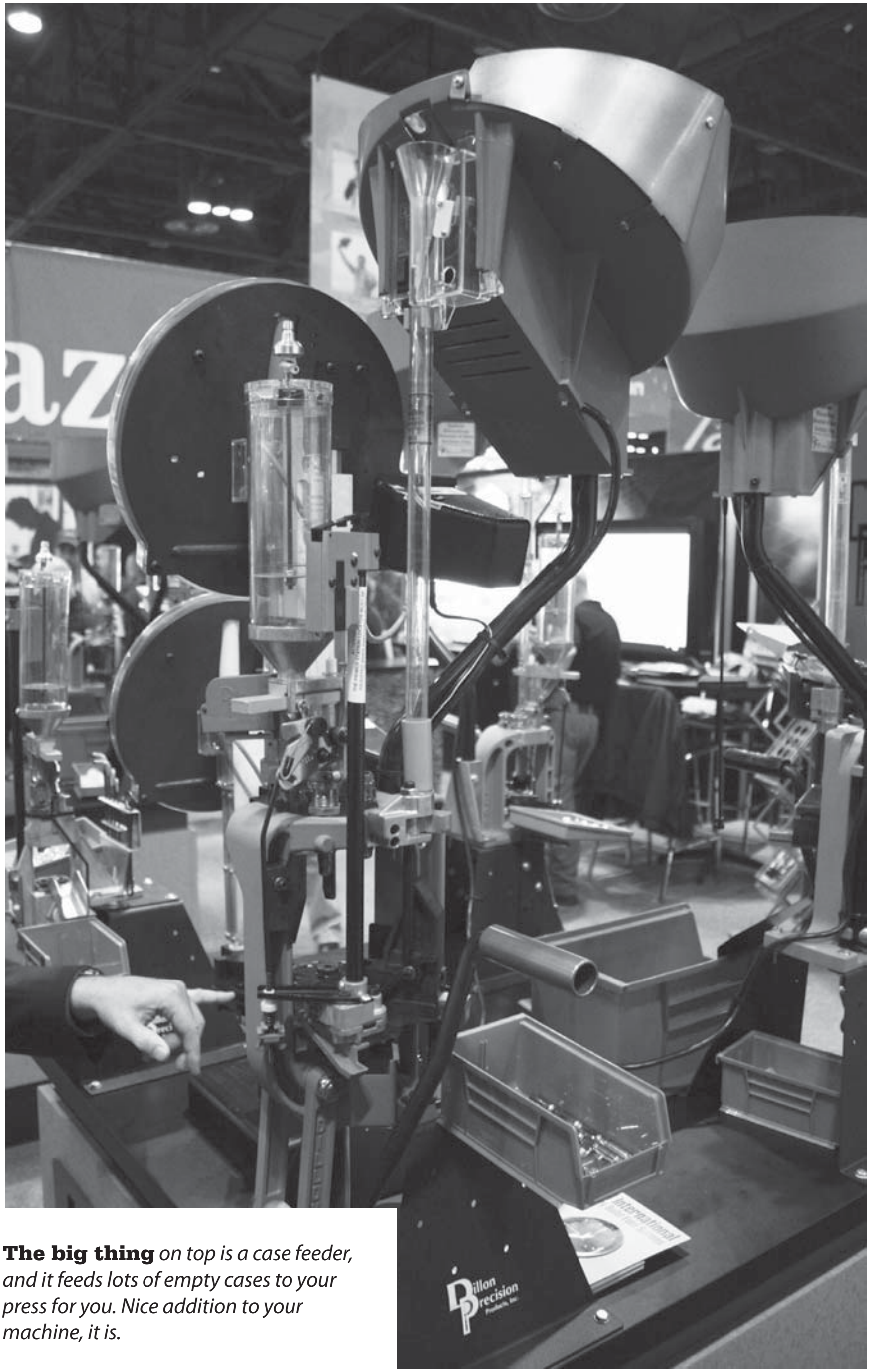
"Shoot more, your hand will toughen up," the new guy flippantly remarked. Everyone sort of froze, and no one said a word until the guy finally walked off.

At that point, Ross looked at the rest of us and said, "Fifty thousand rounds a year isn't enough?" I almost choked on my soft drink. My 10,000 was meager compared to that.

Before Dillon, high-volume Bullseye and PPC competition shooters might shoot as much as 5,000 rounds a year. You can learn a lot on a schedule like that, but nothing compared to diligent and thorough practice at 10,000 or 20,000 or even 50,000 rounds a year.

Anyway, back to the subject of cleaning. When you're loading, cleaning brass can be a real bottleneck. When I first moved up to a progressive press, I still had an old-style brass cleaner. It held 200 rounds, and it took a minimum of two hours to clean a batch of brass. Those 200 empties could be loaded in less than an hour, meaning I had to wait for the next batch. Were I to try and reload the 50,000 that Ross Seyfried had been loading, I'd have spent 250 hours a year doing nothing but brass cleaning. I'd have had to run a batch of brass through the tumbler every single week night, without fail, to even hope to keep up. In one of my periodic assessments of my reloading and practice logs, I finally just tossed the tumbler and bought the biggest one I could find at the next gun show. This was pre-Dillon 2000 and oh, baby, how it opened my eyes. I also discovered that the really dirty brass could be left on overnight and turned off when I got up. Eight hours makes for some really shiny brass. Just be careful with that. I know a friend who forgot about his tumbler when he went on vacation. It vibrated itself off the bench and thrashed around the floor for who knows how long before he got back. He returned to find the bare motor writhing about, shattered bits of plastic bowl, cleaning media and brass all over his basement floor. A timer is a good thing.

The GSI bullet feeder *provides a bullet to your press on each stroke of the handle, allowing you to focus on the loading process, and get more ammo loaded in the same time period.*



The big thing *on top is a case feeder, and it feeds lots of empty cases to your press for you. Nice addition to your machine, it is.*

When you buy a brass tumbler, buy big. (Tumblers, by the way, actually vibrate, but still they're called tumblers. Go figure.) Regardless, buy one bigger than you think you'll ever need. Buy big enough to throw the cat in for a bath. The biggest I know of, the Dillon 2000 (Guess how it gets that name? You're right!) will hold and clean more brass than you can load in an evening's reloading work. Your reloading bottleneck will be somewhere else. It is always going to be someplace, but a whopping big cleaner is the cheapest way to prevent this particular slowdown in the process.

The tumbler needs media. That is something to scrub off the grime. You can use ground corncob, ground walnuts and even rice. I use corncob, as it can be bought in local feed stores. A 50-pound bag lasts a long time, even for a high-volume reloader. Ground walnut shells clean finer, but cost more. When you load up your tumbler, don't overload it. Fill the bowl maybe halfway up and pour in enough brass to cover the surface. If you put in too much, you dampen the swirling action of the vibration and the media and you slow the cleaning process. To speed things up and make shinier brass, I add a dollop of polishing goo. Dillon makes it, but a lot of shooters simply use Brasso. I'm sure other reloading suppliers make something similar as well. The polish simply cuts through the gunk faster and shines up the brass more.

Some shooters worry that exposure to Brasso, with its high ammonia content, might weaken brass cartridge cases. I guess if you immersed a case in the bottle or can of Brasso you might do that, but in the small amounts and short time it sits in the tumbler, I don't worry.

Case Separation

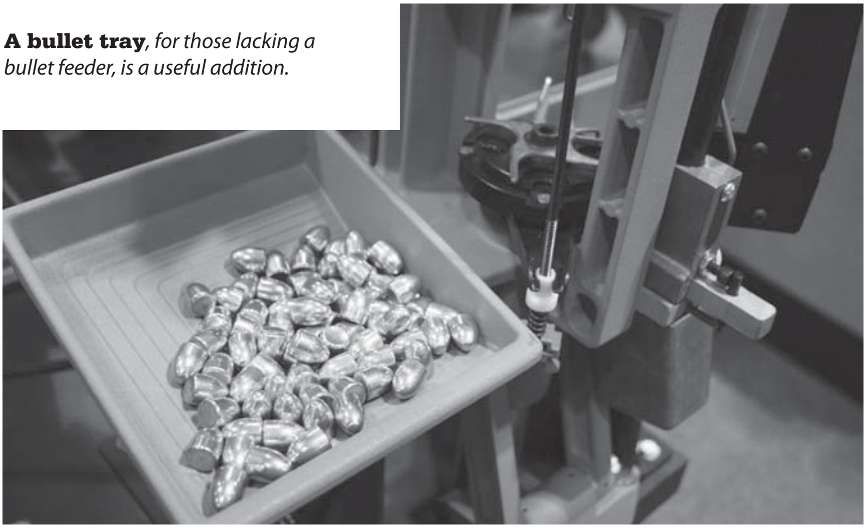
When we talk about case separation, we're not talking about the case actually coming apart, we're talking about it separating from the media. The easiest way to clean brass is to dump it into the Dillon media separator and turn the crank. Less costly is a screen that fits over the mouth of a 5-gallon bucket. Pour the media and brass (once clean) into the bucket through the separator. A little shaking of the screen and the last of the media is separated. Then you can get back to cleaning. Pour the media back, perhaps add a bit more polishing media and add more brass.

Each machine *needs a specific bullet or case feeder. No one makes a "one size fits all" machine.*

Now, when you clean the brass, the powder residue (and a tincture of lead) comes off the cases. It has to go somewhere and where it goes is into the mix of media. The ground corncobs will start out golden-yellow and quickly turn grubby. It will continue to clean brass even after it has turned so grubby you don't want to touch it. How long you use it depends on you. As it gets dirtier, the media will take longer to clean the brass. One thing I've found that extends the life of the media is to clean the bowl. While I have the mixture poured out, I spritz the inside of the tumbler bowl with a glass cleaner and wipe it out. The paper towels come out with green from the brass residue and black from the powder, lead and dirt residue.

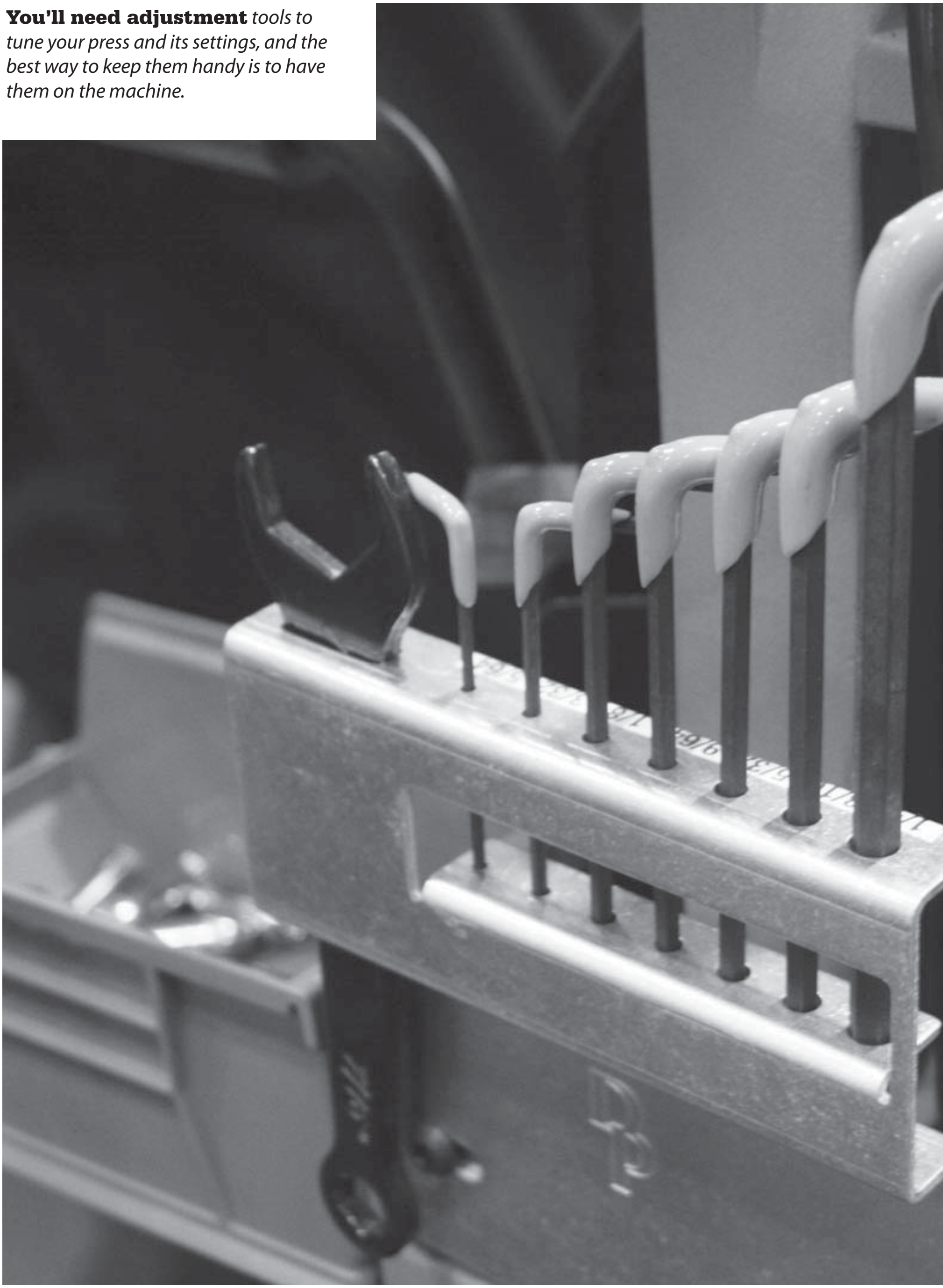
Whatever I clean out is obviously not still there to goop up the media, and the media stays a bit cleaner. Glass cleaner and paper towels are relatively cheap and save me trips to buy more media.

Once the media is too impossibly grubby to continue using, I pour the last mix through the sieve into the bucket. I then pour the dirty media into a plastic bag and drop it in the garbage. I'm sure someone will pale at the suggestion and ask about a toxic waste disposal option. Perhaps your municipality is different, but mine deals with specific toxic wastes and those specific ones only. If you ask about others you get a puzzled look and the suggestion, "I can ask my supervisor." Until they have an answer, I'm doing as I have always done by simply wrapping and tossing it in the trash.



A bullet tray, *for those lacking a bullet feeder, is a useful addition.*

You'll need adjustment *tools to tune your press and its settings, and the best way to keep them handy is to have them on the machine.*



Really Grubby Brass

If you scour the range at your home club, vacuuming up all brass you see, you will discover "chocolate" brass, especially if you are the first one there after the thaw. The dark brown layer of oxidation is alarming, but not particularly troublesome. It will probably wear your sizing die faster, so if you can clean it you can use it. For that, I use chemical cleaners. The Birchwood Casey liquid brass cleaner is just the ticket. It is also a good way of getting muddy brass clean.

I experimented and found that I needed to get faster, more aggressive results. So, I mix the concentrate to twice the strength of the directions. I also leave brass in the solution twice as long. I then decant the solution (pour it back into its storage bottle) and then rinse the brass in hot water, as hot as the laundry room sink can deliver it, which can burn if you aren't careful.

I then (unless it is freezing outside) spread the brass out on an old bath towel in the sunlight, drying it quickly. I don't want water spots to undo the cleaning I've done. If brass is still dark brown at this point I pitch it, and introduce the now-clean brass to my tumbler. Yes, chemical-cleaned and then tumbled clean.

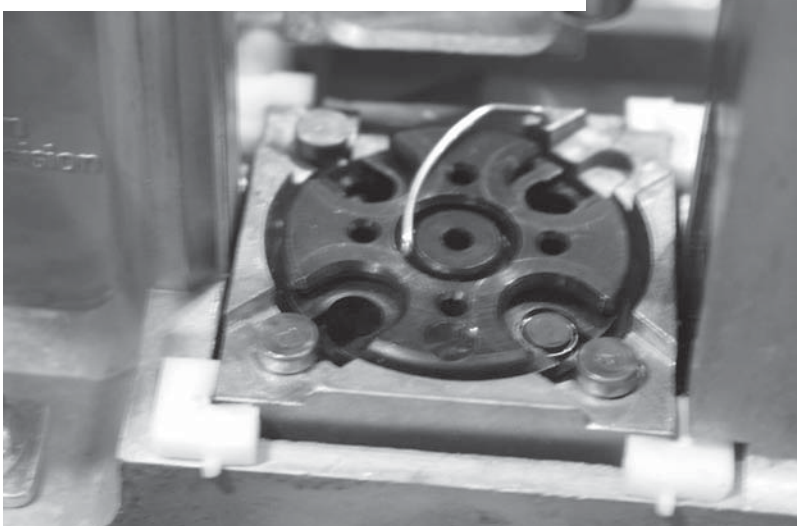
The inside of a case feeder, *showing the feeder plate collecting cases and getting them lined up for the drop tube.*

The beauty of clean brass is that barring dampness, it is clean for a long time. Once clean, you can dump it into bins, close the lid and count on it being ready whenever you need it. So, there is no need to simply clean as necessary, but rather you can get ahead and have all you're ready to load.

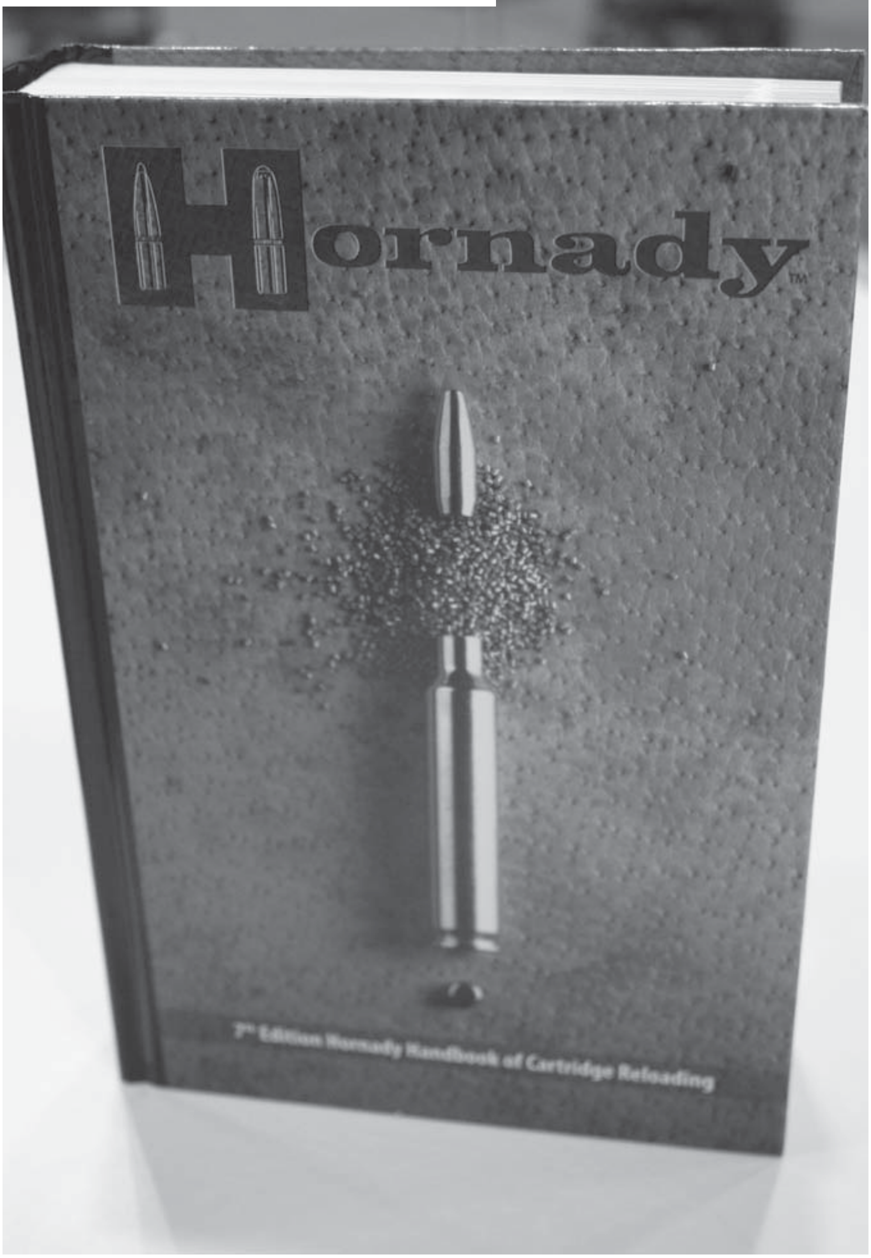
Singing Brass

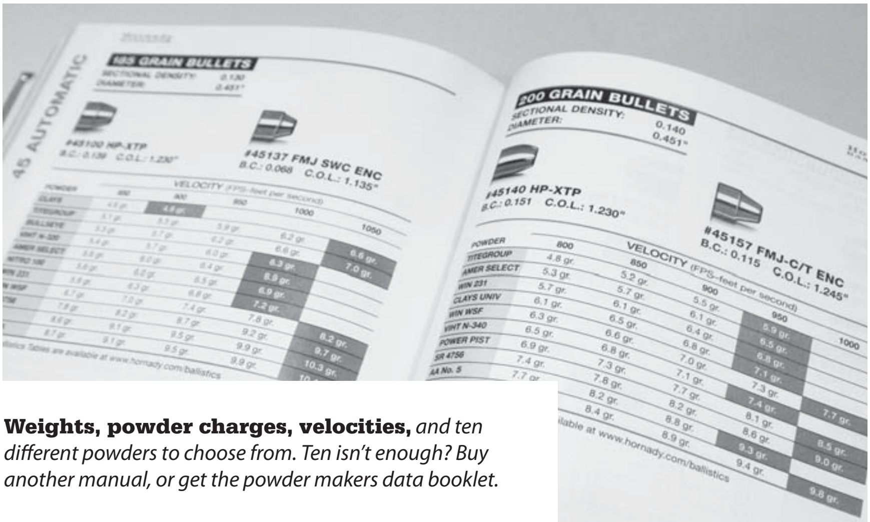
A bell is a metal cup of weight and construction such that when struck, it vibrates at a harmonic (self-reinforcing) frequency desired. Bells can weigh as small as a few ounces to as much as several tons. Each individual piece of brass is a little bell. Each caliber will vibrate at a particular frequency. Ever noticed how experienced shooters, when picking up brass, will jiggle a handful before they drop it into whatever bin they're using? It isn't a nervous habit. Well, it isn't just a nervous habit. You see, once you learn the frequency of intact .45 ACP brass, you can tell what is in your hand. Or rather, you can tell when one of the ones in your hand isn't an intact .45 case. Cracked cases jingle at a higher frequency. The frequency is so different that I can on occasion tell when an empty I've just fired, as it hits the concrete slab of the range, is cracked from firing.

For volume loading, *the Dillon 1050 is king. Eight die stations, including a primer pocket swaging station.*



You can't load *by making it up as you go along. You need data. So get one or more loading manuals and pay attention to what they tell you.*





Weights, powder charges, velocities, *and ten different powders to choose from. Ten isn't enough? Buy another manual, or get the powder makers data booklet.*

Different calibers have different frequencies, so if you happen to pick up a .40 among your .45 cases, you can hear it when you jostle them.

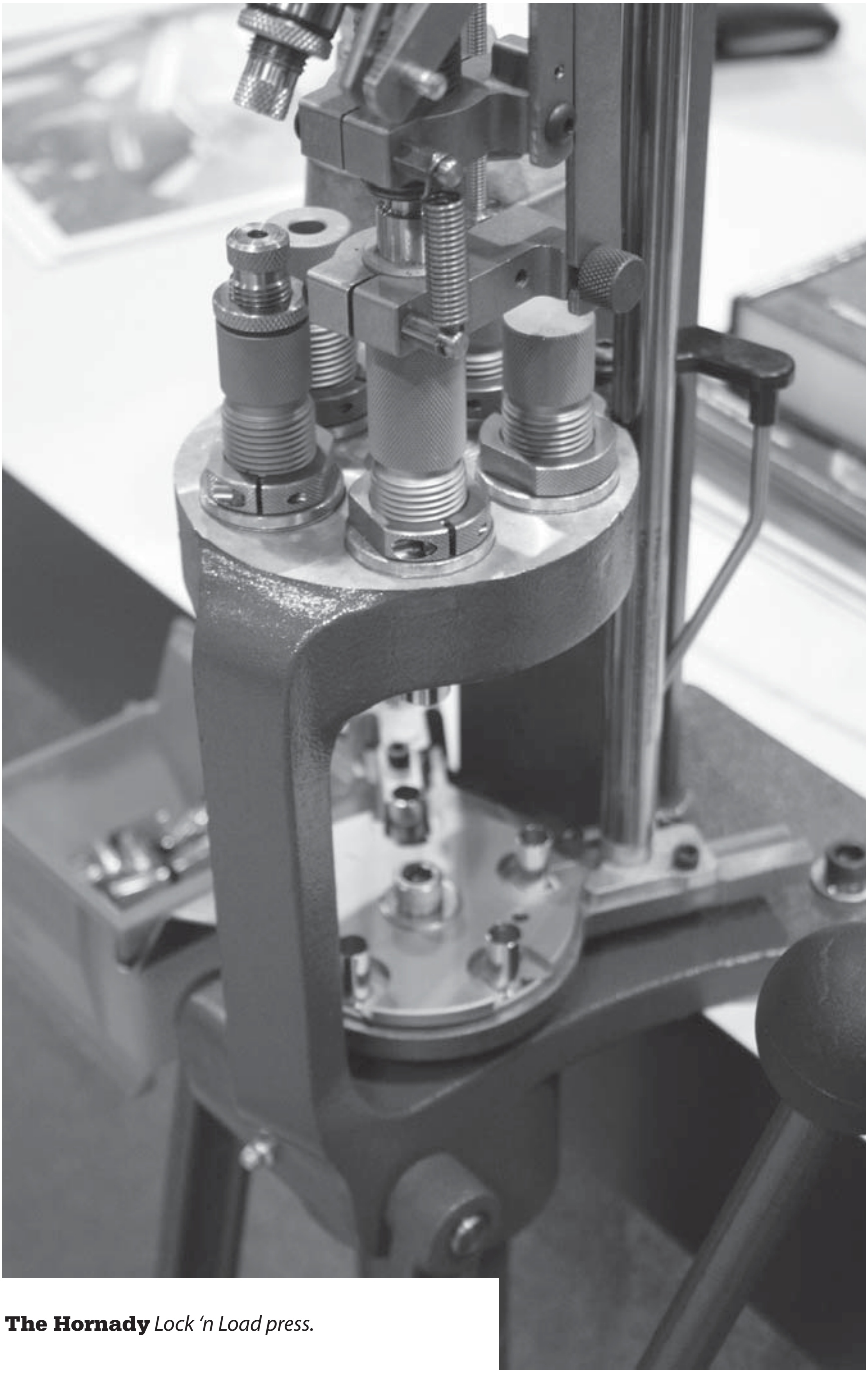
The best time to be doing this is when you're dispensing clean brass for loading; either dropping a handful on the bench, in a container for feeding and loading or tossing it into the automated case feeder.

Just jostle and listen. Hear something off? Split the handful into two groups and jostle each one again. The hand that sounds different than good .45 brass stays, the other gets dumped into the feeder. Split the remaining brass and repeat. It won't take long to learn the system, and you can sort out the bad brass quickly.

If you go to load a different caliber, it will take a bit to learn the new frequency, but you'll pick it up pretty quickly.

Case Prep

In rifle reloading and with some handgun magnum calibers and applications, you measure cases. But with the .45 ACP, don't even bother reaching for those calipers, Bub. Does the headstamp read .45 Auto? Then you're good to go. Measuring, or God forbid, measuring and trimming, is a colossal waste of time. It is such a waste of time that I'm not even sure any Bullseye shooters do it, and they will do anything to scrape a few more points out of the targets.



The Hornady *Lock 'n Load press.*

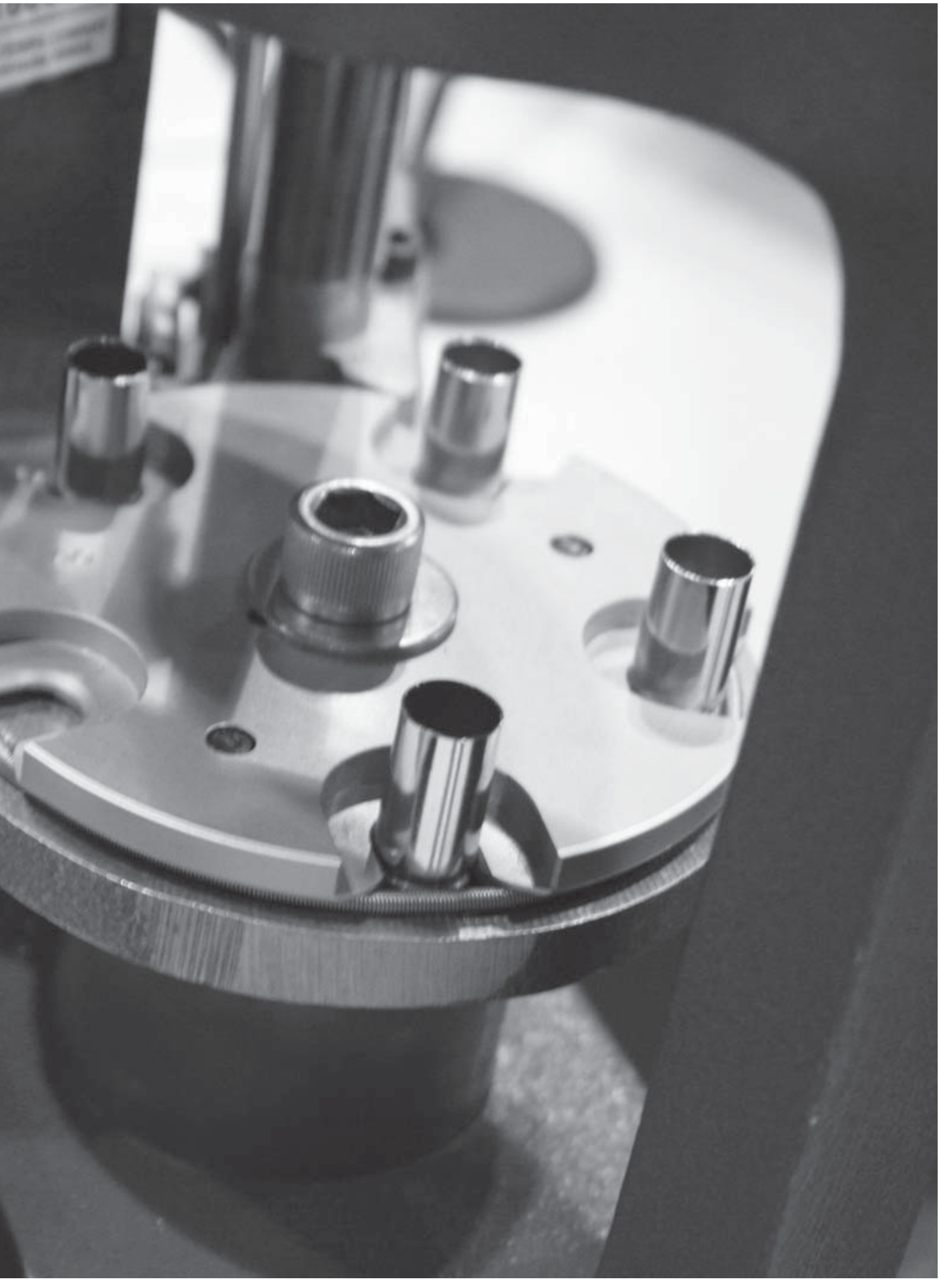
Nope, sort, clean and get ready to load. That's your case prep when you're loading the .45. Didn't I say this was easy?

Press Selection

From here, you're going to need a press. To load in volume, you need a progressive press. Just how fast a model you buy is a decision between you and your wallet. In that regard, presses are much like racing cars, motorcycles, etc.: how fast you go depends on how much you are willing or able to spend. For reloading, it also matters in how many different calibers you reload. Your choices in press brands come down to: Dillon, Hornady and RCBS. They all have strengths and weaknesses. Hornady and RCBS offer a single progressive model each, but they are very capable models. Dillon offers an array of presses, so I will use them as an example of press feature selection.

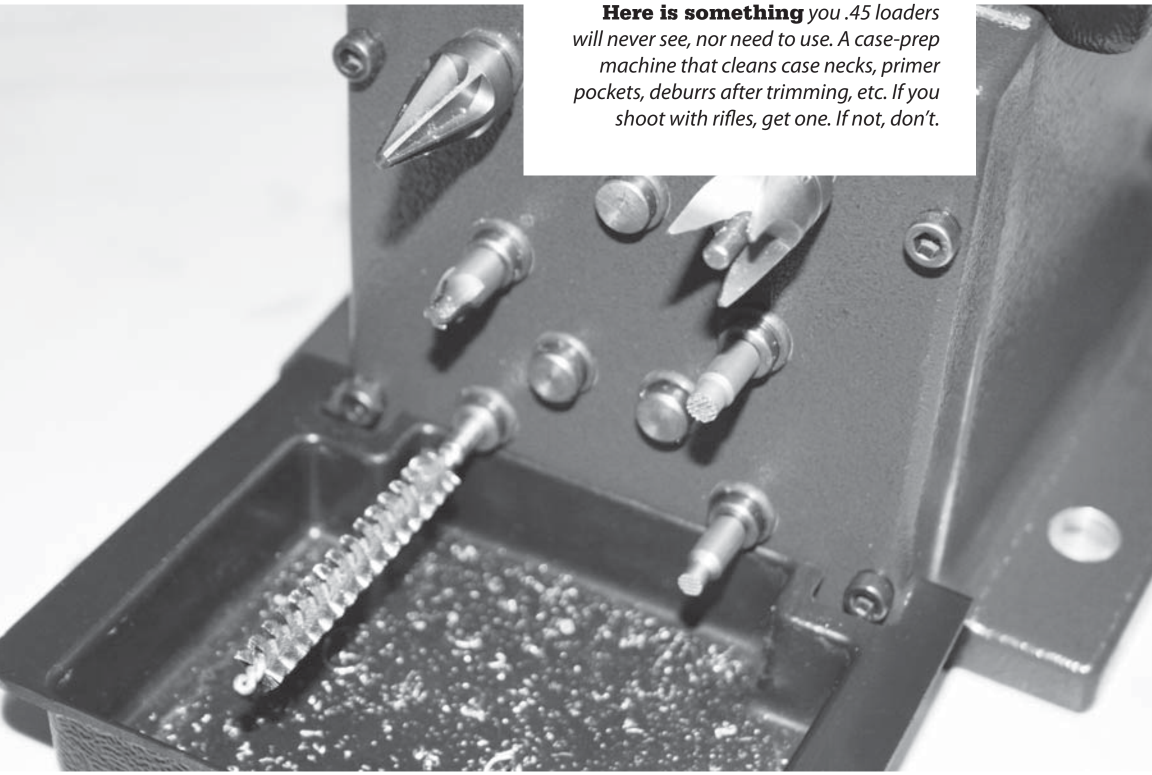
Each dies goes *into its own Lock 'n Load holder, and you can easily change calibers that way.*

The Hornady *case feeding mechanism, shoving another case into the shell plate.*



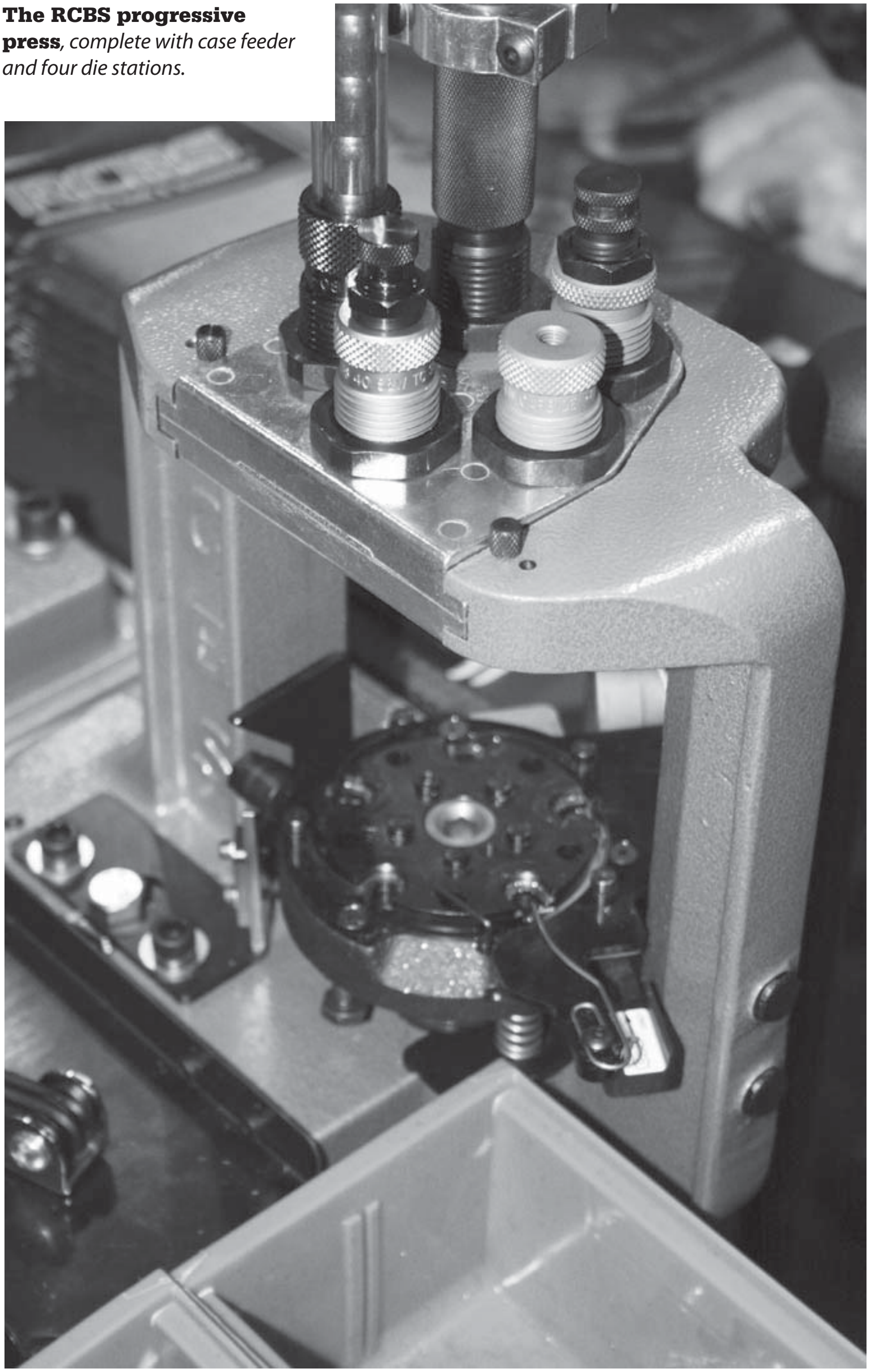
When it comes *to cleaning brass, bigger is better.*

If all you ever want to do is reload .45 ACP, you'll never need another caliber, and if you won't be tempted by others, you can get all you need with a Dillon Square Deal B. It has an auto-advance; that is, it rotates the shell plate in the proper timing so you simply have to push in cases and bullets and pull the handle. You get that simplicity (and relative low cost) at a price, however, as changing calibers is a hassle. Also, you have one choice in sizing dies, and that is through Dillon. The SDB uses proprietary dies, and Dillon is the only one who makes them. Considering the hassle to change calibers, if you ever do want to add another caliber, simply buy another SDB for that one. However, low cost brings another minor shortcoming, and that's low pressure. If your second caliber is going to be a .44 Magnum, don't get an SDB. The press leverage won't like the .44 expanded cases, and you'll have to really muscle the lever. The tipping point is between two and three calibers or adding a Magnum caliber. If you do that, jump up to the 550B.



Here is something *you .45 loaders will never see, nor need to use. A case-prep machine that cleans case necks, primer pockets, deburrs after trimming, etc. If you shoot with rifles, get one. If not, don't.*

The RCBS progressive press, *complete with case feeder and four die stations.*



RCBS offers *a neat idea in primer loading: hold them in plastic strips so you don't have to feed each individually through a loading press transport mechanism.*

The next step up is the Dillon 550B. Here you get a very easy caliber change system. Dies are locked in place in a removable die plate. To change, you slip out a couple of locator pins and slide the die plate out. You unscrew the shell plate, bolt the new one down, slide in the new die plate and you're done. Depending on what you're switching to or from, a change over can be done in a minute. At most, it takes five minutes, maybe 10 if you take the time to do a bit of cleaning and lubing on the press while you have it partially disassembled. The 550B does not auto-advance the shell plate; you have to do that. You can add case and even bullet feeders to a 550B, but that really muddies the cost/benefit calculation when you consider bigger Dillon presses such as the 650 and 1050. The big advantages of the 650 and the 1050 are a greater number of die locations, as well as the auto-advance feature. The 650 has five locations so you can add a powder-check die to make sure no case slips by without powder in it. The 1050 has eight, and with it you also get a primer pocket swaging station. So if you get military-crimped cases into your system, the press automatically swages the crimp out.

If you want, *there is an Italian company that will make custom ammo boxes for you.*


MAGNUM
TRIDGES 50

They can even *make them for particular displays.*

If you change brands, Hornady does not have that kind of lineup for a progressive press. They have a different approach. (You do not want to be loading .45 ACP on a single-stage press unless it is the absolute only way to get ammo.) The Lock 'n Load press is a multi-die press, but to change calibers you don't slide out a die plate, you remove the individual dies. To save the hassle of unscrewing the dies, Hornady came up with the Lock 'n Load system, which is a bayonet-mount converter for dies. You screw the die into the converter (and adjust it to the proper location) and then when you switch calibers you simply snap out the dies of one caliber and snap in the dies of another. Change out the shell plate and you're done.

Owners can get very possessive of their press brand, and I would not want to imply that the press you are using isn't the correct one. If you expect to shoot enough to get good (or even just better) you have to shoot more ammo than a single-stage press can produce.

Get a progressive, set it up properly, keep it clean and correctly timed and make lots of ammo.

Volumetric Loading

The big deal for a while after the 550B came out in the 1980s was getting some kind of case feeder on it. The Dillon 1050 had an automatic case feeder, but the 550 didn't. A lot of people experimented for many years, and we all gave up. Then Dillon introduced the 650 with a case feeder, and other makers began offering such options on their presses. Now you can get any press, from Dillon, as well as Hornady, RCBS and others, all with case feeders. You can even get them with bullet feeders. All you have to do is pull the handle, supervise the process and refill hoppers as needed. It's possible to greatly increase your production rate, but there are still limits.

One limit is how fast you can work and for how long. The gang of four experimenters I was in once tested a Dillon 1050. We took turns pulling the handle, and when we weren't pulling, we were loading hoppers. In one hour flat we loaded 1,550 rounds of ammo. The bottleneck? Pulling the handle. It was easy enough to set bullets (this was before bullet feeders) and the other three of us could easily keep up in cases, primers and powder. But it got really tiring to pull the handle. My arm was sore for days.

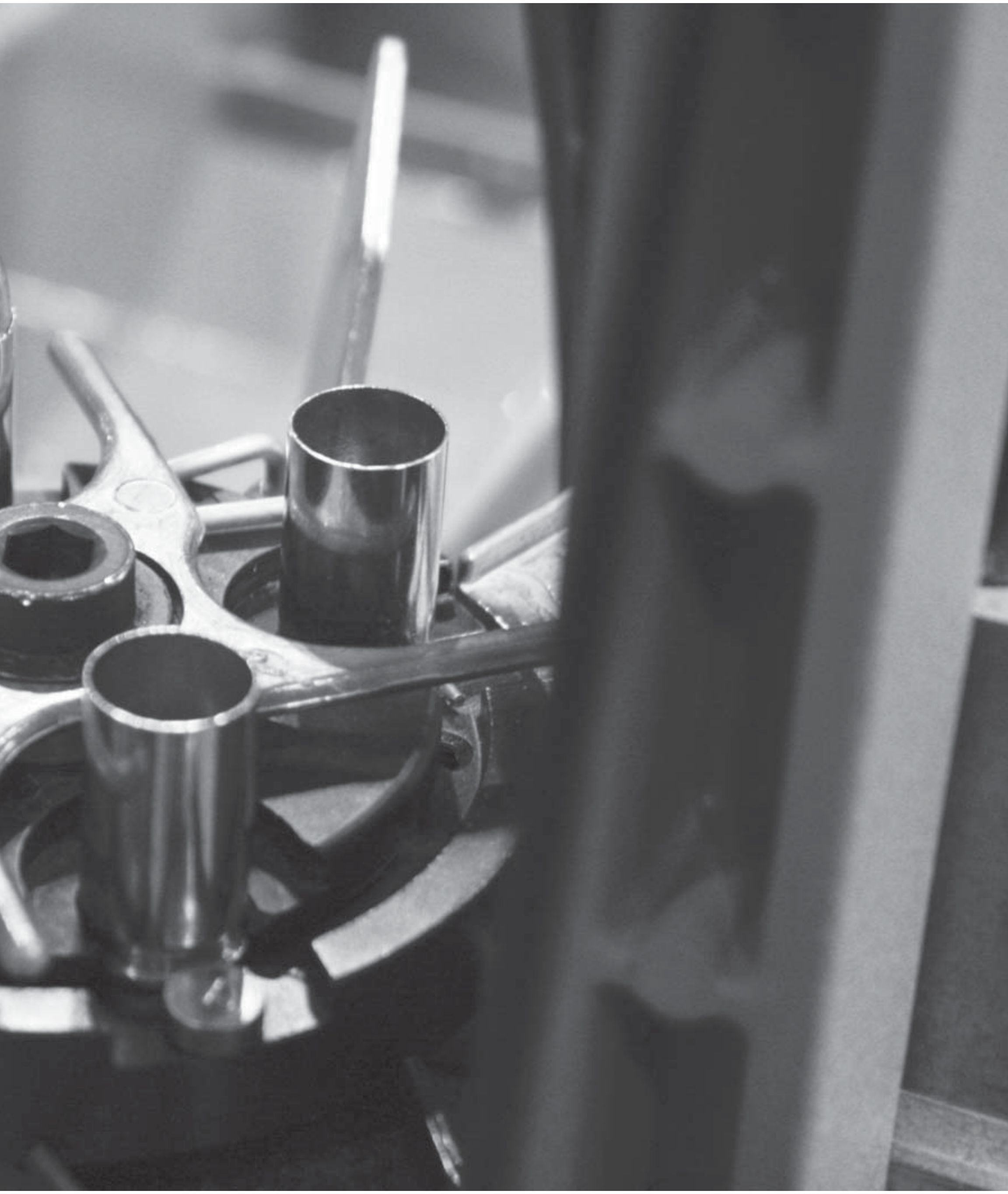
What the feeders do is allow you to focus on the ammo itself. The feel of the press will often tell you when something has gone wrong before you hear or see anything.

Speed does not come cheap. Upgrading a press with case and bullet feeders can often cost as much as the press itself. So consider what your time is worth before you go "blinging-up" your press.

Reloading Process-Sizing

OK, first things first. Don't be so cheap that you save the $10 or $20 difference between steel dies and carbide, Tin or T/C dies. The savings are not worth the hassle. If I had to walk roads, picking up deposit bottles in order to afford carbide dies, I would. Steel dies require lubricant to work, and if you forget lube, you'll get a case seized in a die. Once stuck, it isn't coming out without another tool, which costs more than the savings of not having bought the correct dies. Buy carbide, clean your brass and count on a die lasting 100,000 rounds and then some.

Here you see a Dillon 550B *with a case at each station, being processed on a handle pull.*



Adjust your sizing die so it sizes the case as far down as possible. It's not good for the die to have the shell plate crashing into it every stroke, so you need some clearance. But you want that to be the least possible clearance you can. So, in setting up your press, use the "paper" method. Run the handle of the die all the way up and leave it there. Put the corner of a sheet of typing paper on the press head, and then screw your sizing die down. Trap the paper, but don't squeeze it tight. Now tighten your sizing die lock ring (or whatever), and then lower the handle. Your sizing die is as close as it can be without hitting the die. Common paper is about .007 inch thick, and that is the gap between your die and shell holder or plate.

Sizing dies in progressive presses also deprime, ejecting the spent primer. Keep spare decappng pins on hand. You may not need them, but if you do, it would not be fun to have to wait a week while the package of new pins wends its way to your door. You've heard of Murphy's Law? "Anything that can go wrong, will." The easiest way to make sure you don't break a decapping pin is to have spares on hand. And the easiest way to ensure breakage is to lack spares.

Repriming

You use large pistol primers, standard and not magnum. Seat the primers firmly in the primer pocket, below flush but not crushed. Some presses have a mechanical adjustment for seating, others depend on you learning the feel of a properly-seated primer. You want it firmly seated so that the tension of seating puts a small amount of initial pressure on the tiny pellet of primer material, but not so much that you crush the pellet, leading to inconsistent or nonexistent ignition.

Rifle shooters will sometimes advocate cleaning the old priming ash out of the primer pocket before seating new primers. I suppose, if you're looking to load benchrest-grade ammo. But for handguns it is a colossal waste of time. Rifle accuracy is measured by "minute of angle" or MOA. While not exactly correct, it is considered to be 1 inch at 100 yards. An accurate rifle, when it is treated as a benchrest rifle, can expect to have its 1-inch group decreased to 0.8 inch at 100 yards through all the prep.

A handgun that is accurate will deliver under 2 inches at 25 yards, under 2 inches at 50 yards if it is a real competition gun. That translates to 8 to 4 MOA. Do you really want to decrease groups by the same 0.2 inch at 100 yards by bringing your reloading process to a screeching halt? I didn't think so.

As long as the deprimer ejects all the old primers and doesn't slam into the inside of the case, it's correctly adjusted and locked in position.

Case Mouth Belling

This is done as a separate step on some presses and as a step done as you drop powder on others. Simply, you're opening the case mouth enough (and no more) to ease the bullet insertion in the case. If you don't bell, jacketed bullets can catch on the case mouth and crush the case. Lead bullets will shave bits of lead or bullet lubricant as you set, gumming up the die and creating loaded cartridges that won't properly chamber.

Adjustment of the belling step is a trial-and-error method. Adjust it until it looks like you have enough belling and then proceed to load ammo. You'll soon know if you have too much or too little. Too much, and you can't get the expanded case into the bullet seating die or crimp die. Too little, and you'll be shaving lead or lube or crumpling cases from the caught edges of jacketed bullets. Whatever you see, adjust for it.

Powder Drop

You can weigh each and every powder charge, but for almost all applications it is a waste of time. All standard powder drop dispensers do so by volume, which you then spot-check on a scale to make sure it is accurate to the weight you want. When you load, you must develop a rhythm, and when you dispense the powder, it will be consistent from one cartridge to the next. A choppy rhythm will lead to varying powder charge weights and less accuracy. The weight you throw will be close to, but not the same as weights listed in loading manuals. Also, powders vary slightly in their burn rate. So, if the loading manual shows 5.0 grains of some powder as the max, do not assume you can simply load up 5 grains and get to shooting. Start at 4.0 or 4.5 and check your chronograph to see how that correlates to the expected velocity.

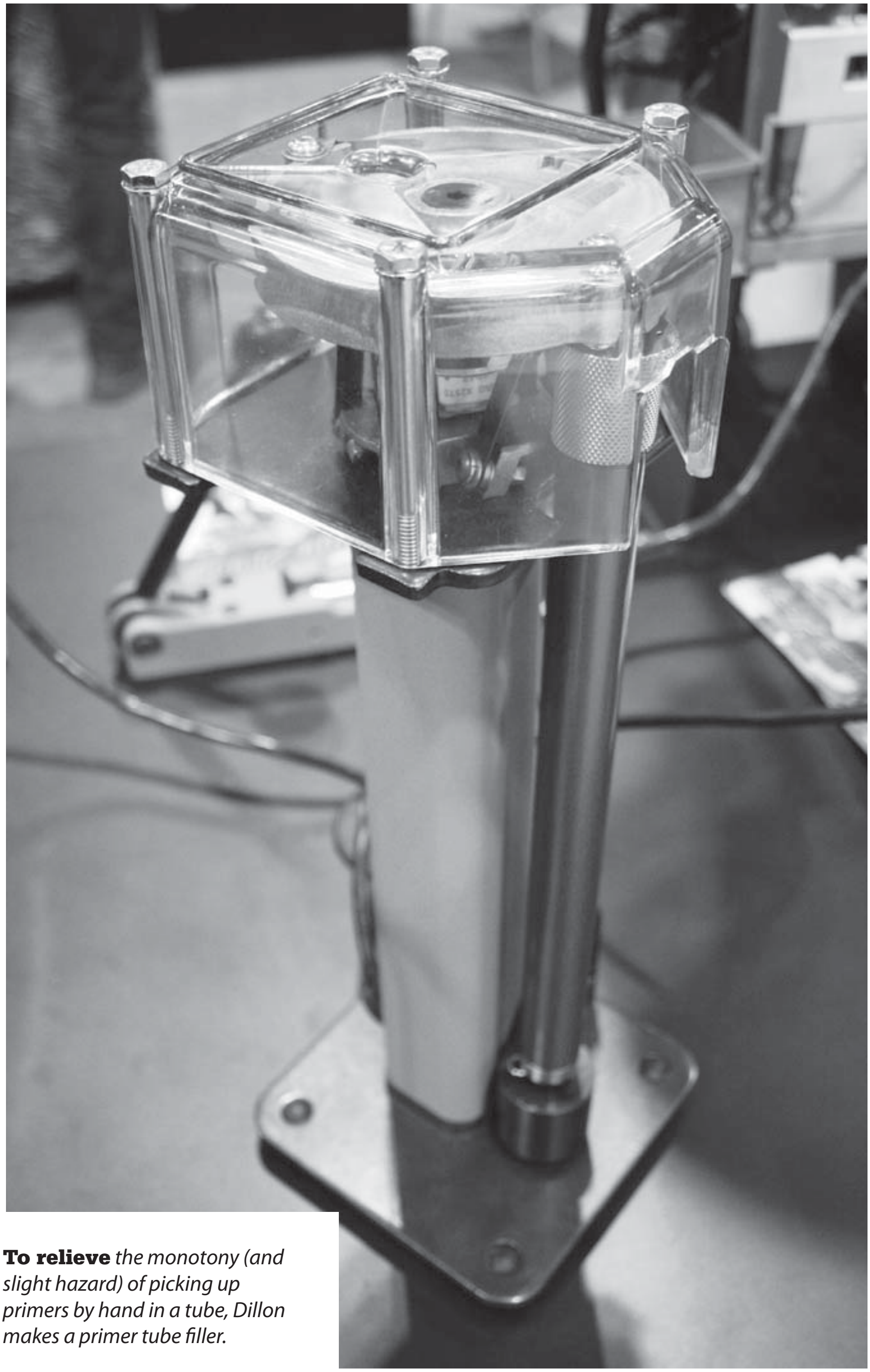
What, you don't have a chronograph? Then don't ever load above 4.5 if the max is 5.0. Not until you get a chrono.

Along with your powder drop tool (either free-standing or as part of the progressive press) you must purchase a scale. No, you aren't going to be weighing each powder charge, but you must (and I cannot stress this enough, you MUST) verify the powder weight you are dispensing when you set your scale and recheck it at intervals as you load. Your kitchen scale (assuming you have one) is not delicate enough. I have a kitchen scale I use to weigh firearms as part of my writing. It is quite precise for a kitchen scale and weighs things to a tenth of an ounce. Which is impossibly coarse for reloading, as a tenth of an ounce is a whopping 43.75 grains. Considering that a load for many handgun powders will be on the order of 4.375 grains, we aren't nearly close enough.

Scales come in two types: beam and electronic. I learned on beam scales in chemistry lab. They can be amazingly accurate, but also slow and finicky. The scales I used in chemistry were three-beam scales, kept in a climate-controlled room, and each sat under a glass cover perched on its own individually-cast concrete pillar. The pillars were insulated from the slab of the floor, so footsteps would not disturb the scale. It could take 30 seconds to determine the weights of an object if you followed the correct process. For reloading, two-beam scales are not as precise (as I recall, we could measure things to a hundredth of a grain on the chemistry lab scales) but a tenth of a grain is plenty good enough. However, slow means either impatience or sloppy work for most people.

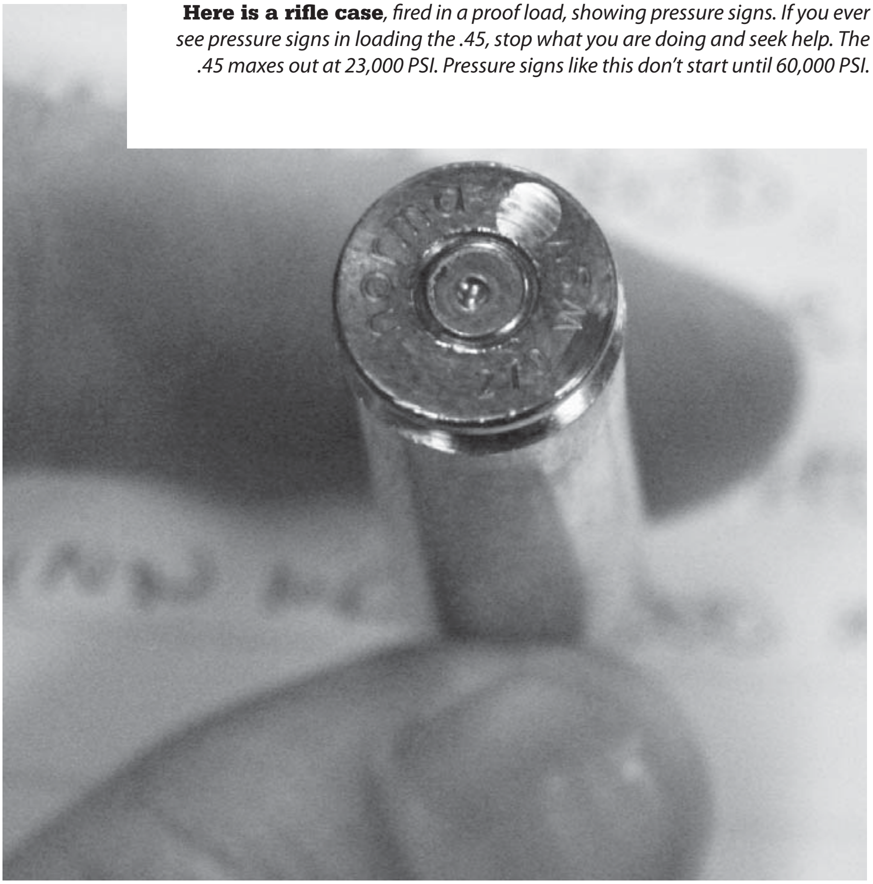
The cost to jump up to a digital scale is not that much. A brief aside on the nature of electronics. When I was back in that same chem lab, one of the students showed up with a brand new calculator. It cost hundreds of dollars (pre-Jimmy Carter dollars, I might add) and all it could do was the basic four functions: add, subtract, multiply and divide. But it fit in a shirt pocket. We were amazed. Now, such a calculator would be so utterly prosaic as to not even be noticed.

The first digital scales for reloading were hundreds of dollars. Now, I think you can find them for $50 to $60. Frankford Arsenal makes them, as does Dillon. As a means of keeping you checking powder weights quickly and regularly, it is money well-spent.



To relieve *the monotony (and slight hazard) of picking up primers by hand in a tube, Dillon makes a primer tube filler.*

Here is a rifle case, *fired in a proof load, showing pressure signs. If you ever see pressure signs in loading the .45, stop what you are doing and seek help. The .45 maxes out at 23,000 PSI. Pressure signs like this don't start until 60,000 PSI.*



When you get one, check to see what batteries it uses and buy a spare. Because you know old man Murphy will get you if you don't.

Neck Expansion

Somewhere in the system, you'll have to expand the case neck. When it was sized down, the case was brought down to the book minimum exterior diameter. The neck has to be expanded up to the proper diameter for the bullet, which varies by caliber. Proper neck diameter ensures proper neck tension, and that keeps the bullet in the right place once loaded. In conjunction with crimp, it keeps the bullet from setting back when being jammed up the feed ramp in a pistol and keeps it from moving forward ("jumping the crimp") in revolvers.

Neck tension is done some place in your reloading system, and that order depends on the dies and press you are using. They all do it, they just do it at different times.

Some setups and dies do neck expansion as a separate step from case mouth belling. If so, you'll have to adjust the two as you go and changing one may alter the desired setting on another. One aspect I particularly like about Dillon presses is that the neck expander is the mouth beller and is also the powder drop actuating rod. You can adjust neck expansion by polishing down the diameter of the tube and adjust mouth belling by how high or low the dies are screwed into the shell plate. If there is no case at that station, the powder drop is not actuated and you avoid the mess of powder dropping with no case to receive it.

Bullet Seating

The bullet needs to go straight into the case. On a press lacking a bullet feeder, you have to place each round on each case. The more consistent you are in placing them straight, the more accurate your ammo will be. Also, if you place them in a sloppy manner counting on the die to straighten things out, you'll end up with some loaded rounds that have a bulge in the neck. This bulge is where the bullet is slightly crooked. It may chamber and it may not. Even if it does, it won't be as accurate as if you'd taken some care.

Crimping

When you belled the case, you made it easier to correctly and straightly seat the bullet. You now have to iron out the belled mouth. In a lot of older loading manuals you'll read of a "rolled crimp" or a "strong rolled crimp." Gack! While appropriate for revolvers in many cases, for your pistol it is exactly the wrong thing to be doing. What is all this talk of crimp, anyway? The crimp you are applying does a number of things:

It removes the flare you put in to seat the bullet.

It tightens the grip of the case on the bullet, resisting pull and set-back.

It tightens the grip of the case on the bullet, ensuring complete powder ignition.

It ensures proper feeding in pistols.

The bottom center case *is one of the horrible French rounds that were imported a while back. It features a Berdan primer of such enthusiastic corrosiveness that I'm surprised it hasn't rusted guns simply stored in the same room with it.*


PETERS
45 AC.

Now, to remove the flare, all you need do is iron the case back to dead vertical. However, as case length varies, what would be enough for a long case would be insufficient for a shorter one. So, we iron the flare out and turn the lip of the case in slightly to get the lip out of the way. On revolvers, rolling the case mouth in for the crimp was easy, and it also worked well with the more powerful cartridges. Especially cast bullets, where there was a recess around the bullet at the correct location for the case mouth. The case mouth rolled would roll right into the crimping groove and lock the bullet in place. It wasn't going anywhere until the powder went off. To get a good idea of just what is going on in a roll crimp, go through your ammo stacks and look at a shotgun slug. That's a roll crimp. In that case the roll is 180 degrees. On a revolver case, the roll will be shorter and only be 45 to 90 degrees.

In magnum calibers the roll also acted as resistance, to ensure the powder would burn completely before the bullet began moving. Without it, the dollops of magnum powder used, as soon as they began burning, would pop the bullet out of the case like a champagne cork, and the resulting chamber pressure would not rise to the full burn pressure needed. Also, in recoil, the revolver yanks rearwards. The bullets, obediently following the dictates of Newtonian physics, attempt to stay where they are in space and are pulled forward out of the case or, more properly, the case is pulled off the bullet. Or, at least it tries to. The crimp resists it. Heavy enough loads, or ones lacking in neck tension and crimp, produce a sixth shot in a cylinder that is longer than it started, known as "jumping the crimp."

In the .45 ACP, even used in a revolver, you aren't using so much slow-burning powder that you need worry about this phenomenon. Fast powders are much less in need of a heavy roll crimp.

Add in the need for the round to feed up the ramp and the resulting headspacing on the case mouth, and you need something other than a roll crimp.

Enter the taper crimp. The roll crimp simply tapers the case mouth in, rather than rolling the edge over. Taper crimp? Turn a funnel upside down. That's what a taper crimp looks like.

How much is enough? Remember this number: .468 inch. That is the ideal diameter of the case at the mouth when properly taper crimped. If you are planning to reload, do yourself a favor and buy digital calipers. Learn how to use them, and when you are setting up your reloading system, make sure your cases on loaded ammo mike .468 inch at the mouth.

Inspection

Once loaded and having gone through all the steps, you need to inspect your ammo. At the very least you need to drop them into a plastic storage box, primer end up, and make sure they all have primers. Take a moment to look over all of the 50 or 100 in the box, and ensure the primers are properly installed, level and below flush with the headstamp. Hold the box against the board or card, and turn the box over. Lift the box, and give the bullets the same inspection. Are they all there, straight and the same length? If so, good. If not, then find out why, and correct it.

Match ammo needs more of an inspection. For this, you need a Wilson or EGW case gauge. Drop each round into the gauge, and see that it drops flush with the gauge base. Then turn the gauge over and see that each round falls out. If it does not pass the gauge, it does not get used as match ammo.

Invariably, your reloading volume will turn out ammo that fails the gauge. Keep it separate from the “pass” ammo. Once you have a few magazines of the failed stuff, take it with you to the range. After (and I mean as the last thing you do before picking up the brass and going home) you have finished your practice, try this ammo. If it all works, great. Your gauge is pickier than your gun, and you can count on your ammo working. If it fails, but not all, then your gauge is picky enough—more so than your gun. If with the “pass” ammo you have failures, and the rejected ammo is worse, then you have a problem.

It may be the ammo. It may be the gun. You’ll have to sort those details out. The first thing to do is try your gun with better ammo. If the gun fails 1 to 2 percent of the time with factory ammo and 5 percent with your reloads, you have to assign some blame to both gun and reloads. Go at it step-by-step and work out the details.

Testing

How fast is your ammo? How accurate is your ammo? Only by testing can you know. We’ll get into downrange tests in the next chapter, but for now let's focus on some simpler aspects of testing. Yes, the loading manual tells you that with X grains of Y powder and Z bullet you'll get a certain velocity. However, you probably won't. Back in the misty depths of time as a gunsmith, I built identical Open guns; one for me and one for my then-girlfriend. By "identical" I mean identical, right down to using match barrels from the same production lot of a top-notch maker. They varied by 50-plus fps when fed the same ammo, and I chrono'd them side-by-side just to be sure. Fifty fps! Theoretically, the fastest barrel and the slowest barrel of a manufacturer could show even more variance. Add in slight differences in powder weight, burn rate, neck tension and crimp, and you could be off the book value by 100 fps.

The only way to test for speed is with a chronograph. In the old days guys would try to check rifle velocities by measuring bullet drop at distance. This is about as accurate as measuring Olympic sprinters by using your pulse as the measuring stick. Which chrono? It doesn't matter, although I've had good luck with the PACT brand and the CED brand.

As for accuracy, well, there's another excuse to buy gear. If you try to shoot each load off a bench, you will quickly find it is more of a test of you than the ammo. You really need a rest, such as the Ransom rest or the Caldwell Hammer. Each of them holds your handgun securely and consistently, and fires it via remote control. You are out of the loop as a variable.

How I came to own one is an interesting story. A long time ago, when .38 Supers and muzzle brakes were still brand new, I was really working my way up the USPSA/IPSC competition ladder. This was even before the USPSA had been formed as a matter of fact. A group of us had just made a large (well, it seemed large at the time) 50,000-bullet purchase. One of the better shooters in our club, on hearing of this, commented, "Oh, don't you know? 185-grain bullets don't shoot accurately."

Uh-oh. A bunch of the bullets we'd just bought were those same 185-grain lead semi-wadcutters for the .45 ACP. What to do? Well, the four of us went in together and bought a Ransom rest. We spent some time experimenting, and we found out a number of things.

First, the accuracy of any load vis-à-vis any other load, mattered little at all. Red Dot vs. WW-231? Guns would disagree. And the most accurate gun with a WW-231 load was second with a WW-452 load, and so on. After greater testing, we found that the statistical variance between session was larger than the differences between the guns or the loads. We could rank the guns 1-2-3-4 in one session. Then, come back a week later, and we'd find the same guns, with the same load, from the same Ransom rest, would be 3-1-2-4. And so on and so on.

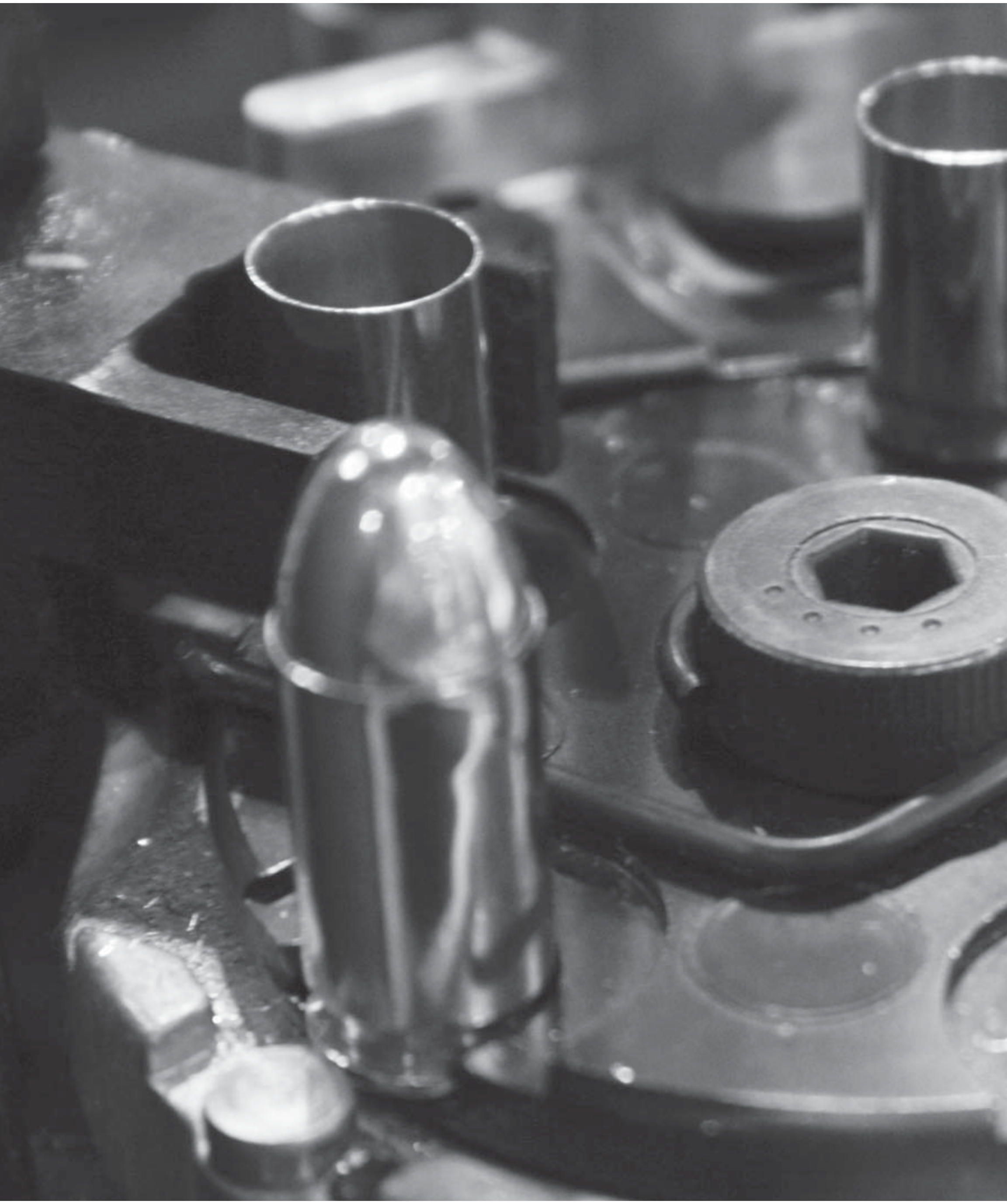
The accuracy of a gun depended more on the press the ammo was loaded on, than other variables. Which also depended on the person setting it up, and what they were willing to "settle" for in the way of precision. If you get sloppy in setting things up and making sure they stay properly set up, then you can count on casual accuracy from your ammo. If you show even just a little effort to the job, your accuracy will be quite good.

Dies did matter. My dies, bought 10 years before this test session and bought used, delivered the worst accuracy of any ammo loaded, even from my own gun. Did I buy new dies? You betcha. Did I then fit and tune them so that my ammo was as accurate as I could make it? Again, you damn betcha. How long does it take to wear dies? That depends on how careful you are to clean your brass before loading. More cleaning means less wear.

The velocity varied. The guns could differ from load to load and even from press to press. To be certain, you really had to test that particular load in that particular gun and adjust accordingly.

Oh, and the 185s shot just fine, thank you very much. I later asked (casually, not trying to put anyone on the spot or on alert) the top shooters at our club who had told us such valuable information—why? How'd they make that assumption? Simply put, at the end of a practice session they had fired a group with a load using 200-grain bullets and a group of a load using 185-grain bullets. The 185s were worse, noticeably so. On that spottily-determined data, they declared 185s to be substandard. Having fired dozens of machine-rest groups just a week before, I knew better. Oh, they were still better shooters than I was (that changed over time), but not because of the "superiority" of their ammo.

If you don't test, and test properly, you don't really know.



Here are five cases, *in a 650, being processed.*

Pressure Signs

Forget everything you learned (or might have read about) concerning rifles. It doesn't work with handguns. By the time you see anything approaching "pressure signs" you are well beyond normal. For instance, it is common to use the ejector plunger on some bolts as a pressure sign when reloading for rifles. When I visited the Sako plant in Finland, I stopped in at the test-fire section. They had just finished proofing a rack of rifles. The proof load, commonly a 130 percent load, showed signs of excessive pressure. The ejector rubbed a bright spot on the red-tinted case head. Care to guess what a proof load is on a rifle cartridge? On the order of 90,000 PSI. As the normal pressure of a .45 maxes out at 21,000, do you really want to be going up to those levels?

I've had shooters using the 9mm who proclaim their loads as "safe," because they don't see any pressure signs. Considering that a standard rifle case running at 50,000 PSI shows no pressure signs, just how "safe" is that 9mm load of theirs? No, don't figure you can exceed the loading manuals and use up that "lawyer factor" that "all loading manuals and ammo companies put in" their ammo.

If you do shoot a normal load and see pressure signs on your fired brass, stop using that ammo. Investigate the cause, and correct it. Pressure signs on a .45 are not "normal."

Labels

It is an awful thing to label people. It is a useful thing to label objects. Of course, the utility of both is greatly increased if the label is correct. So, once you have gone to the trouble of developing a load, you must record and label it. When I first began loading, I had one caliber, and that ammo went into guns that were far superior to the caliber I was loading. It was a .38 Special. That ammo went into either a Ruger Blackhawk or an S&W M-19. There was nothing I could do, short of wildly exceed the reloading manual, to get myself in trouble. The guns were tough (the Blackhawk, anvil-tough) and the normal operating pressure of the .38 so low that I could double them and not exceed the .357 they were both chambered for.

Not so with the .45 ACP. We've been over the pressure issue, and you've probably all seen the results of exceeding those limits. You want to stay within pressure limits, and keep your fingers safe.

In loading the .38 Special, I had a lot of choices of powders, but my budget limited me to two: Bullseye and Unique. I could easily remember what charges I used of each, for the three or four bullets I loaded. With wadcutters, I used 2.9 grains of Bullseye. With semi-wadcutters or round nose bullets, since they were lead, they'd have either 3.5 grains of Bullseye or 4.0 grains of Unique. As for jacketed hollwpoints? Those were 125's only, and they got 5.5 grains of Unique. Jacketed soft-points? Those were 158 grains, and they had 4.8 grains of Unique underneath them.

I reel off this data not to impress you with my memory. (My wife would laugh herself silly at the notion.) No, simply put, it is an interesting bit of data, along the lines of someone who was in the military knowing the serial number of the rifle they carried through boot camp. Curious, interesting, but ultimately not useful. You see, at the present time I am set up to load something like 40 calibers, and the combination of possible bullet weights, powders and charges are so great I cannot remember them all.

There's a reason man invented writing.

I have half a dozen loose-leaf binders containing the loading and chrono data of more than 40 years of experimentation and testing. I have boxes and bins of ammo, all labeled. I can step into the shop and assuming I've loaded it, I can select a firearm and the ammo to go in it for any task I've loaded for. I'll admit that the selection of loads for whacking angry bruins in the Alaskan wild are limited. I haven't done much loading in that sector. But if I was to shoot in a competition this weekend, I could grab the gun and the ammo I needed straightaway.

When you load, write. When you test, write more. How you organize it is up to you. We each have different organizing principles, and what works for you might not work for me and vice-versa. However you do it, do it.

When you test, note everything. Date, time, weather, firearm used, the load (by the reloading data specs you use) and the accuracy and velocity results. Here's an interesting bit of info. In the old days, we used to use a particular shotgun powder to load our .45s with. The powder was Winchester 452AA. It burned clean, it delivered good, consistent velocities and it was accurate in a surprisingly large number of guns. It had one fault, however. It was temperature sensitive. But not in the way you think. As the temps got colder, the powder burned hotter. If you loaded to make Major in the summer, that same ammo fired in the winter cold chrono'd a lot faster. If you loaded and developed your load in the winter, well, come the summer you'd fail to make Major.

How did we know that? Because we kept good records, and could correlate the velocities to the charge weights and the temperatures. Without good record keeping we would not have been able to figure that out.

The volume loading should reflect the load assembled. And the bins or boxes of that ammo should tell you what it is, without guessing. At Second Chance, the annual bowling pin match, you could show up with as many as a dozen guns and more than that in loads. I tried to keep things simple: my Pin, Stock and Space guns all used the same load. But my 8-Pin gun used two, and my 9-Pin gun had two others. The 8-Pin event was done with .45 ACP revolvers, and you had to reload. So my first six shots were 230 JHPs, while my reload was done with 230 FMJ. My 9-Pin load was both a standard, 135 PF load and a "boosted" 145 PF load, and the stronger stuff came out only if the pins were heavy that year. I shot a different 9-Pin-like load for my handgun shots on the rifle and shotgun events, and another load again the years we shot the long-range Handgun Pop and Flop.

Add in a rifle load and two shotgun loads, and I was traveling "light" at 10 different loads. They were all labeled. Just for grins one year, I put misleading labels on the bins. The shotgun slug load was "Secret load #17." The rifle load was ".223 Supreme." Little did I know that years later that name would be used by Winchester.

But the labels were just for the other competitors, as I knew the exact components of each, still on their original bins back home.

Test, label and record.

Loading Safety

You might think that the biggest concern surrounding loading safety is to merely avoid getting your fingers caught in the press while you're working the handle. No, it is more than that. We have three things to keep track of when it comes to safety: loading data mix-ups, press operation errors and cleanliness.

Loading data errors come from using the wrong powder or the wrong amount. (This is why we write things down.) In handguns it is sometimes an "oops" thing, but in rifles it can be a really dangerous thing. If you're loading 6.0 grains of Unique, for instance, and you drop Bullseye powder into the powder hopper to top off as you're loading, there will be trouble. 6.0 grains of Bullseye is a stout load and with some bullets can be too much. You'll blow a case, trash a mag and end up having to scrap or discard the whole production lot.

If, however, you're loading (I'm going to assume that if you load for .45 ACP, you'll be loading for other calibers too) 12.0 grains of 2400 in your .44 Magnum and get Bullseye in instead, you will not be so lucky. You'll trash your revolver and perhaps even be injured.

When you load, have only the components you are loading on the bench, and no others. Store your powders and primers across the room. Get out only the one you'll be using, and put it back when you are done. Do not reuse or relabel powder canisters. Do not have more than one brand or type of primer on the bench. When you're done, pour the powder back into its container, and put the powder and primers back where you store them. Coming back to the press, and not knowing what powder you have left in the hopper, can be an expensive mistake, but not as expensive as shrugging your shoulders and saying "oh well," before loading without knowing.

When loading, develop a rhythm and keep to it. If the press hesitates, don't force it. Remember, you're working a machine that loads flammable substances and delicate and sensitive little gems. If you force it, you may be crushing a primer in the feed mechanism. Eventually we all do it, and when you snap a primer it will be loud. I know some who load with hearing protection on. I prefer not to, partly to hear the soft music in the background (I load with the radio on) and partly to keep me safe through fear. I know I can't force the press, because if the primer pops I don't have protection. I like my hearing and will stop the press to protect it.

Wear safety glasses when loading. I always do (then again, I have prescription glasses, so I'm always protected) and not because I think the press will explode. There are a lot of spring-loaded items

Get a powder scale*, and use it to check what your powder measure is throwing. You cannot reload safely without one, so don't skimp on this.*


.223 REM
1.PLACE PAN ON SCALE AND
PRESS "ON"
ON
grains
Grams
2.IF DISPLAY FLASHES PRESS "ZERO"
3.WEIGH YOUR POWDER
OFF
g:grains
G:Grams
ZERO
4.WHEN FINISHED TURN "OFF"

on a press, and if something launches a piece, or a bit, I don't want my naked eyes in the way.

The last concern is cleanliness, particularly as regards lead. The bullets we load (at least until the state of Kaliforniastan catches up to us all) have lead in them. The powder residue your tumbler is cleaning off your cases has lead in it. You will be exposed to lead. Never fear, it is not something you have to quake in terror from nor load in an isolation suit. The solution is simple. Just wash your hands.

Don't eat or drink while loading (and for God's sake don't smoke), and scrub when you are done, and you'll be cool. Lead does not enter through your pores. It does not soak in through the skin. (At least not in doses less than "bathed in lead ore dust eight hours a day" like some third-world miner.) You ingest it. If you wash it off your hands, you don't ingest it.

If you want extra protection, Esca-Tech makes specialist soaps, scrubbers and test materials to deal with lead. I've been shooting for well over 40 years now. In that time my ammunition consumption has exceeded one million rounds. I loaded a lot of those myself. I've been on the range while several million more rounds have been fired. The state agency I teach for requires annual blood lead tests to make sure the instructors are healthy. My test results have come back in the 6 micrograms per deciliter range year after year. Six is perhaps too much lead for an infant or child, as when growing the nervous system it is quite sensitive to lead. (OK, so we won't let a 10-year-old load and shoot 35,000 rounds a year. He or she can simply shoot that much and use jacketed bullets.)

For an adult, 6 is just above the "background" level. You can find adults who have never fired a gun, who have blood levels of 2-3-4. Why? For decades gasoline used tetraethyl lead as an octane booster. The dust and dirt in cities remains high enough in lead that many a gun-hating Manhattanite will test for lead as high as a regular shooter such as myself. (Oh, the irony.)

So, wash your hands, and you'll preclude lead ingestion. But not that inconsequential hand-rinsing thing that you convinced your mother was "good enough" before you sat down to the dinner table. No, you do the full "surgical scrub" ritual: Get your hands good and lathered with soap, and then scrub for a full 30 seconds,

Just some of my reloading data, *recorded over decades of loading, testing and competition. Write it down, or you'll never keep it all straight.*

at least as high as your shirt cuffs and up to your elbows if you shot in short-sleeved shirts.

Oh, about that guy who tells you to wash in cold water so your pores won't open up and absorb lead? Ignore him. I don't care that he's the state-certified firearms instructor you've been saddled with, nor how many times he's been to the FBI Academy. You do not absorb lead through your pores. Pores (barring certain very nasty solvents) are a one-way conduit, letting things out of your body.

If you wash in cold water, you're certainly going to do a quick and sloppy job. Warm that water up, get a good lather going and scrub your hands clean. If you don't, the lead won't be coming in through your pores, it will be coming in off of your grubby hands while you eat, drink, smoke or whatever.

Now, I've been admonished by some in the LEO community for being a bit harsh on the FBI. (Hey, they're big boys and girls, they can tell me to my face.) The thing is, they are (and I do not mean this as a slam against them) lawyers, accountants, business majors and software experts. That's how they proved they had the mental horsepower to become FBI agents. What they know about guns, they've been taught by other FBI agents, and very few of them have degrees in chemistry or have MDs.

So if an accountant tells you how to be careful around chemicals, does it matter if he's "just" an accountant or an FBI accountant?

But I keep going off on these tangents. Lead does not soak in through your skin, nor through your pores; you breath it, or you eat it. By washing your hands thoroughly when you're done shooting, you avoid both those routes of contamination once you've left the range. Don't eat or drink on the range, wash when you finish shooting and wash after reloading ammo, and you will maintain low lead levels.

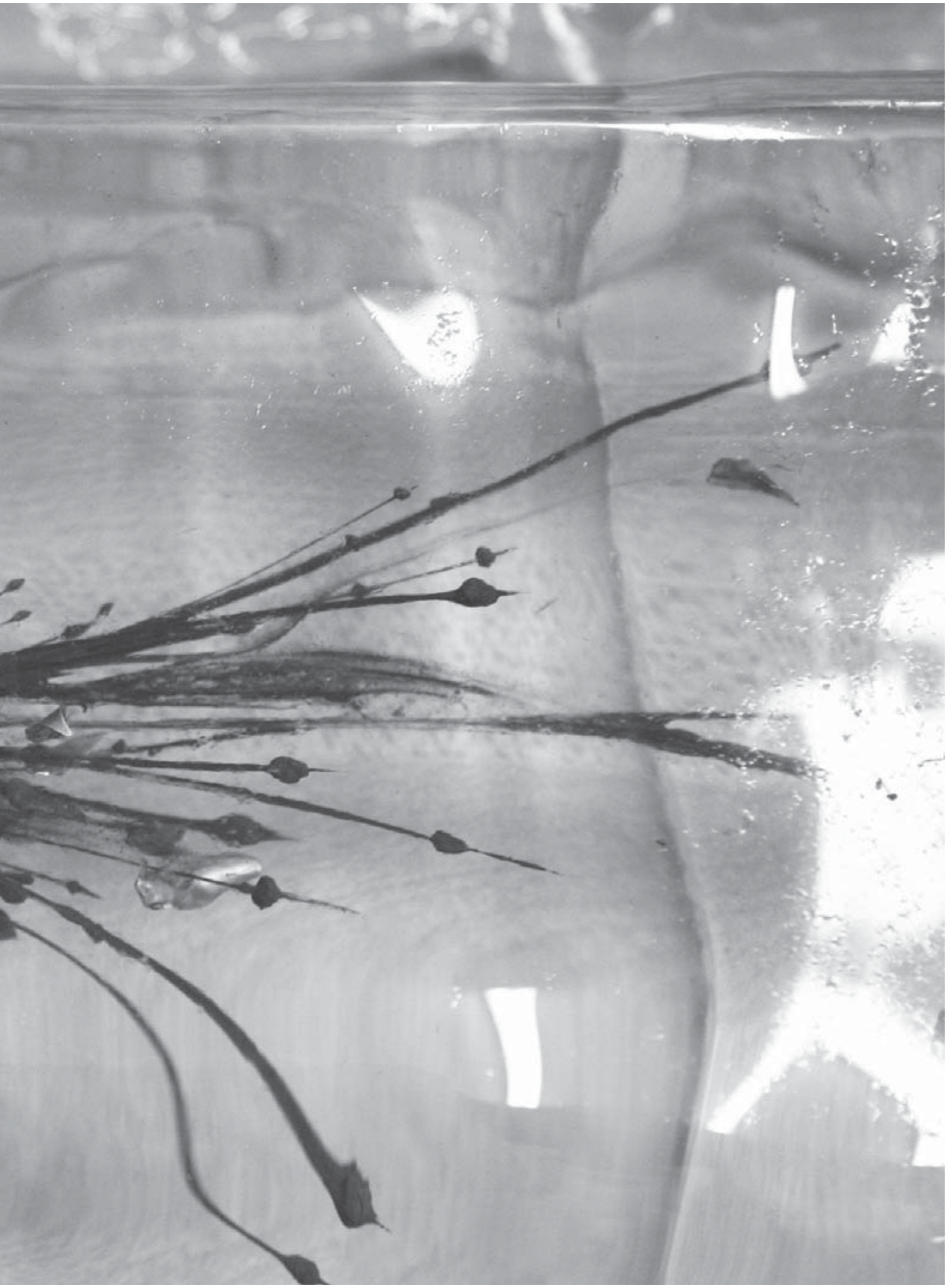
If you listen to the health "authorities" in some states, you'd think lead was a serious threat along the lines of plutonium. T'ain't so.

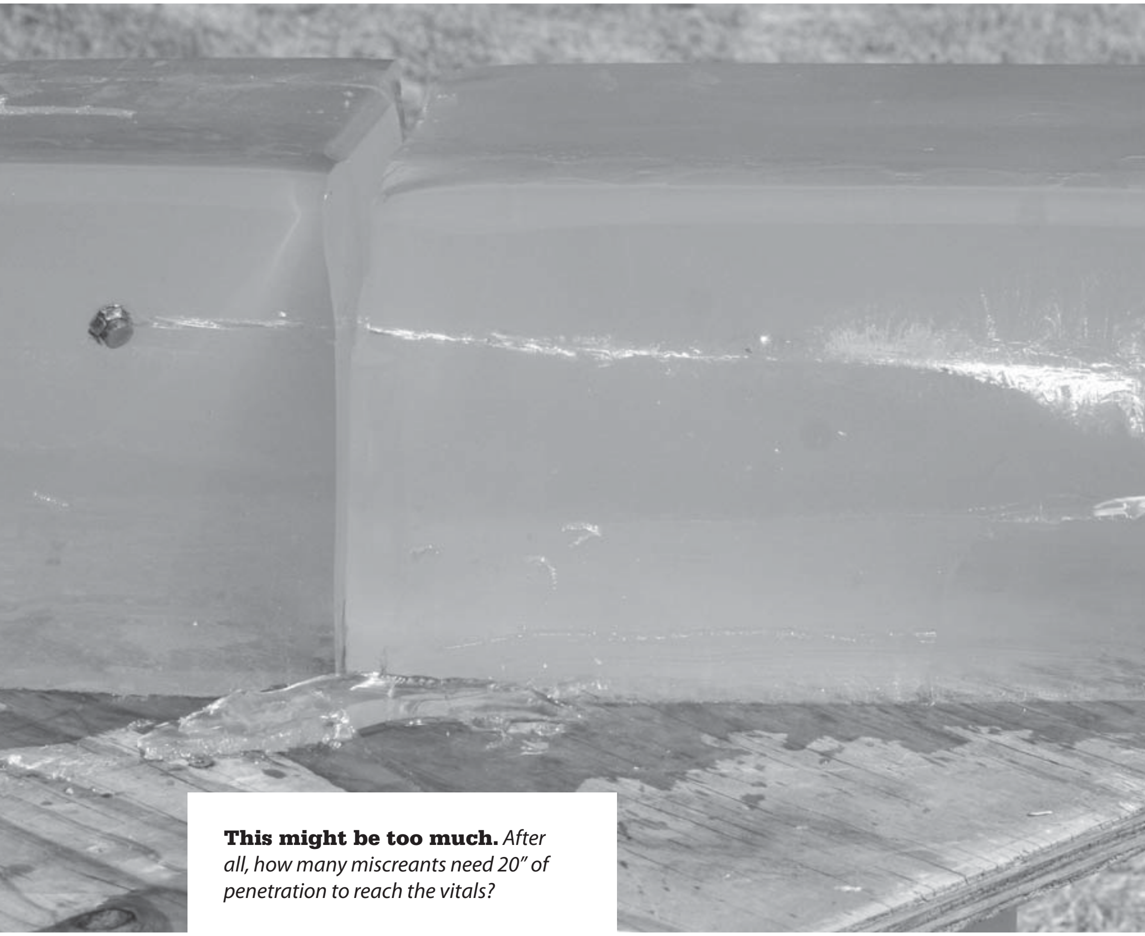
CHAPTER 9

Factory Ammo And Testing

Why a separate section on factory ammo testing? Simple: the smart money is on using factory ammo for defense. My friend and fellow gun writer, Mas Ayoob, strongly recommends using only factory ammo for defense. The usual critique of handloads for defense cites the unreliability, tendency to malfunction and excessive performance as pitfalls of reloads. I have to disagree here, as they are pitfalls only to the extent of the skill (or lack thereof) of the person loading the ammo. If factory ammo were markedly superior in function to reloads, no one would shoot at a national or world championships with anything but factory ammo. That most competitors shoot with reloads is proof that reloads can be the equal of factory ammo in reliability. If the reloader is thorough and detailed enough. That enough individuals are not, should make you shy away from reloads as defensive ammo.

Extreme Shock *takes a different approach, and this is the gelatin test of one of their rounds. Impressive, indeed.*





This might be too much. *After all, how many miscreants need 20″ of penetration to reach the vitals?*

The legal consideration can be summed up with the statement, “Don’t give your opponent another stick.” That’s right, if you’re involved in a defensive shooting, there will be legal inquiries. If you’re completely in the right, and the law in your state is supportive (some are not), then what you use is hardly going to matter. But why risk it? Why give even a hint of aid and comfort to the enemy? Why give them anything at all to make grief for you?

Also remember, all legal proceedings in the use of lethal force are going to be two-pronged. There will be the criminal inquiry, conducted by the police and the local prosecutor’s office. They’ll look at the facts to see if there is anything “worth” prosecuting. (Alas,

there will also be some consideration in some locales as to just how "media-worthy" a particular case might be. If the local DA or whomever needs a boost before an election looks at the case and decides you pose a juicy target, you may be in for what the legal euphemism of "collateral damage" covers. I'm not being entirely cynical in mentioning it, just noting that it has happened in some instances.)

There also likely will be a civil action, conducted by the plaintiff's counsel or the deceased plaintiff's relatives counsel. Unless your state has enacted the Castle Doctrine, you can count on the latter being quite vigorous. Their legal or tactical calculation will include how much money you have, how well-insured you might be and how much media attention they can drum up.

Anything you do that brings more unwanted attention to your case means more legal costs. After all, once it is all done, no one is going to come up to you and say, "You know, we goofed back there. What does it take to cover your unwarranted legal expenses?" No, you're on your own. Heck, it isn't even worth it to countersue, as the DA has immunity (or he couldn't do his job, really) and the family looking for a paycheck doesn't have any money, otherwise they wouldn't be suing you.

The FBI thinks this isn't *good enough. Eleven inches of penetration, full expansion, nice temporary cavity: what's to complain about?*

Now, were I faced with an imminent situation, one requiring the use of lethal force, and all I had at hand was a firearm loaded with reloads, would I hesitate? Not because of the ammo. When the balloon goes up, what ammo is in the gun is a secondary consideration. (A brief aside: If you're wondering where that saying comes from, it is from the Civil War. It was the first war to use balloons as tactical observation platforms. Before the attack, the general would send up his balloons and have the observers on them report on where the enemy units were arrayed on the battlefield. Thus, "when the balloon goes up" is meant as a signal to the start of hostilities or at least a warning that they are imminent.)

Back to cartridges. What are we looking for in a defensive load-

ing? It's simple: reliability, accuracy, terminal performance and reliability. Yes, I mentioned reliability twice, because when you need a gun, you need one that works. Let's take these in order.

Reliability is far and away the number one criterion we focus on. Reliability is primary, such that for a long time revolvers were considered better defensive handguns than pistols, because of the reliability difference between them. Capacity, rate of fire, power were all considered secondary to the much better reliability of the revolver. Things have changed in that pistols are now considered to be as reliable as revolvers, but not in that reliability is downgraded as a concern. How much does it matter? If I had to depend on a particular pistol, and it was reliable with hardball, but less so with hollow points, I'd pack it with hardball. Yes, I'd give up the increased terminal performance of the hollow points in order to retain the reliability I needed.

When it comes to a handgun for defense, there is no such thing as "reliable enough." There is "reliable," and there is "not something to carry."

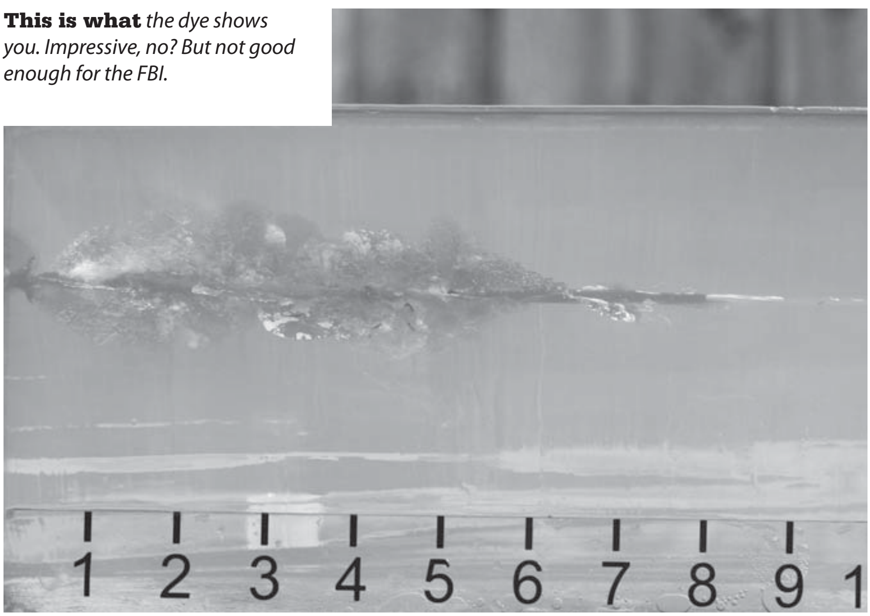
Let's take a moment to consider non-legal defense situations. If you're going to be packing a .45 ACP handgun for "bear" protection, then you need not worry about the legal ramifications of reloads. Unless, of course, the EPA has gone completely off the high side and has banned lead in anything in public spaces (including the word lead). A bear is not going to sue you for using non-factory ammo. Also, you will find that much .45 Auto ammo from the factories will have miserable performance on bruins. The best reloads you can craft will improve that, but almost all will still be a full step behind any convenient .44 Magnum load.

To show the cavity, *you need either elaborate lighting rigs, or dye. Here, red food dye steps in. Things just got messier.*

Now factory ammo is not perfect simply due to its it having come from a factory. Many years ago I knew a police officer in a large city, a city with a reputation (well-deserved) as a place where a lot of people got killed. His approach to ammunition was simple: He visually inspected each and every round that went into his duty or off-duty guns. He'd carefully inspect each primer, then roll each round across a table to make sure they were uniform and the rims properly formed. This was in the old revolver days, and he did this with every caliber he packed. He'd inspect each bullet, to make sure it was straight, well-formed and did not bulge the case neck. Then he'd weigh them.

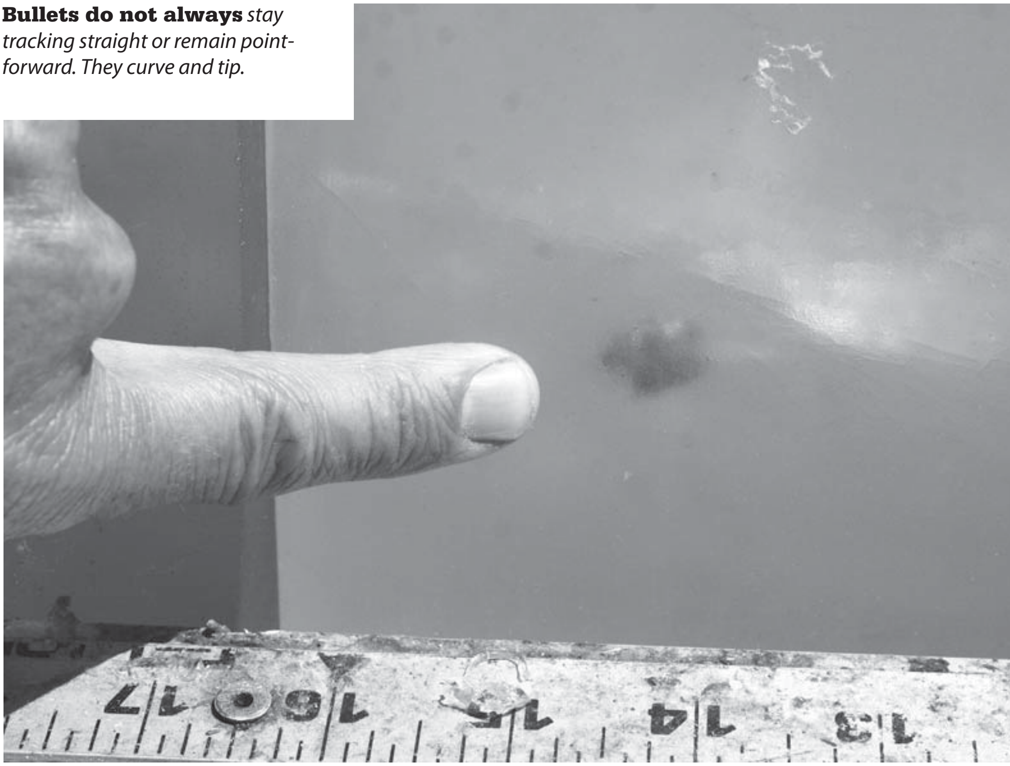
He commented on this one time by saying, "I used to shake them to listen for powder, but my hearing isn't as good as it used to be." No kidding, as by then he'd put enough criminals in the ground to fill two tables with bridge players.

Once visually inspected and weighed, he'd chamber-check them. Each would be dropped into the chamber of one of his carry guns, and then when the revolver was turned over, allowed to fall out onto a folded towel. Any that failed to drop fully in, or any that didn't drop out of their own weight, were set aside.



This is what *the dye shows you. Impressive, no? But not good enough for the FBI.*

To recover *the bullets, you have to go gelatin-digging. More mess, but all in the name of scientific inquiry.*



Bullets do not always *stay tracking straight or remain point-forward. They curve and tip.*

Everything rejected went into the practice bin, and the rest, the ones that all passed, back into their box with a big checkmark on the end flap. He's long retired and probably moved to a warmer state. When he dies, his heirs will no-doubt find a few boxes of handgun ammo, each partially full and each with a big check mark on the end flap.

So, in addition to testing your ammo for reliability as part of your selection process, you have to inspect each individual round that goes into your carry magazines. I mean, it would suck and suck royally to spend years in practice, thousands of dollars on guns, magazines, holsters and proper clothing, spend your waking hours properly alert to your surroundings and then get killed by a teen-aged thug with a cheap handgun because you didn't check your carry ammo and the first round under your hammer had a back-wards or sideways primer. You think you won't get a razzing at the pearly gates over that?

Properly done, *a gelatin test requires more than just some gel. You'll make a real mess with glass, wood, etc.*

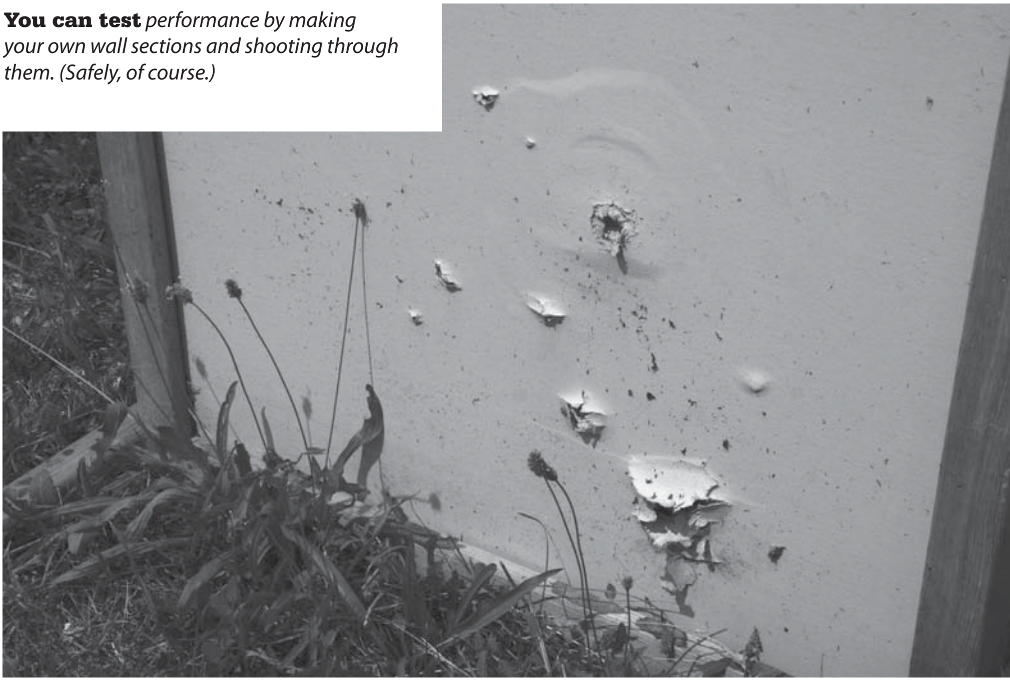

#2
#1

Here's what happens *when you push a traditional cup-and-core bullet too quickly. However, a bad guy isn't going to brush this off like it was an airsoft "owwie."*


45 AC
JH

Other substances *are often tried, but found to not replicate tissue as well as gelatin.*

You can test *performance by making your own wall sections and shooting through them. (Safely, of course.)*



Selecting for reliability is simple. You put 200 rounds of your carry ammo through your gun without a single fault. This, after having put a thousand rounds of plain old hardball through it without fault. Any single malfunction is cause to take corrective action. If your gun can't go 1,000 rounds of full metal jacket round-nose ammo without a malfunction, get the gun corrected or the magazines replaced. If it can't go 200 rounds of your selected carry ammo, change ammo. Damn the cost. Get stuff you can rely on, even if it means a few more dollars out of your pocket.

Police departments do things a bit differently, which is why you have to be careful using them as a recommended source. If the department selects a particular ammo and gun, they sometimes do it through rigorous testing, and sometimes they do it because a ranking officer simply decides to go with something. No, really.

The thinking might go like, "Hey, all the departments around us use the SIG 226, and they report it as being faultless, so let's get those when we refresh our inventory," or "Glocks are cool, and they are cheap. Plus, we can get everyone including the receptionist trained as an armorer for free."

Nineteen inches *of penetration? Do you know anyone that big aside from sumo wrestlers?*


DAVE
CAMELBAK

Nineteen inches. *You can't avoid the mess if you want to recover the bullets.*

Ditto with ammo. Not all departments have the manpower, time, budget or interest in conducting exhaustive tests of everything. And why should they? What they do for reliability is simple. They make the manufacturer deal with it. An agency will issue handguns to all and have officers go out and retrain or just shoot the qualifications course. (The more you learn about police departments and how they train, the less impressed you will be with glowing recommendations of this or that product.) If a particular handgun is troublesome with their selected issue ammo, the gun gets replaced. The officer gets handed a new one, and the old one is either worked on by the departmental armorer or sent back to the manufacturer.

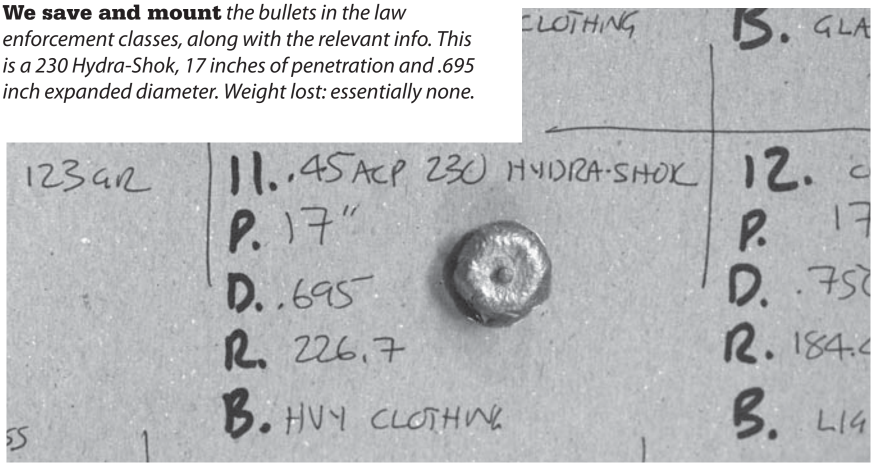
For you, if you are faced with a recalcitrant handgun, the choices are have a local gunsmith work on it or send it back to the manufacturer under warranty. What do you do in the meantime? For the police department, the manufacturer is going to either test and replace or simply overhaul the gun, test and return. In an extreme instance, they'll grab an unnumbered gun off the assembly line, test it, stamp the old number, destroy the old gun, and send it back as fixed. Yes,

When you get a bullet *that works as well as this, stick with it.*

the law allows that. Will they do the same for you? Don't bet on it. How do I know that gets done? I once sent back an inaccurate handgun for a customer with a letter of explanation and Ransom rest targets as demonstration of the problem. In due time I received the gun back, "repaired." Yes, the serial number was the same, but in the time between the first version having been made and the replacement sent, the company had changed how they stamped the serial numbers. The old one was done via the old system and the "repaired" one had been stamped by means of the new system.

Guess how well *230 FMJ penetrates? It whaps right through a loaded steel AK-47 magazine, and goes five inches into ballistic gel on the other side.*

And when it goes through, *it takes a lot of steel shrapnel with it. Ouch.*



We save and mount *the bullets in the law enforcement classes, along with the relevant info. This is a 230 Hydra-Shok, 17 inches of penetration and .695 inch expanded diameter. Weight lost: essentially none.*

I was a commercial gunsmith, doing a good-sized volume of business with that company. I had an inside source, who could get me the real answers and info. Lacking those advantages, are you going to get real-quick turnaround?

No, you'll have to make the one and only gun you have (or the one and only sample of a particular model) work with whatever you can find. Luckily, the ammo manufacturers make that easy for you.

As I mentioned in the bullet chapter, in the old days bullets didn't expand. And there were wide differences between how various brands performed. The good news is that that has changed. They all expand, and they all perform so well that the differences between them are marginal. You could do just fine if you simply selected one or two at random from the slew of brand-name high-performance bullets. All this happened because of the FBI. I sometimes have differences of opinion with the FBI, and that's all right. What they have done for us is amazing as they were the ones who insisted on a standardized and more-or-less publicly known test protocol. By publicly rating bullets as to their performance, they have made it possible for us to buy top performing ammo.

If 20 years ago you had suggested that a .45 bullet perform the expansion and cohesion feats we now see, having gone through glass, wood, cloth and sheet metal, you'd have been scoffed at. That all manufacturers now offer something that does exactly that, we can thank the FBI.

So, we come to the next aspect—accuracy. Despite the advances of performance, there is no such thing as a magic bullet. Placement matters more than anything. The blunt-force example I use when trying to explain this to police administrators is this: "I can 'prove' that .380 hardball is better than the .44 Magnum as a stopper."

"What, huh, how?" they say.

"Simple, staff a SWAT team with nothing but IPSC Grandmaster shooters and equip them with .380 pistols. Staff another team with recruits right out of the academy and give them .44 Magnum revolvers. Everybody the first team shoots will get two shots right through the sternum. Everyone the second team shoots….."

If I see the light go on in their eyes, I know it worked. If I don't, it is time to move on.

Look at it this way. The .223 cartridge fires a 55-grain bullet at 3,100 fps and some people think it is too light for use on people. Compared to that, every handgun cartridge is a weak reed. Placement matters more than most everything else. I recently saw (again, some things never die on the internet) a report on a shooting where a miscreant took more than 10 hits each from .40-caliber handguns and from .223 rifles. He did not immediately fall, and he kept fighting to the end. At first this was shown as "proof" the .40 failed, and that the .223s saved the day. Upon further study, it actually showed that peripheral hits were not sufficient to do the job.

Remember, we are not shooting to kill. It may sound heartless, but the life or death of the bad guy is at most a secondary concern to us. His (or her, there are women criminals) own actions have placed him in a situation where he has forfeited his right to safety and even life. The goal is to make him stop his unlawful actions or prevent further imminent hazardous to the point of life-and-limb actions. We are employing lethal force to stop a person from unlawfully using lethal force of their own. Stopping is the operant word. What stops him or her fastest is best, and as to their death, well, that is a decision they made, not we.

A .22 will kill, but it is cold comfort to your heirs that the bad guy died minutes, hours or days later. Center hits, and high center hits at that, increase the likelihood of stopping. All other hits, even with a 120mm tank cannon, do not. As one wag put it some years ago, "Out there is a GI, a GI with a true story of how some enemy soldier, somewhere, needed a second burst of fifty cal before he went down." What he didn't say was that the first burst probably only produced peripheral hits.

So accuracy matters, and your ability to shoot accurately matters.

I had a particular customer when I was a gunsmith, one who not only studied his craft (he was a private investigator and former police officer), but who paid attention to advances in firearms and the advice given by others. When I remarked that picking defensive ammo was more a matter of accuracy than bullet shape, he had me test his carry gun. I shot it in a Ransom rest and found that his carry gun shot CCI Blaser (yes, aluminum-cased ammo) loaded with 200-grain JHPs well. In fact, it shot that load like it was a Bullseye gun. After I was done, the work order and test target went into his files. If he had to shoot someone afterwards, he'd have all he needed to show why he was carrying that load in that gun. I don't believe he had to, as I never had to sit through a deposition and be asked about my participation in the ammo selection situation.

You have this book. If you go through the tests, you can show good cause as to your selection of ammunition.

The last critical factor is terminal performance. In the old days we'd have gone to a lot of trouble to test stuff. But as I've mentioned, the FBI has done this for us. You can hunt down the latest FBI tests, but I've delved into my test archives and come up with the top performers that I'd use. I've also added a few that might be of interest, simply because the questions come up.

Terminal performance is now conducted in a media known as ballistic gelatin. It is a 10 percent mixture (one part gelatin to nine parts water by weight) mixed at just under 100 degrees Fahrenheit and then poured into molds and chilled to 4 degrees Fahrenheit. It has mass and consistency that closely correlates to pig muscle, which in testing has been shown to correlate closely to people.

In the old days, testers would use whatever was common, cheap or easy to obtain: soaked newspapers, soaked phone books, soap, water, sawdust. The problem was that there was no way to correlate any of the tests. This week's wet newsprint compared to last week's how, exactly? No one knew. The great advantage of ballistic gel is its consistency, from test to test and tester to tester.

That's not to say it's perfect, nor even the best. But it's the best we have right now. Typically, for handgun tests the gel will be cast into blocks that are 6 inches by 6 inches by 16 inches. Rifle blocks are sometimes cast 8 inches by 8 inches by 20 inches, and while the differences can matter when testing rifles, either block size works for handguns. It simply takes a bit more than twice as much gel to make a rifle block as a handgun block is all. (No kidding, do the arithmetic. Adding just a couple of inches makes the bigger block just shy of two-and-a-quarter the volume of the smaller one.)

To follow the procedure to exacting detail, the blocks are measured for temperature and have a calibration BB fired into them. If the temp is too far off or the BB penetrates too much off of the median depth, the block is no good and not fired on. If it passes muster, then the block is fired on. The test can be as simple as measuring expansion and penetration depth or as involved as high-speed photography/videography to examine the temporary cavitation phenomenon.

In all instances, a bullet that holds together passes, and one that fragments fails. The FBI standards require not less than 12 inches of penetration or the bullet is deemed to have failed. One can argue that a bullet that consistently penetrates 11.5 inches and expands to the size of a manhole cover or sprays the interior of the gel/felon with high-speed fragments that deep has hardly failed. However, it is the nature of drawing lines that you have to draw them somewhere. The FBI has selected 12 inches as their minimum, and that's all there is to it. They deem anything over 18 inches of penetration as more than needed and stop giving "extra credit" for it.

A brief aside: I'm not a small man, but I'm no bulky weightlifter, either. I am not a foot deep, sternum to spine. Unless someone is truly massive or has lifted weights to the point that they have slabs of muscle on their chests, a foot is plenty. Six inches is enough to reach the aorta on a whole lot of people. So why a foot? Arms. People do not always "stand like Gumby" as one TV character once remarked, inspecting a crime scene. An arm in the way makes for problems, as it adds 3 to 4 inches at least and perhaps a very tough bone to the bullet's path. It's all fine and good, perhaps even glib, to remark, "Don't shoot them in the arm." But sometimes you don't have an option. So, the FBI wants something that even after it has had to go through an arm, will go deeply enough into the chest to inflict the damage needed. Too much, not enough? You won't know until it is over, and then it is too late to choose differently.

Hornady XTP *shoots brilliantly, and expands likewise.*

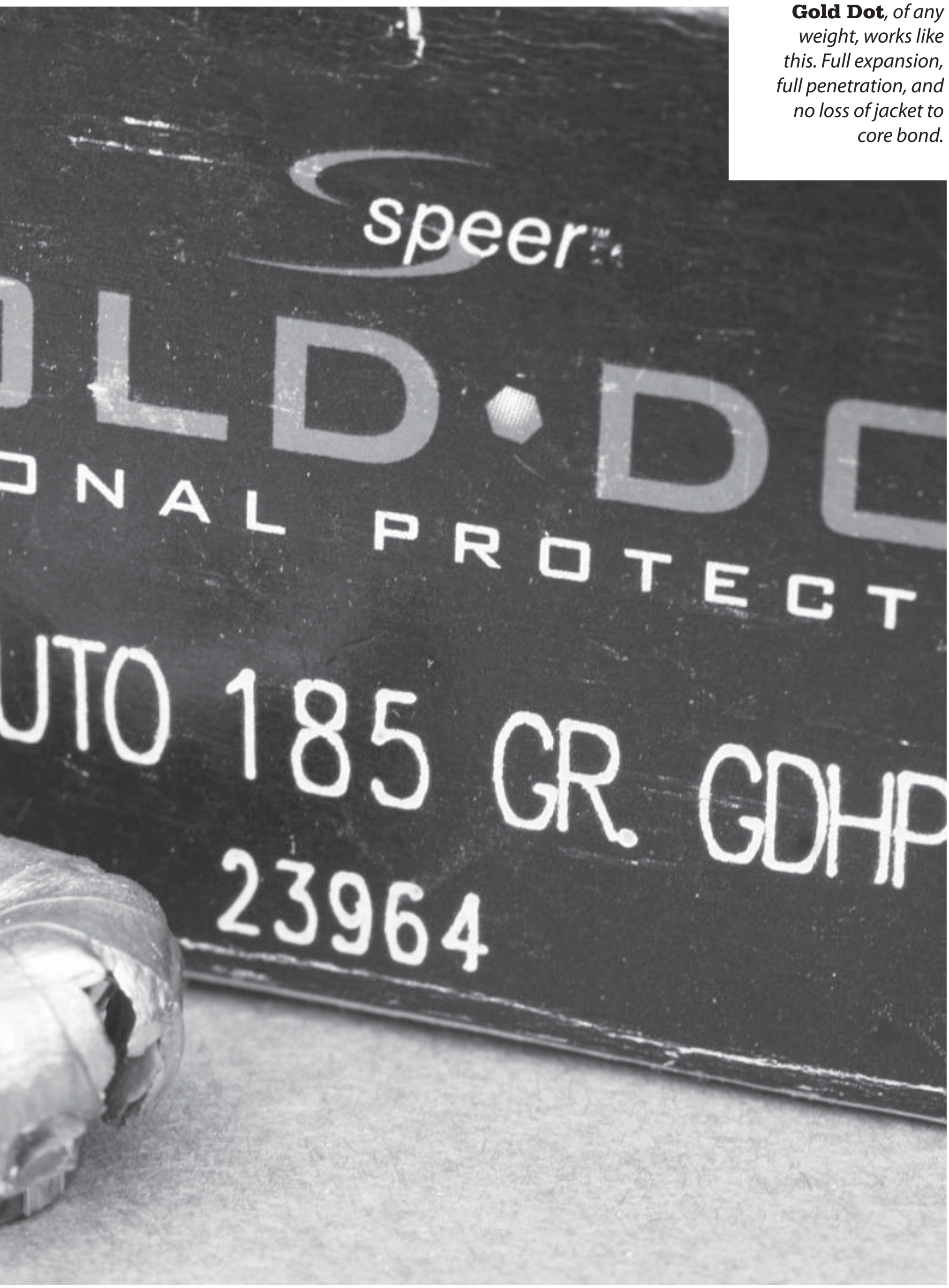
Shooting gelatin as a means of testing bullets is expensive, it is hard work and it is messy. The blocks are prepared by dissolving gelatin (one part gelatin to nine parts water, by weight, it bears repeating) and once dissolved, pouring into moulds. The moulds are then chilled to 38 degrees Fahrenheit, and once they have set (usually overnight, longer if the refrigerator is struggling from having been stuffed full of 100 degree blocks of gelatin) they can then be shot. You can't fit very many gel blocks into a standard refrigerator. Even a deep-chest freezer, set at 38 degrees, doesn't hold very many. A typical law enforcement-only test procedure I regularly attend features eight blocks, which fill two capacious coolers hauled by strong men to the range. It takes the tech preparing them two days to mix, pour, chill, inspect and wrap for transport.

Once shot, the wound track has to be recorded somehow. The best way is with high-speed videography so the dynamics of the wound creation can be studied. At the least, the wound track and bullet is photographed after the *sturm und drang* are done. One way to make the damage clearer is to pump the wound track full of a food dye in water. Of course, the dye is staining, so you'll get the red, blue or green (whatever works) on yourself and your clothes.

The bullet's penetration distance has to be measured, and the bullet then dug out, measured and weighed.

The gelatin? In the strictest of laboratory conditions, it is a one-time use item and one bullet per block. Yes, that adds up. As a demonstration, it's possible to thwack a block with three or four bullets (the more robust the cartridge, the fewer hits a block can take) before it has to be discarded. Once they start melting and oxidating, the blocks get quite smelly. You can make yourself persona non grata at a shooting range by doing ballistic gel testing and then simply tossing your used blocks into the weeds. Once they warm up and the smell starts, the blocks are so slimy that moving them becomes simply awful. If you're lucky, local critters will eat the gelatin. Of course, once the gel is gone, you'll have a swarm of burping raccoons, skunks and opossum hanging around like teenagers looking for more food.


PERS
45 A



Gold Dot, *of any weight, works like this. Full expansion, full penetration, and no loss of jacket to core bond.*

Magtech SCHP *bullets are all-copper, and they retain weight like there is no tomorrow.*

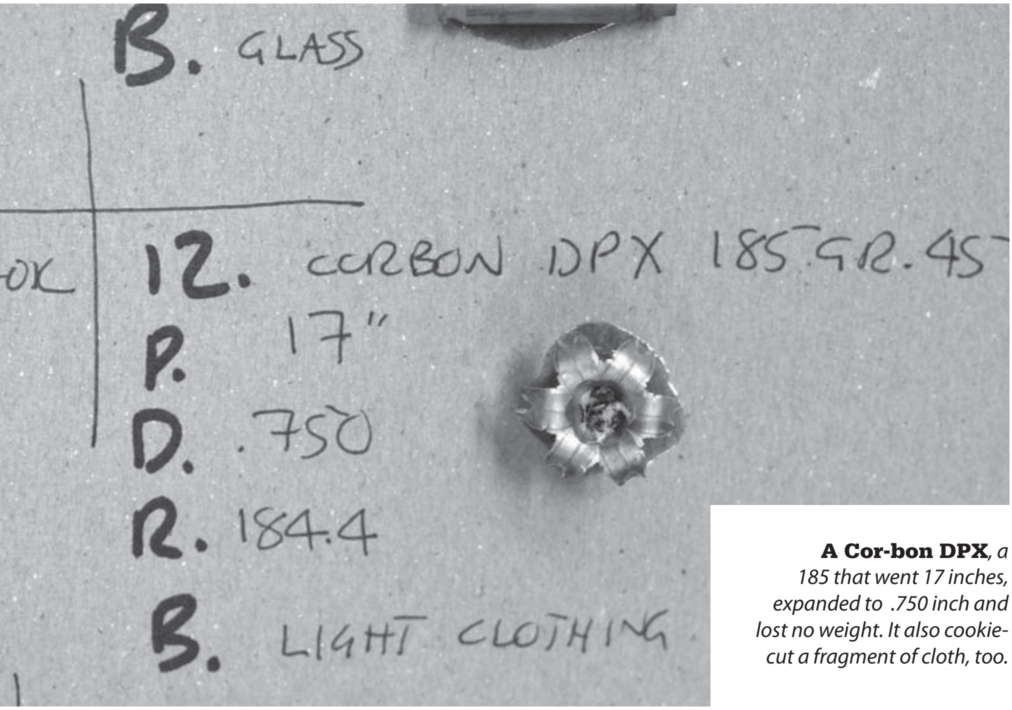
Yes, the gel blocks can be recovered while still cold post-testing, remelted, filtered and re-used. But not many times, and they have to be filtered with a fine mesh to remove the bullet fragments from the previous shootings. That, or subsequent results will be less and less accurate.

In all, it is a lot of work, a lot of cost and a lot of hassle. If you ever get a chance to go to a ballistic gel demo, take it. Even if you have to drive a long way and take a day off of work or something, do it. You won't regret it.

Classic Reloads and Hardball

The load used in IPSC competition for many years in the early days was a 200-grain lead semi-wadcutter loaded over 5.8 grains of WW-231 or a similar powder. It delivered just over 900 fps and shot superbly. It still does. The mould used was either the Hensley & Gibbs #68 or a clone of their design. The semi-wad cutter profile is a long nose, and the curve of the nose was intended to be in the same location in space in the loaded cartridge as that part of the curve of a 230 FMJ bullet. Unlike earlier 200-grain designs, it feeds superbly. When cast well and loaded properly, it shoots accurately. It does not, however, expand. In fact, more than once I've recovered such bullets from a hillside or backstop in clearly recognizable form. Some could have even been traced back to the particular handgun they came from, the rifling marks were so strong and clear. In fact, the phrase "reloaded and fired again" comes to mind. In ballistic gelatin, they penetrate well. I have yet to stop a 200- or 215-grain bullet cast hard and loaded to Major or Pin loads within two gelatin blocks end-to-end. That is within 32 inches of ballistic gelatin. I have had the same results with 230 FMJ, 230 and 240 truncated cone lead and all other non-deforming .45 bullets. When it comes to penetration, momentum, and bullet shape and lack of deformation get the job done.

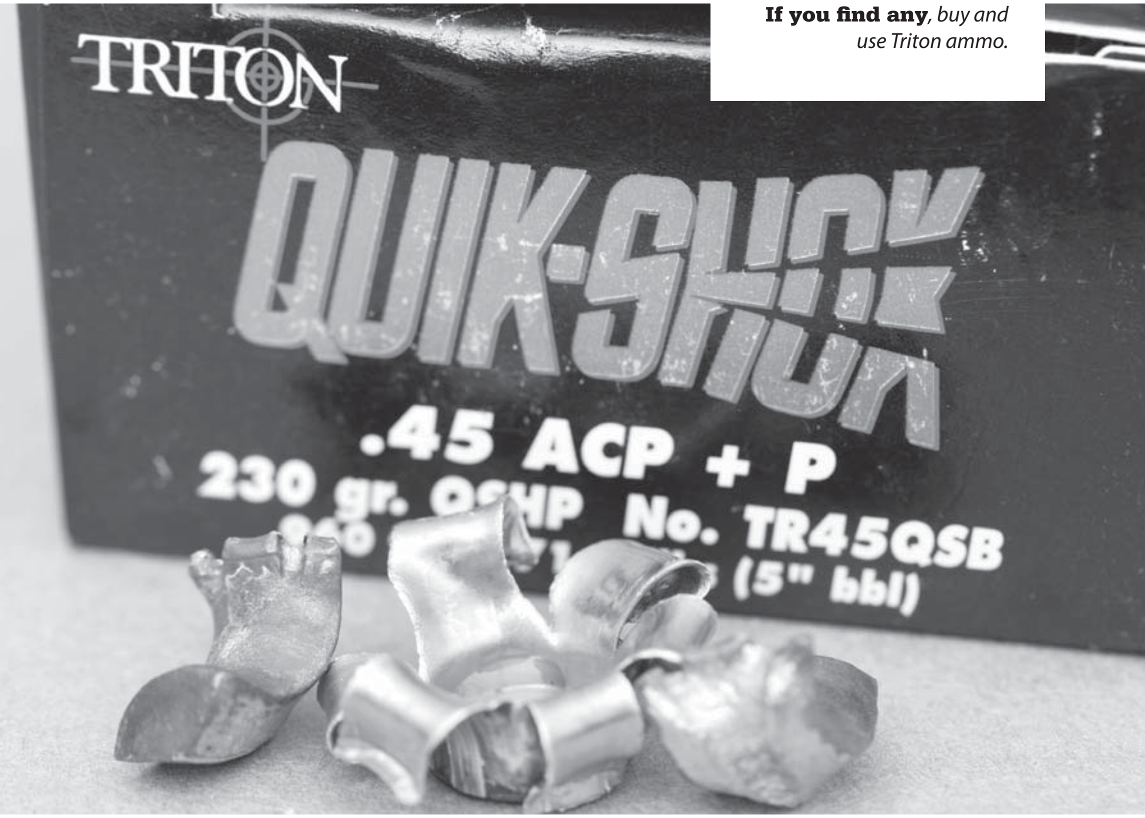
Now, as a competition load they are great. As a carry load, not so much. Yes, the sharp shoulder of the semi-wadcutter is going to create a clean-cut wound channel. But 32-plus inches of gelatin is three or four people's worth of penetration. That is simply too much. When NYPD switched to 9mm pistols, they went with FMJ ammo. Clearly it was more humane, more civilized and a decision made for political reasons. (You have no idea how difficult it was to be polite and civil in phrasing the last part of that sentence.)



A Cor-bon DPX, *a 185 that went 17 inches, expanded to .750 inch and lost no weight. It also cookie-cut a fragment of cloth, too.*

Experts who were not deciding solely for political reasons advised otherwise. It took a number of shootings where bullets passed through bad guys and struck bystanders (inside sources tell me it got to 17, either shootings or bystanders) before the people ostensibly in charge saw the light. NYPD went to JHPs, and everyone was safer.

As for 230 FMJ, or hardball, it penetrates just as much. A friend of mine, a well-known Grandmaster and winner of USPSA Nationals, told me of a class he had taught to some Spec Ops people. The guys he was instructing were the door kickers, the ones who went out and dragged back miscreants by the scruff of the neck. If there was resistance, there was gunfire. On one occasion, they went into a location and ended up in a shootout. He didn't explain how they ended up down to handguns, but I can well imagine several different decision trees that would get you there. They're in a room, in a typical stone building and one of the good guys has to whack a bad guy. So he shoots him with his issued 1911A1. At the shot, the bad guy and one of the good guys goes down. Seems the 230 FMJ bullet passed through the bad guy (and dropped him like a bad habit), then



If you find any, *buy and use Triton ammo.*

ricocheted off the stone wall behind him. The ricochet struck one of the good guys in the leg, breaking a bone and changing the plans for the raid. (I wondered later if that qualified for a Purple Heart. After all, it was "received as a result of enemy action," wasn't it?)

The fact is 230 FMJ penetrates people and chance obstacles (although not stone or concrete walls) quite well.

Ever wonder why some in the military want the .45 back? Because it is the biggest handgun cartridge that they can have any expectation of getting their hands on. Why do a lot in the military not care one whit about any handgun caliber at all? Because they are accustomed to things much bigger and much more "useful" in many contexts. After all, if one is accustomed to thinking of a 40mm grenade as "small ordnance," then a handgun is puny. Alas, a 40mm is not an option for us taxpayers. All we're expected to do is pay for them.

You can complain *about bullets not holding together, but the core keeps sailing on, and the fragments sliced and dice whatever they go through.*

Unless you are living out in the sticks, where there will be no bystanders, a bullet that penetrates as much as the ones above do is clearly unsuited for defense.

Winchester Silvertip

Although the Super Vel came earlier, the Silvertip was the first generally available commercial round that could be counted on to do something other than zip right through things. If you are worried about vampires, werewolves and other nasties, Silvertips do not have any special properties. Silvertip is a trademark, not a materials descriptor. The bullet is made in a simple, straightforward manner. Winchester takes an aluminum jacket and swages a soft lead core into it.

The construction is just like the traditional "cup and core" copper jacketed bullet we discussed in Chapter Four. The advantage of the aluminum was that it protected the core from the bore and vice-versa. You cannot shove a soft swaged lead bullet down a bore at 1,000-plus fps and expect lube to keep the bore from leading. So the aluminum jacket contained the soft core (with its hollow point) down the bore, but did not contain it on impact. The aluminum was too thin and too weak to ensure jacket integrity upon impact, so the effect on impact was that of a soft lead hollow point.

Now, in the FBI tests the Silvertip does not fare too well. The jacket does nothing in the way of containing bullet integrity for the metal, glass, wood and sheetrock tests, and the bullet simply "wads" up as a soft lead lump. But in the clothing sections, it is a very good bullet. So, unless you anticipate needing superior performance against cars and buildings, the Silvertip can serve you quite well. The FBI doesn't like it, but that is understandable. It was a 9mm Silvertip that "failed" to penetrate deeply enough in the Miami shootout, and thus led to the rest of the shooting. However, it did do all that was asked of it. Of importance to readers of this book, the .45 variant is bigger, heavier and almost as fast. I'd have no problems packing Silvertips, nor have I in the past.

Federal Hydra-Shok

One of the earliest high-performance hollow points, the Hydra uses a hollow point with a different shape. The cup has a post in the center of it. The idea is simple. The post redirects the hydraulic flow of material to the sides, forcing the hollow point open. Does it work? You bet. Hydras open with the best of them. Does it work because of the post? Hard to say. I recall that a researcher took some loaded ammo and carefully reamed the posts out of the bullets. When fired into ballistic gelatin, they expanded pretty much the same as the ones with the posts.

Regardless of post or no-post, you can count on Hydra-Shoks doing the job. The bullets were unveiled at the very beginning of the FBI test protocols, so they retain jackets and do not fragment while delivering deep penetration.

Hornady XTP

Designed in the early era of modern expanding bullets, the XTP has been improved and refined over the years. Not that there was anything wrong with it then, but Hornady is not a group of guys who rest on their laurels. The initial idea was to design a bullet that expanded reliably even at the lower edges of the velocity envelope for any given caliber or cartridge. That they did. Then, when the FBI tests became more important, Hornady made the same bullet hold together after passing through all the usual test barriers: glass, wood, sheet metal and clothing.

Now, that is considered normal. But as a bonus, the XTP has something that other bullets do not have: match-level accuracy. Not that other bullets are inaccurate, far from it. But the XTP is so far in advance of the rest that it's used in a surprising application—accuracy matches. Specifically, the XTP is by far the bullet of choice for those shooting in the Bianchi Cup. The match where a perfect score has been necessary to win for almost 20 years.

Serious Cup competitors insist on a load delivering an inch-and-a-half group at 50 yards. If it can't do that right from the start, there is no need to study it further. So, either as the XTP load or as the TAP-FPD load (same bullets, but formulated for defense with low-flash powders) you are equipped with both excellent terminal performance and blazing accuracy.

Gold Dot

The Gold Dot bullets method of construction is detailed in Chapter Four but bears a repeat: a soft lead core is electro-plated with a tough copper alloy, then the bullet is swaged and formed into the exact shape needed. It is then punched for the hollow point.

Why the name, Gold Dot? Simple, the hollow point formation leaves an artifact of the process: a small disk of copper plating at the bottom of the hollow point opening. When the bullet expands, you can see the small dot of copper in the middle of the expanded "mushroom."

Since the copper and lead are bonded via electroplating, jackets can't fragment and expel the core. The tougher copper alloy gives the core shape and resistance to expansion and deformation. The result is a very durable bullet that performs well on the FBI tests.

Magtech SCHP

The Magtech Solid Copper Hollow Point takes advantage of the advances in metallurgy we've seen in the last couple of decades. In the old days, the idea that you could make a solid-copper alloy bullet both strong enough to be fired and soft enough to expand would have been laughed at. Now, that's not the case. With no core-jacket bond to break apart, the bullet can't break up except by one of the expansion petals being busted off.

Advocates also point to busted petals as a good thing—a high-speed chunk of sharp-edge metal, pin-wheeling off on its own course. I'd rather have them stay attached, but that's just me. The big advantage copper bullets have is in barrier penetration. They are much less decreased in performance by encountering a pane of glass, sheet metal, etc., than standard bullets are.

The Magtech copper bullets are sold under their First Defense line, and one thing you'll have to get used to with any all-copper bullet is lighter weights, some of them nonstandard. You see, copper is less dense than lead. If you remove the lead in a bullet and replace it with copper, you'll have a bullet that weighs less. Now, in some calibers and cartridges you can make the bullet longer to regain some of that lost weight. However, in the .45 ACP there is a strictly limited amount of increase you can do. The case is only so long and no longer.

In other cartridges the limiting factor is not the case, but barrel twist is. A heavier bullet is going to be longer. Twist rate has to match bullet length at a minimum level, or the bullet will not be stable. An example, if I may change calibers and ammo brands, Cor-bon makes an all-copper bullet for .223 rifles, meant for use in defensive situations. They offer a 53-grain bullet and have resisted making a heavier bullet simply because there are a large number of rifles in existence with a 1:12-inch twist rate. A heavier bullet will not stabilize in the 1:12 barrels, and even if you clearly mark the boxes and the bullets, there is no guarantee that someone, somewhere, won't get the heavy bullets in a slow-twist barrel and have problems.

Similarly, handguns are manufactured with a certain twist rate. Even if a particular caliber had enough case capacity to hold a much-longer, standard-weight all-copper bullet, it may not be stabilized by the twist rate.

So, all-copper bullets are lighter than usual. In the case of the Magtech SCHP ammo, it is 165 grains, a weight you do not often see in the .45 ACP.

Magtech Guardian Gold

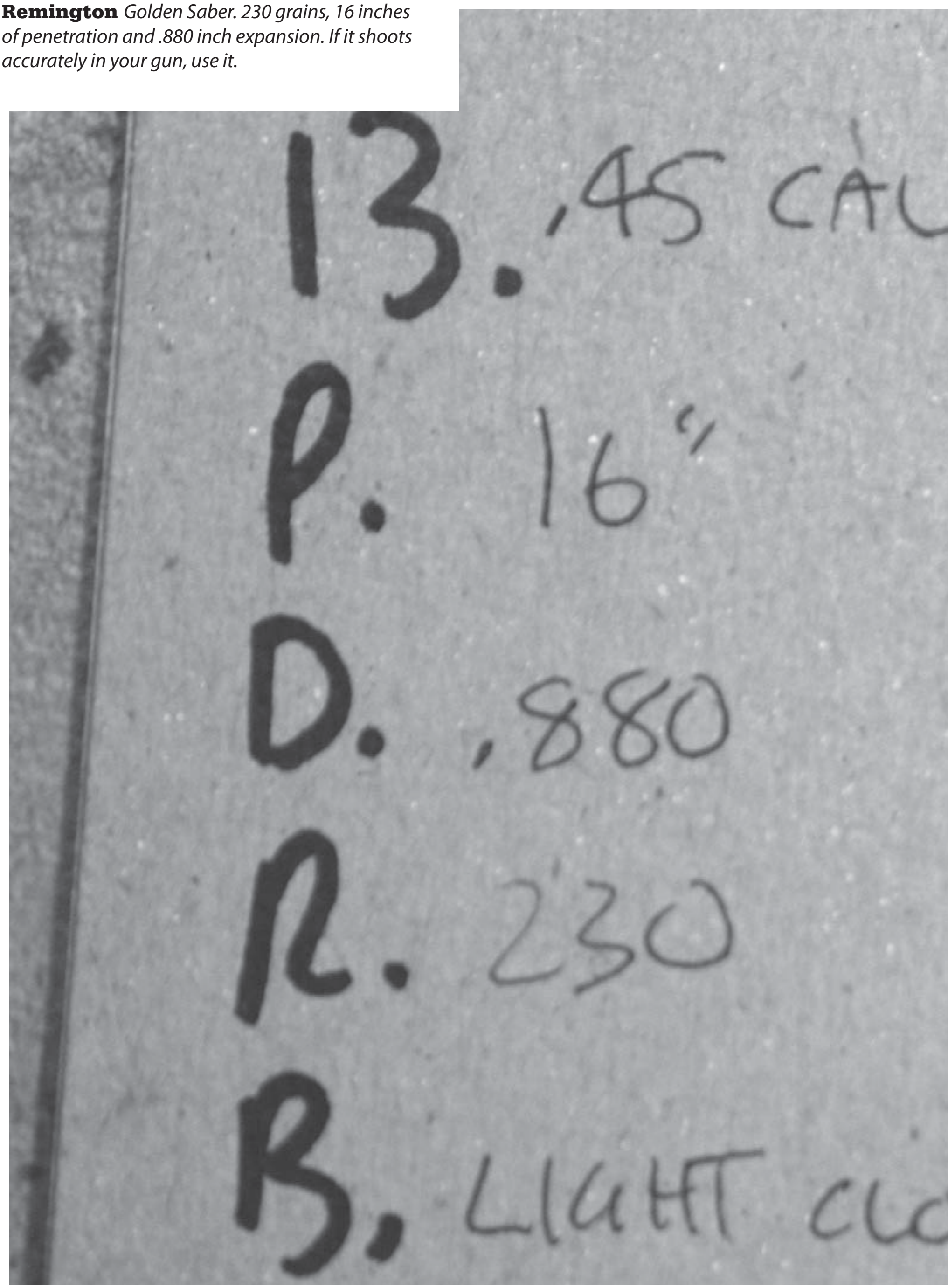
These are lead-core copper jacketed ammunition of the standard bullet weights. At 185 and 230 grains, they give you the customary choices for a .45 ACP handgun—full weight or lighter weight and more velocity.

As modern-design jacketed bullets, they have demonstrated excellent performance on the FBI tests. Gelatin penetration is spot-on at 14 inches to 16 inches depending on weight (heavier and slower there is more, lighter and faster there is less) and the jackets and cores stay together.

Cor-bon

Cor-bon is the oldest high-velocity company around. By that, I mean they are the inheritors of the Super Vel philosophy of "Some is good, more is better, too much is not enough." (OK, it is also the radio rock 'n roll philosophy, too. So sue me.) They started out making ammo with more speed than anyone else. While Peter Pi and the boys have branched out from there, they haven't abandoned it entirely.

Remington *Golden Saber. 230 grains, 16 inches of penetration and .880 inch expansion. If it shoots accurately in your gun, use it.*




REMINGTON 230
GOLDEN SABER
THING

They make super-speed ammo in the .45, ammo like 165-grain jacketed hollow points that churn out 1,160-plus fps from a 5-inch government model. Or 185s that do 1,075 fps. I think that's just more than the bullets can take, but for those who want speed, Cor-bon is the place for it.

One extra line Cor-bon has is the DPX. They are all-copper bullets, and they are meant to penetrate and expand. Copper and its alloys are a lot tougher than lead, so they handle velocity a lot better. Their 160 DPX is listed at 1,050 fps, and it delivers all of that. One thing you can count on, when Cor-bon prints a velocity on the end flap of a box of ammo, it's going to deliver that. If 160 at 1,050 isn't enough for you, then step up to the 185+P DPX, which is at a listed 1,075 fps.

Triton Quik-Shok

Now, Triton is out of business. So don't go calling the local stores looking for it. However, you may find some lurking at your local gun show (and then again you may not) and an internet search might turn some up as well. I mention the loading to show that not everyone followed the same drummer. The basic idea of modern bullets is that fragmentation is bad, and that keeping bullets in one piece is good.

The Quik-Shok bullets were made pretty much like standard cup-n-core bullets, but with a twist. Instead of using a single lead core, the core was composed of three parallel lead segments. Once swaged into the cup, the core was a more-or-less unified piece. It held together just fine when fired, and the swaging produced a homogenous-enough core that accuracy was as good as any bullet out there. But when it struck the gelatin (or a bad guy), the jacket peeled back, the three pieces separated and you had three wound tracks. The idea was simple: Even a greatly expanded bullet is only so big. And the human body is quite resilient, allowing things to be pushed around. It is entirely possible for a bullet heading toward some vital gizmo to not strike it. The pushed tissue ahead of it might roll the vital bit out of the path of the bullet, and you'd miss vital spots entirely. Or the bullet would track slightly off-course as it traversed several inches of tissue, and *voila*, no hit on what you'd expect.

By launching, in effect, three bullets, you'd triple your chances of hitting something important.

Now, the drawbacks are obvious. If you take a 230-grain bullet and divide it into three parts (we'll ignore the jacket weight for the moment), you have three 77-grain projectiles. Subtract the jacket, and you're left with projectiles that are the same weight as a .32 ACP bullet. Of course, you do have three of them. And a pair of shots with Quik-Shok is the same as a burst from a Czech Skorpion.

Alas, Triton did not last long enough to let the market find out if this works. But they made a bunch of it, and you might come across it. If you want to use it, it makes great practice ammo. As for carry ammo, you'll have to make that decision for yourself.

Fiocchi

This top-notch Italian firm makes all the usual suspects in .45 including 230 FMJ, 200 JHP and a 155-grain frangible. But the star of the line is their XTP ammo. If Hornady loads the same bullets, what do you need someone else's ammo using them for? Well, what if yours is the odd gun that won't work reliably with Hornady ammo? (I'd suggest fixing the gun, but hey, I'm a gunsmith.) The other option is that you can always switch to Fiocchi and give that a try. There is also the matter of ammo availability. If you can't find Hornady, then track down some Fiocchi and you're good to go.

Remington Golden Saber

G-S ammo is different. Instead of a gilding copper jacket, Remington uses a bronze/brass jacket. The reason is the harder jacket material offers a stronger bullet to barrier penetration and gives them a bit more leeway in controlling the expansion of their bullets.

This is the bullet the FBI went with back when they were selecting handguns for their SWAT teams. It is a reliable bullet in feeding, and an effective terminal performance load. It does have one minor drawback, however. When the FBI was testing the prospective guns for the SWAT team, they insisted on certain accuracy parameters. Each gun had to shoot Remington Golden Saber to a certain accuracy level. Then the guns would get thousands of rounds pounded through them and then tested for accuracy again.

The companies and gunsmiths who built the test guns found that accuracy with the Golden Saber ammo was a hit-or-miss thing. Not all guns shot accurately with it, even guns that shot other loads accurately. So, if you plan on using Golden Saber you really ought to test your gun with it for accuracy. If it shoots it well, you're in. If not, yours is one of "those" guns.

Here we have to draw the curtain. It would be possible to fill a book with nothing but ammunition, performance, photos of expanded bullets and charts of penetration, etc. Alas, I have but one chapter, and the "bullets in gelatin" thing has been done already. But these will provide you with plenty of options, and I can personally attest to their performance in guns, on targets and in gelatin.

Pick one, try it and see if your gun likes it. If not, move on and don't waste a moment regretting that your first choice didn't work out.

CHAPTER 10

Offshoots of the .45 ACP

I was a newbie to competition in 1977. I was working at a gun shop (no longer in existence) called The Gun Room. The shop handled the general run of firearms, but specialized in defensive firearms (a lot of our customers were Detroit police officers, as the city we were in was contiguous with Detroit) and military collectibles. The guys who were there were not so much into competition. Mike had shot Bullseye with the Navy, and some of the police officers and Federal agents shot in PPC, but I was the "competition" guy. I was just getting started in the new competition—IPSC—I'd been reading about for a few years. It had just hit our neck of the woods, and I had done quite well in my first few tries at it, using borrowed firearms. When the chance came, I jumped all over an Ithaca-made 1911A1 that showed up at the shop. However, a bare-bones 1911A1 wasn't really competitive, even in those early days. So, I had to have it upgraded.

The Big-bore *lineup: left to right, .45 GAP, .45 ACP, 460 Rowland, and 50 GI.*

Luckily, one of our customers was a gunsmith. Frank Paris had been building Bullseye guns for many years and was starting to build IPSC guns for customers. Why Frank, besides the coincidence of his being a customer? An over-used term in business is "paradigm shift." Basically it describes when the ground rules of a process, market or attitude change. I'm not talking about something as simple as "hey, we can get it cheaper from Japan," but more along the lines of "Japan makes things as good as (fill in the blank) or better." The former would be the cheap transistor radios of my youth, radios that could be counted on to quit in short order. The latter would be the replacement of German camera lenses with Japanese lenses. Yes, the cognoscenti will tell you that Leica lenses can be superior to Nikon or Canon, but not so superior that anyone who uses Japanese lenses would be sneered at. In fact, the differences would be so minor that the Liecaphiles are the ones sometimes sneered at for spending many times the value of a Canon or Nikon lens and not getting many times the

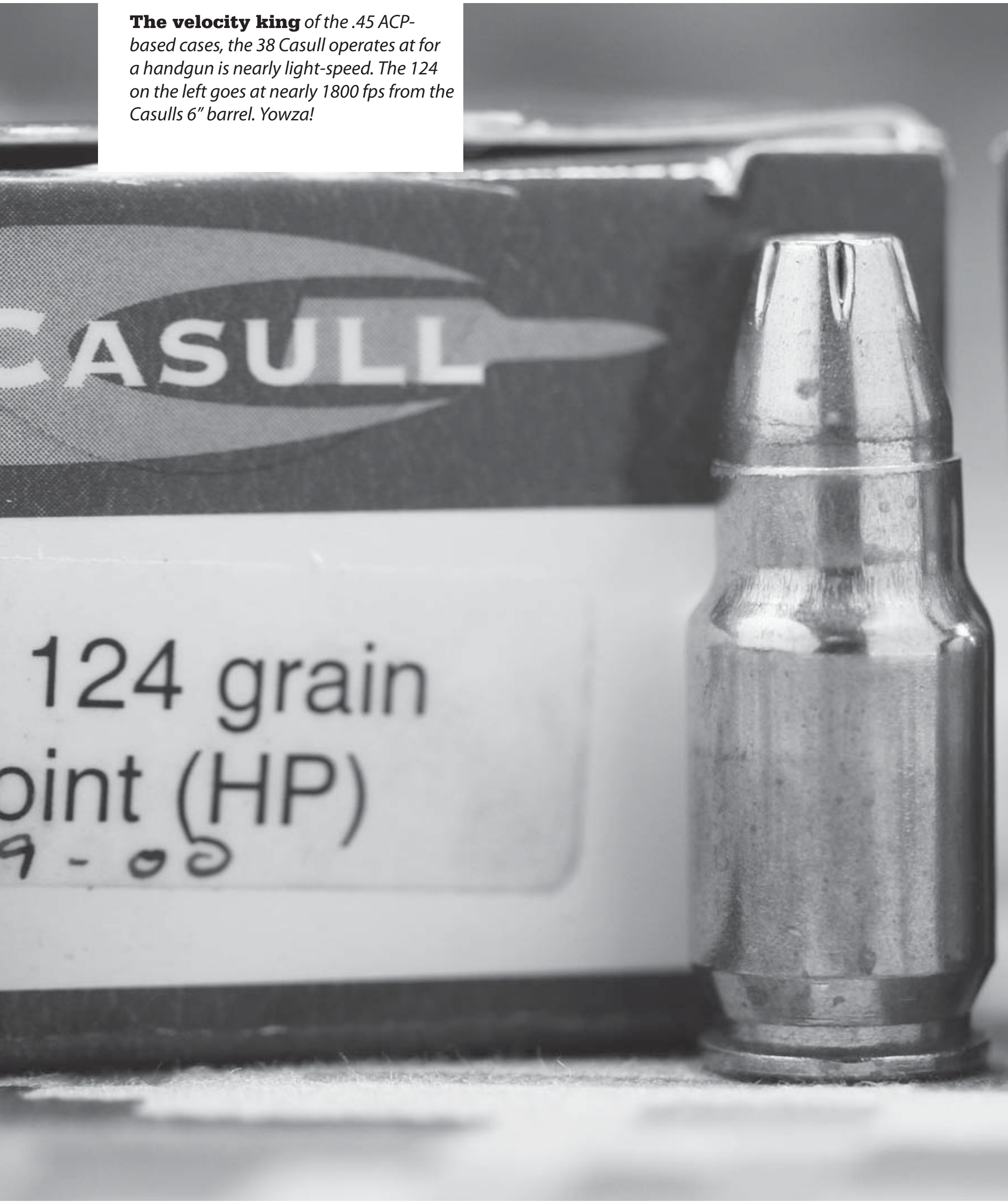
The standard load *is good. The +P load is made to a higher pressure, and delivers more velocity.*

performance. That particular paradigm shift happened during the Korean War, when photojournalists using German cameras found that they could get Japanese lenses that were as good, and maybe even better than their treasured Teutonic glass.

The paradigm shift in IPSC came when customers expected accuracy <u>and</u> reliability. Prior to IPSC, reliable pistols were those that were loose in fit and thus casually accurate. Accurate pistols were made tightly-fitted and thus finicky in function. The then-predominant form of pistol competition, Bullseye, allowed for unreliable function in the form of "alibis." If your pistol malfunctioned on you, you simply raised your hand, and once the referee ascertained that you had indeed had a malfunction, you got to shoot the string over. Mike Karbon, the boss and owner of the shop, was such a consistent Bullseye shooter that he could (and when needed to, did) cause his pistol to malfunction on command.

"Watch your sights. If you call a shot that you've pushed out of the 10-ring, then limp-wrist it and cause a jam. You'll get a reshoot," Mike once told me. He wasn't the only one who could do this, and it was common to have strings reshot for alibis, and not all of them inadvertent.

In IPSC there were no alibi reshoots. If you had a problem, it was your headache to deal with while the clock was ticking. That was one of the bedrock changes that Jeff Cooper built in to IPSC competition. But you still had to shoot accurately. It was a real head-spinner for the Bullseye shooters: Despite the rapid rate of fire, we were actually aiming and needed accuracy. As an aside, PPC didn't allow alibi reshoots either (or at least didn't by the time I got to it in 1985 or so), but no one used a pistol in PPC back then. In fact, when I started shooting PPC in 1985 with a pistol, I was an object of curiosity. A few others had done it before, but not for a whole league. And those who had, had not performed at the level I had. Not to brag, but I shot a .45 ACP on an indoor winter league and carried a 596 average. When I switched a year later to a .38 Super I had built, I upped that to a 598 average. Today, those are mundane averages to carry, but in 1985, to see someone shooting a .45 ACP at 596/600 was enough to get stares from the deputies I was shooting with. That, and I was always assigned the right lane to avoid pelting my fellow shooters with brass.



The velocity king *of the .45 ACP-based cases, the 38 Casull operates at for a handgun is nearly light-speed. The 124 on the left goes at nearly 1800 fps from the Casulls 6" barrel. Yowza!*


.38 CASU
11-30-60
#38147 - 147
Hollow Point (

.400 Cor-bon. *This is some high-velocity stuff, and it uses standard .400 inch diameter bullets, of which there are a slew. If you need speed, this can deliver.*


400
-BON 135GR
CITY 1435 FPS

In 1977, handgun bullets didn't expand. Oh, there were experimenters who claimed otherwise, but regular factory ammo didn't expand. "High velocity" in a pistol was not something you'd associate with a 1911 or the .45 ACP cartridge. Accuracy and reliability were in many cases theoretical concepts, and the idea that in the future those of us with concealed carry permits would be one among many, and not the rare few, would have been puzzling. A lot of things were different back then.

But back to Frank and the good old days at The Gun Room. Frank could build accurate pistols that were reliable. Even if he hadn't been a customer, his ability to build 1911s with both attributes would have made it necessary to visit him. He built that Ithaca up for me, and I used it in competition. Soon after I began using that pistol, the front sight flew off in a practice session. Frank grumbled about the "hot" loads I was using. "Nothing of the kind," I said. Back in those days you could still buy honest-to-goodness military surplus ammo. Not the mil-spec stuff made to be sold as inexpensive ammo, but stuff left over from various wars. I was shooting ammo as new as Remington ammo made in 1967 and 1968, and as old as stuff with 1943 headstamps. It was vanilla-plain 230 hardball, loaded to whatever the arsenal loaded it to but certainly nothing even approaching magnum velocities. It would be a few years before I started shooting bowling pins, and that ammo would be loaded hot. While Frank was reinstalling a new front sight on my pistol, he handed me another pistol and said, "What do you think?" He had to point out the engraving on the chamber for me to see what was different. It was a .41 Avenger.

I had by that time been reloading for a few years. I had been reading about reloading for many more. Although I never met him, and it would be quite a few years before I could be considered as his successor in even the most tenuous sense, I had read everything that Dean Grennell had written about reloading. I knew that it was possible to change the bullet diameter of the parent case, in this instance the .45 ACP, but I had never seen one. In Dean's case it was the .38/45. By necking the .45 ACP case down to the size for a .38 Special bullet, Bullseye shooters could build a target gun of soft recoil without the hassle of making a 1911 work with .38 wadcutter ammo, or the other worse choices. That was long before George Nonte figured out how to make a .38 Super extremely accurate. Ammo for a 9mm wasn't accurate, so even if you built a 1911 in 9mm up to be a Bullseye pistol, you couldn't get accurate ammo to shoot through it. The .38 Special wadcutter gun was finicky to the extreme, expensive to build and it wasn't really much softer in recoil than a leaned-out .45 ACP. The .38/45 only required a new barrel, where the .38 Special wadcutter guns required new or hand-modified magazines that cost five times what a standard .45 magazine cost. Everything else in the .38/45—slide and breechface, magazines and bullets—were either common .45 or even more common .38 Special.

.40 Super, *the speed king of the middlebore cartridges. It makes a 10mm look pokey and the .40 S&W positively sedate.*

You can see some *of the differences between the .400 Cor-bon (L) and the .40 Super (R). What you can't see is the higher operating pressure of the .40 Super. You want a 165 grain bullet to go faster than this? Buy a .30-06.*

The .41 Avenger was meant for other things. It wasn't designed or built to be a soft-shooting caliber, it was meant for speed. The idea was to get the case capacity of the .45 ACP with the lighter-weight bullets of the .41 Magnum. Where a .45 ACP would be loaded with bullets of 185, 200 or 230 grains of weight, the .41 Magnum offered bullets of 170 and 210 grains. For competition, a 170 making Major was an advantage over a 230 making Major, or so it seemed back then. It also offered an advantage to the then-new competition of bowling pin shooting. (Looking back, I really wish I'd given bowling pin shooting a shot when Frank mentioned it in that spring of 1978 instead of waiting until 1984 to give it a try. Oh well.) While competition on cardboard targets and falling steel called for a ballistic pendulum (and later, chronographs) bowling pins were a self-regulating scoring system. If you tried to gain speed in shooting by using a less-powerful load, the bowling pin would "notice." As in, you lacked the energy to push the pin off the tabletop.

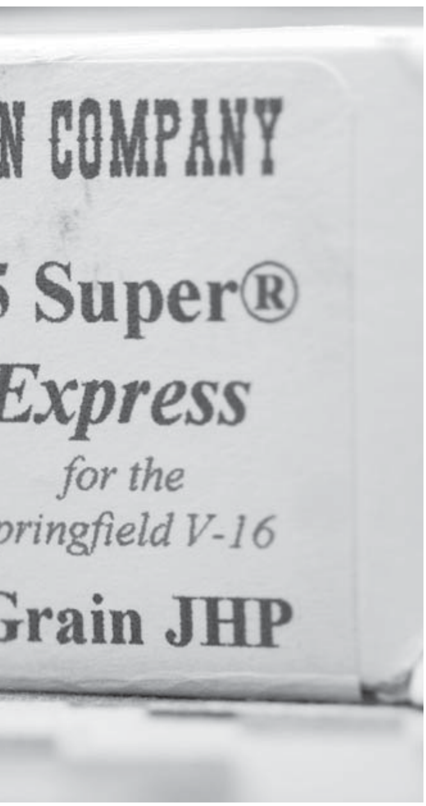
It was a snap back then to boost a 170-grain bullet fast enough to push pins around. We eventually discovered that a Power Factor (bullet weight in grains times velocity in feet per second and drop the last three digits) of 195 was a good threshold for bowling pins. That meant a 170-grain bullet at 1,150 fps. That was a piece of cake to achieve in the .41 Avenger. That a .410-inch bullet of 170 grains at 1,150 fps was a not-inconsequential hunting load was a bonus. Meanwhile, in IPSC competition (there was no USPSA at that moment in time) a Major Power Factor required a 185 figure. Later, it was dropped to 180, 175 and then 165. Even then, USPSA/IPSC Major loads were marginal on pins.

You probably have had to do a Google search to find any mention of the .41 Avenger. It did not catch on and for a good reason. The .41 Magnum offered a lot more room forward of the case mouth than the .41 Avenger did. Most .410-inch bullets therefore were long in the nose and thus unsuited for the .41 Avenger. With only a very few bullets available, it was not widely used. One advantage that the .41 Avenger had over the .45 ACP, one noticed by Frank and that he explored a little more, was the case pressure/gas flow advantages. By going to a slightly higher operating pressure, the .41 Avenger could boost performance over the .45 ACP. The .45 runs at a max of 21,000 PSI, with .45 ACP+P running at 23,000. The case is quite able to handle a good bit more. The .41 could therefore run at about 25,000 to 26,000 PSI and stay safe while delivering extra speed. Why is more pressure better? Compensators or muzzle brakes, that's why. Higher-pressure gas gives a comp more leverage. What's more, the higher pressure allows reloaders more leeway in powder selection. (Pay attention, this is something that will come up repeatedly.) Instead of using a pinch of a fast-burning powder to boot a 230 out the muzzle at a modest velocity, they could switch to a slower powder for the 170s of the .41 Avenger. A slower-burning powder requires more powder (thus creating more gas volume, i.e. pressure) and then when the bullet gets to the muzzle, the gases are at a higher pressure. More gas, higher pressure and the comp really sings. When IPSC competition switched to the .38 Super, the .41 Avenger lost all its advantages and even fell behind. The .38 Super runs at a max pressure of 34,000 PSI. And, being a smaller

Not just a .45 ACP+P, *the .45 Super has more pressure and delivers more velocity.*

cartridge, you could get more in a pistol magazine.

The early 1980s were a time of change. Rob Leatham and Brian Enos lead the way. Their 1911s could hold 10 to 11 rounds of .38 Super versus a .45 ACP (or .41 Avenger) holding only 9. It may not seem like much now, but capacity always matters, and the less of it there is, the more any increment matters. Even more useful was the fast cycling and efficient comps they could take advantage of. For a short while those with .45s tried to keep up. We loaded our ammo with bullets of 152 grains (very hard lead alloy, almost pewter) and switched to slower powders. But in short order we had all given it up, switched to and built .38 Super pistols. The main pistol being used back then for IPSC competition was the 1911. Then and now, you could have a 1911 in a host of calibers that were not .45 ACP. In many competitions today a 1911 in 9mm Parabellum is the hot ticket. In IPSC Open Division, the .38 Super or one of its derivatives (The pressure of competitive advantage has caused eight or 10 different cartridge cases that are all minor variants of the .38 Super to be developed.) reigns supreme. In Limited and Limited 10, the .40 S&W, a derivative of the 10mm, is ubiquitous. For a short while in the early 1990s, there was a cartridge known as the 9X25 Dillon. It was a 10mm necked down to 9mm for the same reasons outlined for the .41 Avenger. It was found to be too much of a good thing. Where the .45 ACP used a pinch of powder and the .41 Avenger used a dollop, the 9X25 Dillon used a shot glass. A .45 ACP might use 4 to 5 grains of powder, while the .41 Avenger used 6 to 7. The 9X25 Dillon used 15 to 18. Yes, the comp was extremely efficient when fed that much powder, but it was so oppressively noisy that even the shooter using it couldn't take it for long. Neither could the barrels, which wore out quickly.



The .460 Rowland *is the king of the power hill in 1911 pistols. It delivers true .44 Magnum power.*

Operating Pressure

OK, someone will look at the options for a .45 ACP, point out that the original pressure was quite low and suggest increasing pressure. After all, powders are better and brass is better, so why not? Well, there is more to it than just peak pressure. The operation of any pistol is mechanical with the various parts acting as levers. If you balance a 5-year-old on a seesaw using a Labrador puppy, you're cool. But if you let the full-grown Lab jump on that same seesaw, you're going to launch the toddler.

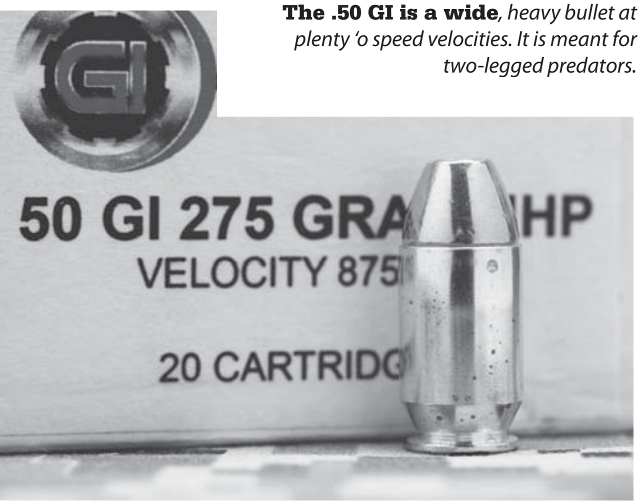
The diameter of the .45 ACP case is .480 inch at the rim. When you fire the cartridge, you pressurize the case to (let's pick a nice, round number) 20,000 PSI. The case rim comprises an area of .180 square inches, giving us a figure of 3,260 pounds of back-thrust. If we build the same pistol as a 9mm, we have a rim of .394 inch and an area of .122 square inches. We can run the 9mm at 34,000 PSI and generate 4,145 pounds of thrust. The biggie here is the 10mm, which has a .425-inch rim with .141 square inches of face, giving us 34,000 PSI and generating 4,823 pounds of thrust. If we assume for the purposes of argument that the 4,823 pounds of back-thrust is the max we can allow in our .45-based firearm, then we can back-calculate the max chamber pressure of the parent case. In the case of the .45 ACP, we come up with a figure of 26,700 PSI.

What if we went with the idea that we can use the extra case strength, say of a parent .308 rifle case, and increase pressure? If we run that new case up to 9mm pressures, we're generating a back-thrust of 6,120 pounds, nearly double our original. If we move up to the low end of rifle pressures, 40,000 PSI, our .45-based case now generates 7,200 pounds of breech-face thrust. Yow, that's a lot!

It's definitely not what I want out of my 45, nor should you. What we do have is a mild increase. Originally, the pressure of the .45 ACP/Auto was in the range of 17,000. That's 3,060 pounds. By bumping that up to 21,000 PSI, the back-thrust becomes 3,780. At the .45 ACP+P pressure of 23,000 PSI, back-thrust is 4,140 pounds, which is the same thrust as the 9mm Parabellum. Back-thrust, and not pressure, is the limiting factor, unless you're going to use a gas-operated mechanism instead of recoil or blowback.

At first glance, *they don't seem big, but the .50 GI rounds are stout in size and delivery.*


GUNCR
INDUS
50
300 GRA
ELOCITY 700
0 CARTRIDG



The .50 GI is a wide, *heavy bullet at plenty 'o speed velocities. It is meant for two-legged predators.*

But in all that time, during all the advances and changes in competition, the .45 ACP never went away, and efforts to make it more than what it is and was never stopped. So, in the order of bullet size and not chronological order, I'll detail the offshoots of the .45 ACP.

.22 Up to .30 Caliber

The smallest we could go would be one of the .14- or .17-caliber bullets, but that is getting to the point of "what the frak were you thinking" when you go looking for barrels. The next step up would be a .22/45, which may or may not be possible. One approach was the .224 BOZ, which used a 10mm, not a .45 case, as the parent case. The .224 BOZ got quite a write-up in the recent past, but nothing came of it. I suspect, from what I read, that the originating company was part of that situation. They are a company based in the UK, and so had either an attitude strange to Americans or were operating under laws we would find oppressive. Basically; no sales of guns, conversion parts or ammo to civilians. And since they patented the cartridge, they wouldn't allow anyone else to produce a reamer. The last part is easy to fix, you simply change some dimension enough that your cartridge doesn't chamber in their chamber, and you're done.

But the 10mm isn't the .45, and that case is our focus. Up from .22 are all the medium-bore rifle diameters: .243, .257, 6.5mm, 7mm, etc. Considering the plethora of diameters and the near-frenzy in rifle wildcatting, I'm surprised that we have so few necked-down .45 ACP case-based cartridges. Once we wade through the thicket of smaller diameter bullets, we get up to the sizes that bottlenecked pistol bullets have been from almost since the beginning, the .30 caliber.

I've never heard of a .45 ACP case necked down to use a .308-inch bullet, like the .30 Luger is a necked down 9mm. ((actually, the 9mm Para is really a necked-up .30.) I guess you could do it, but I wonder just what the result would be. One of these days I'll have to build a barrel for a test-mule 1911 and give it a try. The limitations are much the same as they are for other derivatives—pressure. If you limit yourself to the pressure of a .45 ACP, what's the point? A .30/45 limited to 21,000 to 23,000 PSI isn't going to get you anything more than a .30 Luger would do, probably less. If you boost pressure, you start using some of your safety margin to gain velocity. The way to do it would be to start with a case of greater strength to gain more pressure with safety. Personally, I'd rather do that work using a case made for it and gain some capacity. So, were I trying something like this I think I'd rather shorten a case, say the 7.63 Tokarev down to .30 Luger (or better yet, as a .30 in 38 Super length cartridge) and then use powder selection to run the gun at the 35,000 to 37,000 PSI range. I could certainly get an 86-grain .308-inch or .311-inch bullet up to Tokarev velocities or more, maybe 1,600 to 1,700 fps out of a 5-inch 1911 barrel. I'm not sure you could match that in a .45 ACP parent case without significantly going past the 23,000 PSI limit of the ACP+P specs.

In the end, you'd have a really loud pistol that fired custom-made 7.63 Tokarev-equivalent ammo. What's the point?

One detail that I have to point out when it comes to small-diameter bullets in necked-down .45 cases is length. The severe neck and shoulder you create requires quite a bit of brass, relatively speaking. If your goal is to end up with a loaded cartridge that is the same overall length as the .45 ACP when you're done, you have to start with a parent case longer than an empty .45 ACP case.

9mm/.38

The original was the .38-45, meant originally as a target load. Developed by the gunsmith Bo Clarke and unveiled in Guns & Ammo magazine in the fall of 1963, it was an interesting approach. By using common and easily-fitted .45 ACP pistols (the 1911), a gunsmith could make a .38-45 easily. To a competent gunsmith with a lathe and the knowledge, it is not difficult to get a barrel with half of a .45 ACP chamber and a .38 bore. Indeed, using a common .38 Super barrel, a .38-45 (also known as .45-38 Auto Pistol and .45-38 Clarke) would take a few hours to make. First, weld the 9mm/.38 Super barrel hood up to .45 dimensions and then some.

The .50 GI drops *right into the Glock G-21 platform. In a 1911, you have to have an entire new gun. Get the Glock, or get the 1911, but get a .50.*


AMMO

(The 1911 barrel hood differs in 9mm/Super, 40/10mm and .45 calibers.) Fit the newly hooded barrel to the pistol. Then chuck the barrel in a lathe and use a .38-45 reamer to produce the chamber. The resulting pistol would use .45 ACP magazines, and in the 1960s, .45 ACP magazines could be had for a fraction of what a specially-modified magazine for .38 wadcutter would cost.

Since everyone reloaded in competition, the dies didn't cost much more if any than .45 ACP dies did. Bullets cost a bit less, and since the pistol was going to be gunsmithed anyway, the result was an easy conversion to an accurate and soft-shooting pistol. By today's standards it was a pretty awkward setup, and the recoil and accuracy gains were marginal. But back then, it was enough. The conversion wasn't all that popular for the simple reason any competition modification is not popular: the cost outweighs the benefits. For a dedicated Bullseye shooter, something that gets them 10 to 20 more points is a boon. To the reloader and plinker, points don't matter.

One limitation of the .38/45 was pressure. Loaded with wadcutter bullets, you had lots of bullet sticking down in the case. Try to boost the pressure too much using those bullets, and you started getting real headaches. The long bullet didn't like the higher pressures with the short neck, and you'd blow cases. Using lightweight jacketed bullets allowed you to stretch things a bit, but the case limited the shooter. A 130-grain bullet at 1,200 fps was pretty much the limit, and you could do

The Auto Rim, *on the left, has a fat revolver rim so it will work in revolvers that were made to take moon clips and .45 ACP ammo.*

that in the .38 Super anyway. More velocity wasn't possible without changes. Dean Grennell solved that problem in an elegant manner.

.38 Hardhead

Grennell took the .45 Super case, with its thicker and tougher wall, and necked it down to the .38/45. He then loaded bullets that were not wadcutters, and found he could boost velocities by a useful amount. The result was a round that had not much less recoil than a .45 ACP, but that wasn't the point. He got more velocity, and that made it more useful as a hunting cartridge. That is at least for some hunting. This took place in the mid-1980s and was reported by Dean in *Gun World* in 1987. The stronger case (he used .451 Detonics cases as well as .45 Super cases in development) allowed him to increase velocities while staying within the limits of the brass case itself. He could get a 124-grain 9mm bullet up to 1,500 fps. While impressive, it wasn't much more than what IPSC competitors were doing in the .38 Super case. The big difference was in pressure. Yes, Dean was boosting the parent .45 ACP case with its limit of 23,000 PSI (in the +P trim) up to perhaps 30,000. But the IPSC shooters were taking the parent .38 Super case, with a limit of 34,000 PSI, and running it in the mid to upper 40s. Yes, 45,000 PSI or more.

.38 Casull

OK, now we pull out all the stops. Take the .38-45, make the case stronger still, run the pressure up a bit more and then build a gun to take the work. The .38 Casull (the name of the cartridge and the pistol) exceeds all specs of previous necked-down .45 cartridges. How fast is it?

How about a 124-grain JHP at 1,800 fps or a 147-grain JHP at 1,650? The Casull does it with a 6-inch barrel, a heavy barrel and slide, stout springs and a lot of recoil. Even at that, the empties are hurled an impressive distance. Trust me, you do not want to be in the path of the brass when calling shots for the shooter. They come out fast and hit hard. At those bullet velocities, the Casull makes for a very interesting hunting cartridge. It exceeds the performance of a .357 Magnum. If you consider a .357 Mag. suitable for deer hunting, then the Casull is just the ticket. With a 6-inch barrel and slide to match, it is hardly a defensive pistol. If it was what was at hand at the moment for defense I would most definitely not “kick it out of bed,” but I certainly wouldn’t want to be packing something like that in daily concealed carry.

.400 Cor-bon

After the .41 Avenger and the 1986 shoot-out that left them with dead and wounded agents, the FBI decided that the 10mm was the future. They quickly found out that physics wasn’t a subject that a bunch of Phi Beta Kappa accountants had studied. The 10mm has stout recoil, at least in its more vigorous loadings. The original Norma load was a 200-grain bullet at 1,200 fps. The FBI kept asking for slower and slower loads with less and less recoil (to ensure that all agents could qualify) until Winchester and S&W realized what was up. By the time they got down to 180 grains and 950 fps, there was so much dead air space in the 10mm case that they could shorten the whole thing down and fit it into 9mm-proportioned pistols. Thus the .40 S&W was born. That helps us how, you ask? Simple: the problem the .41 Avenger had was a shortage of suitable bullets. However, if you neck the .45 ACP down not to .410-inch diameter bullets that the .41 Magnum provides, but to .400-inch diameter bullets, the .40 and 10mm provide you with all the bullet selection you need. Unless you load with the heaviest bullets in that diameter, a .40- caliber bullet is stubby enough to be just the ticket.

And so, in 1997 Peter Pi of Cor-bon developed the .400 Cor-bon, using .400-inch bullets and .45 ACP parent cases. The result? The light bullet is a 135 JHP at 1,450 fps, the middleweight is a 150 at 1,350 and the heavyweight is a 165 at 1,300 fps. Why top out there? If you go up in weight, you slide right into the velocities that a +P .45 ACP can deliver, so what's the point? At 185 grains, you can get a factory .45 ACP+P to deliver in excess of 1,100 fps. Why go to the trouble of launching the same weight from a .400 Cor-bon if you can't beat that velocity from a .45? Or at least, can't beat it by enough speed to matter. And when it comes to making bullets expand, velocity is king.

Which is why the loading data also mentions that you shouldn't bother reloading the .400 Cor-bon with lead bullets. Again, what's the point? You get this screamer for the speed, so why lean it out and shoot inexpensive cast bullets at sedate velocities? You could do that without ever changing from .45 ACP.

If the Second Chance bowling pin match were still on, I'd probably have switched over to the .400 Cor-bon for my Pin Gun and my Space Gun. (Maybe even my Stock Gun, but maybe not.) Not because it delivers so much more power, but for other reasons. The power factor threshold we used for pins was 195. A 135 at 1,450 does just that. The 150 at 350 gives you a PF of just over 200, and the 165 gives a 212 PF. No, I can do all that in a .45 ACP, too. But what I can get from the Cor-bon that I can't from the .45 ACP is gas flow. I can use slower powders in the .400, gain the velocity I need and feed the comp. Pin Guns and Space guns had comps, Stock Guns didn't, so why generate more gas for a pistol that can't take advantage of it? More gas, at higher pressure for the comp, and I'm shooting fast on the pins. Could I do it with other cartridges? Yes, the 10mm will do much the same (if half-a-step behind in velocity) but the 10mm can be finicky in feeding, while the .400 Cor-bon is as reliable as the parent case, if not more. I could load used .45 ACP brass for the one-time-use at the match or use .400 Cor-bon brass with several firings on it. If I really wanted to get the most use out of such a setup, I'd have two spring sets for it. One would be the full-power spring for full-power pin loads. The second would be for use in other pin events like the 9-Pin event, where a 9mm equivalent load would be plenty good. There, the same 135 JHP running at 950 fps instead of 1,450 would be perfect. I could even use a cast lead bullet, since I need not run the bullet very fast.

But alas, the Second Chance match is no more, and bowling pin shooting isn't the big deal it used to be. For the matches I shoot, I can use the guns I already have, and have built for, pin shooting.

.40 Super

If the .400 Cor-bon is just too sedate for your needs, then you have to look into the .40 Super. Developed by the now-defunct Triton Cartridge Company, the .40 Super is to the .45 Super case what the .400 Cor-bon was to the .45 ACP case. With tougher brass and a longer case (for capacity) running at yet-higher pressure, the .40 Super gets to the velocity levels that before now one might consider just not possible. I mean a 135-grain bullet going at 1,800 fps, a 165 at 1,600 or a 180 at 1,300fps? The 165 is particularly interesting. The 135 is a real screamer, but how much velocity can it carry to 100 yards? But the 165 is heavy enough to be everything you'd want in a hunting handgun, and fast. If you wanted to launch a 165-grain bullet faster than this, you'd have to seat it in a .308 or .30-06 case, and shoot it from a rifle. A 165 at 1,600 delivers a 264 Power Factor along with 937 ft-lbs of kinetic energy. If your DNR requires a minimum of 500 ft-lbs, you're golden. If it requires 1,000 ft-lbs, then you have to load your own ammo and boost your velocity to 1,655 fps to exceed that particular threshold. You could accomplish that with a bit of prior planning. Get your .40 Super built with a 6-inch barrel. You can have a 6-inch barrel fitted to a 5-inch slide, and the extra inch is certain to get you the 55 fps you need there.

Now, the .40 Super is based on a .45 Super case, but it is not merely a .45 Super case necked down. It is longer than the .45 Super case, running out to a max of .991 inch compared to the .45 ACP/Super at .898 inch maximum. The design takes into account the extra brass needed to form the shoulder and neck, and still be as long as will fit in the magazine and feed reliably. Also, the longer case allows for a longer neck, providing bullet support and precluding bullet setback in feeding. Lastly, the .40 Super case features a small-primer pocket where you can use small pistol primers. Or, if you plan to explore the upper limits of pressure (the .40 Super was spec'd at a 37,000 PSI pressure ceiling) use small rifle primers. To load ammo you'll have to acquire the proper brass, and not go and do something silly like jam .45 Super brass into a .40 Super sizing die. Or something really stupid like taking random found .45 ACP brass, tired from too many loads and left at the range and load that. Get the right stuff, the good stuff and load properly.

The .40 Super came about at Triton with help from Charles Petty and his work on the 10mm Centaur and Charles Burczynsji, inventor of the Hydra-Shok handgun bullet.

10mm Centaur

The 10mm Centaur was designed back in the mid-80s and unveiled in 1988 by Charles Petty, Richard Beebe of Redding Dies and Ray Herriot of Centaur Systems, who invented the Quadra-Loc Drop-In Barrel/Compensators. It was an early attempt to neck down .45 ACP cases to take 10mm bullets. As there was no .40 S&W in 1988 (it didn't get invented and unveiled until the 1990 SHOT Show), the idea was to make a "poor man's 10mm," which avoided the need for expensive brass. In shape it is sort of a long-neck 400 Cor-bon (or perhaps the Cor-bon is a short-neck Centaur) and in his experimentation, Charlie turned out at least two different shoulder shapes. The result was interesting but not really viable. When you consider the cost of reloading dies, a barrel and the load development, someone using a 10mm Centaur drop-in barrel wasn't really saving that much over just buying a 10mm pistol in 1988. However, given that at that time you could buy 10mm pistols from two companies, Colt and S&W, having another option in the form of rebarreling your existing 1911 was not a bad thing.

It did not meet with commercial success, and even a web search turns up little information on it.

.41 Avenger

When shooters think of J.D. Jones, they usually think of impossibly large caliber handguns suitable as backup guns to hunting something escaped from Jurassic Park. But early in his career he developed a hot number for the 1911. The .41 Avenger was simply a .45 ACP case necked down to hold .410-inch bullets. With 170-grain .410-inch bullets meant for the .41 Magnum, you could produce impressive velocities. Of course, if you loaded 185-grain .451-inch JHPs in your standard .45 ACP cases to the same pressures, you'd get pretty much the same velocities. What killed it was the lack of bullets. A single suitable bullet is not a solid base for a wildcat cartridge, not unless it does something no other cartridge can deliver. Also, powders back in the early 1980s were not as suited for high-pressure use in small cases. With many of today's powders you could do more. To get around (more-or-less) the pressure problems, some experimenters cut down .451 Detonics cases or .45 Win Mag cases to give themselves a bit more leeway in pressure control. Today, if you see a .41 Avenger barrel, you're looking at a bit of history and some history you could have fun with. But don't expect much, because the bullet problem still exists.

.44/45

Curiously, no one has developed a necked-down .45 ACP case using .44 Magnum bullets. No .44-45 wildcats exist. And why should they? The bullet weights for the .44 Magnum overlap the weights for the .45 ACP so thoroughly that what advantage is there? The various .38/9mms let you use 124- to 125-grain bullets. The 400 and .40 get you access to the 135, 150 and 165 grain-weight bullets. A .44 Magnum will buy you from 180 grains to 240 grains. Whoop-de-do. Velocities won't be much faster, if at all, in a .44-45 wildcat than they'd be in the parent .45 ACP. Yes, you could up pressures, but you can do that in the parent case and bullet diameter anyway. No, there just wasn't enough of an advantage for anyone to do more than a few paper calculations and write it off. I can't help but wonder also about barrels. You can experiment with a .38/9mm by re-chambering a 9mm or .38 Super barrel. The same goes for a .40-45 and a .40 S&W or 10mm barrel. Where are you going to get a parent barrel with a .430-inch groove diameter?

Let's assume you do solve all those problems, and you find a barrel or make one, fabricate brass with dies, load ammo that fits in the magazines and works and you even boost the velocity a bit from what it might be in a .45 ACP. Consider the bullets you are launching. The 240 JHP or JSP you have managed to hurl out the muzzle at a blistering 975 fps were bullets designed to be fired from a .44 Magnum. They were designed to be fired at 1,200 fps or more. How well do you think they are going to expand, leaving the muzzle almost 300 fps slower than intended? That's right, not very well at all. If they don't expand, then what's the point? Why fire .430-inch diameter nonexpanding bullets when you can be firing .452-inch diameter nonexpanding bullets?

.45 Super

I have to start the section on the .45 Super with another tip of the hat to the late Dean Grennell. He wrote many volumes for his book publisher, then DBI Books (now Gun Digest Books). He wrote much on reloading and quite a bit on gunsmithing, and I read everything by him that I could. He also wrote for *Gun World* magazine, where a lot of his experimenting ended up as monthly column material. Not that I planned it that way, but my first magazine article that ran in a big magazine ran in *Gun World*, and my first book contract was with Charles Hartigan at DBI Books. I now do for *Guns & Ammo* magazine much of the same sort of things Dean did for *Gun World*, and I continued to write for DBI Books through all its various name changes, right on through to this book you are holding now.

In 1988, Dean had a bright idea. (One of many, I might add.) The weak link to improving performance of the .45 ACP was the brass. Yes, you could usefully boost pressure with the existing brass, which is where we now get the +P ammo we so enthusiastically use. But Dean wanted more. So, in straightforward fashion, Dean looked into what brass would fit the rim diameter and exterior dimensions that would be stronger than .45 ACP brass. The first and obvious one is .308/.30-06 brass. But that has a problem. Sure, you can lop off the brass until it is only as long as .45 ACP needs, but by the time you get that deep in a rifle case, you have wall thicknesses so great as to preclude seating a handgun bullet. Who wants to cut rifle cases off and then ream the interior to fit handgun bullets? Only a lunatic or someone so bored with their current schedule that the work of making such brass looked appealing. However, there was another choice, one that had recently become available. It was the .451 Detonics Magnum. At .947 inch in length, it was easy enough to trim the cases down to the max of .45 ACP at .898 inch. Yes, the insides still needed a bit of neck reaming, but nothing like the amount of brass you'd have to carve out of a shortened rifle case.

The result was a useful boost in performance, but nothing like the potential service life or standard velocities of the arrangement had been determined. Having proved the concept, Dean moved on to other projects and left the short .451 Detonics in the hands of a fellow *Gun World* staffer. That duty fell to Tom Ferguson (I was a regular reader of *Gun World* back then, along with all the other gun magazines I could lay my hands on, and read Dean and Tom each month when the magazine came out), who took the project pistol and a bag full of brass and ammo off to Ace Custom Guns. There, they did the gunsmithing refinements needed and also contacted the Hodgdon Powder people for assistance. Dean had worked up his loads through trial-and-error and had stopped when he thought he had done enough. One thing the reloading community has learned through the years is that you cannot develop load data using the same process that is used in rifles.

A slight digression is necessary at this point. A rifle experimenter can work up a load for a rifle by gradually and carefully increasing powder charges and tracking velocity. When the ratio of feet per second gained per unit charge of powder starts to level off, you know you're reaching the limits of what that powder can do. When the bolt handle becomes hard to lift or the primer or case head start to show bright marks from excess pressure, you know you're on the threshold or have begun to exceed it. At that point you back up, and you have the safe limit for that rifle and those components. If you want a longer useful case life, you back off a smidge more, and then load ammo until the barrel wears out. Those steps come in small increments. A .30-06 rifle load might involve 42 to 48 grains. Each one-grain increment (some experimenters step up by half a grain) represents just over 2 percent of the load.

In a handgun, using an 8-grain charge of powder, a 2 percent step up would be a new charge of 8.16 grains. Powder measures just aren't that precise.

Those mechanical warning signs don't work in handguns. The velocity spread from shot-to-shot is too great, and the ratio of velocity gained to powder used is thus obscured. By the time you begin to see typical pressure signs in a handgun, you have gone far beyond the safe and normal pressures for that handgun. In a rifle, operating in the 50,000 to 55,000 PSI range, seeing pressure signs from a test load that is generating 62,000 PSI is a warning. To take a handgun operating at 30,000 PSI and start to see those same signs (and they show up at the same pressure, too) is to realize that you've had a guardian angel on your shoulder for quite some time. Reloaders who use “pressure signs” taken from rifle instructions to make sure their handgun loads are safe, are fooling themselves.

Dean’s loads had been in excess of the 9mm and .38 Super, which have pressure limits of 34,000 PSI. Hodgdon determined that his loads had been around 39,000. Ace Custom Guns, after refining the ammo and the gun, settled on a much more reasonable 29,000 PSI limit for their loads, with some delivering less than that, somewhere down to 26,000. The basic factory specs of the .45 Super thus became a 185-grain bullet at 1,300 fps, a 200-grain at 1,200 fps and a 230-grain at 1,100 fps. Ace Custom Gun then undertook the modification of customer’s guns to the .45 Super specs they had determined were necessary for pistol longevity. The cartridge is so strenuous that not all pistols are suited for conversion. Many are not at all suited, so Ace will and would not convert them. It takes more than a heavier recoil spring and a sacrificial shock buff in your .45 ACP pistol to make it suited for .45 Super use.

As with all things proprietary and sole-source, Ace ran into a problem. The supply of .451 Detonics brass was limited. Once it was all used up, that was it. However, in 1994 Starline was convinced to make a run of .45 Super brass complete with .45 Super headstamp. The Texas Ammunition Company loaded it and ammo was available again. Since they were buying the brass and making the ammo, Ace applied for and was granted a trademark on the .45 Super name. At this point, it became necessary to change markings and writings, and thus it becomes the .45 Super®. Having thus fulfilled my duty in regards to the registered trademark of .45 Super, I will spare your eyes (and my proofreader) from applying the “R in a circle” to every instance of the caliber in this book.

Handgun manufacturers who wanted to offer the caliber to their customers had to arrange with Ace custom to use the moniker, and other ammunition makers who wanted to load the ammo had to come to an agreement as well.

You might ask, why all the fuss? After all, Remington doesn’t bill Winchester on trademark licensing for every cartridge of .44 Remington Magnum (its official name) loaded, right? Smith & Wesson doesn’t collect a fee for each round of .40 S&W, does it? No, but those are choices they make. If they didn’t apply for a registered

You wouldn't think *of it as a .45 ACP derivative (and Glock would protest) but the .45 GAP is really a .45 ACP Short. It runs at .45 ACP+P pressures, though.*

trademark, they can't charge. And even if they did register it, if they don't ask for a fee at the start, they aren't allowed to come back years later and say, "Hey, you loaded a billion rounds of our ammo, we want a penny each, plus interest." Tax and copyright law may seem capricious, but they aren't that capricious.

However, if you copyright, or acquire a registered trademark on something, you are allowed to charge for it from the start. Which is what Ace did.

The cartridge has much use but limited appeal. First of all, and it would seem to be obvious to all, recoil is stout. I mean, a 230-grain bullet launched at 1,100 fps boasts a 253 power factor. Where IPSC competition only requires a 165 for Major and bowling pins only need a 195, 253 is stout. It also slows down repeat shots. However, for those who want the power, there it is. One application I can see is as a bear gun. Loaded with a hard-cast lead bullet with a large meplat (the flat point on the tip) it would penetrate quite well. It would hold more rounds than a revolver and could be reloaded much more quickly. One small hazard is the obvious one. Ammo for the .45 Super will readily chamber in a handgun or carbine chambered for .45 ACP. In an unmodified 1911 government model, a magazine of .45 Super through it may not prove too harsh on your pistol. In a compact 1911 or a similarly compact Glock, the experience might lead to broken parts. If you plan to have a .45 Super and non-Super .45 ACP handguns at the same time, keep your ammo carefully segregated.

.450 SMC

There used to be an ammunition manufacturer called Triton Ammunition Company, you know, the ones who made the .40 Super I mentioned earlier. They made first-rate ammunition. However, the ammunition business, especially in the area of brand new, brand-name ammo, is competitive. Hmm, let me rephrase that. It is competitive, in the way the original pirates of the Caribbean (not the silly movies that distort the time period) were competitive—take no prisoners unless they could be ransomed for a lot of money or were vastly entertaining alive. Kill the wounded and strip the bodies of all profitable assets. Pirates made money until they ate into the profits of those making real money. Then they were squashed like bugs. The profit margins in the ammo business are small, competition is fierce and the marketing budgets needed to survive are huge. So it is not a surprise that a new company with an excellent product didn't make it for very long. But while they were in business, they made excellent ammo and loaded in calibers not commonly seen. As we mentioned in the caliber just before, the name ".45 Super" was trademarked. That meant if you wanted to use the name, you had to pay the licensing fee, as agreed to, by and with the owner of the trademark. Triton and the owners of .45 Super could not come to an agreement. So, Triton changed the case. The primer was changed to a small pistol from a large pistol (a good idea anyway in a cartridge running at the pressures of these hot rods), and they also changed the bunting die. A bunting die is the last operation a cartridge case sees in its manufacturing. The bunting die is used to accomplish two things: It hammers the case head to mark it as to caliber and maker. Also, the impact of the die also hardens the case head and rim, and the work-hardening makes the case in the head and rim area tough enough to do its job.

The specs of the .450 SMC were right in step with the .45 Super. It was a 165-grain bullet fired at 1,450 fps and a 230-grain at 1,150. Reloading data for the Super worked equally well in the SMC. However, the market segment was not large enough for two makers of essentially the same product. And, while the cases were essentially identical, "essentially" isn't good enough when you have two different primer sizes. If you have both brands of ammo on your shelf (as I do), you have to sort empty cases by headstamp and primer size. Otherwise, one stray case of the wrong primer size will bring your progressive reloading machine to a halt.

.460 Rowland

The .460 Rowland was developed by the cable show host Johnny Rowland and is offered by Clark Custom Guns. In design it is simple. Take a .45 ACP bullet at the full length available to the cartridge or rather the standard overall length. Then run a case up from the breechface, past the standard .45 ACP case length max of .898 inch until you have a case that is .960 inch in length. Why? To handle the vigorous pressures you'll be developing? No, to keep someone from getting it mixed up with other ammo and shooting it in a pistol unsuited for it. It perhaps bears a quick repeat of the pressures we're dealing with. The .45 ACP has a max of 21,000, .45 ACP+P is 23,000. The various .41 Avenger, .38-45, .38 Casull and .40 and .45 Supers all run between 21,000 and around 27,000. The Rowland? It runs just over the pressures the 9mm, .38 Super and .40/10mm max out at. That is, it runs above 34,000 PSI. Your gunsmith may be comfortable rebuilding your 1911 to .45 Super specs by putting in a heavier recoil spring, a shock buff and doing some trickery with the locking lugs to slow down unlocking, but he isn't going to get it to run at .460 Rowland specs with those tricks.

What does the Rowland get you? How about these numbers: a 185-grain JHP at 1,550 fps, a 200-grain bullet at 1,450 fps or a 230-grain at 1,340 fps. Read that last one again: a 230 Gold Dot JHP at 1,350 fps. Now, before you dismiss the velocity as so much advertising fluff, I've shot the Rowland. I have a Clark conversion installed in my Wilson CQB and it delivers all of those 1,350 fps. Basically, we're talking the real-world factory ballistics of a .44 Magnum revolver. I'll admit it isn't the J.D. Jones version of a .44 Magnum, but who in their right mind would want to fire a 1911 (or any other pistol, for that matter) that delivered J.D. Jones specs of a 315-grain bullet at just over 1,100 fps? No, if you have an S&W M-29 or 629 or a Ruger Vaquero in .44 Magnum with a handy and convenient barrel length of 4 inches or so, you can count on an honest 1,250 fps from your 240-grain bullet.

I mention the Clark custom in a 1911 because that is the only way you're going to do this correctly. No, you can't just ream out a .45 ACP barrel. No, you aren't going to make it work in a lesser pistol than a 1911. Nothing has the bank-vault like locking strength and durability to stand up to the Rowland. And even then, I suggest you have a competent gunsmith, one who is familiar with the 1911, do the installation.

The Clark conversion includes a barrel with compensator, guide rod, recoil spring & capture cup. You want a complete and consistent lockup on your upper lugs and full bearing of both feet on the slide stop pin. Lacking that, move on to another likely candidate pistol. Oh, and don't even think of taking the comp off. The comp not only dampens felt recoil, it delays unlocking and reduces the slide velocity once it does unlock. Take the comp off and you will have a pistol that will beat itself to flinders in short order. If anything, I'd be installing a more-effective comp if I could find one better than the Clark comp.

For hunting soft-skinned game, the Rowland is great. A 230 Gold Dot JHP leaving your immediate vicinity at 1,350 fps is going to settle the hash of any deer in the Americas. That is, of course, assuming you place your shot correctly. None of this "Texas heart-shot" nonsense.

One might think of it as a bear gun. Well, there is some validity to that line of inquiry, but you have to make some adjustments. First, no handgun is a "good bear gun." A good bear gun is a .338 Win Mag. or a .375 H&H Magnum. But if you're going to depend on any belt gun for wear in bear country, something that launches 230s at 1,350 is not bad. But you have to change bullets. The 230 JHP has to go, and in its place you have to load a hard-cast 230 (or so) bullet with a flat nose. The trick will be finding one with a nose short enough to not be too long when loaded, nor sit too deep in the case such that the case mouth projects past the corner of the bullet nose/shoulder junction. A hard-cast bullet, especially one with a flat point, will penetrate (and the flat nose will make the penetration on a straight line), and with bears you want penetration. Expansion gains you nothing. You want a .451-inch diameter drill, one that will get through muscle, gristle, break bone and get to the vitals. Nothing else will help you, if you find yourself in need of bear help. The big advantage of the .460 Rowland in such a situation is the multiple shots. With a revolver you may not get more than one shot (single-action) or two (double-action), but with a 1911 in .460 Rowland, you can keep shooting at a rapid pace. Not that you are going to machinegun yourself to safety, but when you are launching tepid projectiles (tepid at least in bear terms) then more is better. Also, knowing you can get more shots off allows you to more-or-less-calmly hammer the spot you know you need to hit, the shoulder in an ideal situation.

But the chances of needing such help are very small. Still, if we all shrugged off small chances no one would buy a lottery ticket, wear a seatbelt or buy insurance on their house.

Bigger?

We can't go bigger in the world of .45 ACP, because we'd be making a cartridge where the bullet is bigger than the case or case base it was constructed on. We can make the bullet smaller, but not bigger. To go bigger we need a bigger case. There is such a thing, and it's called the .50 GI, but it has only the most tenuous link to the .45 ACP through its rim diameter. Oh what the heck, a rim is enough. The .50 GI is a new case that takes a .500-inch bullet and does so in the overall length of the .45 ACP. To make the conversion possible, the inventors, Vic Tibbetts and Alex Zimmerman, designed the case to use the .45 ACP rim diameter. That way they didn't have to be making a whole new slide. The result is impressive, but not in the way the .38 Casull or .460 Rowland are. Instead of greatly increasing velocity, Vic's and Alex's design allows for an increase in bullet weight. Greater work performed through mass, not velocity. Where a .45 ACP tops out normally at 230 grains and can be coaxed into bullets of 255 or 265 grains, the .50 GI runs with 300-grain bullets or more. The 300-grain loads run at 700 to 850 fps, while the 275-grain bullet runs at 900 fps. When it comes to thumping upright bipedal predators into submission, a lot of us prefer mass to velocity. Alas, you cannot simply install a .50 GI barrel in your otherwise standard 1911.

You see, the wider case requires a wider magazine, which complicates frame and trigger geometry and so on. You cannot fit a .50 GI into an existing .45 ACP pistol, at least not a 1911. What Vic and Alex did was design a new 1911 that would hold the .50 GI, and which can then be retro-fitted down to .45 ACP. Not to be 1911-centric, they also make a Glock conversion, where you need simply the upper complete and a new .50 GI magazine. There, the task is easier for two reasons. One, the double-stack magazine means you can wedge .50 GI brass into the tube and not have a problem. They just stagger at a different angle. Second, on the Glock, the trigger parts don't go anywhere near the magazine well, so the design does not have to take into account any changes there. (Not that there are any, of course.)

Some You Might Not Think Of: .45 Auto Rim

In 1917, the United States declared war on Imperial Germany, which was a bold move, considering our entire army was less than the size of the Culinary Corps of the French Army of the time. We hadn't fought a real war against a real enemy since we beat Spain in 1898 (which some wouldn't count as a real war). As a result, we were woefully underequipped. The entire U.S. Army owned perhaps 200 machineguns at the time. Those were split among more than a dozen different designs, mostly purchased for study or testing and almost uniformly poorly maintained or even improperly used. We needed arms, a lot of them, and right away. Luckily, we had a massive industrial base (which was nothing compared to where we'd be after WWII) and lots of hard-working, inventive people.

One severe shortage was in pistols. When faced with a shortage of pistols, the French Army solved it in an interesting way. They simply paid the Spanish to make boatloads of .32-caliber pistols. Most fall under the general description as the "Ruby," and they were all Browning-patent (not that they paid any patent fees) blowback pistols, all-steel and durable, if undistinguished. They all worked, more or less, and many of them simply disappeared (along with the soldiers to whom they were issued) into the trenches of the Great War. But I can't imagine doughboys accepting a cheap blowback Spanish pistol as their insurance program. No, they'd want something more, and I'm sure a lot took something more with them. The 1911 was the best, but Colt could not make enough of them, particularly when Colt was also making machineguns 24/7. The War Department let contracts for other makers to produce 1911 pistols, but it would take time to create tooling and set up plants. Colt and Smith & Wesson both had complete lines of production in big-bore revolvers and skilled workers to make them. So, they proposed making revolvers in .45 ACP. The lack of a rim was a problem, because without one you can't get the empties out quickly. And when you've shot or shot at some of a group, but not all of them, getting more ammo in your weapon is a priority. The trick that solved the problem was half-moon clips. By clipping three rounds together, you give the ejector star something to push and allow for quick reloads in the trenches. This worked marvelously. What is a real scream is the selection of half-moons. Apparently they tested clips that held two, three or all six together. However, the machinery to fabricate, transport and pack-up moon clips worked best with the clips that held three rounds. *Voila!* It would be 60 years before someone reinvented moon clips and made full-moon clips, which rapidly took over the revolver competition world. (At least the action shooting part of it.)

Fast-forward a few years from the Great War. Bullseye shooters are using revolvers (pretty much all of them all the time, except when required to use 1911s in the Service Pistol category) and are sick and tired of those damned moon clips. You can tire your fingers or break a nail putting rounds in or taking brass out. The military never worried about taking the brass out, as they issued moon clips stacked flat on three-foot long wooden bars. In fact, hundreds of them on a bar. But Bullseye shooters might only have half a dozen, and needed to swap out empty for fresh. The ammo companies took care of that by making new brass in the way of .45 Auto Rim brass and loading ammo. The new brass has a honking big rim on it. A standard revolver rim is .060 inch thick. The .45 AR rim is .090 inch to fill the .030 inch thickness of the missing half-moon clip.

As a means of getting revolver shooters with .45 ACP revolvers into Bullseye shooting, it is cool. As a means of reloading a .45 ACP revolver quickly, it isn't. Full-moon clips are faster, as the .45 AR ammo requires a separate speedloader, and competition shooters have found that speedloaders aren't as fast as full-moon clips. But as a means of keeping your competition and defense ammo for your revolver separate from your hunting ammo, .45 AR brass excels. You can load the hunting ammo in .45 AR brass, and your target stuff in .45 ACP brass and never worry about mixing the two. After all, you don't want to be tagging deer with your 167 PF ammo, and you don't want to shoot a match with your 215PF ammo.

.45 GAP

Gaston Glock is going to blow a gasket at my saying this, but the .45 GAP is a derivative of the .45 ACP. Basically, it involves shortening the case and seating the bullet deeper into it until you have an assembly that fits in a 9mm/40-depth magazine. It is done much the same way that the 10mm was shortened to the .40 S&W for the same reason. To regain the performance that a shorter case might give up, the .45 GAP runs at what is .45 ACP+P pressure, a listed 23,000 PSI. Now, had Gaston Glock done that a decade before he had, he might well have turned the handgunning world upside down again. In 1993, the .40 S&W was still going through its teething problems. Yes, the police world had started to shift to it in a big way, but there were still a lot of departments in 1993 that had 9mm pistols that were going to eventually go to the .40 but that hadn't yet. If offered in 1993 instead of 2003, the .45 GAP would have stalled, perhaps even killed, the .40 S&W and made the .45 GAP the default law enforcement caliber.

But by the time the .45 GAP was unveiled, the .40 S&W had had all of its problems solved, and the law enforcement shift had already been made. Also, the .357 SIG had been on the scene for a number of years by then so those who wanted performance could have it in a number of guises and not just in a big-bore, heavy bullet package.

Still, the .45 GAP sells well. It also sells to a group you would not expect it to—revolver shooters. Those who shoot .45 in action shooting find the .45 GAP attractive for a number of reasons. First, it fits in full-moon clips and chambers correctly. It should, being only a short .45 ACP case with an odd-sized rim. (It is smaller in diameter by a measurable, but trivial, amount.) Second, the short cases take a shorter distance to fall into chamber and a shorter stroke to eject, thereby speeding reloads. To give you an example of how big a deal that is, at the 2005 IPSC World Shoot held in Ecuador, I shot on the USPSA Revolver Team with Jerry Miculek. The match was 35 stages fired over five days. The stages were anything from eight-shot speed stages to 30-shot field courses. In the course of the match, the Open shooters with their 29-round magazines stuffed full of .38 Super reloaded maybe twice a day. (Reloading during a stage takes time and introduces the possibility of an error, decreasing your score.)

Revolver shooters reloaded almost 100 times that week. That's 100 opportunities to fumble, add time, induce a malfunction and hurt your score. If each reload was shaved down by a tenth of a second because you used .45 GAP brass, you have saved 10 whole seconds in the match. Last, the .45 GAP uses a small pistol primer. Small pistol primers are just a tad more sensitive than large ones, and thus a reloader who hand-seats primers can get away with a slightly lighter trigger pull (all revolver action shooting is done double action) gaining an advantage over his fellow competitors.

Starline

Located in the wilds of Missouri, just down the road from the Sierra Bullets plant, Starline makes brass. Not ammo, not components, just brass. And lots of it in many different calibers. If you are of a mind to load an odd caliber or to make your own wildcats, then Starline is probably the place to go. With what they already make, you can probably fabricate anything else you want or need. However, there may be something you've thought up that can't be made from one of their cases. In which event, you have two choices. You can give up the dream or reach deep into your pockets. If you really have to have a case named after you, and all it takes is a bunting die, no problem. Send a letter to Starline saying you want .45 ACP cases made up with the headstamp ".45 Jones Magnum," and they'll send you a quote as well as the minimum number of cases you'll be buying. What, you don't need 10,000 (or whatever) cases with your name on them? Well, that's what quotes are for. Don't send a check, and they won't make the brass.

For completely custom numbers the problems become more difficult. You see, brass is made by the "cup and draw" process. A coiled strip of brass of a known thickness is unwound in a machine, which stamps out brass "coins," more appropriately just little disks of a known diameter and thickness. These disks go into machines that pound them into cups, which are then drawn longer and thinner until they are case-sized. Then the proto-cases have the primer pockets punched, rims lathe-turned, headstamp hammered and all the while inspected.

Ammunition engineers went to school for quite some time to learn the details of this process, which is used in many other industries with steel, aluminum and other alloys. You see, each caliber requires a certain "coin" size. And then, depending on how big it is, how long it will be and how much pressure the end result has to withstand, each caliber has additional steps of annealing the work-hardened cups, washing off lubricant from forming and oxidation from annealing.

If you want custom brass, they will have to start from square one, or more properly, a new "coin." Then they will need to determine how much they can draw it, how many times it needs to be washed, annealed, etc., before they can send you a quote. A truly custom caliber can be an expensive proposition.

Guns for These Rockets

You have probably noticed a common thread in the stories of these cartridges: the 1911 pistol. As mentioned earlier, the sheer ubiquity of the 1911 pistol, and its basic durability combine to make it the logical choice for much experimentation. I've experimented with a number of calibers using 1911 pistols simply because I have a shelf in the safe of nothing but 1911 pistols. Yes, a Desert Eagle might be a more durable platform for experimenting in things like the .460 Rowland, but where are you going to find a spare barrel to make into a .460 Rowland? And when you find it, what machinist will be able to figure out how to hold it in a lathe to bore it out and re-rifle it? If all you wanted to do was launch .355-inch or .357-inch diameter bullets at the greatest velocity, a T/C contender with a 10-inch barrel in .357 Maximum is a much better choice than a 1911 pistol. But to make a self-loading pistol, hmmm, what are our choices? Not many, and the 1911 is often the best. Or at least most common.

If you go to build a pistol in these calibers, it is best to not be scrimping on things performance or safety related. Yes, you can probably find a cheap 9mm barrel for your 1911 from one of the gun dealer warehouse/wholesaler operations and borrow a .38 Casull chambering reamer, but do you really want to be firing magnum-pressure loads out of it? Buy a good barrel, preferably one originally chambered in that caliber. Get an experienced, competent gunsmith to fit it to your gun, and don't be surprised if he turns down the opportunity to fit it to your worn-white WWI surplus 1911 that you picked up for a pittance at the last gun show.

In the world of experimental gunsmithing and load development, there are things a whole lot worse you can be called than "cautious." Terms like "Lefty" and "White-Cane Charlie" come to mind.

Everything Changes

Everything changes. Everything, that is, except the .45 ACP itself, apparently. The cartridge began in 1910 as a 230-grain full-metal jacketed round nose bullet at a book spec of 825 fps. That produces a power factor of 189.9, which has been viewed as a man-killing load ever since. In the time since then we've gone and made high-tech hollowpoint 230-grain bullets that expand at that same 825 fps, and lighter bullets at faster velocities that expand even more. Frank Paris has gone to the big gun range in the sky. The Gun Room is closed, as is every other gun shop I ever worked at, as well as many of the gun shops I browsed, bought from, visited and spent endless hours discussing guns and ammo at.

Many of the ranges I used to go to are gone as well. One wonders if in the next 50 years (roughly the length of my life so far) those left will recognize the world as anything like what it is now. And a century hence, the lifetime of the .45 ACP so far? I've got to wonder. There was a TV show of great promise that didn't last too long, basically because the executives at that network apparently couldn't run a beer stall in Germany during Oktoberfest. (Hey, not my opinion, but observation from the shows they cancelled, time and time again.) That show was called *Serenity*. Set hundreds of years in the future, it was a frontier show with spaceships arriving at planets where the settlers were scratching out a living. Those future worlds were settled by the United States and China, as no one else could afford to move. So lots of the characters spoke both English and Chinese, and they all carried guns. Hey, future or no, the frontier needs guns. Realistic? I don't know; my job isn't predicting the future, it's writing about guns. I don't doubt, though, that if the political powers-that-be still permit firearms to exist, that some, perhaps even many of those left in the future will be chambered in .45 ACP. The derivatives we've looked over in this chapter, not so much.

CHAPTER 11

Competition with the .45 ACP

You've got a .45 handgun, so now what? What can you do with it besides expend large amounts of expensive ammo making big dirt clods into smaller ones? Why, shoot competitively, that's what. Now you're going to hear a lot of nay-saying from certain circles—the mall ninja crowd, for one. Another will be the "I wuz there" crowd, either the old-timers from Vietnam or the newer ones from Iraq and Afghanistan. Curiously, I find fewer false claimants to being in "the sandbox." I also find that those who were actually there are less likely to claim that "IPSC will get you killed."

Competition will test you *and your gun, as well as your ammo. In the driving rain, this ammo worked. The going prone in the mud, that was a different test.*

I suspect for the former, numbers are part of it. There were at any given time half a million men (and women, although few of them) in Vietnam. Total, some 2.5 million men were there, and while the war was going on some 4 million to 4.5 million men served in the armed forces.

In Iraq, the most at any given time there was 140,000. And those that went have rotated through two, three or four times. The totals just aren't as great. As a result, those who were can spot a faker right away.

As for the latter, a lot of the Special Ops guys (and they are all guys, "G.I. Jane" notwithstanding) have been taught by IPSC grandmasters. The top shooters have been hired by the top units to teach them how to shoot fast and accurately. No, competition shooters don't coach door-kickers on the tactics of dealing with room-clearing. But they do teach how to shoot faster, more accurately and with greater efficiency. An example: An Special Forces trooper races up to a truck as they are taking down a terrorist hideout. He reaches the back of the truck, and there are three guys sitting in the truck holding AKs. He whacks them each in turn with his M4. (Yes, the top IPSC shooters taught rifle shooting, too.) He notices that they don't fall, so he shoots each of the three again. Still they don't fall, so he awards them extra shots. Then they fall. Is it an example of the miserable stopping power of the 5.56 cartridge? No, it's an example of IPSC shooting skills outracing bad guys' realization that they'd been shot. The trooper shot three men, three times, in a couple of seconds. It's no wonder the first guy hadn't fallen.

Now, competition can teach you bad habits, there is no doubt about it; but only if you let it. If you insist on strict adherence to tactical realities (however you define them) then you can use each and every IPSC match to your advantage. You won't win the match, but you'll get the training you want, need or desire. The same can take place through any other competition for that matter.

If the only competition you "enter" is plinking with your buds at the gun club with the loser having to buy the soft drinks, you'll still be better for it.


PRO
EARS
Dimension Plus
ns.com

If you are a chauvinist, *you may want to skip a practical shooting match. The test is of shooting, and you may well find yourself bested by a woman only five feet tall.*

Bullseye

First and foremost among all the competitions is a match that was in-progress before the .45 ACP was even developed. It's called Bullseye. The process is simple and straightforward, as befits the era in which it was developed. You simply stand up, stick a handgun out in front of you with one hand and attempt to place your shots as close to a single point of aim as possible. The details are what make it difficult. In fact, it's extremely difficult if you ask me.

First, the distances are 25 and 50 yards. That's right; one is the distance across the front of a pretty good sized house and the other the width of a football field. The second factor is the time limits. Slow-fire isn't too bad; you have 10 minutes in which to fire 10 rounds. I mean you could practically use the same case and reload it between shots. But remember, you're shooting the same course everyone else is. So you can't give up any points at all in Slow Fire.

Next comes Timed Fire, where you have 20 seconds for five shots, and you do it twice. The last round is Rapid Fire. Here you get a grand sum of 10 seconds for your five shots and then repeat. That's 30 rounds. The rest is simply detail and duplication. You can fire just the 30 or you can fire multiples of 30 up to 90 rounds. You can fire just a rimfire, just any centerfire or just in .45. Or you can fire all three. You can fire all three for 90 rounds each, which is the culmination of Bullseye. At 10 points a shot, the possible total is 2,700. The current record at Camp Perry (the National Championships) for Bullseye is 2,680, meaning the best shooter ever dropped twenty points out of 2,700 possible. "Impressive" hardly begins to describe such a feat.

Bullseye has a number *of odd rules, one of which is you can only hold the handgun with one hand. However, doing so will make you a much better shot than if you don't compete.*

A final test is Service Pistol, which until a short while ago meant 1911s. However, the services changed over to requiring their competitors to use the Beretta M9, as it was, after all, the current service pistol. The 1911 is still allowed in Service Pistol, as it was for a long time the issued handgun, and many competitors are familiar with it and would not want to give theirs up.

As a test of skill, Bullseye is excruciating, exceeded only by Olympic Free Pistol. In Bullseye you have an advantage if you can slow your heart rate like a Buddhist monk. In Olympic Free Pistol you allegedly can't be competitive unless you can stop your heart at will, and defy gravity like a Shaolin temple gung-fu master. However, the Bullseye test is limited: accuracy while handling the power of the .45 in a constrained but not restrictive time frame.


MSA

Not only can you *watch a top shooter like Robbie Leatham, you can compete against him. How many of you have played golf with Tiger Woods lately?*

IPSC

The next step for the .45 ACP is the one in which it is to many ineradicably identified: IPSC. The International Practical Shooting Confederation was formed in 1976 with the late Jeff Cooper at the helm. After all, he had been the one developing the basics of the sport for nearly 20 years before that. Where Bullseye tests accuracy with power, IPSC was designed from the beginning to test all three legs of shooting skill: accuracy, speed and power. If you slacked off in speed or accuracy, your fellow competitors would score better than you would. If you tried to ease up on power, the scoring system would punish you harshly. Many systems have been tried, but the one that works best and seemed the most simple at the start is called "Comstock" scoring.

In USPSA/IPSC competitions, every course of fire is different. In fact, in the beginning, while many individual clubs had courses of fire they would use over and over again, the IPSC rules forbade any club from using the same course in any 12-month period. I was the president of my gun club back then (1981 to 2001), and I have to tell you, trying to come up with a different stage design using the same ranges and sets of props (doors, windows, walls, etc.) had become pretty difficult. Anything to jazz it up was welcome. Traveling to other clubs to see other stages helped. The reason for different stages was to prevent shooters from simply practicing the individual stages until they could do them in their sleep. With a different stage design each match, shooters had to dig down and practice the basic techniques themselves, the building blocks of tactics, and not simply "groove" into the course of fire.

Scoring was simple. You shot the stage until you had engaged all the targets. Your time was noted. You completed the course either when you got to the end of the field course, knocked down all the steel or told the scorer you were done somehow. For a long time, we used a "stop plate" as the end signal. Once you shot that, the timer would kill his stopwatch (yes, that long ago) and you could not shoot again after you knocked it off. Each shooter did the stage one at a time and only once. No alibi reshoots, no time-outs, no going back for a new gun if yours broke. Once the time was jotted down, then the scorer (often the scorer/timer/referee/etc.) would total up the points you gained on the targets. You

The egalitarianism *of practical shooting is unfamiliar to many people. Where else will a world champion, like Todd Jarrett, be standing steel back up?*

could shoot as many times as you wanted, but we'd only score the best two hits on each cardboard target. More shots meant more time, so you didn't want to miss, and have to make it up "against the clock."

With the best two hits counting for score, he'd tote up what you shot. Then note your penalties. Your score would be a calculation: points earned minus penalties assessed divided by the time you took. Basically, it was a points-per-second ratio. Whoever shot the highest ratio (known as "hit factor" or HF) got all the points associated with that stage. Lesser factors were assigned a percentage according to the ratio of their SF to the winner's SF.

An example would be the classic stage called El Presidente. It involved three targets; you draw and fire two shots on each, reload and fire two shots at each again. You got five points for a center hit. If you shot all "A" (center) hits you'd get 60 points. If you did it in 10 seconds (a damn fine time in the very early 1980s) your HF would be 6.00. If someone else did it in nine seconds, but shot sloppily and only gained 50 points, their HF would be 5.55. With 60 Match Points (the number of points you could shoot on paper) available, the stage winner, with an HF of 6.0, got all 60. The other guy got 55.5 stage points.

Practical shooting competition *will teach you bad habits only if you let it. What it will teach you is unconscious competence, and how to perform under pressure.*

Then you would total each shooter's stage points for all the stages, and the total is their match total. The highest point total wins.

Yes, it sounds a bit complicated, but it tests all three factors that make for a good shooter: speed, power and accuracy. Shoot slow, you suffer. Shoot sloppy and you suffer. Shoot a weak caliber resulting in fewer points for each hit and you suffer. Make a mistake, like not pick up a miss with an extra shot, and the penalties would eat up your score.

Where it gets complicated is in volume. In the early 1980s, a three-stage match with 20 to 30 competitors required a bit of time number-crunching with a desktop calculator. I still have the calculator our club bought to do those score totals, and it still works. It took an hour or so, but I had the hour, being single, working late-night radio in an automated station and being there by myself. I could tote the numbers Sunday night, type up the results and have them in the mail Tuesday morning.

Where the system becomes cumbersome is in volume. Now, imagine yourself today, trying to total the scores at a state championship: 10 stages, 175 competitors, two days of shooting. You have 1,750 stage scores to calculate. Then, rank competitors in each stage, assign ratios of stage points and total them for the match. You aren't going to be doing that with a table-top, four-function calculator—at least not in anything approaching a reasonable time frame. No, it requires a computer and software. Then, it becomes a simple inputting process and bingo-bango out come the results.

Technology has also made the scorer's job easier. Electronic timers hear the sound of the shot and display the time since the start beep. No need for stop plates or procedural stops in a course of fire. Your time is accurately registered and recorded to a hundredth of a second.

There is, however, a drawback to the scoring system that makes it difficult for spectators: No one has any way of knowing who is in the lead until all the scores are in. So, unlike, say, golf, there is no way of knowing who leads as the match goes on, how much someone has to do to catch up to beat them and thus it becomes extremely difficult to show in any kind of TV or video format.

While the .45 ACP ruled in the early days, it was supplanted in some IPSC Divisions as the sport evolved. In Open, you now have to shoot a .38 Super or something like it, or you are hopelessly uncompetitive. The .45 ACP pistol doesn't hold enough rounds, and the cartridge doesn't produce enough gas to run the compensators used in that Division. In Limited, .40 S&W rules the roost due solely to capacity. Who wants to use a 13-round .45 ACP pistol on a 30-round field course against fellow shooters using 19-round .40 S&W pistols? Not me, and I love the .45. Limited 10 is a division where it would be competitive simply because (as you might guess from the name) capacity doesn't matter. Everyone is restricted to no more than 10 rounds in a magazine. In Production, every caliber is scored the same regardless of actual power, so there is no scoring advantage gained by using the more-powerful (than 9mm) ammo. You have a recoil disadvantage shooting a .45 ACP, as well. In Revolver Division, the .45 ACP reigns due to reloading. Using full-moon clips, a wheelgunner is faster reloading with a .45 ACP than any other caliber simply due to the dimensions of the cartridges and the chamber spacings.

Last is the Single Stack Division. Made as a solely-1980s (and early at that) Division, it allows only 1911 pistols. You can use other calibers than .45 ACP, but scoring-wise and capacity-wise there is no advantage, so few do.

IDPA

The International Defensive Pistol Association got its start in the 1990s due to the reaction of some against the competition guns of IPSC. Viewing the Open guns and the capacity wars that raged, the founders wondered what had gone wrong. IPSC had strayed from its roots as a martial art, one done with handguns instead of medieval Japanese, Okinawan or Chinese weapons. So, they rolled back the clock, restricted capacity and required (where state law allows) everyone to start with their handgun concealed.

The differences between USPSA/IPSC and IDPA in a nutshell are in IDPA, you'll probably be required to start a stage concealed. You'll not see more than 18 rounds in a stage. (IPSC can be more, in fact much more with 30-plus rounds in the biggest.) You will be required to hang on to your magazines unless they are empty. Then you can ditch them and reload. You can't reload on the move, you must reload behind cover. In some instances, the exact sequence of the targets will be dictated to you, either by the course description or the tactical imperative described.

IDPA guns cannot have extended magazines (indeed, no capacity greater than 10 or holding more than 10 rounds), speed holsters (they have to be "suitable for daily wear"), compensators, red-dot sights or special clothing designed to give a competitive advantage.

Additionally, there is an attitudinal difference: in most USPSA/IPSC stages where you shoot the stage freestyle. (It isn't completely free, as you still have to comport yourself safely, stay within the boundaries of the stage and follow USPSA/IPSC rules.) In an IDPA match, the stage procedure is pretty much choreographed for you. As a result, IDPA has a penalty not seen in USPSA/IPSC: Failure to do right.

If you try to bend the limits of the stage procedure too much to gain an advantage, a safety officer in IDPA will slap you with an FTDR. It costs you 20 seconds. Which brings us to the scoring method—time.

When you shoot a stage, the SO will use the same audible timer used in other matches. He will record your time, and then score your targets. If your hits are all in the center ring of the target, they are all called "zero down." Each hit outside of that ring is an extra half-second or second-and-a-half. So, you could shoot a stage in a blazing 10 seconds. But if half of your 18 shots were out of the center ring, you could have earned between 4.5 and 13.5 extra seconds. Someone else who shot it all "zero down" and did it in 12 seconds will have seriously kicked your butt.

Now, in IDPA, there are only two divisions where the .45 ACP makes sense. Indeed, it isn't allowed in some of the others. The two where it rules are Custom Defensive Pistol (aka: 1911 Division) and Enhanced Service Revolver (aka: the 625 Division Jerry Miculek always wins.)Both USPSA/IPSC and IDPA have the same power factor for Major in .45 and that PF is 165. That way what ammo works for one, will work for the other.

Steel

When it comes to banging and clanging, you have to understand that there are two worlds of thought here: what falls and what doesn't. In the "doesn't" category we have the Steel Challenge, and in the "what does" we have the Handgunner Shootoffs.

Steel Challenge

The idea is simple. Array steel plates, time how fast you can shoot each array and the fastest shooter wins. With seven stages, most of them with five plates, most with five runs (the four fastest count for score) and just a bit under 200 rounds to shoot, the draw is important. Accuracy is important. Lack of recoil is important. The last part makes it real tough for the .45 ACP.

What can salvage things for you is the use of 152-grain lead semi-wadcutters and reloading. A 152 at 900 fps comes out as a 136 PF, which is no different than a 9mm shooter using any load he or she might scrounge up. Capacity doesn't matter, for if you need more than the eight or nine rounds in a 1911, you aren't going to be competitive anyway. As long as your load is accurate and reliable, you're golden. However, be aware that the last man to win the Steel Challenge using a .45 ACP handgun was Jerry Barnhart in 1987. And he worked extra hard to do so back then, because he wanted to prove it could be done.

Handgunner Shootoff

The Handgunner format is simple. You are slotted in a squad composed of people at the same skill level (by classification) and using the same equipment. You shoot on the same arrays of falling plates, side-by-side. The first one to knock down his plate rack and then knock over the stop popper wins the bout. Potential ties are solved via a simple method: the stop poppers are angled to each other, so they overlap when they fall. Whoever's popper is underneath (barring a fault, like leaving a plate standing) wins the bout.

At each stage is a book with an elimination ladder on each page, and your names are entered. You shoot against whoever you shoot against. Win two of the three runs, and you advance. Lose and you sit down. The more you win, the more points you earn. At the end of three days and 15 stages, the one with the most points in their category is the winner.

Let's say you are in the C Class Stock Semi-Auto Squad (a very popular category.) You could be there with 31 other shooters, 32 being the max allowed in a squad. At the very minimum, you will shoot (assuming you have a 10-shot magazine) 300 rounds. That's two bouts every stage. Get two losses, empty your gun and sit down. That's more shooting than you'll do on any other match you enter.

If you do just a bit of winning (and with 31 other shooters, nobody will lose every single bout) you can easily shoot 400 to 500 rounds. If you have practiced, you can win bouts and shoot 1,000 rounds or more—all in three days, all man-on-man and all without a single timer. Then, the category and class winners go against each other, head-to-head until there is one winner left.

The plates and poppers do not need more than a 9mm to knock them down, so you can use the same steel load you used for the Steel Challenge. You might want something a bit stiffer, as some of the plates are slow-fallers for light loads. But you won't need much, and the rest can be soft 152s at 900 fps or 185s at 800.

In all fairness I have to tell you of two drawbacks to shooting the Handgunner Shootoffs. One, you will find it a pretty intense environment. In a regular match you can drift along at your own pace and not be the center of attention. Your score and standings won't be clear until the match is over. In the Shootoffs, your score is known in real time and everyone knows you just stepped up and won or lost again. If you don't like that kind of environment, you won't like the Shootoffs. Second, you don't get your brass back. There isn't time. The more you shoot, the more you leave. So, you do not want to be shooting this match with rare or expensive brass. Luckily, that means it is very well suited to three calibers: 9mm, .40 and .45 ACP. Since this book is not devoted to two of them, you can imagine what the recommendation is for caliber.

Whatever you shoot, your skills will be the better for it. Yes, you can learn bad habits. For instance, there is nothing in either the Steel Challenge or the Handgunner Shootoffs that will teach you about using cover. If, in your plans, cover matters, then I guess those matches won't have much attraction for you. But if you do shoot them, you'll learn speed and accuracy under pressure, which are not bad skills to have.

Whatever it is, get out and do it.

CHAPTER 12

Defense with a .45

OK, after making the .45 your first choice as a self-defense tool, the first thing you have to do is realize that you've set yourself on a hard path. You see, the problem is that what you want to do is not easy. Oh, yes I know, the .45 does not really kick. Anyone can learn to control it. You're right, if you're talking about shooting it from a 5-inch government model. Now, go and pack that 5-inch all-steel gun all day long. You'll need a good holster, belt and a lot of other things in your favor; things like the right physique, proper clothing, an environment where you can get away with carrying it and physical forbearance.

Whatever you carry, *you have to test it.*


SPECIAL FORCES
PERRY, MD USA
4174

When I started carrying, I toted a full-sized 1911. It was all I had. The moment I had a chance to pick up a lightweight Commander, I did. However, I was a lot younger then. I had a 28-inch waist, and the way clothes draped on me I could have hidden a bazooka and not have it "print." I was also a lot more pain and discomfort tolerant than I later became.

Shooting a gun that is easy to shoot is not the same as carrying a gun that is easy to shoot and vice-versa. The easy-to-carry gun is going to be a bear to shoot. Lightweight pocket pistols loaded with

Small guns *will recoil harder, so you have to practice. Once you practice, you learn things like: this one shoots very well. No surprise, it's a Kimber.*

stout defensive rounds are a bear to shoot.

This may seem like a cop-out, but it comes from years of experience: You should carry what you have, while you're looking to carry something better. Get the best holster you can for the gun you are using. It is false economy to buy a cheap, shoddy holster for the gun you have—not all inexpensive holsters are bad, in fact some are quite good—because you'll be "getting a better gun soon" and don't want to "waste" the money.

What you carry depends on what you feel is an appropriate handgun and what trigger and safety system you are comfortable with. Not everyone is happy with a cocked and locked 1911. Not everyone wants to carry a brick-like Ruger or HK.

At every range session, if you have a chance to try a different gun, do so. (You do go to the range on a regular basis, don't you? How else do you expect to become proficient with the life-saving piece of emergency equipment you are packing with you every day?) Many indoor ranges have rental guns. For the range time, a rental fee and often range ammo, you can try whatever you want. That is a good way to learn the ins and outs of a particular model. Everyone in your group may lust over an XYZ, but if you shoot one, you'll know whether it is right for you or not. While not a .45, the Browning Hi-Power is an illustration of that. Some people can shoot them just fine. Me, I love the grip shape, but the unmodified hammer bites me mercilessly—as in less than a full magazine and I am bleeding profusely. Better to find out if a particular .45 handgun treats you similarly while shooting it as a rental rather than after you've paid full retail for it. Blood is hard to wash off completely, and hammer or grip safety modifications can be expensive.

Rarely will any shooter simply pick a handgun, any handgun or especially the first handgun and find it is perfect and stick with it forever. People change, needs change and firearms change or even improve.

Test your gun *with different ammo, to see what it likes and doesn't like. This one gets Hornady or Fiocchi.*


FIOCCHI
AMMUNITION
Extrema XTP Line
Loaded with XTP HP Bullets
50 CENTERFIRE PISTOL CARTRIDGES
WARNING: KEEP OUT OF REACH OF CHILDREN

What should you look for? First of all, fit. Yes, just like shoes. If you pick shoes that are the wrong size you'll know right away. Just standing up, you'll know. It has to fit your hand, and it has to fit your carry comfort and lifestyle. You might not know so quickly with a handgun as you do with shoes. You may have to carry it for a while, even days or weeks, before you figure out that it is the gun that is causing the leg pains and headaches. You may have to shoot it a while, even in matches, to determine that it and you just don't get along. As I've mentioned before, forget all the nonsense about "IPSC getting you killed" and get in some trigger time under a bit of stress. It is far better to discover in a match that your grip safety is only a 90 percent certain to work with your grip style rather than at an ATM at midnight. Plinking on the range you'll get a good grip each time. On the stress of match day, you'll get the grip you get under stress. That's how you find stuff out.

I know I risk sounding like a broken record, and I may even ruffle the feathers of some who are experts or style themselves "experts" in defensive matters, but matches are good for you. Just don't take a match or your full match performance as reality, and you'll be all right.

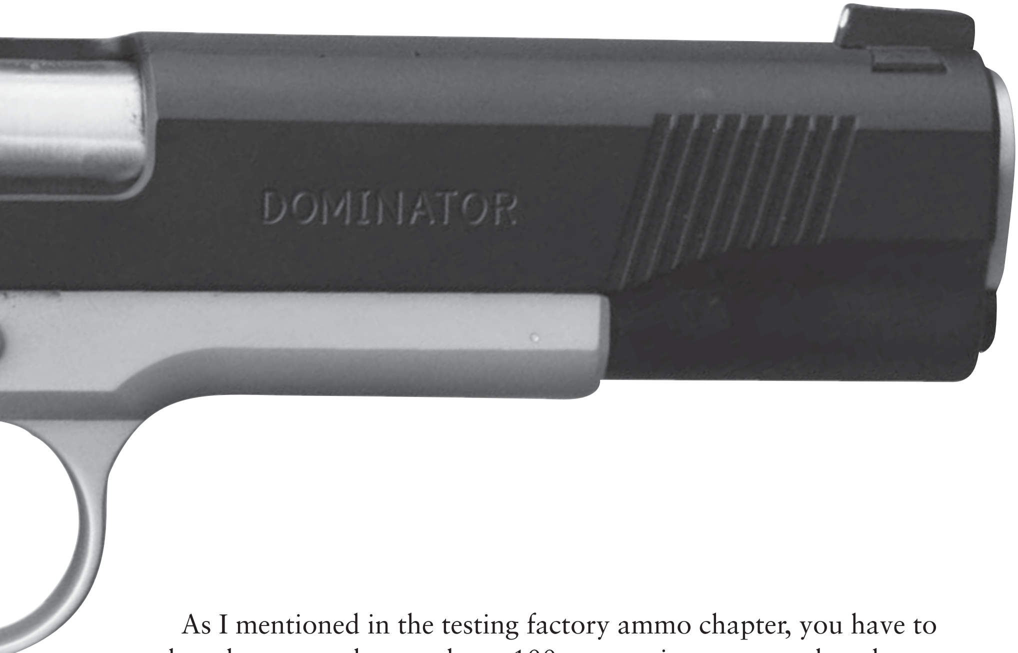
In a match you may find that the vaunted "safety" of a double-action trigger system means you miss the first shot because it is so heavy, and the second shot because it is so light. You aren't really hitting until the third shot. Let's forget for the moment about where those shots go, and what it was you just bought when you hit something with those two "warm-up" misses. You might not get a two-shot running start in an altercation. Again, better to find out on the range or in a match than on the street.

Don't let style, looks or the fashion of the moment steer you from what feels good, works and is comfortable.

Once you have a good handgun and a holster in which to carry it, you then have to go through the selection of ammo process. Yes, the FBI uses "this" and your State Police use "that," but those are just recommendations. If "this" shoots inaccurately in your chosen (and comfortable to carry) handgun, and "that" feeds unreliably, does it matter who else uses them? Not really.

For daily carry *you need a solid, comfortable holster, like this Galco (top) and Langlois (bottom).*

A custom gun *is a comfort, not because it is easier to carry (it can be) but because you know it gives you a higher probability of function and accuracy.*



As I mentioned in the testing factory ammo chapter, you have to select the ammo that works at 100 percent in your gun that shoots accurately and hits to your sights. Luckily, you have a large selection of modern hollow-point designs to choose from. So, what to do? Simple, man-up and pay the cost of testing them. If you are a good enough shot to test accuracy, do so. If not, find someone who is and ask them for help. Or use an accuracy machine like a Ransom rest or Caldwell Hammer. Test a batch for accuracy and point of impact. (We'll test reliability later.)

Keep records. If you ask someone to help, tell them this is defensive ammo. They may want to decline, as having helped you is something they can be asked about should you get in some sort of trouble later. If you're a sensible, rational, reasonably skilled person, you won't have problems. If (and I raise this hesitantly) you find it impossible to get anyone to help you, you might ask "Why?" It may be that you have expressed political opinions people don't want to be stuck with. You may be manifestly unsafe with a firearm. You may be so unskilled at shooting that no one wants to be on the range with you for fear of being infected by whatever "unskilled bacteria" you have.

If you really want to improve your chances of prevailing in an armed encounter, you should do some self-reflection and find out why. Safety, skills, attention span, all can be improved. A poor choice in political opinions can be overcome with reading.

But I digress. Having tested ammo for accuracy and point-of-impact, you now decide which works best. Given a slew of choices in reliably expanding bullets, you can choose according to cost, brand, origins or the color of the box. It doesn't matter much, pick one. Buy 200 rounds of it. Ouch. Save the receipt, and test the ammo in your carry gun for reliability. Better yet, test your gun for point of aim and accuracy, and then don't clean it. That should be 100 rounds or more. Then do the 200-round reliability test. Save all the documentation—the receipt, the test targets, if you went to an indoor range, the range receipt. If you went to your gun club, take a digital photo and save it. And save this book, with a bookmark at this page.

If and when it comes to pass that you get involved in a defensive shooting, you have all the data you need.

"Why did you select that ammo?" they'll ask. The book explains why and how and the receipts show that you did it. It helps here if you know at least one police department that uses the same ammo, but that is gilding the lily. They might even ask, "Why did you select such 'vicious' hollow-point ammo?"

"They all work pretty much the same, many police departments use this and I chose it because it was the most accurate ammo in my gun," you'll be able to honestly and responsibly reply.

"Ah-ha! You selected accurate ammunition so you could place your killing shots with greater deadliness," they might shoot back.

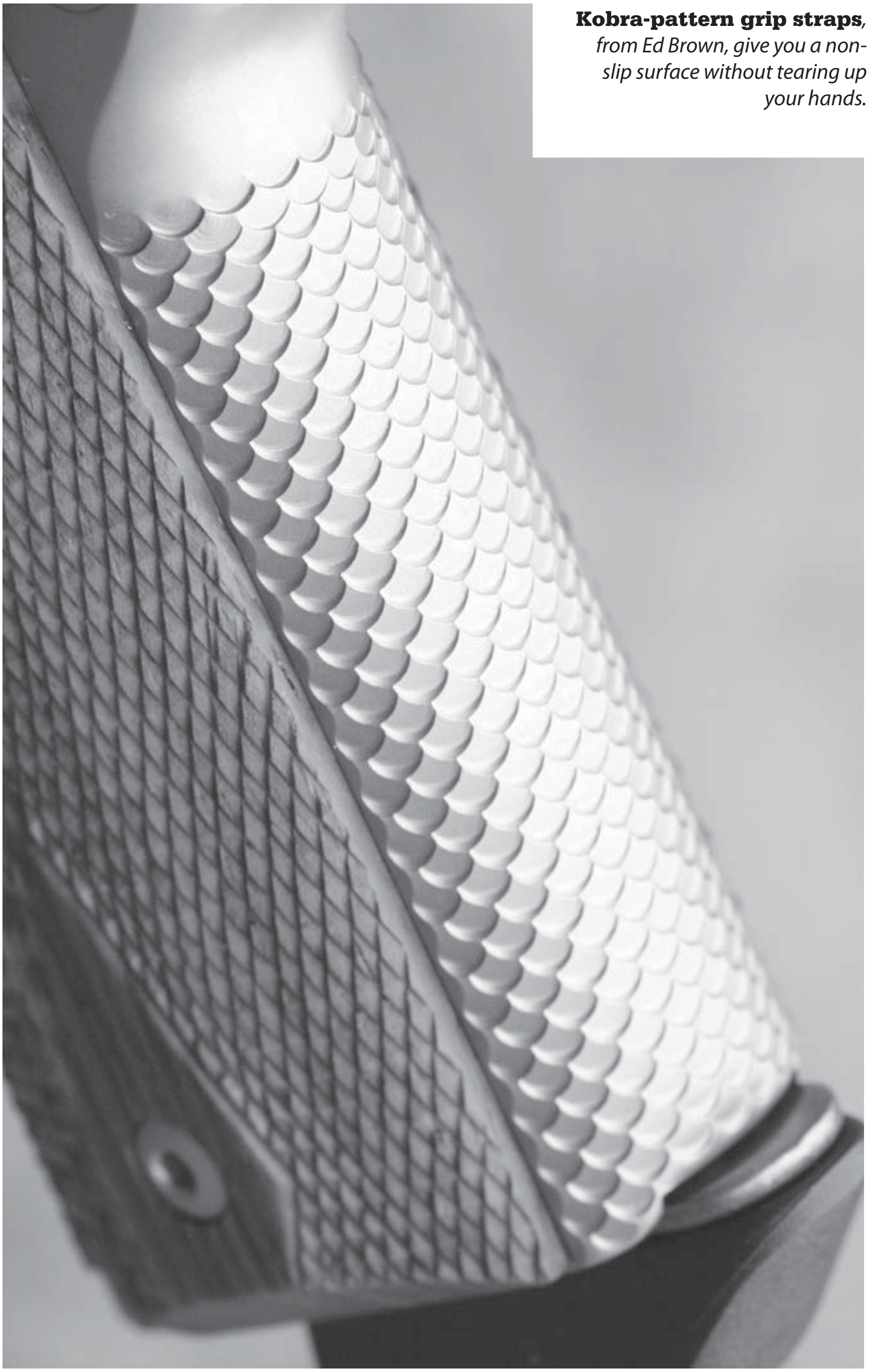
"Actually, no. I didn't want to kill him, I just wanted him to stop what he was doing, Misses don't do that, and they place other people at danger," you can answer.

It probably won't even get that far. If you have all your ducks in a row, when it comes time to make a decision regarding the incident, the prosecuting attorney is going to look things over, decide you were a good citizen involved in a bad situation through no fault of your own and conclude his or her time is better spent on prosecuting actual criminals.

Plain guns *can be good, too. This Para USA GI Expert delivers groups like this with 100% reliability.*

You want to know, *you have to test. And to know for certain takes a lot of testing.*


Speer
GOLD DOT
PERSONAL PROTECTION
MICRO COMPACT
CAL .45
MAGTECH
GUARDIAN GOLD
45 AUTO+P 230 GR JHP
20 Centerfire Cartridges



Kobra-pattern grip straps, *from Ed Brown, give you a non-slip surface without tearing up your hands.*

No, that is not a .45 Auto Rim *on the left. It is a .45 ACP, and is headstamped ".45 Auto" Somehow it slipped by. Think your 1911 will feed that? OK, how well will it extract? Check! Your! Carry ammo!*

Inspect your ammo! *No matter how good, or custom your gun is, it won't work with ammo (factory ammo, too) like this.*

I would be remiss if I did not at this time recommend the time and services of a friend of mine: Mas Ayoob. A lot of people will teach you how to shoot. A lot of people can teach you the finer aspects of custom handgun work and the details that go into it. Few, perhaps only Mas, teaches you how to solve, as the late Jeff Cooper called it "Problem Two."

Problem One is the bad guy in front of you. Problem Two is the legal aspects afterwards. A misstep, or even a misstatement, following a harrowing and entirely lawful shooting, can land you in years of litigation and even prison. Mas teaches a course that covers these aspects, and his course is more involved and longer in length than the instruction one receives in law school on this subject. After all, most lawyers will go on to work on contracts or taxes or divorce law. They only learn enough about lethal force to remember where to look it up if they have to do research and

When you buy custom, *you get performance. These guns are all tack-drivers.*

to learn what the bedrock tenets of the legal code are in that area. Beyond that, most attorneys don't know much more than you do on lethal force.

I can see the puzzlement on some faces. Lawyers not know the law? Of course. Ask a tax attorney about litigation in the environmental area, and you'll get a shrug and an "ask Bob down the hall, he covers that." That goes ditto on any subject other than their own.

So obviously, you should have beforehand the name of a local attorney who covers lethal force issues. Again, I'm not an attorney, nor do I even play one on TV, so take the class, do the legwork, find the lawyer and become a client.

Know the law in your state and city if they have differences. Unless you are someone well-placed like Carl Rowan, you can't wing a teenaged trespasser in your pool and expect to not

For some training, *you'll have to use a non-.45 handgun. This "sims" gun uses paint parkers, for force-on-force training.*

suffer the consequences. Then again, if you've got a close relative who is in the FBI and political friends who will pull your bacon out of the fire, I'd really rather not have you buying this book and putting it on your shelf for all to see.

Some decry that we have to go to all these efforts (lawyer, legal codes, keeping receipts) to exercise a basic right. Those in the "first thing we do, let's kill all the lawyers" camp really ought to know where that quote comes from. It hails from Shakespeare, of course, from one of the Henry histories, *Henry VI*. Having built the power of the English crown, Henry V (the "St. Crispins Day" guy) turns the monarchy over to his son, who is remarkably bad at it. Things devolve to the point where there is a civil war for the crown, and pretenders are both to the right and the left.

Test your ammo, *in your gun, enough to know it works. This may look like "flashy" ammo, but it isn't. The camera just caught it right, is all.*

This retired LAPD *detective is practiced and comfortable with his handgun. If you expect to do well, you have to practice.*

Practice. *This is a 200-yard group. Ten shots, eight hits, and the misses were really close. If you know what you can do, you will be less stressed doing it.*

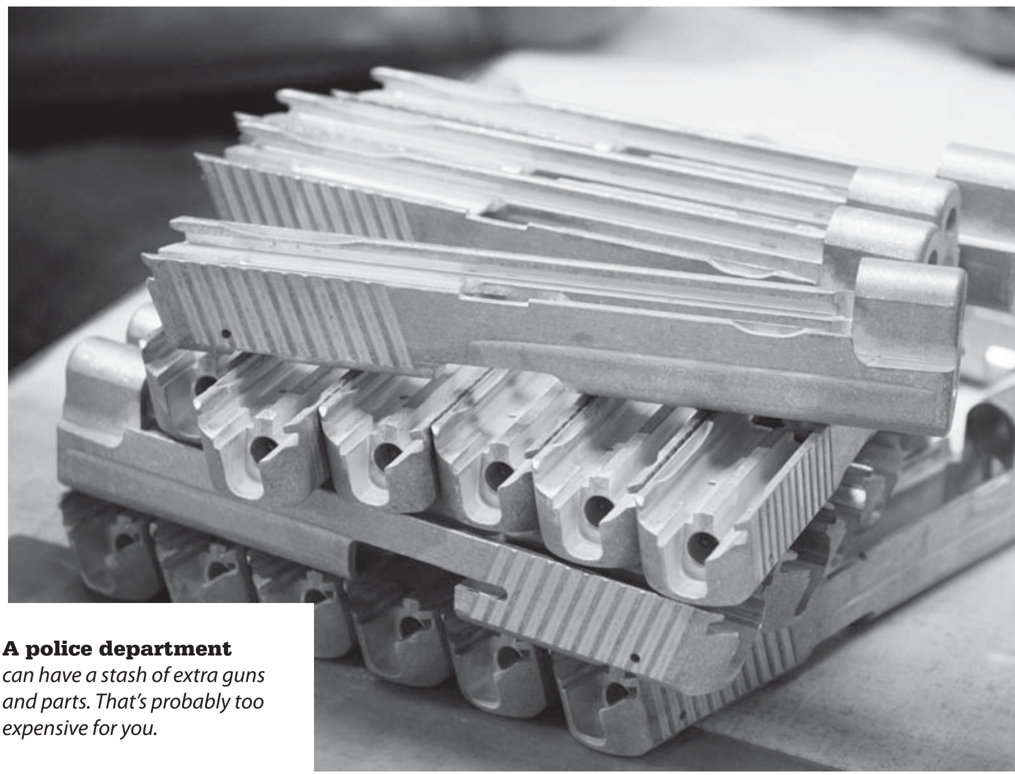
One of them is far off the path. Not even of noble birth, just a rabble-rousing criminal commoner. He baits the crowd into a frenzy with a speech that includes the lawyer quote with the intent to either seize the crown or create enough chaos that he and his henchmen can loot and pillage to their heart's content.

So when you use that line, you are not setting things straight, you're inciting a riot.

A better quote comes to us from *A Man for All Seasons* about Henry VIII and Sir Thomas More. An associate has argued with Sir More that laws ought to be selectively struck down where laws protect criminals. "You would strike down laws in pursuit of the devil?" asks Sir Thomas.

"Yes, I would," proudly declares the associate.

"And then having felled every law in England, like trees in a forest and finding the whole island bare, where would you hide when the devil turns and comes for you?" asks Sir Thomas.



A police department *can have a stash of extra guns and parts. That's probably too expensive for you.*


WARD

Why does the military *go with 9mm? Not to discount this Afghan police officer, but a lot of people think a .45 kicks too much. Photo courtesy US Army.*

Laws protect us all, you have to know what they are, and what you can and cannot exercise under them. Just as you have to know what caliber handgun you're carrying and where it hits to the sights, you have to know the law. If you don't, you're almost as much of a hazard to the rest of us as the criminals you're protecting yourself from.

So, you have a comfortable carry gun, holster, effective ammo and you practice. Now what? Stay alert. Your handgun is not a magic talisman. Your ammo is not an amulet. You have to see trouble coming in order to do anything about it. Stay alert.

You see, the best outcome of any altercation is not to prevail; it is to not be there. You've all heard the old question, "What is the best gun to have in a gunfight?" The real answer is, "Any gun at all will do, and to be someplace else."

Another of my friends covers this quite well in his classes (and yes, you should arrange to attend). His name is John Farnam and he calls it the "not present" defense. If the bad guys are cruising for a victim, and they just plain flat don't see you (you aren't there, you don't look to be profitable enough, someone else looks "better," etc.) then you have won. I'll admit, the poor guy they do select is in for trouble, but that is not something you have a legal, moral or intellectual responsibility for. The police do. The politicians who let him out early or tie the hands of the police or refuse that other guy a carry permit, bear responsibility.

You have to look out for you and your family. If the bad guy's targeting software just slides off you and moves on, good. That's where that comfortable holster helps. If you aren't spotted as carrying, you don't draw attention to yourself.

Which brings us back full circle. Buy holsters. Try them. If they don't work, trade or sell them. Don't let the marginal cost of a new holster keep you from searching for and finding comfort. You see, if comfort is lacking, you will find yourself in one of two predicaments. You'll either be carrying an uncomfortable gun (and thus letting everyone who knows what to look for see that you're packing) or you'll leave it at home. Both are bad choices.

And, on the subject of comfort and packing, let's not forget extra ammo. Not because you expect to be involved in extended firefights, but simply because if you have a pistol, then you are depending on reliable magazines. If you have one-and-only-one magazine, and anything happens to it, you are probably going to undergo a change of status very quickly, as in changing from Mr. Smith to the late Mr. Smith. If you have spares and one goes bad, becomes damaged, lost or dropped, you have options. And if you're packing a revolver, well, even when revolvers were the mainstay of defensive carry, people packed extra ammo.

So find the room and pack spares.

Oh, and don't forget to practice, because in that lightweight, compact pistol you selected for daily carry, the robust, jacketed hollow-point ammo is going to recoil. You don't want to slack off, and have the recoil come as a surprise to you. Of course, having proven that your ammo is reliable and accurate, you can give your wallet a break and practice with 230 FMJ or something else cheap that replicates the recoil, muzzle blast and accuracy of what you carry. Even reloads will work for practice. Just use the real stuff, factory-loaded, in daily carry.

Stay safe, healthy and out of the local lockups. I mean that both because honest citizens should look out for each other. I also want you around to be reading (and buying, hey I'm a capitalist) more books in the future.

EVERYTHING You've Ever Wanted to Know About America's Favorite Handgun Cartridge!

Designed nearly a century ago, the .45 ACP cartridge has earned a well-deserved reputation as a superbly accurate, slap-'em-down handgun cartridge. An honored veteran of two World Wars, Korea, Vietnam and lesser conflicts across the globe, the .45 ACP is now more popular than ever for competition shooting, law enforcement and self-defense.

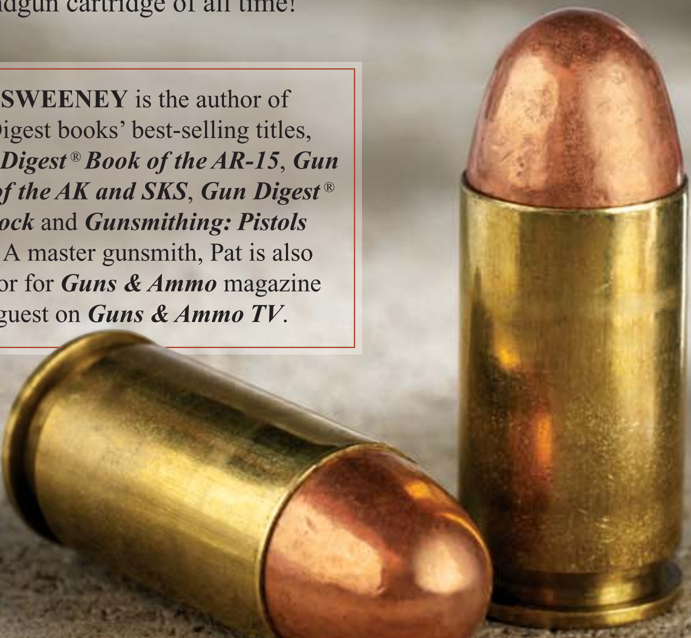
Handgun expert **Pat Sweeney** gives you the inside scoop on America's favorite big-bore cartridge. If you own a handgun or carbine chambered for the big .45 – or if you're considering buying one – you'll find everything you need in ***Gun Digest® Big Fat Book of the .45 ACP***.

It's All Here:

- The origins of the .45 ACP and the guns that use it
- Reloading tips, tricks and techniques
- The inside story of .45 ACP cases, bullets, primers and powder
- And so much more!

It's the best one-volume guide to the most popular big-bore handgun cartridge of all time!

PATRICK SWEENEY is the author of many of Gun Digest books' best-selling titles, including ***Gun Digest® Book of the AR-15***, ***Gun Digest® Book of the AK and SKS***, ***Gun Digest® Book of the Glock*** and ***Gunsmithing: Pistols and Revolvers***. A master gunsmith, Pat is also Handguns Editor for ***Guns & Ammo*** magazine and a featured guest on ***Guns & Ammo TV***.



UPC 0 74962 01000 1

Gun Digest® Books
An imprint of F+W Media, Inc.
www.gundigestbooks.com

Z4204
US $24.99
(CAN $29.99)
ISBN-13: 978-1-4402-0219-3
ISBN-10: 1-4402-0219-2
52499
EAN 9 781440 202193