

Timberland Historical Archaeology Notes:

- 1: Firearms and Cartridges as Historical Evidence in California**
- 2: California Gold Rush Mining and Refining Methods**
- 3: A Brief History of Logging in California**

By:

Brian D. Dillon, Ph.D.

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PREFACE

The three papers comprising the present volume originally formed part of the manual used in the California Department of Forestry and Fire Protection's archaeological training classes beginning in 1994. The papers were written so as to address what was perceived as a need for background information by California foresters who encounter historical sites, features, and artifacts in our state's timberlands on a daily basis. In my opinion, cartridges and other firearms-related artifacts, traces of mining, and, last but certainly not least, indications of early logging, are the three most common forms of historic evidence found in the California backwoods. Curiously, however, while the literature on tin can types is quite abundant and easily accessible, the three technological areas I have written about are much less well represented.

The present volume, therefore, addresses this shortcoming. Responses to all three papers has been most positive in the context of their use as assigned reading for California Registered Professional Foresters, and with the publication of this volume, they should reach a wider audience. Comments, corrections, suggestions, and additions are welcome, with the expectation of future revision.

Brian D. Dillon, Ph.D.

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Timberland Historical Archaeology Notes 1:

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Brian D. Dillon, Ph.D

prepared for:

**The California Department of Forestry and Fire Protection
Archaeological Training Program for
Registered Professional Foresters**

INTRODUCTION

While engaged in a recent archaeological survey of a timber harvest plan in El Dorado County, California, I found myself recording a newly-discovered prehistoric archaeological site unfortunately just burned by a major forest fire (Dillon, 1992). I mapped such features as bedrock mortars and surface artifacts such as manos, pestles, and obsidian bifaces. I also found atop the prehistoric site a few indications of an historic component, in the form of very thin sheets of iron, some glass bottle fragments, and a single shell casing. Did this historic component date to the Gold Rush, or was it simply the result of deer hunters camping at the spot in the 1950's? It was hard to determine the age of the sheet metal and the bottle fragments because, as a result of the forest fire, all were quite badly damaged.

The single shell casing, however, was of a most unusual type, at least in comparison with modern examples I was familiar with: it was quite large, straight-sided, and had a pronounced rim around its base, rather like a giant .22 rimfire casing. Furthermore, where the primer should have been on a modern centerfire cartridge was simply stamped the letter "H", and at two places on the back of the rim, 180 degrees opposite each other, seemed to be hammer or firing-pin marks. A little bit of research and a trip to a local gun shop resulted in a positive identification of the cartridge: it had been fired in a .44 caliber rimfire Henry Repeating Rifle, the predecessor of all lever-action Winchester and Marlin rifles that one usually associates with the "old West". The 16-shot Henry rifle made its appearance in 1862 and within four years was no longer being made; the .44 rimfire cartridge, however, was taken over by the newly-formed Winchester Repeating Arms Company, and was used in their very first repeating rifle, the Winchester Model 1866, essentially a copy of the Henry with a few improvements. The .44 rimfire cartridge was soon abandoned in favor of the much safer (and, reloadable) centerfire cartridge, so that by 1873 the earlier guns, while still in use, were no longer in great demand. I had my answer; the single shell casing could have been ejected onto the site's surface as early as the mid-1860's, but probably not later than the late 1870's. This being the case, the historic component at the site could be dated to at least 120 years of age, well within the chronological period considered "significant" by most historical archaeology yardsticks.

The following year while conducting another archaeological survey of a Sierra Nevada Timber Harvest Plan, this one in Calaveras County, California (Dillon, 1993), at yet another ostensibly prehistoric archaeological site, in addition to the midden deposit, bedrock mortar boulders, and surface lithic artifacts of obsidian, chert and granite, I found a partially flattened lead bullet eroding out of the side of a small drainage channel. No shell casings were encountered at the site nor in its vicinity, and in fact the bullet was the only historical artifact found at the site. The condition of the projectile -its surface highly patinated, the lead quite soft, unlike many modern "hard" lead bullets, and some evidence of rodent gnawing present- argued against its identification as recent. Although distorted from impact, no trace of a cylindrical basal portion could be found on the flattened bullet; consequently it must have originally taken the form of a round ball of the type common to the muzzle-loading rifles and pistols of the California Gold Rush period. The reconstructed diameter and weight of the bullet, similar to that of distorted .45 ACP slugs, seemed to indicate that it was probably originally fired from a .44 caliber cap-and-ball pistol.

Calaveras County formed part of the heartland of the Gold Rush's "Mother Lode" Country, and was one of the first areas prospected by miners in 1848, a full year before most "49'ers" arrived. Certainly, with boomtowns such as Angels' Camp and Murphys a short distance downslope from the archaeological site in question, and tens of thousands of prospectors swarming over every creek and stream searching for gold by 1849, we may not be too far wrong in concluding that the flattened lead bullet recovered from the archaeological site may have been fired by a miner at a California Indian over 140 years ago. Contemporary newspapers and diaries are full of accounts of miners or other gold camp hangers-on blazing away at each other with pistols at close range, frequently with fatal results. The 49'ers, quick to shoot each other under the flimsiest of pretexts, were even more prone to intimidate or even murder Indians when the opportunity arose. While clashes between prospectors and the local California Indians were so common as to have been endemic throughout the California Mother Lode country in the late 1840's and throughout the decade of the 1850's, the discovery of the flattened lead bullet brought home how much of a tragedy the Gold Rush was for the California Indians in a way that no amount of written history could. The Calaveras County bullet was the latest artifact found at what was the most impressive site in the entire drainage, and its appearance, not coincidentally, was contemporaneous with that site's abandonment.

The small bits of detective work I did in the two cases mentioned above revealed the near-total lack of any single reference work usable for the identification of bullets, cartridges, or firearms as these might be encountered in historical sites in California, and ultimately led to the writing of the present paper. Some outstanding historical archaeological writing has either argued for an increased awareness and use of such evidence (cf. Russell, 1957; 1967: 387-401) or used it to good advantage in projects perhaps best described as forensic historical archaeology (cf. Scott, et. al, 1989). Russell, perhaps the most eloquent spokesman of the school of historical archaeology developed by the US National Park Service, writes, however, primarily about the fur trade. The fur trade while undeniably important in California for a few decades, was nevertheless completely overshadowed by later events and its characteristic firearms quickly rendered obsolete. Scott and his associates have studied a single important historical event, using classic archaeological methods; the 1876 Battle of the Little Big Horn, for which of course no eyewitnesses survived so as to describe the tactics or command decisions of the losing side. Unfortunately, such examples of meticulous research and exemplary publication of firearms and firearms-related artifacts as historical evidence are the exception, not the rule.

Investigating the subject further, I found that despite much recent writing by historical archaeologists on such arcane subjects as tin cans, bottles, horse-harness, and that old favorite, barbed-wire varieties, few historical archaeologists, at least in California, have specifically dealt with firearms and firearms related materials as archaeological evidence. This may be partly explained by the fact that much historical archaeology, as practiced in California, is essentially "urban" archaeology, and consequently seldom the setting of much firearms use. It may also be the result of the present situation in California where academic archaeologists and historians profess little interest in firearms because it is politically "incorrect" to do so. Given the normal level of interest in lithic projectile weapons evinced by the average prehistoric archaeologist, it is somewhat surprising if not perhaps hypocritical that a similar interest in weapons of the historic period (i.e.: firearms) has not developed along parallel lines.

On the other side of the coin, I have been told by several students and even by some faculty members that firearms are not worthy of serious historical archaeological study because most information relating to them is already common knowledge. Such "common knowledge" on the part of most Californians (students and academics not excluded) is often derived not from personal familiarity with historical weapons, nor even from long hours in the library, but from mass-media entertainment sources, which in this country, are undeniably "gun-happy". Unfortunately, Hollywood is hardly a reliable source of information on the history of firearms technology. I grew up in a household where as children in the late 1950's we were encouraged to spot Hollywood historical errors, the most common, of course, being Winchester Model 1894 lever-action repeaters showing up on TV or in Movie "horse operas" purporting to take place in the 1880's, 1870's, or even 1860's. While a concern with historical accuracy has increased in recent years, Hollywood nevertheless continues to perpetuate firearms history errors. For example, the 1993 Clint Eastwood film *Unforgiven*, set in 1880, contains a line of dialogue in which members of a vigilante posse are concerned about reimbursement for expenditures on .30-30 shells, a round which, of course, will not be invented for yet another 14 years.

Anyone with an interest in history knows that firearms technology changed remarkably during the 19th and early 20th centuries: what is perhaps less appreciated is the fact that specific changes can be precisely dated. Often the various kinds of firearms evidence found at historic archaeological sites can be related to specific periods or even events and, consequently, can serve as very useful chronological and even cultural indicators. Knowing how to identify and to date firearms-related artifacts is particularly important for foresters for a very good reason. California's timberlands have been, from the very earliest introduction of firearms, a prime locality for their use: after all, hunting is often the second most common use of forest lands after timber harvesting. Evidence in the form of spent bullets, gun flints, percussion caps and, latest and most common of all, cartridge casings, can be and is commonly encountered in forested settings. Many California foresters, working as they do in the woods where hunting and much target-practice takes place, are already quite familiar with the arms and cartridges discussed in this paper; conversely, many if not most California archaeologists are not.

The purpose of the present paper, then, is to expose the average forester or archaeologist working in California to a body of historic evidence that he or she may not have been previously conversant with. Given the lack of any single basic reference work and the continuing supply of misinformation from popular sources, there does seem to be a need for the present offering. Despite the current fascination of historical archaeologists with early urban centers such as San Francisco, Sacramento or Los Angeles, the earliest historical archaeology in California is (or at least should be) often that of *Presidios*, rural ranches and the long-abandoned camps and boomtowns of the Gold Rush period. All such historical contexts would be inconceivable without firearms present in some numbers and diversity, and none of them can be studied with any hope of completeness if firearms and firearms-related artifacts are ignored as historical evidence. To my knowledge, the present paper is the first specific reference guide to historic archaeological firearms-related evidence which may be encountered in the field. It is intended as a means towards the identification and interpretation of such evidence, and an objective source for determining its significance rather than as an all-encompassing encyclopedic work on the subject. As this study is the product of ongoing research, additions or corrections are welcome.

HISTORICAL OVERVIEW

After perhaps some 12,000 years of American Indian residence, the arrival of Spanish, Portuguese and Mexican *Criollo* (or New World-born) *Conquistadores* and explorers in California in the 16th century ushers in the Historical Period. In California the historical period is customarily divided into the following chronological subdivisions:

Protohistoric	1542-1769
Spanish Colonial	1769-1822
Mexican	1822-1848
Anglo-American	1848-present

While such divisions have chronological validity for the state as a whole, and their names, based upon the dominant political force of the period, are generally accepted nationally and internationally, it must be remembered that in many parts of California, including much of Northern California and essentially the entire Sierra Nevada province, the historical period "arrived late", and the four successive periods noted above were not in every case represented. More importantly, naive historians, as well as most present-day Californians, tend to assume that during the Spanish period, all non-Indian inhabitants of California were Spaniards- i.e., white Europeans, that during the Mexican period the population changed to a *mestizo* or mixed Spanish-Indian group, and so forth and so on, and this of course is a great oversimplification. Just as we can characterize the demographic situation in California during each successive period, we can also characterize the kinds of technology current within what is now our state, including the level of firearms development.

THE PROTOHISTORIC PERIOD

California takes its name from a 15th century Spanish novel by Garci Ordenez de Montalvo entitled *The Exploits of Esplandian*, in which the hero engaged in chivalrous ventures on a mythical island ruled by the black Queen *Calafia*; the people of the kingdom were supposed to be *Amazons*, or female warriors, and their weapons were of gold (Jackson, 1970: 3). The first European to see California (albeit *Baja California*), and perhaps to use the name, may have been Hernan Cortes, the Conqueror of Mexico himself. In 1535, less than 20 years after his conquest of Aztec Tenochtitlan, Cortes, with a party of over 300 soldiers, reached the western coast of what would become Sinaloa and Sonora, on the eastern side of the long, narrow gulf fed by the Colorado River to the north: this narrow body of water would be named the Sea of Cortes by the followers of the great *Conquistador*. California would remain, however, the most neglected and little-valued possession of Spain for nearly 250 years, only colonized after other European powers expressed an interest in it.

The first European to visit what would later come to be known as *Alta California* and to have contact with local Indians was Juan Rodriguez Cabrillo, in September of 1542 (Cabrillo, 1929). Cabrillo was followed by a handful of other Spanish visitors over the next 220 years, all of them coming by sea, some accidentally, such as Sebastian Cermeno and his Manila Galleon, wrecked on

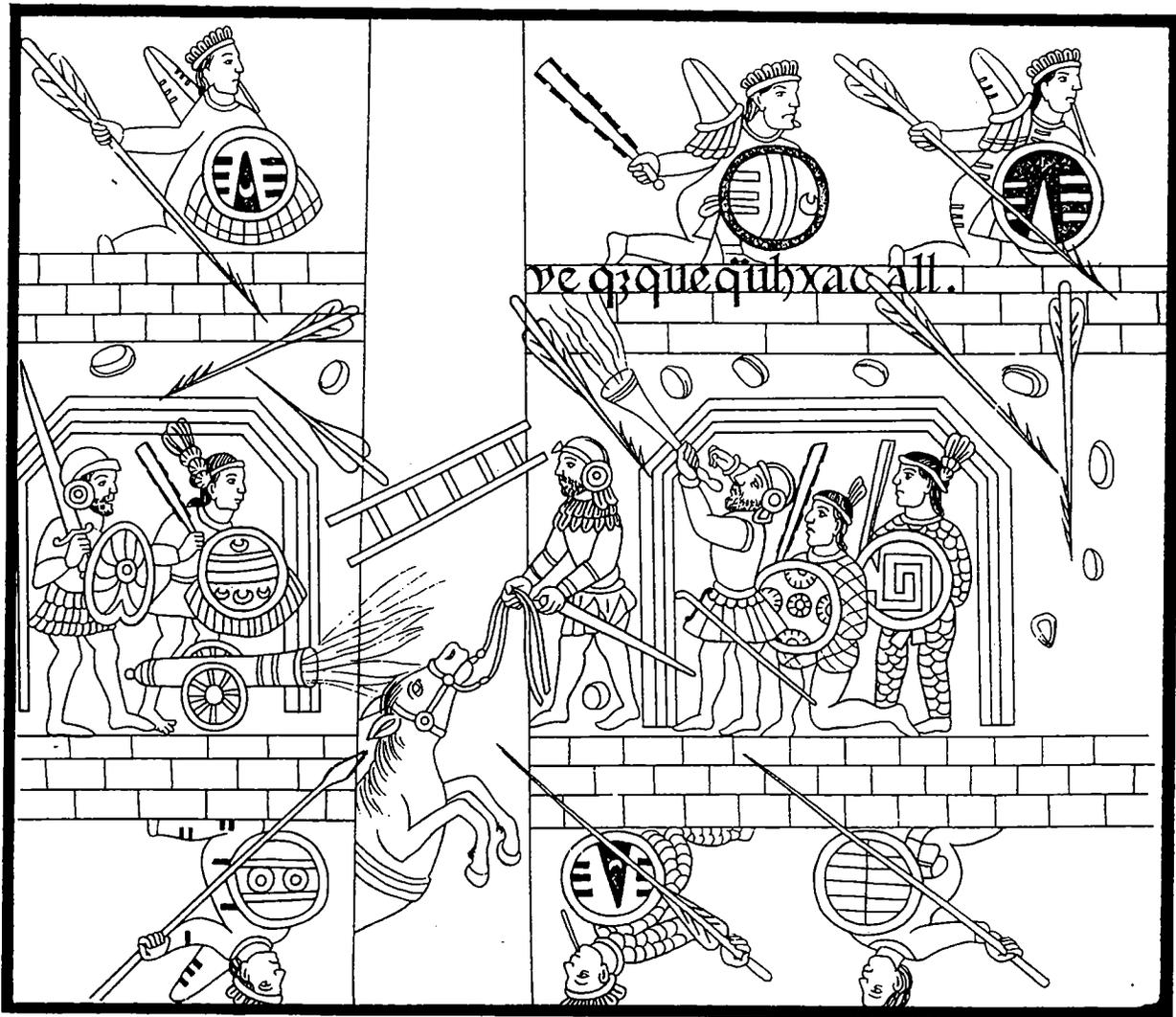


Figure 1: The earliest effective use of firearms in the New World was by Cortes' army in its conquest of Mexico, 1519-1521. In this drawing, Lamina 17 of the Lienzo de Tlaxcala, circa 1550, Spanish soldiers and Tlaxcalan auxiliaries hold off attacking Aztec warriors with artillery (left) and hand-held arquebus (right) on June 30, 1520, just prior to the Noche Triste, in which the Aztecs drove the Spaniards from their capital, Tenochtitlan. Within 25 years similar weapons would make their appearance in California.

the Point Reyes Peninsula in 1595, others intentionally, such as Sebastian Vizcaino in 1602. None of these Europeans came to stay, and their impact was negligible.

The Spaniards considered the Pacific Ocean a "Spanish Lake" between their Central and South American colonies and their holdings in the Philippines; to a very great extent up to the mid-18th century, it was. But English explorers had invaded "Spanish" waters as early as 1579, when Francis Drake landed, probably in what is now Marin County. Two centuries later, the Portuguese,

English, French, and even the Dutch were sending ships to the Pacific Coast of Asia while the Russians were establishing outposts in Alaska and even exploring the Pacific coastline as far south as northern California.

All of the European visitors to California during the Protohistoric Period came with firearms: it is not recorded to what extent these were used, although we can assume that demonstrations were held so as to inspire awe in the local Indian populations and contribute to European prestige and superiority. These first firearms to appear in California were the almost ludicrously clumsy and inefficient *arquebus* or matchlock guns which so impressed the Aztecs of Mexico and the Incas of Peru, but which actually did so very little damage to them. Before the invention of the matchlock, the burning end of the match had to be held in the fingers and pressed against a touch-hole at the base of the barrel so as to ignite the powder charge inside just as larger cannons were fired (Figure 1). Such guns were the earliest to appear in Europe, having arrived in the 1320's (Blackmore, 1985: 5), and all of course made use of gunpowder, a Chinese invention then at least a thousand to 1500 years old.

The falling hammer matchlock action was invented sometime in the late 15th century, and by the first quarter of the 16th no European army was without them. The advantage of the falling hammer matchlock was that now its user could actually take the time to aim along the barrel and possibly hit something he was aiming at, rather than concentrating on getting the match to the touch-hole and still hanging on to the gun once it went off. The best eye-witness account of the use of matchlock guns in the New World is supplied by Bernal Diaz del Castillo (1957), whose *True History of the Conquest of New Spain*, one of the greatest works of literature produced in the Americas. Cortes began his conquest with only 13 such guns, but by its end two years later nearly 70 were in use, along with small cannon mounted on wheeled carriages. Europeans introduced matchlock guns not only to the New World, but to Africa and Asia as well. Matchlocks of Portuguese or Dutch design became so common in Japan that they threatened the existence of the Samurai class of professional soldiery and even the entire feudal system of government. The guns were eventually outlawed and the foreigners who had introduced such "technological poison" were banished, effectively closing Japan to the west for the next two centuries. Matchlocks of Portuguese design quickly became important to the growing African Slave Trade, and were carried by Arab and African slavers long, sometimes centuries, after more modern arms had been developed in Europe and North America.

The 16th and 17th-century matchlocks were completely non-standard as to caliber, barrel length, range and accuracy. All were smoothbores, and most were carried with either a forked stick or a forged iron rod with "U"-shaped element at its top to rest the gun on while it was being fired (Figure 2). The guns had bores around the size of a modern 10 gauge shotgun, roughly .90 caliber, were charged with around an ounce of black powder and, when they were not firing a load of shot equivalent to modern "buckshot" size, fired a cast ball of which a ten or a dozen would account for a pound of lead. Essentially small caliber, portable hand-cannons, the Spanish and English matchlock guns produced very loud noises, lots of black smoke, and fearful wounds if their operators were lucky enough to get human targets to stand still close to their muzzles. Gun practice was standardized at around 100 paces (i.e.: 30 yards). Matchlocks were probably most effective within 50 yards and probably were useless beyond 100; at best, perhaps one aimed shot out of 5 went where it was supposed to. This was often not of great concern, however, as most

Figure 2: Dutch soldier with matchlock smoothbore, forked gunrest, powder flask, and sword, circa 1600. Spanish versions were similar due to Spain's occupation of the Netherlands in the 16th century. From Peterson, 1962: 36.



were loaded with lead shot and intended for use as scatterguns on massed targets (i.e.: crowds). Spanish matchlocks weighed between 15 and 20 pounds; soldiers carrying them routinely placed a small pillow on their shoulder first so as to ease the burden of carrying them around.

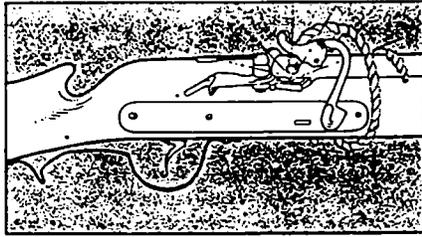
All matchlock guns were fired by a burning rope, fuse or "slow match", often impregnated with saltpeter or nitre. The "match" was lit by flint and steel and kept alight by constant blowing. These guns had rudimentary trigger mechanisms and falling hammers either powered by weak springs or simply by gravity. The end of the burning match was either fed through or clamped to the hammer itself. The hammer was aligned with a priming pan or touch-hole at the base of the barrel against which the burning match end was mashed when the hammer fell (Figure 3), setting off the charge. The burning match had to be protected at all costs, and matchlock guns were completely useless in wet weather. The more elaborate matchlock guns had tunnels, usually brass-lined, bored through their wooden stocks so that the match or fuse could be fed through and kept both dry and out of the way when not in use. Experienced *arquebusiers* or *fusiliers* (from *Fusil*, ultimately from *fuse* or *match*) carried pre-measured powder charges in small bottles suspended by loops from a bandoleer; they could reload the guns in under a minute, and when trained to fire in unison, could deliver a *fusillade*.

Matchlocks, which demanded one's full attention and both hands for proper functioning, were from the outset developed for foot-soldiers, and, consequently, from their first appearance in Europe, were associated with private soldiers rather than with officers or upper-class cavaliers, who normally fought from horseback with swords and were protected by body armor. By the middle 1500's, however, the "democratizing" effects of matchlocks fired by peasant foot-soldiers not only at each other but also at aristocratic cavalymen had been felt to the extent that full body armor had become completely obsolete as even the most low-powered guns could penetrate it. More importantly, the horsemen themselves were now demanding their own firearms as well. Needed was some kind of gun that could be fired from horseback, and, of necessity, controlled with but a single hand while the other held the reins: the solution was the wheel lock pistol, which owed at least as much to 16th century watchmakers as to gunsmiths.

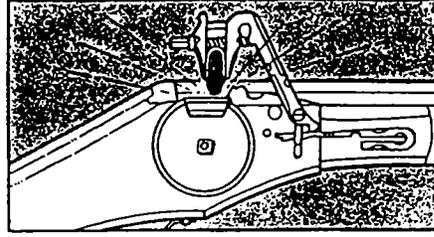
Wheel locks incorporated an iron wheel of small diameter mounted on the side of the barrel's base with its rim just beneath the touch-hole penetrating the barrel wall to the powder charge. The most elaborate wheel lock guns had priming pans and made use of fine-grain ignition or "priming" powder: their wheels either penetrated this pan or protruded slightly above it, forming its outer boundary. The wheel, which had rough serrations on its rim, was powered by a concentric watch-spring, was wound up with a key, and held in place by a ratchet just like the pocket watches of the period. The falling hammer, usually in front of the wheel, now had a screw-clamp or small vise in its head: clamped tightly within this holder was a flat piece of iron pyrites. The falling hammer was aligned with the spring-powered wheel (Figure 3). When the trigger was pulled, a ratchet released, the wheel began to spin, and the hammer fell, forcing the iron pyrites against the rough serrations of the spinning wheel, and setting off sparks which, hopefully, ignited the powder charge.

The wheel lock, because of its many moving parts, was difficult to make and maintain, somewhat delicate and consequently expensive. From beginning to end, these were guns for the wealthy, not for the common soldiery. Their great advantage, besides being manageable from horseback in their form as the original horse-pistols, was that they could be loaded and then used at any later time, hours or even days later, unlike the matchlocks, which required minute-by-minute attention for maintenance of the burning match. By the final quarter of the 16th century, in Europe at least, wheel lock pistols had eliminated the earlier disadvantage mounted soldiers had against foot-soldiers armed with matchlocks, and most horsemen carried them in addition to their swords. Never popular as long guns, nevertheless some old matchlock shoulder arms were converted to wheel lock actions.

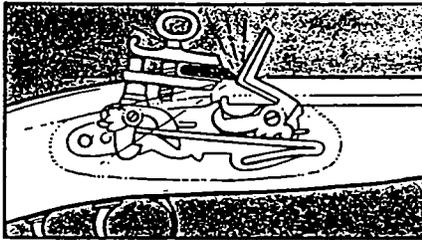
Wheel locks were, however, much slower to reload than matchlock guns, so mounted noblemen sometimes took to carrying them in pairs. European wheel lock guns, even at their best, were quite complicated and frequently misfired; they were heavy and prone to breakage, and for these reasons they never appeared in the New World in any quantity. In the New World, few if any wheel-locks were used except perhaps by the highest governmental officials such as Viceroy's, or by the captains and officers of the Manila galleons making their landfall (hopefully) at Acapulco. Some were known to have been used in Central Mexico, a few were present as far north as New Mexico, but none probably ever reached California. Consequently, throughout Spain's New World colonies, the old and completely obsolete matchlocks continued in use, in some cases even a hundred years past the time that more modern arms had replaced them in the mother country.



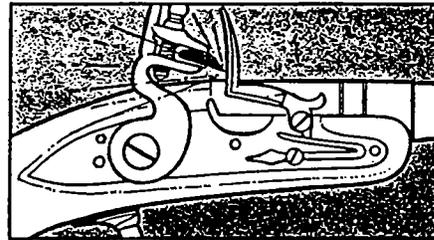
MATCHLOCK—A cord of hemp fiber, treated with saltpeter and other substances for slow burning, served as firing agent for the matchlock, first to use a lock mechanism



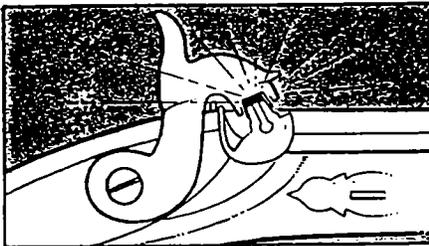
WHEEL LOCK—Pyrite, brought into contact with a fast revolving serrated wheel protruding through the bottom of the pan, threw off sparks to ignite the priming powder



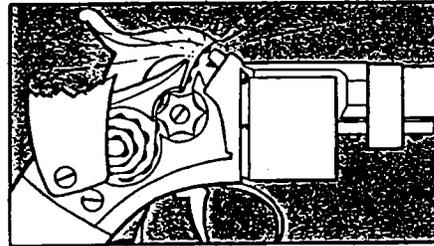
MIQUELET—In this form of flintlock, the mainspring was on the outside of the lock-plate. It was developed in southern Europe and was particularly popular in Spain and Italy



FLINTLOCK—In the flintlock the action of the flint striking the combined steel and pan cover opened the pan and produced the sparks which ignited the priming charge in it



PERCUSSION CAP—Small copper caps containing a bit of fulminate of mercury, when placed over a hollow nipple and struck by the descending hammer, ignited the main charge in the barrel. Capt. Joshua Shaw of Philadelphia brought this device to U. S. in 1814



TAPE PRIMER—Fulminate spaced at regular intervals, and encased between 2 strips of paper, was fed to firing position over the nipples by a ratchet wheel revolved by hammer action. Dr. Edward Maynard, a Washington, D. C., dentist, invented it in 1845

Figure 3: Ignition systems and actions, from 1550-1850. Drawings by H.C. Logan, from Peterson, 1972a: 6, 7; Peterson, 1972b: 8).

The first flintlock actions were developed in Holland around 1560. As the low countries were under Spanish control during much of the 16th century, and as Holland was later allied with England against Spain, this Dutch invention was quickly copied by both Spanish and English gunsmiths, who were experimenting with a variety of different ignition devices. After a half-century of trial and error with various locks, the flintlock action became standardized in Europe, and by the time of the English Civil War of the 1640's had rendered the earlier matchlock and wheel lock guns

obsolete. Developed flintlocks (Figure 3) employed a two-part hammer with top screw similar to the earlier wheel locks. But, into the hammer clamp was now locked a small, precisely-chipped gunflint held in a folded rawhide gasket or by upper and lower flint caps. The leather gasket or thin lead flint caps not only helped keep the flint at the proper alignment and angle for striking but also cushioned the brittle stone and kept it from shattering upon impact. The old touch-hole of the matchlock weapon now gave laterally onto a shallow pan into which was sprinkled priming powder, similar to the most advanced of the later wheel-locks. This pan was covered by an "L" shaped metal piece hinged at its forward end; the vertical portion of the "L", the *frizzen*, was slightly concave and faced the hammer and flint. When the spring-loaded hammer was cocked back and the trigger was pulled, the flint struck the concave surface of the frizzen and a shower of sparks flew down into the back end of the priming pan, setting off the priming powder and then, hopefully, traveling through the touch-hole into the chamber and firing the charge.

A diffusion lag of around 50 years or so occurred before the guns of new design appeared in the New World in any quantity, but certainly by about 1680 throughout Spanish America the old matchlocks had been superseded by the more modern flintlocks. All Spanish Colonial military flintlocks were smoothbores; most were short-barreled cavalry-type weapons, in keeping with the Spanish tradition of mounted warfare, and most were of large caliber, around .70 or .75, with little standardization. Virtually all flintlocks were referred to as *escopetas* in the Spanish New World; today, long after the introduction of rifles, the term still means shotgun, or smoothbore.

THE SPANISH COLONIAL PERIOD

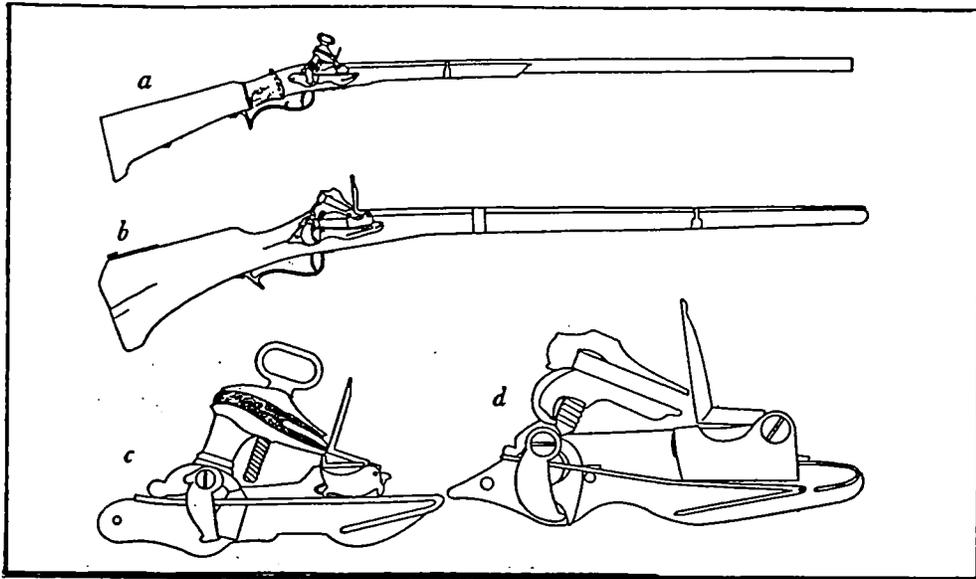
As a means of protecting the exposed northwestern flank of her New World colonies, Spain finally authorized permanent settlements in California in the 1760's. The focus of all subsequent Spanish Colonial presence in what came to be called *Alta California* was the coast; a direct outgrowth of the comparative ease of maritime transportation in comparison with overland travel. Again, this new interest by Colonial Spain in its northwesternmost territory had as its goal not the exploitation of what was perceived as a rich province, but rather the denial of a worthless province nevertheless coveted by other European powers such as Russia and Great Britain which were encroaching upon it (Sanchez, 1990).

The Spanish Colonial period, from 1769 to 1821 or 1822 witnessed the takeover of southern California by Mexican-born people of Hispanic and sometimes mixed Hispanic-Indian origin, with the bulk of the local population remaining overwhelmingly Indian. The few true Spaniards, mainly ecclesiastics, were normally outnumbered by Mexican and later by California-born Spanish-speaking whites, *mestizos* and Indians. Rios-Bustamante and Castillo (1986: 52) point out that in 1793 the official Spanish census of Alta California counted only 32 Spaniards in the whole province, only four of whom were not Franciscan missionaries. The *Criollos*, or those of pure Spanish blood, but born in the New World, numbered only 435, whereas another 183 were listed as being either Black or *Mulato* of mixed Spanish and African ancestry, and another 418 were identified as *castas*, or those of mixed Spanish, Indian, and African blood, including *Mestizos*, *Zambos*, etc. This notwithstanding, some of the very few Spanish troops who reached California were, in fact, volunteers from Catalonia; their unique story is told by Sanchez (1990).

The initial overland European penetration of California took place in 1769, when Capitan Gaspar de Portola and Fray Juan Crespi ventured north along the coast from San Diego, locating potential mission sites and making observations on the local Indians they encountered. Portola commanded a party of 63 soldiers, each mounted and armed with a lance, broadsword, and short flintlock musket. Portola, born in Spain at Balageur, was forty-six at the time. He had been a military officer since the age of eleven, and had fought for the Spanish crown in Portugal and Italy with distinction. Portola was sent to the New World specifically to establish a reliable Spanish military bulwark in California against Russian and English encroachment. In order to achieve this goal, he was authorized to both expel the Jesuit order from Baja California and found colonies in Alta California. Arriving at San Francisco Bay, Portola sent a subordinate, a Sergeant Ortega, on a brief exploration of the bay, but the great rivers draining into it from the Sierra Nevada from northeast and southeast remained undiscovered until three years later. A few years later, in 1772, Pedro Fages and Fray Crespi explored parts of the Sacramento/San Joaquin Delta, journeying perhaps as far as forty miles up the San Joaquin River in pursuit of deserters from the Spanish army (R. Dillon, 1982).

In 1775, *Capitan* Juan Manuel de Ayala, in command of the tiny, 58-foot Spanish brig *San Carlos*, was the first European to sail into and explore San Francisco Bay by water. The *San Carlos* carried a crew of 30, mounted two 4-pound cannon and had in her arms locker muskets, pistols and cutlasses for a force of 12 men (Galvin, 1971: 3). Ayala sent two pilots in a small boat into the Sacramento/San Joaquin Delta, but they returned with the report that it was unnavigable, even for the small and shallow-draft boats of that time. Juan Bautista de Anza followed in 1776, marching up the length of Alta California at the head of a party of 30 soldiers, all armed with flintlock muskets, and more than 300 settlers, many of whom also carried contemporary firearms. De Anza founded the city of San Francisco, and establishing a base from which most later exploration of the Delta, lower Sacramento and San Joaquin Rivers, and adjacent Sierra Nevada foothills would take place (R. Dillon, 1982).

The greatest of all Spanish Colonial explorers in California was Ensign Gabriel Moraga (or Moraga the younger), undoubtedly the first European to visit many Sierran streams and tributaries to the San Joaquin and Sacramento Rivers and the first non-Indian to make contact with many California native groups. A master of "hit and run" exploratory tactics and punitive raids, Gabriel Moraga may have organized and led as many as 50 *entradas* into the interior from the coast (Cook, 1960). Many geographic features and landmarks were named by Moraga; these are known today both in the original Spanish and in their present English translations, or by the Indian names that he recorded. He was the first European to visit the Merced, Tuolumne, Mokelumne, Cosumnes (Rio de San Francisco), and Stanislaus (Guadalupe), Fresno (Santa Ana), Kings (Rio de los Santos Reyes), Kaweah (San Gabriel and San Miguel) and Tule (San Pedro) Rivers. The Mokelumne was named by Gabriel Moraga in 1806, who in that year explored some of its lower reaches. Moraga named the area still known as *Mariposa* after its butterflies, and, in 1808, also probably the *Calaveras* River after the unburied human skeletons he found on its banks. Possibly, Moraga traveled up the Mokelumne drainage to what would become the Mother Lode Country almost a half-century before the California Gold Rush: according to local legend, miners at Mokelumne Hill in the 1850's found a bullet imbedded in a tree surrounded by approximately 50 growth rings; Hoover, et. al. (1990: 27) conclude that this bullet may have been an artifact of the 1806 Gabriel Moraga expedition.



*Figure 4: Spanish flintlock smoothbores and flintlock actions of the late 17th and 18th centuries, of the type used in the colonization of California in the 1770's.
From Russell, 1957: 32.*

While Hispanic influence on the coast from San Diego to San Francisco Bay became pervasive after the 1770's, despite the travels of Moraga and others it was but only feebly felt in the interior. Virtually no part of California north of the northern or east of the eastern fringes of San Francisco Bay was colonized during this period, and the great Central Valley and Sierra Nevada were at best only incompletely known from "hit and run" exploratory raids.

All Spanish Colonial ventures in California were military operations, despite the presence of either religious missionaries or civilian colonists, so, consequently, firearms accompanied every colonization and exploration effort. Flintlock guns became standard in Mexico and in Spain's other New World Colonies long before Portola's arrival in California (Figure 4); the Spanish New World army had turned in their old matchlocks for the much more efficient flintlocks almost a century earlier. The new guns were much more reliable than the old matchlocks, and could function, if not in pouring rain, at least occasionally in wet weather with moderate success: they also had longer ranges and improved accuracy. For the first time calibers were standardized, even if the guns themselves were not. Standardization of calibers greatly simplified ammunition supply and cut down on needless waste and redundancy. Each gun was usually made from start to finish by a single gunsmith or master gunsmith and his assistants, and consequently few had any interchangeable parts. As before, all were smoothbores, with little accuracy beyond 50 yards. The first pistols in California arrived with the Portola expedition; these flintlock handguns were large caliber monsters deadly at close range, but ineffective at much more than 50 feet.

Meanwhile, the Russians had established trading and trapping outposts in Alaska by 1740, and in Hawaii by 1812. In that latter year they founded a base much more threatening to the Spanish Colonial authorities, at Fort Ross on the Sonoma coast, from which they set about colonizing the North Coast Range country drained by the watercourse still known as the *Russian River*. The Russians brought with them Aleut sea otter hunters and quickly came to dominate the fur trade

along the California coastline. Fort Ross, however, was at the end of what was then perhaps the world's longest and most tenuous colonial supply-line, and the Russians in reality posed little threat to Spain's New World frontier. A greater threat were the English, who by the 1770's were also establishing bases on Pacific Islands and pushing westwards across Canada towards the coast of what would become British Columbia.

Spanish Colonial California was technologically stagnant, receiving not only the most obsolete firearms, but all other technological items a backwards Spain had to offer only after all other Spanish Colonies had had first pick. Simultaneously, however, a different technological pattern was developing far to the east. In the English Colonies on the Atlantic Seaboard of North America and, slightly later, in the infant United States, firearms technology was becoming as advanced as anything in Europe, and then overtook Old World developments so as to achieve the leading position it still enjoys today. The period of Spanish Colonial expansion into California, the late 18th century, coincided with the development of the so-called "Kentucky Rifle" in the newly-formed United States of America to the east.

Most Yankee guns up to and after the American Revolutionary War were little different from Spanish Colonial guns used in California. These were smoothbore flintlock muskets, commonly .69 caliber, used for hunting with solid ball, bird shot, or "buck and ball": a mixture of solid ball and large buckshot particularly lethal at close range. Smoothbores were also often double-shotted, or loaded with two balls, one atop the other, for twice the likelihood of hitting the target. The smoothbore could be loaded rapidly with an unpatched ball that fit the bore fairly closely and could be seated with a couple of strokes of the ramrod. These smoothbore guns were fairly accurate at short range, but had neither the range nor the accuracy of even the crudest rifled weapon.

Around the time of the French and Indian Wars, the mid-1750's, woodsmen in Britain's American Colonies began to favor a heavy rifled gun of German origin, called a *Jaeger* (or "hunter"), made both in Germany but also in the North American Colonies where communities of German origin congregated. The first rifled guns made in the New World were the products of German immigrants, often referred to as *Pennsylvania Dutch* after their own name for themselves, *Deutsch*, or "German", and were short-barreled on the European pattern. The rifled bore made this weapon very accurate but mating the lead ball to the rifling was problematical. As with all muzzle-loaders, the ball had to be rammed all the way down the length of the bore prior to firing. If the ball could be pushed down the bore with the ramrod easily, it would not fit the rifling tightly enough to spin and be little more accurate than a smoothbore. Conversely, in order to mate the bullet to the lands and grooves of the bore tightly enough to impart a stabilizing spin, the ball had to be of larger diameter but consequently had to be hammered home by pounding with a mallet on the end of the ramrod. The German or Pennsylvania *Jaeger* rifles were quite accurate, came with a mallet as a standard accouterment, but were much slower to load than a smoothbore, and of little use for military applications which demanded, above all else, a high rate of fire through prompt reloading.

A compromise solution that greatly increased the popularity of the "rifled gun", later called "rifle-gun", and finally, simply, "rifle", was the introduction of the greased patch. The lead ball, just smaller than the rifled bore itself, was seated over a cloth patch just slightly larger in diameter than

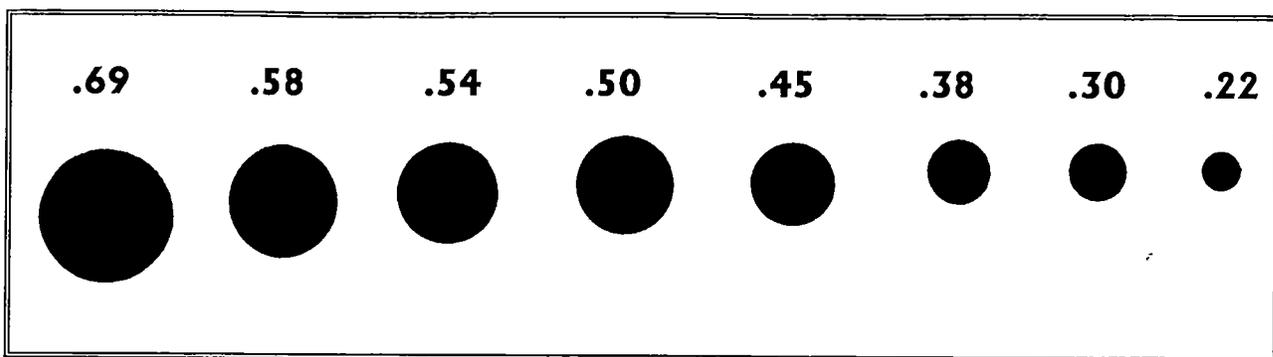


Figure 5: Diameters of musket and rifle balls and later bullets from modern cartridges for comparison purposes. Obvious is the general trend over time towards smaller bullet diameters and, consequently, lighter bullet weight. Diameters expressed in terms of caliber (or hundredths of an inch), all natural size.

the ball and bore itself, so that the patch would wrap around the sides of the ball when it was rammed home. This patch was greased with tallow, which served to lubricate the ball. Now, the rifle could be loaded almost as rapidly as a smoothbore musket, remained just as accurate as the *Jaeger* rifle, but involved none of its fuss and bother: the mallet became obsolete as a reloading tool. Archaeological examples of round balls fired from rifles as opposed to smoothbore muskets are usually easily distinguishable; while both will normally be flattened from impact, the bullets fired from rifles will normally exhibit the parallel scars imparted by the lands and grooves of the rifling, whereas the musket balls will not.

The famous *Kentucky Rifle* popularized by Daniel Boone and others after the Revolutionary War was a modification of the older German design; it was much lighter, usually had a smaller bore, and, most importantly, had a very long barrel. Increased barrel length followed the theory that the longer the rifling was, the greater the resultant accuracy and range. This theory was correct, but in a way unsuspected at the time; actually it was the increased distance between front and rear sights that led to the great reputation for accuracy enjoyed by these rifles. Increased accuracy resulting from increased sight separation is a principal well understood by anyone who shoots both modern rifles and handguns; that it was not well understood in the 18th century is proven by the fact that many smoothbores and even some rifles were still being made without rear sights, and some smoothbores had no sights of any kind. At any late 18th-century North American shooting competition, the marksman with the long-barreled Kentucky rifle could expect to win out over any smoothbore and most other rifles at long-distance shooting.

Kentucky rifles were made according to no particular standard pattern and each one, typically, is different. Most were in calibers from .40 to .60, much smaller than the big-bore .69 caliber revolutionary war muskets used by both sides, and most were full-stocked with barrels around 40 inches long. Short-barreled versions with barrels of around 30 inches length were made for horseback use; such guns were carried in saddle scabbards, and some even appeared in California during the Mexican Period, carried by Jedediah Smith, Kit Carson, and other trappers and explorers long after more modern percussion weapons had rendered them obsolete. The old Kentucky rifle of the 1770's and 1780's evolved into the Plains Rifle of the 1820's under the impetus of the fur trade (Russell, 1967: 58-64), its most famous version being the Hawken Rifle of St. Louis.

THE MEXICAN PERIOD

Mexico proclaimed independence from Spain in February, 1821, but it took the news fully 11 months to reach California, in January of the following year. In April, 1822, Pablo Vicente de Sola, the last Spanish Governor of California, upon receiving the news that the 12-year old Mexican revolt against Spain had finally been successful, requested all members of his government to take an oath of allegiance to the newly-formed Mexican Republic. This was done, and, as before, the capital of *Alta California* remained at Monterey.

During the Mexican period in California, from 1822 to 1848, political, economic and military power in California passed from the old Spanish Empire to the new Mexican Republic. In ethnic terms, however, this brief period saw the ascendancy not of *Mexicans* (i.e., people born in Mexico), but of *Californios*, or persons born in California of Hispanic ancestry who were Mexican citizens. By 1826, the *Californio* population of *Alta California* was only about 8,000, of whom a mere 300 lived at Monterey (Pitt, 1966: 2).

With Mexican independence from Spain, and the radical anticlerical movement that followed, the California missions were viewed as the most tangible and still dangerous representations of Spanish control. Consequently, they entered a period of limbo for more than a decade during which no clear decision was reached as to their fate, then were stripped of their vast land holdings. By 1829 the number of Mission Indians in California had fallen from a high of 15,000 to only 4,500 at all 21 missions (Pitt, 1966: 10). Many Indians and in fact some clerics continued to reside at some of the missions during the early years of Mexican control, but the leaders of the poorest province of the impoverished new country finally decided to raise monies by taking the mission lands completely out of church control and selling them off to secular investors, or granting them outright to persons in lieu of payment for services rendered, who could then be taxed later.

According to Pitt (1966: 6-7), many *Californios* were actively anti-Mexican, not only seriously contemplating allying themselves with some other power such as England, France, or the United States, but actively working against legitimate Mexican authority. The situation was not helped by the new regime's use of California as the "Botany Bay" of the Mexican Republic, the dumping ground for criminals, many of whom ended up in Los Angeles, the provinces' largest town:

"Californios struggling for autonomy learned to despise. . .governors, soldiers, and colonists from *la otra banda* (the other shore) [or Mexico proper]. Since, among the upstanding citizens of Mexico, "to speak of California was like mentioning the end of the world", the government had to empty the jails of Sinaloa and Sonora to encourage colonization and military occupation of the northern part of the province. As a sort of Siberian work camp, California acquired hosts of petty thieves and political prisoners-18 in 1825, 200 in 1829, 130 in 1830, and so on. Those convicts usually arrived in a state of wretchedness exceeded only by that of the Indians. Bands of these so-called *cholos* (scoundrels) would brawl drunkenly on the public streets and commit theft and other assorted misdeeds-even homicide-while the political prisoners among them organized rebellions." (Pitt, 1966: 6).

While armed encounters between the Mexican soldiery and the largely Christianized Indians of the California Coast were rare, occasional confrontations, such as the Chumash Revolt of 1824, were bloody and resulted in repressive measures quite harsh in nature. Such uprisings probably owed no little part to the loosening of European control observed by the Indians as the mission system began to unravel. Perhaps the most trying military campaign of the Mexican soldiery prior to the Mexican war of 1846-47, however, was that against *Estanislao* and his followers in the California interior, at the eastern margin of the San Joaquin Valley where it meets the Sierra Nevada foothills. *Estanislao*, for whom first the Stanislaus River, and, eventually, the California County, were named, has been called "by far the most able military and political leader produced by the red man in California (Cook, 1962: 165). *Estanislao* was very intelligent, understood European customs well and could predict the behavior of the Mexican soldiery; using bows and arrows against flintlock muskets, he fought the Mexican army in California to a standstill, and lived to tell the tale.

Estanislao was a neophyte, or Christianized Indian, at *Mission San Jose*, who had been named after the Polish Saint Stanislaus, rendered *Estanislao* in Spanish. *Estanislao's* tutor was Fray Narciso Duran, himself an adventurous type, who had spent time on military *entradas* in the San Joaquin and Sacramento Valleys, who may have been familiar with *Estanislao's* home village. Probably descended from the Miwoks of the Stanislaus River drainage, whether he was born at the Mission or in an Indian village is uncertain. Raised as an Indian by his mother's people, Cook (1962: 165) suggests that *Estanislao* may have in fact been a *Mestizo*, the son of a Spanish father, for he was described as being of six feet in height, light-skinned, and possessed of a heavy beard. *Estanislao* worked as a mule-breaker and *vaquero* at Mission San Jose and as a consequence would have been a quite competent horseman, unlike many if not most of the mission Indians, who, under Spanish Colonial authority, were actually forbidden to ride.

Despite his favored status at the mission, *Estanislao* ran away from Mission San Jose in 1827, escaping, as was the usual pattern, to mother's country on the Stanislaus River on the eastern side of the San Joaquin Valley. In short order he became the leader of a general Indian uprising in the San Joaquin Valley, then still considered a no-man's-land by the Mexican authorities. *Estanislao* began persuading other christianized Indians he met in the San Joaquin Valley to join his revolt, and stealing the possessions, especially the horses, from those who refused, sending them back to the missions with threats of dire consequences if the Mexican authorities were to act against him.

At least three, and possibly four, Mexican military expeditions were sent against *Estanislao*, all but the last being failures. Cook (1962) sifts through the conflicting and contradictory accounts (normal when defeats require explanations and, or, scapegoats) of these campaigns, and the reconstruction offered below is based upon his translations. The first punitive effort may have taken place in April, 1827, but more likely in April of 1828, under the command of Corporal Pablo Pacheco, on his first solo military effort. Pacheco found that *Estanislao* had fortified his camp on the banks of the Stanislaus, placing it atop a high bluff, and had built a palisade around it of split stakes with a trench behind. Despite the fact that in terms of weaponry, it was Mexican flintlocks against Indian bows and arrows, Pacheco, faced with such an unassailable redoubt, retreated in disgrace without inflicting a single casualty.

Then, in late 1828, Sergeant Antonio Soto of the San Francisco *Presidio* was sent with a small force of 10 to 20 men in pursuit of Estanislao. Soto was an especially appropriate choice, as it was said that he spoke the language of the Indians. This ability was the result of academic study, but most likely had been acquired through a "sleeping dictionary" as was the custom of the time. If so, it is possible that Soto may even have been related to Estanislao. Trying to parley with the Indians while dismounted with six of his men, Soto was ambushed, had two men killed, and all other members of his party wounded in the face by arrows; he himself was shot in the right eye, and died after a few days back at Mission San Jose. A different account suggests that Soto was actually acting under the command of Jose Sanchez, who, after being defeated, decided to shift the blame to his subordinate who was, by that time, conveniently dead.

The next *entrada* against Estanislao, in May of 1829, was led by *Alferez* (Ensign) Jose Antonio Sanchez. Sanchez, in 1818, had led his first punitive expedition to the Sierra Nevada foothills, reaching the Mokelumne River. Eight years later, in 1826, then-Sergeant Sanchez led another punitive expedition to the rivers of what is now Calaveras County, this time to the Cosumnes. This action was so successful that he was promoted to the rank of *Alferez*, having made the long climb up through the ranks of the Spanish, then the Mexican, Army beginning as a Private some 35 years earlier.

Sanchez set the countryside around the Stanislaus River on fire so as to burn the Indians out, but found that they had strengthened their fort with timbers, on the European plan, doubtless at the insistence of Estanislao. Sanchez attacked unsuccessfully, retreating after losing three dead and being himself wounded in the neck. Sanchez' attack caused not a single Indian casualty, and the Indians celebrated their second victory over the Europeans. It was said by one eyewitness, himself a wounded Mexican, soldier, that Estanislao captured one of the Mexican flintlock muskets and was shooting it back at the European soldiers, taunting them and insulting them by name, as he knew many of them personally.

The third or fourth (depending upon whose count one favors) military expedition saw the combined efforts of both the San Francisco and the Monterey *Presidios* to crush Estanislao. A force of some 100 to 250 Mexican soldiers, Indian auxiliaries and volunteers, consisting of the entire Military might of Northern California and probably the largest ever assembled against Indians during the Spanish Colonial or Mexican periods, was formed, under the command of *Alferez* Mariano Guadalupe Vallejo of the Monterey *Presidio*, with Jose Sanchez of the San Francisco *Presidio* as his second-in-command. Because of Sanchez' certain knowledge that the Indians had wooden parapets and fortifications, Vallejo for the first and only time in Mexican California, brought cannon along specifically to use against the Indians.

Returning in late May, 1829, to the scene of the Pacheco, Soto and Sanchez debacles, Vallejo's Mexican soldiers found that Estanislao's Indian warriors had now built three concentric rows of parapets with a trench network behind them. Vallejo's troops again set fire to the brush around the Indian camp, trying to burn them out, but it was their cannon which made short work of the defenses. Many of the Indians, including Estanislao, fled after their force suffered numerous casualties. Some Indians taken prisoner were summarily executed, and the Indian dead were buried in the ruins of their defensive trenches. Vallejo called the river near the battleground the *Rio de los*

Laquisimes or the *Rio de los Pescadores* (fishermen), after the Indians who lived near there, who relied in great measure upon the annual salmon and steelhead runs. But, because the place was so firmly under the control of the Indian war leader, Vallejo's troops began calling the watercourse *El Rio de Estanislao* after their opponent, and, of course, the name stuck.

Remarkably, Estanislao escaped the massacre, and laid low, protected, it was rumored, by Fray Duran, his old teacher. Living what can only be described as a charmed life, he was eventually pardoned by Governor Echeandia at Duran's urging, and apparently lived at Mission San Jose, still making forays into the San Joaquin Valley. In 1830 he was said to have had a herd of no fewer than 100 horses, and by 1836 the townspeople of San Jose were petitioning the authorities to have him arrested as a dangerous criminal.

Apparently Estanislao was still traveling between the Mexican coast and the Indian interior in the early 1830's. Some time between 1830 and 1835, Sebastian Peralta, a citizen of the *San Jose Pueblo*, mounted a private punitive expedition of 17 mounted men against the Sierra Nevada Indians with the permission of General Figueroa (Cook, 1962: 201-202). Peralta's expedition rode to the Tuolumne River, where they attacked a party of Indians who fled north to the Stanislaus. The chronicler of the event, Jose Francisco Palomares, stated:

"Peralta ordered us to continue the march, as we did, arriving shortly at the Stanislaus River. At that point, there were two tribes or villages of Indians who made frequent raids to rob horses of the white man. One of these was captained by the famous Estanislao (Stanislaus) from whom the river took its name, and the other by his brother Saulon, little less renown than he himself. . ."

"From here we went to the village of the Moquelumnes (which today are called Calaveras) [this is obviously in error]. We encountered all the Indians, assembled at a point called "El Zanjon" [the big ditch] about three leagues from the settlements of the tribe. Immediately we attacked them on all sides, keeping up a fierce fire which caused them many casualties. . .About 30 remained as corpses in the slough, and because those who remained alive did not bother to bury the bodies they stayed there until they were reduced to bones and skulls. For this reason the place was called *Calaveras* " (quoted in Cook, 1962: 202).

Estanislao's military successes were the exception, not the rule, in Mexican California, and the account of only a single Spanish/Mexican soldier suffices to indicate the more usual result of battles between European flintlocks and Indian arrows. Jose Maria Amador, born in San Francisco in 1794, had been a soldier first for Spain, then Mexico, between 1810 and 1827. He had fought under Jose Sanchez in many actions against the Indians of the interior, and had been wounded several times (Cook, 1962: 194-198; 209-210). Amador, when he dictated his memoirs in 1877, claimed to have spoken the language of the *Moquelumne* Indians; if so, he probably learned it through a sleeping dictionary like his contemporary Soto and others. Amador was a bloodthirsty individual, by his own admission personally having killed many Indian adversaries in battle, and perhaps more through enforcing the common Latin American *ley fuga* (shooting prisoners while "trying to escape") on different occasions.

In 1818, Amador followed Jose Sanchez to the *Rio de las Calaveras*, near present-day Stockton, fighting a battle in which 50 Indians were killed and another 50 captured. Two years later, in 1820, Amador, again under Jose Sanchez, fought a battle on the Cosumnes River, in which 7 or 8 Indians were killed and two chiefs taken prisoner were given 200 lashes. In 1828 Amador, then retired from the service but still capable of leading volunteer military forces, led 14 irregulars against Indian horse thieves at the village of *Lilame*, which he located upstream from the Rio Mokelumne. The Indians took refuge inside their sweat house, which Amador set on fire; some escaped, and Amador chased them into the mountains, obviously the Sierra Nevada of the Mokelumne drainage. Still pursuing the survivors, Amador was wounded in an engagement on the Tuolumne River and forced to retire.

After recuperating, seeking revenge, Amador returned to the Mokelumne River as part of a punitive expedition where he caused one of the most gruesome examples of race warfare and murder ever recorded in Mexican California. Despite the protests of *Alferez Prado Mesa*, who was actually in command albeit young and inexperienced, Amador facilitated the murder of 100 Christianized Mokelumne Indians in groups of six at a time while kneeling in prayer, and then, if his account is to be believed, caused another hundred to be baptized, upon which they were also immediately shot in the back (Cook, 1962: 198). Amador's justification for this outrage is not clear; possibly the Christianized Mokelumne failed in their duties as auxiliaries, which led to Amador's earlier wounding; alternatively, Amador simply may have been so eager for revenge for his wounds that he found it more expedient to murder Indian allies rather than Indian enemies. Amador's massacre took place at the height of the excitement caused by Estanislao's revolt, and after Mexican forces had been defeated by the Indians; as such, it may simply have been a retaliation in principle.

The murderous Amador later became *Mayordomo* at *ex-Mission San Jose*, then a rancher on the *Contra Costa* or eastern side of the San Francisco Bay. The old murderer went to the Sierra Nevada in 1848 during the initial gold excitement and established himself as a miner, doubtless accepted by his newly-arrived Anglo neighbors because of his boasts of the many Indians he had killed. The creek he settled on came to be called after him, and as other miners built their shacks nearby, the location came to be known as *Amador City* by 1849, and, a short time after California statehood in 1850, he was commemorated by the creation of *Amador County*. Jose Maria Amador survived the Gold Rush, eventually dying in Gilroy in 1883, a very old man, having lived through the Spanish Colonial, Mexican, and Anglo American periods.

Meanwhile, the Anglo-American penetration of interior California was following very late upon Francis Drake's 1579 landing on the Marin coast, not getting underway until after the turn of the 19th century. As opposed to the Spanish occupation of California, which took place from south to north, this English-speaking invasion came from north to south, primarily from the Anglo-Canadian fur outposts on the Columbia River, and from east to west, by trappers pushing out from the Great Plains and Rocky Mountains. For the first decades of the 19th century a single economic incentive promoted exploration in the North American West, including California, an area known or thought to have large river systems: beaver, the focus of the early Mountain Men and the fur trade. - The earliest English-speaking fur trappers and traders in California in no instance developed permanent

settlements, simply passing through the country, hunting and trapping, and moving on (Farquhar, 1932; Russell, 1957; 1967; Morgan, 1965; R. Dillon, 1975).

Yankee fur trappers and traders had ventured from their great jump-off point, St. Joseph, Missouri, as far west as Santa Fe in the New Mexico country by the time of Mexican independence. From there they made plans to continue west so to explore trapping prospects in California, crossing the mountains and deserts between Santa Fe and the Pacific coast in order to explore commercial possibilities on the Pacific Coast. In 1826, the famous fur trader and explorer Jedediah Smith became the first Yankee to push all the way west to the California coast (Sullivan, 1934; Morgan, 1965). Smith crossed the Mojave Desert, following the Mojave River southwards into the mountains along the old Indian trail used by the Mojave Indians of the Colorado River country in their trading with the Indians of the Pacific Coastal strip. Jed Smith took 15 days to reach the San Bernardino Mountains from the Colorado River; he named the Mojave the *Inconstant River* after its propensity of drying up unexpectedly. The first Yankee to traverse the San Bernardino Mountains, it took Smith another six days to cross the range from north to south, much of this time doubtless spent in searching for beaver sign along the creeks and streams of the forested uplands. On November 26, 1826, Smith emerged from the mountains onto the flat lands of the San Bernardino Valley.

In late January, 1827, Smith and his party, ignoring Governor Jose Maria Echeandia's command that he leave California immediately, instead left the Mexican settlements on the southern coastal strip and recrossed the San Bernardino Mountains, heading north so as to further explore California. Moving northwest, the Yankees crossed the Tehachapis, its members becoming the first Anglo-Americans to enter the San Joaquin Valley from the south or east. The trappers worked their way up the eastern side of the valley and the foothills, investigating each stream for its beaver potential, trying to cross the mountain range once and failing before finally succeeding. Jed Smith kept his party in the San Joaquin Valley until late May. Smith's party journeyed as far north as the *Rio de los Americanos*, named in honor of his visit, but found the river too high and the temperatures too cold to allow for more than a brief sojourn along its banks (Farquhar, 1965: 26). By this time the trappers had 1,500 pounds of beaver pelts from animals taken in Sierra Nevada streams. Still exploring, Smith left most of his party on the Stanislaus and traveled up that stream and the upper Mokelumne, finally crossing the Sierra with only two companions, probably through or near modern-day Ebbett's Pass (Merriam, 1924) heading east so as to make the great summer trapper's resupply rendezvous in the Rocky Mountains.

On July 13, 1827, with new supplies and another 18 trappers, Smith headed back towards California after the rendezvous in midsummer. But, while crossing the Mojave River on or around August 18, 1827, the party was attacked by Mojaves, who killed ten of the trappers and captured the two women traveling with them. Smith and the eight surviving members, with only five rifles between them, held off an estimated four or five hundred Indians long enough to make their escape. Smith again crossed the San Bernardino Mountains via Cajon pass, which he called the *Gape of the Mountains*, in August of 1827, after trading with Serrano Indians for horses. Knowing that if he tarried too long in the Mexican settlements of southern California he would again wind up in hot water, Smith headed north, returning to his first party of trappers still waiting for him on the Stanislaus River. Smith then ventured across the valley to the town of San Jose on the coast so as

to buy provisions, but finally ran afoul of the Mexican authorities after having eluded them for almost a year. Jedediah Smith was taken to the Capital at Monterey and thrown in jail in disgrace.

Released upon promising, for a second time, to leave California, Smith, his party of 19 trappers, and his *remuda* of 300 horses headed back into the San Joaquin Valley, reaching the river of that same name by January 2, 1828. The party stayed for a while at French Camp near the present site of Stockton, then traveled north and made camp on the Sacramento, then called the *Buenaventura*. Moving up the American River, the Yankee's contact with Indians was tragic, for in late February, 1828, local Indians, doubtless curious, approached some of the Smith party's beaver traps, and some of Smith's men fired on them, killing one and wounding another (Morgan, 1965: 258-259).

The Yankees then trapped their way north up the Sacramento Valley, reaching the region of present-day Redding by mid-April. Jedediah Smith finally left California by way of the *Smith River*, his namesake, and the Oregon Country, preferring to take his chances with the British than to suffer another Mexican imbroglio. Jedediah Smith is often accorded the title of "first White man" overland to California by patriotic North American historians who forget that the route he took had been pioneered by the Spanish Colonial explorers and colonists Anza, Fages and Font in the 1770's. Nevertheless, Smith's California accomplishments of 1826-28 are not to be discounted; he was the first non-Indian to cross the Sierra Nevada, and he opened up the route that would later be followed by a trickle of fur trappers and then by a flood of gold-seekers (Merriam, 1924; Cook, 1962).

The invasion of California by English-speakers was a two-pronged assault, from the north as well as from the south, for in 1827, the same year that Jedediah Smith invaded the great Valley of California from the opposite direction, Peter Skene Ogden had meanwhile reached the upper Sacramento Valley, trapping southwards from Oregon. Ogden, born in Canada of American Loyalist refugee parents in 1794, had become a well-known Canadian fur trapper and explorer, and was based at the Hudson's Bay Company's post on the Columbia River in the mid 1820's. Smith, surviving yet another Indian attack in early 1828 in Oregon, enlisted the aid of Hudson's Bay trappers in trying to repatriate some of the goods and furs stolen from him and in doing so had further interested the British fur traders on the Columbia, whose appetite had already been whetted by Ogden's exploration of the year before, in California trapping prospects. Alexander R. McLeod, another Canadian who had worked as a Hudson's Bay fur trapper and explorer since 1802, had been transferred to the Columbia River in 1825. McLeod, in April of 1829, became the second British subject to reach the Sacramento Valley overland, penetrating as far south as the Mokelumne.

By the early 1830's, parties of Canadian trappers working for the Hudson's Bay company were a fixture in the Sacramento Valley, and probably introduced the great disease epidemics that so decimated the California Indian population between 1830 and 1833 (Cook, 1960; 1962; R. Dillon, 1975: 199-206; 224-225). All such Canadian trapping in Mexican territory was illicit; the parties entering without notice and leaving without much trace (Russell, 1967; R. Dillon, 1975). As such activities were recognized by all as completely illegal, not surprisingly, little or no documentary evidence exists as to where such and such a trapping party was at any given time. All such trappers were armed, often with British flintlocks, but sometimes, especially in the cases of their French-

Canadian and Eastern Woodlands Indian auxiliaries, with Indian trade flintlocks.

News of Jedediah Smith's achievement spread, and in 1828, another party of trappers, including James Ohio Pattie and his father, entered California overland. The Patties, as was Jed Smith, were also thrown in jail as suspected spies. Unfortunately, the elder Pattie died, and James Ohio was only released upon promising to vaccinate "all" Californians against smallpox (Valle, 1973). If the Mexican authorities were genuinely concerned about "spies", they acted in an incomprehensible way, essentially providing Pattie the younger with *carte blanche* for travel throughout the populated parts of California. Pattie visited the Missions, ranchos and settlements of the California coast for almost two years, becoming quite familiar with the territory, albeit never doing any trapping, before leaving in 1830. Meanwhile, in 1829, Ewing Young and other famous trappers had made their way west to California, providing what would become a constant demand for Yankee firearms and related supplies on the California frontier.

Joseph Reddeford Walker, more than any other Yankee explorer, sounded the death knell of Mexican California's isolation and opened the way for United States influence by finding a year-round, snow-free pass through the Sierra Nevada that effectively bypassed Mexican-controlled Southern California. Walker first entered California by Smith's trans-Sierran route, but from east to west, and came down the Stanislaus to the San Joaquin Valley, visited San Francisco and spent the winter of 1833-1834 at Monterey. Then, heading southeast, following the course of what would later be named the Kern River into the high country of the southern Sierra Nevada. Walker then followed a path used by the Koso Shoshoni so as to trade with the Tubatulabal of the Kern River Valley, probably for many centuries, being the first non-Indian to use a route that Fray Francisco Garces had thought feasible but left untried almost 60 years before.

By 1837 the Hudson's Bay Company had signed an agreement with the Mexican authorities giving it the right to trap in the Sacramento Valley. There is little doubt that the Hudson's Bay Company trappers were also taking animals deep into the San Joaquin Valley as well. Perhaps the most curious and certainly one of the least known episodes of the British attempts to explore California from their foothold in the Oregon Country was the abortive exploration of the Sacramento and American Rivers by a British Naval party commanded by Captain Edward Belcher from the *HMS Sulphur* in a large cutter named the *Starling* along with four smaller boats powered by sail and oar. On the last day of October, 1837, Belcher and his sailors reached the mouth of the American River, patriotically naming the spot *Point Victoria* after their newly acceded queen. Needless to say, the name didn't take.

Captain John A. Sutter (R. Dillon, 1967) was a Swiss who came to California in 1839 via Santa Fe, Fort Vancouver, and Honolulu. Sutter had abandoned his wife and children and was one step ahead of a European debtor's prison, but in only five years became the single most important colonist of California's Central Valley and the Mexican governor's right-hand man. Sutter set out to carve out his own empire in the California interior, aided by a cosmopolitan group that would presage the modern California mixture: Yankees, Hawaiians, New Mexicans, Californios and Indians. By 1840 he had established his camp on the American River at its confluence with the Sacramento and was exploring most other Sierran streams, sometimes in the course of punitive raids against hostile Indians. Captain John Sutter named his great ranch *New Helvetia* in honor

Figure 6: The Yankee fur trapper in Mexican California, as romanticised by Hutchings' California Magazine during the late 1850's, some 30 years after his first appearance. Note the percussion plains rifle, longer than our stalwart is tall.



of his homeland, but the place quickly became known as *Sutter's Fort* due to the high adobe walls and cannon he had erected around the place as a defense against Indian attack.

Until the Mexican Period, there were no private gunsmiths in California, the only local work on firearms being performed by blacksmiths on the Spanish Colonial arms kept in the Presidios at San Diego and Monterey. Gunsmithing remained an essentially non-Californian practice until the Gold Rush; Hugo Reid (Dakin, 1939: 202) in his census of British and American residents in California prior to 1840 lists but a single gunsmith, one William Breck, of San Luis Obispo, and only 7 blacksmiths practicing their trade in California during the Mexican period. In keeping with its quasi-military outpost status in the California "outback" of the time, Sutter's New Helvetia had a completely equipped blacksmith's shop, an armory, and the best gunsmith in all of California. Stated another way, the gunsmith at Sutter's Fort was the first (perhaps the only) one you were likely to encounter between Santa Fe in New Mexico and the Pacific Coast.

Simultaneous with the beginning of California's Mexican period, but far to the east, firearms technology was again advancing, with flintlock guns beginning to be superseded by the new percussion arms. Around 1807, an amateur chemist in Scotland named Alexander Forsyth invented fulminate of mercury a highly explosive compound which would "go off" if struck sharply. Its application to firearms technology was obvious, and by about 9 years later, in 1816, fulminate of mercury was experimented with inside a small, disposable copper cup made to fit tightly over a

hollow iron nipple leading to the old, familiar touch-hole bored through the barrel of the firearm. When struck with a falling hammer, the fulminate in the cap exploded and sparks traveled down the inside of the nipple and set off the charge (Figure 3). The fulminate of mercury, somewhat unstable by itself, could be sealed inside the cap with a tinfoil disc gasket, and then waterproofed with shellac. This new invention came to be called the "percussion cap" and revolutionized the world firearms industry.

The flintlock action, at this point at least some 200 years old, was now obsolete, for the percussion cap made gun flints and priming powder a thing of the past. The percussion cap remained experimental, however, throughout the 1820's, and more popular in Europe than in the New World. While civilian manufacturers quickly came to appreciate the advantages of the new ignition system, and some US Government arms were being issued with percussion actions as early as 1826, the old flintlocks died hard, and in fact the US Army was still commissioning the manufacture of flintlock shoulder arms as late as 1840.

There were many reasons for consumer resistance to the percussion cap and the continued popularity of the flintlock. Percussion caps were expensive and not always easy to purchase, especially in the first years of their use, and even more so on the far western frontier. Only the factory could make a percussion cap, unlike the gun flint, which could be chipped out of suitable lithic material available worldwide at no cost. The flintlock action could also be, and was, used as a tinder-starter and many a fire under miserable conditions was lit by snapping an unloaded flintlock. Finally, the new guns were slower to reload than the old familiar flintlocks: an experienced rifleman could get off 4 shots a minute with a flintlock; only 3 with a percussion rifle, because of the extra time required to find and seat the cap on the nipple.

Despite these drawbacks, percussion arms "caught on" in North America, but did not in Latin America. The most important reason for this technological disadvantage was the accident of timing; percussion arms began to appear just as Spain's New World colonies gained their independence, but the brand new countries from Mexico in the north to Chile in the south universally, after more than a decade of rebellion, had wrecked economies and nonexistent heavy manufacturing capabilities. The most logical source of the new technology, Spain, was now cut off as the mother country and the ex-colonies went their separate ways, and the few percussion arms to arrive in Latin America came quite late, almost exclusively in the form of rifles and pistols manufactured by US makers.

In Mexican California, the only percussion weapons present were those in the hands of Anglo-American newcomers, or those which had been traded in illegally via the constant stream of Yankee and British sailing vessels putting into California ports. All the early Yankee and British fur trappers to enter California during the first decade of the Mexican period used flintlock long arms and pistols (Russell, 1957; 1967). By the early 1830's, however, percussion arms were beginning to make their appearance on the Great Plains and into the Rocky Mountains, but these, again, were late to arrive in California. Jedediah Smith himself may have been the first to carry percussion arms to California as early as 1826-1827. Severn (1972a) believes that Smith had a Hawken percussion rifle when he first arrived at San Gabriel mission; certainly he had a cap and ball dueling pistol in his possession when he was killed by Comanche Indians in 1831 on the Cimarron River, far from California (Russell, 1957: 88) and this gun or ones like it may have earlier traveled to the Pacific

with him. Alternatively, the British-supplied fur trappers from the Oregon Country probably also began using percussion arms after 1830, so by the beginning of the decade, percussion guns were becoming common in the hands of English-speaking foreigners in California.

Californios even into the 1840's preferred the old, trustworthy flintlocks over the newfangled percussion guns, for one never knew when the very tenuous supply of percussion caps, which had to come all the way around the Horn, might be cut off. In South and Central America, flintlock arms continued in use in some places until they were replaced by single-shot cartridge weapons at late as the 1870's and '80's. The gunflints that were integral to the functioning of flintlock firearms kept the flintknapper's craft alive and well into the early 20th century; gun flints are perfect archaeological indicators of the pre-percussion cap period of California history, and doubtless many have been misidentified by archaeologists as malformed prehistoric bifaces instead of the historic artifacts which they truly are.

THE MEXICAN WAR

After ten years of fulmination over the existence of the *Texas Republic*, created by North American interlopers out of Mexico's northeasternmost province in 1836, and further fueled by John Charles Fremont's provocative armed invasions of California, Mexico had had enough of her bellicose neighbor to the north and war was declared on May 13, 1846. The war in Mexico's northwesternmost province, California, was very much of a side-show for both sides, with the decisive battles fought far to the south in Central Mexico itself.

All the major California engagements of the war were fought in Southern California, despite the fact that various U.S. Military and Naval forces kept invading northern California by land and by sea, repeatedly in the early 1840's, years before the actual outbreak of war. The worst offender was Lieutenant J. Charles Fremont, son-in-law of the ambitious and expansionist US Senator Thomas Hart Benton of Missouri, the biggest booster of the fur trade interests of his electoral state. In February, 1844, Fremont, at the head of a small military detachment including the peripatetic Kit Carson, who had served his apprenticeship in western exploration under Ewing Young at a very young age, invaded Mexican California by passing to the south of Lake Tahoe through what is now Alpine County, coming to the South Fork, American River, near the present settlement of Strawberry (Farquhar, 1965: 56-57). Fremont entered California illegally again in late 1845, coming to Sutter's Fort with another military force whose presence did much to strain the worsening relations between Mexico and the United States.

The Mexican War was a long time coming, but was inevitable once the United States Government recognized Texas as no longer part of Mexico, and annexed it in 1845. The Bear Flag Revolt of June, 1846, where naturalized Anglo-American Mexican citizens rose up against the *Californios* and captured the town of Sonoma, was a replay of the Texas rebellion a decade earlier. The official US military commanders in or near California seized upon the Bear Flag rebellion as an excuse to protect "American" interests, and promptly invaded without a declaration of war. Fremont, who had invaded California twice already and had been roaming around Central and Northern California this time for nearly six months waiting for war to break out, simply changed

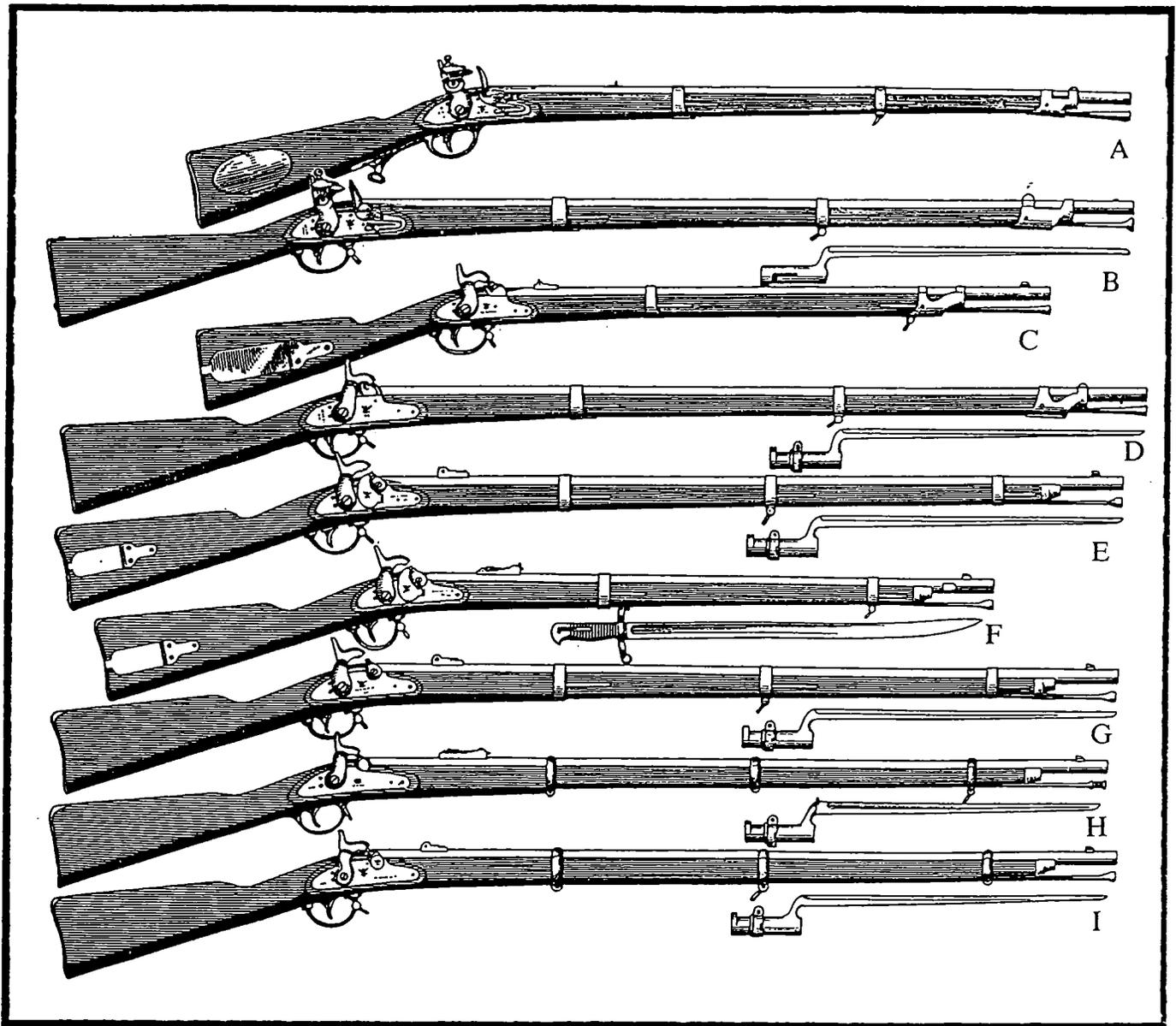


Figure 7: U.S. Army muzzle-loader miscellany, 1819-1863. From top: A: U.S. Flintlock Rifle, Model 1819, .54 Caliber. B: U.S. Flintlock Musket, Model 1822, .69 Caliber. C: U.S. Percussion Rifle, Model 1841, .54 Caliber, the "Mississippi Yager" of Mexican War fame. D: U.S. Percussion Musket, Model 1841, .69 Caliber. E: U.S. Percussion Rifle, Model 1855, .58 Caliber, with Maynard tape primer. F: U.S. Percussion Rifled Carbine, Model 1855, .58 Caliber, with Maynard tape primer. G: U.S. Percussion Musket, Model 1861, .58 Caliber. H: English Enfield Musket, Model 1853, .577 Caliber, .U.S. and C.S.A. issue. I: U.S. Springfield Rifled Musket, Model 1863, .58 Caliber. Drawings by James E. Coombes, from Bannerman & Sons, 1938: 258.

course and headed towards the Mexican garrisons on the coast. Meanwhile, Commodore Robert Field Stockton's US naval forces sailed unopposed to blockade and occupy the towns of coastal

California while Brigadier General Stephen Watts Kearny's *Army of the West* headed overland towards New Mexico and California so as to complete the pincers movement by land as well as by sea. The route Kearny's army took has come to be known as the *Gila Trail* (Moody, 1963).

The American warship *Savannah*, Commodore John D. Sloat's flagship, reached Monterey from Mazatlan in early July, 1846. On July 7, Sloat sent a force of American sailors and marines ashore, capturing the town, and hoisting the American flag at the Mexican customhouse (Beardsley, 1946). Sloat turned his command over to Commodore Robert F. Stockton on July 29, and Stockton organized Fremont's forces and ordered him to march throughout California with his "California Battalion" of regulars and volunteers, capturing it for the United States. Anglo-American volunteers, now coming to be called "gringos" by the Californios, traveled from all over to join Fremont at Monterey. One group of 35 recruiters and foragers bringing a remuda of 500 horses to the North American forces at Monterey was ambushed by Manuel Castro and a force of *Californios* at *Natividad* near Monterey Bay north of the mouth of the Salinas River on November 16, 1846. While the battle of *Natividad* was small in scale, with both sides losing less than a dozen men combined, it was the only actual military engagement fought in Northern California during the Mexican War that produced casualties amongst US troops.

Despite the early successes in the north, *Los Angeles* was indisputably the most important town on the Pacific Coast, and the most crucial military engagements of the Mexican War in California were fought in what would shortly become San Diego county. The *gringo* invasion proceeded from north and south with *Yerba Buena*, *Monterey* and *San Diego* all occupied before the final push to take *Los Angeles* was made. On August 6, 1846, Commodore Stockton with a force of sailors and marines captured San Pedro, and on August 13, Commodore Stockton and John Charles Fremont together captured *El Pueblo de Los Angeles*, essentially unopposed. With *Los Angeles*' occupation by American troops, the Mexican war was thought to be over in California, and the *Norteamericanos* relaxed their vigilance.

The *gringo* garrison left in the pueblo only numbered 50 US Marines, commanded by the intolerant Captain Archibald Gillespie. Gillespie by all accounts was the worst man for the job; he hated Mexicans of any kind, considered the Californios cowards, and went out of his way to publicly humiliate those civic leaders most inclined to make friendly overtures to him (Bancroft, 1884-1890, Vol 5). Not surprisingly, his repressive dictates and abrasive manner enraged the Mexican populace, which would just as eagerly have welcomed the gringos if treated on an equal basis. Gillespie single-handedly prolonged the Mexican War in southern California for another four months. On September 23, 1846, the *Californios* revolted against the Yankee forces of occupation. The *insurrectos* chose Jose Maria Flores as their commander, Jose Antonio Carrillo as second in command, and Andres Pico as third in command; their force incorporated approximately 300 *Angelenos*, roughly half the town's male population. The main force of the North American army, centered in San Francisco, embarked for the south, and 350 to 400 US troops arrived in San Pedro on October 7, 1846, incorporating Gillespie's small (and humiliated) force. Marching north towards *Los Angeles*, on October 8, the US troops fought and lost a battle at Dominguez' ranch on the *Los Angeles* plain; the Mexican lancers killed six gringo soldiers, wounded another six, and suffered no losses themselves. After another series of skirmishes during the retreat to San Pedro,

the US forces withdrew, sailing to San Diego so as to lick their wounds and plan for their next attack.

Firearms technology and tactics differed greatly between the opposing sides. The Mexican forces were completely outgunned by the North Americans, for while the Californios were equipped with flintlocks, most of the gringo soldiers and sailors in the Mexican War had more modern percussion arms. The US troops also used, for the first time in California, breech-loaders (Figure 10a), albeit flintlocks. Adding to the technological imbalance, most of the US weapons were rifled and consequently quite accurate, whereas virtually all of the Mexican guns were short-range smoothbores, little better than shotguns. Offsetting this technological advantage, however, was a Mexican superiority in tactics. The US troops usually fought as infantry (and, often, in fact, were actually sailors disembarked from blockading warships totally unaccustomed to land warfare) while the Californios invariably fought as cavalry, preferring to use their long lances over their short-range muskets. At the time, the Californios were amongst the most expert horsemen in the world, far superior to any mounted troops the North Americans could muster. As a consequence, gringo superiority in weapons technology proved not as decisive as the intimate knowledge of local terrain and great mobility of the Californios.

Meanwhile, US Army scout Kit Carson, bearing dispatches from Commodore Stockton for General Kearney and his troops, headed eastwards through Warner's Ranch in the high country east of San Diego and met with the *Army of the West* so as to guide them to the Pacific. General Kearney's mounted dragoons reached Warner's Ranch on December 2, 1846, after a very difficult crossing of the Sonora and Colorado deserts. Kearney found J.T. Warner, the naturalized Mexican owner of the ranch, absent: suspicious of his loyalties, the Mexican authorities had jailed him. General Kearney received intelligence that a horse herd of importance to the Californio cavalry was grazing only 15 miles away at the same time that Mexican forces received news of the invaders through their own sources. Twenty-five dragoons under Lieutenant Davidson and Kit Carson went after the horse herd, capturing more than 100 horses and mules, and brought them back to Warner's Ranch. On December 4, Kearney, with around 140 men, met with the recently-promoted Captain Gillespie and a party of Marines who had been sent by Commodore Stockton from San Diego so as to link up with the overland forces.

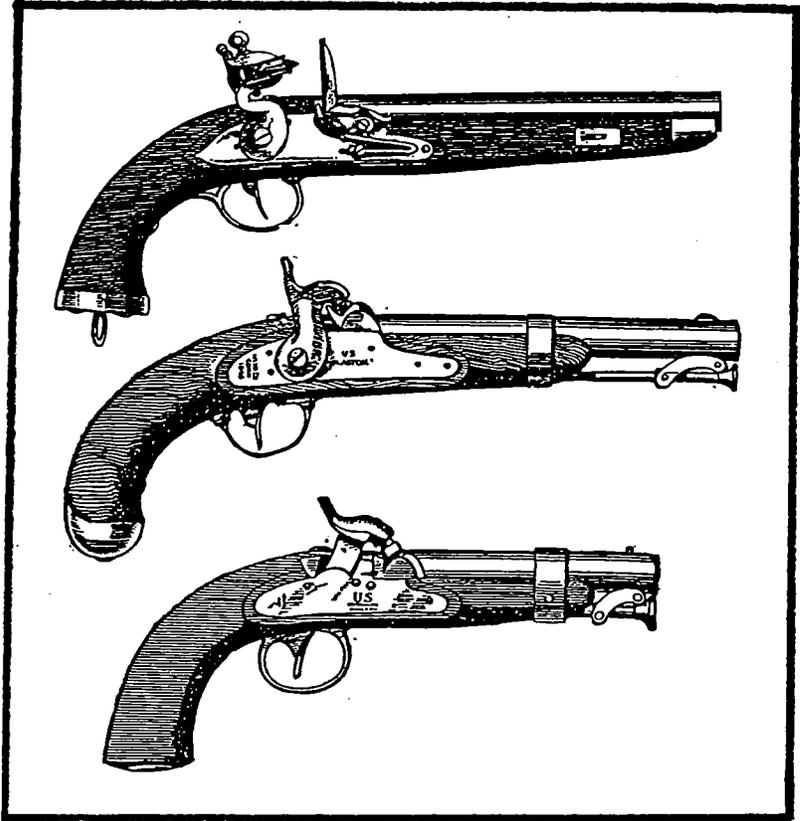
The American troops sallied from their base at Warner's Ranch, and at 2 A.M. on the morning of December 6, Kearney led 85 Yankee soldiers and two howitzers forwards into an ambush at *San Pasqual* engineered by Andres Pico, J.T. Warner's own brother-in-law. Pico was in command of less than 80 horsemen armed mainly with lances, whereas the US troops had some of the most modern firearms available at the time. In a brilliant stroke of generalship, Pico employed a small decoy party to mislead the US forces and misinterpret his position and strength; the North American soldiers fell for his ruse and become strung out in a single line pursuing Pico's decoys, their flanks unprotected. Pico then attacked the gringo line from his concealed positions on both flanks. Outnumbered by around two to one, the Mexican lancers nevertheless won an amazing victory; as it had been raining all night, many of the US trooper's guns misfired, and their swords were useless against the long lances of the Mexican horsemen. The North Americans lost one of their howitzers, and 35 men killed or wounded, more than a third of their total troops involved in the engagement. Two of Kearney's seconds-in-command, Captains Johnston and Moore, were

Figure 8: Muzzle-loading pistols of the Mexican War period.

Top: .70 Caliber flintlock of European manufacture, 9-inch smoothbore barrel, ca. 1835.

Center: U.S. Dragoon percussion smoothbore pistol, .54 Caliber, Model 1842.

Bottom: U.S. Navy percussion smoothbore pistol, .54 Caliber, Model 1843. Drawings by James E. Coombes, from *Bannerman & Sons*, 1938: 56, 64.



killed, as was another Lieutenant, three Sergeants, two Corporals, and 13 Privates. Captain Gillespie, Captain Gibson, and General Kearney himself were all wounded, and a call for reinforcements was sent out to the US Naval forces at San Diego while Kearney's troops prepared for a siege (Harlow, 1982; Rios Bustamante and Castillo, 1986: 89-91). While the Yankees claimed to have inflicted great losses on the California lancers, none were killed, and only one of them was actually wounded.

After the battle of *San Pasqual*, by all accounts perhaps the most important engagement of the Mexican War in California, fighting continued on in the form of skirmishes between December 6 and 10, 1846, when 180 of Stockton's sailors and marines arrived to reinforce Kearney. Both sides claimed victory. The war began to wind down by January 8, 1847, when the battle of San Gabriel was fought at the southern end of the present city of Montebello, and lost by the Mexicans. The California troops, led by General Jose Maria Flores, retreated towards Los Angeles, fighting and losing their final battle of the war in southeastern Los Angeles at *La Mesa*, later the site of the *Union Stockyards*, against Commodore Robert Field Stockton (Native Sons of the Golden West, 1926). General Flores, accepting defeat, retreated to Los Angeles, and turned over his command to Jose Antonio Carrillo and Andres Pico, and fled to Mexico.

In the north, the "Battle" of Santa Clara was fought in early January, 1847, between the Californios led by Captain Antonio Sanchez, acting commandant of the Yerba Buena (San Francisco) garrison of 150 troops, and a mixed force of gringos including the Aram company, a few US Marines from

the naval vessels at Monterey, and 33 volunteers led by James Frazier Reed, numbering less than 100 men. After skirmishing all day long with no soldiers killed on either side, the fight resulted in a "draw", and Sanchez surrendered after negotiating with the armed force of Yankees. In the south, on January 10, *El Pueblo de Los Angeles* fell to the Americans for the second time, and on January 13, 1847, the formal document of surrender was signed by Andres Pico at what is now called the *Campo de Cahuenga*, and the Mexican War in California came to an end.

Despite some brilliant victories, the war was a tragedy for the Californios, and set their world upside down. While the final peace was not negotiated until early 1848, all the fighting in California was over by early 1847, and the change of government meant little to most California residents at first. Too late to fight the Mexicans, the famous Mormon Battalion arrived at Warner's Ranch on January 21, 1847, after a march of 1,100 miles: many of the soldier's pronounced the place paradise reached after many weeks spent in purgatory. The Mormons built the first wagon road through Warner's Pass down to the desert floor, pushing aside huge boulders with human muscle, and chopping through bedrock with hand-axes. The *Treaty of Guadalupe Hidalgo* on February 2, 1848 confirmed the Anglo-American possession all of California, and statehood came in 1850.

From the beginning of the Mexican War, firearms technology in California became as current as that almost anywhere else in North America, due to the continued presence of US troops and modern issue weapons. Percussion caps began to flood into California for the first time with the appearance of US forces during the Mexican War. They came in waterproof boxes or circular tins containing 50, 100, or 250 caps, and were also supplied to the military in bulk bags of 10,000 caps, which only weighed 12.5 pounds. From this point on, percussion caps were used by the millions in California, and became an easily-recognizable archaeological indicator of the post-flintlock but pre-metallic cartridge era in historic sites.

Even before the Mexican War, as we have seen, the tip of the technological iceberg had appeared. Certainly, by the time of Fremont's various invasions, the Hawken rifle was the most sought-after arm in the California interior; Fremont, in fact, armed his own followers with the Hawken in addition to the standard military arms of the time. The Hawken gun was the most famous of all the "plains" rifles to develop out of the old Kentucky long rifle, and, ultimately, the even earlier Pennsylvania Dutch Jaeger rifle. The earliest Hawkens were flintlocks, the later ones percussion; all had heavy barrels and most were half-stocked, unlike the earlier, full-stocked Kentucky Rifles. Most Hawkens were big-bore pieces, shooting patched balls of .66 down to .50 caliber, the most popular caliber being .58 to .52.

These latter guns used a black powder charge of sometimes as low as 80 grains, but sometimes as great as 180 to just over 200 grains, commonly called a "double" charge, and fired a round lead ball sometimes as light as 225 grains, roughly the same weight as a modern .45 automatic bullet, but often as heavy as 292 grains. Hawkens were heavy, weighing between 10 and 12 pounds, many of them had double or "set" triggers for increased accuracy. Some Hawkens shot 3 inch groups at 100 yards, and with their flat trajectory would consistently bring down game as large as buffalo at 200 to 250 yards. The introduction of conical bullets many years after the Mexican War increased their accurate killing range to 500 yards.

Figure 9: A deserter from the U.S. Army detachment at the Monterey Presidio, still in uniform, carrying a Model 1841 U.S. Rifle, en route to the California gold fields in 1848. From W. Colton's *Three Years in California, 1846-1849* (1850).



As Russell (1967: 84-96) has conclusively explained, while Mexican War vintage US rifles of comparatively small caliber (.40 to .45) produced quite high initial bullet velocities, in some cases in excess of 2,000 feet per second, their velocities decreased rapidly, and the bullets dropped quickly, giving poor long-range accuracy. Such guns didn't have the range or accuracy of the larger bore rifles such as the .52 and .54 caliber flintlock and percussion muzzle-loaders carried by some US troops (Figure 7). These larger bore rifles in some cases fired bullets with muzzle velocities some 500 feet per second slower than the small-bore guns, but the heavier bullets maintained their velocities for several hundred yards, giving a flat trajectory with concomitant increased long-range accuracy that the small-bore guns couldn't match.

The favorite standard US shoulder arm of the Mexican War was the .54 caliber US Percussion Rifle, Model of 1841, known as the "Mississippi Yager" rifle (Figure 7c; Figure 9). This gun was only slightly less accurate than the big Hawken rifle, but, more importantly, was mass-produced by the thousands and was quite common in pre-Civil War California. Curiously, one of the most popular US arms during the Mexican War, especially amongst naval troops and Marines, was a flintlock, and the old, breech-loading Hall flintlock rifle of 1819 was preferred by some US troops over the newer percussion arms because it could be loaded faster, and its action even taken out of the rifle and carried concealed as a kind of makeshift pistol.

THE ANGLO-AMERICAN PERIOD

California's nick-name, the "Golden State", is an obvious reference to the Gold Rush of the late 1840's and early 1850's when, for a while, California was not only the central focus of North America, but the world as a whole. California's Mexican period came to a sudden end with the nearly simultaneous termination of the Mexican War of 1846-48 and the discovery of gold. By the end of the Mexican period, and the American takeover of California after the Mexican War, the Anglo-American population was fast eclipsing the *Californios*. By the beginning of 1848, it is

estimated (Reinfeld, 1966: 10) that fully a quarter of all the Anglo-Americans in California were then living at Sutter's Fort: this body of men was thus perfectly positioned to take advantage of the discovery of gold at Sutter's Mill on the American River in January of that year. The California Gold Rush was a massive population invasion of people intent upon "seeing the Elephant" (actually getting to California and trying their hands at mining). The California Indians, considered citizens of Spain under Spanish Colonial authority, and even second-class citizens of the Mexican Republic under subsequent Mexican rule, now entered a kind of legal limbo under the North Americans. The murderous excesses of earlier cutthroats like Amador would now, tragically, become the norm under the gold-hungry newcomers.

The first to respond to news of the discovery of gold, in 1848, were the veterans of the Mexican War just concluded. Benjamin Butler Harris, the Texas schoolteacher who came overland to California in 1849 wrote that:

"The mines in '49 and '50 were as full of ex-soldiers as of ex-sailors. Like the sailors, the former enjoyed the Saturnalian life . . . Deducting the Mexicans, it is possible that one-half of the people one met in the Southern Mines in 1849 were ex-soldiers and sailors, the majority of whom, when closely cross-examined, confessed to desertion from the service" (Harris, 1960: 162).

All or most of these deserters took their issue arms with them to the gold fields "in lieu of pay" (Figure 9). R.B. Mason, military governor of California, estimated that by July of 1848 some 4,000 people were working the placer deposits in the Sierra foothills, half of them Indians in the employ of whites: this pattern would soon change.

Farquhar (1965: 65) calculates that whereas the Anglo-American population of California may have been 2,000 at the beginning of 1848, by the end of 1849 it had exploded to over 53,000. In 1849 alone more than 40,000 argonauts made it overland to California from the Eastern U.S. and 6,000 Sonorans had traveled north from the Mexican borderlands. By the end of the year 697 ships had landed in San Francisco, bringing another 41,000 gold-seekers, only about 800 of whom (roughly 2%) were women (Holliday, 1981: 297). Most of the 49'ers were young, perhaps 4/5ths of them between the ages of 18 and 35. There is no doubt that all but a handful were male, and most of them unmarried (Jackson 1970: 81).

By the end of 1849, at least 40,000 miners were actively panning gold, digging claims, and diverting rivers in the Mother Lode, and another 40,000 were either en route to the mines or had just left them in disgust. In 1850, another 50,000 came overland, and 35,000 came by sea (Ibid, 397). By 1852, the number of miners actually working in the Sierra Nevada numbered over 100,000, with many thousands more working in support capacities. Despite as many as 31,000 disappointed miners leaving California so as to return home in a single year (1853) the state's population grew to 380,000 by 1860, and to 560,000 by 1870, not counting Indians. In 1850, women in California totalled only 8% of the population; by 1860 they numbered 30%, but only 2% in the mining camps themselves (Holliday, 1981: 455).

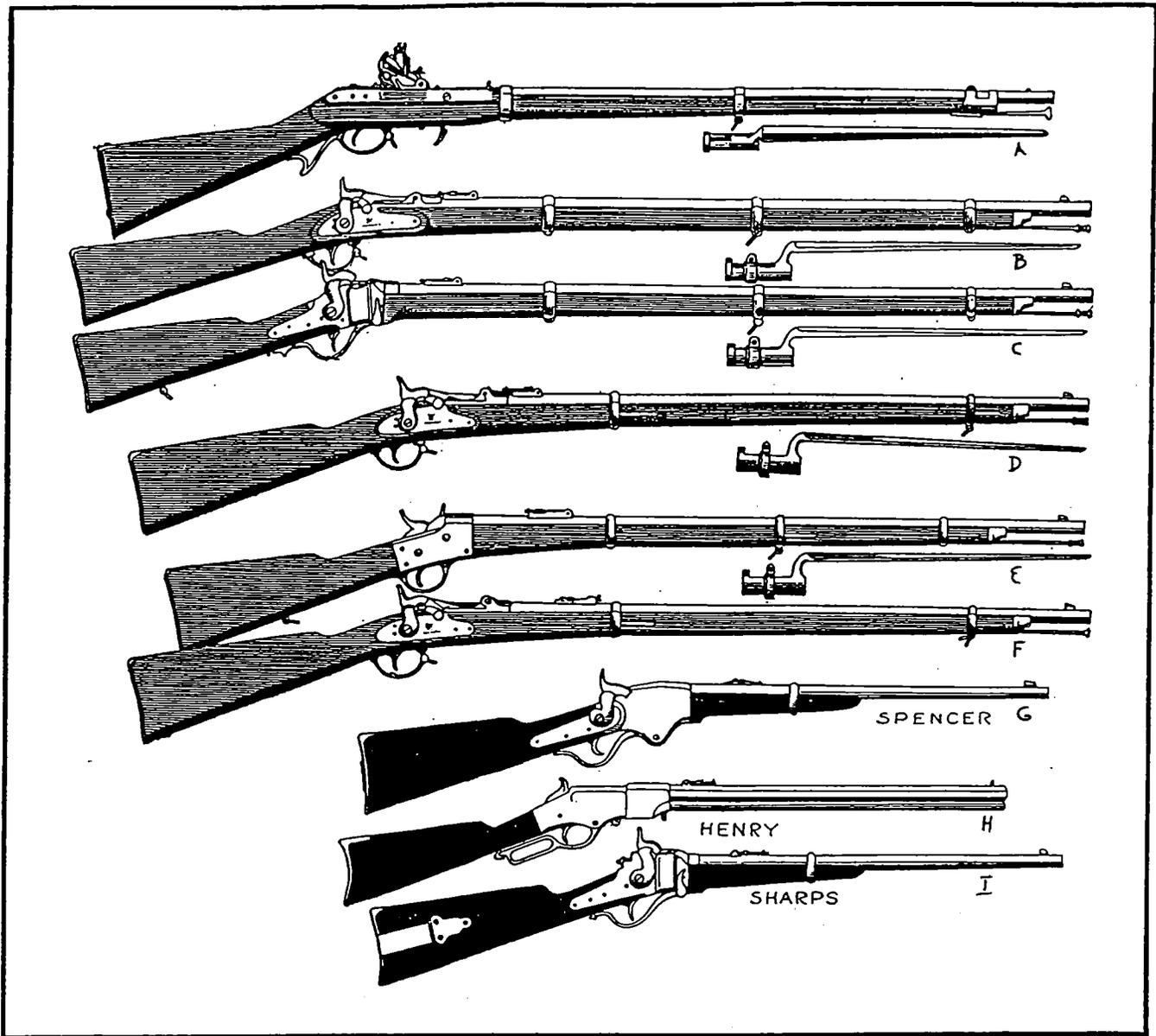


Figure 10: U.S. Army breech-loader and repeater miscellany, 1819-1862. A: U.S. Rifle, Hall Flintlock Model of 1819, .53 Caliber. B: U.S. Springfield Rifle, Model 1866, .50 Caliber. Originally a muzzle-loader converted by the Allin trap-door method. C: U.S. Sharps breech-loader conversion of a U.S. Military muzzle-loader, Model 1870, .50 Caliber. D: U.S. Springfield Rifle, Model 1870, .50 Caliber. E: U.S. Remington rolling-block rifle, Model 1870, .50 Caliber. F: U.S. Springfield Rifle, Model 1873, .45-70 Caliber. G: Spencer 7-shot Repeating Carbine, Model 1862, .56-56 Caliber. H: Henry 16-shot Repeating Rifle, Model 1862, .44 Caliber. I: Sharps Percussion Carbine, Model 1850, .52 Caliber, firing a paper or linen cartridge. Drawings by James E. Coombes, from *Bannerman Sons*, 1938: 263, 269.

Virtually all of the California gold rush argonauts were armed, either with current or obsolete military weapons or with the newest and most experimental firearms being produced in New England, at that time the world center of firearm technology, or imported from England, France or

Germany. Those 49'ers who came overland sometimes had ample opportunity to give their rifles, pistols, and shotguns trial runs on the Indians of the Great Plains, Rocky Mountains, or Great Basin; once they arrived in California, they turned the guns not infrequently on the local Indians and upon each other. Murders and armed robbery were of daily occurrence in California, and any miner who wanted to keep the gold obtained at such personal cost had to learn to protect it, at gun point, if necessary.

James Carson, himself a deserter from the Monterey Presidio turned respectable after a successful sojourn in the gold fields, commented on the level of danger resulting from almost unlimited riches available to an almost completely lawless California population:

"The flood of emigration that soon set in, changed the state of affairs to such an extent that every person believed his precious carcass to be in momentary danger of becoming a target for some adventurer's fire arms; self-defense being the first law of nature we soon became an armed community, which has continued to be an increasing propensity until the present time [1852]. Arming a man's person with a Colt's revolver and a fine finished Bowie knife, is now considered a part of our toilets; this part of the dress has become so fashionable that a California gentleman is not considered properly *dressed* to see his *friends* without these *ornaments* (Carson, 1852b: 136).

Even the most upstanding citizens presented a cutthroat appearance. Carson describes a regular jury trial held in San Jose, California's first State Capital, in 1849:

"The jury, composed of twelve honest men, presented rather a rough appearance, for so honorable a body. Eight out of the twelve had their waist belt adorned with California *jewelry*, in the shape of six shooters and bowie knives; the other four being Spaniards [Californios], had the tops of their leggins beautified with the protruding silver handles of the never absent boot knife" (Carson, 1852b: 142).

Time and distance did little to change this pattern; even California towns some distance from the mines a decade after the initial "rush" were rough places indeed. William H. Brewer, who worked in California as an official surveyor and cartographer for four years prior to a 39-year career as a college professor, commented upon Los Angeles in 1860:

"I was dressed in colored woolen shirt, with heavy navy revolver [a Colt .36 caliber model 1851] (loaded) and huge eight-inch bowie knife at my belt; my friend the same; and the clergyman who took us out in his carriage carried along his rifle, he said for game, yet owned that it was "best to have arms after dark"

Here let me digress. This southern California is still unsettled. We all continually wear arms--each wears both bowie knife and pistol (navy revolver), while we have always for game or otherwise, a Sharp's rifle, Sharp's carbine, and two double-barrel shotguns. Fifty to sixty murders per year have been common here in Los Angeles, and some think it odd that there has been no violent death during the two

weeks [in December, 1860] that we have been here. Yet with our care there is no considerable danger, for as I write this there are at least six heavy loaded revolvers in the tent, besides bowie knives and other arms, so we anticipate no danger. I have been practicing with my revolver and am becoming expert" (Brewer, 1866: 14)

The influence of gold-rush California on the development of firearms technology in the United States, while seldom appreciated, cannot be over emphasized. In terms of the advances made in the reliability of black powder arms, especially the revolving pistol, "six-shooter" or "revolver", the California Gold Rush can be seen as a kind of civilian-based technological rehearsal for the Civil War. Most of the shortcomings of American-made firearms became apparent through the just-concluded Mexican War, and thousands of foreigners arriving in California from every corner of industrialized Europe brought the latest products of the gunmakers art with them, so that a great cross-fertilization of ideas and trial and error of different designs took place as a result.

California became the world's preeminent civilian market for firearms in the world overnight. The demand for pistols, rifles and shotguns there seemed inexhaustible, and the gold miners, shopkeepers, gamblers and bankers certainly had the money to pay for the latest in firearms technology. As the single most important arms market in the pre-Civil War US, perhaps the world, California during the gold rush years stimulated much experimentation in firearms technology that otherwise might not have occurred. It was widely believed that, during the 1850's, Californians were rich and crazy: they would try anything, but more importantly, they would buy anything as well, especially if they thought they needed it. Almost as important, the civilian demand for guns, especially pistols, existed without the kinds of restrictions imposed by military review boards, which were notoriously conservative and frequently so slow to approve new designs that inventors or experimenters often went bankrupt before ordnance trials were over.

If California exerted a dominant influence as the market for arms prior to the Civil War, it played a minimal role in the production of arms itself: California was always the consuming end of the line, never the producing center. Shelton's (1977) research, the best study of the subject, reveals that prior to the Gold Rush, only two more gunsmiths (James McDowell and Henry Huber, had arrived in California besides Breck, the lone gunsmith mentioned by Hugo Reid. McDowell came to Sutter's fort in 1845, and worked there for some years; doubtless his presence constituted one of the principal attractions of the place; Huber arrived in San Francisco in 1847. None of these early California gunsmiths probably made guns from scratch; nevertheless, they probably enjoyed all the business they could handle simply repairing guns on the farthest frontier of North America at the time. With the gold rush, gunsmiths' business boomed, no California town, regardless how small, was without its gunsmith, and every dry goods store in California sold firearms, powder, caps and balls: the guns were still made, without exception, east of the Mississippi.

By the time of the California Gold Rush, the Colt Revolver was the most advanced firearm in the world, being not only a repeater, quite accurate, but essentially fool-proof to use as well. While many, if not most, miners had a shotgun or rifle in their tent or cabin for use in hunting, virtually all carried some kind of handgun as a means of self-protection while working their claims, visiting town, or traveling, especially while carrying gold dust. Bankers and shopkeepers routinely went

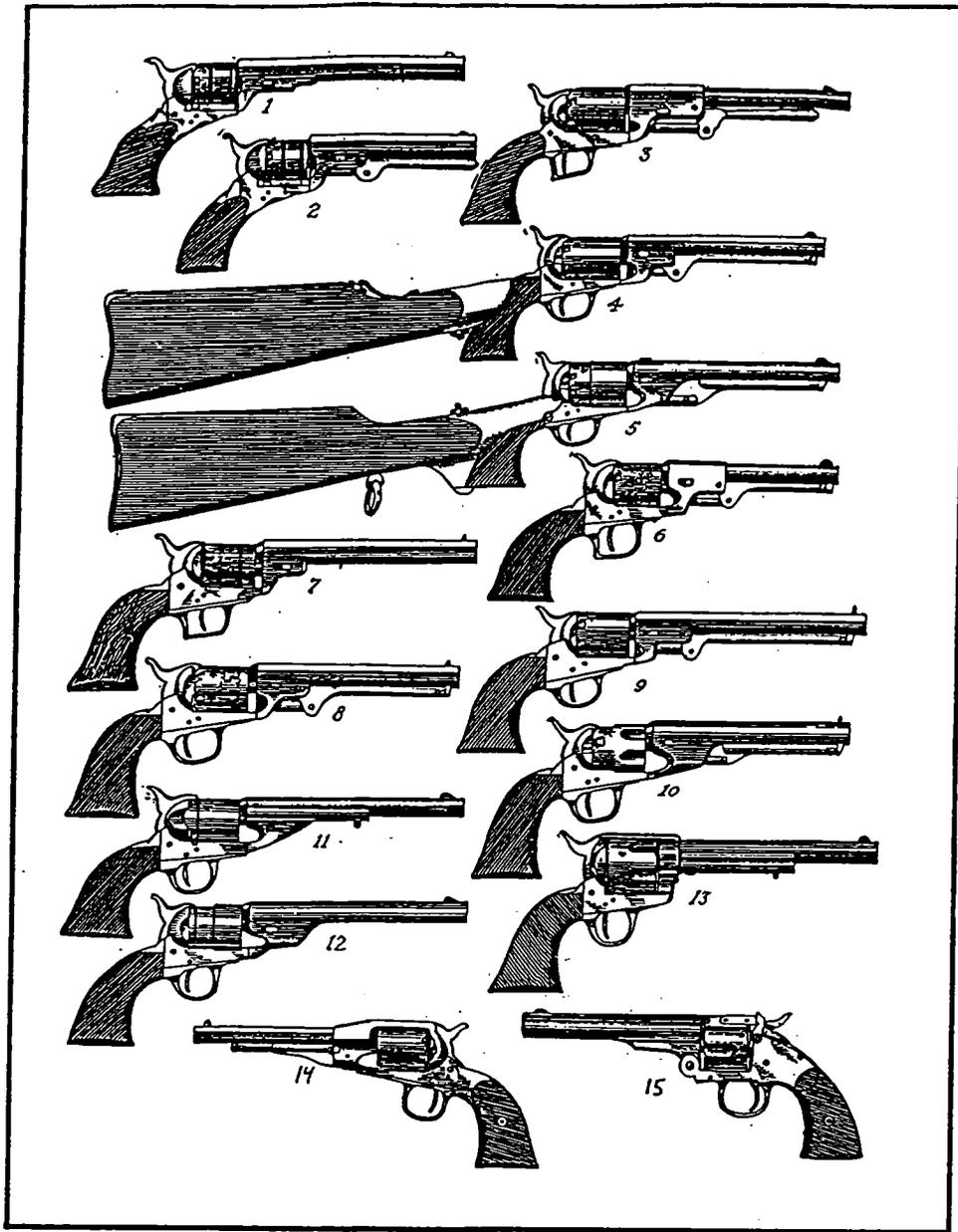


Figure 11: Revolvers of the California Gold Rush and later periods. 1, 2: Colt 1836 Paterson, .36 Caliber & .28 Caliber; 3: Colt 1847 Walker .44 Caliber; 4: Colt 1851 Navy .36 Caliber with shoulder stock; 5: Colt 1860 Army .44 Caliber with shoulder stock; 6: Colt 1848 Dragoon .44 Caliber; 7: Colt 1848 "Baby Dragoon" .31 Caliber; 8: Colt 1849 Pocket Caliber .36; 9: Colt 1851 Navy .36 Caliber; 10: Colt 1862 Police .36 Caliber; 11, 12: Colt 1860 Army .44's converted to cartridge; 13: Colt 1873 Single Action Army .45 Caliber; 14: Remington 1861 Army Revolver .44 Caliber; 15: Smith & Wesson 1873 Schofield Model 1873, .45 Caliber. Drawings by James E. Coombes, from *Bannerman & Sons*, 1938: 266, 268.

armed as well, for they were constantly subjected to holdup attempts. The kinds of single-shot, smoothbore military pistols issued to Mexican War troops (Figure 8) had been tried but found wanting, detours on the road to progress such as the multiple barreled "pepperbox" were found to

be both inaccurate and dangerous to use. Everybody's pistol of choice was Colt's Revolver (Figure 11), and it is not only described in countless diary and newspaper accounts of the time but also shows up in a good percentage of all gold rush period photographic portraits, even being supplied as a prop sometimes by helpful photographers to gold seekers who had not yet bought one. The earliest Colt pistols appeared in 1836, but were not particularly effective, being somewhat light in weight, small of bore, delicate and prone to breakage. Early in the Mexican War, at the urging of a famous US Cavalryman, Captain Samuel Hamilton Walker, the hero of gun battles in both Texas and Mexico, Colt redesigned his pistol for harder usage, and the resulting gun, the big-bore, 4 pound, 9 ounce *Walker Colt* of 1847, began the long line of successful Colt revolvers that sold by the hundreds of thousands around the world.

But, as with all muzzle-loading weapons, Colt's Revolver could not be loaded as rapidly as any modern cartridge-firing weapon. The most common problem in charging muzzle-loaders of any kind, since their first use hundreds of years before, was that of getting the correct amount of powder down the bore. Too much powder would explode the gun and kill the person firing it, too little would leave the bullet only halfway down the bore, jamming the piece and rendering it useless until the lead ball could be extracted with a screw-tipped "gun worm" or stuck-ball remover. Prior to the invention of paper cartridges, one either had to measure out the black powder with a "dipper" of a size specific to the charge required, or simply pour the best estimate of powder required down the bore from a powder horn. With either method, depending upon the kind of powder, moisture in the air, etc., each charge could be and usually was different. More efficient loading came about with the invention of the military type powder "charger", in use throughout Europe by the time of the Napoleonic Wars, and quickly put to use in North American as well.

Powder chargers were metal powder flasks with special funneled necks: the necks terminated in short tubes smaller in diameter than the bore of the weapon for which they were made, and feeding into the tube was a small powder reservoir with sliding valves or gates at top and bottom, or at the powder reservoir and feeder tube. With the flask turned upside-down and the tube inserted in the guns' muzzle, and with the tube valve closed, you simply opened the reservoir valve, which let the gunpowder in the flask travel down by gravity so as to fill the reservoir. The charging reservoir was of a predetermined size specific to the powder charge required for the gun, and could not be overfilled. One then closed the reservoir valve or, if it was spring-loaded, let it slide back under its own power. The process was completed by simply opening the tube valve, which let the pre-measured charge of powder fall into the gun's bore.

The problem of inconsistent powder charging was solved once and for all by the introduction of the paper cartridge, containing a pre-measured charge of powder wrapped up along with the ball to be fired by it. Paper cartridges (Figure 12) did away with necessity of measuring each powder charge as it was required, for with their appearance, dozens or hundreds of cartridges could be made up under carefully controlled conditions long before the need for each one arose. For muzzle-loaders, one simply tore the end of the cartridge off, usually with the teeth, and, using the paper itself as a funnel, poured the pre-measured charge down the barrel, tamped it tight with the ramrod, then you unwrapped the lead ball from the opposite end of the cartridge, dropped it down the bore, and rammed it home, throwing the paper container away. Some muzzle-loaders using greased patches had cartridges made for them which also contained the cloth patch; others were designed to make

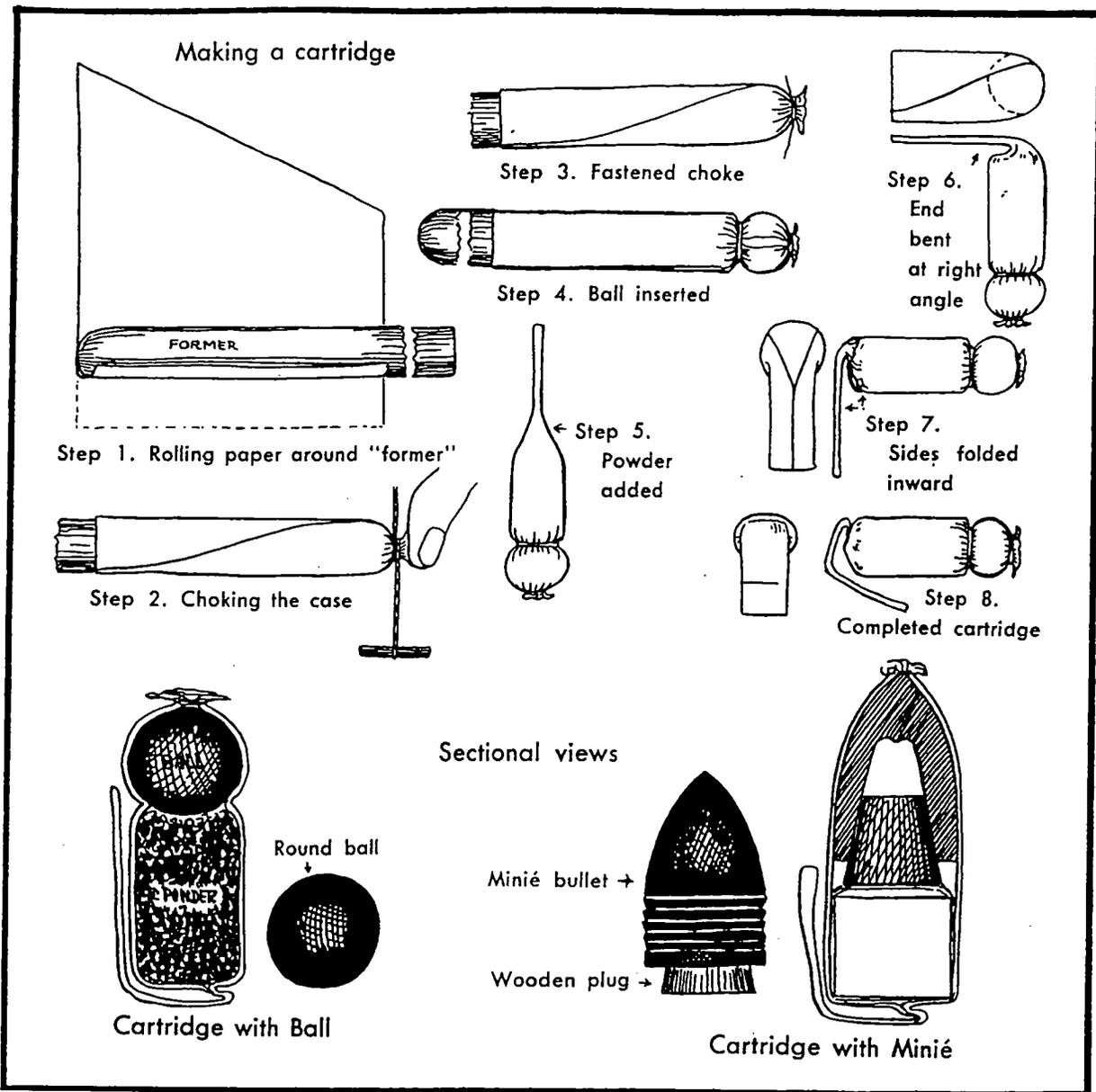


Figure 12: Paper cartridges of the 1840's through 1860's. Steps in their manufacture (top), and cutaway examples for ball (lower left) and Minié ball (lower right). Drawing by Evelyn Curro, from Foster-Harris, 1955: 46.

use of a patch torn from the paper cartridge itself. Both cartridge types were nominally water-resistant, if not actually waterproof, as the former could be made of waxed or oiled paper, and the latter was normally grease-impregnated.

The patched-ball reloading method, popular since the Revolutionary War, was still somewhat cumbersome and of course led to increased fouling of the rifle or pistol barrel after only a few shots. Two inventions of the 1840's provided at least partial solutions to the problem, making the slightly undersized ball and greased patch obsolete. One of these inventions was specific to pistols,

the other to rifles. Forcing a close-fitting lead ball or, later, a pointed bullet down the chambers of a Colt's revolver without a greased patch ceased to be a problem from the time of the introduction of the Colt Walker pistol of 1847. With this model was introduced an underbarrel rammer on a hinged fulcrum that would become standard on virtually all cap and ball pistols produced from that time onwards (Figure 11). The fulcrum rammer provided much more mechanical advantage than could be obtained with a free ramrod. It allowed for a much closer-fitting (and, consequently, more accurate and longer-range) bullet in the Colt than could be fired by any contemporary single-shot muzzle loading pistol that had to be hand-rammed.

For rifles, the French-invented "Minie" ball solved the problem in a different way. Claude Etienne Minie was a French Army Captain who had seen action in Algeria and devoted his attention to improving the loading and accuracy of muzzle-loading rifles. Instead of hammering a close-fitting round ball down the bore with a mallet, or swaging it with a greased patch, in 1849 Minie simply dropped an aerodynamically shaped bullet with flat base and pointed tip down the bore of the rifle, tamped it once with the ramrod, and it was ready to fire, the bullet closely-mated to the rifling. The Minie ball could drop down the bore unimpeded because it was of a slightly smaller diameter than the bore itself. It fitted the rifling tightly when fired because it had a hollow, conical depression in its flat base with an oversized conical metal plug seated partway into the depression. Ramming the Minie ball against the powder charge in the back of the chamber with the ramrod forced this plug up into the conical recession in the base of the lead bullet, and flared the bullet skirts outwards, forcing them to mate tightly with the lands and grooves of the rifling. The metal plug proved problematic, so by the early 1850's a hardwood plug had become standard instead (Figure 12). In a pinch, one did not even need to ram this bullet home, for the powder charge going off would drive in the wooden plug, expanding the skirts, a split-second before the bullet began to travel down the bore.

Minie's invention caught on like wildfire. Not only did his new bullet simplify reloading, but the pointed, aerodynamic shape of the projectile imparted greater range and accuracy, making the old round ball obsolete. The *Minie Ball* was copied and improved by a U.S. Army armorer who developed a hollow-based variant that would expand without the plug at all. Minie balls of various types were used by both sides in the Civil War: my own Great-grandfather was crippled for life after being shot with one by a Rebel in 1863. Self-expanding muzzle-loader bullets are good archaeological indicators, as they did not reach California until the late 1850's, and were becoming obsolete by the mid-1870's, when cartridge guns began to replace muzzle-loaders.

Meanwhile, a specialized kind of paper cartridge was developed for both Colt's Pistols and percussion breech-loaders such as the famous Sharps rifles of the 1850's. The single-shot rifles were designed to have the entire cartridge, paper and all, shoved into the chamber with the bullet and charge still encased as a means of solving the problem of slow reloading time inherent with muzzle-loading paper cartridges. The sharp edge of the rising breech cut off the rear end of the paper cartridge, exposing the black powder to the spark supplied by the percussion cap. Two problems with the system, however, had to be overcome. First, the cartridge had to be stiff enough to resist breaking while being inserted, and secondly, its paper casing had to burn completely when the round was fired, or else smoldering remnants might touch off the next round prematurely. The solution to the first problem was to use linen cloth cartridges, or heavy paper casings high in cotton

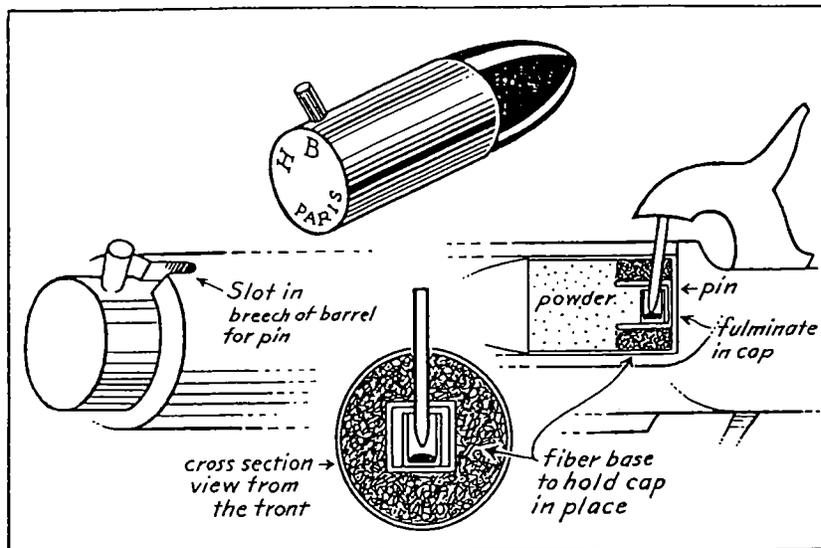
content, both less prone to breakage than paper ones. The second problem was solved by impregnating the paper or cloth casing with dissolved saltpeter or nitrate so that it would "flash" itself, burning completely, and eliminating the problem of preignition. Such impregnated paper eventually became famous in espionage fiction as the kind of "flash paper" secret messages were supposedly written upon.

The early Colt pistols, beginning with the 1836 Paterson Models, were loaded by removing their cylinders and charging all five or six chambers simultaneously with a special combination powder flask with multiple tubes, one for each chamber. The other end of the flask held pistol balls, also aligned so as to simultaneously drop through as many loading gates as chambers in the cylinder once released. So as to eliminate fumbling with percussion caps, an automatic capper was available, which kept dozens of caps in the correct position in a kind of internal concentric snail, releasing them one at a time so that a cap could be quickly placed over each nipple on the cylinder. Many of Colt's early revolvers were supplied with extra cylinders, and their owners often kept these in special pouches, already loaded and capped, for very quick reloading: as such, they became the predecessors of the modern, post-World War II, revolver "speed loaders", and about as fast to use. Colt shortly realized that most pistol users didn't want to wait to reload until all the chambers were empty, but preferred to keep them all charged at all times, reloading them one or two at a time as single or multiple shots were fired, so, by about 1839, Colt began offering a special powder flask for his pistols, which would deliver a pre-measured charge via a plunger action, doing away with exterior controlled valves altogether.

The self-consuming paper or linen pistol cartridge was a Colt invention, and appeared around 1855, greatly speeded up loading Colt's revolvers: here the lead bullet was actually glued inside the end of the paper or parchment cartridge, which was highly impregnated with nitre. The tip of the gunpowder end of the cartridge was ripped off so as to expose the charge, then the whole thing was loaded into a chamber and rammed tight with the fulcrum loading lever. All five or six chambers could be reloaded using the paper cartridge system in less than a minute, and you could not only "roll your own" cartridges but buy them in sealed boxes from the Colt factory itself (Wilson, 1985: 47). Of all the many different Colt revolver models offered from 1836 through the Civil War years, by far the most popular in California were the .31 Caliber Pocket Model of 1849, and the Model 1851 Navy .36 Caliber. Production of the two models, both introduced in 1850 despite their Model year designations, numbered more than a half a million pistols combined, many of which were sold in California prior to the Civil War. Samuel Colt, using first the Texas Republic, then Gold Rush California as proving grounds for his constantly improving pistols, opened a factory in England, and sold as many revolvers as he could make in Europe as well as in North America. For their part, European gunmakers were not idle, but were experimenting with many different designs and technologies themselves.

The first formal, recreational shooting club in California was founded in Sacramento in 1852, and the first great statewide shooting match, advertised in the newspapers with prizes awarded, was held the following year, in July of 1853. Competition shooting caught on and spread like wildfire, until virtually every town in California by the mid-1850's had a public shooting range for long-distance rifle and trap shooting matches, and local champions competed against each other, preparing for the big annual "shooting match" at the California State Fair (Sheldon, 1977).

Figure 13: Typical French pinfire cartridge of the 1850's and '60's, with cutaway showing internal composition and method of ignition. From Logan, 1972: 162.



At the height of the gold rush in the early- and mid-1850's, more informal contests were held in every mining camp, lumber camp, and on the larger ranches throughout the state, and were high points of the annual 4th of July celebrations. The usual prizes were fine guns or cash awards; marksmen practiced all year round, and some very fine guns were made just for competition purposes by a growing number of California gunsmiths. The easy money began to dry up, and many California cities became "ghost towns" as placer gold petered out by the end of the 1850's. The flood of immigrants coming to California slowed to a trickle, and many miners left California to return home after many unsuccessful years in the gold fields; hard-luck stories replaced the earlier tales of gold nuggets waiting only to be picked up by potential millionaires. The Comstock silver strike of 1859 reversed the downward spiral, and revived mining fever in California, or at least along its eastern border, and led to the creation of the state of Nevada just before the outbreak of the Civil War. During this great conflict, California gold and Nevada silver bankrolled the Union Cause, giving the North an economic advantage the South could never hope to match.

Metallic cartridge firing guns made their appearance in large numbers in Europe before they did in the New World, but the earliest European cartridge design, that of the pinfire (Figure 13), was one better done without. Pinfire pistols were quite popular in Europe, especially France, from about 1846 to 1870, by which time more conventional rimfire and centerfire cartridges had rendered them obsolete. While some European gold rushers carried pinfire cartridge guns to California in the 1850's, and more than 12,000 pinfire weapons of 12mm size were purchased by the US Army for use during the Civil War, and many more still were bought by the Confederate Army, cut off as it was from guns made by New England manufacturers, and forced to rely upon European suppliers, pinfire arms were always rare in California.

Unlike paper or linen cartridges, metallic pinfire cartridges carried their own integral primer and were completely self-igniting and self-contained. Instead of having an externally exposed primer such as modern centerfire cartridges, or a continuous, circumferential enclosed primer such as the only slightly-later rimfire cartridges, the pinfire rounds had an internal primer in the form of a percussion cap held in place by a cork or fiber wafer. A metal pin serving as a striker for this primer penetrated the shell casing and protruded vertically a short distance above it; the cartridge

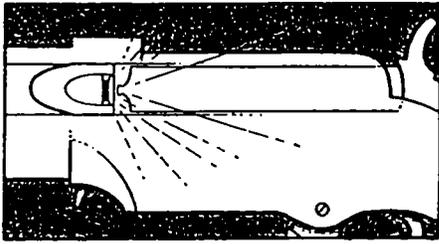
was loaded in the pistol so that the pin aligned with a notch in the chamber or cylinder directly in line with the falling hammer. When the hammer fell, it drove the pin downwards and set off the primer, which ignited the charge as well.

Pinfire cartridges, however, were notoriously unsafe, for they would go off if dropped on the pin, or even handled roughly, and a loose bunch of them carried in one's pocket was an invitation to disaster. One of the few advantages of the pinfire rounds were that they were reloadable, the first such metallic cartridges to appear in North America. Some pinfire guns were well-made, and lasted a long time: Sears, Roebuck & Company still offered pinfire pistol cartridges in 1894 in 7mm, 9mm, and 12mm, corresponding to .32, .38 and .44 calibers, and pinfire shotgun shells in 10, 12, 14, 16, and 20 gauge, but few were sold in the far west. Pinfire cartridges were still manufactured new until 1951 (Logan, 1972: 162-163), but mainly sold in Europe. Consequently, any pinfire cartridge found in a California historical site probably is quite early, likely predating the general adoption of rim and centerfire cartridges after around 1870.

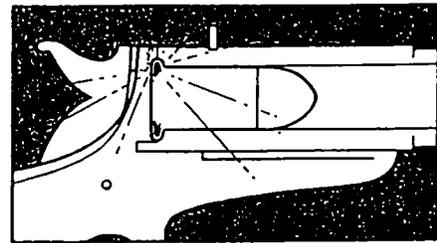
In North America, transitional between muzzle-loading cap-and-ball percussion arms and metallic cartridge-firing breech-loaders, simultaneous with the French pinfire weapons, were the unusual Volcanic Repeating Arms Company's pistols and rifles (Figure 14). These weapons were lever action, tube-fed repeaters with brass frames of either .41 or .31 caliber. They were the direct linear antecedents of the 1862 Henry Rifle and 1866 Winchester, and were designed by the same New England technological wizards who only slightly later developed the reliable rimfire cartridge. The Volcanic guns had developed out of earlier experimental models made by Smith and Wesson in 1854. Horace Smith was an ex-employee of the Springfield armory and a brilliant firearms inventor of the 1840's and '50's. Smith, together with a friend, Daniel Baird Wesson, another inventor and gunsmith jobber who had previously filled orders for Samuel Colt, formed a partnership in 1852: the company would eventually become famous as Smith and Wesson (Jinks, 1977).

In 1855, Smith and Wesson created a new company, the Volcanic Repeating Arms Company, bringing in stockholders, including a shirt manufacturer named Oliver F. Winchester, soon to be famous for his own firearms company. The company went bankrupt in 1857, and Winchester took it over, continuing to sell the Volcanic pistols and rifles while developing his own pet project, the Henry Repeater. The Volcanic pistols came with 4-inch barrels (6-shot), 6-inch barrels (8 shot) and 8-inch barrels (10-shot); the carbines and rifles with 16, 20, and 24-inch barrels, firing 20, 25, and 30 rounds respectively.

Instead of using paper or metallic cartridges, the Volcanic guns fired "self-primed, loaded ball, caseless cartridges", or, in other words, hollow lead bullets filled with black powder with a cork-covered primer set in the center of a copper disk sealing in the powder charge. The "caseless cartridge" was not a Smith and Wesson invention, but that of Walter Hunt in 1848 (Jinks, 1977: 16-18). While the guns were indeed repeaters and their ammunition was self-contained and reasonably waterproof, the powder charge was so weak, due to the limitations of space provided by reservoir in the base of the bullet, that their range was comparatively short and hitting power negligible. Sheldon (1977: 4) notes that at least one Volcanic Pistol and Rifle had appeared in California as early as 1858, where they were displayed in the San Francisco Mechanic's Fair of that year; the arms were judged "Ingenious but rather complicated for general use", and did not



VOLCANIC—Leading the parade of self-contained cartridges (though anticipated by somewhat similar devices in Great Britain and Europe) is this bullet with a hollow base in which was contained powder and a tiny speck of fulminate. This had no cartridge case



RIMFIRE—Containing fulminate in its rim, this cartridge has undergone but little change in outward appearance since it was developed by Smith & Wesson nearly a century ago

Figure 14: Intermediate steps of the 1850's towards the development of the modern, centerfire, metallic cartridge. Left: the Volcanic system, using a "caseless cartridge" or hollow, powder-filled, self-primed, lead bullet; Right: the large-caliber, copper rimfire cartridge. Drawings by H.C. Logan, from Peterson, 1972c: 11.

catch on. The guns were not a success elsewhere either, being more of a curiosity and a halfway step towards something better. Something better was already being experimented with, for metallic cartridges got their start in the United States in 1857. Smith and Wesson, now freed of any connection with the old Volcanic dead-end, introduced the first successful production cartridge, a .22 rimfire short, firing a 29-grain lead bullet propelled by 4 grains of black powder.

The .22 short rimfire cartridge, also commonly referred to as the .22 pistol, has been continuously improved and is still in use today: it is the oldest continuously produced cartridge design still in its original caliber. Universally reviled today as a non-performer in comparison with more modern, powerful centerfire rounds, the .22 short was used as a self-defense round during the entire Civil War and as a hunting round for many years thereafter. I myself seem to be unique amongst my peers for having actually killed deer with it, long ago and far away. The chief importance of the .22 short rimfire was to illustrate the practicality of metallic cartridges, make breech-loading, repeating arms possible, and to point the way for better rounds not long in coming. It should also be remembered that the millions of .22 rimfire cartridges sold each year in California at present are all descended from the old Smith and Wesson 1857 .22 caliber short cartridge.

The Smith and Wesson pistols had frames hinged at their tops, and the whole barrel assembly swung up and back so as to allow for the removal of the cylinder for reloading. By 1861, Smith and Wesson had introduced a more powerful rimfire pistol cartridge, the .32 long rimfire, and a large-caliber cartridge (.44-100 rimfire) for the single-shot Wesson Rifle: both became popular and did much to popularize the Smith and Wesson reputation for precision and quality. Within 5 years of the introduction of the .22 short rimfire by Smith and Wesson for their little pistols, big-bore repeating rifles were also being chambered for rimfire cartridges, and these had reached a good degree of reliability and fair power in the 1862 Spencer and 1862 Henry repeating rifles.

Both the Spencer and, to a much lesser extent, the Henry, repeaters were used in the Civil War, appearing after the first year of the conflict, but incredibly, U.S. Governmental resistance and

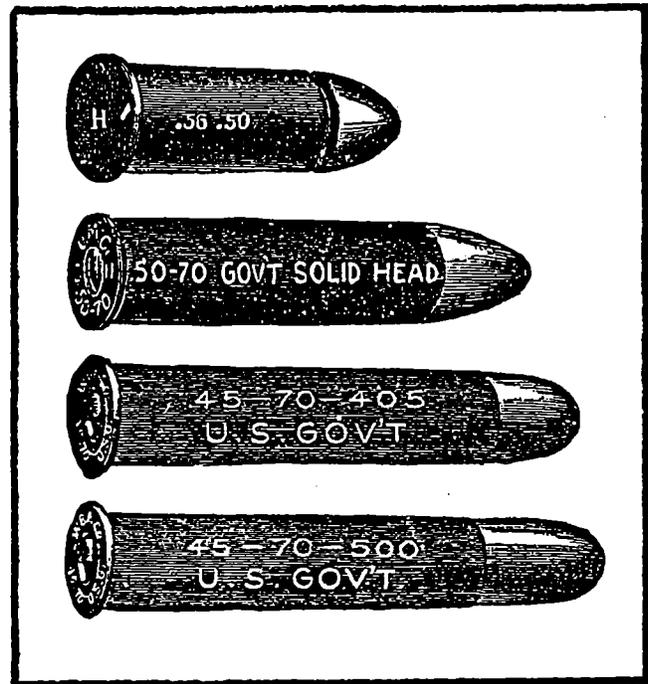
ineptitude slowed their adoption at a time when they could have made a difference in the length of the war. U.S. War Department officials at one time stated that not just repeating rifles, but breech-loaders of any kind were inappropriate for U.S. Army troops because they would only shoot up their ammunition faster than they would with the standard issue muzzle-loaders. Only a few detachments of U.S. Cavalry were issued the Spencer 7-shot repeaters in any quantity during the Civil War; they were first used to good effect in the battle of Gettysburg.

The Henry "sixteen-shooters", on the other hand, only appeared in the hands of US soldiers as privately-purchased arms towards the end of the Civil War. Nevertheless, if the US War Department was retarded in its appreciation of a cartridge-firing gun that could hold 16 rounds in its magazine, law enforcement officials in California were not. A Henry repeater was carried by Undersheriff James B. Hume in the only armed exchange between legal authorities and Confederate Guerrillas in California, which took place in El Dorado County in 1864 (R. Dillon, 1969: 89-104; Boessenecker, 1988: 133-157; B. Dillon, 1992: 141-143). Hume would go on to become Sheriff of El Dorado County and the man who eventually captured Black Bart. And then, only a year after the end of the war, in May of 1866, Steve Venard, a deputized posse member chasing stage robbers in Nevada County, California, in an incredible feat of marksmanship and coolness faced down three armed bandits and killed all of them with his .44 Henry Rifle, firing only four shots (Boessenecker, 1988: 43-46).

With the end of the Civil War, westward expansion again became the order of the day, and a great variety of metallic-cartridge single-shots and repeaters became readily available, many in large calibers. The earliest of these metallic cartridge guns were all rimfire; the rimfire round was for a while considered more reliable than early centerfires: if the first strike of the hammer or firing pin didn't set off the rimfire round, you simply opened the breech or the cylinder, rotated the cartridge to new position, and tried again. Rimfire casings had to be soft all around their rims in order for the hammer or firing pin to dent them sufficiently to set off the fulminate of mercury, for the pin or falling hammer could strike them anywhere around their rim circumference (Figure 14). This resulted in all early rimfire cartridges casings being made of soft copper because the manufacturing ability for mating a soft copper rim to a harder brass casing did not yet exist. Consequently, virtually all early rimfire rounds were quite soft and fragile, prone to denting, warping or bending. Because they were not reloadable, rimfire casings were discarded once fired, a boon to modern historical archaeologists. Their non-reloadability worked against them, however, once centerfire cartridges appeared on the scene in some numbers after 1870, breaking the factory monopoly of supply at whatever price the market would bear.

Rimfire cartridges appeared in California in many calibers from the late 1850's through the 1880's, but after the introduction of smokeless powder in the 1890's, and the resultant, almost universal, practice of "necking down" cartridges, which didn't work well with rimfire rounds, big-bore rimfire guns became essentially obsolete. Ammunition for the .44 Henrys and the variety of tapered .56 caliber cased Spencers was available as military surplus as late as the late 1930's from such dealers as Bannerman and Sons, but most such big-bore rimfire guns by that time were kept only as curiosities. The old .22 rimfire cartridge, however, kept getting more and more popular all the time, and as the larger rounds such as .25, .30, .32, and .38 rimfire fell by the wayside, a greater variety of .22 rounds entered the market and stayed there. The only other early rimfire round to

Figure 15: U.S. Army issue metallic cartridges of the 1860's and 1870's. From top to bottom: Spencer repeater .56 caliber copper rimfire, 1862; Springfield single-shot rifle .50-70-450 caliber brass centerfire, 1866, both used in California's Modoc War; Springfield carbine .45-70-405 caliber brass centerfire, 1873; Springfield rifle .45-70-500 caliber brass centerfire, 1873, both the standard military round in California for 25 years. From Bannerman & Sons, 1938: 75.



stave off extinction until well into the present century was the .41 short rimfire, adapted to the first cartridge versions of the tiny, short-barreled Deringer pistols which made their appearance early in the Civil War, but by the 1950's it was gone too. The only new rimfire round to be introduced in the past 80 or 90 years is the .22 Winchester Magnum Rimfire, which appeared in 1959. This being the case, just about any and all large caliber rimfire cartridges encountered in California are likely to be quite old, probably fired before the turn of the century, and even as early as the 1860's..

Making a reliable centerfire cartridge was problematic, and numerous dead-ends were explored until the final design, essentially unchanged today, was settled upon. One of the most ingenious of the early centerfire experiments was to be found in the Maynard Carbines of the Civil War years. Edward Maynard was a Washington, D.C. dentist, oral surgeon, chemist, tinkerer and inventor, who had been experimenting with firearms ignition systems for more than 20 years. One of his earlier inventions, the Maynard tape primer (Figure 3; Figure 7,E & F), incorporating a long continuous paper tape with evenly-spaced flattened "bubbles" of fulminate of mercury sealed within (the system should be familiar to any child who played with toy "cap guns" in the 1950's), had been adopted by the US Army in the 1850's. Maynard's centerfire cartridge of the following decade was designed specifically so as to be reloadable; and, to make things easy on the Union troops in the field who bought some of them, used standard percussion caps, interchangeable with the issue muzzle-loaders.

It was only with the end of the Civil War that the US Military finally made the decision to replace all muzzle-loaders with breech-loading arms, and as a consequence, gunmakers and inventors were invited to submit prototypes for test purposes in 1865. Sixty-five such prototypes were tested at the Springfield Armory that year, and by May of 1866, the field had been narrowed to only five finalists, including guns made by Sharps and Remington. The design chosen, however, was quite conservative, and would be famous for the next 30 years as the Allin trap-door action, first used on the US government .50 caliber Springfield Rifle and Carbine, then on the .45-70 Springfield.

Erskine S. Allin was the head armorer at the Springfield Armory, and had devised the "trap-door" or top-flip action as an experimental means of modifying the hundreds of thousands of existing muzzle-loaders left over from the Civil War and upgrading them to cartridge use.

Allin's "trap-door" was simplicity itself; a "flip-block", or reinforced upper portion of the breech was hinged at the front, and had a lock at the back; it was released by a spring-loaded thumb-catch. Closing the trap-door seated the cartridge firmly in the chamber; a small ejector on the left side was levered back when the trap-door was lifted up, pushing back on the rim of the fired cartridge and ejecting it. Sometimes called "needle guns" because of the long firing pin that traveled through the flip-block, the .50 caliber centerfire guns accepted by the test commission and issued beginning in 1866 were intermediate between the big-bore muzzle loaders using the Civil War minie-ball and the more modern, and smaller caliber .45-70 centerfires that replaced them in 1873. The importance of the 1866 Allin trapdoor Springfield, introduced the same year as the appearance of the Model 1866 Winchester Repeater, which still fired the old .44 Henry Rimfire, was that it took a centerfire cartridge and directly stimulated the growth in popularity of centerfires over rimfires. The new US military trend towards centerfire breechloaders (albeit, still single-shot) continued when the .45-70 was adopted as the standard US cartridge in the summer of 1873, and the Allin trap-door Springfield again the standard issue arm after 99 different arms had been tested by the US Army ordnance department.

One immediate advantage of center-fire cartridges over the rimfire was that the casing could be made hard and only the primer inserted in its base needed to be soft enough to be crushed by the hammer or firing pin. This meant that the harder casings could withstand greater pressures than the softer rimfire casings, so, consequently, more powerful powder charges could be employed. Another advantage was that one didn't have to treat the cartridges as delicately as raw eggs, as was the case with rimfire shells, and better still, as Maynard had demonstrated years earlier, the hard brass shell casings could be reloaded after being fired. As centerfire ammunition came to be more refined, not only the caliber of the round but the name of the maker came to be stamped on the base of the cartridge: such *headstamps* are the best means of cartridge identification and, sometimes, direct dating. Beginning towards the end of the 19th century, military issue ammunition began to be stamped with the date of manufacture, if not with the actual caliber of the round, so that ordnance troops issuing these cartridges would know how long they had been in storage, and could replace them when they became too old.

The 1860 census listed some 380,000 people in California, not counting Indians, who were still considered to be members of their own "nations" or individual tribes; of the non-Indian population, the vast majority were still newcomers, only 1/3 having been born within the boundaries of the state. The Civil War years were comparatively quiet in California, despite a number of bloody actions against local Indian groups, usually by volunteer militia units rather than federal troops. The 1860's witnessed the development of hard-rock mining on a large scale in the gold country, extensive development of timber lands throughout the state, and conversion of much of the Sacramento and San Joaquin Valleys to farm land. In 1869 the transcontinental railroad finally linked California with the eastern states, and California's potential as an agricultural and lumber-producing source seemed as inexhaustible as the eastern market seemed insatiable.

By the early 1870's virtually all rural Californians engaged in ranching, farming, or lumbering also obtained a good deal of their meat through hunting, much of it on forested lands. If the California gold miner of the 1850's was not considered fully dressed without his .36 Caliber Colt Navy percussion revolver, similarly, twenty to thirty years later, very few rural homes in California were without a cartridge-firing rifle and single or double-barreled shotgun. "Social shooting" was also very popular; after the Civil War, US Army and Navy detachments, as well as California militia companies, regularly held shooting competitions to which the public was invited. All California universities and colleges, beginning in the late 1860's, and many high schools as well, had shooting clubs and sometimes formal shooting teams. Towards the end of the century, the state's best shooters would compete for national marksmanship titles, and, by the turn of the Century, with growing international interest in sports, the first step towards shooting at the Olympics was through the state finals.

By 1870, despite the early dominance of rimfires, centerfire cartridges were increasing in popularity, and beginning to displace the older design (Figure 15). As significant an indication of this trend as the adoption of the trap-door Springfield was the introduction, in 1870, by Smith and Wesson, of their first big-bore revolver using .44 centerfire cartridges, and the somewhat belated changeover, in 1873, of the world-famous Colt Revolvers from percussion to centerfire cartridges as well. While a few were offered as rimfires, the new Colt pistol, in its Single Action Army manifestation in .45 caliber, became the official US sidearm after being selected over the Smith and Wesson, and quickly became popular as a civilian pistol as well, especially in .44-40 caliber. It was no accident either that the most popular repeating long arm was the Winchester Model 1873, also in .44-40: the same round would fit both rifle and pistol, and the combination was a favorite of rural sheriffs and deputies throughout California and the west.

Even more common in California from about 1875 to 1900 than the Winchester repeaters so popularized by Hollywood were a bewildering array of single-shot cartridge firing rifles (cf. Grant, 1947), many made by now-defunct companies, most in calibers long extinct. Ballard, Maynard, Remington, Sharps and Stevens, to name only the most prominent, sold tens of thousands of single-shot rifles in California in the final quarter of the 19th century, many firing such strange and unfamiliar cartridges as the .32 Extra Long Rimfire, the .32-35 Tapered centerfire, the .40-50 bottleneck, or even such behemoths as the .44-100 centerfire. Some of these rifles were chambered for a variety of rounds; some would even handle both centerfire as well as rimfire ammunition by virtue of specialized firing pins.

New cartridges were often first developed for single-shot rifles, then, when and if the same caliber was adapted to repeaters, a slightly less-powerful round was substituted for the original. This was so that case length could be shortened so that many rounds would fit in the magazine or loading tube, not a concern with single-shot rifles. This also led to the not-undeserved reputation of some early repeaters of limited range and poor accuracy beyond short distances. There were many advantages single-shot rifles had over early repeaters; they were generally more accurate than repeaters, could have greater range, could fire a diversity of cartridges, were much less prone to jam or break under hard use, and, most importantly, many were inexpensive; for example, small caliber Remington single shot rifles in 1894 sold for \$5.00, Stevens single-shots for \$6.95 and many models had interchangeable barrels, so that a quick change turned the single-shot, small-caliber

target rifle into a medium-caliber, long-range hunting gun, or even into a smoothbore shotgun. But, not all single-shots were cheap: the finest large-caliber Winchester single-shots by the mid-1890's cost more than the model 1873 repeaters, the latter design more than 20 years old at the time.

Many rural shooters in California reloaded their own ammunition as a means of saving money. Most major US gunmakers offered reloading tools specific to the rifle or pistol being sold; sometimes the reloader was part of a package deal. Winchester was an early leader in the reloading supply business, introducing their line of reloading tools in 1874, and upgrading them as new model rifles and new cartridges were marketed. Most reloaders today of course use bench-mounted, vertical presses, but the small, portable, hand-held reloading tools first seen in the 1870's continue to sell today little changed from their original form of 120 years ago. Aftermarket manufacturers were also quite active in supplying the reloading market: as late as 1894, the Sears, Roebuck catalog, for example, devoted no fewer than 8 pages to reloading equipment and supplies, one page more than they allotted to ready-made metallic cartridges.

California's Modoc Indian War of 1872-73 was only conflict fought within the borders of the state in which the new government issue centerfire cartridges were used by US Army troops alongside the older rimfire rounds; other combatants, mainly on the Indian side, also used obsolete muzzle-loaders as well as more modern guns. The Modoc War was the most costly the US Government ever fought, in terms of casualties and money expended when contrasted with the number of enemy fought against. The fighting lasted for seven months, and at peak over 1,000 US soldiers and Indian scouts armed with mountain howitzers, Spencer repeaters and breech-loading, .50 Caliber Springfield and Sharps Rifles, were arrayed against no more than 50 or 60 Modoc warriors (R. Dillon, 1973; 1983: 187-199). The Modocs, for their part, had a few modern repeaters, a few more obsolete muzzle-loaders and even occasionally used bows and arrows or threw rocks at the U.S. soldiers and state militia troops from California and Oregon.

Isolated in their Lava Beds stronghold, the Indians were cut off from any resupply of ammunition for their miscellany of old and new guns, and took to ambushing Army patrols and small detachments just so as to keep up their supply of cartridges. Eventually, the Modocs captured nearly as many modern breech-loaders from the army troops they killed, wounded, or sent running back to the lines in panic as they had warriors. Nevertheless, by the end of the Army's long siege, the Modocs were reduced to reloading fired cartridges with pebbles due to the lack of lead bullets, and to cutting holes in the bottom of spent Spencer rimfire casings so as to insert percussion caps as makeshift centerfire primers and then forcing such abortions into the chambers of some of the captured, single-shot, .50 caliber Springfields for which they had little or no ammunition.

In spite of their poor armament and small numbers, the Modocs nevertheless fought the government troops to a standstill. The Modocs killed an estimated 65 US troopers, Indian scouts and militia volunteers, and wounded at least another 65 more at a cost of only five killed in battle themselves; some counts put the US casualties as high as 163. The greatest number of Modocs killed at any time was when a group of them were attempting to extract the powder from an unexploded cannon shell fired by the Army into their position by trying to open the casing with a file, hammer and knives. In addition to the cost of keeping an army in the field for half a year, the

US Government also paid a quarter of a million dollars to the states of California and Oregon so as to reimburse them for expenses incurred in their state militias participation in the campaign.

By the late 1870's, all the major US manufacturers had made the change to cartridge guns; just one of these cartridge makers, Winchester, had a production capacity of up to 2,000,000 cartridges daily. But, despite the growing military and civilian acceptance of cartridge-firing guns, Shelton (1977: 4) nevertheless points out that muzzle-loaders continued in use in California long after the introduction of breech-loaders for a number of reasons. Muzzle-loaders were much cheaper to fire, as powder and shot was always less expensive than purchased cartridges, they could be loaded for a wide diversity of ranges by simply varying the powder charge or weight of the bullet, unlike most cartridge guns, which were "wedded" to a specific cartridge designed for a specific range, and, in many cases, the old muzzle-loaders were more accurate and harder-hitting than the newer breech-loaders. Not only were many old muzzle-loading guns saved, but reconditioned ones continued to be sold as well, particularly after the first world war, when black-powder shooting experienced its first revival as a nostalgic hobby. The 1940 *Shooter's Bible* devotes 5 catalog pages to muzzle-loaders, both percussion and flintlocks, offered to hobbyists or collectors, all in shootable condition.

Gunpowder, from the time of its invention in ancient China up to the late 19th century, was composed of 75% saltpeter, 10% sulphur, and 15% powdered charcoal; the powdered charcoal gave it a characteristic dark or "black" color, hence the common name of black powder. Well-known disadvantages of black powder were its incomplete combustion, which led to chamber and barrel fouling and, eventually, jamming in breech-loaders if not attended to, as well as comparatively fast-burning, which led to low bullet velocities but, unfortunately, high or arched trajectories. Early black powder cartridge identification, even nomenclature, can be quite confusing. Few cartridges from the 1860's or '70's bear the familiar headstamp listing caliber and manufacturer, and even old catalog descriptions are unlike those for modern cartridges. Rounds for the Spencer repeaters of the 1860's are amongst the most troubling, as, for example, the .56-.50 round indicated that the cartridge was slightly conical, with a basal circumference of .56 caliber tapering down to a lead bullet of .50 diameter, the actual bore size.

The standard way of identifying black powder cartridges from the end of the Civil War til well after the turn of the century normally was a "three entry" designation, indicating caliber, powder charge, and bullet weight. Thus the .50-110-300 Winchester cartridge employed 110 grains of black powder to propel a 1/2 inch diameter (.50 caliber) bullet that weighed 300 grains. This was nothing new, as each variable had been considered critical information by muzzle-loader shooters for whom, until the introduction of metallic cartridges, getting such variables correct meant the difference between shooting as desired or, possible injury or even accidental death. The old three-part designation system began to break down with the introduction of smokeless powder in the 1890's; since there were many different kinds of smokeless powder, and since none were exactly comparable, much less so with their black powder predecessors, the powder grain designation became essentially meaningless. As a kind of compromise, some early smokeless rounds introduced during the twilight years of the black powder era, such as the .30-40 Krag and .30-30 Winchester, retained the old designation system in modified form, using a two-part system whereby bullet weight was dispensed with, but the powder designation indicated smokeless, rather than black, powder.

Even more confusing was the fairly common situation which held around the turn of the century whereby two cartridges identical in their two-part designation, such as the old Winchester .25-20, would actually have different case lengths, the shorter casing for the tube-fed repeaters, the longer for single-shot rifles. After the turn of the century, most smokeless rifle cartridges came to be identified by only a single designation, that of caliber (i.e., .35 Remington), and sometimes, especially in the case of guns of European manufacture, rounds were labeled by a two-part designation incorporating the caliber plus the case length: for example, the 8mm Mauser cartridge was known as the 7.92 x 57mm round by its German manufacturers.

The 1880's and 1890's saw a shift in the California population, away from the gold country which during the 1850's and into the '60's was the most heavily populated part of the state, and westerly to the growing cities on the coast. At the same time, however, small farming, stockraising and lumbering communities spread out through the state so that by 1900 California was essentially a land thoroughly saturated with small towns producing basic resources. The growing population of the California cities also created a demand for market hunting, which was extensively practiced throughout the state into the 1880's, until subjected to stringent controls by law. The establishment of the first restrictions on hunting in California date to the 1880's, when sportsmen became alarmed at the rapid decline in many species of wildlife throughout the state. Some species became extinct (such as antelope in the San Joaquin Valley) before two simple legislative expedients, both quite successful, were introduced: specific hunting "seasons" were made mandatory for the first time, tailored to individual game animals and/or birds, and the sale of wild game was completely outlawed (Shelton, 1977).

Always as common in California as rifles were shotguns, but unlike some eastern states which prohibit the hunting of large game animals with any arms other than shotguns, in California the shotgun never achieved the 20th-century importance it did in some of the smaller states on the eastern seaboard where it was, and is, the only legal long arm. The earliest cartridge-firing shotguns were amazingly inefficient and dangerous pinfire units of French manufacture: the first of these were made by Lefauchaux, the inventor of the pin-fire system, perhaps as early as 1836. Rimfire and centerfire cartridge shotguns first became practical in the early 1850's in England, predating their general adoption in California by some 20 years. The English Guns were very expensive and not mass-produced; few cartridge shotguns of any kind showed up on the West coast of North America prior to the 1870's. The old black-powder, muzzle-loading shotgun continued in common use in California well past the introduction of metal cartridges in the 1870's, and some were even used (not as curiosities, but as the gun of preference) up to the turn of the century. Similarly, some large caliber (in the .40 to .58 caliber range) muzzle-loading rifles that were "shot out" (i.e.: their rifling excessively worn) were converted to shotguns by the simple expedient of reboring their barrels smooth, and such guns continued in use for many years. Sears, Roebuck & Company in 1894 still listed a single-shot, muzzle-loading shotgun brand-new for \$3.35; and a double-barreled muzzle-loader for only \$5.35: available were guns in 11, 12, 13 and 14 gauge. But, by the turn of the century there seemed no good reason not to buy a cheap single or double-barreled cartridge shotgun, apart from the fact that a box of 25 shells cost 50 cents, or sometimes up to one sixth of the purchase price of the gun itself.

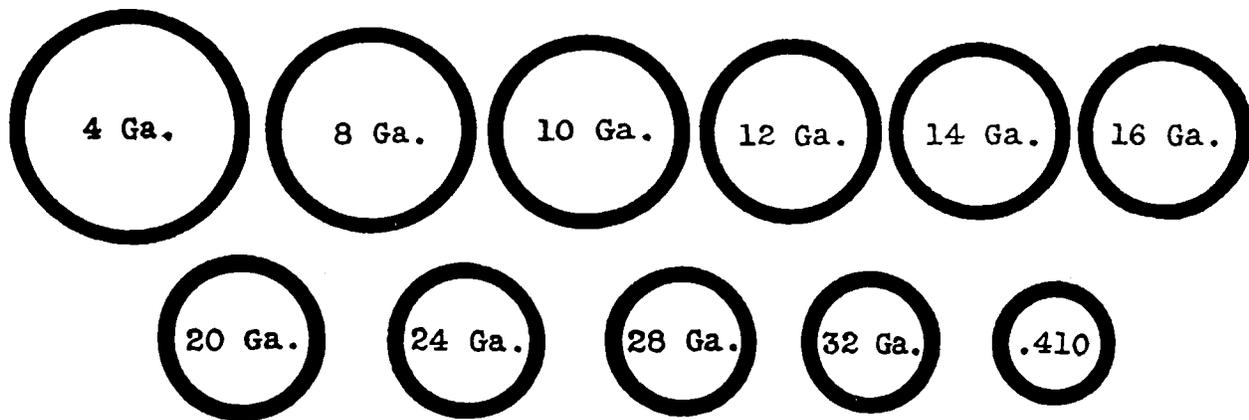


Figure 16: Shotgun chamber size chart, giving the diameter of common shotgun cartridges in gauges popular from the 1870's to the present. From Stoeger Arms Company, 1940: 252.

An instant success in California was the Colt double-barreled top-break shotgun of 1878, especially in 10 and 12 gauge; this gun's sales were helped in no small way by the name recognition already accruing to the firm's pistols, in use on the Pacific Coast for the previous 30 years. By 1880 muzzle-loading shotguns were completely obsolete and by 1900 the single-shot, top break, hammer or hammerless shotgun could be purchased brand new for around \$3.00. While double-barreled shotguns are as old as any single-shot pieces, pump-action, repeating shotguns only began to appear in California in large numbers in the late 1890's: their arrival caused a panic by conservationists, who were convinced that they would render extinct endangered game bird species, and new hunting legislation was enforced as a result. Automatic shotguns in California generally were post-WWI phenomena, and did not really become popular until after World War II.

In mid-1890's California, the most popular shotgun cartridge by far was the 12 gauge, followed by 10 gauge with 16 gauge running a distant third. Different gauges were normally considered appropriate for different kinds of game: 10 gauge shotguns were called goose guns, 12 gauge, duck guns, and 16 gauge pieces dove and quail guns. All of course were used in all contexts, but is the opportunity presented itself, such would be the choice. By the mid-1890's, 20 gauge guns were beginning to make their appearance, but did not become popular until after the first world war. Similarly, by that time 14, 16, 24 and 28 gauge shotguns were losing popularity, and the big-bore guns (larger than 10 gauge) had been ruled illegal and shells were no longer available for them. It was only after World War I that the now-common .410 gauge (actually not a gauge at all, but .410 Caliber) or "boy's" shotgun became popular in California.

So as to overcome the expense of shotgun ammunition, most smoothbore shooters in California reloaded their shotshells, and, in fact, some ammunition companies such as Winchester only sold unloaded hulls for individual hunters to load themselves to their own specifications up til 1885, and continued to offer primed, unfilled casings until well after the turn of the century (Williamson, 1952: 108). Many of the earliest shotgun shells were of solid copper, then of brass. These were easily reloadable and reusable until their terminal ends became so cracked or frayed that they finally had to be discarded, or cut down for re-use as short rounds. By the mid-1880's shotgun shells

No.	12	11	10	9	8	7½	6	5	4	2	Air Rifle	BB	No. 4 Buck	No. 3 Buck	No. 1 Buck	No. 0 Buck	No. 00
DIAMETER IN INCHES																	
	.05	.06	.07	.08	.09	.095	.11	.12	.13	.15	.175	.18	.24	.25	.30	.32	.33
	← APPROXIMATE NUMBER OF PELLETS TO THE OUNCE →											← NUMBER TO THE OUNCE →		← APPROXIMATE NUMBER TO THE POUND →			
	2385	1380	870	585	410	350	225	170	135	90	55	50	340	300	175	145	130

Figure 17: Shotgun pellet or shot size chart. From Stoeger Arms Company, 1961: 234.

were being made with a brass base and treated paper or cardboard tube casing; some experimental models were half-brass, or brass up to half their overall lengths, into the 1920's. In the field these shell casings degrade so that only their brass bases are left; these invariably appear quite "early" looking but, nevertheless, many brass-and-paper shotgun shells were sold into the 1970's. Extinct for the past 50 years or so are the all-brass shotgun shells introduced in the 1870's, but again, these need not be universally early, for empty, primed, solid brass shotgun shell casings, erroneously thought by many to have ceased production in the 19th century, were actually still sold by major suppliers right up to World War II for handloading purposes, in 8, 10, 12, 16, 20 and 28 gauge.

While the relative price of shotgun shells has diminished today, it is interesting to note that single-shot, 12 gauge shotguns virtually identical to the ones advertised in the 1908 Sears catalog complete with reloading kit, a box of shells, cartridge belt, gun case, etc., are still being sold brand new in California; the 1908 gun with all the extras sold for under \$5.00, the gun of the 1990's (without extras) costs approximately \$80.00. An invention useful in dating mass-produced shotgun shells was introduced by Winchester in 1896; circumferential grooves around the brass casing of the shell near its base. These grooves held the paper or cardboard wad and shot casing in place and eliminated the problem of casing separation, which was common to earlier shells. As a consequence, such shotgun shell casings cannot have been made earlier than 1896.

The modern two-part brass and plastic shotgun shell was a Remington introduction of 1958; for many years brass and paper shells were sold new along side the plastic shells, but by the early 1970's paper or cardboard shells were essentially extinct as new items. A more recent development (circa 1980) is the all-plastic shell marketed by Fiocchi and other European manufacturers. These were marketed at a cheaper price than American-made brass and plastic shells and many were purchased as novelties but have become unpopular for two reasons: they work fine in single or double-shot guns but tend to jam in repeaters and are not prone to reloading. As a consequence, all-plastic shotshells are seen less and less in the stores and in the field.

The vast majority of shotguns sold in California since 1920 have been, and continue to be, 12 Gauge, regardless of whether they are single or double shot, or pump action repeaters or automatics. The next most popular modern gauge is 20, which is usually preferred by those who want a lighter gun, rather than any difference in the kind of shooting; the final most popular gauge today is .410, considered to be a child's caliber in California. Such preferences are comparatively recent, for a glance at Figure 16 reveals that many other gauges exist, or existed until fairly

recently. No shotgun larger than 10 gauge is presently legal in California, although these did exist in the 19th century, and, in fact, 10 gauge (now somewhat rare) was common from the 1860's until the 1890's. Similarly, 16 and 28 gauge once were not uncommon in California, but have diminished in popularity since World War II. Any shells of 14, 24, or 32 gauge found in the field are likely to have been used in guns dating to the turn of the century and are probably not of recent manufacture. Shotgun pellets are much more common than the shell-casings themselves, and, of course, cannot be identified as to the gauge of the shell from which they were fired. Also, sometimes the larger pellets or buckshot are confused with cap-and-ball pistol rounds, or with small-caliber muzzle-loading rifle or musket balls. In the 1980's, concern over pollution by lead shot led to the introduction of steel shot in California; any such shot in archaeological contexts must of necessity be quite recent. Figure 17 shows the sizes of standard shotgun shot used in most gauges.

In addition to the usual rifle and shotgun, most rural California families also had a pistol or two; these were often Colt .45 or .44-40 single actions or Smith and Wesson .44's, although many smaller guns such as the numerous .32's and .38's were common for self-protection amongst the state's growing urban population. None of the nomenclatural systems used for rifle cartridges were applied to US made handgun cartridges (except for those which also fit repeating rifles) which, despite being changed from black powder to smokeless loads, sometimes kept their old secondary adjective describing case length (i.e.: .22 short, .41 Long Colt, etc.). By the turn of the century, virtually all rural families in California also had a .22 rifle for use by the children, or for recreational "plinking", or for pest-control: these were frequently single-shot guns, but more commonly lever-action or pump ("trombone") repeaters. By 1900, probably more .22 rounds were being fired in California than all the other rifle, pistol and shotgun rounds combined.

The Spanish-American War led to a military buildup on the Pacific Coast, with numerous forts and camps being built, and much of the population volunteering for military service. The Spanish-American War was also a wakeup call for the US military, which was at least 10 years behind Europe in terms of firearms technology. Glaring deficiencies in US Army small arms quickly became obvious through combat, for many U.S. soldiers (such as my own grandfather) were still armed with the old black powder .45-70 single-shot long rifles, while the Spanish troops in Cuba, Puerto Rico and the Philippines were armed with bolt-action Mauser repeaters, firing smokeless powder cartridges. The Mausers, themselves a ten-year old design (Schreier, 1987) could be fired many times faster than the old .45-70 single-shot U.S. Springfields, which were essentially the same in design as the 1866 Allin conversions of Civil War muzzle-loading rifled muskets.

Even worse, the supposedly concealed positions of U.S. soldiers were often revealed by the dense clouds of smoke generated by the black powder cartridges of the .45-70's, whereas enemy troops firing the smokeless powder Mausers did not give away their positions every time they fired. As early as 1895, civilian rifles such as the Winchester Model 1894 lever-action were being sold which fired the new .30-30 smokeless powder necked cartridge (Figure 18), but the U.S. Military was slow to catch on to the merits of smokeless powder. Some of the U.S. troops fighting in Cuba in 1898 had been issued the comparatively new .30-40 Krag-Jorgensen smokeless bolt-action repeaters, which had begun to be issued to a few troops as early as 1896; the difference between these new guns and the old single-shot .45-70's was like night and day.

Experimentation in Europe with guncotton and nitroglycerin, beginning in the 1840's and paralleling the development of dynamite, eventually led to the invention of smokeless powder, which was first commercially employed as a cartridge propellant in the 1880's. Smokeless powder was clean-burning, and consequently didn't foul the gun's barrel or action like black powder did. It was also slow-burning, which allowed for a more gradual buildup of pressure behind the bullet than did black powder, resulting in increased bullet velocity and flatter trajectory. Finally, smokeless powder was more powerful than black powder: consequently, less of it was needed to propel a bullet of a given caliber and weight than the older propellant. This being the case, existing rounds could be made harder-hitting without any change in casing dimension, the casings of old rounds could be down-sized without giving up any range or hitting power, and, perhaps most importantly, bullets of smaller caliber could be used without any sacrifice of range or trajectory over the earlier, much heavier large caliber bullets propelled by black powder.

Some American companies such as Winchester began experimenting with smokeless powder as early as 1888, but it was not until 1893 that Winchester would offer ready-made cartridges using smokeless powder; these were custom-order shotgun shells using what was then called "Nitro" powder. Winchester first made metallic cartridges with smokeless powder the following year, a government contract to supply rounds for the new .30-40 Krag, and then the following year for the first of their own guns, the model 1894 lever-action, in .30-30. Far from smokeless powder being an overnight success and rendering black powder obsolete, it is interesting to note that by 1914, Winchester was making 175 different cartridges using smokeless powder, but still making and selling 375 different rounds that continued to employ black powder (Williamson, 1952: 144-145). Just as the centerfire cartridge had earlier become more popular than the rimfire which preceded it, so too did centerfire cartridge forms now evolve. Tapered cartridges, amongst the earliest forms introduced, became a thing of the past, so much so that today any tapered metallic cartridge found in archaeological context is likely to be quite old. To a lesser extent, the once-common straight-sided rifle cartridges began to disappear as well, replaced by more advanced cartridge designs. With more powerful smokeless powder, and dramatic increases in bullet velocity, caliber size decreased. This led to the dominance of the "bottleneck" cartridge shape, where a large powder reservoir contracted or "necked down" to a bullet of much smaller diameter and lighter weight than those fired by most black powder cartridges.

In the 1880's one went hunting with a .44, .45 or .50 caliber rifle that fired a 300, 400, or even a 500 grain bullet from a black-powder, often straight-sided cartridge; in 1900, one went after the buck with a .30 caliber 150 or 180 grain bullet propelled by smokeless powder from a necked cartridge. Hand-in-hand with the advances in smokeless powder and cartridge casing design went improvements in bullets. The old round ball as we have seen, was known to be ballistically inferior to pointed bullets as early as the 1850's, but most bullets fired by the late 19th-century repeaters and single-shot rifles had round or even flat noses so not to pose a danger to the centerfire primers of the rounds in front of them in the common underbarrel tubular magazines of the time. The round-nose bullets were usually fine for short-range shooting, but had poor trajectories over long range, and left much to be desired in terms of initial penetration and subsequent expansion.

The problem of poor bullet expansion was solved by some of the early, large-caliber Winchester rifle hunting rounds which employed hollow-point or dum-dum bullets as early as the 1880's.

Figure 18: Military and Civilian centerfire metallic rifle cartridges, old and new. From top to bottom: .25-35 Winchester, with rimmed, necked casing, round-nose bullet 1895; .257 Roberts, with rimless, necked casing, round-nose bullet, 1934; .280 Remington with rimless, necked casing, Spitzer bullet, 1957; .300 Savage, with rimless, necked casing, round-nosed bullet, 1899; .30-40 Krag, with rimmed, necked casing, round-nose bullet, 1894; .32 Winchester Special, with rimmed, necked casing, round-nose bullet, 1894. Compare the above smokeless rounds with the 1873 black powder .45-70-405 Government cartridge at bottom, with rimmed, straight casing and round-nose bullet. From Stoeger Arms Corporation, 1961: 211- 3, 215.



Dum-dum bullets had a conical, sometime tubular, recess cut into the tip of their heads. This recess or relief was small enough so as not to influence their ballistic characteristics, but large enough to cause the bullet to "mushroom" after penetration, which radically increased their stopping power and shock value. Military use of such bullets was outlawed by international accord in the late 19th century, and enforced by the Hague and later the Geneva conventions through World War II, and most commercial ammunition suppliers did not offer them for sale until the late 1940's. Hollowpoint bullets are now, of course, quite common in handgun ammunition, and are used in standard police and military loads throughout California and most other states.

With the increased velocities now possible with smokeless powder, gently tapering or pointed bullets began to see increasing use, for it was recognized that such shapes provided for greater range and a flatter trajectory. The old lever-actions had to use flat or at best round-nose bullets in their underbarrel, tandem-round magazines, but the new bolt-action, box-magazine rifles could use ballistically superior pointed-nose or *Spitzer* bullets, and these rounds became standard in all military shoulder arms worldwide. The European development of the bolt-action beginning in the 1880's provided a new application for such efficient designs, although the original 1888 Mauser bolt-action fired round-nosed slugs. Nevertheless, by the mid-1890's *Spitzer* bullets had been designed for the Mauser action and soon became the world standard in terms of muzzle velocity, range and trajectory. At the same time, bullets of any form fired by smokeless powder were found to be more efficient if partially or completely jacketed with copper, nickel, or other metals harder

than the lead which still provided their mass and weight. Jacketed or semi-jacketed bullets became the world-wide military standard by 1900, and the standard for civilian hunting shortly afterwards.

After 1900, the growing popularity of the bolt-action rifle led to changes in cartridges casing design as well as in that of bullets (Figure 18). Previously, most rounds fired in non-bolt action weapons had a rim or flange around their base so that the gun's extractor could get a purchase on the casing after firing and eject it; now, in the new design, the extractor was incorporated into the bolt, and rounds fired by bolt-actions had a circumferential recess just ahead of their base, whose diameter was normally the same as the casing wall. After World War I, some very high powered rounds designed for bolt-actions used extra powder, and their casings had to be reinforced; these were the first magnum rounds, and such cartridges are identifiable by the raised, circumferential band of extra metal just ahead of the extractor recess near the base of the casing wall. Since about 1940, a large variety of magnum rounds have been developed, some by major manufacturers such as Winchester and Remington, but most by Wetherby, the private California-based firearms inventor. Most such magnum rounds are used for big game, so as a consequence they are rare in California, their only common application being for bear-hunting.

The Spanish-American War led to major changes in pistol and pistol cartridge design as well as the final rejection of the the black powder, single-shot rifle. The 1898 American occupation of the Philippines and the subsequent Aguinaldo insurrection fomented an ongoing, low-level guerrilla war. U.S. troops issued Colt or Smith and Wesson double-action revolvers firing the US service cartridge (the .38 Long Colt) found this round incapable of stopping Moro guerrillas, even when shot repeatedly. Most .38 caliber revolvers chambered for the military round would also fire the .38 short Colt and .38 S&W, both even more anemic than the Army round. Being hit with any of these early .38 cartridges (Figure 19), even six times, only seemed to make the amazingly brave Filipino fighters angrier, and they would still come on and kill the US soldier, with his now-empty .38, often with just a machete or a knife. A number of solutions to the problem were tried, the simplest being the return to service of the old, single-action Colt .45 and .44-40 big caliber revolvers of the 1870's and 1880's, which usually could be relied to put down an attacking Moro, often with just a single shot. The second option was the improvement of existing "modern" (i.e., smokeless, small caliber) cartridges such as the unsatisfactory Colt and Smith and Wesson .38, which resulted in the .38 Special Cartridge (Figure 19) by 1902. The .38 Special cartridge simply upped the amount of powder from 18 to 21.5 grains, and increased bullet weight from 150 to 158 grains. Most importantly, the old S&W .38 casing was lengthened by another 1/3 so that the new rounds would not fit in guns designed for the older cartridge.

The most radical solution to the problem of the punky US .38 round not stopping Moros attacking U.S. soldiers in the Philippines was the eventual introduction of the .45 ACP, or .45 Caliber Automatic Colt Pistol as the standard sidearm of the U.S. Military beginning in 1912. The Colt .45 Auto saw its first military use in the Mexican Campaign of 1914-1916; in fact, one made during the very first year of manufacture was carried in that campaign by my Grandfather. The .45 Auto remained the official US pistol in World War I, II, Korea, and Vietnam, only being replaced by the large-magazine 9mm automatic in 1985 under pressure from our Nato Allies, all of whom had earlier adopted the 9mm Luger round. Millions of .45 auto pistols were made by Colt and by other manufacturers. They were sold brand new as civilian versions or as military surplus on the civilian

Figure 19: Military and Civilian centerfire metallic revolver cartridges, old and new, with dates of introduction. From top to bottom: .32 Smith & Wesson Short, 1876; .32 Short Colt, 1875; .32 Long Colt, 1875; .32 Smith & Wesson Long, 1896; .38 Smith & Wesson Short, 1869; .38 Short Colt, 1873; .38 Long Colt, 1875; .38 Smith & Wesson Special, 1902; .41 Long Colt, 1876; .44 Smith & Wesson Special, 1906. The bottom three cartridges were interchangeable in Winchester lever-action repeaters and in Colt Single-action revolvers. .32-20 Winchester, 1882; .38-40 Winchester, 1874; .44-40 Winchester, 1873. From Stoeger Arms Corporation, 1961: 208-210.



market almost from their first introduction just before World War I: thousands of them are still in daily use in California.

Improvements in revolver cartridges continued alongside the increasing popularity of automatic pistols, and resulted in the invention of the S&W .357 Magnum cartridge in 1935, with a very powerful load of smokeless powder and a lengthened casing almost twice as long as the original S&W .38; both the .38 Special and .357 Magnum continue to be standard military and police rounds to this day (Figure 20), having coexisted alongside the venerable .45 automatic, and, more recently, the 9 millimeter Parabellum or Luger. The 9mm Luger cartridge was first introduced in

Germany in 1902 as an alternative to the necked down Mauser and early Luger .30 caliber auto pistol cartridges that first saw extensive use in South Africa during the Boer War. In general, there has been an increasing trend since the early years of the century in handgun cartridges towards decreasing weight somewhat parallel to the situation with rifle bullets; the old .45 Long Colt bullet weighed 250 grains, the 1911 .45 auto bullet 230 grains, the .357 Magnum jacketed semi-hollowpoint, 158 grains; and the currently popular 9 mm Luger round only 115 grains.

Soon after the Spanish-American War, the standard US rifle became the Springfield bolt-action model 1903, essentially a copy of the German Mauser Model 1898. The 1903 Springfield bolt-action fired a modern, smokeless round; its chamber was modified three years after its initial adoption to accept an improved round, the high-powered .30-06 cartridge. The 1903 Springfield was the standard arm of US troops in World War I, and popularized bolt-action rifles of all types, which gradually came to displace lever-actions and, especially, the short-lived pump-action guns beginning in the early 1920's. The old .45-70 was as dead as the dodo; the new smokeless .30-06 round with Spitzer bullet hit much harder, had a greater range, and was more accurate than the old, black-powder .45-70 round-nose rounds. The new guns were repeaters, and since the new .30-06 rounds were much smaller and lighter than the old cartridges of the 1870's, many more of them could be carried than ever before. .45-70 long guns became relegated to use as Hollywood props, and were sold by Bannerman & Sons for a little as \$3.50 apiece in case lots by the late 1930's.

In the first decade of the 20th century, as the automobile began to be seen in greater numbers in the west, railroad building reached its height, with short lines extending to towns and communities long since abandoned, but locally famous then as crop, lumber, or stock producers. While the U.S. resisted entry into the European War that had been raging since 1914 until 1917, soldiers based in California participated in the Mexican Campaign of 1914-1916, when US troops were called to the border area so as to attempt to control the overflow of violence generated by the Mexican Revolution. The Mexican Revolution of 1910-1923 saw the use of many arms of old as well as new design just to the south of the border States; Mexican guerrillas tended to favor US-made weapons because they were comparatively cheap and available, whereas Mexican government troops were normally issued modern, German-made Mannlicher or Mauser bolt-action rifles, usually called, erroneously, "Spanish Mausers" by the English-speakers to the north. During and after the long and bloody conflict, many such arms ended up on the North American side of the border, either as curiosities or sold as surplus.

After the First World War, in which thousands of Californians served, the state again began to experience a population shift, that of its center of focus from the Northern to the Southern part of the state. The 1920's were boom years, with a steady growth of new residents in the state, and increased local and national demand for California resources such as agricultural products, lumber, livestock, minerals, and oil. The depression years were a time of stagnation in California, as they were throughout the country as a whole, but in general times were not as hard in the Golden State as they were in the "dust bowl" and other parts of the US. For this reason, thousands of dustbowl "refugees" came to California, increasing the density of the rural population, leaving large areas of their home states, such as Oklahoma and Texas, virtually abandoned. The 1930's in California were hard for many people, who came to rely on hunting, either licensed and legitimate, or as poaching, to put food on the table.

As before, California's timberlands were a standard destination of such hunters, in particular those known to be well-stocked with mule and black-tailed deer. In addition to older weapons, the post-World War I hunters typically carried .22 rifles of all types, .30-30 Marlins and Winchesters, Spanish-American War surplus .30-40 Krag rifles, and World War I souvenirs such as captured 8 mm Mausers, or interesting items such as .35 caliber pump guns or .300 Savage lever actions. The old tradition of social or recreational shooting continued unabated in California up until the outbreak of World War II. My father and uncles, for example, practiced target shooting in the 1930's at the small-caliber range in the basement of one of the buildings of the local high school they attended in Marin County.

With the American entry into World War II, California became the preeminent base of Military power on the Pacific Coast, and California manufacturing for the first time took precedence over production and extraction of natural resources. The entire Pacific War was fought from staging and supply points originating in California, and California factories and farms also contributed a major portion of the European theater's supplies as well. Again, as with the Spanish-American War and World War I, California was well-represented in all branches of the service. The bolt-action Springfield 1903 remained the standard Army, Navy, and Marine Corps issue rifle into World War II, when it finally began to be replaced by the Garand automatic rifle, also firing the .30-06 round.

The .30-06 cartridge remained the official U.S. Military round from 1906 until 1957, when it was replaced by the only marginally different "Nato" round, the 7.62 mm or .308 caliber Winchester cartridge, whose improved powder allowed for a smaller casing, which in turn allowed troops to carry more rounds of ammunition. After World War II, thousands of 1903 Springfields were "sporterized" and converted to civilian hunting rifles with lighter stocks and, in some case, shorter barrels. Thousands of these guns are still used in California. Similarly, since the 1920's, virtually all major gunmakers have offered their own civilian bolt-action hunting rifles in caliber .30-06. Millions of rounds have been fired from these guns in California since the early years of the century, and the .30-06 is one of the most common shell casings one can find in the forested parts of the state.

The postwar "baby boom" came to be most representative of California throughout the 1950's and early '60's, with thousands of ex-servicemen moving to the state and suburban sprawl coming to characterize the San Francisco Bay area and the Los Angeles Basin. With the postwar population explosion, the demand for raw materials correspondingly expanded; land prices shot up, lumber prices had never been higher, and much agricultural produce that had previously been exported overseas or back east was now being consumed at home. Again, many ex-servicemen returned to, or began, hunting or plinking in California forest lands, with .22's, .30-06 rifles, fancy bolt-action Winchesters, Remingtons, and even foreign makes in a bewildering array of "three decimal" calibers, such as .270, .308, or .375, and, for the first time, with automatic rifles such as surplus .30 caliber US Carbines, in fairly large numbers.

Just as had been the case after earlier conflicts, many servicemen returned to California with captured enemy arms, or later bought them as curiosities when they were offered for sale as surplus: confiscated weapons later sold as obsolete often went for a fraction of the price of a new,

American-made gun, and many German, Italian, and even Japanese-made rifles and pistols of World War II vintage began to appear in rural California during the late 1940's. Near California logging camps for at least the past 140 years on days off in the woods, loggers have engaged in hunting, target practice, etc: after World War II much of this recreation was done with guns of foreign manufacture. Most American ammunition companies had manufactured cartridges for foreign weapons from time to time, not simply for sale abroad, but also for North American sportsmen lugging war souvenir arms around in the woods; if one finds an 8mm Mauser cartridge in the California forests, it could have been dropped as early as the 1920's, but, if a 7.7mm Arisaka cartridge is encountered, it could not have been dropped before 1945 or '46.

During the late 1960's, California took the lead in social, cultural, and intellectual experimentation long before such new behaviors were tried in the rest of the country. California became known as the place where "things were happening", and happening first. Much of this behavior was positive and has led to changes which have improved our lives and which we now taken for granted; much of it, on the other hand, was not only self-destructive, but disruptive of society as a whole, and, unfortunately, continues today. Wholesale drug abuse, rampant venereal diseases, political extremism, random violence, and a spiraling murder rate, all spawned in the California of the 1960's, and unthinkable only a decade earlier, are sadly all now very much a part of the national scene. Young Californians just reaching voting age today have never known a time when these blights were not a part of the landscape; again in the 1990's, just as in the bad old days of the Gold Rush, California can again be said to have the "best bad things available anywhere". People interested in guns, who in earlier decades were assumed to be "outdoorsy" in their orientation, by the 1970's were now assumed to be either warmongers or potentially unstable individuals, law enforcement officials included.

Private organizations such as the YMCA and the Boy Scouts had sponsored hunter's training courses and regularly hosted shooting matches in California from about the time of World War I until well after the Korean War. I myself learned to shoot, as did thousands of others, as an 11-year old Boy Scout in the early 1960's at the local National Guard Armory Range, the old high school range where my father used to shoot having been closed down. Such socially acceptable shooting declined in popularity as the state continued to urbanize in the post-World War II period, despite the fact that hunting continued to attract more and more people each year. In the late 1960's, as the Vietnam War grew increasingly unpopular, the public acceptance of competitive shooting in California fell to its all-time low, because it was deemed too "military" in nature.

Despite the growth of "anti-gun" sentiment in California directly as a reaction to firearms misuse by urban criminals and gangsters, more hunting and plinking than ever before is being done in the rural, often the forested, parts of the state, and a greater diversity of firearms and calibers than at any previous time are in use. Communist-made souvenir arms began showing up in California shortly after the Korean War; more began to appear in the late 1960's as thousands of troops returned from Vietnam. Also, beginning in the 1950's, foreign-made ammunition began to show up in great amounts in California, both in "foreign" calibers such as 9mm, but also in standard US calibers such as .45 auto, .30-06, 12 gauge, etc. Virtually all such foreign-made ammunition will be relatively recent; obviously Israeli-made 9mm cartridges post-date the development of the Israeli

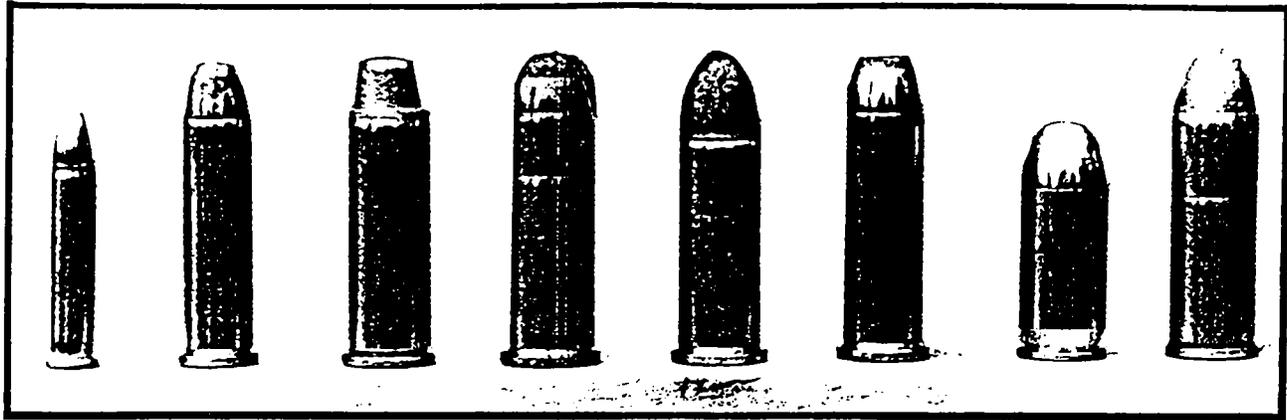


Figure 20: Pistol cartridges, old and new, with dates of introduction. From left: .22 Magnum, 1959; .357 Magnum, 1935; .41 Magnum, 1964; .44-40, 1873; .44 Special, 1906; .44 Magnum, 1955; .45 ACP, 1905; .45 Colt, 1873. Actual size. From Thompson, 1982: 35.

armaments industry in the 1950's and cannot be confused with rounds of older vintage. Most Spanish-made pistol cartridges are equally recent and amongst the most common, Italian-made shotgun shells run a close second, and, in the post-Cold War era, even ammunition of Red Chinese manufacture is beginning to flood the US market. During a recent survey of brush covered land in the uplands of east-central San Diego County preparatory to a controlled burn, I found the ground carpeted with 7.62 x 39mm shell casings, fired by the communist-made SKS and Kalashnikov assault rifles, and with 9mm Luger casings, both the modern California urban gangsters' calibers of preference, all of Red Chinese manufacture; obviously, all such specimens will be quite recent.

On a less ominous note, muzzle-loaders also have enjoyed a great resurgence of popularity after World War II; this trend continues to increase today as part of the ongoing "nostalgia" craze. Black powder replicas in particular have becoming popular, and it is now possible to buy near identical copies of Colt 1851 Navy revolvers, Derringers, even Sharps Buffalo guns in the same calibers as the originals. California companies have taken a leading role in the reproduction of authentic copies of the actual guns important at different stages of our history. Black powder replicas are, of course, used for hunting today in California; archaeologically speaking, these are potentially problematic for they can and do introduce modern artifactual expressions of very old technologies (i.e.: round balls, percussion caps, etc.) that if not recognized for what they are, could be interpreted as chronologically much older items.

California at present remains the most economically, culturally, and technologically diverse state in the most economically, culturally and technologically diverse country on the face of the earth: it is the place where more change happens, and happens more quickly, than anyplace else on earth. We are as different today from the Californias of the 1840's as the Californians of that decade were from the Romans at the time of Christ, and the trend continues. All that is certain for the future is that changes, some good, some bad, will continue to take place in California long before they do in other parts of the country or even the world at large, but that at the same time the unique personality of California, shaped by its almost 500 years of history, will be preserved the most distinctive and complex of all the western states.

CONCLUSION

The next time you look down at the surface of a log landing, or at an old cabin or homestead site at a meadow margin, or poke through yet another can dump in or adjacent to timberland in California, I encourage you to seek out and collect the shell casings that will inevitably be found. Some of these will be immediately recognizable; probably 95% will be recent, and at least 50% of these will most likely be casings from rimfire .22's shot at cans, targets, or small game since the end of World War I. It is the other 10% or so of cartridges found that might be of historical interest, for these may be of larger calibers, and perhaps some representatives of bygone eras may be represented.

Germane to forestry as practiced in California today, some cartridges, depending upon their age, may either obstruct or enable timber harvesting activities. What should one do when an unfamiliar cartridge is found in the field, say at the bottom of a can dump, eroding out of a cut bank right where your proposed logging road is supposed to go? Being as it was at the bottom of the can dump, the entire historical deposit must post-date or at least be contemporaneous with the shell casing; depending upon its age and significance, you may either proceed as planned, or have to re-route your road so as to avoid the historic dump. An initial look at the base and headstamp reveals that it is a centerfire cartridge of .40 caliber, but you don't know how old it is, what kind of gun it was fired in, and, most importantly of all, how significant it is. In order to make a positive identification of your shell casing, Appendix B of the present paper informs you that over 30 different .40 caliber rounds were made, ranging in age from 130 to only 4 years old, so you must next narrow the field. Is the shell casing straight-sided, necked or tapered? Is it long or short, rimmed, or rimless? Is it for a rifle or a pistol? For a single-shot or a repeater?

If your shell casing is long, rimmed, and tapered or necked, it is for a rifle, and could have been dropped into the forest dump as early as the 1870's, but probably no later than the turn of the century, as all .40 caliber rifle cartridges became obsolete by around 1900. If it is long, rimmed, but straight-sided, it is also for a rifle, and could even be earlier, dating to the 1860's: in either case, the single shell casing dates the entire dump by association, and constitutes evidence that the historic deposit is significant and worthy of preservation through avoidance. On the other hand, if your .40 caliber centerfire casing is short, straight-sided, and rimless, it is for the .40 caliber Smith and Wesson Automatic Pistol, a brand-new weapon introduced about 1990; consequently, the can dump which might otherwise remain uninterpretable, and thus force the relocation of your proposed road, can now be identified as of very recent vintage, and historically insignificant. Because there is no present legal compunction to preserve or to avoid can dumps of recent creation, you may now fire up your D8 and have at it.

But, what happens if you find a .40 caliber rifle cartridge from the 1860's at the bottom of your can dump, and a .40 caliber auto pistol cartridge at the top of it? What does this indicate? Can it even be possible? Such a situation probably indicates a chronologically mixed deposit, with both early and late components. Dumps are particularly notorious for this, as conscientious people, rather than throwing their garbage all over the place, tend to keep dumping it in the same, often circumscribed, location, year after year, and decade after decade. Dumps are also particularly common places to find cartridges of recent vintage as well, for few localities in California offer a greater number of breakable targets for recreational shooters than isolated dumps in the forest.

Appendix A lists many rifles, shotguns and pistols that, if found in historical archaeological contexts in California would be considered significant in most cases; as a corollary, the bullets they fired and cartridges the later examples used would also, by extension, constitute significant archaeological evidence. Many more examples of specific firearms than those offered in Appendix A could be briefly described: in the interest of brevity, the ones selected are adequate as representative of their time and pattern of historical use in California. No recent weapons are described for the simple reason that as we approach the present time, historical significance diminishes until it is nonexistent. Similarly, the very few cartridges illustrated in this paper are by no means exhaustive of all types historically or currently in use, they are simply a selection denoting some popular examples of the most basic differences between the various generations of 19th and early 20th cartridges as they developed.

Appendix B, on the other hand, hopefully achieves something like a complete inventory of the most important cartridges in use in California over the past 140 years. So as to facilitate the identification of metallic cartridges which may be encountered in California, and, perhaps more importantly, to allow for a determination of their potential historical significance, Appendix B lists examples both old and new. Each cartridge is identified as either rimfire or centerfire, its shape is noted (straight, tapered, or necked), its date of introduction given, and whether or not it is currently produced is stated. Finally, an evaluation of each cartridge's potential historical significance in terms of California history and archaeology is offered in the right-hand column.

In Appendix B, significance categories range from "A" (most significant) to "C" (insignificant). Category "A" specimens are those that have long been obsolete, and have not been made or sold new for many years: in most cases the guns which fired them ceased production many years before the last cartridge was produced. A different order of historic significance is represented by category "B", which incorporates many examples that may have been invented before the turn of the 19th century, but which remained popular for many years, and, in some cases, may still be manufactured and sold new today. Many modern cartridges are the result of an ongoing process of evolution going back to the late 1850's, including the venerable and ubiquitous .22 rimfire.

Consequently, simply because a given cartridge may have had a 19th century date of introduction need not mean that examples of that type are terribly old when found in the field. Category "B" status indicates not that such cartridge casings *must* be historically significant, as is the case with Category A casings, only that cartridges of that type *could be*. Secondary characteristics such as degree of patination, maker's marks, etc., then must be considered before deciding, for example, that a .30-40 Krag, .30-30 Winchester, or .300 Savage cartridge was fired in the year 1900 instead of in 1950 as a reload, or even in 1990 as brand-new. The third and final historical significance category ("C") incorporates cartridges of recent introduction (.308 Winchester, 10mm auto, etc.) which can under no circumstances be mistaken as either "historic" or historically significant. Identification of such cartridges should prove most useful, consequently, for elimination purposes.

Proceeding from the somewhat cold-blooded justification of the present field of study as a means of compliance with present legal obligations to a loftier plane, some observations about the limitations of cartridges and other firearms impedimenta as historic archaeological evidence seem necessary. A number of problems inherent in the field recognition of firearms-related artifacts

challenge the interested researcher. Gun flints, percussion caps, lead balls, and frequently-flattened shell casings are small in size and easily overlooked, especially in forested regions where leaf or needle fall leads to rapid buildups of obscuring duff layers. Nevertheless, if one can successfully recognize prehistoric chipped-stone artifacts, also normally of small size, one can certainly find a .36 caliber or larger pistol ball or lead slug. I find them all the time in surface contexts in the Sierra Nevada and Coast Ranges, and have excavated them in archaeological sites in the California desert, Coastal zone, Central Valley, and Mountain areas. Shell casings, owing to their unnatural shape, are even easier to spot than prehistoric stone artifacts once you have trained your eye.

But, the *in situ* preservation of firearms evidence in California can be problematic. Brass cartridge casings were collected during the great scrap drives of both world wars, are routinely scavenged by reloaders, by hunters wishing to conceal the location of a favorite hunting blind or game trail, or even hidden away inside packrat nests (if shiny enough). Lead bullets were routinely dug out of trees or dirt banks during the many decades of California history when shooters cast their own rifle and musket balls, and all such lead either had to come by ship up the coast from Central Mexico, or overland either from the Eastern States or the Columbia River country. Even when recovered, musket, rifle, or pistol balls may be so deformed from firing impacts as to be unidentifiable as to caliber: the evidence for the earliest use of firearms in California may be scant indeed. Nevertheless, a lot of old lead and brass survived, especially in timbered, isolated parts of California too far off the beaten path to be systematically picked up by gleaners.

Firearms evidence as a means of direct dating should be used with caution, for such evidence will only indicate the *earliest* potential date, not invariably the *latest* possible date of the deposit or locality. Different levels of firearms technology, both advanced and old-fashioned, were in simultaneous use during all periods of California history: we recall the Mexican War situation, with percussion arms in use against flintlocks. Similarly, a gun's patent or "model" date does not necessarily correspond to its actual years of production, for many guns, while introduced some time after the year of their patent date, were nevertheless made for many years or decades essentially unchanged: the century-old 1894 Winchester is still being made. Finally, US military arms were routinely "behind the times", and civilian or commercial arms were often much more advanced. The military retained muzzle-loaders long after breech-loaders became common as civilian guns; it retained cap-and-ball arms long after cartridge weapons became standard for civilian use; it held on to single-shot cartridge arms long after even the American Indians or foreign troops it was pitted against had cartridge repeaters; it clung to black powder guns for some years after most civilian arms had made the switch to smokeless powder, and so on and so forth. So, when military arms became surplus and were offered for sale on the civilian market, they were often "doubly" obsolete (but certainly more affordable) in comparison with the newest non-military offerings.

The contemporaneity of different and successive levels of firearms technology was manifested in many other ways in California history, such as in the continued use of heirloom pieces. No still-functioning gun ever gets thrown away, regardless of how old-fashioned it is. In rural families, the younger brother probably inherited the old flintlock when older brother graduated to a percussion piece; next generation, junior inherited the percussion arm when dad bought his first new cartridge gun. On the open market, old, outmoded guns still sold, provided they were shootable, but for a fraction of the cost of the "latest" development. This being the case, economically marginal groups

could often be expected to have a higher percentage of old-fashioned firearms than up-to-date weapons.

Yet another wrinkle in the story is the result of the common practice of converting or upgrading old style weapons to newer ones: far from being a "shade-tree" kind of amateur operation, such work was often performed by major contractors on behalf of the US Military. There were many conversions of flintlock rifles to percussion, and even a few from matchlock to percussion. In the 1860's and '70's, hundreds of thousands of percussion weapons were converted to cartridge-firing pieces, and the results of many of these efforts appeared in California. Most commonly, percussion revolvers were upgraded through conversion to cartridges after the Civil War (Larson, 1972). With the existing cap-and-ball rifling often the same caliber as the new cartridge, all that was required was the purchase of a new cylinder chambered for cartridge rounds, or the modification of the existing cylinder, the addition of a conversion "ring" holding a firing pin behind the cylinder, and the bobbing of the hammer so as to strike the new firing pin. The most commonly converted pistols were the 1860 .44 Colt Army and .44 Remington, especially after the introduction of the popular .44-40 Winchester cartridges after 1873. Much less common were conversions of the .36 caliber Navy revolvers, as these had to be re-bored for .38 Caliber.

Most of what I have tried to communicate in this paper is not taught in any college or university course that I know of. Some "crime lab" courses as taught by local police departments or on the national level by the FBI perhaps come closest, but such forensics/ballistics instruction typically focuses on modern, not historical, developments (cf. Hatcher, et. al, 1977). I learned most of what I know about firearms technology through what might most accurately be called "family firearms folklore" directly or indirectly from family members who were personally familiar with many of the kinds of evidence discussed in these pages. This folklore had been passed down from my great-grandfather, who fought in the Civil War, to my grandfather, who fought in the Spanish-American War, the Philippine Occupation/Aguinaldo Insurrection, the Boxer Rebellion, the Boer War (on the Boer side), the Mexican Expedition (on Pershing's side) and finally, World War I, from him to my father, who fought in World War II, and to my uncles, who variously fought in World War II, Korea, Vietnam, or saw FBI service, who in turn passed it on to me; I finally wrote it all down. Similar kinds of "firearms folklore" probably can be found within most old California families, but in all cases such recollections must be checked against "firearms fact", either in the form of the guns, cartridges and bullets themselves, or against reference works in the library.

General firearms history and the invention and evolution of individual makes or models is well documented and books on the subject are available in most California public libraries, and in the book sections of most larger gun shops. Probably the most readable and comprehensive treatments of the development of firearms technology in the English language have been produced by Peterson (1962; 1972a; 1972b; 1972c; 1972d), while the importance of firearms on the Western frontier is best described by Russell (1957; 1967). Russell also argued persuasively for the creation of a field of study very much like that addressed in this paper; between the two of them, these authorities have written much of what has been my bedside reading over the past 30 years. Descriptions of black powder muzzle-loading long guns significant in California history are offered by Carlson (1993); Fadala (1982); Lewis (1956); Peterson (1972e); Severn (1972a); Shelton (1977); Spangenberg (1975c) and Stetson (1992), to mention only a few;

single-shot, breech-loading rifles are discussed by Grant (1947); Sellers (1978); Severn (1972c) and Spangenberg (1975f); lever-action repeaters by Marcot (1983); Savage Arms (1992); Severn (1972a; 1972b), Williamson (1952) and Woods (1975a; 1975b), and bolt-actions by Askins (1985), Schreier (1987), and Thompson (1993). Detailed, informative discussions about historically significant pistols have been published by Arganbright (1983); Cochran (1984); Fines (1983a; 1983b); Grennell and Lewis (1979); Hoffschmidt (1974); James (1975); Jinks (1986; 1992); Larson (1972); Lewis (1982); Logan (1972); Patterson and De Marco (1972a; 1972b; 1972); Spangenberg (1975a; 1975b; 1975d; 1975e) and Wilson (1985), again, naming only a few.

I believe that nobody can truly understand metallic cartridges until he or she has spent a few years reloading a variety of calibers him or herself. Even then, many mysteries can only be clarified through recourse to standard reference works. The single best source of information about historically significant, as well as modern, cartridges is Frank Barnes' remarkable *Cartridges of the World* (1989). Barnes' book is the first I open when a newly-discovered shell casing defies easy identification. This work is continuously revised and updated, and is truly the *Bible* of the cartridge collector and black powder cartridge reloader: it should attain similar status for historical archaeologists interested in firearms and cartridge identification. Other useful sources on cartridges are by Anderson (1985); Fadala (1987); Grennell (1979); Hackley, et al., (1967); Hagel (1981); Hoyem (1981; 1982); Lewis (1972); Logan (1959); McDowell (1984); Steindler (1975); Thompson (1982); Warner (1987); Waters (1981) and Woodin (1958). The best sources of information on modern cartridges, powder, bullet types and ballistic performance are offered by their various manufacturers, and also by the makers of reloading equipment, such as Dillon Precision (1994); Federal (1993); Hercules (1991); Hodgdon (1994); IMR (1990); Lee Precision (1994); Nosler (1993); Redding-Hunter (1993); Sierra (1992) and Winchester-Western (1980), once again, naming only those that come immediately to mind.

Californians, both those whose families have lived in the state for many generations as well as those more recently arrived, have a growing awareness of and interest in their own unique history. On a larger scale, we should remember that a great deal of Western US history on the Great Plains, in the Rocky Mountains, and in the Southwest occurred because of California's influences even farther west, and that many western territories were not settled nor even became states until long after earlier populations had moved through them en route to the Golden State. Current interest in California history is manifested in many ways; as required curricula in formal education, from the grammar-school through university levels; through mass-media entertainment; through the informal "nostalgia" craze in architecture, clothing, and other forms of design; and even to a certain extent in the current environmental movement, which seeks to turn back the clock to a putatively more "natural" time in our state's history. Each approach interprets California history in its own way for its own purposes, and each in some measure neglects that aspect of history which attracts the attention of the archaeologists first: the kinds of technology that helped to shape the course of our development. Like it or not, that technology in the rural parts of our state from our earliest recorded history has always included firearms.

In the eastern United States since the 1920's, Revolutionary and Civil War historical archaeology has developed as a specialized field of study. The best such work may be described more

vernacularly as "battlefield archaeology". More than a quarter-century ago, Russell (1967) argued for a broadening of similar kinds of historical archaeological research westwards so as to incorporate fur trade sites of the trans-Mississippian West. Much more recently Scott (et. al, 1989) in one of the most spectacular examples of problem-oriented historic battlefield archaeology yet completed, has solved many long-standing mysteries surrounding the defeat of George Armstrong Custer at the Little Bighorn in 1876.

If California can offer nothing equivalent to a Gettysburg or a Little Bighorn, where historic battlefield archaeology might otherwise develop along the lines now familiar in some eastern states, California nevertheless can offer hundreds of much smaller historic sites where dramas involving lesser numbers of participants but perhaps of no lesser historical significance were played out. California history from very early times was characterized not by a few momentous battles, but by a long, almost chronic series of small skirmishes between different groups of people; evidence of these conflicts still remain on and in the ground in the form of lead bullets, gun flints or caps, and shell casings. Despite the existence for more than a century of some of the most modern cities on the Pacific Coast, until after World War II most of California was predominantly rural, and when the traces of over two hundred of years of hunting in California with firearms and nearly 150 years of recreational shooting is added, the body of firearms-related historical evidence is too substantial to overlook. I believe that firearms evidence is a worthwhile avenue of research in California historical archaeology, and one that is yet to achieve its full potential. Slowly but surely archaeologists and historians are coming to recognize the utility of firearms-related artifacts as tools for dating and for determining the relative significance of historic sites in California. The present study will, hopefully, prove helpful in our attempts to reach these objectives.

ACKNOWLEDGMENTS

The present paper continues a lifelong personal interest in firearms and the historical development of firearms technology. In the early 1960's while other 3rd graders at my Marin County, California, grammar school were bringing autographed baseballs to class for required "show and tell", I was lugging .56-52 Caliber Spencer carbines and .50 Caliber Remington rolling block rifles into the classroom so as to supplement my own "show and tell" discussions on, respectively, the Modoc War and buffalo-hunting on the Great Plains. My presentations didn't suffer from my having been raised by an historian, for while other kids played baseball with their fathers, I played Pershing vs. Pancho Villa with mine. As children we were constantly being dragged off to look at some Mission, battlefield or museum full of, what I now, after a formal archaeological education, recognize as historic archaeological evidence. Some years later, at UC Berkeley during my doctoral orals in archaeology, when one's examiners are empowered to ask literally any question under the sun, I had the almost unutterable joy of being asked about the historical development of gunpowder, "Greek fire", and other pyrotechnic inventions of the ancient world. I talked for an hour straight on the subject, forestalling other, potentially more difficult, questions I was not as well prepared to answer. So, many thanks to my father, Richard H. Dillon, who introduced me to the study of California history and to the history of firearms as well. Thanks also to my uncle John A. (Jack) Dillon, who put an 1851 Colt Navy in my hands at a tender age and explained how to field strip and clean it, then subsequently suffered through my disassembling a different gun from my grandmother's basement each week for more than a year, returning them with at least a majority of their most essential parts intact and in a general approximation of their original positions.

On a less personal note, the present paper originally appeared in 1993 as required reading in the syllabus for the archaeological training course I have been teaching for the California Department of Forestry and Fire Protection since 1990. Numerous comments and suggestions from those foresters who read the first version have been incorporated into the present offering, and I am grateful to all who brought points of interest to my attention. In particular, discussions with foresters Wayne Knauf, Jack Sweeley and Dennis McCain helped improve the content of the present offering. Dan Foster of CDF encouraged me at all steps in the production of this paper and secured permission to reproduce many of the illustrations used in it. Other archaeologists and historians who read earlier drafts and advised me on specific problems include the late Frank Fenenga, Jeff Hamilton, Rich Jenkins, Bob Jensen, Clem Meighan, Fritz Riddell, and Jackson Underwood. Marilyn Holmes, my copy editor, painstakingly read the manuscript and kindly corrected numerous errors.

I have found that most gunsmiths and reloading specialists are a wealth of information on old firearms, cartridges and calibers, and are capable of making positive identifications very rapidly on problematic specimens. Amongst others, Doug Campbell and Rick Ward, as well as Ray Howser, of the Pony Express Gun Shop of Sepulveda, CA, helped me by reviewing early drafts and shared much hard-to find information with me about historic and modern cartridges and calibers. Since the appearance of the first version of this paper, the handloading bug has bit hard, and much arcane information about current and obsolete cartridges has been shared by the employees of the Reloading Center, Sepulveda, CA. To all these people I am most grateful; any omissions or inaccuracies in the preceding pages are my own doing, and I gladly welcome their correction.

APPENDIX A: SIGNIFICANT FIREARMS IN CALIFORNIA HISTORY

FLINTLOCK ARMS

All Spanish Colonial military arms in California were Flintlocks, and all the Latin American Republics fought with flintlocks so as to gain their independence. Virtually all Russian, English, and Yankee firearms that appeared in Spanish Colonial and in Mexican California as imports or trade items were also flintlocks; it was only after approximately 1830 that the first percussion guns may have appeared. Flintlock guns in Latin America (including California) were notoriously non-standardized. Interchangeable parts, first invented by Eli Whitney of cotton-gin fame, were an early Yankee advance over all other world gunmakers, and gave the US a technological advantage over most other countries. Interchangeable parts were the single most important precursor to mass-production of firearms, which essentially was again a North American invention, made long before Henry Ford applied the idea to the automobile. Gunflints obviously relate to flintlock arms and to no other weapons; these are very good chronological indicators of pre-1850 firearms in California.

U.S. Rifle, Model 1803

This rifle was a major advance over the common smoothbore musket of the Revolutionary War. At .54 caliber, and with a 33-inch barrel, the 1803 rifle was much smaller (the musket was usually .69 caliber) lighter in weight: most importantly, it was a rifle, not a short-range musket. It used between 75 and 100 grains of black powder and was considered quite accurate. More than 4,000 of these rifles were made at the Harpers Ferry Arsenal in Virginia between 1803 and 1820. This was the weapon carried by the men of the Lewis and Clark Expedition, the first US Military force to reach the Pacific Ocean overland. It was also a standard gun of the fur trade, and doubtless appeared in California prior to the Mexican War.

Hall Breech-Loading Rifle, Model 1819

The Hall rifle was years ahead of its time in many respects, but absolutely unique in at least two ways: it was the first US Military weapon to be made of completely interchangeable parts, and it was the first breech-loader issued to US Troops. The Hall was well-liked by the soldiers that used it, and had a reputation for reliability and accuracy. The Hall Rifle had a tip-up breech released by a small trigger in front of the firing trigger on the underside of the gun; the hammer and trigger assembly were entirely housed by the movable breech, which made for a very strong action. The Hall rifle was in continuous use by US forces for more than 20 years; in fact, large numbers of them saw combat during the Mexican War, when they were actually preferred to the more modern but slower-loading percussion muzzle-loaders.

As an added bonus, the Hall action could be removed from the rifle and used in a pinch as a non-barreled pistol: US troops off-duty in Mexico routinely carried these loaded Hall rifle actions in

their pockets as "hide-out" weapons and in some cases killed assailants with them. Some of the Hall flintlocks were converted to percussion; these were the first official percussion arms of the U.S. Army, and some of these rifles saw use as late as the Civil War. Steven Kearny's Mexican War force of 1700 mounted infantry was equipped with Hall's percussion carbines; at least that many saw service in California, but few if any of these guns remained in California after the Mexican War.

PERCUSSION CAP ARMS

By the time of the Texas Republic's formation (1836), percussion cap pieces were replacing flintlocks; and by the time of the Mexican War (1846), the U.S. Army had almost completely changed over. Some percussion caps, especially the basal-flanged "top hat" or "beaver hat" variety, were made to shatter or break upon firing, which simplified their removal from the nipple. Others, especially pistol caps, fitted more tightly and could only be removed with the thumbnail. In either case, fired caps or cap fragments can be archaeologically located and are good chronological indicators.

RIFLES

Hawken Rifles, 1820-1854

Calibers .60 through .30, patched ball.

Jacob Hawken began selling rifles in St. Louis, Missouri, in 1820; in 1825, his brother Samuel joined him. The company made most of its rifles in the early 1840's, and went out of business in 1854. The Hawken guns were individually made, not mass-produced, and fewer than 3,000 were ever made. Because they were sold, however, to almost exclusively a "western" clientele, a great many Hawkens ended up in California around the time of the Gold Rush. The Hawken rifle was produced expressly for the fur trade, and was widely-regarded as the best-quality rifle money could buy. Most professional beaver trappers and fur traders considered all official US army shoulder arms, with the possible exception of the 1841 Mississippi Yager, as junk in comparison to a good Hawken. The big-bore Hawken shot a lead ball weighing 1/2 oz, had a range unequaled by any gun until the appearance of the Sharps breech-loader almost 30 years after the introduction of the first Hawken rifles, and was extremely accurate. Eventually the most famous Hawken rifle of all, that carried by Kit Carson when he guided Kearny's column to California during the Mexican War, came into the possession of President Teddy Roosevelt, who no doubt appreciated its range and accuracy as much as its historical importance.

U.S. Army Rifle, Model 1841

Caliber .54, patched ball (early); Caliber .58, minie ball (late); 33-inch barrel.

Many of these guns were made at the US Arsenal at Harpers Ferry, Virginia, and by other manufacturers such as Whitney and Remington. This was the standard and most modern long arm

of the US Army during the Mexican War. The rifle came to be called the "Mississippi Yager" by the troops, after its effective use by the First Mississippi Regiment, led by Colonel Jefferson Davis, in various Mexican War battles. "Yager" (or Jaeger, German for "hunter") guns were simply rifled pieces, as opposed to the old-style smoothbore muskets. The Mississippi rifle had a dual advantage over many of the arms used by the Mexican forces it came up against in that it was rifled and used percussion caps rather than being a smoothbore flintlock. Nearly 100,000 of these rifles were produced under US Government contracts between 1841 and 1862; hundreds of them were used in California from the 1840's up to the end of the 19th century. Many of these rifles were re-bored out to .58 caliber around the time of the Civil War so as to accept the newly-developed minie ball: the .54 caliber rifle took 70 grains of black powder, the .58 caliber version 80.

U.S. Army Springfield Rifle-Musket, Model 1855

Caliber .58, 40-inch Barrel, weight 8 Lbs. 10 Oz.

This was the first U.S. Army weapon expressly designed to fire the new, expanding-based bullet usually called the "Minie Ball", after its French inventor. This gun used a paper cartridge charged with 60 grains of black powder with round ball (500 grains) giving a range of 200 yards, or a Minie Ball (500 grains) with a range of up to 1,000 yards. An innovation over the earlier percussion muskets and rifles was the use of the Maynard tape priming system: the priming tape with fulminate of mercury pockets spaced at regular intervals between two layers of paper was kept in a hinged box on the side of the receiver. When the hammer was cocked, a standard length of tape was pushed forward so that a primer pocket lay directly over the nipple, similar to the action of the 1950's cap-gun. Standard percussion caps could also be used, giving the rifle a great deal of versatility.

Colt Repeating Rifle, Models 1836-1865

Calibers .34; .44; .47; 52; .56; and .69, 5 to 8 shot

The only marginally-effective percussion repeating rifle to appear in California was a long barreled, stocked, outgrowth of Colt's revolver. These were something of a curiosity when first introduced and did not sell. Depending upon the caliber, these guns were 5, 6, 7 and 8 shot: the larger the caliber, the fewer the shots. When fired, they would throw flames out to the side and frequently the chamber firing would ignite neighboring chambers, with disastrous results. Such rifles appeared in California as early as 1849, when William Manley carried one to Death Valley in his famous rescue, but these guns were never common.

Sharps Breech-Loading Rifle/Carbine, Model 1850

Caliber .52, linen or paper cartridge.

Christian Sharps was an ex-employee of the Harpers Ferry Arsenal who had worked with John Hall; leaving the arsenal in 1840, he began to work on refining his own invention, the slanting-breech or Sharps' action rifle. A great number of different Sharps percussion models were made as

early as 1848 and as late as 1866: what is most important is that they were cap-and-ball, lever-action breech-loaders that could be fired up to 9 times a minute and had ranges of up to a half-mile. The Sharps action employed a sliding breechblock that dropped vertically when the lever (actually the trigger-guard) was moved down and forwards; with the lever forwards, the chamber was exposed, and a paper or linen cartridge could be fed into it. Pulling the trigger-guard lever back slid the breechblock upwards; the top of the breechblock was sharpened to a chisel point, so this action not only closed the chamber but cut off the butt end of the cartridge, just like a cigar-cutter trimmed the end of a cigar, leaving the round ready to be fired.

If paper cartridges were not available, the breech could be left closed and it could still be fired (albeit much more slowly) as a muzzle-loader. The 1850 model Sharps was one of the first rifles to use a multiple percussion system; it could be fired either with the standard copper musket caps, placed individually on the nipple, or with the continuous-feed Maynard tape primer which was kept in a roll inside a hinged compartment on the side of the receiver. Maynard's tape primer lives on in less volatile form as the roll of caps fired by the once-ubiquitous toy "cap guns" of the baby-boom years. The Sharps carbines were made with a 22-inch barrel, weighed 7lbs, 8 Oz., and had ranges in excess of 500 yards. Many of these guns came to California overland in the 1850's and were famous as long-distance weapons of great accuracy. By 1853, US Mounted Cavalry (Dragoons) in California were being armed with Sharps carbines as their official weapon.

Sharps Rifle/Carbine, New Model 1859

Caliber .52; .54, linen or paper cartridge.

Similar to the earlier version of this rifle, but lacking the Maynard tape primer, and using waterproof disk primers, the New Model Sharps became the favorite single-shot weapon of the Civil War, and was reissued in yet a second "New Model" of 1863. Altogether, the US Army bought more than 80,000 Sharps carbines and 9,000 Sharps rifles, and more than 16 million linen cartridges for use during the Civil War; many of these weapons, sold as surplus after the war, appeared in California in the 1870's.

PISTOLS

U.S. Army Pistol, Model 1842

Caliber .54, weight 2 lbs, 12 oz or 2 lbs, 8 oz.

This was one of the first general issue US Army pistols designed specifically for percussion and was made as a counterpart to the 1841 US Rifle: both were of .54 caliber and would shoot the same lead ball. The pistol, however, was a smoothbore, and not rifled. Meant as a cavalry arm, the 1842 gun was commonly called a "horse pistol", as it was usually carried in pairs in saddle-mounted holsters. The US round ball bullet mold for the pistol cast a ball .525 inches in diameter and weighing 1/2 ounce. This ball was packaged in a paper cartridge along with the powder charge of 35 grains of black powder; the cartridge was torn open, the powder poured down the barrel, tamped tight with the ramrod, then the cartridge paper was placed over the muzzle, the ball seated

in it and forced down over the powder charge with the ramrod; the paper which now wrapped the ball served instead of a greased patch so as to ensure a tight fit. Modern tests with this pistol indicate very poor accuracy at ranges up to 25 yards, and near-total inaccuracy at greater distances.

It need hardly be pointed out that at the time of manufacture of the U.S. single-shot percussion pistol that Colt's revolver had been in production for 6 years and that the very idea of the large-caliber, smoothbore, single-shot pistol was an anachronism. Despite their poor accuracy and obsolescence, Steven Kearny's 1700-man force that invaded California during the Mexican War was nevertheless armed with these large-caliber, single shot pistols, either of the 1842 or slightly earlier 1836 pattern. Within a year or two, with the massive influx of Colt's pistols made and sold specifically for the California market, you could hardly give away a single-shot, muzzle-loading smoothbore.

Allen and Thurber Pepperbox Revolver, 1837-1842

Caliber .32, Six shot, Double action.

Made while revolvers of the modern type were still "experimental", pepperboxes had multiple barrels revolving around a central axle instead of a cylinder serving a single barrel. Pepperboxes were made in calibers from .28 to .50, but the larger guns were almost as dangerous to their users as to anyone being shot at. As a consequence of their design, they were quite heavy and in general, quite inaccurate. Another problem was their tendency to have the spark from the barrel being fired travel to an adjacent nipple and set off that barrel simultaneously; sometimes all six barrels went off at once. Mark Twain, never one to pass up a potentially humorous situation without literary embroidery, has a number of "pepperbox" stories to his credit: in one, the marksman aims for an oak tree out the window of a stagecoach he is riding inside of, but kills one of the mules pulling the coach instead.

Colt Paterson Revolver, Model of 1836

Caliber .36; .34; .31; .28, Single action, 5 or 6 shot.

The Paterson was Samuel Colt's first production revolver; like all of Colt's percussion revolvers, the Paterson was single Action; like most, it carried six shots, although the .36 was a five-shot. The smaller caliber versions were known as the "Baby Patersons", and none sold particularly well. The Paterson had no trigger-guard or exposed trigger; the trigger popped out when the hammer was cocked. The chambers had to be charged with a free ramrod, and reloading was a slow and complicated business. For quick reloading extra cylinders already charged with six shots could be carried; one Santa Fe trader as early as 1839 carried five extra cylinders with him, and this practice would continue until the introduction of cartridge-firing pistols after the Civil War.

At least a few Paterson Colts arrived in California prior to the Mexican War: Edwin Bryant mentions a "Colt's revolving-pistol" amongst his party in 1846, which would have had to have been a Paterson. The six loads were waterproofed with tallow packed over the end of the revolver's cylinders, which also served to lubricate the bore. While the Paterson was in actuality a fairly

weak performer, Colt nevertheless took out a patent on the revolving-cylinder pistol, which effectively hamstrung all competitors until it expired in 1857, giving him an essential monopoly on the repeating-pistol field in the United States for more than 20 years.

Colt Walker Revolver, Model of 1847

Caliber .44., 4 lbs, 9 Oz.

The Colt Paterson was widely recognized as inadequate for military use, so a greatly improved revolver was designed by Colt so as to see service in the Mexican War. The "Walker" Colt was the only revolver to be issued to US Troops late in the Mexican War and as such was the first US Military issue revolver of any kind. Many of the changes made in the old Paterson revolver were at the insistence of Captain Samuel Walker, who had used the Paterson revolver fighting Comanches in Texas and who wished to arm his Mexican War detachment with a large, heavy repeating pistol. Like the earlier Paterson, the Colt Walker was single action and six shot, but it had a vastly-improved loading method with a lever-action fulcrum-hinged ramrod permanently attached to the frame under the barrel. Walker Colts did show up in Gold Rush California, but were never as common as later, more lightweight models.

Colt 3rd Model Dragoon, 1848

Caliber .44, 7 1/2-inch barrel, 4 lbs., 1 oz.

This revolver continued the development of the Walker Colt of the preceding year, but the Colt Dragoon appeared too late to see service in the Mexican War. It did, however, arrive just in time for the California Gold Rush. This large, heavy pistol was issued in pairs to the US Cavalry, and kept in saddle holsters. Joaquin Murieta, the famous California bandit thought to have been killed by Harry Love and the California Rangers in 1853, is said to have carried as many as 6 Colt Dragoons at a time.

The large-caliber round or conical lead bullet was driven by 40 grains of black powder; standard tactics dictated that when the weapon was used against a mounted adversary, one tried to shoot the horse rather than the rider so as to dismount him then finish him off while unable to rapidly escape. The Dragoon could withstand very hard usage and was a favorite of many law enforcement officers and vigilantes in California up to and even after the Civil War.

Colt "Baby Dragoon" Revolver, Model of 1848

Caliber .31

This small, five shot, single-action pistol was available with 3, 4, 5 or 6-inch barrels, and being quite concealable, was a favorite of gamblers and hold-up artists in the California Gold fields. Many were sold to argonauts on the east coast prior to their sailing for the California diggings. The small .31 caliber lead ball was propelled by 15 grains of black powder; this proved to be a very weak load and comparatively ineffective.

Colt Pocket Revolver, Model 1849

Caliber .31; .36.

This was an updated version of the previous year's "Baby Dragoon", many of which arrived in California with "Gold Rushers" as early as 1849. The later .36 caliber piece, still a 5-shot, was much superior to the low-powered .31 and led directly to the .36 Colt Navy, arguably the best percussion revolver ever made. The Model 1849 Colt's revolver was specifically made and advertised for the California market, and during its 24-year production run, nearly 350,000 were made. A very large percentage of these pistols were used in California, and they essentially rendered obsolete all earlier single-shot pistols.

Colt Navy Revolver, Model of 1851

Caliber .36, 7 1/2 inch barrel, weight 2 lbs., 10 Oz.

This was Colt's most famous antebellum revolver, with over 215,000 produced between 1851 and 1872, and most sold to civilians: the type was also widely copied. A six-shot, single-action piece using 25 grains of black powder and either ball or conical lead bullets, the .36 Colt Navy weighed almost half as much as the Colt .44 but was only minimally less effective at close range. The Colt .36 Navy was probably the most common revolver of the California Gold Rush as well as the most popular of the Civil War due to its comparatively small size, light weight and accuracy.

Colt Army Revolver, Model of 1860

Caliber .44, 8-inch barrel, 2 lbs, 11 oz.

The new version of the earlier Dragoon, the Colt .44 Army was still a single-action, six-shot gun meant to be a cavalry arm capable of killing an opponent's horse. More than a pound lighter than the earlier Dragoon, the big Colt could still be carried in saddle holsters but was now light enough to be worn on a gunbelt. Almost 250,000 of these pistols were made by Colt, many more were close copies by other manufacturers. Thousands of these guns appeared in California during and after the Civil War years, almost as many as the more popular Colt .36 Navy. The .44 Army Colt was also the single most common percussion revolver later converted to cartridges, usually to .44-40 caliber, and hundreds of such conversions survive.

Remington .44 Revolver, Model 1861

Caliber .44, 2 lbs, 14 oz., 8 inch barrel.

Like the 1860 Colt Army, the Remington .44 was a single-action, six-shot piece, brought out to satisfy Civil War demands for as many pistols as could be produced by Union manufacturers. Between 1861 and 1866 the US Army bought more than 115,000 Remington .44 Revolvers, both the 1861 and the "New" model. Hundreds of these pistols appeared in California after the Civil War.

Remington .36 Revolver, Model 1861

Caliber .36, 7 3/8 inch barrel

Similar in appearance to the Remington .44, the .36 was slightly lighter in weight, and made as an obvious counterpart to the Colt 1851 .36 Navy revolver. Over 13,000 of the .36 Remingtons were sold to the US Army and Navy during the Civil War, and many showed up in California as surplus after the conflict.

Remington New Model .44 Revolver, 1863

Caliber .44

Essentially the same as the Remington Model 1861, the New Model had an improved cylinder pin over the 1861 pistol, which had the tendency of jumping out of its socket when the gun was fired. The Remington New Model .44 was the second most common US Army revolver in use during the Civil War, after the Colt 1860 Army. Hundreds showed up in California after 1865.

METALLIC CARTRIDGE ARMS

While the metallic cartridge was first employed in the United States for small-caliber pistols, its advantages over muzzle-loading and breech-loading systems with paper cartridges were immediately apparent. The metallic cartridge also paved the way for the modern repeating rifle; resistance to the adoption of the metallic cartridge by the US chief armorer during the Civil War led to the direct intercession of president Abraham Lincoln and the replacement of that official with a more "pro-metallic" appointee. By 1870, metallic cartridges were obviously the wave of the future, and all muzzle-loaders were obsolescent.

SINGLE SHOT RIFLES

Ballard Rifle, Model 1861

Caliber .22 rimfire.

The Ballard single-shot rifle was quite famous for its accuracy, and over its 30-year lifespan, appeared in many different models and in a very wide range of calibers, now mostly extinct. The Ballard action was similar to that of the Sharps, in the breech was opened and closed by lever action, the lever being an elongated trigger-guard. The Ballard Hunter's Rifle of 1875 established its reputation as a field gun, and was available in caliber .38 rimfire; .44 Long rimfire, .44 Long centerfire, and other more unfamiliar (at least now) calibers. Special mid- and long-range target versions were offered, some firing quite unusual cartridges such as the .40-90-370 paper-patched round, as long as a Havana cigar, and with the same general dimensions. An unusual feature of some Ballards was their ability to chamber both rimfire and centerfire cartridges by virtue of a reversible, offset, firing pin. In 1881, John M. Marlin formed the Marlin Firearms Company, and took over the manufacturing of the Ballard rifles. The Ballard single-shots continued to be sold by Marlin under the Ballard name for almost another twenty years.

Springfield Rifle, Model 1866
Caliber .50-70-450 Centerfire

The first single-shot long arm of the US Army, these were essentially conversions of the Civil War period muzzle-loaders into breech-loaders via the Allin trap-door breech action. The .50-70-450 round is just what it sounds like: a .50 caliber, 450 grain lead bullet propelled by 70 grains of black powder. The bullet generated nearly 1500 foot-pounds of pressure at the muzzle, and traveled at more than 1250 feet per second. The carbine version fired a less powerful cartridge with lighter bullet and shorter casing, the .50-45-400; both were used in the Modoc War of 1872-73.

Sharps Rifle, Model 1866

Caliber .50-170-700; .50-105-520; .45-120; .44-77; .40-50; .40-70 bottleneck, and many others.

The Sharps rifle had the reputation as being the single most accurate long-range rifle in use in California and the Western US. Essentially a big-game killer, the gun was designed to kill buffalo on the great plains, but was used on elk in the Pacific states and moose in the great north woods as well. The big gun (some versions weighed 18 lbs, the carbine 12 lbs) had such range that elevated shots in excess of 1,000 yards could be made with it. The most common calibers were .50 and .45; most cartridge-firing Sharps were made in the 1870's, and production stopped in the 1880's. The Sharps .40-50, .40-70 and .44-77 cartridges were among the very first to be necked (i.e.: have the powder casing a larger diameter than the bullet) and these were called, not surprisingly, "bottleneck" cartridges.

Some of the Sharps .50 caliber rounds had casings almost as large as the modern .50 caliber machine gun, 3.3 inches long by more than 1/2 inch diameter. The .50-140-700 Sharps straight cartridge had such a casing, just about exactly twice the length of a modern M16 cartridge case, and its bullet was virtually 3/4 of an ounce of lead, equivalent in weight to stacking more than three modern .45 auto slugs atop each other. Some of these big Sharps guns were used in California by lawmen and bandits alike, essentially as "siege" guns which could keep opponents under fire long before their own weapons came into range. Some of the old Sharps single-shots in .40 or .44 caliber were rebored so as to fire the standard .45-70 or .45-55 US government cartridge, and continued in use long after the original cartridge they had been made for became obsolete.

Remington Split-Breech Rifle/Carbine, Model 1864
Caliber .56-.50 Rimfire (Spencer).

The predecessor of the famous Remington Rolling Block, this single-shot gun was chambered for the Spencer .50 caliber rimfire round and operated with a very simple action. A breech-plate with basal hinge covered most of the chamber and rimfire cartridge when "up", and allowed for cartridge insertion and extraction when "down". A notch at the top center of the breech-plate served both as an aiming aperture and allowed the hammer to pass through it and hit the rim of the rimfire cartridge beyond, setting it off. These guns appeared too late to see service in the Civil War, but a few may have appeared in California in the postwar years, as early as 1866 or 1867.

Remington Rolling Block Rifle/Carbine, Model 1867

Caliber .50-70; .45-70 Centerfire; .22 Rimfire, and many others.

The post-Civil War Remington Rolling Block became the most common single-shot rifle in the Western Hemisphere. Using the Rider or "split-breech" action, the Remington action was world-famous as the most trouble-free and reliable of any single-shot large caliber gun. In .50-caliber with octagon barrel and half-stock, the rolling block was almost as common a Buffalo gun as the Sharps Rifle; not as heavy as the Sharps, it still weighed around 15 lbs. George Armstrong Custer used a .50 caliber Remington Rolling block as a hunting rifle, and in a testimonial letter to the company claimed to have killed over 40 antelope with it in a single season at an average range of over 250 yards. Full-stocked, with round barrels and smaller calibers, the Remington was used as a US Militia arm and most Central and South American Armies were armed with them prior to the introduction of the Mauser-type bolt action in the late 1890's. Tens of thousands of these guns in all calibers were in use in California, still being sold brand-new as .22 boy's guns into the ought's and teens of this century.

Springfield Rifle, Model 1873

Caliber .45-70-500; .45-70-405; 45-55-405 Centerfire

The "trapdoor" or Allin action Springfield rifle was the standard long arm of the US Army all through the Plains Indian Wars up to, and in some cases, after, the Spanish-American War. The carbine version was the standard US Cavalry weapon. The .45-55 and .45-70 black powder cartridge fired a very heavy, slow-moving bullet with a curved trajectory that later shooters would compare to mortar shells, but could knock over game up to buffalo size, was quite accurate, and had great range. The bullet was so slow it was said (probably apocryphally) that if you were being fired at at long range, if you could see the puff of smoke coming out of the muzzle and you dropped instantly, you could literally "dodge the bullet".

The carbine version was initially designed for the less powerful .45-55 cartridge; later carbines, beginning around 1880, would fire the larger round as well and the ammunition distinction was lost. The long guns were never popular as surplus civilian sporting arms in California, but the late model .45-70 carbines were sold as surplus by the thousands in California and the western states, going for as little as \$10.00 or \$15.00 as late as the mid-1930's. Many such carbines were used as deer rifles, and, because a wide range of civilian single-shot and repeating rifles were also chambered for the government round, the old .45-70 cartridge is still in production today, the sole-surviving big-bore, straight cased round of the dozens developed during the early 1870's.

Conventional US Army folklore circulating through the ranks as late as the Spanish-American war held that extractor failure in his .45-55 Springfield carbines was what got Custer's entire command wiped out: greasy, improperly cleaned cartridge casings would stick in the breech after firing and the extractor could not remove them, either ripping through the cartridge rim or itself breaking. The jammed guns were rendered useless, and many tales were told of troopers being scalped while trying to pry the casings out with their pocket knives. New recruits as late as 1898, including this

writer's grandfather, were told this tale as a means of encouraging them to keep the chambers of their issue .45-70's clean, and their issue ammunition free of dirt and grease.

Springfield .45-55 carbine extractor failure was in fact found through archaeological research (Scott, et. al. 1989: 113-115) to have occurred in perhaps as many as 131 of the US Army .45-55 Springfield carbines used at the Little Bighorn, almost 25% of all carbines employed in that battle. While extractor failure definitely was a factor in Custer's defeat, nevertheless, as Scott (et. al, 1989: 118) have proven beyond any shadow of a doubt, a more important cause was the fact that the US troops, vastly outnumbered by the Indians, were shooting single-shot weapons, while the Indians in very many cases were shooting repeaters. These Indian guns were most commonly .44 Henrys and 1866 Winchesters and .44-40 Winchester Model 1873's. By doing a painstaking job of battlefield excavation reminiscent of much police "crime scene reconstruction" and combining this with forensic historical archaeology, and extensive study of hammer and firing pin marks on fired cartridges, Scott (et al, 1989) estimated that Custer's command was outgunned by the Indians by more than 2 to 1, and furthermore, that about half of the Indians were firing repeaters.

REPEATING RIFLES

Spencer Repeating Rifle/Carbine, Model 1862

Caliber .56-.56 Rimfire, 7 or 8 shot .

The earliest repeating rifle used by US troops was the Spencer repeater, actually fired during a test by Abraham Lincoln, and a favorite cavalry weapon. Spencers were butt-loading via a spring-loaded, tubular magazine which carried 7 rounds; one more could be carried in the breech for a total of 8 shots. Extra charged magazines could be carried for very quick reloading, faster than any other repeater until the advent of independent magazine guns which did not arrive until the 1890's. The Spencer was lever action, but the hammer had to be cocked for each shot. The gun was very reliable and popular with the troops it was issued to: by 1866, the US Army had purchased more than 94,000 Spencer carbines, 12,000 Spencer rifles, and nearly 60 million rounds of Spencer rimfire ammunition. The first Spencer used the .56-.56 rimfire cartridge, using a brass casing .56 inches in diameter and firing a .56 caliber, 350 grain conical lead ball with 45 grains of black powder. Spencers were issued to some Civil War troops in California; later, they saw service in garrison duty and in the Modoc War of 1872-73 on the California-Oregon border.

Spencer Repeating Carbine, Model 1864

Caliber .56-52 Rimfire; .56-50 Rimfire; .56-46 Rimfire, 7 or 8 shot

In 1864 a new round was designed for the Spencer, the .56-.52 rimfire, which again used a casing .56 inches in diameter at its butt which tapered to a .52 caliber lead conical ball; later still another cartridge appeared, called the .56-.50, it was similar to the .56-.52 but used a lighter bullet of .50 caliber and only 320 grains. Yet a third new caliber, .56-.46, appeared in 1866, but didn't catch on. The Spencer repeaters in .56, .52 and .50 calibers remained in US Army service until the single-shot trapdoor Springfields began to replace them around 1870, and were considered obsolete by the

time the .45-70 cartridge was standardized as the US Army round in 1873. Most Spencer repeaters were then sold as surplus, and many of them appeared in California, especially in the carbine version. The most popular caliber surplus Spencer was .56-50, and ammunition for this version was still sold up through the late 1930's by Bannerman & Sons and other dealers specializing in collectibles and historical arms.

Henry Repeating Rifle, Model 1862

Caliber .44 Rimfire, Sixteen shot

Oliver F. Winchester took over the assets of the Volcanic Repeating Arms Company after it went bankrupt in 1857, and organized a new company the same year, called the New Haven Arms Company, after the factory at New Haven, Connecticut. Winchester's chief gunsmith was B. Tyler Henry, an inventor, who by late 1860 had patented a much-improved new version of the old Volcanic rifle. Like the Volcanic, the new Henry rifle had a heavy brass receiver, an end-loading tubular magazine under the barrel, and was lever action. The revolutionary aspect of the new weapon, however, was that the magazine held 16 copper .44 rimfire cartridges which were vastly more efficient and powerful than the old volcanic rounds. The Henry was loaded by opening the muzzle end of the magazine tube and then dropping the cartridges in base-first, then inserting the magazine spring and stopper. The .44 rimfire incorporated 26 to 28 grains of black powder and a flat-nosed lead bullet of 200 to 216 grains weight. Only just over 1700 Henry repeaters saw service in the Civil War, but a few of these remarkable rifles arrived in California for civilian use during the Civil War years.

Winchester Repeating Rifle, Model 1866

Caliber .44 Rimfire, Carbine: 13-shot, Rifle: 15-shot, "Musket": 17-shot.

The first Winchester lever-action rifle, the Model 1866 fired the Henry .44 caliber rimfire cartridge with 28 grains of black powder behind a 200 grain flat nosed bullet. Like the Henry, it had a heavy brass receiver, and a tubular underbarrel magazine. Unlike the problematic Henry loading system, however, the Winchester was loaded through a port on the right side. More than 170,000 of these rifles were sold and a few were produced up until 1898: many were used in California.

Winchester Repeating Rifle, Model 1873

Caliber .44-40, .38-40, and .32-20 centerfire; .22 rimfire. Carbine: 12-shot, Rifle: 15-shot, Half-Magazine or "Sportsman's model: 6-shot.

The more modern successor to the Model 1866, this second Winchester lever-action repeater had a lighter and stronger iron receiver and was now chambered for the more efficient, less dangerous and, perhaps most important of all, reloadable, centerfire black powder cartridge. The .44-40, .38-40, and .32-20 black powder cartridges were interchangeable in Colt single-action pistols and the new Winchester repeating rifle, and the gun in these calibers was quite popular for many decades. Firing what was essentially pistol cartridges, these guns were not effective at ranges much in excess

of 200 yards. In continuous production for over 50 years, almost 750,000 Model 1873 Winchesters were made, and tens of thousands of them were used in California, most of them in .44-40 caliber.

Winchester Repeating Rifle, Model 1876

Caliber .40-60-210; .45-60-300; .45-75-305, .50-90-300 Express Centerfire.

Basically the same as the Model 1873, the Winchester Model 1876 was specially chambered as a long-range hunting rifle, and fired a round similar to the big military .45-70 cartridge, only slightly smaller with a lighter bullet but more powder, termed the .45-75-350. Later versions fired a wider range of cartridges, both larger and smaller. This model was a favorite of Teddy Roosevelt during his pre-presidential years as a western rancher, and was adopted as the issue arm of the Royal Canadian Mounted Police. Never as popular in California as other Winchester Repeaters firing lighter rounds, some were nevertheless used for hunting Bear and Elk.

Colt Lightning Rifle, Model 1885

.22 rimfire, .32-20, .38-40, .38-56, .40-60, .44-40; .45-60, .45-85, .50-95.

This was Colt's unsuccessful attempt to break into the civilian market for repeating rifles, and was first offered in 1885 as a medium-frame, pump-action rifle shooting .32, .38 and .44 caliber rounds: almost 90,000 medium frame Lightning pumps were made before the run ended in 1902. In 1887 a small frame version made its appearance, chambered for the .22 rimfire; this model was made until 1904, again with a production of just under 90,000 units. The least successful Lightning was the large frame version, also introduced in 1887, which was made only until 1894; less than 6,500 were made in .45 and .50 Caliber. The medium-frame Colt Lightnings used some now-obsolete calibers such as .44-40, .38-40, and .32-20 which would also fit Colt Pistols, an obvious attempt to cut into the market dominated by the Winchester lever-actions with the same capability, but the Colt pump-actions were never as popular as the Winchesters, and few were sold in California.

Winchester Repeating Rifle, Model 1886

Caliber .50-110-300; .50-100-450; .45-70-500; .45-90-300; .40-82-260; .40-70-330; .40-65-260; .38-70-255; 38-56-255 Centerfire.

Bowing to the consumer demand which had been in evidence since 1873, Winchester introduced a special version of its model 1876, chambered for the big US Government Springfield round. The Model 1886 had a stronger action than the earlier model, and soon was available in a wide variety of calibers, including even the very large .50-100-450 round, something of a throwback to the immediately post-Civil War period. These rifles were never as popular in California as earlier versions shooting the .44-40 cartridge.

Winchester Model 1890 & 1906 Pump Rifles

Caliber .22 short; .22 long; .22 long rifle; .22 Winchester Rimfire.

The Model 1890 was Winchester's first pump-action .22 repeater, similar in most respects to the small-frame Colt Lightning which had been introduced some five years earlier. Like the various Winchester lever-actions, it had an exposed hammer, and tubular, underbarrel magazine. In 1892, a takedown version was introduced, and in 1906 a new, smokeless powder version, was brought out that would fire .22 short, long or long rifle shells interchangeably. Just under 850,000 Model 1890's and a like number of model 1906's were sold before both lines were discontinued in 1932; for at least two generations, these two rifles were the most common young boy's first repeater in the western U.S. With more than a million and a half made, many survive in use to the present day. In the 1930's, the Models 1890 and 1906 were replaced by the (hammerless) Model 61 and (hammer) Model 62, both themselves made into the 1960's.

The Winchester pump .22 was known as the "trombone" or "gallery" rifle, after its functioning and common use in commercial shooting galleries. Tens of thousands of these .22 pump-actions were sold in California, and until the advent of modern automatic .22 rifles after World War II, were the most popular .22 repeaters in the Western US. I carried a Model 1906 Winchester .22 "trombone", possibly as ancient as 70 years old every day in Central America in the late 1970's, and with it supplied my archaeological field camp with fresh meat for more than a year.

Winchester Repeating Rifle, Model 1892

Caliber .44-40; .38-40; .32-20; .25-20; .218 Bee.

The last of the black powder Winchester lever actions, the Model 1892 was similar to the Model 1873 but had a much smaller receiver. The rifle was in production for almost 50 years; before the end of its run in 1941 it had been chambered for smokeless calibers such as .25-20 and .218 Bee. One of the most popular of all Winchester repeaters, just over a million of the guns were made. Tens of thousands of these rifles were sold in California and were in use for hunting well past World War II alongside much more modern guns. The most popular caliber in California, as before, was .44-40; many hunters maintained that the old .44-40 was a better deer round than the later .30-30, especially in the heavy brush and broken timber typical of California.

Winchester Repeating Rifle, Model 1894

Caliber .25-35; .32-40; .38-55 Centerfire black powder.

Caliber .30-30; .32 Winchester Special Centerfire, smokeless powder.

Like all Winchester repeaters of the previous 20 years, the Model 1894 was a side-loading, tubular magazine, lever-action with a steel receiver, firing a flat-nose bullet. This was, however, the last "new" Winchester tube-fed lever-action, for from now on the company would concentrate on pumps, bolt-actions, and automatics in which to fire the new and more powerful smokeless ammunition that was being developed. Although the first Model 1894 versions were offered in old black powder calibers such as .38-55, the design itself was introduced specifically so as to take

advantage of the first cartridges designed to use the new smokeless powder just coming onto the civilian market. The Model 1894 had a very strong action, and used much tougher alloy steel than earlier models so as to withstand the increased pressures created by the smokeless rounds.

The flat-nosed, smokeless .30-30 cartridge was an obvious civilian counterpoint to the military .30-40 Krag. The .30-30 cartridge used 30 grains of smokeless powder and a 170 grain flat-noted bullet which generated a muzzle velocity of around 2200 feet per second, much faster than the old .44-40 black powder round, which only developed around 1200 feet per second. Later, a lighter bullet of 150 grains was introduced, and muzzle velocities approaching 2400 feet per second were obtained. While the most modern round ever fired by the old tubular-magazine Winchester, the .30-30 nevertheless was a poor performer in comparison with the more aerodynamic *Spitzer* bulleted rounds first used in the German Mauser bolt-actions and shortly afterwards adopted by most armies around the world. This notwithstanding, by 1932, 1,000,000 Model 1894's had been produced and by 1948, production had reached 1,500,000, probably 90% of them .30-30's.

A very large percentage of these rifles were sold in the far west, including California. Of all the thousands of lever-actions still in use in California today, probably 90% of them fire the .30-30 cartridge. The model 1894 is still in production, 100 years after its introduction, although those made since 1965 have stamped, not forged parts, many of which are made in Japan. Ironically, the best version of the Model 1894 Winchester since the early years of the century was not made by Winchester at all, but by Marlin. Unlike the 1894 Winchester, which had a poorly designed stock and even worse, was top-ejecting (eliminating the possibility of mounting the telescopic sights that became popular in the early 1930's), the Marlin .30-30 lever-actions had sporter stocks with pistol grips and were side-ejecting, so that they would accept scopes.

Winchester Repeating Rifle, Model 1895

Caliber .30-30 Winchester; .30-40 Krag; .30-03 US; .30-06 US; .303 British; .35 Winchester; .38-72; 40-72; .35 Winchester; .405 Winchester; Magazine-fed, 5 shot.

This was the first Winchester rifle to utilize a box-type magazine that would accept pointed-nose ammunition, impossible for all earlier underbarrel tube-fed rifles of the preceding 30 years, which could only take flat or at best round-nosed bullets. The first of these rifles were chambered for the early pointed-nose .30-40 Krag cartridge, the most modern round used by US troops in the Spanish-American War of 1898; the latest took the .30-06 US cartridge which was standard in World War I. The Winchester Model 1895 was produced for more than 40 years, until 1938, and 426,000 were sold. These guns were never as popular in California as the old lever-action tube feeders that they were intended to, but never did, replace.

Krag-Jorgensen Bolt-Action Rifle, Model 1896

Caliber .30-40, Breech-loading, 5 shot, Jacketed soft-nose bullet.

The Krag was the first US Army issue bolt-action rifle, and the first to fire the new necked-down, smokeless powder cartridges. The Krag was developed in 1892, adopted by the US Army on a

limited basis for trial in 1894, and finally issued in small numbers in 1896. A few US units in the Spanish-American War were armed with the Krag, most notably Teddy Roosevelt's Rough Riders, not surprisingly, at T.R.'s personal request; most other units with less influential commanders had to make do with the old, black-powder, .45-70 Springfield single-shots. The .30-40 Krag shell casing looks very much like the Winchester .30-30, and, unusual for bolt-action cartridges, has a prominent rim. Ballistically, the .30-40 Krag round was almost identical to the .30-30 Winchester. The Krag was rendered obsolete after only a few years by the adoption of the 1903 Springfield Rifle; as a consequence, thousands of Krag .30-40's were sold as surplus in the Western States; many became the first bolt-action rifles to be used for hunting in the forests of California.

U.S. Springfield Rifle, Model 1903

Caliber .30-03; .30-06, Jacketed, Spitzer bullet.

The 1903 Springfield was a direct copy of the German bolt-action, box magazine Mauser model 1898, and replaced the .30-40 Krag as the official US Army rifle. The initial version of the Springfield fired a 220 grain round-nose bullet at about 2300 feet per second muzzle velocity, equal to or at best only about 5% faster than the Krag .30-40 or Winchester .30-30 round. Three years later, in 1906, the Springfield's necked cartridge was shortened, and improved powder and 150 grain, aerodynamically-shaped bullet were substituted. Muzzle velocity, consequently, was increased to over 2700 feet per second, and the improved round was designated, in abbreviated form, as the .30-06.

The .30-06 Springfield was the official US Army rifle of World War I and was made by several major manufacturers to government specifications. Many also saw service in the early days of World War II as well, then later as training, garrison, or sniper rifles. Many hundreds of these were later sold as surplus and "sporterized" for hunting use in California: my own Springfield was made in 1942 by Remington. Continual improvements in bullet shape and powder content allowed for muzzle velocities in excess of 3000 fps; the most common hunting round used a 180 grain Spitzer bullet. The .30-06 is probably still the most popular high-powered sporting round used in California today, despite its old age. All major US rifle makers still offer new guns in caliber .30-06, and all US ammunition makers stock the round in a variety of bullet weights.

SHOTGUNS

Colt Model 1878 Hammer Shotgun

10 and 12 gauge, 2-shot.

The Colt model 1878 shotgun was a double-barreled, side-by-side, top-break design with a long release lever running back between the hammers. The Colt guns were expensive, and only 22,000 were made before their run ended in 1889. In addition to their use as favored bird guns, many rural law enforcement officers, bank guards, express agents, railroad and stagecoach mail and express guards in California and the Western states carried the Colt Hammer shotguns or similar shotguns loaded with buckshot as a means deterring robbers or as a basic defensive weapon.

Colt Model 1883 Hammerless Shotgun

10 and 12 gauge, 2-shot.

By the early 1880's, the American public was overcoming their distrust of hammerless shotguns, which were widely (and correctly) believed to be less safe than hammer models, which of course had to be cocked for each shot and therefore could be carried at half-cock. This gun was not a success, and just over 8,000 were made until the model was discontinued in 1895. The reason for the failure was that the Colt shotgun was priced high, and by the early 1890's cheap imported shotguns, or those of "no-name" American make had flooded the market.

Winchester Model 1887 Lever Action Shotgun

10 and 12 Gauge, 5 shot.

Winchester's first repeating shotgun was an ungainly-looking, lever-action arm designed by John Browning: a short, tubular underbarrel magazine held four rounds, and a fifth could be carried in the chamber. These guns were made up til 1919; the 10 gauge version appeared in 1901, and just under 80,000 were sold. Like the bolt-action shotguns one occasionally sees even today, the old lever-action smoothbores were never very popular in California, being rendered essentially obsolete by the much more reliable and easy operating pump-action shotgun beginning in the 1890's.

Winchester Model 1893 Pump Shotgun

12 gauge, 5 shot.

The first commercial pump shotgun made in the US was offered by Spencer, in 1882, but was not a big seller; Winchester introduced their own first pump shotgun in 1893, and fought a long patent infringement battle with the Spencer interests as a result. The Winchester pump gun looked very much like a scaled-up version of their slide-action .22 rifle introduced three years earlier. Like their earlier lever-action shotgun, the first Winchester pump had a tubular, underbarrel magazine and exposed hammer. The Model 1893 was somewhat delicate and not a big seller; only around 35,000 units were sold before the model was rendered obsolete by the introduction of the Model 1897.

Winchester Model 1897 Pump Shotgun

12 and 16 Gauge

This was an improved version of the earlier model 1893 shotgun, similar in appearance with exposed hammer. It was extremely popular, being cheap and rugged, and by 1914 over 620,000 had been sold, many in California. The original model was sold until 1919, but in its takedown version, was still available into the late 1950's. The Winchester Model 1897 helped to establish the 12-gauge pump shotgun as the standard smoothbore in California and the western US. A short-barreled riot gun version was marketed for police departments, and was later converted to the famous trench gun of World War I. The 12 gauge trench gun firing 00 buckshot was so effective

that the German government protested its use, claiming that those using it were guilty of war crimes, and threatened to summarily execute any Doughboy found carrying one. The 1897 riot/trench gun was the progenitor of virtually all short-barreled defense/police issue 12-gauge shotguns sold since that time. The later, Model 1912, Winchester pump shotgun popularized the hammerless pump gun, today the standard repeating shotgun made by various other manufacturers such as Remington, Ithaca, etc.

PISTOLS

Smith and Wesson Model No. 1 Revolver, 1857

Caliber .22 short copper rimfire; .32 short copper rimfire, 6 & 7 shot, single action, 8 oz.

The Smith and Wesson Model No. 1 was a hinged-frame, spur-trigger revolver, the first cartridge gun of its type to appear in the US. The S&W Model No. 1 was introduced in 1857 because this was the year that Samuel Colt's original patent for his revolving pistol expired: it continued in production until 1869. Smith and Wesson pioneered the metallic cartridge and introduced the very first pistol in the United States that was chambered for it. The revolutionary Smith and Wesson pistol was chambered for the .22 short black powder rimfire; about all that could be said in favor of these anemic rounds is that they usually went off when struck by the pistol's falling hammer. The early .22 casings were made of copper, rather than brass, as were most later casings. A different Model, sometimes called the No. 11/2, appeared in 1861, firing the still substandard .32 short rimfire copper cartridge. This round incorporated only 9 grains of black powder and an 80 grain bullet; later it was upgraded to 13 grains of powder/90 grain bullet. The .32 rimfire was more popular than the .22 but much inferior to later, more powerful centerfire cartridge pistols. The Model 1 1/2 continued in production until 1874: over 75,000 were sold, some in California,

Smith and Wesson Model No. 2 Revolver, 1865

Caliber .32 short rimfire, 1 lb, 13 Oz, Single action six shot.

The S&W No. 2 was a break-frame, single-action, design like the Model 1. The new model was introduced as a response to Civil War demand, but came too late to see much use in that conflict. While very low-powered, the pistol was nevertheless quite light and many were carried by Union officers during the immediately post-Civil War period. The gun was produced until 1872, and over 77,000 were made. Some appeared in California, but the cartridge was never terribly popular in rural contexts, and larger-caliber, center-fire guns rendered these pistols obsolete quite early.

Smith and Wesson Model No. 3 American .44 Revolver, 1870

Caliber .44 S&W Centerfire, 8 inch barrel, 6 shot, single action

The Smith and Wesson Model 3 revolver combined many old and new features; it was S&W's first big-bore centerfire gun, a top-break, multiple ejector, multiple loader much superior to the earlier Models 1 and 2. In the Model 3, all spent casings were ejected simultaneously, making it the fastest

pistol to reload so far introduced. The S&W Model 3 or "American" (the latter identifier used to distinguish it from the "Russian" Model after 1873) established Smith and Wesson as the principal challenger to Colt for both the civilian and military market. Originally designed for the then-popular .44 Henry Rimfire cartridge, US Army ordnance board interest in the gun convinced the company to issue production models as centerfire guns instead. The .44 caliber round was much more powerful than the earlier, small-caliber, rimfire offerings. The new round was brass-cased, contained 25 grains of black powder and fired a 218 grain, soft-nosed lead bullet; it produced under 700 fps of muzzle velocity and less than 200 foot pounds of muzzle energy. The first mass-produced, large-caliber centerfire pistol offered by any US maker, the S&W Model 3 was much more advanced in every respect than the percussion Colts that had set the standard for the preceding 30 years and which were still its contemporaries. Many thousands of these pistols were sold in the 1870's, mainly in civilian contexts, many of them appearing in California.

Smith and Wesson Model No. 3 Russian Revolver, 1873

Caliber .44 Russian Centerfire, 7 inch barrel, Single action six shot.

This version of the S&W Model 3 was named for Grand Duke Alexis Romanoff, who, in 1872, had hunted across North America from his special car on the Transcontinental Railroad accompanied by, amongst others, William (Buffalo Bill) Cody and the Smith & Wesson sales representative. Duke Alexis expressed an interest in Cody's S&W Model 3, and the result was a deal initiated on the train which resulted in Smith & Wesson's sale of over 100,000 of the "Russian" model pistols to the Czar's army between 1873 and 1878. The .44 S&W Russian was also sold in the thousands in the Western US, including California, and became famous as the most accurate revolver on the frontier; it was favored by many professional "pistoleers", such as Buffalo Bill Cody, for target shooting, and by numerous lawmen as their primary defensive weapon.

The .44 Russian pistol was similar in appearance to the S&W .45 Schofield except for its curved spur below the trigger guard and rounded grip: its cartridge was different from the .44 American round. The .44 Russian cartridge used slightly less black powder, 23 grains, than the American cartridge's 25 grains, but fired a much heavier bullet, weighing 246 grains, by comparison just slightly heavier than the modern 44 magnum bullet of 240 grains. The .44 Russian round was slightly faster than the .44 American, at around 700 fps of muzzle velocity, but much harder-hitting, with 25% more muzzle energy at over 260 foot-pounds.

The .44 Russian was originally meant to be a cavalry weapon, and for more than 40 years was the official sidearm of the Czar's famed Cossack troops. Long after their counterparts in the United States were considered obsolete, numbers of S&W .44 Russian pistols, originally delivered to the Czar's Imperial Army in the 1870's, continued in use. Beginning with the communist revolution of 1917, thousands of these guns were used by both the Russian Red and White Armies until the early 20's and the eventual end of the conflict. Later still, in early 1930's, some of the old American-made "Russian" guns were declared surplus by the Kremlin and sent to the forces of Mao Tse Tung and Chou En Lai, where they were greatly appreciated by the poorly-equipped Chinese communists. Some of these pistols survived the many battles with *Kuomintang* forces, and subsequently saw World War II service against the Japanese as guerrilla arms. Some .44 Russians

continued on in use in China up to and past the communist takeover in 1949, and a few were carried by Red Chinese troops as late as 1950 when they entered the Korean War after US forces defeated the North Korean regular army. One such "Chinese" Smith and Wesson .44 Russian pistol, captured by my Uncle in Korea, was brought back to California after the Korean War, having circumnavigated the globe over a 75-year period.

Smith and Wesson Model No. 3, Schofield Revolver, 1874

Caliber .45 S&W, 7 inch barrel, Single action six shot.

The S&W Schofield was yet another Model 3 variant, in this form chambered for .45 caliber and featuring an improved release latch for its top-break mechanism. The new release was the idea of Major Schofield of the 10th US (Colored) Cavalry, one of the "Buffalo Soldier" outfits. Schofield's brother later became famous in the Spanish American War and Schofield Barracks in the Hawaiian Islands were named after him. The S&W .45 round was shorter than its contemporary the .45 Colt (or "long" Colt cartridge), so while the S&W cartridge would fit in the Colt, the reverse was not the case. The S&W cartridge used a 230 grain lead soft-nose bullet and 28 grains of black powder, which gave it around 730 feet per second of muzzle velocity and under 300 foot pounds of muzzle energy. The S&W Schofield was promoted as a Cavalry sidearm but the Colt Single Action Army was adopted instead as the official Army pistol. Nevertheless, some western cavalry units, most notably the Black "Buffalo Soldiers", were armed with the Schofield, and many turned up in California in the 1870's and 1880's; Wells, Fargo Company, for example, bought dozens of surplus Army Schofields with which to arm their agents.

Smith and Wesson .38 Single Action Revolver, 1875

Caliber .38 S&W, 3 1/2 inch barrel, Single action, five shot.

This pistol became the most popular "concealed weapon" in California and the Western U.S., and more than 108,000 were made between 1876 and 1891. While small, the pistol was nevertheless similar in appearance to the big S&W Russian .44, so the .38 came to be called the "Baby Russian". The round it fired carried 14 grains of black powder and used a 150 grain lead bullet. By the late 1880's, at least in urban contexts, the large .44 and .45 caliber military pistols were coming to be considered "too big" for common use, and later model double-action .38's made by Smith and Wesson and by Colt were increasing in popularity, both in civilian as well as in military and police contexts.

The .38 S&W pistol round, first introduced in 1869, generating only around 700 feet per second of muzzle velocity and a mere 173 foot-pounds of muzzle energy, was a weak performer. The .38 Long Colt pistol cartridge, its principal competitor, was only slightly more powerful, with over 800 fps of muzzle velocity and around 220 foot-pounds of energy. Both .38 rounds were found to be unequal to the demands placed upon them in service in the Philippines during the Spanish-American War, and were rendered obsolete by the development of the Smith and Wesson .38 Special smokeless round in 1902: the .38 special generated over 1000 feet per second of muzzle velocity and more than 350 foot-pounds of muzzle energy, just about twice that of the old S&W .38 round.

Colt Single Action Army Revolver ("Peacemaker"), Model of 1873

Calibers .45; .44-40; .41; 38-40; .32-20, and many others.

7 1/2-inch or 5 1/2-inch barrel, Single-action, fixed-cylinder six shot.

Introduced first in 1873 as a US Cavalry weapon in .45 caliber, none were sold directly to civilians until the mid-1870's. Probably the single most famous cartridge-firing pistol in use not just in late 19th century California, but throughout the American West, between 1873 and 1940 more than 310,000 were made, most of them before the turn of the century. The most common Peacemaker caliber was .45; the cartridge used 28 to 40 grains of black powder propelling a 250 or 255 grain soft-nose lead bullet. Somewhat of a slow-mover but hard-hitter, the .45 Colt round generated between 800 and 860 feet per second muzzle velocity but over 400 foot-pounds of muzzle energy: one sixth faster and a third more harder hitting than the contemporary S&W .45 round. In its .45 Colt chambering the pistol was the official US Army sidearm until 1892, when it was replaced by the .38 Colt revolver.

Only slightly less popular as a Peacemaker caliber was the .44-40 which, along with .38-40 and .32-20 black powder versions, were introduced so that the same cartridge would fit both Colt pistols and Winchester lever-action repeating rifles. The .45 Colt cartridge had a muzzle velocity roughly the same as the .44-40 round; both were more than .20% faster than the .44 S&W American round, although the S&W .44 Russian round, the Colt's principal competitor, was roughly equivalent in velocity. Eventually the Single Action Army revolver was chambered for virtually every pistol or small rifle round available, from .22 rimfire through .476 Eley: 28 calibers in all. While production of the model ended with World War II, it was revived as a "nostalgia" weapon in the postwar period.

While not as advanced technically as the contemporary Smith and Wesson hinged-frame revolvers, the Colt pistols were nevertheless correctly seen as more powerful and widely assumed to be less delicate than the S&W guns. Colts were used as clubs in many a barroom fracas, or as hammers for pounding in fence-wire staples on many a ranch. Peacemakers with broken internal parts could often be made to fire, and some such guns were never fixed but simply carried broken. One such .45 Single Action Army Colt, made in 1878, saw hard use over a 35-year period culminating in the Mexican Revolution; this included the cutting of four notches or tally marks on its left grip. The pistol was so beat up by the time it was obtained by my Grandfather just before World War I, still in its left-handed Mexican holster, that it could only be fired by "fanning" the hammer. The Colts, despite their reputation for ruggedness, because of their fixed cylinders were much slower to load than the Smith & Wesson pistols. Worse, they were dangerous even by comparison with their earlier Colt percussion predecessors.

Most of the older percussion Colt revolvers had "hammer rests" or notches where you could rest the hammer equidistant between each chamber with its live percussion cap; if the pistol was accidentally dropped, the hammer would strike the metal edge of the cylinder, not a live cap, with no harm done. The Single Action Army cartridge pistol, however, had no such safety provision, and if dropped, or if, while carried in a flapless holster, its hammer was snagged on brush or clothing and then released, it would set off a round unintentionally. The term "shooting yourself in the foot" originated from careless handling of the Colt Peacemaker. Consequently, as a safety

measure, most people carried the Single Action Army Colt with the hammer down over an unloaded cylinder so as to avoid accidental discharges. This practice rendered what Western U.S. folklore has identified as the pre-eminent frontier "six-shooter" in actuality a five-shot weapon.

Colt .45 Auto Pistol Model 1911

Caliber .45 ACP, 5 inch barrel, 7 shot clip.

The Colt .45 Auto was a Browning design of 1905 for the civilian market. These early guns were not especially popular, but nevertheless suggested the military practicability of a large-caliber automatic pistol to the US military which, still smarting from the failure of the .38 caliber Army pistol in the Philippines, needed to replace it with a big-bore handgun. The comparatively short .45 ACP (Auto Colt Pistol) smokeless cartridge fired a 230 grain round-nose bullet and ballistically was slightly superior to the old black powder .45 Colt Peacemaker cartridge. Once again a comparatively slow-moving but very hard-hitting round, it generated approximately 850 to 900 feet per second muzzle velocity and 400 to 450 foot pounds of muzzle energy. Government trials and minor design modifications of the 1905 Colt culminated in its adoption as the official US military sidearm, the Model 1911 .45 auto. Never as accurate as a good revolver beyond 100 yards or so, the Colt .45 auto nevertheless gained the reputation as the most sturdy and foolproof automatic pistol ever made. Some initial resistance to the weapon by those more comfortable with old-style revolvers was overcome as a result of the new gun's primary advantage over all revolvers; its ease and speed of reloading via insertion of a full 7-round clip in less time than it took to load a single revolver round.

Shortly after its adoption by the US military, the .45 auto pistol was offered for non-military sale; many thousands had been sold by the end of the 1920's to civilians as well as to law enforcement officials, particularly those working for federal agencies. The Model 1911 Colt .45 Auto enjoyed remarkable success in World War I, and many veterans returning to California either brought their issue pistols home with them or bought civilian models after their demobilization. A popular accessory was a .22 caliber conversion kit, which enabled many .45 auto owners to engage in target practice or "plink" with cheap rimfire ammunition. Beginning in the 1920's, the .45 auto was modified slightly and the resulting newer version designated the 1911A1; the old 1905 cartridge remained the same. In its 1911A1 configuration, the .45 auto was the official US pistol of World War II, Korea and Vietnam. My own Colt .45 auto, serial No. 14,825, was made in 1912 and carried by my grandfather, in its 1913 US cavalry issue swivel holster, in Mexico in 1914-1916, and then in France in 1917-1918. It returned to France in 1944, carried by my Uncle, eventually going to Belgium, Luxembourg, Czechoslovakia, and Germany by mid-1945. In 1950, it went to Korea where, after another couple years, it ended its military service and returned to California for good.

The .45 auto remained the US pistol until 1985, when, in keeping with the current US military emphasis on rate-of-fire over accuracy, it was replaced by what some US troops call the "Axis powers pistol", the 9mm Beretta: an Italian-designed gun firing a German-designed cartridge. The Beretta, adopted mainly because of its large (15 round) magazine capacity, fires the 9mm Luger round, vastly inferior in stopping power to the old .45 auto, and provides us with a strange sense of *deja vu*, a return to the low-powered .38's of the Philippine Insurrection years a century later.

**APPENDIX B:
METALLIC CARTRIDGES: INTRODUCTION DATES & HISTORIC SIGNIFICANCE**

Caliber/Make	Rimfire/Centerfire	Shape	Introduced	Current	Significance
.17 Remington	C	Necked	1971	Yes	C
.218 Winchester Bee	C	Necked	1938	Yes	C
.219 Zipper	C	Necked	1936	No	C
.22 S & W Short	R	Straight	1857	Yes	B
.22 S & W Long	R	Straight	1871	Yes	B
.22 Stevens Long Rifle	R	Straight	1887	Yes	B
.22 Winchester Extra Long	R	Straight	1878	No	A
.22 Winchester Auto	R	Straight	1904	No	A
.22 Savage Hi-Power	C	Necked	1912	No	B
.22 Winchester Magnum	R	Straight	1959	Yes	C
.22 Remington Jet Magnum	C	Necked	1961	Yes	C
.22 Hornet (5.6 x 35mm)	C	Necked	1928	Yes	C
.22-7-45 Winchester Rimfire	R	Straight	1890	No	A
.22-8-45 Maynard Extra Long	C	Straight	1882	No	A
.22-13-45 Winchester Centerfire	C	Necked	1885	No	A
.22-15-60 Stevens	C	Tapered	1896	No	A
.220 Winchester Swift	C	Necked	1936	Yes	C
.221 Fireball	C	Necked	1963	Yes	C
.222 Remington	C	Necked	1950	Yes	C
.222 Remington Magnum	C	Necked	1958	Yes	C
.223 Remington (5.56 x 45mm Nato)	C	Necked	1964	Yes	C
.224 Weatherby Magnum	C	Necked	1964	Yes	C
.225 Winchester	C	Necked	1964	Yes	C
.22-250 Remington	C	Necked	1965	Yes	C
.240 Weatherby Magnum	C	Necked	1968	Yes	C
.243 Winchester	C	Necked	1955	Yes	C
.244 Remington	C	Necked	1955	No	C
6 mm Lee Navy (Rimless)	C	Necked	1894	No	A
6 mm Remington	C	Necked	1963	Yes	C
.25 Short Rimfire	R	Straight	1860	No	A
.25 Stevens Short Rimfire	R	Straight	1902	No	B
.25 Stevens Rimfire	R	Straight	1890	No	A
.25 Auto Pistol	C	Straight	1908	Yes	B
.25 Krag	C	Necked	1907	No	B
.25 Remington (Rimless Rifle)	C	Necked	1906	No	A
.25-06 Remington	C	Necked	1969	Yes	C
.25-20-86 Stevens Single Shot (Long)	C	Necked	1882	No	A
.25-20 Winchester Repeater (Short)	C	Necked	1895	Yes	B
.25-21-86 Stevens	C	Tapered	1897	No	A

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Caliber/Make	Rimfire/Centerfire	Shape	Introduced	Current	Significance
.25-25-86 Stevens	C	Tapered	1894	No	A
.25-35 Winchester	C	Necked	1895	Yes	B
.25-36 Marlin	C	Necked	1895	No	A
.250-3000 Savage	C	Necked	1913	Yes	B
.256 Newton	C	Necked	1913	No	B
.256 Winchester Magnum	C	Necked	1963	Yes	C
.257 Remington Roberts	C	Necked	1934	Yes	C
.257 Weatherby Magnum	C	Necked	1944	Yes	C
6.5 mm Remington Magnum	C	Necked	1966	Yes	C
6.5 x 50 Arisaka***	C	Necked	1897	No	C
6.5 x 52 Carcano***	C	Necked	1892	No	C
6.5 x 54 Mannlicher**	C	Necked	1903	No	B
6.5 x 55mm Swedish	C	Necked	1894	Yes	B
7 mm Baby Nambu***	C	Necked	1920	No	C
7 mm Weatherby Magnum	C	Necked	1944	Yes	C
7 mm Remington Magnum	C	Necked	1962	Yes	C
7 mm Remington Express	C	Necked	1979	Yes	C
7 mm-08 Remington	C	Necked	1980	Yes	C
7 mm -30 Waters	C	Necked	1984	Yes	C
7 x 57 mm Mauser**	C	Necked	1893	Yes	B
7 x 61 mm Sharp & Hart Super	C	Necked	1953	Yes	C
.264 Winchester Magnum	C	Necked	1959	Yes	C
.270 Winchester	C	Necked	1925	Yes	B
.270 Weatherby Magnum	C	Necked	1943	Yes	C
.275 H & H Magnum	C	Necked	1926	No	B
.28-30-120 Stevens	C	Tapered	1900	No	A
.280 Remington	C	Necked	1957	Yes	C
.284 Winchester	C	Necked	1963	Yes	C
7.35 mm Carcano	C	Necked	1938	No	C
.30 S & W Rimfire (short)	R	Straight	1857	No	A
.30 Rimfire (Short)	R	Straight	1862	No	A
.30 Rimfire (Long)	R	Straight	1872	No	A
.30 Borchardt**	C	Necked	1893	No	B
.30 Remington (Rimless Rifle)	C	Necked	1906	Yes	B
.30 Newton	C	Necked	1913	No	B
.30 US M1 Carbine	C	Straight	1940	Yes	C
.30 Herrett	C	Necked	1973	Yes	C
.30 Mauser (7.63 x 25mm) Pistol**	C	Necked	1893	No	B
.30 Luger (7.65 x 21.5mm) Pistol**	C	Necked	1900	Yes	B
.30-30 Winchester	C	Necked	1895	Yes	B

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Caliber/Make	Rimfire/Centerfire	Shape	Introduced	Current	Significance
.30-40 Krag (.30 Cal Army)	C	Necked	1894	Yes	B
.30-03 US Springfield	C	Necked	1903	No	B
.30-06 US Springfield	C	Necked	1906	Yes	B
.300 Savage	C	Necked	1899	Yes	B
.300 H & H Magnum	C	Necked	1925	Yes	C
.300 Winchester Magnum	C	Necked	1963	Yes	C
.300 Weatherby Magnum	C	Necked	1944	Yes	C
7.62 x 25mm Russian (Tokarev)****C	C	Necked	1930	Yes	C
7.62 x 39mm Russian (SK/AK)*****C	C	Necked	1943	Yes	C
7.62 x 54 mm Russian (Nagant **	C	Necked	1891	Yes	B
.303 British***	C	Necked	1889	Yes	B
.303 Savage	C	Necked	1897	Yes	B
.307 Winchester	C	Necked	1983	Yes	C
.308 Winchester (7.62 x 51mm Nato)C	C	Necked	1957	Yes	C
7.65 x 53mm Argentine Mauser**	C	Necked	1891	No	B
7.7 x 58mm Arisaka***	C	Necked	1939	No	C
.32 Short Colt	C	Straight	1875	No	B
.32 Long Colt	C	Straight	1875	No	B
.32 Colt New Police	C	Straight	1892	No	B
.32 Remington Extra Short	R	Straight	1871	No	A
.32 Remington Long Rifle	R	Straight	1900	No	A
.32 S & W Short Rimfire	R	Straight	1865	No	A
.32 S & W Long Rimfire	R	Straight	1861	No	A
.32 Smith & Wesson Short	C	Straight	1876	Yes	B
.32 Smith & Wesson Long	C	Straight	1896	Yes	B
.32 ACP (7.65 x 17 mm)	C	Straight	1899	Yes	B
.32 Ideal	C	Straight	1903	No	A
.32 Remington (Rimless Rifle)	C	Necked	1906	No	B
.32 Winchester/Stevens	C	Tapered	1875?	No	A
.32 Winchester Special (Rifle)	C	Necked	1894	Yes	B
.32 Winchester Self-Loading	C	Straight	1905	No	A
.32 H & R Magnum	C	Straight	1984	Yes	C
.32-13-90 Long	C	Straight	1875	No	A
.32-20-90 Extra Long Rimfire	R	Straight	1870	No	A
.32-20-115 Ballard Extra Long	C	Straight	1876	No	A
.32-20-115 Winchester (WCF)*	C	Necked	1882	Yes	B
.32-30-125 Remington	C	Necked	1884	No	A
.32-35 Maynard Everlasting	C	Tapered	1882	No	A
.32-35-153 Stevens & Maynard	C	Tapered	1886	No	A
.32-35-165 Stevens Tapered	C	Tapered	1886	No	A

APPENDIX B: METALLIC CARTRIDGES: INTRODUCTION DATES & HISTORIC SIGNIFICANCE

Caliber/Make	Rimfire/Centerfire	Shape	Introduced	Current	Significance
.32-40-150 Bullard	C	Necked	1885	No	A
.32-40-150 Remington	C	Tapered	1870	No	A
.32-40-165 Ballard & Marlin	C	Tapered	1884	No	A
.32-40-165 Winchester	C	Tapered	1884	No	A
.32-44 Smith & Wesson	C	Straight	1887	No	A
.32-70 Navy Rimless	C	Necked	1893	No	A
.33 Winchester Center Fire (WCF)	C	Necked	1903	No	A
.338 Winchester Magnum	C	Necked	1959	Yes	C
.340 Weatherby Magnum	C	Necked	1962	Yes	C
.348 Winchester	C	Necked	1936	Yes	C
8 mm Mauser (7.92 x 57mm)**	C	Necked	1888	Yes	B
8 x 21.5mm Nambu***	C	Necked	1909	No	C
8 mm Remington Magnum	C	Necked	1978	Yes	C
.35 Smith & Wesson Auto Pistol	C	Straight	1913	No	B
.35 Maynard Percussion	C	Straight	1865	No	A
.35 Newton	C	Necked	1915	No	B
.35 Remington (Rimless Rifle)	C	Necked	1906	Yes	B
.35 Whelen	C	Necked	1987	Yes	C
.35 Winchester Center Fire (WCF)	C	Necked	1903	No	A
.35 Winchester Self-Loading	C	Straight	1905	No	A
.35-30 Maynard (Wide Base)	C	Straight	1873	No	A
.35-40 Maynard	C	Straight	1883	No	A
.350 Remington Magnum	C	Necked	1965	Yes	C
.351 Winchester Self-Loading	C	Straight	1907	Yes	B
.356 Winchester	C	Necked	1983	Yes	C
.357 S&W Magnum	C	Straight	1935	Yes	C
.357 Remington Maximum	C	Straight	1983	Yes	C
.357 Auto Mag	C	Necked	1973	Yes	C
.357 Herrett	C	Necked	1975	Yes	C
.358 Winchester	C	Necked	1955	Yes	C
.375 Holland & Holland Magnum	C	Necked	1925	Yes	B
.375 Winchester	C	Straight	1978	Yes	C
.378 Weatherby Magnum	C	Necked	1953	Yes	C
.38 Short Rimfire	R	Straight	1861	No	A
.38 Short Colt	C	Straight	1873	Yes	B
.38 Long Colt	C	Straight	1875	Yes	B
.38 Auto Colt Pistol (ACP)	C	Straight	1908	Yes	B
.38 Remington Long (Rifle)	C	Straight	1875	No	A
.38 Smith & Wesson (Short)	C	Straight	1869	Yes	B
.38 S & W Special	C	Straight	1902	Yes	B

APPENDIX B: METALLIC CARTRIDGES: INTRODUCTION DATES & HISTORIC SIGNIFICANCE

Caliber/Make	Rimfire/Centerfire	Shape	Introduced	Current	Significance
.38 S& W Special + P	C	Straight	1970	Yes	C
.38 Colt Super Auto	C	Straight	1929	Yes	C
.38 Colt Super Auto +P	C	Straight	1970?	Yes	C
.38-20-150 Long Centerfire	C	Straight	1875	No	A
.38-21-148 Long Rimfire	R	Straight	1863	No	A
.38-38-148 Extra Long Rimfire	R	Straight	1870	No	A
.38-38-160 Ballard Extra Long	C	Straight	1885	No	A
.38-40-245 Remington-Hepburn	C	Tapered	1875	No	A
.38-40-180 Winchester (WCF)*	C	Necked	1874	Yes	B
.38-44 Smith & Wesson	C	Straight	1891	No	A
.38-45-190 Bullard	C	Tapered	1887	No	A
.38-50-245 Remington-Hepburn	C	Tapered	1904	No	A
.38-50 Maynard Everlasting	C	Straight	1882	No	A
.38-50-255 Ballard	C	Straight	1876	No	A
.38-50-265 Remington-Hepburn	C	Tapered	1883	No	A
.38-50-250 Stevens Everlasting	C	Straight	1885?	No	A
.38-55 Winchester	C	Straight	1884	No	A
.38-55-255 Ballard & Marlin	C	Tapered	1881	No	A
.38-56-255 Winchester	C	Necked	1887	No	A
.38-70-255 Winchester	C	Tapered	1895	No	A
.38-72-275 Winchester	C	Necked	1895	No	A
.38-90-217 Winchester Express	C	Necked	1886	No	A
.380 Auto Pistol (9 x 17mm Short)	C	Straight	1908	Yes	B
9 mm Luger (9 x 19mm)**	C	Straight	1902	Yes	B
9 x 18 mm Russian (Makarov)****	C	Straight	1950	Yes	C
9 mm Winchester Magnum	C	Straight	1988	Yes	C
9 mm Federal Auto Rim	C	Straight	1989	Yes	C
9 x 57 mm Mauser**	C	Necked	1890	No	B
.40 Maynard Percussion	C	Straight	1865	No	A
.40 S & W Auto	C	Straight	1990	Yes	C
.40-40-270 Maynard (Wide base)	C	Straight	1873	No	A
.40-45-265 Remington & Sharps	C	Straight	1875?	No	A
.40-50-265 Sharps Straight	C	Straight	1879	No	A
.40-50-285 Sharps & Remington	C	Necked	1875	No	A
.40-60 Colt Lightning	C	Tapered	1885	No	A
.40-60 Maynard	C	Straight	1882	No	A
.40-60-210 Winchester	C	Tapered	1884	No	A
.40-60-260 Marlin	C	Tapered	1895	No	A
.40-63-330 Ballard Everlasting	C	Tapered	1881	No	A

APPENDIX B: METALLIC CARTRIDGES: INTRODUCTION DATES & HISTORIC SIGNIFICANCE

Caliber/Make	Rimfire/Centerfire	Shape	Introduced	Current	Significance
.40-65-330 Ballard	C	Tapered	1876	No	A
.40-65-330 Sharps & Remington	C	Straight	1879	No	A
.40-65-260 Winchester	C	Tapered	1887	No	A
.40-70-330 Ballard	C	Tapered	1881	No	A
.40-70-232 Bullard	C	Tapered	1887	No	A
.40-70-270 Maynard (Wide base)	C	Straight	1873	No	A
.40-70-330 Sharps Straight	C	Straight	1879	No	A
.40-70-370 Sharps & Remington	C	Necked	1876	No	A
.40-70-330 Winchester	C	Necked	1886	No	A
.40-72 Winchester	C	Straight	1895	No	A
.40-75-259 Bullard	C	Tapered	1887	No	A
.40-75-260 Winchester Hollow Point	C	Straight	1887	No	A
.40-82-260 Winchester	C	Necked	1885	No	A
.40-85-370 Ballard	C	Necked	1881	No	A
.40-90-300 Bullard	C	Necked	1886	No	A
.40-90-370 Ballard	C	Necked	1878	No	A
.40-90-370 Ballard Everlasting Ideal	C	Straight	1878	No	A
.40-90-400 Bullard	C	Necked	1886	No	A
.40-90-370 Sharps & Remington	C	Necked	1876	No	A
.40-90-370 Sharps Straight	C	Straight	1884	No	A
.40-110-260 Winchester Express	C	Necked	1886	No	A
.401 Winchester Self-Loading	C	Straight	1910	No	B
.405 Winchester	C	Straight	1904	No	B
.41 Short Rimfire (Derringer)	R	Straight	1863	No	B
.41 Long Rimfire	R	Straight	1873	No	A
.41 Long Colt	C	Straight	1876	No	B
.41 Short Colt	C	Straight	1884	No	B
.41 S & W Magnum	C	Straight	1964	Yes	C
.41 Action Express Auto	C	Straight	1988	Yes	C
.416 Remington Magnum	C	Necked	1988	Yes	C
.416 Weatherby	C	Necked	1989	Yes	C
.10 mm Auto Pistol	C	Straight	1980	Yes	C
.44 Auto Mag	C	Straight	1971	Yes	C
.44 Ballard Long Rimfire	R	Straight	1873	No	A
.44 Colt	C	Straight	1871	No	A
.44 Colt Flat Rimfire	R	Straight	1873	No	A
.44 Long Centerfire	C	Straight	1875	No	A
.44 Remington Magnum	C	Straight	1955	Yes	C
.44 Short Rimfire	R	Straight	1864	No	A
.44 Smith & Wesson (American)	C	Straight	1869	No	A

APPENDIX B: METALLIC CARTRIDGES: INTRODUCTION DATES & HISTORIC SIGNIFICANCE

Caliber/Make	Rimfire/Centerfire	Shape	Introduced	Current	Significance
.44 Smith & Wesson Russian	C	Straight	1873	No	A
.44 Smith & Wesson Special	C	Straight	1906	Yes	B
.44 Webley	C	Straight	1868	No	A
.44-28-220 Long Rimfire	R	Straight	1860	No	A
.44-30-220 Extra Long Rimfire	R	Straight	1872	No	A
.44-28-200 Henry Flat	R	Straight	1862	No	A
.44-28-215 Evans Short	C	Straight	1875	No	A
.44-40-200 Winchester (WCF)*	C	Straight	1873	Yes	B
.44-40 Extra Long	C	Necked	1875	No	A
.44-42-280 Evans Long	C	Straight	1877	No	A
.44-48-250 Ballard Extra Long	C	Straight	1876	No	A
.44-60-395 Sharps & Remington	C	Necked	1875	No	A
.44-60 Winchester	C	Necked	1874	No	A
.44-70 Maynard	C	Straight	1882	No	A
.44-75-405 Ballard Everlasting	C	Straight	1876	No	A
.44-77-405 Sharps	C	Necked	1875	No	A
.44-77-470 Sharps and Remington	C	Necked	1875	No	A
.44-90 Remington	C	Straight	1888	No	A
.44-90-405 Sharps	C	Necked	1873	No	A
.44-90-470 Sharps & Remington	C	Necked	1873	No	A
.44-90-500 Sharps	C	Necked	1873	No	A
.44-90-520 Remington/Sharps Special C	C	Necked	1873	No	A
.44-100-430 Maynard (Wide Base)	C	Straight	1873	No	A
.44-100-500 Ballard Everlasting	C	Straight	1876	No	A
.44-100-550 Remington Creedmore	C	Straight	1880	No	A
.44-105-520 Remington & Sharps	C	Necked	1875?	No	A
.444 Marlin	C	Straight	1964	Yes	C
.45 Smith & Wesson (Short)	C	Straight	1870	No	A
.45 Colt (Long)	C	Straight	1873	Yes	B
.45 Auto Colt Pistol (ACP)	C	Straight	1905	Yes	B
.45 Auto Rim	C	Straight	1920	No	B
.45 Winchester Magnum Auto	C	Straight	1979	Yes	C
.45-55-405 Springfield (US Carbine)	C	Straight	1873	No	A
.45-60-300 Winchester	C	Straight	1879	No	A
.45-70-500 Springfield (US Army)	C	Straight	1873	Yes	B
.45-70-405 Winchester (US Army)	C	Straight	1876	Yes	B
.45-75-350 Winchester	C	Necked	1876	No	A
.45-75-420 Sharps	C	Straight	1876	No	A
.45-80-500 US Sharpshooter	C	Straight	1880?	No	A
.45-82-405 Winchester	C	Straight	1886	No	A

APPENDIX B: METALLIC CARTRIDGES: INTRODUCTION DATES & HISTORIC SIGNIFICANCE

Caliber/Make	Rimfire/Centerfire	Shape	Introduced	Current	Significance
.45-85-285 Marlin	C	Straight	1886?	No	A
.45-85-295 Bullard	C	Straight	1887	No	A
.45-85-350 Winchester	C	Straight	1886	No	A
.45-90-300 Winchester	C	Straight	1886	No	A
.45-90-550 Sharps	C	Straight	1876	No	A
.45-100-550 Ballard Everlasting	C	Straight	1878	No	A
.45-100 Remington	C	Necked	1880	No	A
.45-100-500 Sharps (Short)	C	Straight	1876	No	A
.45-100-500 Sharps (Long)	C	Straight	1876	No	A
.45-105-550 Sharps	C	Straight	1876	No	A
.45-120-550 Sharps	C	Straight	1870	No	A
.45-125-300 Winchester Single-Shot	C	Necked	1886	No	A
.45-125-300 Winchester Express	C	Straight	1886	No	A
.450 Alaskan	C	Necked	1955	Yes	C
.454 Casull	C	Straight	1959	Yes	C
.455 Webley***	C	Straight	1897	No	B
.455 Webley Auto***	C	Straight	1912	No	B
.458 Winchester Magnum	C	Straight	1956	Yes	C
.46 Short Rimfire	R	Straight	1870	No	A
.46-40-300 Long Rimfire	R	Straight	1873	No	A
.46 Extra Long Rimfire	R	Straight	1875	No	A
.460 Weatherby Magnum	C	Necked	1958	Yes	C
.470 Nitro Express	C	Necked	1985	Yes	C
.50 Action Express Auto	C	Straight	1992	Yes	C
.50 Maynard Percussion	C	Straight	1865	No	A
.50-23-290 Remington Navy Pistol	R	Straight	1865	No	A
.50-25-300 Remington Army	C	Straight	1865	No	A
.50-50-400 Springfield US Carbine	C	Straight	1870	No	A
.50-50 Maynard	C	Straight	1882	No	A
.50-70 US Rimfire	R	Straight	1866	No	A
.50-70 Maynard	C	Necked	1870?	No	A
.50-70-450 Springfield (US Army)	C	Necked	1866	No	A
.50-90 Sharps	C	Necked	1875	No	A
.50-90-300 Winchester Express HP	C	Necked	1879	No	A
.50-90-473 Sharps	C	Straight	1880?	No	A
.50-100 Maynard	C	Straight	1882?	No	A
.50-100-300 Winchester Express	C	Straight	1889	No	A
.50-100-450 Winchester	C	Straight	1895	No	A
.50-105 Winchester	C	Straight	1886	No	A
.50-110-300 Winchester Express HP	C	Straight	1887	No	A

APPENDIX B: METALLIC CARTRIDGES: INTRODUCTION DATES & HISTORIC SIGNIFICANCE

Caliber/Make	Rimfire/Centerfire	Shape	Introduced	Current	Significance
.50-115-300 Bullard (Rimless)	C	Straight	1887	No	A
.50-140-700 Sharps	C	Straight	1880	No	A
.50-140 Winchester Express	C	Tapered	1886	No	A
.52-70-405 Sharps Rimfire (Copper)	R	Tapered	1868?	No	A
.52-70-405 Sharps	C	Straight	1878	No	A
.55-100 Maynard	C	Straight	1882	No	A
.56-46 Spencer (.46-45-330)	R	Necked	1866	No	A
.56-50 Spencer (.50-45-350)	R	Tapered	1865	No	A
.56-52 Spencer (.52-45-386)	R	"Necked"	1866	No	A
.56-56 Spencer (.56-45-350)	R	Straight	1862	No	A
.577 Snider	C	Tapered	1867	No	A
.58 US (Miller) Rimfire	R	Straight	1867	No	A
.58-40-530 US Carbine (long)	C	Straight	1869	No	A
.58-70-480 US Carbine (short)	C	Tapered	1869	No	A
.58-85-530 US Musket (Berdan)	C	Straight	1869	No	A

* = Caliber developed to fit both rifles and pistols.
 ** = "Early", but did not arrive in California until after World War I as souvenir/surplus.
 *** = "World War II"
 **** = "Korea"
 ***** = "Vietnam"

APPENDIX B:
SHOTGUN CARTRIDGES: INTRODUCTION DATES & HISTORIC SIGNIFICANCE

Caliber/Make	Centerfire	Shape	Duration	Current	Significance
4 Gauge Shotgun	C	Straight	1880-1920	No	A
8 Gauge Shotgun	C	Straight	1880-1925	No	A
10 Gauge Shotgun	C	Straight	1875-1942	Yes	B
12 Gauge Shotgun	C	Straight	1875-Present	Yes	B
14 Gauge Shotgun	C	Straight	1878-1920	No	A
16 Gauge Shotgun	C	Straight	1880-1960	Yes	B
20 Gauge Shotgun	C	Straight	1880-Present	Yes	B
24 Gauge Shotgun	C	Straight	1895-1942	No	A
28 Gauge Shotgun	C	Straight	1885-1965	Yes	B
32 Gauge Shotgun	C	Straight	1895-1942	No	B
.64 Maynard Percussion*	C	Straight	1865-1885	No	A
.64 Maynard*	C	Straight	1873-1895	No	A
.55 Maynard Percussion*	C	Straight	1865-1885	No	A
.44-50 Stevens*	C	Straight	1875-1900	No	A
.44-65 Stevens*	C	Straight	1875-1900	No	A
.410 Shotgun	C	Straight	1895-Present	Yes	B
.38-45 Stevens Everlasting*	C	Straight	1875-1900	No	A
.38-35 Stevens Everlasting*	C	Straight	1875-1900	No	A
9mm Shotshell	C	Straight	1920-1924	No	B

*Some 19th-century gunmakers offered their single-shot rifles with interchangeable smoothbore barrels so that the same gun could be used as a shotgun. In some cases, the same cartridge casing could be loaded either with a bullet or with shot.

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