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ZIP GUNS AND CRUDE COVERSIONS—IDENTIFYING CHARACTERISTICS AND PROBLEMS

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This is the second part of Bruce Barak Koffler's article. Part one appeared in the December, 1969 issue. Mr. Koffler is pursuing graduate studies in criminology at the Center of Criminology, Ottawa University, Ottawa, Ontario, Canada. He holds a B.S. degree from Trenton University and serves as a firearms instructor for the Government of Ontario.—EDITOR.

Conversions

CAP-FIRING PISTOLS

The toy cap pistol represents an advance over the crude zip gun because it already has the entire action and needs only minor modifications to make it fire a .22 rimfire cartridge. The gun is usually a light metal casting held together by rivets through the grip, cylinder, and barrel. By removing the barrel rivet and inserting a piece of car radio antenna, taping the original barrel so that it firmly holds the tubing in place and providing a firing pin, one has a weapon capable of firing live ammunition. If the tubing does not fit tightly enough, it may have to be soldered into position. A firing pin may be added to the hammer by drilling a small hole through it and screwing in a self-tapping screw. Some weapons examined in New York City simply had the face of the hammer filed to a crude point. If the shooter finds that his gun misfires quite often, he may strengthen the hammer spring by wrapping rubber bands around the frame and the back of the hammer. This serves to add more snap to the hammer fall. When such a modification is made, the double action trigger pull is eliminated by removing the entire trigger and sear. The shooter then cocks the hammer back with his thumb and releases it when he wishes to fire. Most cap pistols can be cocked back farther with the thumb than by pulling the trigger. Thus a longer hammer fall is achieved, and this increases the momentum and striking energy imparted to the firing pin. If a gun that is modified in this way is dry fired the firing pin could snap off due to the brittleness of the cast alloy, or the hammer could snap off at the thinnest part of the shaft. The heavy blows of the pin against the weak metal of the tube barrel may damage the mouth of the chamber to such an extent that no test cartridges can then be chambered. If the weapon must be tested, only .22 B.B. Caps should be used to see whether the weapon is capable of discharging a bulleted load. Anything that has a heavier bullet or powder charge may destroy the casting and injure the investigator. If it is only necessary to test the serviceability of the weapon, that is, whether or not it will fire a live cartridge, either use a blank load or pull the bullet from a bulleted load and test with the primer only. If soft copper-blanks or B.B. Caps are used to test for serviceability, they may not give a valid test of whether the same gun will fire harder brass cartridges. If brass cartridges are found in the possession of an accused, this hardness factor could be important.

The typical cap pistol that is altered in this manner has no extractor or ejector yet the shell often does eject by straight blowback against the hammer. However, the construction of the gun may be such that the hammer cannot make a full enough rotation to clear the shell in its rearward movement. If the hammer is subject to battering very often, it is liable to snap off at its weakest point. The piece that breaks could jam into the slot in the frame, but more likely it will be left at the scene of the crime and will match the shaft left in the weapon. The break often will not occur with "standard" velocity .22 short cartridges or when .22 B.B. Caps or C.B. Caps are used as the pressure is too low. As with the first weapons discussed in this article, the converted cap pistol has an ill-fitting bore and much of the gas is lost. If the hammer fall is particularly light the trigger may have to be pulled several times or the hammer may have to be cocked and dropped more than once. The rim will show multiple strike impressions placed close together or overlapping, especially if the bore is loose and the cartridge is free to rotate in the chamber with each blow.

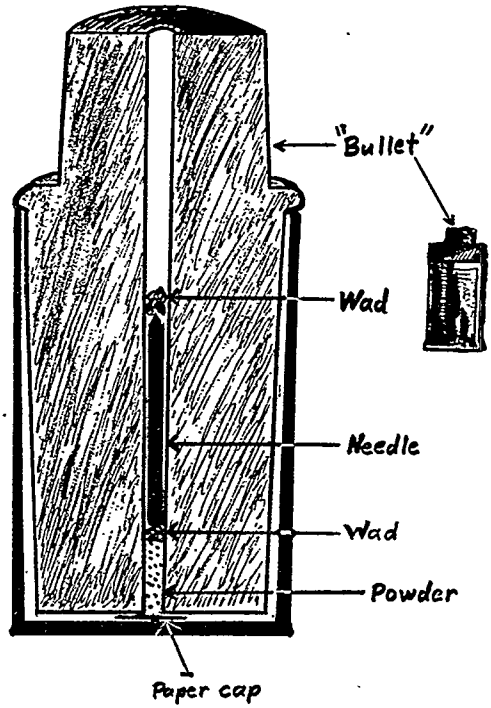

FIGURE 13
A "Shootin' Shell" type of cartridge seen from the outside and in cross section. A small diameter lead shot may be used in place of the needle.

THE SHOOTIN' SHELL

Variations of the cap pistol sometimes encountered are the Mattel "Shootin' Shell" guns and replica toy derringer pistols. These utilize an imitation cartridge consisting of a semi-rimmed brass case having no provision for a primer, and a gray cast light metal bullet which appears to be a semi-wadcutter design (fig. 13). The "bullet" runs the length of the inside of the shell and projects about ¼ of an inch beyond its mouth. The inside hollow (the "bore") is about ⅛ inch in diameter, but it may vary. It is not meant to be loaded with powder. A round cap made of red paper with a disc of fulminate compound in the center, is available from toy and drug stores. The cap is placed in the bottom of the shell and the bullet is then pushed in. The bullet does not fit tightly into the shell unless salt deposits from many fired caps cause friction between the two pieces of metal. When the cartridge is chambered, the nose of the bullet rests against the rivet that fastens both halves of the barrel together. The rear end of the bullet serves as the anvil for the cap. The hammer blow forces the inner surface of the brass shell

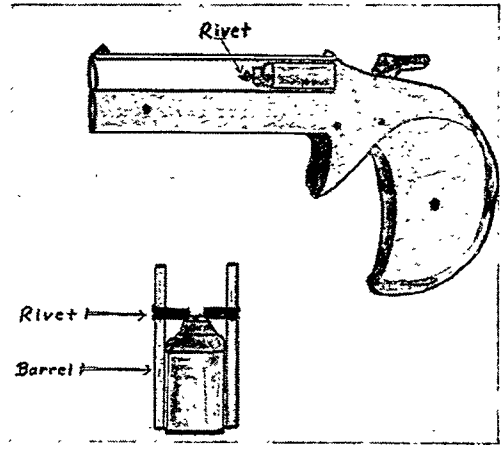

FIGURE 14
A replica derringer toy pistol; the rivet has been bored through to permit passage of the needle down the barrel.

against the cap and there is a small explosion. It is possible to drill out the center of the rivet so that the bullet is still held in place. A phonograph needle of the old steel and osmium type for 78 r.p.m. records is then inserted into the bullet cavity and can be fired out of the gun. Its velocity can be increased if the fulminate scrapings from a few caps or the powder from several ground up match heads are placed in the bullet cavity, wadded tightly and then the needle is inserted flat and first. This activity reached fad proportions in the late 1950s but has tapered off in the last few years. Two police departments showed me examples of this and one officer said that a boy had lost an eye after being hit by a finishing nail fired from a "Shootin' Shell".

The derringer type of pistol was banned from sale in many Ontario cities because it was being altered as described, and there were a number of accidents stemming from the misuse of these guns (fig. 14). The cost was only about one dollar, and they were readily obtainable. Caps cost only a few cents, and the needles sold for less than a dollar a package. The large Mattel revolvers cost from four to ten dollars and so were less readily converted by children. However, a number of these guns have been purchased by adults for use in holdups because the detail on these pistols gives them a very realistic appearance. The writer has seen one revolver that had a firing pin fitted and six barrel tubes soldered into the chambers to fire .22 caliber ammunition. It had been used in an unsuccessful bank holdup in a Montreal suburb.

Needles fired from these guns are not engraved with any markings by the gun. They may have traces of chlorate salts (potassium chloride) and match head residue so they should be handled carefully. Fragments of wadding may also adhere and a shooter's unusual preference may implicate him. Record stores in the area should be investigated for recent sales to boys and anybody buying large quantities of needles should be suspected. Finishing nails and lengths of hanger wire may also be fired from a "Shootin' Shell," but these require being cut to proper length. A tool mark analyst can usually match the cut surface to the piece from which it was cut and to the wire cutters that were used to cut the metal to size. Such tools as have a metal cutting device should be seized where possible, and an analysis done on them.

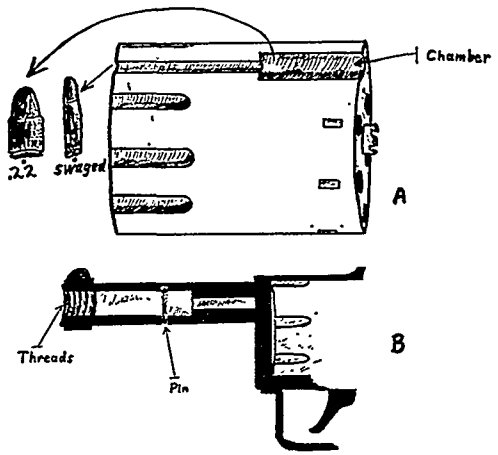

FIGURE 15
(A) A blank revolver cylinder, with one chamber in cross-section. The narrower half of the chamber swages the .22 calibre bullet, making it longer and thinner. (B) The barrel of one type of blank revolver. The pin cannot be driven out easily as it does not go all the way through the barrel. The muzzle is threaded for a signal flare attachment.

BLANK-FIRING REVOLVERS

Blank guns, like cap pistols, offer a complete frame and action and are often much stronger than anything homemade. The writer once saw a Röhm blank revolver with an alloy frame and barrel tested for strength. The cylinder was very hard steel. A number of .22 Ramset blanks with a purple wad (extra heavy load) were fired through it without damaging the gun. The Remington Arms Company that manufactures these blanks for stud driving tools says that even the lightest of their loads may ruin a well-made sporting arm in good condition. Some blank gun manufacturers recognize that their product may be doctored for the use of bulleted loads and may build in safeguards. Others such as the manufacturers of very cheap Italian blank revolvers that sell for about three dollars, use the poorest quality castings of light metal. Close inspection of some models makes one hesitate even to fire blank loads in them. When these are converted to fire bulleted loads, the shooter is asking for trouble.

The cylinder in some blank revolvers is made too hard to alter by drilling, and the section of the chamber ahead of the cartridge is factory bored to a narrower diameter than a .22 caliber bullet. At that point it is about .175 caliber. (See fig. 15A.) In some models a pin is inserted into the barrel wall through the bottom and goes part way into the top wall. (See fig. 15B.) Because it does not go completely through the top of the barrel, the pin cannot be punched out to clear the bore and allow a bullet to pass. The bore is sometimes undersized between the cylinder and the muzzle. The Röhm "RG" series blank revolver has all of the above features. The writer examined one that had had the barrel cut off just behind the point where the pin passed through it and test fired the weapon. Pressure was extremely high and the bullet appeared to have been swaged through a die, coming out longer and thinner. The shell expanded at the rim and the base stretched to fill the hole that the firing pin comes through. It resembled figure 7 in appearance. It was nearly impossible to turn the cylinder by hand for the next shot, and the second shot effectively locked the cylinder fast. Although in most circumstances this would prevent the discharge of subsequent shots, the first one before the gun seized up could certainly be lethal. The chambers of these revolvers are usually made to accomodate only a .22 Long cartridge; however, some may chamber only a .22 Short blank and even a .22 Short bulleted round will not fit. When a bullet is swaged through an undersized bore it will be engraved with depressions duplicating the irregularities of the barrel. No rifling marks will be present as blank revolvers are not rifled. In some of these weapons the front section of the bore is threaded to accept a signal rocket attachment, and these threads may account for deep gouges sometimes on bullets fired through this type of barrel. The bullet may not be scored by the threads in the same way every time so one should not invest too much faith in such markings as indentification characteristics.

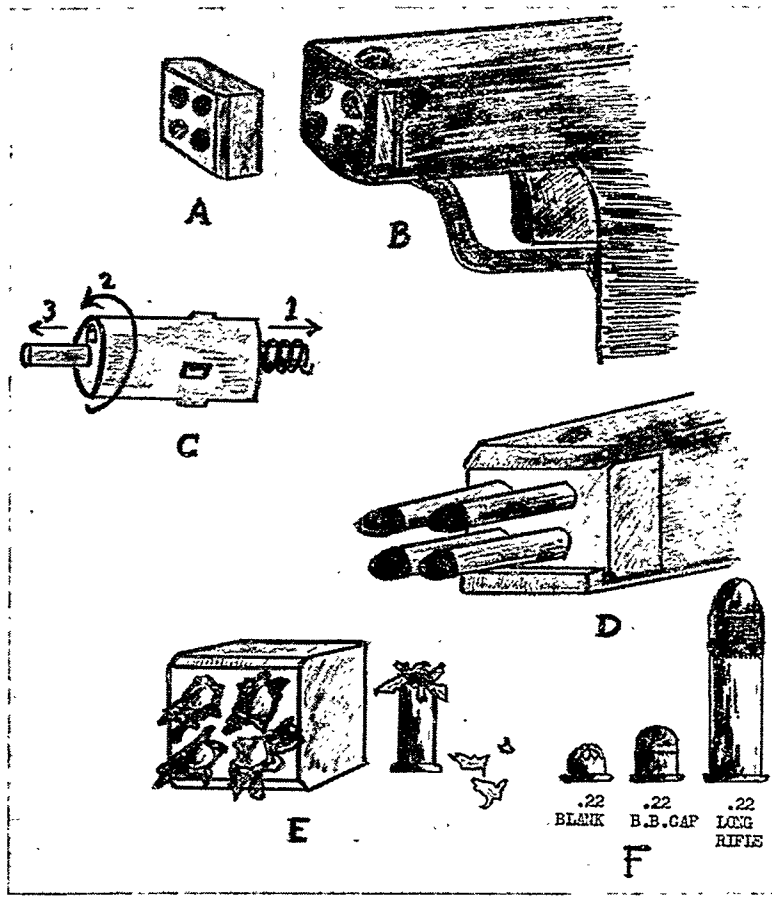

FIGURE 16

(A) Magazine for Czechoslovakian blank pistol. (B) Muzzle arrangement on unaltered pistol. (C) Revolving cylinder. The firing pin is eccentric, on the left face. (D) Altered muzzle, and magazine, with .22 Long Rifle cartridges loaded. (E) Burst shells. Extraction is difficult. (F) Three types of cartridges that may be used in this pistol. Note the difference in length and the effect that this would have in a short magazine of the kind supplied.

If an attempt is made to rebore the barrel or the cylinder, the same situation may result as is depicted in figure 4 and the bullet will be shaved. Shaving also is usually present in rebored revolvers that are made with a solid barrel and a top gas port.

OTHER PROBLEMS

As these revolvers are not intended for bulleted loads, no real effort is made by the manufacturer to ensure proper indexing or locking. The timing may be faulty to begin with or may rapidly deteriorate if too many bulleted loads are permitted to batter soft metal parts. These variables may impart a whole series of shave marks to fired bullets, and the extent of the lead loss can be expected to differ from one chamber to the next. Therefore, it is important to test fire all chambers in a particular cylinder to match test bullets with crime bullets. Occasionally, a revolver will be encountered that has had its barrel completely sawed off at the frame. Since most cast frames are made in one unit with the barrel, the latter generally cannot be removed by unscrewing it in the manner possible with a regular revolver. Since the powder of a .22 Long Rifle is high speed loaded for use in at least a sixteen inch barrel, a sawed-off revolver produces a spectacular muzzle flash and an unnerving amount of noise. Most of the powder burns outside the barrel and can cause a bad burn at close range. Some of the powder load will be carried into a wound channel or be deposited in a

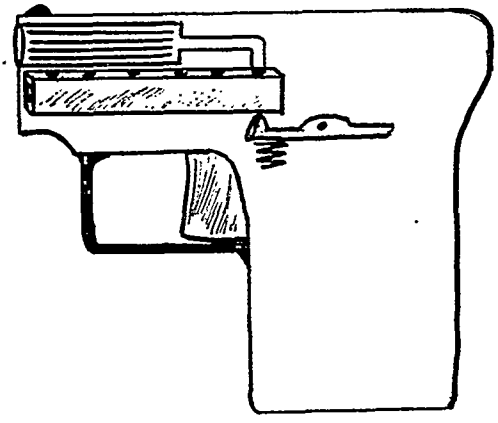

FIGURE 17
A Gecado blank pistol with fluted bore. The bore is made for firing small signal flares and tear gas cartridges. It is similar to the design of the Perfecta bore, but the action is completely different.

circle on clothing when a cartridge is fired close to a person from a weapon with no barrel. The blast and the heat it produces causes the base of the lead bullet to upset violently. This extreme degree of upset will give a good indication to the investigator of what kind of weapon to search for. If the barrel has been sawed off sloppily, the projecting edges of metal at the "muzzle" will score the flared edges of the bullet's gas cup. If a screw-in barrel is removed from the odd gun that is manufactured with a separate one, the base of the bullet will be torn by the threads inside the frame of the weapon as it passes over them.

In a discussion of any of the above weapons it should be remembered that they differ from the crude zip gun both in general reliability and in the provision for firing several shots in rapid succession. However, these features tend to decrease in importance with the amount of abuse applied to the weapon and with the number of high pressure cartridges fired from it.

A BLANK-FIRING "AUTOMATIC REVOLVER"

There is a blank pistol manufactured to look like an automatic pistol but which functions like a revolver. This weapon is Czechoslovakian and uses a small square magazine holding four .22 Short crimped blanks pointing forward (Fig. 16). The magazine slides into the gun from the right side, and the four gas holes point forward through one large opening in the frame of the pistol. The firing pin is an off-centered projection on the circular face of a small cylinder as shown in fig. 16C. The cylinder has four evenly spaced ratchet teeth on its circumference. Pressure on the trigger cocks the cylinder on the shaft that passes through it, and a ratchet hand simultaneously rotates it one quarter turn. At the end of its rearward cycle, the cylinder is tripped and flies forward under spring pressure to fire one round. To convert this weapon to fire bulleted loads, the muzzle must first be cut and filed to permit entry of projecting cartridges. Caliber .22 B.B. Caps function best in this conversion because the longer cartridge cases are mostly unsupported and burst. They are then very difficult to remove. When B.B. Caps are used the shell is completely surrounded by steel, and only the bullet protrudes from the magazine.

THE PERFECTA PISTOL

The Perfecta pistol is an unorthodox German model. It fires .22 Short crimped blanks from a tubular magazine that fits into the butt; the blanks are inserted into the tube from the top, rim downward. This gun differs from most in that it has an extractor (a flat ring) through which the shell fits as it is being chambered. After firing, the trigger is released with a snap, the extractor cams the shell back and down out of the chamber, and the empty casing is pushed out of the top of the gun through an ejection port; it rolls over the side and drops near the feet of the shooter. There is usually a slight bulge near the rim where the extractor fits around the blank. If this pistol is operated with B.B.s or any other projectiles, the blank expands and locks into the extractor, causing the action to seize up. The gun must then be completely dismantled to remove the shell. It is unlikely that this pistol would be converted, since the instructions provided warn that a jam will occur if anything other than a blank is used. Although standard models of this pistol have a top gas port, one version has a flare/tear gas barrel that is deeply fluted. Loosely fitting projectiles can be discharged from this model without causing the action to seize up. The fluting appears to be deep straight-cut rifling as the cutaway in fig. 17 shows.

OTHER "AUTOMATIC" PISTOLS

The repeating blank pistols that are most commonly encountered are shaped like an automatic pistol, are about the size of a small .25 automatic firearm, and employ a rectangular

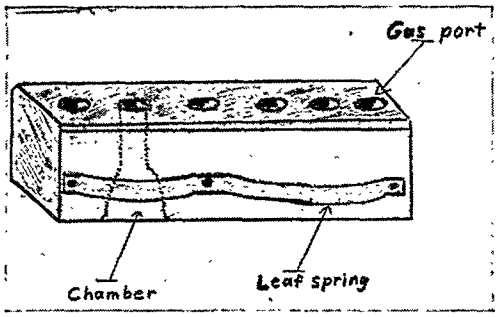

FIGURE 18
A magazine for crimped blanks, showing a chamber in cross section. Ratchet teeth on the underside push the magazine back one chamber for each shot.

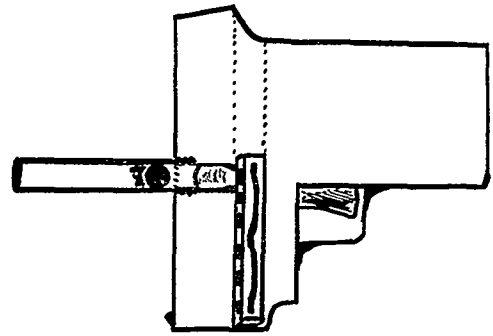

FIGURE 19
A Gecado blank pistol with top gas port and home-made barrel attachment threaded into place.

moving cartridge magazine that passes over the firing pin for each shot. Figure 18 illustrates the design of the magazine which typically has the capacity for six blank cartridges. The weapon cannot be fired without the magazine for it is also the chamber for each blank. With consecutive pulls on the trigger each blank lines up with the firing pin below and the gas port above. A hand engages ratchet teeth on the base of the magazine and moves the metal block from front to rear. When the magazine reaches the back of the gun an additional pull on the trigger moves it back through a hinged trap door. The Röhm, EM/GE, and Gecado pistols as well as more obscure makes are patterned on this design. Most of these firearms have a very sharp firing pin, and it cuts a weak point into the soft copper blanks made for such guns. A barrel attachment is sometimes home-made to screw into the gas port on top of the gun; the original muzzle of the pistol is then pointed to the ground to direct the attachment toward a target (fig. 19). It will fire small shot pellets or steel B.B. shot. If the bore is too tight the blank case may burst around the firing pin impression, and the powder gas may damage the action. Several of these pistols have an escape hole on the left side of the gun to handle the gas safely, but the opening is level with the thumb of the shooter and not too many burns are needed to get him to smarten up. A small black burn mark will be present near the web of the thumb after a blank bursts. Although the weapon holds six blank cartridges only one projectile can be fired at a time. The shot pellet must be replaced for each shot and wadded in place to keep it from rolling out of the barrel when the gun is tilted. One smart youngster simply placed a piece of masking tape over the

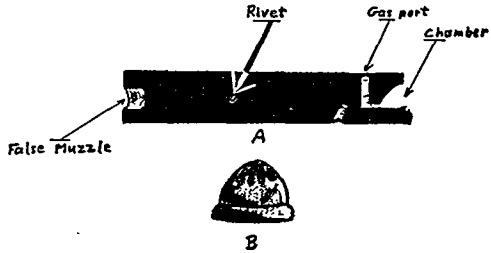

FIGURE 20
(A) Barrel of an "H.S." starter's pistol in cross-section. If the barrel is drilled through it will fall out, as the rivet does not have enough metal left to hold the barrel tightly in the frame. The hole underneath will bleed off gas onto the shooter's trigger finger if the barrel is bored through. (B) A .22 short crimped blank. The shell is made of soft copper. Actually, the opened shell is the length of a .22 B.B. cap shell, not that of a .22 Short case. These blanks are made only in Europe.

muzzle of the gun to avoid having to wad in each shot pellet. If a ramrod and soft lead shot are used, identifiable impressions may remain. Usually no worthwhile striae are engraved by the barrel on the projectile.

THE "H.S." SINGLE SHOT PISTOL

This starting pistol is the cheapest one made and possibly the most difficult one to convert. It sells for two dollars, and is made from three sheet metal stampings held together with pins and spot welds. It is a German firearm, and only .22 Short crimped German blanks will function because the chamber is so shallow. The cartridge mouth projects downward and the barrel has a hole bored partway through the bottom wall in line with the cartridge mouth to discourage those who would attempt to ream it out to accomodate a bulleted load (fig. 20). The gas port is on top of the barrel which is riveted through the center to the

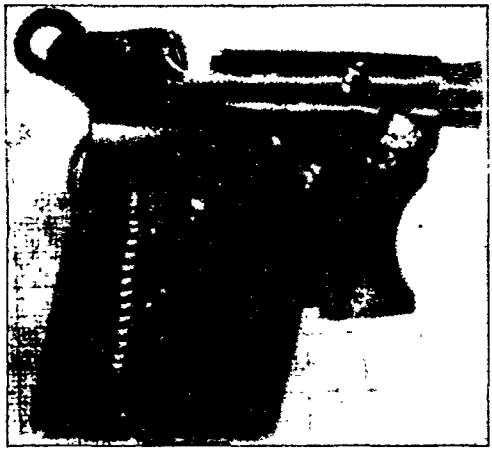

FIGURE 21
A homemade semi-automatic Zip Gun. The hammer recocks and stays locked back, even if the finger is on the trigger.

sheet metal frame. The hammer is designed for soft copper blanks and often the wide firing pin will not detonate the primer in a hard brass shell on the first blow. Although this pistol is inexpensive, it must be reworked at more expense than would be required to build a gun using the same design from basic materials. The barrel must be removed by punching out the soft metal pin and then it has to be cut and bored. The firing pin shape needs to be changed, and a stronger hammer spring must be substituted for the original one. Space limitations within the frame make this a difficult proposition. Several boys in a high school machine shop copied the design and for about fifty cents were able to turn out a product that they were selling for five dollars. Figure 21 illustrates the design that is basically that of its German counterpart. It is two by two and one-half inches square including the barrel. All parts are heavy sheet metal spot welded together. The barrel is made from bar stock bored on a drill press, and the two small springs were purchased at ten cents apiece. The frame is only three eighths of an inch thick. This weapon fires .22 Short and B.B. Cap ammunition, ejects empty shells and recocks automatically, just like the original. Its accuracy from the one inch barrel is two feet for practical purposes, since the entire weapon is put far out of line of sight with a tiny motion of the wrist. There is so little to hold onto, that it is difficult to point it at waist level without looking at the gun at the same time to be sure it is on target.

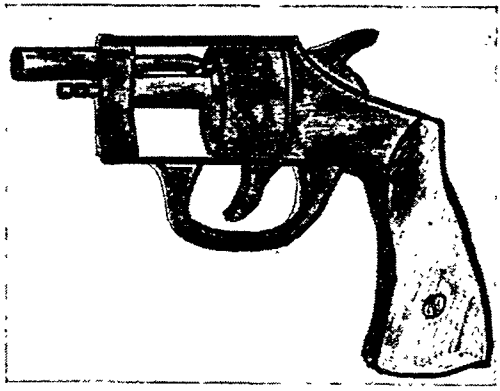

FIGURE 22
A blank revolver of the type made by Iver Johnson and by Harrington and Richardson. The pointed extension may be cut off and the barrel bored through. The bullet has to jump an inch from the cylinder to the barrel and would be "shaved" and badly deformed.

AMERICAN-MADE BLANK REVOLVERS

Iver Johnson and Harrington & Richardson both make a rather expensive blank revolver similar to figure 22. There is no barrel used as such. An extension of an imitation solid barrel has a point that sits directly in front of the uppermost chamber. This point deflects gas to the sides and helps to break up any wadding that is still potentially dangerous to bystanders. Since it is so expensive in comparison to imported models, few stores sell them except as a special order item. It is unlikely to be found in juvenile hands although removal of the "barrel" could easily convert this pistol into a deadly weapon. The writer knows of no instances where such a pistol has been converted to fire bulleted loads.

TEAR GAS PENS

Most tear gas pens sold today do not use a cartridge that fits into a barrel because the earlier projectors were too easily converted. Recent models have no barrel but use a type of cartridge that screws into the front end of the device. If the threads inside the projector can be duplicated, a screw-in barrel can be made. Since most of the projectors on today's market are center fire .38 caliber models, a .22 barrel must be bored off-center to allow the firing pin to strike the cartridge rim. These guns are often unsafe to use in the unaltered condition because there is no positive safety device to prevent accidental discharge. Two models have a safety notch for the cocking handle, but tests show that this is not to be trusted, espe-

cially with a bulleted load in place. One Japanese gas pen has a barrel that unscrews to accept a .38 tear gas cartridge. This cartridge is the standard .38 Special case carried by police officers but loaded by two companies with gas-producing powder instead of a bullet. The manufacturer warns that a ball cartridge will destroy the device and injure the shooter. It is possible to put an off-center .22 bore liner into the manufactured barrel and fire it as a single shot weapon. This device has the appeal of a weapon disguised as a pen, and is easily carried in the shirt pocket without arousing suspicion. Fired bullets are engraved with the irregularities of the barrel and can be analysed for individual characteristics. One device that was actually made to look like a pen but fired .22 bulleted loads was manufactured by R. F. Sedgely, Inc., in Philadelphia. It looked exactly like a fountain pen and had a short rifled barrel. Very few of these are in circulation at present, because none have been made for 35 years.

Police gas billy sticks take a 12 guage shotgun shell that is loaded with a lacrymatory powder. The writer has seen one of these fired with a shotshell intended for hunting use. The nightstick cracked with the first round, and a subsequent shot would have burst the chamber. Loosely mounted in a vise for testing, the nightstick jumped from its grip and flew across the room. The recoil would likely be enough to break a wrist if the device were to be fired with one hand.

Flare Pistols

These military signal pistols are available in 20mm, 25mm, and 37mm types. The first size was used mostly by Germany in the last two wars. Britain has favored the 25mm caliber; while the United States has used it along with the 37mm size. The British models follow the Webley design while U.S. models in common circulation are made by Harrington & Richardson. Most types are proofed for a black powder launching load, and the British models bear the "B.P." proof mark to indicate this. American firearms do not require a proof mark. A flare cartridge may be reloaded with a shot charge, but the primer may be difficult to obtain as it is an odd size. An insert tube may be made to fit the pistol's bore and chamber a 12 gauge shotgun shell. It is difficult to find pipe with a large enough outside diameter to fill the bore and walls thick enough to accept the much smaller shotshell. Of course, the smaller the gauge the harder it will be to solve the problem. An insert may be machined to proper fit, inside and out and then soldered in place. More common is a system of telescoping tubes that have been crudely filed to fit tightly within one another. The innermost tube that serves as the bore is difficult to file accurately. If it is too loose the shell will burst. If it is very tight the shell cannot be extracted easily and irregular areas of the bore will leave highly individual characteristics on the brass portion of the shell. The pistol must be fired with the left hand around the barrel to absorb the heavy recoil. Commercial inserts for several of these pistols were made during the last war and some were made on special order for police departments. These were made only in twelve gauge and had provision for the pistol's extractor to remove the empty shell. The writer has seen no homemade inserts that allow for extraction and pistols converted in this way are clumsy to use for more than one shot.

Pellet-firing Weapons

Air guns offer considerable scope for illegal conversions. To cock the gun a spring loaded piston is pushed to the rear and locked in place by the sear. The trigger releases the piston and air compressed ahead of it thrusts a pellet, B.B., or dart down the bore. To convert a pellet weapon to fire live ammunition, a precondition is that the piston be in direct line with the bore. The Webley pistol has the piston beneath the barrel and is cocked from back to front. It cannot be altered in the manner described here. To convert the Falke, Diana, Marksman, and other pistols, the face of the piston must be fitted with a firing pin that projects out to the edge of the chamber mouth. A hole may then have to be drilled to relieve air pressure as the piston moves, or the piston can be sanded down to remove the hermetic seal. If air pressure is unrelieved, the firing pin will move too slowly to positively fire the primer. The bore in a .177 pellet gun and a .175 B.B. gun is unsuited for cartridges because it is too narrow. If the chamber is reamed out a .22 B.B. Cap can be shot with reasonable safety. The bullet is swaged by the bore in a way similar to figure 16 A. If a longer and more powerful .22 load is to be used, the entire barrel must be rebored. In a long barrel, the boring is often done from both ends since a drill bit the required length is seldom available. The planing effect this often produces on the bullet, as was described in an earlier section, can be expected to be present. The only way around the problem of

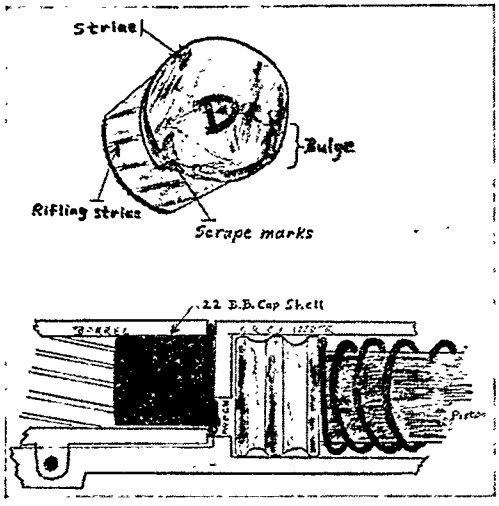

FIGURE 23
A .22 B.B. cap shell fired by slamming pellet rifle barrel shut.

barrel length is to shorten the barrel before boring it. When this is done, rough edges left around the muzzle can provide some identifiable characteristics. In altering a gun originally chambered for a .22 caliber pellet, the shooter need only lengthen the chamber. Rifling in these weapons is usually a microgroove type with as many as 14 grooves. This can be troublesome to identify on .22 bullets swaged down to .177 inches, but with patience a positive match can be made.

Most of these weapons are designed as single shot break-action guns. A .22 B.B. Cap can be fired from some .22 pellet rifles without making any change in the action. The cartridge is inserted into the chamber and the barrel is slammed closed. Since there is not enough clearance for the rim it is crushed by the sudden force put upon it. The round fires and internal gas pressure against the base of the cartridge bulges it back into the airhole between the piston cylinder and the barrel. The effects of this are illustrated in figure 23. The base metal appears to have been "smeared", and this is complicated further when the barrel is broken to reload. The bulged area of the shell is scraped again by the top edge of the airhole. The cartridge case is longer than the pellet meant to be used in these guns, and it extends into the rifled portion of the barrel. Gas pressure forces the case into the grooves and an impression of the rifling is left on the outside. These striae are not as useful for analysis as those engraved on a bullet that has travelled the length of the bore. If nothing else, they can provide a count of the number of the lands and grooves in the particular rifle if the recovered bullet is badly deformed.

HEAVY CALIBER ZIP GUNS

Most youngsters have no comprehension of the energy stored in a high-power rifle cartridge or a heavy-gauge shotshell. They construct guns to fire these and are often maimed by the resulting explosion. The 12 gauge shell is the usual one encountered, because it easily fits old plumbing pipes, television antenna masts, and tubular chair legs. If a threaded plumbing pipe is used for a barrel a cap may be affixed to the breech. A cap pistol action or a rubber band and a nail is then mounted to set off the primer. The shooter is then holding a bomb. Alert citizens often report this type of weapon to the police who then confiscate it before any damage is done. Many potential victims have been spared in this way. The investigator should not be so bold as to fire it by hand. If it must be tested, the weapon should be set up with sand bags shielding it on all sides. The investigator should then fire the cartridge remotely by a long string. It is not necessary to use a full charge, and if the gun must be saved intact as trial evidence, firing a primer should be enough to prove the serviceability of the action. It might be worthwhile to blow up a gun, collect, and mount the fragments and display the remains of the weapon in schools, at the same time the local police are carrying out their annual "Report Blasting Caps to Your Teacher" campaign.

LETHAL EFFECTS

The .22 Long Rifle high speed cartridge is the one most often fired in zip guns. The working pressure developed depends on the amount of powder that is burned. This varies with the individual gun as some have very tight bores if drilled out with a $\frac{7}{32}$ inch drill bit while others made from .25 inch car radio antenna tubing are so loose that they barely hold the rim. A loose one usually causes the case to split and most of the driving pressure is wasted. If a suspected crime weapon is tested with the type of cartridges that were used in the crime, and the bullets fairly roll out of the barrel, this is unlikely to be the one used in a fatal shooting. A confirming factor is a deformed bullet that has penetrated deep into flesh, and a recovered cartridge case showing signs of high pressure (a flattened rim, for instance). The identifying characteristics of the crime gun should be reproducible

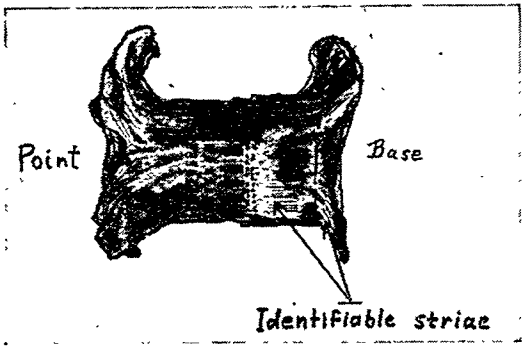

FIGURE 24
A Hollow-point bullet fired from a revolver without a barrel. The base upset from hot, high pressure gas rushing out around it as the bullet emerged from the tight cylinder into the wide bore left by removal of the barrel. The hollow point expanded when it penetrated flesh.

in the laboratory to the same extent with a zip gun as for any commercial firearm. In an earlier section it was stated that the base of a lead bullet will expand if it is fired from a revolver without a barrel. A .22 bullet may nearly double in diameter at the base. If it is a hollow point bullet and strikes an object or a body point first, it will expand in front as well as around the gas cup. This barbell-shaped slug tumbles as it makes a wound channel and is capable of inflicting great tissue destruction. Figure 24 shows a bullet that has been distorted at both ends. The large base will cause an entrance hole, in tissue, that is bigger than what a .22 bullet would normally produce.

No definitive statement about every possible type of projectile used in a zip gun can be made. There are too many variables involved because nearly anything that can be inserted into the bore of one of the muzzle-loading weapons is a potential bullet. Marbles, carpet tacks, ball bearings, phono needles, pieces of hanger wire and of course regular bullets have all been fired from homemade weapons. One police museum had a box of .30 caliber rifle bullets that had been pulled from rifle cartridges with pliers. An exploding bullet for a firecracker zip gun had been made by drilling out the centers of these soft point bullets from the front end, and inserting a Remington "Rocket" high speed .22 Short cartridge bullet-first into the nose of the .30 caliber projectile. The rim of the .22 shell protruded and the projectile exploded when fired at any surface that provided the slightest resistance. The live cartridges fired from another gun were described earlier. The effects in tissue are beyond the experience of this writer, but it can be presumed that the shock effect of an exploding bullet would be far more devastating than an expanding bullet produces. Kitchener, Ontario, police tested a marble-firing firecracker zip gun some years ago and found that it would go through a steel 45 gallon drum. The marble emerged nearly intact. Police in Whitby, Ontario, tried a similar weapon about the same time and fired a marble through a 2 inch plank. B.B.s or small shot can be lethal if used in large quantities. A mass of them driven by a cannon firecracker can be as effective as the shot charge from a .410 shotshell. Carpet tacks and other sharp objects can produce terrible lacerations. The writer tried these on the carcass of a groundhog and found the skin to have many jagged splits. All irregularly shaped projectiles will tumble to some extent if there is no rifling to stabilize them and keep the point forward. A short distance from the muzzle yaw begins and the missile strikes broadside. All of one side of a lead bullet which has struck in this way often bears the weave pattern of the victim's clothing. This proves that the bullet actually did not strike point first.

A particular weapon or load may be more damaging to the shooter than to his intended victim. Large caliber cartridges in an inappropriate weapon can produce the effects of an offensive grenade as pieces of metal fly in all directions (ref. 1). Burst .22 shells may cause facial lacerations to the shooter and to bystanders. Blank revolvers that do not index correctly shave lead off the bullet as it passes from the cylinder to the barrel. The writer had fragments of lead embedded in his index finger at bone level for many years after test firing a weapon of this type, without wearing heavy gloves for protection. The eyes of a shooter are always endangered by flying shells, shell fragments, and searing gas. His hand shows powder burns if the weapon is not gas-tight. Finally, a converted signal flare pistol is a sawed-off shotgun both in classification and in degree of effectiveness. The appearance of a 1½ inch diameter muzzle usually convinces a potential victim that it might be better not to be shot. The bank robber who uses one of these weapons understands the psychological effect.

CONCLUSION

The writer has presented a broad descriptive outline of many types of zip guns. Some varieties such as the one described in the November 1966 *F.B.I. Law Enforcement Bulletin* are not true guns in the sense of the word used in this article. If it is

not a powder-operated firearm, it is a projector rather than a gun. In the past, the literature on firearms and criminology has largely ignored the special problems of these weapons. That these firearms do in fact pose a threat in some urban centers was pointed out by a member of the New York City Police Ballistics Squad as this article was in preparation. He related that in an average week about 35 or 40 homemade weapons are seized by his department. Many more go undetected. In a city that has probably the most restrictive pistol laws on the continent, we have an example of how such legislation fails to achieve its purpose. The individual who cannot legally obtain a firearm and wants one badly enough can make a serviceable weapon in very short order and with limited skills and tools does a reasonable job. The same detective made it clear that this was not just a juvenile problem. Adults with a little more pocket money, access to better materials, and having the use of more machine tools can turn out a better finished product that is usually quite safe and accurate. Fifty percent of the zip guns in New York City are made by adults. When we ask for stricter gun ownership legislation in future, this is something to bear in mind.

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