BROWNELLS® REVOLVER CHAMFERING TOOL KITS

READ & FOLLOW THESE

INSTRUCTIONS

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BROWNELLS GUNSMITHS DATA RING BINDER

SAVE THESE INSTRUCTIONS IN YOUR

INTRODUCTION

.22/.32 Kit

.38/.45 Kit

The Brownells Revolver Chamfer Tool Kit was designed with the assistance and cooperation of noted professional pistolsmith, Ron Power, whose many years of building some of the finest PPC revolvers in the U.S. brought invaluable experience and expertise to the project. Until the introduction of this Kit, tools of this type were almost impossible to obtain commercially, and even the most proficient pistolsmiths seldom had chamfering tools of such excellent design and high quality for use in the modern revolver. The forcing cone is a very critical and sensitive area that greatly affects accuracy and reliability. Very little has been written on how to correct the problems that are directly traceable to faults in forcing cone design or function.

With these very detailed and complete instructions - plus the Brownells Revolver Chamfering Tool Kit and the other accessories - you can now make forcing cone work an important part of the service you offer your customers and a profitable part of your operation. You'll be very pleased with the results you can achieve.

NOTE: We urge you to read all of these instructions carefully and thoroughly, prior to doing any work. You will be dealing with a critical area of the revolver; there is little room for error. Be Careful!

THE FORCING CONE FUNCTION AND SIGNIFICANCE

Although forcing cones are found in one form or another in almost every modern breech-loading firearm, it is of no importance whether the revolver is singe-action, double-action, .22 rimfire or .44 magnum. The forcing cone, or barrel throat, always functions in the same manner and is extremely important to the safety, reliability and accuracy of the receiver.

The forcing cone is located at the breech end of the barrel, immediately in front of the cylinder. It can be thought of as a "funnel" or internal taper at the beginning of the barrel. The function of the forcing cone is to guide the bullet into the bore after it has left the cylinder. The forcing cone may vary in length up to ⅜" or more, and the angle of internal taper may range from less than 1° to 45° or more.

Modern firearms manufacturers employ some incredibly sophisticated and advanced production techniques. But, it is still not financially practical to produce a revolver in which all six chambers of the cylinder align themselves perfectly with the bore of the barrel under all conditions. As a revolver is used and develops cylinder/frame wear, the alignment of the individual cylinder chambers with the barrel bore deteriorates. Under certain conditions, this misalignment can progress to a dangerous condition.

Extreme cases result in the cylinder chamber being so far out of alignment with the barrel bore that the bullet hits the side of the barrel as it leaves the cylinder. It then "skids" into the bore and continues on down the barrel. This condition results in very poor accuracy.

In some instances, part of the bullet, especially lead bullets, will be forced from between the cylinder and the barrel. This is often referred to as "spitting" or "shaving" lead. It is dangerous to the shooter as well as to bystanders. As you would expect, the potential accuracy of a revolver is greatly diminished, because the bullet is deformed prior to its entry into the bore. Also, bullet weight is no longer consistent.

Firearms manufacturers developed the forcing cone as a means of compensating for cylinder-to-bore misalignment brought about either by wear on the various parts of the mechanism, or by inconsistency in the manufacturing process.

It has only been within the last few years that the significance of the forcing cone as an element of revolver accuracy has begun to be fully realized.

The growth of revolver competition, and the demand for greater accuracy in revolvers, has played a major role in focusing more attention on the forcing cone because a well-designed and constructed forcing cone allows for the smooth entry of the bullet into the bore. The goal is to have minimum bullet deformation which, in turn, will lead to greater accuracy. A properly constructed forcing cone aids in minimizing lead buildup or "leading" in the bore. Again, this causes less bullet deformation, more uniform pressures and contributes significantly toward greater accuracy.

BROWNELLS REVOLVER CHAMFERING TOOL KITS

The Brownells Revolver Chamfering Tools are available as individual items and in a variety of kits. Let's begin by examining each tool in the **Complete Gunsmith's Chamfering Tool Kit** and its function.

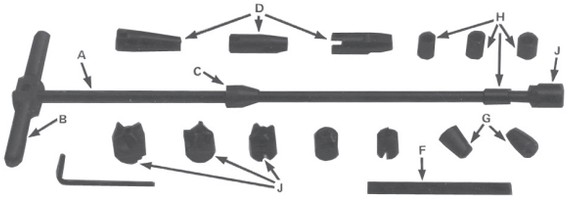

FIGURE 1 - Complete Certerfire Kit

The **Extension Rod ("A", Fig. 1)** is approximately 11½" long, made of high-strength stainless steel and threaded at one end to accept a variety of cutters and laps. The other end has a small, flat area, milled into one side approximately ⅛" from the end. This milled area was designed to provide a locking surface for the tool handle.

The **Handle ("B", Fig. 1)** is secured to the Extension Rod by a small Allen set screw. A 3⁄32" Allen wrench is also provided. (One note of caution at this point. It is **not** necessary to apply a great deal of pressure to the Allen screw when attaching the Handle to the Extension Rod. Make it snug and then stop. You don't want to strip out the screw threads.)

An **Aluminum Center Guide ("C", Fig. 1)** is provided to both protect the muzzle of the barrel from possible damage by the Extension Rod and to ensure that the Extension Rod is centered in the bore. It is utilized by sliding the guide onto the Extension Rod so its tapered portion will extend down into the bore during use. The Extension Rod is then inserted through the barrel from the muzzle end.

The **Chamfering Cutter ("D", Fig. 1)** is threaded onto the Extension Rod after the appropriate Brass Pilot is in place. Three Chamfering Cutters are provided: an **18° Cutter** for 9mm to .41 caliber barrels; an **18° Cutter** for .44 caliber to .45 caliber barrels; an **11° Cutter** covering all calibers from 9mm to .45. Also available is a **5° Cutter** for .38/.357 which duplicates the Ruger factory chamfer for these calibers. The 18° chamfer has been used

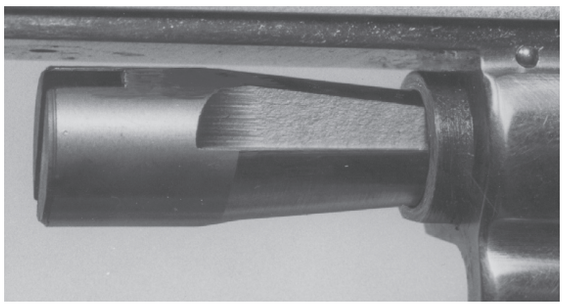

FIGURE 2 - 11° Cutter positioned in barrel throat

quite often by firearms manufacturers, and in most instances, will provide a slight accuracy advantage when shooting jacketed bullets. The 11° Cutter was designed by Ron Power after extensive research and experimentation during which Ron found that the 11° chamfer provided optimum accuracy when using hollow-base lead wadcutter bullets, the type most often used in PPC guns.

Additionally, **82° Cutter ("E", Fig. 1)** (9mm to .41 caliber) is available to slightly chamfer the inside edge of the rear of the forcing cone. These Cutters are used only after the forcing cone has been cut. Their function is to break the sharp corner that may be present on the inside edge of the barrel chamfer. **DO NOT** use the 82° Cutter to form a compound angle forcing cone. Test results have shown this is detrimental to good accuracy.

The **Breaker Bar ("F", Fig 1)** is provided for use as an aid in removing the various cutters from the Extension Rod. Slots are provided in the end of each cutter for its use. **DO NOT** attempt to remove cutters with pliers or vise grips. Doing so risks almost certain damage.

Brass Laps ("G", Fig 1) in various calibers and 11° or 18° are available for those gunsmiths who wish to polish or lap the chamfer cut. After the final cut has been made, the proper Brass Lap is attached to the Extension Rod and an abrasive such as the Brownell Abrasive Compound used to coat the lap. The extension Rod is then rotated in a *clockwise* direction while the lap is pulled into the chamber. Normally, very little (if any) polishing is required.

The **Brass Pilots ("H", Fig 1)**, which are available in five sizes (.32, .38, .41, .44, and .45), are very desirable accessory items. By utilizing a Brass Pilot, you can, in many instances, recut or realign off-center forcing cones. The Pilot also aids in ensuring that the Chamfering Cutter is in proper alignment with the axis of the bore during use in the installation of new barrels. It is **mandatory** that a Brass Pilot be used when utilizing a 90° Facing Cutter.

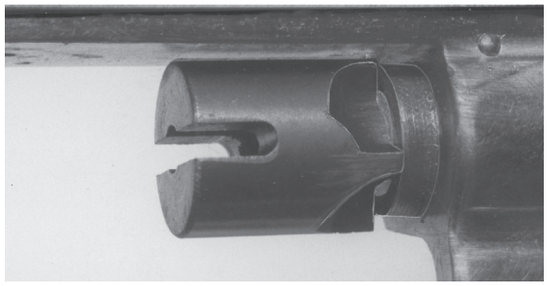

FIGURE 3 - 90° Facing Cutter - Note clearance between Cutter and top strap

The **90° Facing Cutter ("J", Fig. 1)** is used to square up the breech end of the barrel. This is especially useful when fitting a new barrel to a revolver. The use of the Facing Cutter can make this job faster, easier and much more precise, and is just the ticket for removing "high" spots on the barrel which may interfere with cylinder rotation.

The 90° Facing Cutters are available in four diameters: .450, .560, .625 and 687. You should use the Cutter whose diameter just exceeds the diameter of the end of the barrel extension. It should **never** be smaller than the extension diameter. Ideally, it should just exceed the diameter of the barrel extension while not being large enough to contact any point on the inside of the frame.

FIGURE 4 - Plug Gauges

The **Barrel Chamfering Plug Gauges (See Fig. 4)** are additional accessory items that are very helpful. Available in five sizes: .22, .32, .38/.357, .44 and .45 to check either 18° or 11° chamfers and in one size (.38/.357) for 5° chamfers: these precision-ground, hardened steel gauges enable you to accurately measure the width of the chamfer and ensure you never remove too much metal from the barrel extension.

IMPORTANT: READ BEFORE PROCEEDING

To date, there is no apparent "standard" for forcing cone configuration within the firearms industry. Individual manufacturers utilize a great diversity of designs and, from time to time, change these. Because of this, **you MUST always carefully check the configuration of the existing forcing cone prior to making any modifications.** We suggest the use of the appropriate Brownells Chamfer Plug Gauge following the procedures detailed on page 3 of these instructions, plus a good visual inspection.

You will encounter many revolvers with extremely short, almost non-existent forcing cones. These guns can be helped greatly by using the Brownells Revolver Chamfer Tools. Occasionally, you may encounter a revolver with a forcing cone that is cut too deeply when measured with our Plug Gauges; and some may be larger in diameter than recommended (see Page 3, Col-

umn 2, Paragraph 3 of these instructions). When an existing forcing cone is either too deep or too large, you may be compelled to either accept it as is, or set the barrel back and reface it prior to cutting a new forcing cone. You should **NEVER** recut a forcing cone if doing so will result in a "Stepped" or compound angle.

USING THE TOOLS

Begin by making sure your revolver is not loaded. While it is not necessary in most cases, the removal of the cylinder from the gun will make your work easier and faster. You may also wish to remove the grips and place the butt of the revolver in a suitable padded vise so your hands will be free. The barrel can be in almost any position; horizontal, perpendicular or vertical. Place it in the position most comfortable for you.

It is a good idea at this point to lay a clean shop cloth through the cylinder opening on the frame in order to catch any stray metal chips, drops of cutting oil, lapping compound or any other debris that may be removed from the barrel. You should also run a cleaning patch or two through the barrel to remove any excessive oil or fouling prior to beginning any work.

Loosen the set screw and place the Chamfering Tool handle on the Extension Rod. The Handle should be secured to the non-threaded end of the rod in such a manner that the set screw in the Handle enters the small, flat, milled area on the Extension Rod. Tighten the set screw until the Handle is secure. **DO NOT** -- repeat **DO NOT** -- over-tighten the set screw. You may strip the threads from the Handle.

Place the Center Guide on the Extension Rod so the tapered portion is pointing away from the Handle. The Extension Rod can then be inserted through the barrel from the muzzle end. This should be done carefully. The Center Guide should then be pushed forward so the tapered portion enters the barrel bore.

FIGURE 5 - Barrel throat being recut on Colt Diamondback

If you have a Brass Pilot of appropriate caliber, it can be slipped over the threaded end of the Extension Rod and gently slid into the bore of the barrel. It will provide an additional aid in aligning the Cutter and the Extension Rod with the axis of the bore.

A Chamfering Cutter can now be threaded onto the Extension Rod. Position the Cutter against the threaded portion of the Extension Rod with one hand so by turning the Extension Rod Handle with your other hand in a *clockwise* direction, the Cutter will be drawn onto the rod. After the Cutter is properly secured to the Extension Rod, you can begin cutting by gently pulling on the Handle of the Rod and by rotating the Cutting Head in a *clockwise* direction.

Cutting oil should always be used with any cutter to increase its effectiveness, aid in ensuring that the cuts will be as smooth as possible, and to extend the life of the cutter. **NEVER** under any circumstances, should the Cutter be turned in a *counter-clockwise* direction while it is being pulled into the barrel. To do so will dull and possibly ruin, the cutting edges of the tool. We repeat - **NEVER turn any Cutter in a** *counter-clockwise* directon.

You may be surprised at how easily the Cutting Tool operates. Do not get carried away! It is quite easy to cut more than you should, either when cutting a chamfer or facing off a barrel.

When cutting a chamfer, you normally do not want to have the internal diameter of the rear-most portion of the chamfered area to be over .020" larger than the diameter of the bullet of the cartridge that is being used. In other words, in a .38 Special revolver, which utilizes a bullet that is normally .356" to .358" in diameter, the maximum diameter of the chamfer should be .376" to .378". A very simple and easy way to check this, and to ensure you do not cut more than you should, is to utilize the Brownells Chamfer Plug Gauges. By using these Gauges, you can tell at a glance exactly how deep a cut should be. Above all, be extremely careful when cutting with this tool. It is very easy to cut too much. **Go slow! Be careful!**

The precision ground and hardened Barrel Chamfering Plug Gauges are available in .22, .32, .38, .44 and .45 calibers. Each gauge has an integral pilot to assure precise alignment with the axis of the bore and to minimize measurement error. The most important part of each gauge is the .0256 step located at the base of the knurled handle. The top of the lower step and the top of the upper step represent the minimum and maximum degrees of acceptable chamfering repectively.

These gauges can be used quickly and easily. Begin by carefully cleaning the throat area of the barrel to remove any oil or metal chips which could result in an erroneous reading. Carefully place the appropriate caliber gauge in the barrel throat, utilizing the knurled handle. If the lower step of the gauge is above the edge of the barrel extension, then additional chamfering is needed. If the top of the upper step is **BELOW** the edge of the barrel extension, **TOO MUCH** material has been removed (**See Fig. 6**)! The chamfer should be cut so the lower step is slightly below the edge of the barrel extension, while the top of the upper step is just above the barrel extension (**See Fig. 7**). While doing barrel chamfering, it is **IMPERATIVE** that you check your work **FREQUENTLY** with a Barrel Chamfering Plug Gauge.

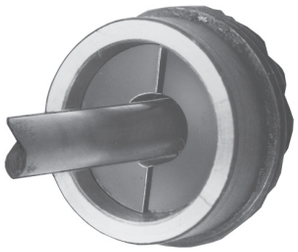

FIGURE 6 - Excessive chamfering readily apparent in this barrel.

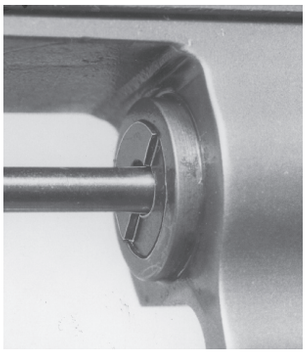

FIGURE 7 - Plug Gauge shown in properly cut chamfer.

In utilizing any of the 90° Facing Cutters on the rear-most portion of the revolver barrel or barrel extension, you should be aware of several points, especially when fitting a new custom barrel. In no case should the clearance between the face of the cylinder and the barrel extension (the cylinder gap) exceed .008". If you have more than .008" cylinder gap, you are almost certain to have lead "spitting" and excessive loss of gas, thereby reducing your pressure and velocity.

FIGURE 8 - Checking cylinder gap with feeler gauge

Ron Power believes the optimum clearance for the cylinder gap is .006" to .007" (**See Fig. 8**). According to Ron, the absolute **minimum** cylinder gap should be such that with a .004" feeler gauge in place between the face of the cylinder and the barrel extension, you can pull the revolver through the double action cycle without having the cylinder hang up on the feeler gauge. In other words, the cylinder should be able to spin freely. With .004", you run the risk of having a malfunction due to the normal buildup of powder residue and fouling on the face of the cylinder during firing.

The 908 Facing Cutters can also be utilized to remove "high" spots on

the barrel extension which may bear against, or “drag”, on the face of the cylinder. Again, exercise **EXTREME CAUTION** when utilizing this Cutter. If you accidentally cut too much and the cylinder gap exceeds .008°, you may be forced to refit the barrel to the revolver! **BE CAREFUL!**

After the Cutters have been utilized, you may wish to use the Brass Lap, available for the 11° and 18° chamfers. The Lap is attached to the extension rod in the same manner as the Cutters. Spread an abrasive compound such as the Brownell Abrasive Compound Paste on the lap and gently draw it into the chamfer. While rotating the lap in a clockwise direction, pull gently toward the muzzle. Remove the lap to check the chamfer periodically until the desired degree of smoothness is obtained.

Depending upon the finish of the chamfer, you may wish to start lapping with the Brownell 240 Grit Paste and work up to a mirror finish with the 800 Grit Paste. While a highly polished chamfer sure looks great, it is not necessary for optimum performance. Also, a highly polished surface will quickly become etched by hot gases from the chamber when the gun is fired.

FIGURE 9 - Chamfer laps in place

While the procedures are identical to those utilized for the larger calibers, the .22 caliber chamfering tools are different in two respects: First, due to the extremely small bore diameter, it is not practical to utilize either a Brass Pilot or a Center Guide. In lieu of these, we have provided three .22 caliber Extension Rods in .211", .213" and .215" diameters repectively.

It is necessary to utilize three different sizes due to variations in bore diameter in .22 caliber handguns. After cleaning the barrel, carefully insert the Extension Rod which provides the closest, snuggest fit. This Extension Rod will act as a pilot and will properly center the various cutting tools. Second, the .17 and .22 kits are available **only** with an 11° Chamfering Cutter. The 18° Chamfering Cutter is **not** available in .22 caliber.

After you have completed your work with the Chamfering Tools, be sure to check the barrel to ensure you did not leave a Brass Pilot in the bore! It is also necessary to thoroughly clean the bore with a liquid bore solvent and cleaning patches in order to make certain all metal shavings or traces of lapping compound are removed. The bore should be spotless! The frame and other parts of the revolver should also be wiped down and lightly oiled.

We are especially proud of our Chamfering Tools. As with all our tools, we guarantee their quality and construction. If you have any questions relating to their use, or if you have any suggestions for improvements or modifications, please feel free to contact our Technical Services Section by mail or phone.