



The Short, Piloted Barrel Liner Drills need to be modified to accept an extension so they will work in the barrel to be lined. The shank of the drill needs to be drilled in the lathe for the drill extension, which is then silver soldered to the drill. The .22 caliber liner drill requires a $\frac{1}{4}$ " to $\frac{3}{16}$ " diameter extension, while the .25-20 and larger centerfire liner drills should have a $\frac{3}{16}$ " to $\frac{1}{2}$ " diameter extension.



WARNING



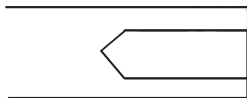
Never attempt to disassemble or reassemble a firearm unless you are absolutely certain that it is empty and unloaded. Visually inspect the chamber, the magazine and firing mechanism to be absolutely certain that no ammunition remains in the firearm. Disassembly and reassembly should follow the manufacturer's instructions. If such instructions are not immediately available, contact the manufacturer to see if they are available. If they are not available at all, then you should consult other reference sources such as reference books or persons with sufficient knowledge. If such alternative sources are not available and you have a need to disassemble or reassemble the firearm, you should proceed basing your procedures on common sense and experience with similarly constructed firearms.

With regard to the use of these tools, the advice of Brownells Incorporated is general. If there is any question as to a specific application it would be best to seek out specific advice from other sources and not solely rely on the general advice and warnings given.

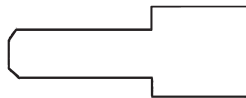
HOW TO USE

If you run into problems or have questions about using our Barrel Liner Drills or liners, stop work and call us during our normal business hours.

ALTERING THE DRILL & ATTACHING THE EXTENSION - Degrease the Liner Drill and chuck it in the lathe so only about $\frac{5}{8}$ " of the butt end of the shank protrudes from the chuck. Use a dial indicator to make sure the drill is true in the jaws of the chuck, and adjust if needed. Mount a Jacobs chuck in the tailstock and install a center-drill. Center-drill the drill's shank using plenty of Do-Drill™ or other good cutting oil. Use a sharp drill with plenty of Do-Drill; clear your chips frequently, and use an appropriate speed for the drilling operation. **.22 Drill:** Drill a $\frac{3}{16}$ " diameter x 1" deep hole in the shank of the .22 liner drill. **Other size Drills:** Use a drill one size smaller than the Extension Rod you are going to attach. The hole should be 1" to 1 $\frac{1}{4}$ " deep. (For a $\frac{3}{16}$ " diameter extension, drill shank with a Letter Drill #N, .302" drill.) Remove the Barrel Liner Drill from the lathe, chuck the extension rod in the lathe, leaving about 1 $\frac{1}{2}$ " protruding from the jaws of the chuck. Turn the end of the extension to about .002" smaller than the hole drilled in the Liner Drill, and to the same depth as the drilled hole. See illustration for more de-tails.



Short, Piloted Barrel Liner Drill - Center drill and drill 1"-1 $\frac{1}{4}$ " deep - See instructions for suggested hole diameter.



Drill Extension - Lightly chamfer/break sharp edges. Length of turned section must match drilled hole in shank of drill. Diameter of turned section .002" smaller than drilled hole.

Degrease both the drilled hole in the Liner Drill and the turned end of the extension using Brownells TCE Cleaner/Degreaser. Clamp the extension vertically in the bench vise, with about 4" to 6" of the turned end extending above the vise jaws, turned end uppermost. Lightly flux both the extension's turned end and the drilled hole in the shank of the Liner Drill with silver solder flux and place a $\frac{1}{2}$ " long piece of $\frac{1}{16}$ " diameter silver solder in the Liner Drill hole. Protect flutes of the drill from excess heat with Brownells Heat Stop Heat Control Paste. Heat the Liner Drill and extension together, using an oxyacetylene torch. **CAUTION:** As with any silver soldering operation,

BROWNELLS[®] SHORT, PILOTED BARREL LINER DRILLS

READ & FOLLOW THESE
INSTRUCTIONS

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provide adequate ventilation; use welding goggles to protect the eyes, and clear the area around the vise of any flammable materials. If the Liner Drill does not seat on the extension by its own weight, use a pair of needle nose pliers to push the Liner Drill onto the extension as the silver solder melts. DO NOT use your "good" pliers, as any excessive heat transferred to the pliers may ruin them for small parts holding or metal bending.

Allow the parts to cool completely in the vise before removing them. Clean up any excess flux from the parts following the manufacturer's directions. Be certain that no excess flux or silver solder remains on the shank of the Liner Drill itself; this can cause the Liner Drill to bind in the drilled hole, and possibly ruin the barrel, break the drill, or both.

DRILLING THE BARREL - As with any work on firearms, make sure the gun is UNLOADED and both the magazine and chamber are EMPTY. Following the manufacturer's instructions, disassemble the gun and remove the barrel from the receiver. At this point, it would be worthwhile to make a detailed, dimensioned sketch of the breech of the barrel, paying attention to the depth of extractor cuts, integral feed ramps (if present), and any other details that you may later need. Check the muzzle end for crown shape; will you reuse the factory type crown, or change it to a different design? Again, sketch any details worth remembering.

Before continuing, be certain that you have the following materials on hand: finishing chambering reamer in the appropriate caliber; "GO" and "NO-GO" headspace gauges to match the reamer; TCE Cleaner (at least one quart); Brownells Do-Drill; a pump-type oil can for the Do-Drill; a heavy bench vise with soft jaws, mounted on a sturdy workbench; a large tap wrench (to fit the chambering reamer); DUMMY ammunition, especially if the rifle is a repeater; a depth micrometer; a proper power source - if lining a .22 caliber barrel; a $\frac{3}{8}$ " low rpm variable speed drill with at least a $\frac{1}{4}$ hp motor can be successfully used. For the larger liner drills; a $\frac{1}{2}$ " hp drill, either fixed speed low rpm or low rpm variable speed is best. The barrel can be drilled in the lathe if you have access to one big enough. (See Willis Sprunger's comments in the .22 Barrel Lining Instructions or in *Gunsmith Kinks™ II.*)

Secure the barrel in a padded bench vise to protect any original finish. The barrel should be at about elbow height to the person doing the work, with the muzzle pointed very slightly down. Place a container under the muzzle to catch any excess Do-Drill that may drip from the barrel. A trash can under the breech would be helpful to catch chips as the drill is removed from the bore at each cut. Since the extension and drill together may be as much as 10" long, make sure there is sufficient clearance around the bench and vise to do the work. Keep the chip brush and oil can handy to the work, as both will be needed very frequently.

When drilling a centerfire barrel, keep in mind that these barrels were usually made of tougher/harder steel than most .22 RF barrels. Be patient! If drilling from the breech end of the barrel - the recommended method - machine a bushing to support the pilot while it is in the chamber, before it reaches the bore. A less effective but simpler pilot bushing can be made from the front half of an empty cartridge case. After the chamber has been drilled out to about half its depth, the pilot bushing can be removed. At this point, the Liner Drill's pilot will be supported by the bore.

BEFORE STARTING TO DRILL, READ THROUGH THESE INSTRUCTIONS AGAIN, VERY CAREFULLY, TO BE SURE YOU UNDERSTAND THEM AND HAVE ALL OF THE SUPPLIES AND EQUIPMENT ON HAND THAT WILL BE NEEDED TO FINISH THE JOB.

In the case of a **.22 barrel**, squirt some oil in the chamber on the Liner Drill, and position the drill's pilot in the chamber before starting the drill. With a **.32-20 barrel**, place the pilot on the drill's pilot, oil the chamber and pilot end of the Liner Drill, and place the Liner Drill pilot into the chamber. Make sure the Liner Drill is aligned properly with the bore...you can check easily for side alignment. Have a second person check the vertical alignment the first few times you drill a barrel. You will soon get the hang of it. Back the cutting edge of the Drill Liner away from the barrel by about $\frac{1}{32}$ " and turn it on. Use a SLOW SPEED -- about 80 to 300 rpm -- and advance the Liner Drill into the chamber. If the Liner Drill tries to catch in the starting cut, stop immediately and remove it. Use a small scraper, Dremel hand grinder with small stones, or files, as appropriate, to remove any burrs that the Liner Drill has kicked up, and start over. Do not switch the drill motor into reverse and try to spin it out of the cut...you may break it. If it jams in the hole, turn the drill backward **BY HAND** until the cutting edge is clear, and then remove the Liner Drill from the cut while the motor is turning with forward rotation.

The limiting factor in how much metal can be removed at each cut is the hardness/toughness of the barrel material, speed of the drill motor, degree of sharpness of the drill and flute length of the drill. If the flutes become fully packed with chips, the Liner Drill may jam in the hole and break. Depending on the above factors, clear the Liner Drill of the chips every $\frac{1}{4}$ " to $\frac{3}{16}$ " of travel, minimum. Use plenty of Do-Drill or other good grade cutting oil...it will help lubricate the cut and help the Liner Drill from overheating. It's cheap insurance against a jammed or broken drill...**GIVE THE LINER DRILL AND HOLE A GOOD SQUIRT EVERY TIME IT GOES INTO THE BARREL.**

If you find before the work is started that the Liner Drill pilot is larger than the bore of the barrel, the pilot will have to be ground to fit. The pilots of our Short, Piloted Barrel Liner Drills have been ground to just under SAAMI specifications for their respective calibers. Some older guns built long before the standardization of barrel and cartridge dimensions, may have undersized bores.

BONDING THE LINER - Refer to the instructions in the *.22 Caliber Barrel*

NOTE: Brownells/Redman Barrel Liners have a groove cut on the outside of the liner at one end. THIS IS THE BREECH END of the liner. Position the groove so it will be removed completely when the breech end of the liner is faced off as described below.

Lining Instructions & Equipment booklet, for bonding the liner to the barrel using **ACRAGLAS**® or by soldering it in place.

CHAMBERING THE BARREL - After the liner has been securely bonded to the barrel, and the **ACRAGLAS** has had several days to cure (or in the case of a liner which has been soldered into the barrel, is cool enough to handle safely) the barrel should be cleaned up as appropriate to the bonding method, to remove any excess **ACRAGLAS**, solder and/or soldering flux.

Although the chambering method used in the *.22 Caliber Barrel Lining Instructions & Equipment* booklet can be used successfully on .22's, most .32-20's are of locked breech design. Many of them have developed excessive headspace over the years of use and abuse that led to this relining. Because of the possibility of excessive headspace on these rifles *before* relining, it is best to cut the chamber *after* the liner has been bonded. The receiver will need to be partially reassembled in order to take measurements for chambering. Clean the receiver internally prior to reassembly...any dirt on the locking surfaces of the bolt or locking block will give false measurements, which can lead to cutting the chamber too deep and building in excessive headspace. Reassemble the receiver to the point where the bolt or breechblock can be locked into the closed position, as it would be for firing. Using

a depth micrometer, measure from the front face of the receiver, where the barrel shoulder meets the receiver, back to the face of the locked bolt or breechblock. Record this measurement...it is the distance that the rear face of the "GO" headspace gauge will be from the barrel's shoulder when the chamber has been cut. Secure the barrel, breech end facing up, in a padded bench vise. Place a container under the muzzle to catch any Do-Drill cutting oil that may drip from the muzzle as the chamber of the lined barrel is cut. Use a Brownells Rifle Muzzle Facing tool, with an appropriate pilot for the barrel and the 90° cutter, to take the liner down flush with the breech end of the barrel. Be sure to use plenty of Do-Drill when facing the liner. An alternate method would be to file the liner down flush with the breech of the barrel.

Secure the "finish" chambering reamer in the tap wrench. Oil the flutes of the reamer and the breech end of the barrel with plenty of Do-Drill. Place the reamer in the bore, and turn *clockwise* two or three turns, with even, gentle, downward pressure on the tap handle. Continue turning the reamer *clockwise* and remove it from the bore. Never reverse the rotation of the reamer to remove it from the bore. You may jam chips between the back of the flutes and reamer. Clean any oil and chips from the chamber and bore with a chip brush. Re-oil the reamer and chamber end of the barrel, and take several more turns on the reamer.

Continue cutting the chamber and cleaning it frequently, until the rim cut portion of the reamer is within $\frac{1}{32}$ " of the breech of the barrel. Clean the chamber and bore thoroughly, and insert the "GO" headspace gauge into the chamber. Use the depth micrometer to measure from the rear face of the headspace gauge to the shoulder of the barrel which butts up to the receiver when the barrel is in place. Subtract from this figure the distance you recorded earlier -- the distance from the front face of the receiver to the bolt face. This difference is the depth that the chamber still has to be reamed. At this point, go very SLOWLY in cutting the chamber...cut too deeply and the new chamber will have excessive headspace.

When the chamber has been cut to the proper depth, refer back to your original sketches of the barrel breech, and form any necessary extractor slots, feed ramps, or breechbolt clearance cuts. Deburr the chamber and extractor cuts as required. Clean the breech of the barrel, paying close attention to the threaded shank. Clean the chamber and bore of the lined barrel. Reassemble the barrel to the receiver, making sure the barrel is at the proper position so the sights will be "square" with the receiver.

Following the manufacturer's instructions, reassemble the rifle, paying close attention to any SAFETY features. Insert the "GO" headspace gauge into the chamber and gently close the bolt. The bolt should close with no "feel" of the "GO" gauge. If the bolt does not fully close with the "GO" gauge in the chamber, the chamber needs to be reamed deeper. Make absolutely certain that the resistance to closing you feel is from the headspace gauge and not from dirt, chips, a misaligned barrel, or incomplete clearance cuts. Remove the "GO" gauge, and insert the "NO-GO" gauge. Gently attempt to close the bolt. Remember that any headspace gauge is a precision, hardened tool steel instrument, and if the bolt is forged closed on a gauge, the gauge, bolt, or chamber (or all three) may be damaged. With the "NO-GO" gauge in the chamber, the bolt should NOT be able to be closed fully in a locked breech firearm. You should have some "feel" or resistance to closing, as opposed to when the chamber is empty. If the headspace checks out properly, insert a DUMMY cartridge in the chamber, and cycle the action. Pay close attention to the function of any SAFETY features. If the rifle is a repeater, insert several DUMMY cartridges in the magazine, and cycle the action to be sure the feeding, extraction and ejection mechanisms are functioning correctly. If everything checks out properly, the barrel may be crowned.

CROWNING THE MUZZLE - Secure the muzzle end of the barrel in the vise and hacksaw off the protruding end of the liner, leaving about $\frac{1}{8}$ " extending past the muzzle. (A cleaning patch in the bore, about 1" below the muzzle, will catch any chips and make cleaning up easier.) If a flat crown is to be used, as was common on many older rifles, use a Brownells Rifle Muzzle Facing & Chamfering Tool, with the appropriate pilot and the 90° cutter, to take the liner down to the original barrel muzzle. Be sure to use plenty of Do-Drill when facing the liner and muzzle. Cutting a few thousandths of an inch farther than the original muzzle face will help to "blend in" the liner. Use either the 45° or the 79° (11° is the more common name) chamfering cutter to finish off the crown. Alternate methods are given in the *.22 Caliber Barrel Lining Instructions & Equipment* booklet.

After the muzzle has been crowned, the bore should be cleaned thoroughly, and the rifle test-fired with live ammunition in a safe and appropriate manner.

Reassemble the firearm according to the manufacturer's instructions. Check for proper functioning using **ACTION PROVING DUMMIES**. Make sure **ALL SAFETY MECHANISMS** are fully functional as designed and approved by the manufacturer. If these tests prove satisfactory, test-fire the firearm with live ammunition in a **SAFE** and **APPROPRIATE** manner. **IMPORTANT!** Start the live ammunition tests by first loading an **ACTION PROVING DUMMY**, then a live round, into the magazine. Only after several tests have been conducted in this manner should additional rounds be placed in the magazine and fired.