J. C. Braconi on A New Barrel

[Editor: J. C. Braconi, of Nice, France, won the heavy varmint class at the 1989 IBS Nationals, at Fassett, Pennsylvania. JC smithed his own rifles . . . and when you win the Nationals in the heavy varmint class . . . you had to be doing something right, back there at the lathe. Readers here are asked to take into consideration two things: 1.) JC speaks perfect French . . . the English is a bit behind (albeit far better than the Editor's French) . . . and finally, the Editor (who rewrote the original manuscript for publication here) knows as much about machinist's practices as he knows about the mating habits of aardvarks . . . and probably less. If, between JC and the Editor, we make some point a bit less than clear . . . hopefully the photos accompanying will clarify the intent. If there are a few things (or more) not clear . . . be kind in your thoughts. Someday you yourself will be old and infirm . . . and less than clear on a point that you were making (although it was perfectly clear to YOU, at the time).]

I have nothing really new to tell you, or show you. In other places, at other times, there have appeared in print the basic descriptions of chambering and crowning a barrel for an accuracy rifle. Having the action in hand to control the threads, the clearance between bolt and barrel, the chambering with reamers and gauges . . . they have virtually all been discussed before . . . in these pages, and other pages as well. But PS has picked up many new subscribers lately, and some of the needed back issues are no longer available. So I thought that I would tie it together in one current article, complete with photos, and hopefully I will be able to make some of this clearer (at least) to some of the new readers of PS. Between my struggles with English, and the editor's struggles with all things mechanical . . . I am confident that we will not be too far "over your head".

Often when a shooter orders a new rifle, he will order two or three barrels to go along with it, on the theory that their chances of getting "everything alike" will be improved by such a step. These jobs are a lot easier for the gunsmith than when he is given a rebarrel order for a rifle with a glued in action. Or, to complicate things further, make that rifle one with a sleeved action, or a sleeve extension, such as a Stolle Teddy, or Hart 1A, and now add a cone faced bolt to the issue.

Our action manufacturers are good people. But I'll still bet that all of them have been roundly cursed a few times by new shooters who are attempting . . . rather clumsily . . . their first "barrel job" . . . followed . . . haltingly . . . by their second and third efforts. The young lad is rapidly learning now how many things are completely different from model to model . . . the diameter of the barrel tenon, the length of the tenon, the kind of thread used, the shape of the bolt . . . my, my, but we could go on and on.

You can see a little sampling of all this in photo #1.

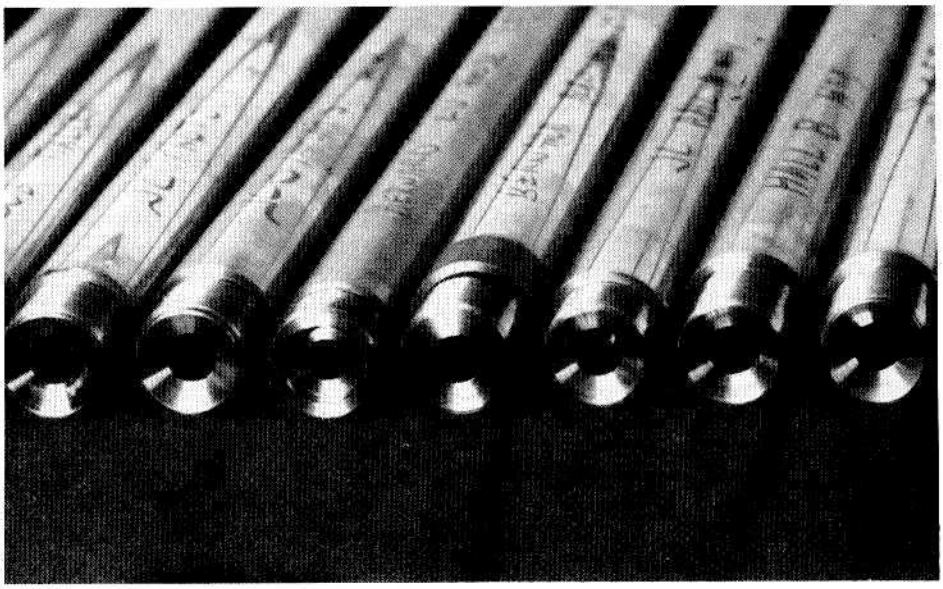

Photo #1

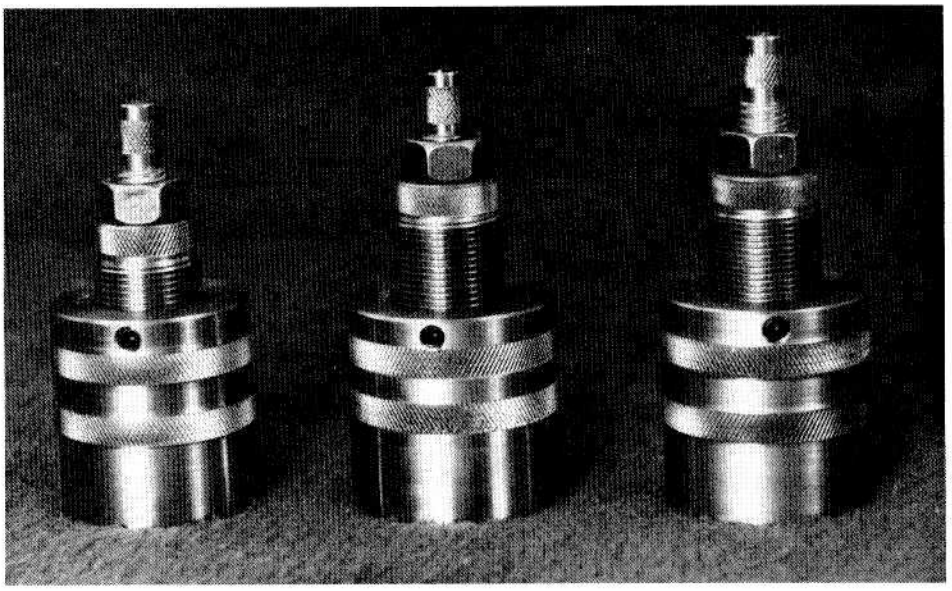

Photo #2

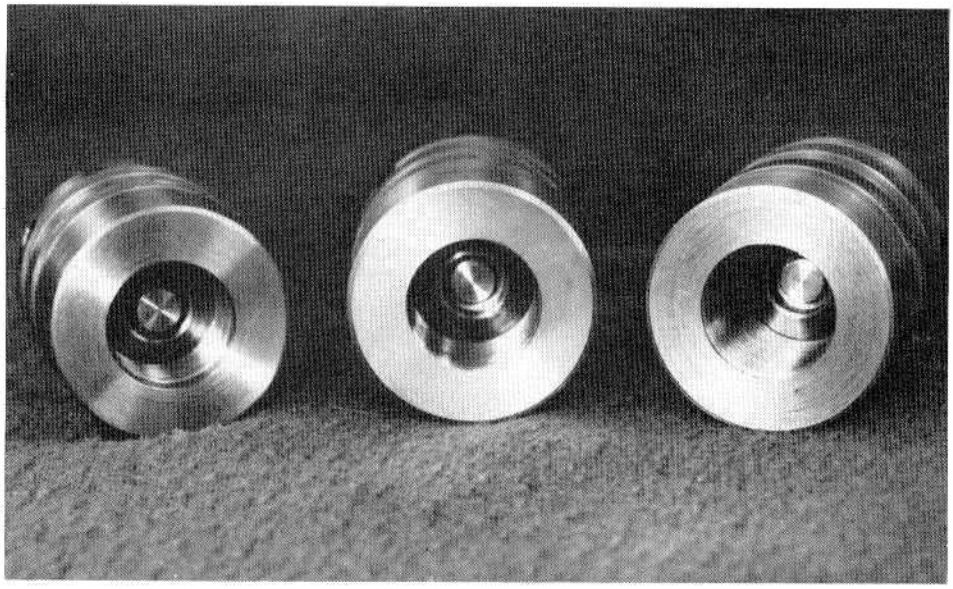

Photo #3

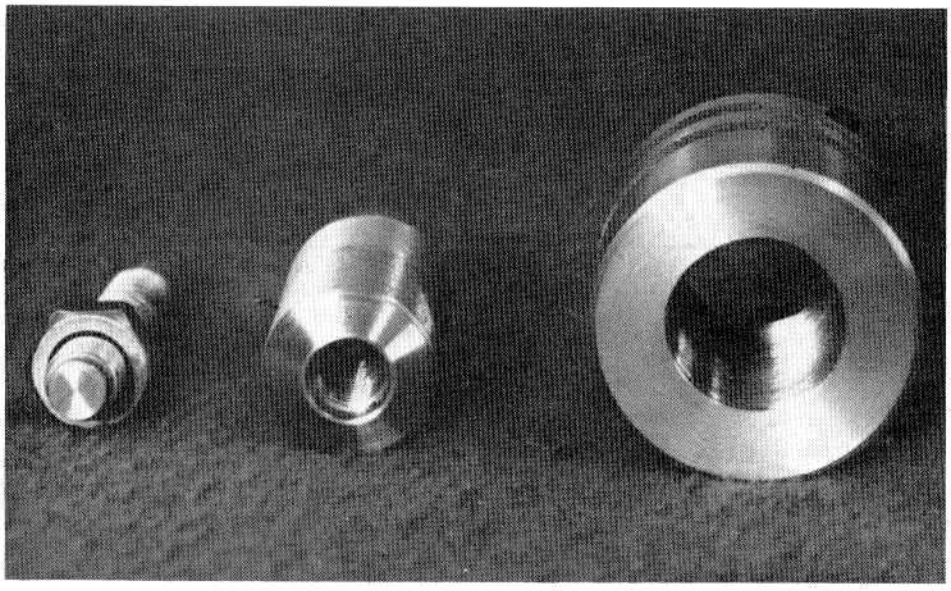

Photo #4

I personally like to do a complete job when the barrel is in the lathe . . . without clamping off, trying something or other, and then returning to again center the barrel in the lathe. I did a lot of thinking on this little problem, and over a period of time there evolved a little widget that I call the "TTT" . . . for "tip top tool". The TTT widget appears in the accompanying photos #2-3-4. The biggest part of the unit is two inches in diameter, and two inches long.

In photo #2 you will see three complete units. The first is for Remington/Hart actions, the second for Stolle/Shilen actions, and the third for Hall actions.

Before describing the use of the unit we need to do a bit of measuring on that old barrel . . . the one to be replaced . . . BEFORE you take it off . . . because we will use the old barrel for "setting" the unit.

Before you unscrew that old barrel, we must make some "controls".

The first control has to be done on the bolt clearance, closed and uncocked, in the travelways. The bolt handle needs clearance with the action body, and with the face of the barrel (0.004 to 0.008).

The second control proceeds thusly . . . after cleaning the chamber, insert the go-gauge for the caliber in the chamber, and close the bolt. If you cannot close, the chamber is too short. You would then have to unscrew the barrel a bit, and try with the go-gauge again. Screw or unscrew the barrel as needed to get a good contact with the gauge. When you get it, measure with a calibrated thickness gauge the clearance that you have between the front of the action and the barrel tenon stop. Make a note of that measurement.

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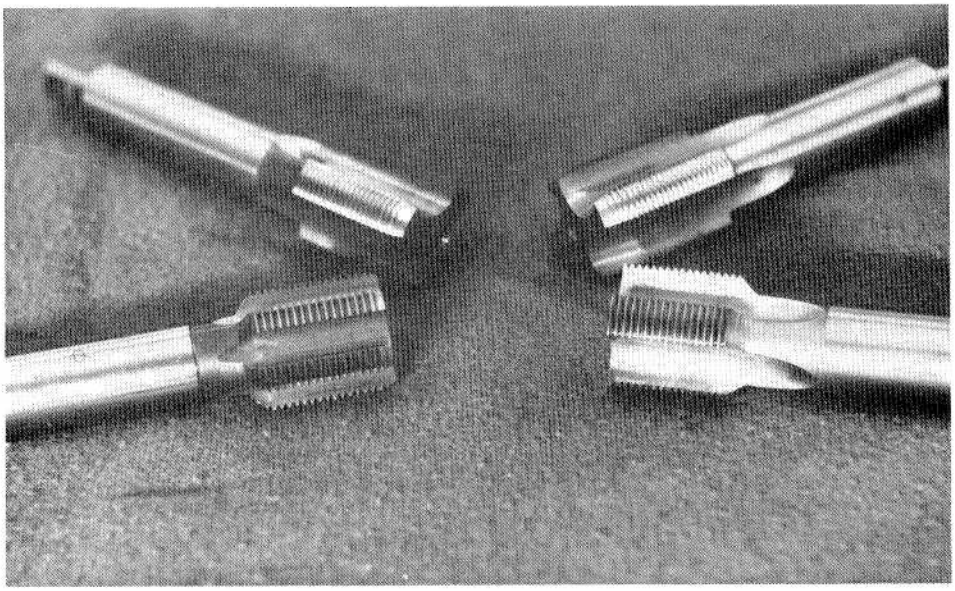
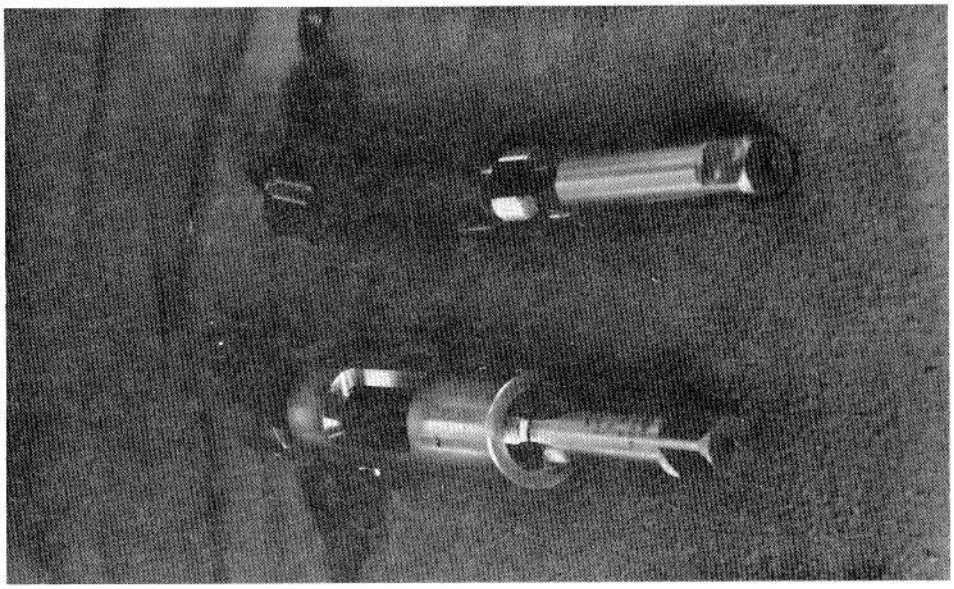


Photo #5



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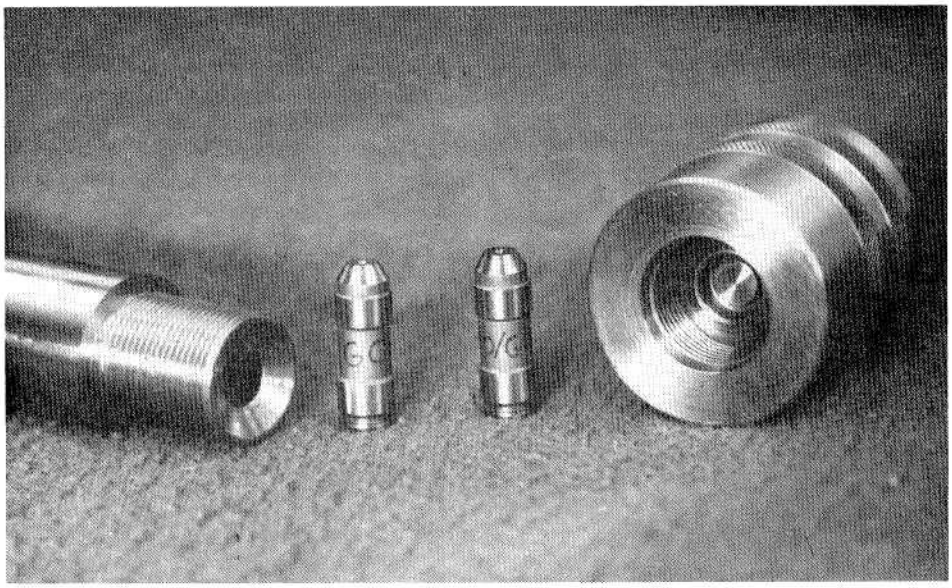

Photo #7

A NEW BARREL

Continued

If, with the go-gauge inserted, you close the bolt without unscrewing the action, now try the no-go gauge. Hopefully you cannot close the bolt, thereby indicating the correctness of the present barrel's chambering. If you find instead that you can close the bolt easily, try a few swear words that you feel comfortable with, and accept the fact that you have a too long chamber here. Now you have to try different shims between the bolt face and the no-go gauge to get just the right camming of the bolt. If you're lucky you have one of those little, round thickness calibration gauges; if you're not lucky you can use plastic or paper washers until you finally get the right one. Then you measure its thickness with a good micrometer, and make a note of that measurement as well.

The next job is to control the threads of the action with the same tap that you used for lapping the threads made by the tool in the units.

Photos #5-6. For a glued-in action you can use a multi groove wrench that fits the square head of the tap, and with an in-line extended rod, work the action vertically. Remember to use a good tap lubricant, even if there is but little material to remove. Work smoothly. Don't try to go much deeper than the point where the threads stop. Afterwards clean carefully with solvent and air pressure.

Now, with the old barrel in hand, carefully clean the threads and chamber.

Photo #8. Insert the go-gauge in the chamber.

Photo #9. Loosen all the lock screws of the unit. Screw the complete unit on the barrel until you get a firm contact on the tenon stop. Screw down the second part of the unit until you get a firm contact with the feeding cone of the barrel. Lock the two set screws. Screw down the third part of the unit until you get a firm contact with the chambered gauge. Lock the nut firmly.

Photo #10. Unscrew the unit, now completely set, from the old barrel. Now, if you need to, based upon the notes that you made previously about the bolt or chamber offset clearance, you can accurately reset your unit with the help of a good dial caliper.

Now, gang, you have a real replica of your action in hand. And, if you are so inclined, we can move on to the rebarreling job proper. There are many different ways to do this job . . . I am merely going to describe the way that I do things.

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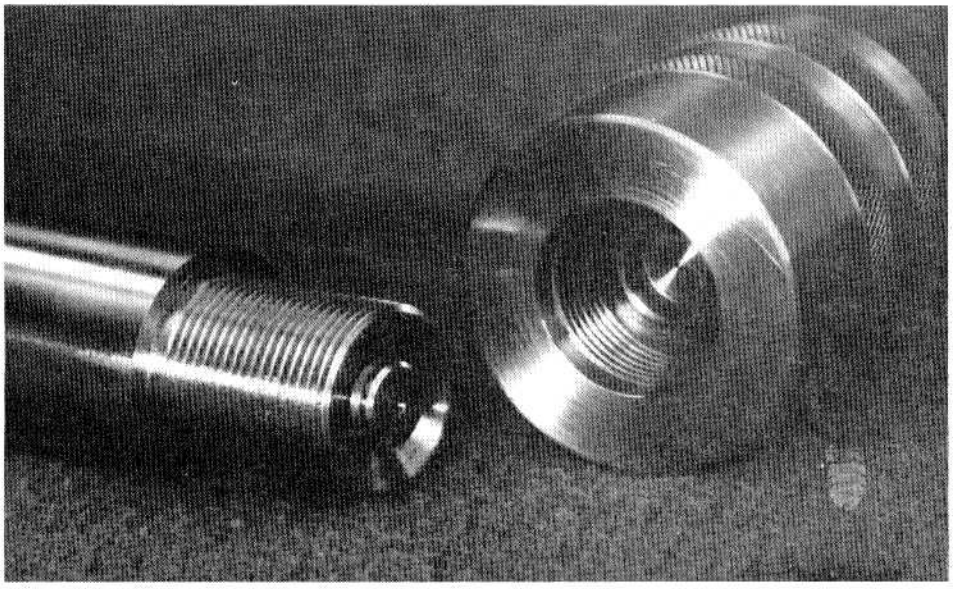

Photo #8

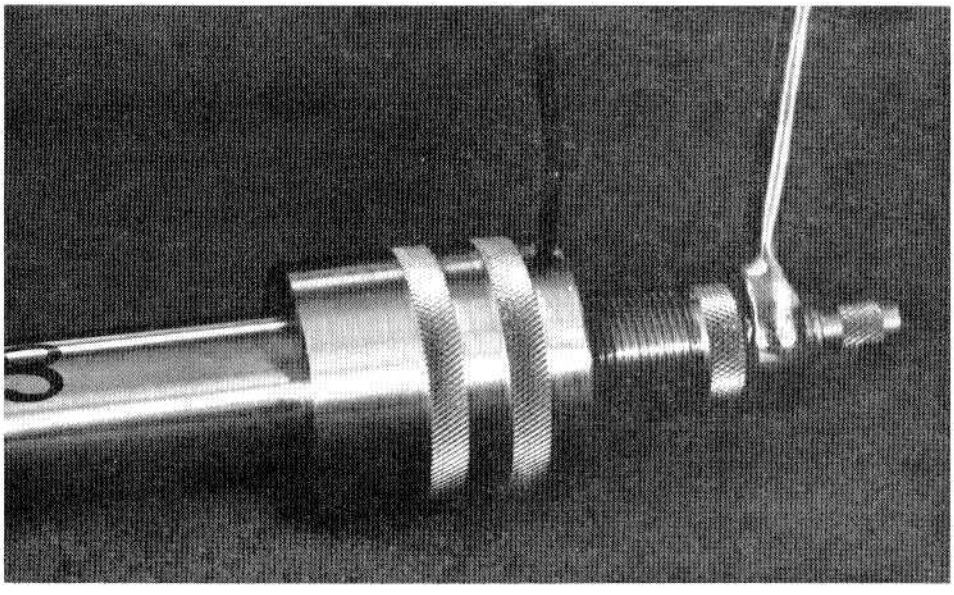

Photo #9

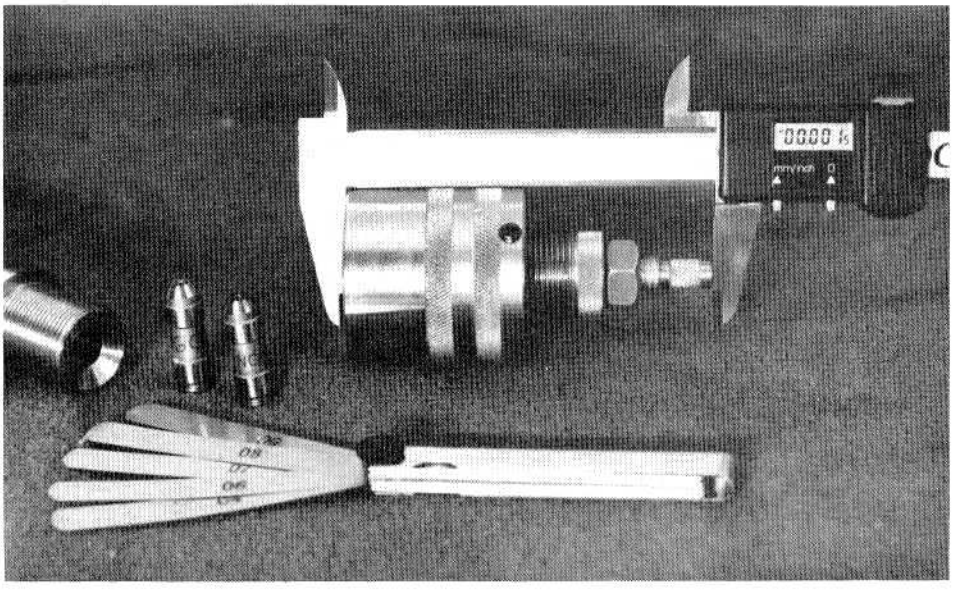

Photo #10

Photo #11

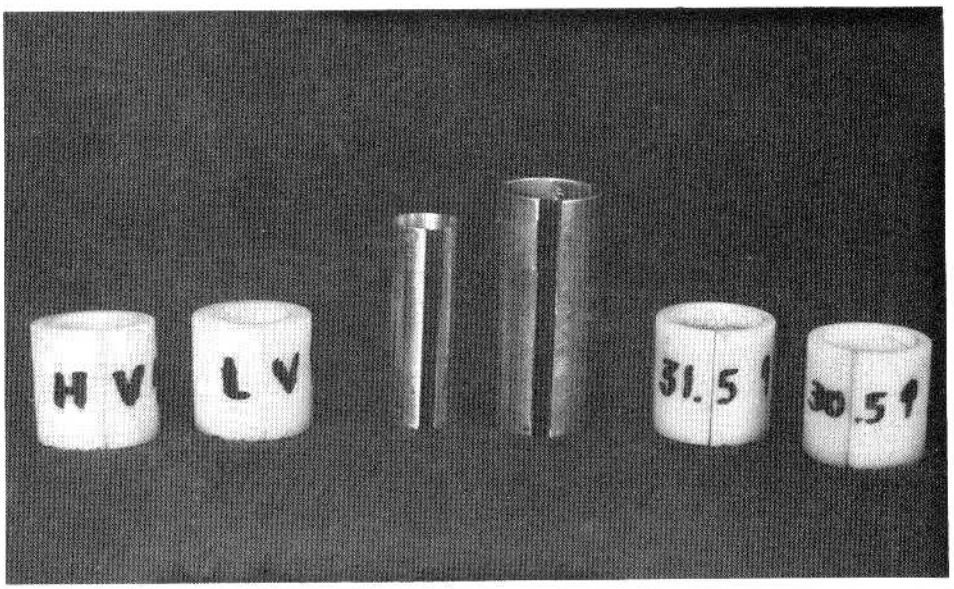

Photo #12

A NEW BARREL

Continued

Photo #11. The barrel is clamped in the lathe, center to center, with turning cone. Try to protect all the parts of your lathe that you can against abrasive dust. Do not get the barrel hot during the lapping process. Be careful; the jaws can be finger eaters. We start off with a dirty job, the lapping.

To clamp the barrel in place in the lathe, I use bushings. To keep it in place in the internal tube of the lathe I use Delren cleaved bushings, of two types. One is internal tapered, with the same taper as the barrel. Two of this type are on the left side of photo #12. The second type I would term internal half long stepped cylindrical; their largest diameter is the same as the breech end of the barrel (1.200 or 1.250). These are the two on the right side of photo #12. The external diameter of the Delren bushings is the diameter of the internal tube of your lathe; mine are 40mm (1.575″). To protect the barrel against the jaws I use soft cleaved aluminum bushings; these appear in the center of photo #12.

When you have inserted your barrel in the lathe, fit the appropriate Delren bushings around the barrel through the tube and push it by hand, with an aluminum tube. As the bushing is cleaved it will slit on the barrel inside, and will contact the internal tube outside. When you stop, clamp the jaws a little, by hand, and next, with a large mallet knock on the aluminum tube to assure the inside bushing. Photo #13 shows, outside, the position of the bushings.

Now we need to center the barrel in the jaws. You need to have independent setting jaws. Using 4 or 6 jaws will speed up the setting time, but not the accuracy. Keep outside of the jaws the length of barrel where you need to work. Not only for external work . . . remember that when you apply an external strength (pressure) on a tube (yes, your barrel is a tube) you in turn get a diminution of the internal diameter. So imagine what would happen if your reamer had to work at a spot where the jaws were clamped. While we are on the subject, choose the right reamer pilot when you have the barrel in hand, without any stresses on it.

I begin by centering the external breech part (photo #14).

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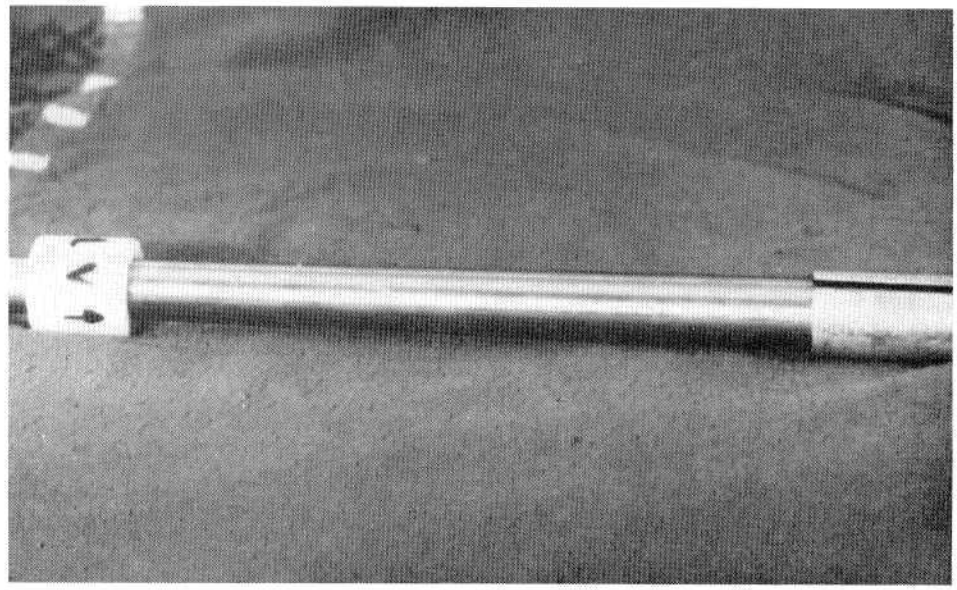

Photo #13

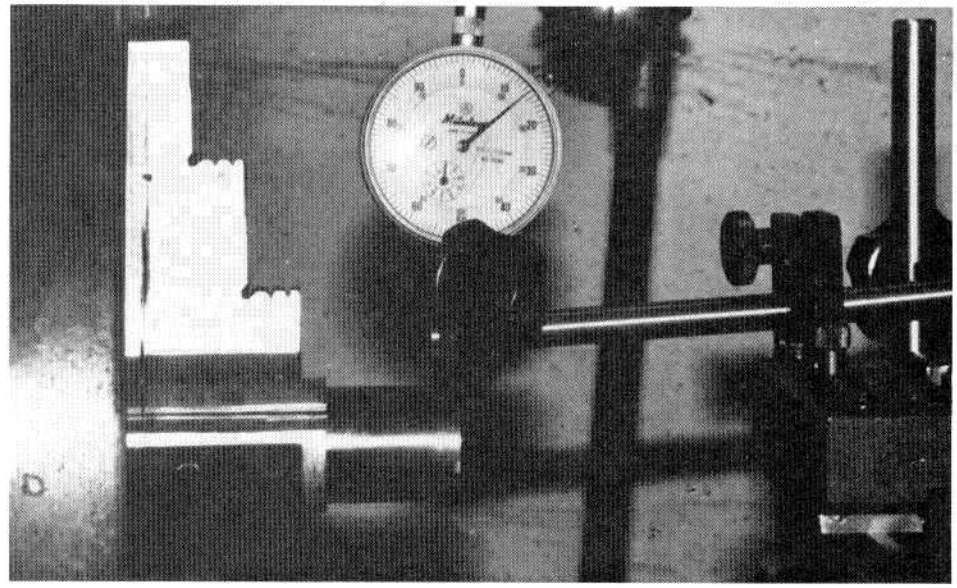

Photo #14

A NEW BARREL

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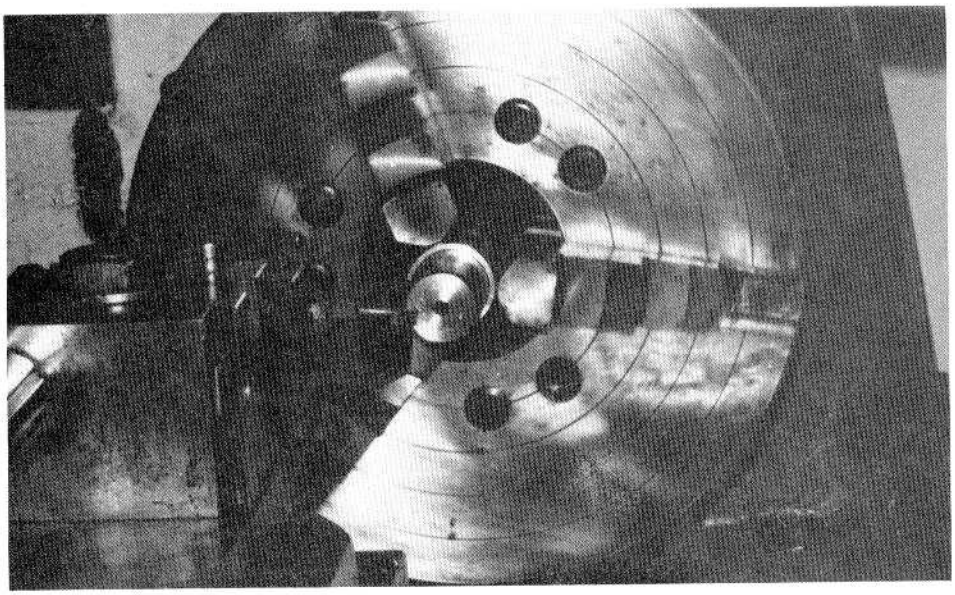

Photo #15

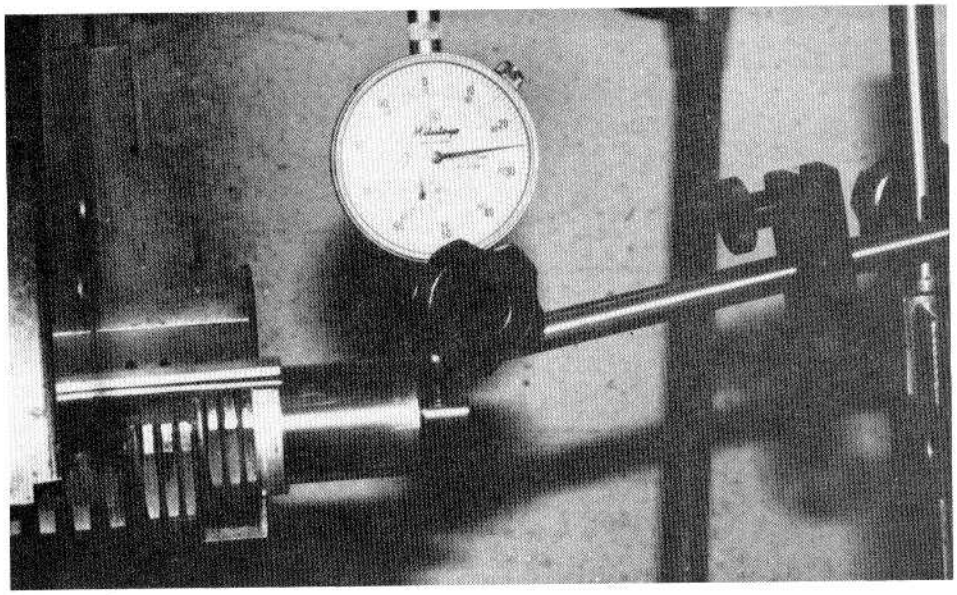

Photo #16

In photo #15 I am cutting square the breech part, to the length needed.

Photo #16. I now insert an aluminum rod, two inches long, 6mm diameter (but tapered for one inch) into the bore. As a first step I recenter the bore, with a comparitor, in hundreds of mm. As a next step I take out the rod, and cleaning carefully with a swab and air pressure, I finish the centering, using a micrometer in thousandths of mm.

Photo #17. I try to turn at zero . . . on the LANDS . . . for the chamber face, not only for the pilot. Keep in mind that your bullet will begin its journey centered on the lands, not in the grooves. Some of these steps will take longer than you really wish. Be patient; it will be paid back in the future.

Now I cut the barrel tenon to the exact length needed. Speaking about the diameter . . . using a chrome moly steel action I get 2 tenths of mm. in less clearance on the diameter (0.008). Using a stainless steel action I get 4 tenths of mm. in less clearance on the diameter (0.016). This is due to the different friction coefficients between the two steels. Keep in mind also that only the sides . . . in reality, one side under strength . . . needs to have contact in the thread assembly, and never the top or bottom.

Photo #18. Note the chamfer on the right side for the threading tool, and the release thread tool groove on the left. This is for a Remington 40X action.

Photo #19. With this in mind I begin to cut the thread with the appropriate tool, and when I am near to the needed dimension I try the thread with my TTT tool. It must screw easily, but without excess clearance.

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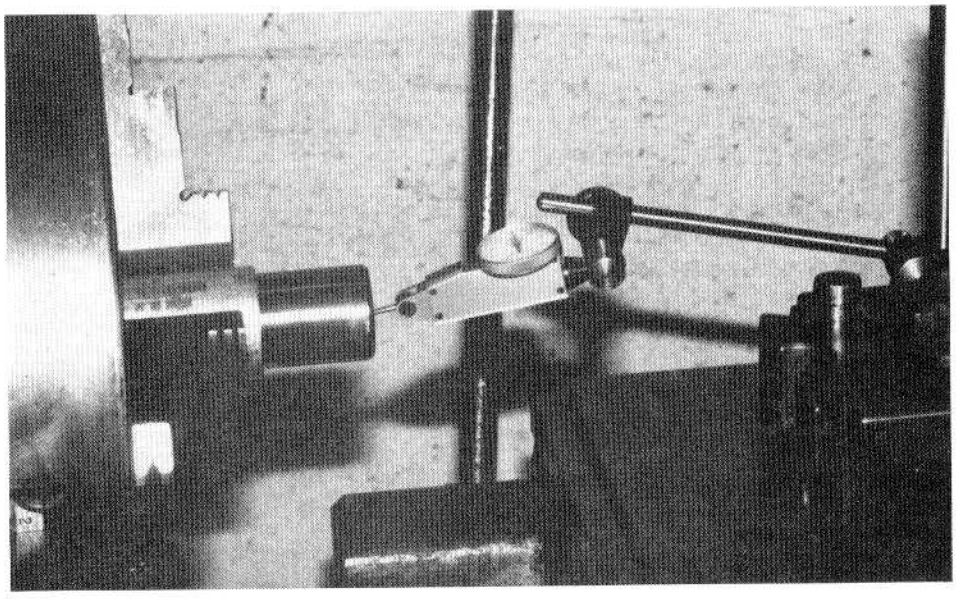
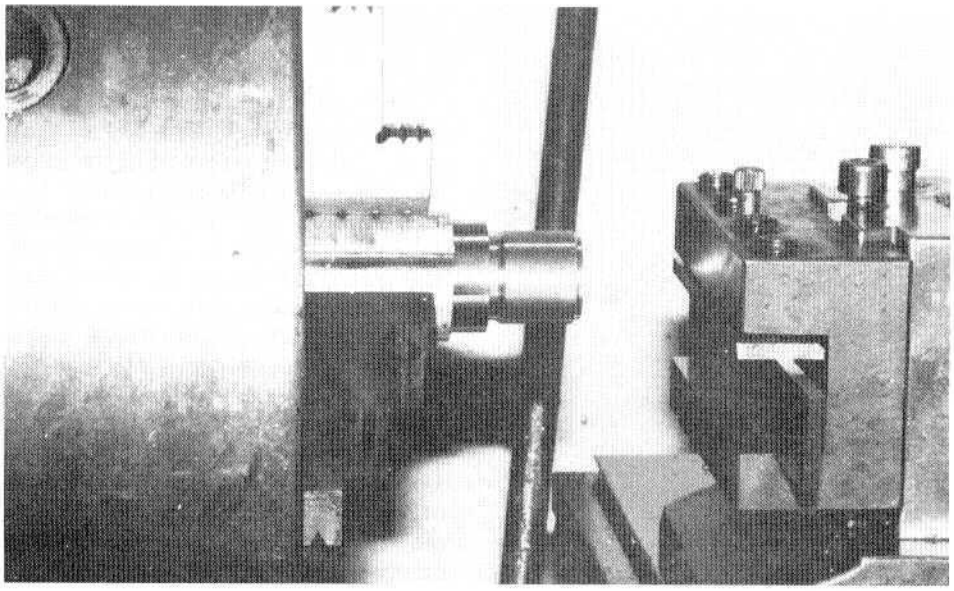


Photo #17



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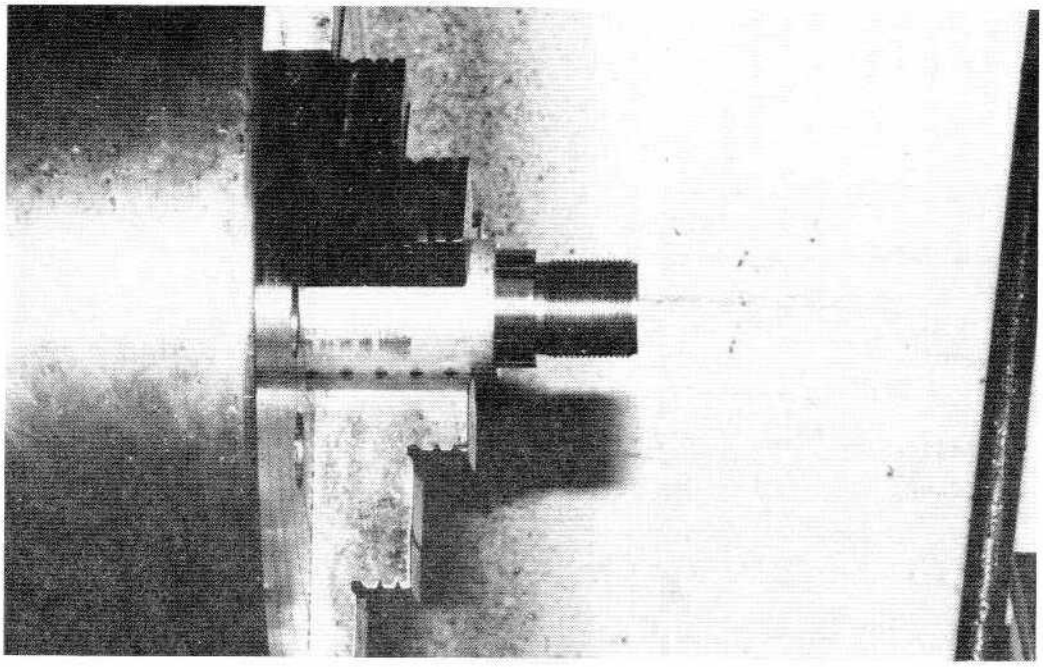

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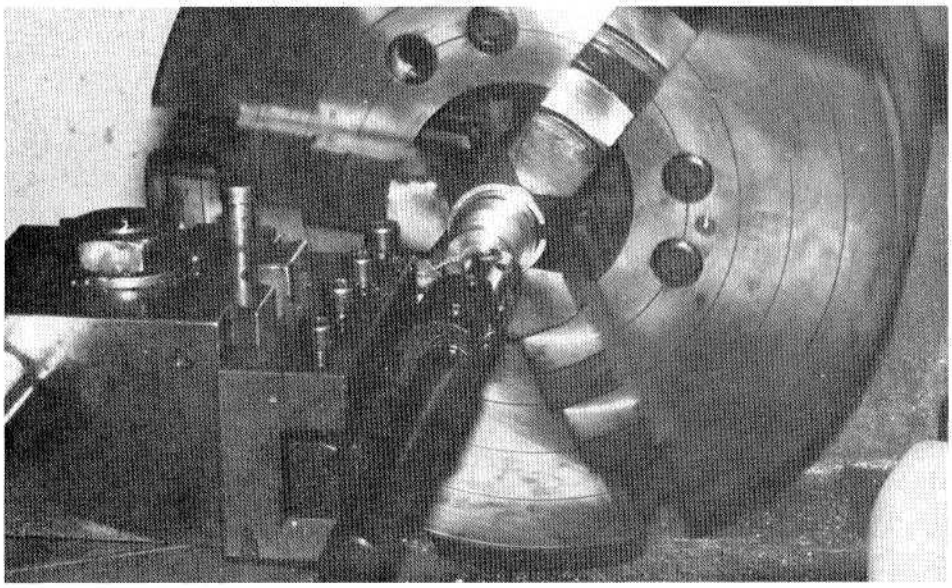

Photo #20

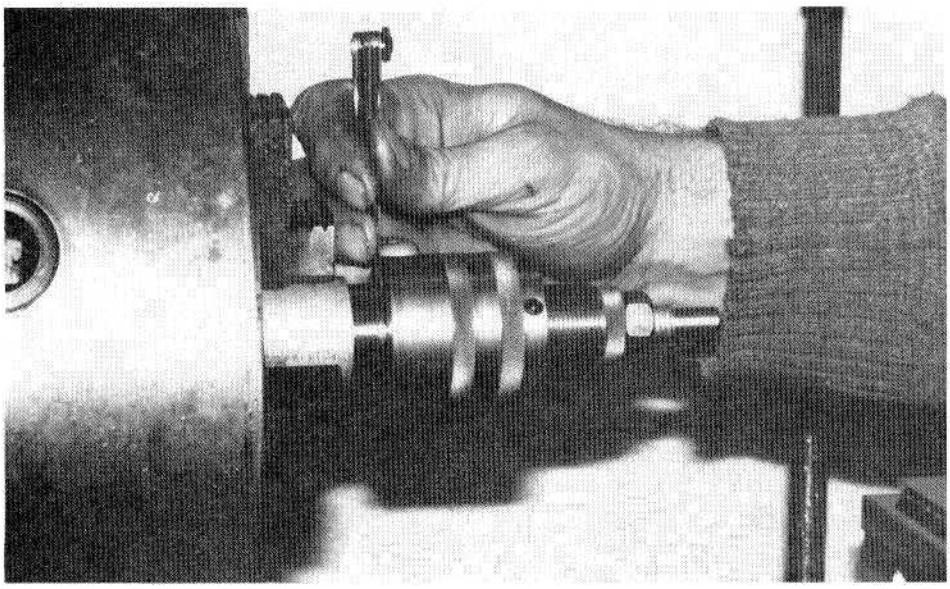

Photo #21

A NEW BARREL

Continued

Photo #20. For example, a 25 degree cone faced bolt. I set the zero of my turret, clamping the tool, on the 65 degree angle, and I begin to cut the feeding cone.

Photo #21. When I am near the end of the job I screw the TTT on to the barrel, and after getting a contact (cone to cone) I measure the clearance I get from the unit to the tenon stop with a calibrated thickness gauge, and make a note of it.

Photo #22. Removing the TTT unit I cut the same amount of metal as I had measured in the step above to get the final feeding cone. You can screw again and control, the unit touch on the cone and touch on the tenon stop. I use an ink-alcohol marker for contact control.

Photo #23. Now we are ready for the chambering job. I personally use a piloted drill, and after getting contact with the barrel I cut 22mm (0.870) long for a PPC cartridge in a non-stop movement, being careful to have good lubrication.

Photo #24. Next, after cleaning, I clamp the rougher reamer in a tee-handle, and insert a lot of lubrication in the hole and on the rougher. For this purpose I use Tarfil . . . it is a Winn's product, and I always get a nice job when using this lubricant. Then, using the turning cone I push the reamer to get contact on the cone left by the piloted drill, and slowly cut 1.5mm (0.60″), turning at a rate of 50 turns per minute.

Photo #25. Next, releasing the turning cone I take off the rougher reamer, gently and in line. Clean with air pressure both the reamer and the chamber.

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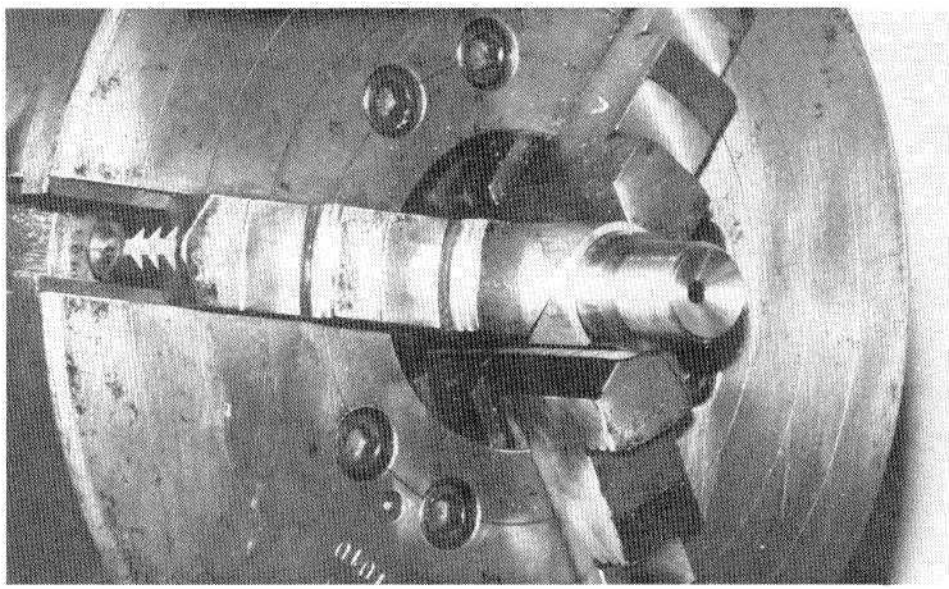
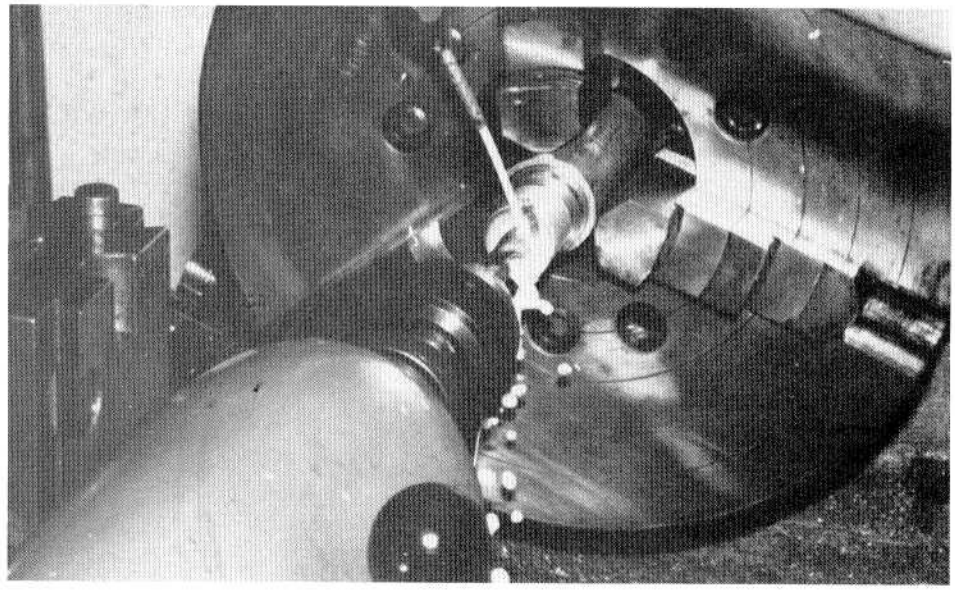


Photo #22



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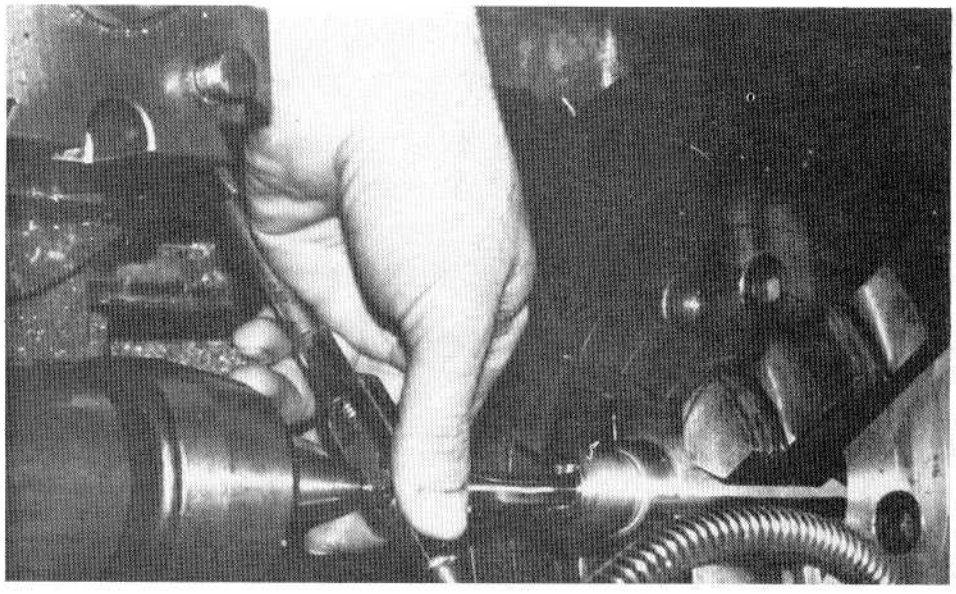

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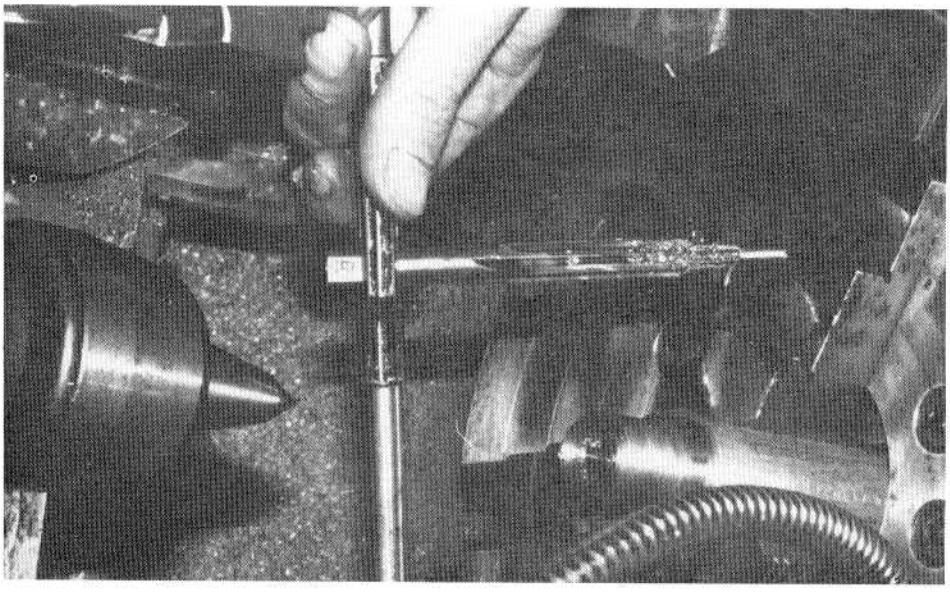
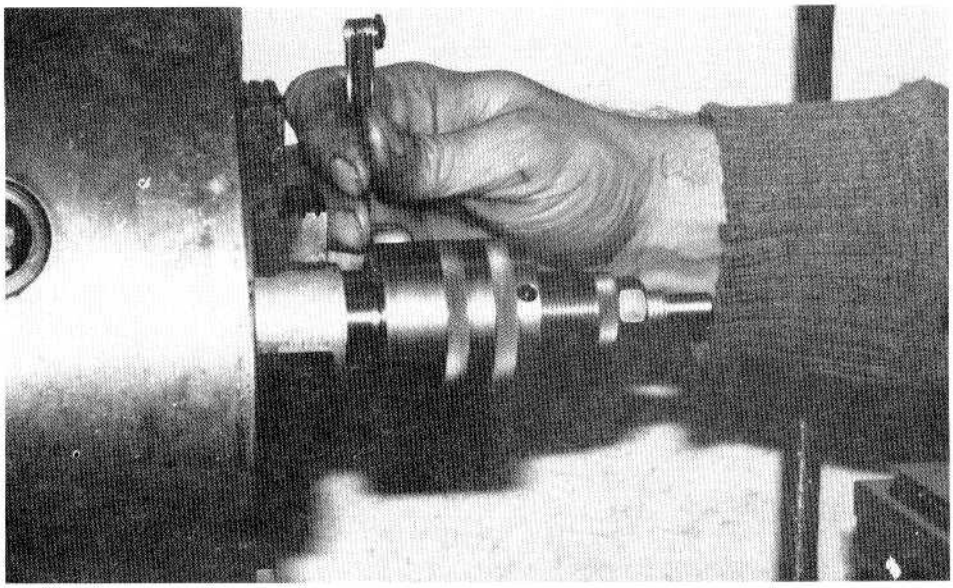


Photo #25



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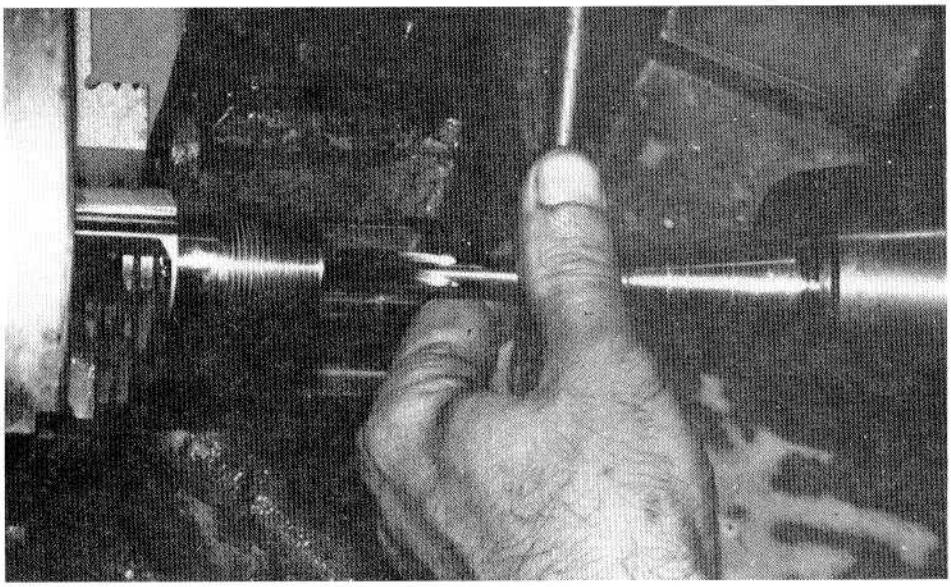

Photo #27

A NEW BARREL

Continued

Photo #26. Insert the go gauge in the chamber and screw the TTT unit on the barrel, to get contact with the gauge. Now measure the clearance between the unit and the tenon stop with a calibrated thickness gauge, and make a note of it.

Photo #27. Unscrew the unit and clamp the finisher reamer on a tee handle and lubricate it and the chamber. Now proceed as we did with the rougher reamer, 1mm (0.040″).

Photo #28. Release the turning cone and the reamer gently. Clean everything, and insert the go guauge again in the chamber and screw the TTT unit to take the last measurement, and make a note of it. We are now working in terms of hundreds of mm (thousandths of an inch).

Photo #29. So, after lubricating and inserting the finisher, and just getting the contact with the shoulder in the chamber I install a comparitor on the table of the lathe, and with the pin touching the head of the turning cone I set it on zero (in line, not as shown in the photo). Before starting turning, release the cone a little, now start, and while watching the comparitor, cut the same length as you noted when you last used the TTT unit, adding 0.002 cutting for clearance between the go and no-go gauges.

Switch off the lathe without moving anything. After it has fully stopped you can release the cone, and take off the finisher reamer carefully. Clean everything, and do a final check with the TTT unit and the gauges. You should have no clearance with the go gauge, and 0.002 with the no-go gauge. This part is now finished, and you can release the barrel from the lathe. Clean your lathe carefully. Clean your barrel carefully as well, and lubricate the threads of the barrel and of the action. Screw the barrel on to

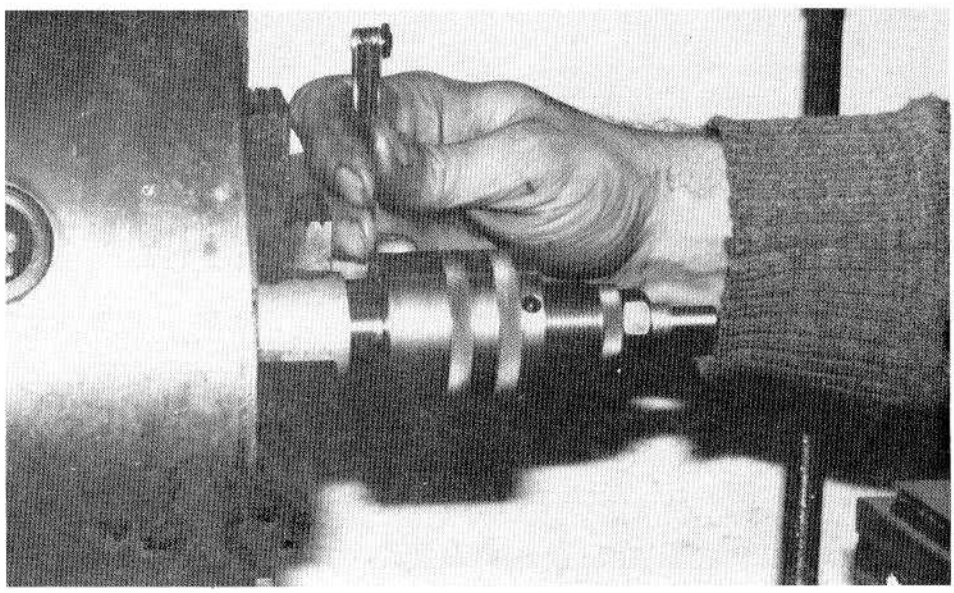

Photo #28

the action, and check everything with the gauges.

Photo #30. As you know, the barrel has two ends, so the job is not yet finished. Using the appropriate bushings, clamp your barrel back in the lathe as you previously had done for the chamber face. With a comparitor center your barrel externally. Cut the amount of length to get the barrel weight that you need. Square the face. Clean with air pressure.

Photo #31. Now insert the little aluminum rod in the bore and center the barrel with the comparitor. Don't be alarmed if you see more offset from bore to external than on the breech. It does not matter; the important thing is to center the bore. The next step is to finish the centering with a micrometer in thousandths of mm in the bore. For this step I try to set my zero in the groove. Why? Because it is my theory that, having arrived at

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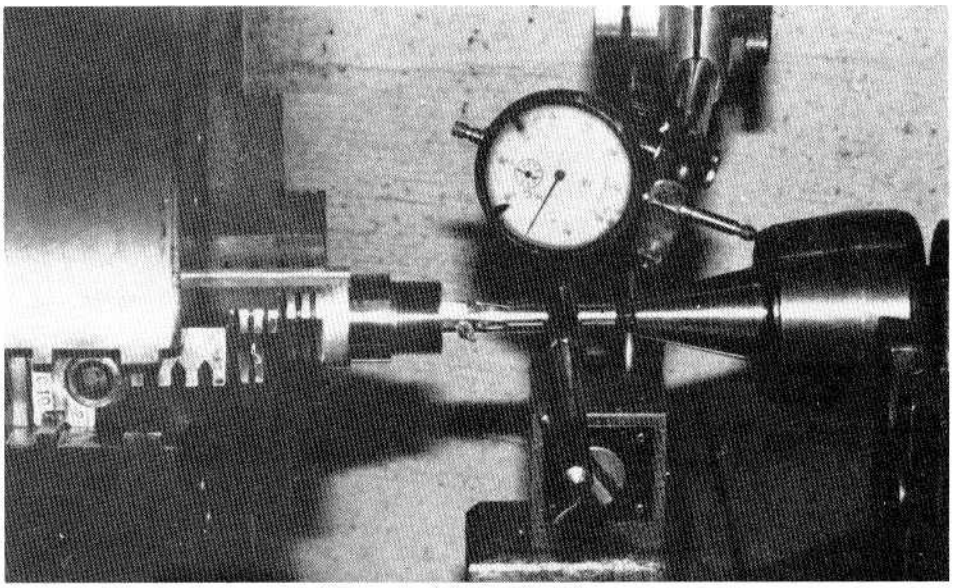

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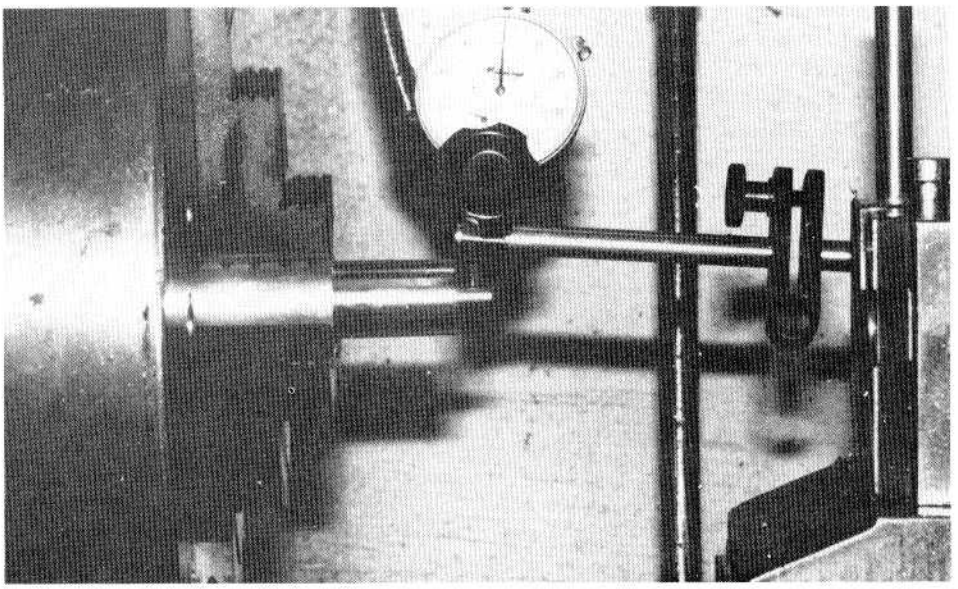

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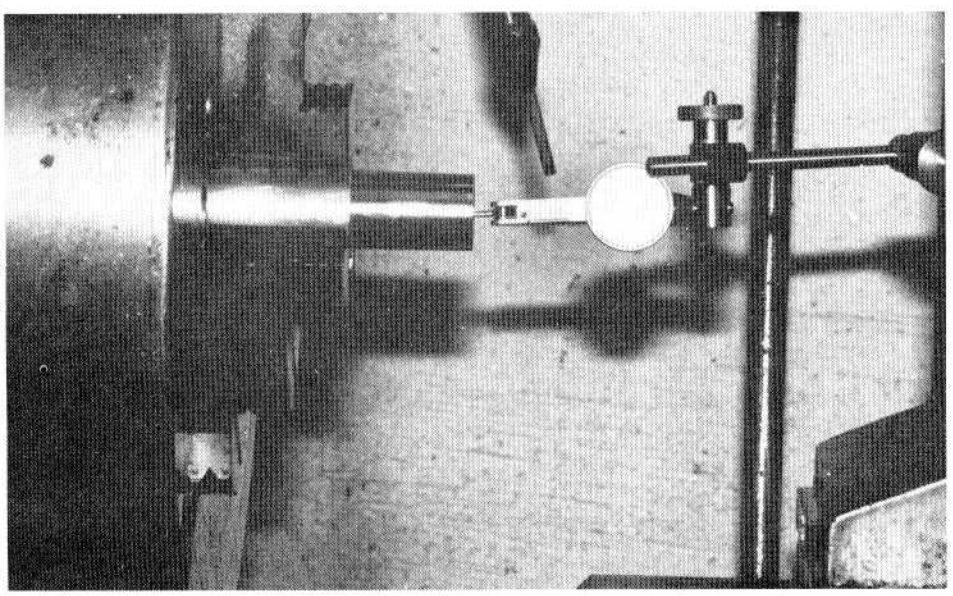

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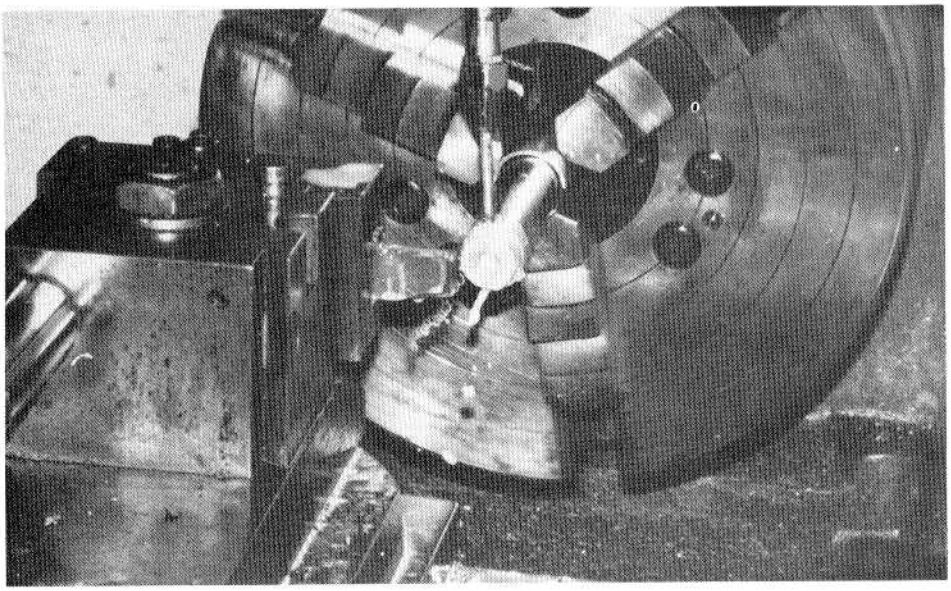

Photo #32

A NEW BARREL

Continued

this point the bullet is centered all along the rifling, but the gases need to escape as regularly as possible.

Photo #32-33. Using the same tool, and setting, step by step, the turret, I cut the 11 degree crown.

Photo #34. Next I cut a 45 degree chamfer, so as not to have an outside cutting edge.

Finally, I cut a 60 degree chamfer on the rifling, to protect the barrel from cleaning brushes and rods.

Photo #35. Shows the three different angles, and the amount of cutting.

Now, take the barrel out of the lathe, and clean everything in sight thoroughly.

If we have done everything correctly we should have a good barrel job here.

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— End —

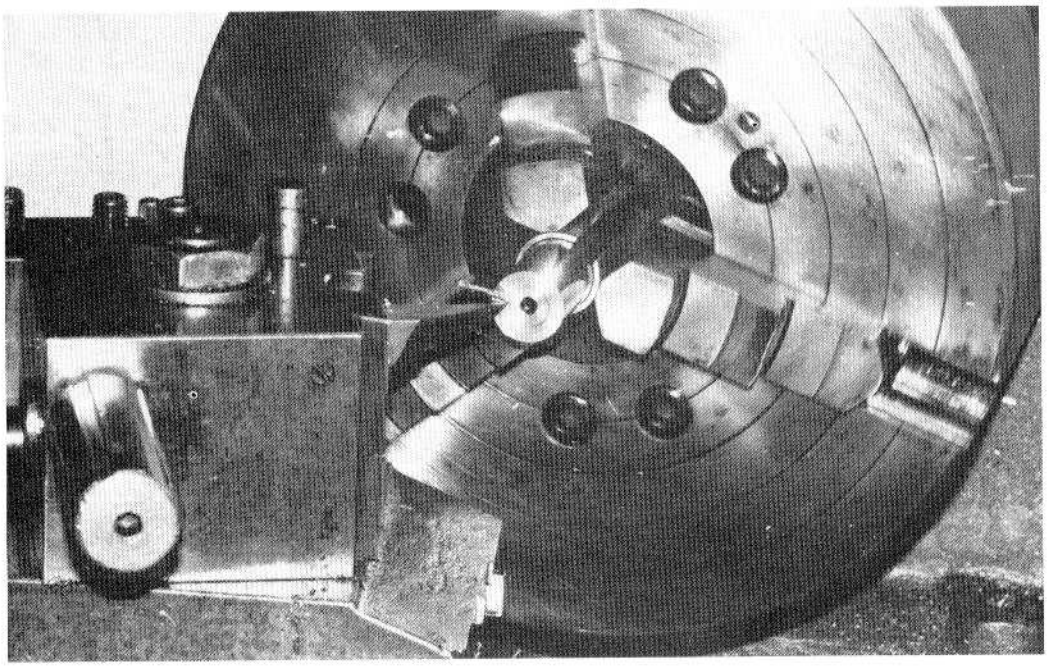

Photo #33

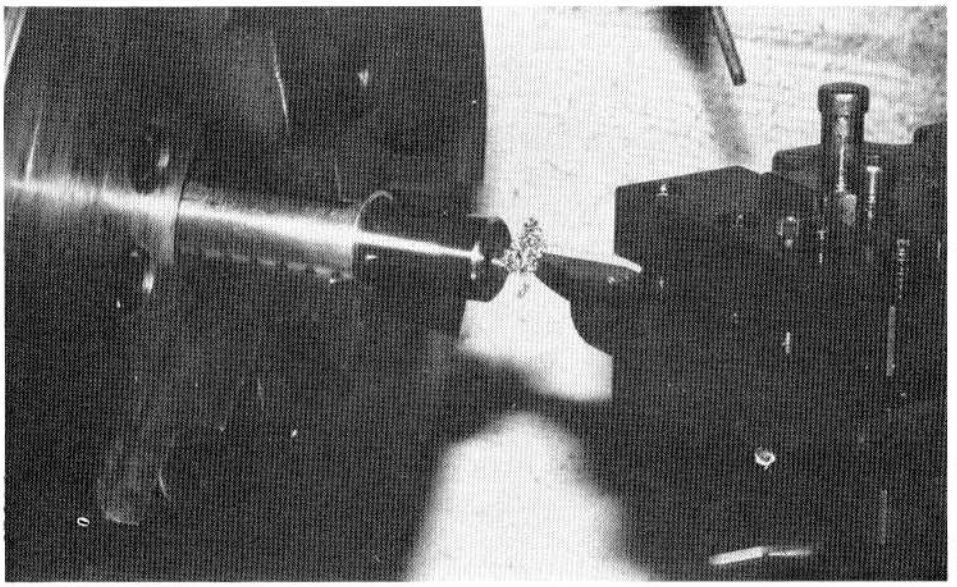

Photo #34

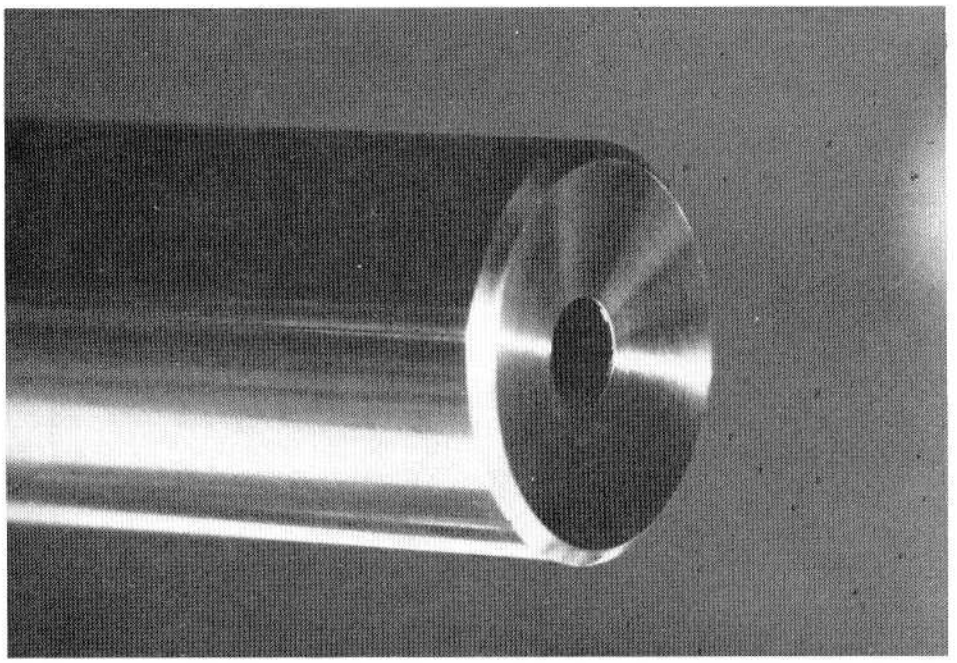

Photo #35