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### American and British Shotgun Choke Specifications

As anyone who has visited England will testify, a knowledge of the language is certainly helpful but it's no guarantee you'll be able to make yourself understood. Nowhere is this more apparent than when comparing the two systems of shotgun chokes. Although the same terms are used on

both sides of the Atlantic, the meanings aren't always the same. Just look at the accompanying chart which cross-references our choke terminology with that used by the British.

Our thanks to Steve Vogel of Sturm, Ruger & Company, who obtained the chart from Mr. G.A. Brooks of Holland & Holland and passed it on to us.

U.S.A. designation	U.K. designation	constriction (inch)	percentage
Full	Full	.040	70
Imp. Modified	3/4	.030	65
Modified	1/2	.020	60
N/A	Modified	.015	
Imp. Cylinder	1/4	.010	55
N/A	Imp. Cylinder	.005	50
Skeet One & Two	Skeet	.002/.001	45
Cylinder	Cylinder	NIL	40

### Duplex Shot Charges from Remington

Those clever folks at Remington have just announced what they call "A new concept in shotgun shells designed to improve both versatility and long-range performance."

What they did was combine two sizes of shot in the same charge — specifically, No. 2's and 6's for turkey and BB's and 4's for wild fowl (where permitted).

The two sizes were not mixed indiscriminately. Instead, the smaller shot was loaded first, then the larger layered on top of it. In that way, the smaller pellets provide the high-count base for pattern density at short to medium ranges. The larger pellets supplement the pattern by offering high retained energy and penetration capability out at the longer ranges.

The loads have been thoroughly field-tested, of course. An acquaintance, a turkey hunter, who tried some of the loads this past spring, was full of praise for them. He prefers head shots but as he noted, "If you miss that first shot, the second — if you get one — is usually at the south end of a northbound bird. There are plenty of feathers back there,

too many for a No. 6 shot to wade through. There are just enough No. 2's in these new Duplex loads to make a shot like that practical."

The first Duplex shotshells will be available in three-inch, 1 7/8-ounce Magnum and 2 3/4-inch, 1 1/2-ounce Magnum loads. The 1 7/8-ounce charges will contain 1 1/8 ounces of the lighter shot and half an ounce of the heavier. The short Magnum 1 1/2-ounce loads will combine 1 1/8 ounces of the smaller pellets with 3/8 ounce of the larger. All lead pellets are extra-hard "Copper-Lokt" shot, buffered for additional protection and cushioned in "Power-Piston" wads.

The hulls of the new shells will be colored a dull, non-reflective olive drab with a non-glare black oxide outer base.

Eventually, Duplex shells will be offered with steel shot with combinations of No. 2's and 6's, BB's and 4's, BB's and 2's, and BBB's and 2's.

### Contender Skeet

A new form of handgun competition — Contender Skeet — is being introduced in several parts of the country.

(Continued on page 56)

## Chapter 14

# THE IN-BUILT CHOKE

*Every Shotgunner Knows About It, But Few  
Know How Or Why It Does Its Thing!*

**I**N-BUILT CHOKE — choke that is an integral part of the shotgun barrel — is the most common use of the choke principle and the most misunderstood.

Regardless of type, choke should be understood easily if you will remember one simple rule: Measure the diameter of the choke section at its smallest point, then measure the bore diameter before the choke section begins. Subtract the choke diameter measurement from the bore diameter measurement. The result is the amount of barrel bore constriction, or, in simple language, the amount of choke. This sometimes is referred to as the “choke constriction.”

Putting this to practical use, suppose we have a barrel and our measurement shows that the bore diameter before the choke section begins is 0.730 inch. We measure the tightest diameter in the choke area and come up with the figure of 0.700 inch. Subtracting 0.700 inch from 0.730 inch leaves 0.030 inch. Therefore our barrel has a choke that constricts the diameter 0.030 inch from the bore diameter. The common usage of this is simply thirty-thousandths constriction (0.030 inch) or thirty-thousandths choke.

If we were using the most common set of figures, this would be a full-choke barrel in a 12-gauge gun, but only in a 12-gauge, as the other gauges use a different set of figures. More about this later.

What confuses most people is not the method of determining the constriction, but the fact that they stick by the measurement figures instead of the constriction figures. For example, suppose we had a gun of European origin with a bore diameter that measured 0.725 inch (and this is not uncommon). If we used measurement figures of the choke being 0.700 inch as in the first sample then did the subtraction bit we would end up with a difference of 0.025 inch or 0.005 inch short of that required thirty-thousandths constriction (0.030 inch). The result would be a tight modified choke! This is like trying to subtract oranges from apples. As the little boy said, “It ain’t possible.”

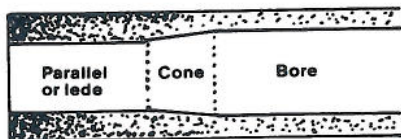
Subtract the choke diameter from the bore diameter of each and every barrel separately. One barrel has absolutely nothing to do with the other and only adds confusion. Each barrel must stand or fall on its own measurements.

One of the supposedly sure-fire methods you will run across is to drop a dime coin down the bore of a 12-gauge barrel. Supposedly if the dime sticks in the bore, you have a full-choke barrel; if the dime passes through, it is a cylinder bore barrel. You will see this practice at gun shows and I have seen it in some of the best gun shops. However, the best description of this I have ever heard was from another gunsmith: “What you have is a dime on one side, a barrel on the other and an idiot in the middle.”

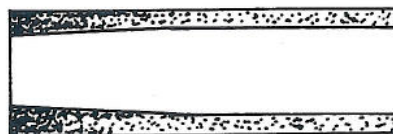
First of all, few dimes are round. Check it with a micrometer! Most important of all, no round disk or even a plug gauge will work for measuring choke, although there are several on the market. One of the most common is a tapered piece of brass with the various chokes inscribed thereon. It is as useless as the dime gizmo. If you machined a plug gauge somewhat like a rod and it was 0.700 inch in its diameter, then tried it in the full-choke barrel with a bore diameter of 0.730 inch, it would slide right in as the choke diameter would match that of the gauge. Now try it in a barrel with a bore diameter of 0.725 with thirty-thousandths constriction or full choke. Thirty-thousandths constriction (0.030) in this particular barrel would place the choke diameter at 0.695 inch. Naturally the gauge with its 0.700 diameter would not go in, yet both barrels would have thirty-thousandths constriction.

The most accurate choke measuring instrument available is marketed by Poly Choke. While expensive, I have one that has been in use for thirty years and it is still going strong. It was designed specifically for the job of measuring bore diameters and choke diameters and the differences between the two in 20-, 16- and 12-gauge barrels. It will not work on the 28-gauge nor the .410 and will not extend up to 10-gauge. This tool resembles a common micrometer

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*Standard or English choke boasts a parallel section at end of barrel.*



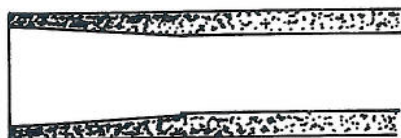
*The cone choke is of American origin and also is known as the taper choke.*



*Swaged choke has been found on less expensive models. It is achieved by merely tapering muzzle of the gun.*



*The so-called jug choke is made by hand with a rod, emery cloth. This is popular with Russian shooters.*



*The reverse or bell choke design is meant for throwing a broad pattern.*

in its barrel or reading section which is connected through a long shaft to a precision tapered end of the shaft. The shaft bears against three ball bearings located at the end of the instrument. As the taper is pushed forward by turning the barrel, it exerts pressure on the ball bearings forcing them outward to contact the walls of a shotgun bore. Naturally the walls halt this movement and the measurement is read on the barrel section of the instrument just as you would read a common micrometer. As the taper shaft moves backward it exerts less pressure on the ball bearings and they retreat into the end unit for a smaller diameter reading.

Stan Baker, one of the nation's finest shotgun smiths, designed a variation of the bore micrometer that uses a dial indicator for its reading. A ring gauge of exactly 0.700-inch dimension is used to set the dial indicator at zero. With the ring gauge removed from the ball bearings, the instrument then is placed in the bore and the diameter is read directly on the dial indicator. This tool is quick and accurate for bore readings and choke readings. Its only drawback is that it is limited to 12-gauge.

An advantage of the Poly Choke bore micrometer and the Baker Barrel Reader is that either can measure the bore diameter to a distance of twenty-three inches. Thus if you measure from the muzzle, then remove the instrument and

measure from the chamber end of the barrel, you have a forty-six-inch measurement range, which will cover virtually any shotgun barrel. Both also can be used to measure chamber forcing cones.

Brownell's also markets a dial-indicated choke caliper. This also must be set by turning the dial while the ends are in a ring gauge. Once set, it will give a readout quickly. Being short, it will measure only the choke section and the bore diameter directly behind the choke. Its other use is in measuring the dimensions of a chamber from rim to bore.

All of these instruments are costly. If you do a lot of shotgun barrel work or choke work, the price is justified. Some years back I designed a simple, inexpensive choke comparison caliper that is marketed exclusively by Brownell's. One end is inserted into the bore section, held open, then locked. A common micrometer or dial caliper is used on the opposite end of the calipers to take a reading. It then is unlocked and moved up into the choke section of the barrel and relocked. Again a reading is taken via a micrometer or caliper. Thus you have the bore diameter just behind the choke area and the diameter of the choke. Subtract choke from bore and you have the amount of constriction or difference between the two diameters. It is a simple instrument to use and also can be utilized for chamber and chamber forcing cone dimensional reading.

Both the inexpensive choke comparison calipers and Brownell's dial caliper offer a range from the .410 up to and including the 10-gauge. Any of these four instruments will give the necessary precision reading of bore and choke diameters that are absolutely essential for accurate choke designation and gunsmithing requirements.

Many years ago the British came up with the definition of choke and how to measure it. They gave only five specifications: *Choke* was what we would currently term as full choke and consisted of a difference of forty-thousandths inch between bore and choke diameter. *Three-quarter choke* was thirty-thousandths inch between bore

and choke diameter; *half choke* was twenty-thousandths inch between the two dimensions. *Quarter choke* was a difference of ten-thousandths-inch. *Cylinder* had no constriction.

The British called every one-thousandth-inch constriction a "point". Hence forty points of choke was forty-thousandths inch (0.040 inch), thirty points of choke being thirty-thousandths inch (0.030 inch), and so on. They still stick by their original system and it is simple to use.

On the European continent everything was metric, which can be confusing to us. To convert millimeters to inches simply multiply by the figure of 0.03937 or if you want to chop off a few figures, 0.04 to round out the multiplication process. I am too old a dog to change and use the metric system only if there is no alternative!

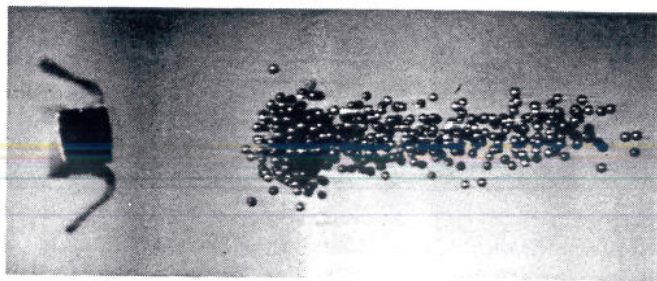
Every manufacturer in the United States had his own idea as to how to mark the amount of choke on their barrels, causing no end of confusion. Some figured it was none of the shooter's business and you will find many of the old double-barrel guns sans any designation!

Those makers that did mark their barrels for choke generally used only one single number for the purpose: #4 for full; #3 for improved modified; #2 for modified; and #1 for improved cylinder, with #0 being no-choke/cylinder. This was the system used on most Ithaca double-barrel guns and with their Model 37 pump. Several others adopted the system and used it to great extent.

There have been dots, dashes, stars and whatnot used as a code for choke markings. The Italians use one star for full, two stars for improved modified, three for modified, and four for improved cylinder. Straight cylinder is generally marked only CL or CIL. The Browning shotguns use a variation with asterisks and dashes: \* is full; \*- marks improved modified; \*\* is modified; \*\*- improved cylinder; \*\*S marks skeet and \*\*\* is cylinder. Another variation is the metric points of choke. For instance, the numeral 7 would indicate .7mm points of choke or .7 millimeters of constriction, which if converted would be roughly twenty-eight-thousandths inch constriction. Perazzi used a form of this with 7/10 being the same figure of .7 millimeters of constriction (0.028 inch).

Somewhere along the line it became evident shooters did not carry a code book of various numbers, dots, dashes, stars and asterisks to figure what chokes they had in the guns they were carrying over hill and dale. So the current system is to stamp the choke designation in plain English on the barrel near the gauge designation. Full was simple enough to stamp, although a few use the letter *F* as some sort of saving of time or stamp I guess. Improved modified comes out, *Imp-Mod* usually or again the abbreviation *I-M*. Modified choke is *Mod* or *M*. Improved cylinder is *Imp-Cyl* or *I-C* on most barrels. No choke is *Cylinder*, *Cyl* or simply *C*.

The joker is those designated as skeet barrels. In past years there were two skeet chokes which had to do with whether the claybird was going away from you or coming toward you. *Skeet Out* and *Skeet In* were the terms in use. Choke designation was *Skeet-2* or *Skeet-1* with abbreviations of *S-2* and *S-1* respectively. *Skeet-1* was a choke constriction half-way between improved cylinder and straight cylinder. Today a barrel marked as *Skeet* has zero constriction and is identical with cylinder in every way. Bar-



This microflash photo was taken by White Laboratories in 1971 to show pattern from a full choke 30-inch barrel. The distance was four feet from the end of the muzzle.

rels marked *Slug* are intended for shotgun slugs. If marked *Buck* they are simply no-choke cylinder barrels. This marking is a sales gimmick; hence, if you cut off a thirty-four-inch barrel and mount open sights, you have the same thing as the *Buck* barrel sans the stamp on the barrel. Quite recently some barrels have had *Riot* stamped on them. It's the same thing: zero constriction, no choke.

There has been one choke, if you wanted to call it a choke, that reversed the procedure. It spread the pellets rather rapidly and was used to some extent in skeet and in some upland bird hunting. It bore a host of names such as reverse choke, spreader, et al. It also was bored into one high-quality gun as a "Reversed Conical Parallel." Whatever it is called the basic principle has been to enlarge the end of the muzzle to a diameter in excess of the bore diameter; in doing so the gas behind the old-style nitro wad rushed around the wad and mingled with the shot thereby scattering the pellets to quickly produce a wide pattern.

A slight variation came about a few years ago when the Russians "discovered" the principle and quickly named it the Tula Choke, Tula being the name of the arsenal at which the barrels were made. It worked fine in International Skeet competition and one American firm currently markets a version, the Smith & Wesson Super Skeet. All is well as long as the old-style wads are used in the shotshells, but the modern one-piece plastic wad with the shot protector plays hob with the principle as it does not allow gas to enter the shot column. Soft shot also works best in conjunction with the old-style multi-piece wads for this system.

Occasionally another oddball choke idea is rediscovered. By cutting the choke section larger on each side, the existing shot forms a somewhat rectangular pattern. A variation is simply to push the barrel toward the center from top and bottom to form an elliptic-shaped barrel end. Again the shot is supposed to exit in this shape and add to the chance of hitting game to each side of the normal pattern. Not too long ago a firm marketed a similar arrangement for riot purposes calling it the Street Sweeper.

The degree of constriction that constitutes choke is most confusing and it is virtually impossible to get a straight answer from any source and impossible to secure exactly the same set of dimensions from any two sources!

For matters of comparison, let's stick to the 12-gauge, for each gauge has its own set of requirements regarding amount of constriction. Let's also back off the standards established by the British, as they were set with the old shotshells that consisted of the nitro wads, filler wads, no shot protector and a roll-type closure with the over-shot

wad. With the advent of the star-type crimp and the elimination of the over-shot wads, the same gun would shoot a slightly tighter pattern with the same constriction, but not enough to constitute a radical change.

The one-piece plastic wad with the shot protector changed the rules. Constriction of 0.040 inch now delivered a pattern too tight for the full-choke designation and commonly accepted pattern. To compensate for this and return to the accepted standard of seventy percent of the shot hitting in a thirty-inch circle at forty yards, the amount of constriction was opened up to around 0.030 inch. This amount of constriction was the old improved modified standard that now delivered the same pellet count that the old 0.040 constriction did with the old shell. As a choke designation the term *improved modified* went the way of the carrier pigeon and is seldom used.

The modified choke remained at around 0.020 inch with some barrels having a few thousandths inch less constriction for this choke designation. Improved cylinder remained in the neighborhood of 0.010 constriction, again with some a few thousandths less constriction. On the other end of the stick, a choke with 0.035 constriction usually was termed extra-full or over-full. A constriction of 0.040 constituted a trap choke and was referred to as the maximum choke that should be used in a 12-gauge bore.

In recent years there has been a movement toward even tighter chokes. This is what the public demands and gun-makers always produce the gun and the choke that the public is willing to buy; that rule overrides everything else, I've learned.

As I have stated previously, the correct method for determining degree of choke is not to test every choke at the forty-yard limit, then compute the pattern percentage, as the information is totally useless from a practical point of view. No one shoots an improved cylinder or cylinder choke at forty yards! The seventy percent pattern is a good standard, I only advocate retaining it and changing yardage.

#### SEVENTY PERCENT DESIRED PATTERN PER CHOKE DESIGNATION

CHOKE	YARDAGE OF RANGE
Full	40
Modified	35
Improved-Cylinder	30
Cylinder	25

As you can see, each degree of choke designation is equal to approximately a five-yard increase or decrease. So, what is the pattern percentage for other yardage? Perhaps the following will shed some light on the subject:

#### PATTERN PERCENTAGE PER CHOKE PER YARD

Yards	10	15	20	25	30	35	40	45	50	55	60
Full				100	90	80	70	60	50	40	30
Modified			100	90	80	70	60	50	40	30	20
Imp-Cyl		100	90	80	70	60	50	40	30	20	10
Cylinder	100	90	80	70	60	50	40	30	20	10	

I hasten to add that the above figures are only approximate to what will be achieved with most 12-gauge shotguns with the 2¾-inch chamber

Bore diameters vary from manufacturer to manufacturer, but the Small Arms & Ammunition Manufacturers Institute (SAAMI) does issue a recommended standard dimension for each gauge. These and the amount of choke constriction per designation is as follows: The chart below covers internal diameters.

Gauge	Bore (Inch)	Full Choke (Inch)	Modified Choke (Inch)	Imp-Cyl Choke (Inch)
12	.729	.694	.710	.720
16	.667	.639	.652	.660
20	.617	.592	.603	.510
28	.550	.528	.538	.545
.410	.410	.393	.402	.406

Cylinder choke would of course be exactly the same as the bore diameter per gauge.

This particular chart covers each of the chokes in the amount of constriction maximum.

Gauge	Bore (Inch)	Full Choke (Inch)	Modified Choke (Inch)	Imp-Cyl Choke (Inch)
12	.729	.035	.019	.009
16	.667	.028	.015	.007
20	.617	.025	.014	.007
28	.550	.022	.012	.005
.410	.410	.017	.008	.004

Cylinder choke has no constriction and is the same as the bore in diameter.

There is no recommendation for improved modified choke nor for Skeet-1 and Skeet-2 chokes, but I have found the following figures very close, altered as necessary to give correct percentage with the modern one-piece plastic wad and the shot protector.

Gauge	Bore (Inch)	Improved Modified (Inch)	Skeet-2 (Inch)	Skeet-1 (Inch)
12	.729	.025	.012	.005
16	.667	.020	.010	.004
20	.617	.019	.009	.004
28	.550	.016	.007	.003

These constriction specifications were determined by checking numerous custom chokes in a wide variety of barrels.

While cylinder choke is supposed to have zero constriction, with the diameter the same as that of the bore, I have found that a constriction of about two points (.002 inch) will result in a slightly improved pattern. The small amount of constriction seems to result in a more evenly distributed pellet pattern while the straight cylinder will show holes in some areas in pattern tests.

It is important to take these specifications as average, for they will not be exact for every barrel. Whenever the bore diameter is changed, even one-thousandth inch plus or minus, from the recommended standard, you change the choke constriction for any designated choke! Nothing can be taken as exact when it comes to chokes, any gauge, any designation. This is the first thing to learn in working with custom choking.

Normally, as the bore diameter is increased, the amount of constriction required to produce a desired pattern percentage will be less. In other words, less constriction will be required for full choke results if the bore is .735 inch in diameter as compared with a bore diameter of .725 inch. This works in reverse in that a tighter than normal bore diameter will require more constriction than a standard bore diameter.

Pattern performance is the final deciding factor for any constriction of choke, regardless of designation of type of choke. This cannot be over-emphasized as too many shooters and gunsmiths are seemingly awe-struck by a set of constriction figures. Pellets break targets or kill game, not statistics! One of the problems is that so few shooters or gunsmiths have a clear mental picture of the expanding shot charge pattern diameter at various ranges both before and past the target. The following should help clarify this:

**TOTAL SPREAD OF PATTERN DIAMETER  
PER CHOKE AND PER YARD  
YARDS OF RANGE**

Choke	10	15	20	25	30	35	40	45	50
Full	10"	15"	20"	25"	30"	35"	40"	45"	50"
Modified	15"	20"	25"	30"	35"	40"	45"	50"	
Imp-Cyl	20"	25"	30"	35"	40"	45"	50"		
Cylinder	25"	30"	35"	40"	45"	50"			

When the diameter of the pattern exceeds fifty inches, it is of little practical advantage. If it is remembered that a pattern considered "good" is one of seventy percent of the pellets within a thirty-inch circle, then a fifty-inch-diameter pattern would mean that there was a pellet in almost twice the area and would result in a lot of open spaces within the fifty-inch circle.

Most people are of the opinion that the shot charge diameter opens up somewhat like a large cone with the small end in the barrel muzzle. The cone continues in diameter in proportion to distance from the muzzle. This is not quite correct. The cone shape exists for a distance as the chart above shows. Then the pellets tend to flare out somewhat like the end of a trumpet with the diameter increasing rapidly. Past the fifty-inch diameter the spread widens at a much more rapid rate as the distance increases.

This can be proved to anyone's satisfaction by placing a series of six-foot-square sheets of paper at five-yard intervals. Now fire the shotshell at the center of the first sheet of paper. The diameter of the pattern will increase on each sheet about the same as shown on the chart up to fifty inches, then it will flare rapidly.

If the chart is examined closely and studied per choke, per range, you will have a good picture of what the exiting shot charge looks like as far as diameter is concerned. It must be remembered that the shot charge is three-dimensional, some of the pellets ahead, some trailing behind to resemble a tear drop with the tail at the rear.

To prevent that trumpet-shaped flare from taking place at fifty yards with a full choke it is possible to increase the constriction past full choke for an extra-full choke and thus extend the thirty-inch diameter circle about five yards to a maximum of ten yards, but this is about tops. The diameter of the pattern circle then would increase for a few yards as shown on the chart. A hard shot protection wad will help as will increasing the number of pellets in the shot charge to some degree. This is the thinking behind the magnum-type shotshell loads. However there is a limit to all of this.

Simply stated, most shotguns have a maximum efficient pattern at forty to forty-five yards. By increasing bore diameter, as a 10-gauge, and increasing the choke constriction, the maximum efficient range can be increased out to sixty yards, but beyond this forget it if you are thinking of shot-after-shot pattern efficiency.

Nonetheless there seems to be an unending quest to obtain a proficient pattern at the longest possible range. Someone always is trying to get just a hair more distance with a shotgun by any means possible. Little practical advantage is gained by such yard stretching except for some waterfowl shooting and turkey hunting; this is a limited need in proportion to the time and energy spent in this quest.

Most game taken with the shotgun is within the twenty-five- to thirty-five-yard range. With a full choke you are trying to hit game with a pattern much smaller than the thirty-inch desired pattern diameter. If successful, all you have is a big red mist in the air and a few feathers floating down! With a smaller pattern diameter of fifteen to twenty inches, you also have increased the probability of a miss by one hundred percent; it is difficult enough to score with a thirty-inch-diameter pattern.

Game does not position itself at any exact yardage. Range varies with every shot. Therefore there must always be a minimum and a maximum pattern diameter to work with. Anything below twenty-five-inch diameter is simply too much shot, both in size of the pattern and the number of pellets striking the game, rendering it useless for food. If we thin the pattern much more than a forty-five-inch diameter, it becomes too skimpy. So a workable minimum would be twenty-five inches and a maximum diameter would be forty-five inches. With any choke this gives a working range of twenty yards inside of which we can be reasonably sure of success, provided the pattern is placed on the target.

Again looking at the chart and being realistic, we find that most game could be taken with the improved-cylinder choke which would give that working pattern a kill range of from fifteen to thirty-five yards. This is adequate to compensate for poor range estimation and within the need for more than seventy-five percent of hunting needs for the shotgun.

During World War II a common saying in England was that the trouble with American troops was, "over-sexed, over-paid, and over here." If we apply this adage to shot-

guns, it could say, "over-choked, over-shot content and over-powered." This would not be far wrong from a practical view of most American shotgun hunters. Anyone who doubts this can satisfy himself with a simple experiment. Most game bird's bodies are not more than a three-by-five-inch rectangle, the size of a large index card. Simply cut a few of these rectangles from a piece of cardboard and nail them to a stick. Place the sticks with the cards at the ranges as shown on the chart. Back up to the firing line, bring the shotgun to your shoulder and fire. Don't rifle shoot the gun, but bring it up and fire as you would normally. One shot-shell per card. Take a close look at the results and it will be an eye opener.

All of the shot within that thirty-inch desired pattern diameter will not be used under actual game conditions. Only the shot pellets that strike the card are of practical use, with the rest of the shot only stirring the surrounding air. Unless the bird is sitting on a limb or a power line, you will not have the same shot. A moving bird, feathered or clay, will be struck only by the shot within the space where it is at the moment of impact. Taken in respect to miscalculated speed of the target or lead, the wider diameter of circle of pellets assures that the shooter's error will be compensated for by its diameter. Thus what is desired is as wide a pattern as possible with enough pellets striking the game to score a kill. This means that we must have as efficient a pattern as possible with even pellet distribution.

No two shotgun barrels made — even those side-by-side on the manufacturing line — will shoot exactly alike on the pattern board. Even if you shoot shells from the same box, the results never will be identical. I do not know why and neither does anyone else. It is simply a fact that must be

accepted. I have bored shotgun barrels, same model, within less than one-thousandth-inch variation and have never obtained the same identical results. You can use dimensions as a guide, but only as a guide. The final dimension is obtained only by trial shooting.

Few shooters realize that no barrel, no choke, will give the same results with different size shot! In other words, a full-choke barrel on a specific gun will give full-choke patterns with size 8 shot, but if you switch shot size, same load, to size 9 or 7½ shot, the percentage will go up or down to extra-full choke or improved-modified. Change to a larger shot such as #6 and you may or may not get modified pattern results. In other words, a barrel marked *Full* may deliver full with one size shot. Switch shot load, same size shot, and the results will not be identical. Change the power of the shotshell and again you change pattern results. You will obtain consistent pattern results only with a consistent shotshell. Change any factor and you have another set of results on the pattern board. Why this occurs is unknown, but anyone who has spent any amount of time shooting patterns will agree that it does occur.

The only solution is to shoot different shot sizes, shot loads, different powered shotshells, all by different manufacturers. You will learn which gives the perfect patterns, which show a variation — which may be small but still a variation.

Proficiency with a shotgun depends to a large degree on consistency. This is in the shooter mounting the gun the same, the same power of shotshell and of course the same consistent pattern diameter at the same range every time. Then and then only will the percentage of hits on a target increase!



*There was a time when hunters might take more than one gun into a blind, but today's interchangeable choke tube concept has changed this habit.*

## Chapter 12

# A MATTER OF THEORY

### *Early Barrel Choking Was More Luck Than Knowledge, But All That Has Changed!*

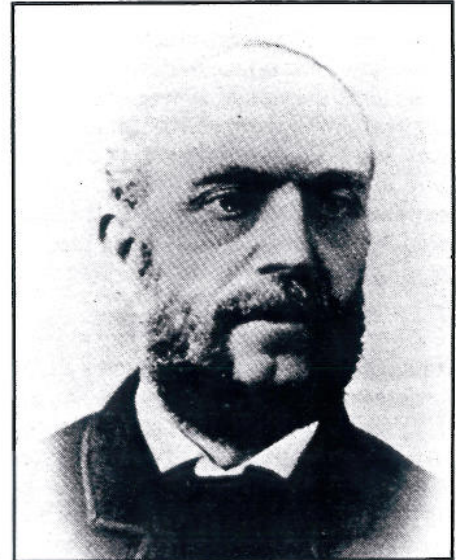
**I** WANT to cut my thirty-two-inch shotgun barrel back to twenty-six inches, so how much choke will I have left?"

"I'd like to have a twenty-six-inch barrel as my twenty-eight-inch is too long, how far can I cut it without losing the choke?"

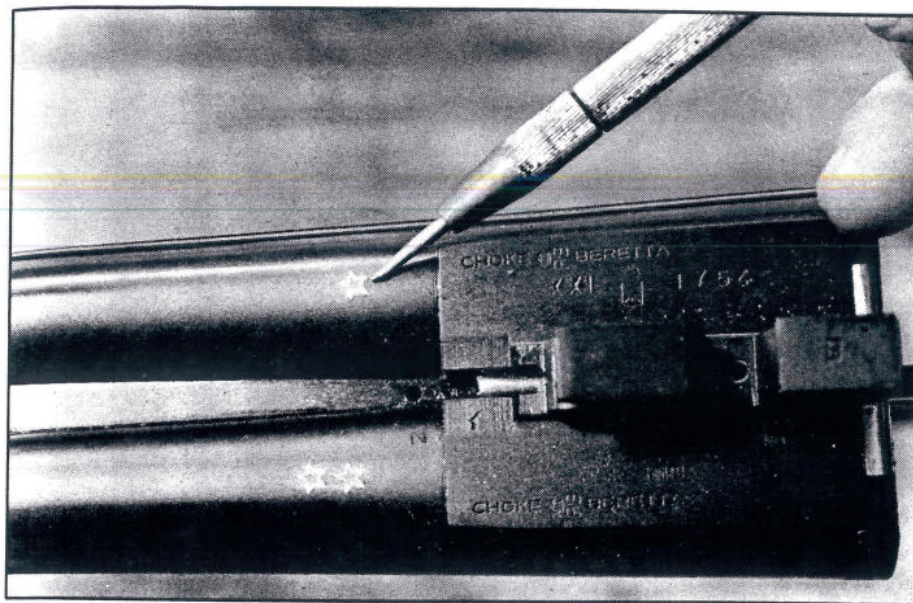
"Can you put the full choke back in my barrels that were cut to eighteen inches because I blew the ends off?"

These and associated questions are put to the average gunsmith at least once a week. I think I get more than my share, as I specialize in shotguns.

If there is one mystery regarding firearms of any type, my vote would go to the matter of choke in the shotgun. Many people not only do not know where the choke is in a barrel, but I doubt that one in a hundred has even a foggy notion of what it does. All the average shooter knows is



*English gunsmith William Pape has been credited with design of the first shotgun choke. (Left) These shotguns at author's gunshop are awaiting various types of work, but greatest call is for choking.*



Left: Stars on Italian-made Beretta indicate choke: one star is full, two designates improved modified. (Lower left) Browning choke markings utilize asterisks and dashes. In this case, the code identifies the modified choke of this shotgun.



that his barrel is choked — it says so right on the barrel — and it keeps the shot together somehow to hit a target at a long distance. Beyond this, choke is a dim, vague subject.

Two individuals have been credited with initial choke development for shotgun barrels. Fred Kimble was a professional market hunter of Peoria, Illinois, whose skill with the shotgun was legend. He personally bored many of his

own barrels, which were predominantly of large bore single-shot muzzleloading persuasion. The story goes that he goofed during one such job and decided to rebores the barrel to a larger size. Inadvertently he left some of the original smaller bore diameter at the muzzle. Test firing revealed an unusually tight shot pattern at extreme distance; being inquisitive, Kimble gauged the bore and discovered the accidental constriction at the barrel muzzle. He purposely bored other barrels with various constrictions at the muzzle and did a lot of test shooting. This happened “around 1870,” but Kimble never patented the process.

In England, W.R. Pape patented a choke-boring process on May 29, 1866. His patent #1501 states, “The invention further relates to an improvement in the manufacture and construction of the bore of barrels of breech-loading and other shotguns. Instead of making the bore cylindrical throughout, I propose firstly to bore the barrel or barrels through and through one size or number smaller than the true bore to be formed; I then rebores the barrel with one full size or number larger than the former, begin-

The Baker barrel micrometer is packaged in a box that features printed instructions on how to use it properly.

### Stan Baker Shotgun Barrel Micrometer

#### INSTRUCTIONS

This is a precision instrument and should be properly handled in order to insure that it will maintain its accuracy.

Do not put the probe into a dirty bore. You will not get a proper reading and the bore fouling will find its way into the probe and spoil its accuracy.

The standard included in your kit measures .700" inside diameter. Slip it over the probe and turn the outer ring of the dial to put the needle on '0'. This will be .700" and the dial will read in a logical manner: When the needle is on 30, it will be read as .730". When the needle is on 90, it will be read as .690".

To determine the constriction of the choke, in relation to your barrel, just subtract the choke diameter from the bore diameter.

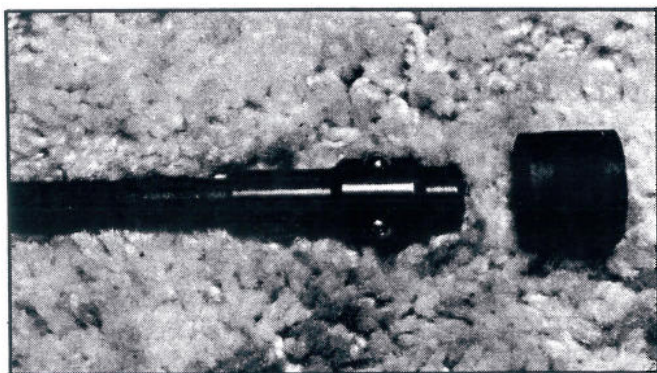
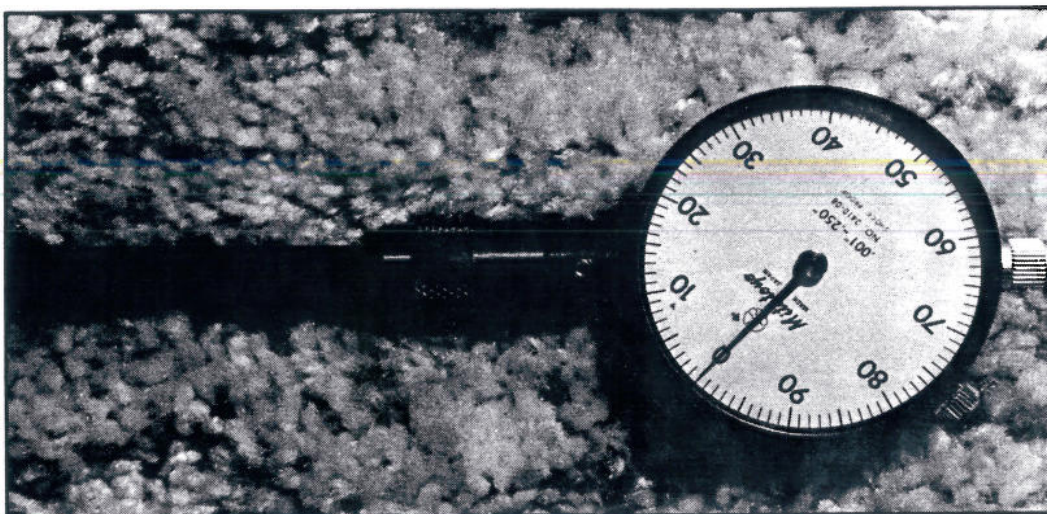
If the probe becomes sticky or sluggish, squirt some WD-40 into it through the ball holes.

### Choke Diameter Chart

CHOKE DIAMETER	CHOKE DESIGNATION	CHOKE CONSTRICTION
.680" .685" .690" .695" .700"	Full Choke	.020" to .040"
.705" .710"	Imp. Mod.	.020" to .030"
.710" .715" .720"	Modified	.010" to .020"
.720" .725" .730"	Imp. Cyl.	.005" to .010"
	Shoot	.000" to .005"

\*These are approximate standards for barrels with a .720" bore diam.\*

Stan Baker Bore Reader is similar to the Poly Choke micrometer for bore, except it has a dial indicator head. (Below) Front end of gauge uses three ball bearings for measuring.



ning at the breech or open end, but continuing only to within one inch or thereabouts of the muzzle end; I then finish the bore by a taper from the conclusion of the larger bore direct to the very extremity of the muzzle. By this improved constriction of the bore, stronger and closer shooting will be acquired besides other advantages."

Pape's description is of a conical choke in the truest sense and the description unquestionably is the beginning of the term, "choke boring." His is the conical choke still in use today. The London Field Trials were held on May 22 and 23, 1866, one week prior to Pape's patent date and there is a known record that "soft shot was used at the trials and choke boring was not known to England gunmakers," in reference to a description of the gun used in the trials by one William Rochester Pape, a well known gunmaker of the period.

To add to the confusion there is ample evidence that one Jeremiah Smith, a gunmaker in Smithfield, Rhode Island, discovered the merits of choke boring in 1827. He bored quite a few guns using the system and also taught another gunsmith, N. Whitmore of Mansfield, Massachusetts. Whitmore in turn bored guns for many sportsmen of the area using the choke principle.

The one man who introduced choke boring and chokes to the average shooter was W.W. Greener of England. Fred Kimble publicized the system with his skill in matches and in hunting. Greener imported one of his barrels in 1870 and conducted numerous tests of the principle. Wide

recognition was all that choke boring needed to bring it to the fore among sportsmen.

Greener described his boring by saying, "Barrels intended for choking are left two sizes smaller than the cartridge (shell) they are intended for — that is to say, the 12 bores are left 14 bore, the 16 is left 18 bore — and the barrels are bored up within three inches of the muzzle with a fine boring bit, using a spill and liners as described." This description is of the conical parallel type of choke, which will be explained later in this chapter.

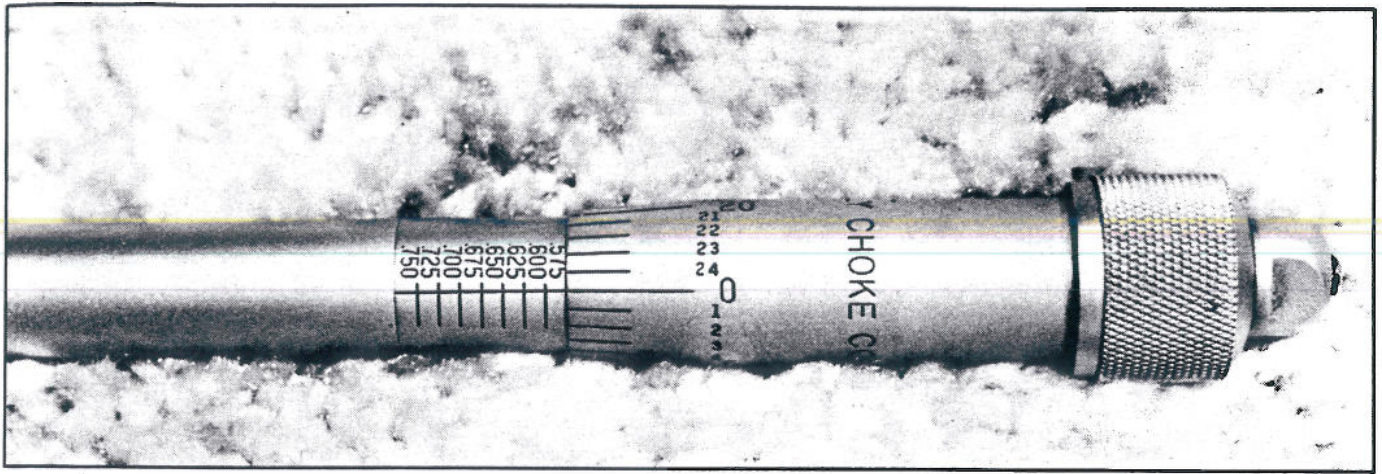
So take your pick: Pape has the patent, Kimble publicized the advantages and Greener put choke-bored shotgun barrels into the hands of the shooting public. Regardless of who gets the credit, by 1880 choke boring was a well established practice, which others have been trying to improve for the past hundred years!

Simply stated, there are no magic answers as far as choke is concerned nor are there any dark secrets in choke boring known but to a few old gray-haired gunsmiths who refuse to share the knowledge. Many people think there is a magic answer and one hears stories about such and such a choke that "shoots like a rifle" out to amazing distances. There ain't no such critter!

One rumor persists that a barrel with one or more chokes placed in its length of bore would deliver that magic pattern. The fact is that the bore must be absolutely the same diameter from its beginning to the choke at the muzzle to be efficient. Any constrictions within its entire length decreases the proficiency, not the opposite. As previously explained, shot pellets are deformed any time they pass through a constriction. Therefore one or more constrictions in the bore would result in the pellets being deformed with resulting loss of pellet percentage within the target.

Another fallacy is that some form of tapered bore can produce a magic pattern. Detail of this particular dream is that the bore diameter must be formed as a cone or taper extending from the beginning of the bore at the chamber to the muzzle or up to the beginning of the choke section itself. This does not work either.

Some years ago a well known American shotgun was so constructed and ballyhooed to the public as the final answer to tight choke shooting. It did taper gradually from the beginning of the bore to the muzzle extreme. I test pat-



Head of the Poly Choke bore micrometer shows the range of instrument's capabilities. It is simple to use in that it is read the same as a common micrometer. The author feels this is the best available for determining bore specs.

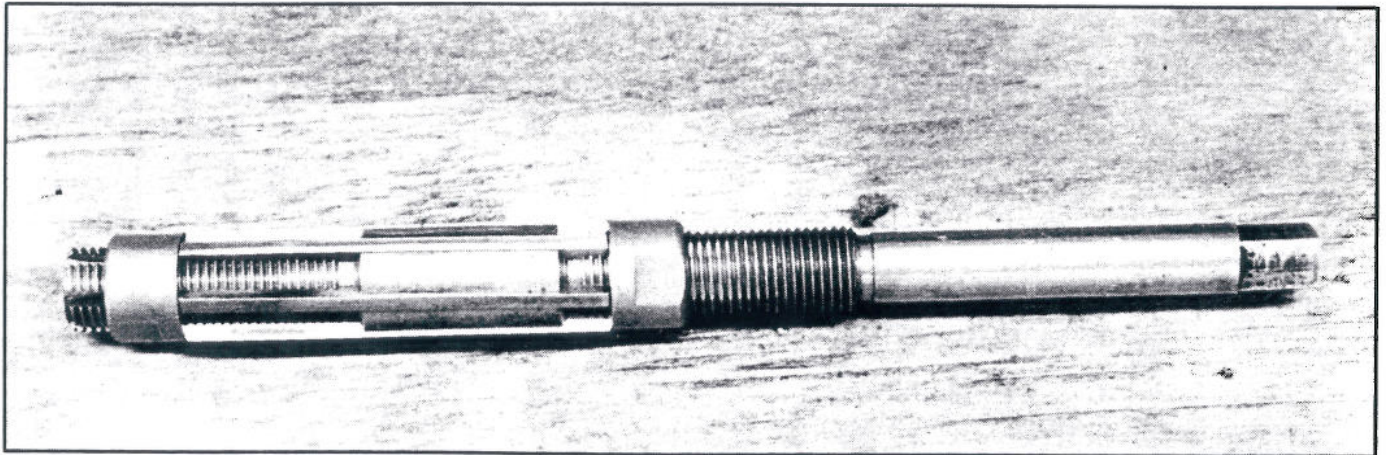
tered one of these shotguns, shooting just about every shotshell on the market, including a one-piece-wad skeet and target precision load. To say that the pattern results were discouraging is an understatement. It shot with less efficiency than the cheapest single-barrel shotgun with a crude choke system.

In an attempt for a fair test, I loaded some shells using the old nitro card or over-powder wad and felt filler or cushion wads. Results were even worse! Since that time I have seen others attempt "something new in choking."

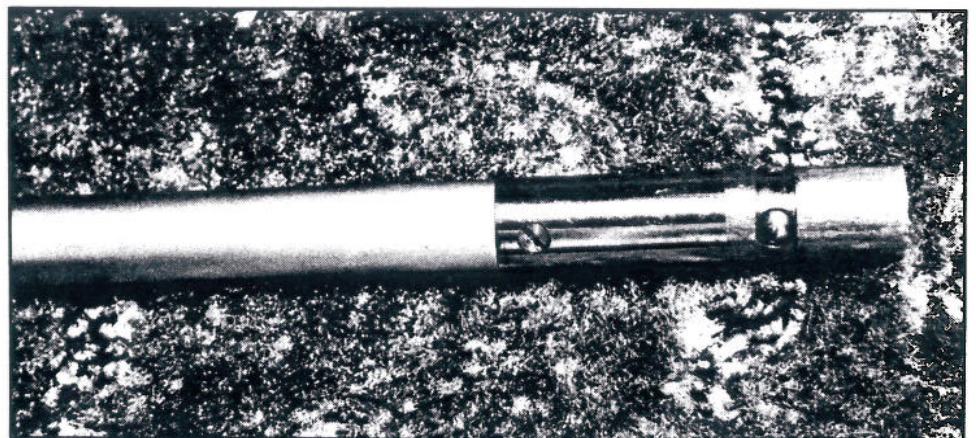
Results were always the same: a less efficient pattern than those shot through a regular choke.

Nothing is totally impossible in this old world and perhaps someone out there does have a taper-bored shotgun barrel that is the hottest thing around in delivering tight patterns, but I have never seen such a critter in all my years of gunsmithing. Nor do I know of anyone else who has seen such a gun barrel or the patterns produced.

There are only three basic types of chokes with all other variations of these three. Without exception, all are some



Author designed Brownell choke reamer; it is angled, tapered, adjustable. (Right) The three ball bearings on Poly Choke's bore micrometer move outward as dial is turned on the head. A tapered rod makes them move until they contact walls of bore. The bearings move inward when measuring lesser diameters.



form of constriction that reduces the diameter of the bore just before the choke starts, to a smaller diameter at the muzzle. It is this constriction of the inside diameter from large to small that produces the choke effect on the shot leaving the muzzle of a shotgun barrel. The definition of choke is positive: *Choke of a shotgun barrel is a constriction of the bore diameter inside to a smaller diameter inside taking place within the last few inches of the barrel near the muzzle.*

Even the three basic types of chokes follow this established definition. It is the method of achieving the reduced constriction and the dimensions resulting that give the varying amount or degrees of choke effect on the exiting shot column. This has never changed since the days of Pape and Kimbel. Improvements, yes; basic principle change, no.

The earliest choke — the one described by Pape in the patent he obtained — is known as a *conical* choke. The reduction of bore diameter is achieved through a continuous angle from large to small with the small end of the taper exactly at the muzzle where the barrel ends. The large end of the taper being at the bore diameter section before the start of the taper. The taper also is referred to quite often as the choke forcing cone. To avoid confusion taper is a mechanical dimension; choke forcing cone describes an effect in that the shot column is forced via a cone shape to a smaller diameter.

The second form of choke is a variation of the first. The term *conical parallel* aptly describes the shape. The conical reference is to the first type of choke in that it is a taper inside of the shotgun barrel that reduces the bore to a smaller diameter through a taper or cone. Unlike the first type of choke, the taper or cone begins at the bore diameter, but has its smaller end a specified distance from the muzzle of the barrel. Where the smaller end of the taper takes place, a section of the bore with a dimension smaller than the bore behind the taper runs *parallel* out to the muzzle. In other words, the taper reduces the diameter of the bore, then there is a parallel section where the diameter is smaller but continuous in dimension until it ends at the muzzle. Thus a combining of the two words, *conical parallel*, for a clear description of the second type of choke.

The third choke type takes the combination of the first two, then one more aspect is added. Result is that there are two taper sections and two parallel sections inside the barrel. The first taper begins where the bore ends, but the small end of the taper is toward the chamber end of the barrel, the large end of the taper toward the muzzle. Then where the large end of the taper ends, there is a parallel diameter section of the bore, but the diameter of this section is larger than the diameter of the bore before the choke section begins. Toward the muzzle, where this large-diameter parallel section ends, another taper begins with the large end of the taper where the enlarged bore diameter ends. This in turn tapers down exactly like a conical choke toward the muzzle. The second parallel section is exactly the same as the parallel section of a conical-parallel choke, but the dimension of the parallel section is the same as the diameter of the bore prior to the choke section. This type of choke is a recess choke.

The first use of the recess choke came about through a method wherein straight cylinder-bored muzzleloading

shotguns could be given the choke effect by cutting a larger "recess" behind the muzzle an inch or so. This recess, or enlarged bore diameter section, allowed the shot to expand to the greater diameter, then be "choked" down to smaller diameter, although this smaller diameter consisted actually of the original, unaltered bore diameter. This type of choke was used in newly produced barrels in less expensive shotguns as it did not require retooling of bore reamers. The original reamer simply cut the bore the same diameter from chamber to muzzle. A small but less expensive reamer was used then to cut a recess into the bore a little way back from the muzzle and produce the recess choke type with resulting choke effect.

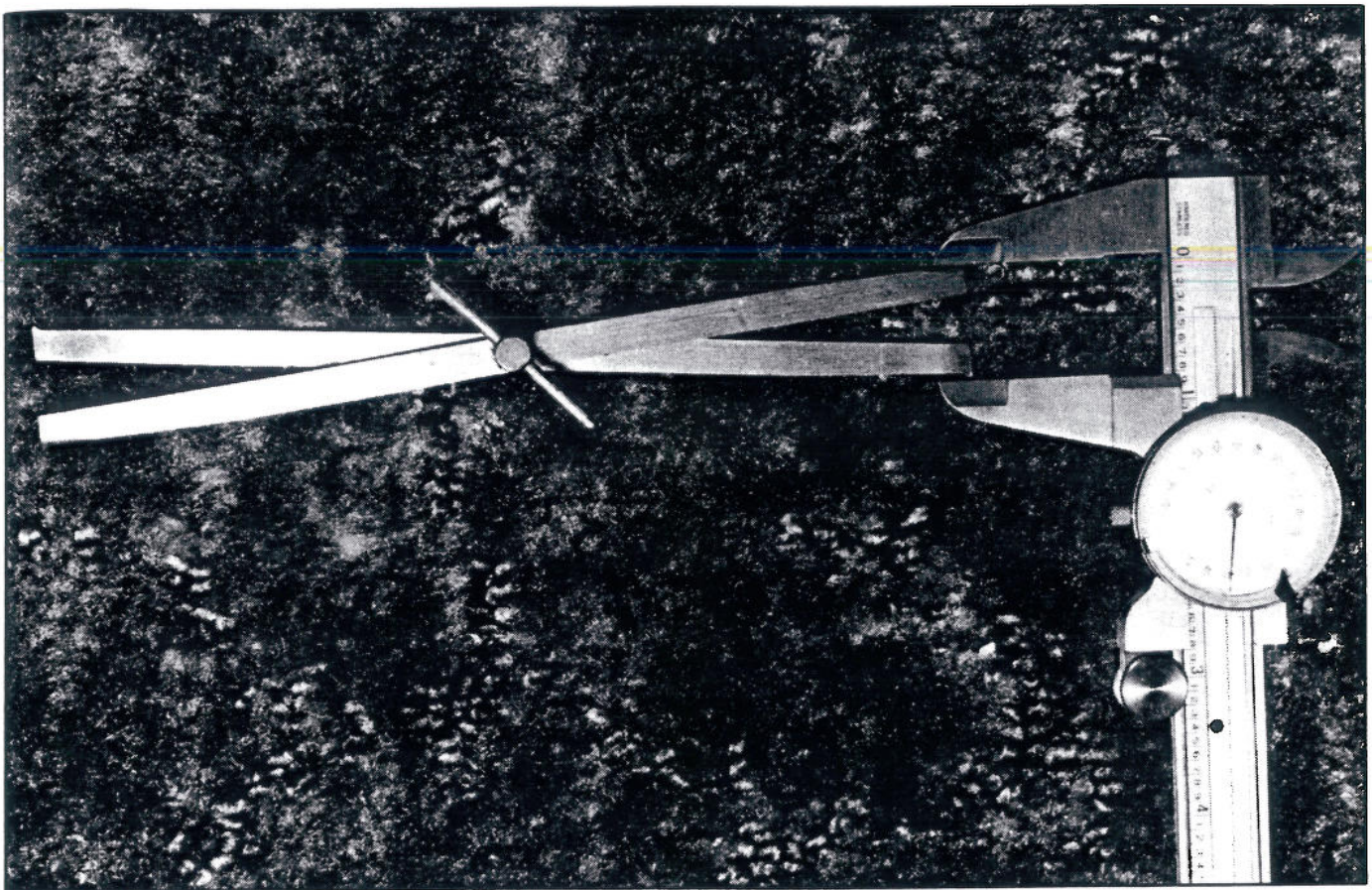
Today, the recess choke is not used on shotgun barrels currently manufactured. Its primary use is to put choke back into barrels where the choke section has been cut off for one reason or another. By enlarging the bore diameter of a cut-off barrel, then letting the column of shot be reduced in diameter, some degree of "choking" can be attained. The amount is strictly limited by the wall thickness of the barrel where the recess is to be cut. In most shotgun barrels only a minor amount of choke is possible because of this limitation. One of the new hot-shot chokes is nothing but a variation of the basic recess choke.

Even though one knows what the three basic choke types look like, the questions remain: What do they do and how do they work? These questions are not easily answered. To be totally honest, no one can offer answers with full understanding or accuracy. Exactly how chokes work is still a partial mystery. There is an abundance of theory, not all proved completely. What choke does from a practical standpoint can be explained in most respects. There are portions of even this phase, however, that cannot be explained fully.

A crude and not totally accurate explanation of choke function is as follows: Assume we have a two-inch-diameter pipe through which water is being pushed under ten pounds of pressure. Now we take a large-diameter bucket and place it facing the water exit end at a distance of five feet. The pressure pushes the water over the five-foot distance and we catch it all in our large-diameter bucket. If we double the distance to ten feet, then we can no longer catch the water as some of it goes outside of the diameter of the bucket. We could enlarge the bucket diameter, of course, but this does not fit our needs, so let's say we do not have the larger bucket.

So we reduce the size of the water pipe via a taper to one half its diameter, which would be one inch, maintaining the same water pressure. The catch bucket, same diameter, is then at ten feet from the end of the pipe "muzzle." As the stream of water is half the diameter of that with the two-inch pipe, it travels farther before it starts to break away from its exiting diameter. Hence we can capture the water in the original-diameter bucket.

As I stated, this is a crude, not totally accurate example. The tapering section of pipe that reduces its diameter from two inches to one inch is somewhat like the taper or forcing cone portion of a shotgun choke. The reduced section of our water pipe to one inch is the parallel section of the choke. The pressure behind the water, as the pressure in a shotgun barrel from the gas, is in essence the same. The water bucket is the shot pattern diameter. Catching the



*Brownell choke calipers were designed by the author. The end of one side goes into the barrel or choke and a common dial caliper or micrometer is used to read the other opened end to determine measurement; an inexpensive instrument.*

water is the same as the impact of shot pellets onto the pattern. Shot, of course, is not the same as water, but if we substituted sand for the water, the effect would be roughly the same.

Virtually the same effect can be seen with a common lawn water hose. When turned to the open setting we have a wide stream that does not go very far. When we turn the nozzle to a smaller diameter setting, the smaller stream extends farther. But this can be slightly misleading when compared to shot in relation to the distance. Shot pellets exiting the muzzle of a true no-choke cylinder bore and that of shot exiting from a fully choked bore will travel the same distance and at the same rate of speed or, to use the correct term, velocity. Comparisons are fine for purposes of explanation, but must not be construed to have the same mechanical effect.

The only thing that can be stated with total accuracy is that a restriction of the diameter will result in the *impact* diameter being less at the same distance or the same at a greater distance. The amount of diameter constriction will determine the diameter of the impact. There is, of course, a limitation to the amount of diameter constriction for which this effect takes place. Exactly what takes place in the constricting system inside a shotgun barrel is not completely known.

Having studied theory upon theory over the years, I have formed my own opinions of what occurs in the choke section. This is based on a lot of experience in altering or

changing choke, building choke, reaming barrels and the thousand and one things that a gunsmith who specializes in shotguns does throughout a lengthy career. In addition I have shot my share of shotgun patterns, then carefully examined and recut barrels to improve same. So I hasten to state that what follows here is opinion only.

Recognized laws of physics state that a mass at rest tends to remain at rest until acted upon by an outside force; a mass in motion tends to remain in motion until acted upon by an outside force.

So in this instance mass would be the column of shot as it travels up the bore toward the muzzle. For purposes of explanation, assume that we have a hypothetical centerline drawn lengthwise through the mass.

When the mass strikes the taper edge of the choke forcing cone, the individual pellets are acted upon by the walls of the tapering bore. The outside pellets touching the taper to a greater degree than those on the inside of the mass. The pellets, being solid, cannot be compressed as a liquid would be. However they must rearrange their positions in order to pass through the taper. In doing so, the shot are pushed inward toward the mass centerline to become mass in motion. As the centerline cannot be compressed, there is a limit to this rearrangement of pellet position, but pellets from the outside inward are definitely in motion toward that centerline.

The mass, having passed through the taper and parallel section of the choke, are freed by their exit from the res-

tricting walls. The thing to remember is that, although freed, there still is the principle that the mass remains in mass centerline even though the mass has left the muzzle. The force toward the centerline lasts for only milliseconds, but it does exist.

The key to performance lies in velocity of the mass exiting the bore with the velocity imparted by the gas pressure behind the mass of shot. A standard 12-gauge shotshell will impart a velocity of around 1200 fps. Change this to yards and we have four hundred yards per second velocity. As the target is forty yards away, the shot would take roughly one-tenth-second to cover that distance. Naturally velocity drops off, but this is only a rough explanation.

With the laws of physics demanding that the mass in motion toward its centerline remain in motion, there is a millisecond of inward "push" toward the center of the mass. As this happens, forward velocity is still pushing the mass toward the forty-yard target. Let's consider two things: (1) the shot mass is being pushed toward its centerline; (2) the shot mass is pushed toward the target by its powder charge gas pressure. Both time frames indicate that the mass would tend to stay together to some degree as the mass covers the distance to the target.

A steel ball bearing dropped on a solid surface will bounce, the reason being that part of its velocity energy is not

absorbed and is redirected backward from whence it came. A shot pellet will do exactly the same thing.

So when the instant of time occurs that the shot pellets cannot be compressed farther toward that mass centerline, the "bounce" effect takes place and the energy of the shot is redirected in the direction from which it came, in this case directly away from the centerline. From a practical point of view, the choke effect is no longer in effect and the reverse is occurring in that the shot is "scattered." Air resistance to the shot passing through it enhances the scatter direction.

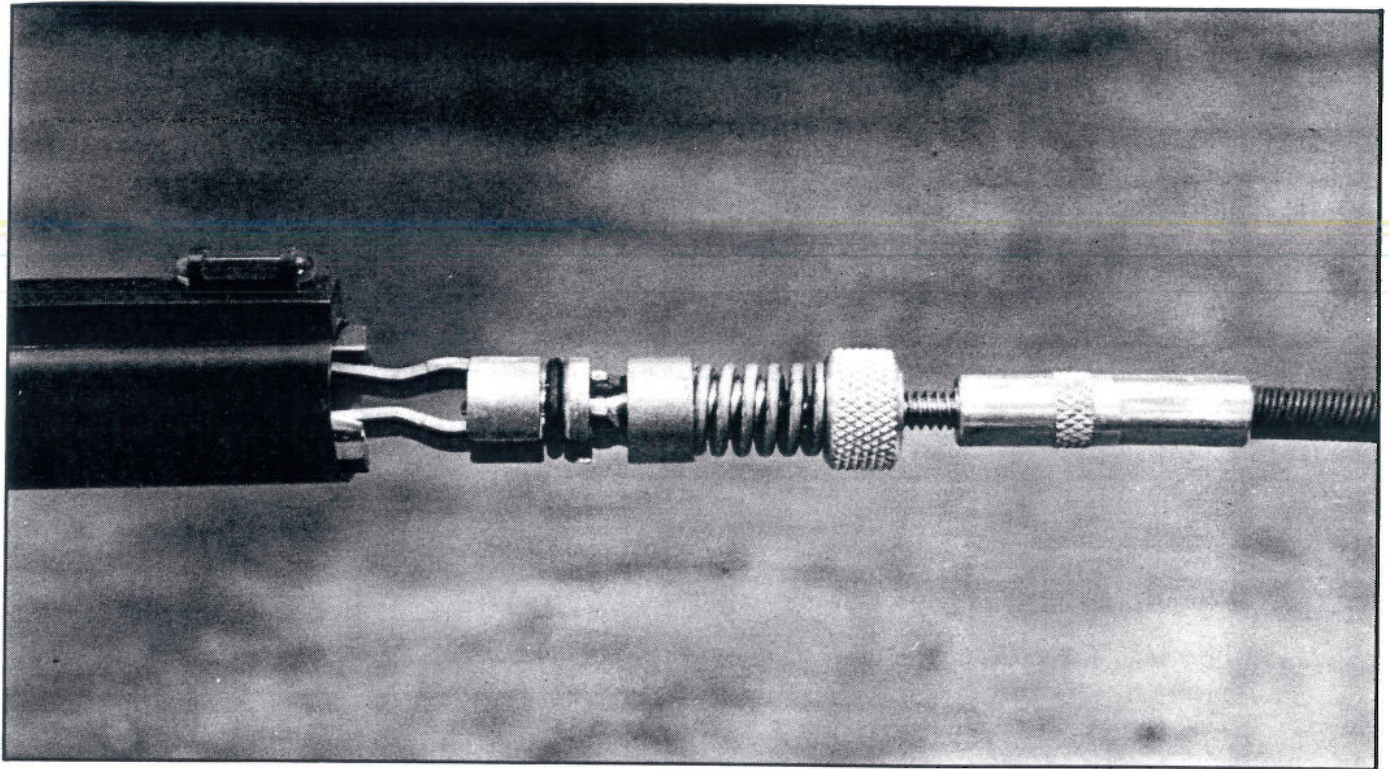
It is an established fact that shot as it leaves the muzzle is not in the shape of a large ice cream cone or an ever-expanding taper toward the target. Shot will stay together to a large degree and then start to expand to a greater diameter of coverage rapidly. If you wanted a comparison, then the shot would not appear as a cone but rather somewhat like a trumpet or bugle shape with a flaring at the end. This is the "bounce" and air resistance coming into form the flare.

If constriction of the choke is extreme, the desirable choke effect does not take place. Just the opposite occurs and the shot is scattered as it leaves the muzzle. In effect, the "bounce" effect occurs too quickly and the air resistance force must be added. Decrease the amount of constriction and the "bounce" will decrease in exact ratio.

The more choke constriction, the more the shot column

*Brownell dial choke calipers are designed for the dial to give the reading of opening of the arms as choke is being measured. For best accuracy, dial is set on zero with a ring-type gauge, then dial is read plus or minus.*





*In custom choking, Brownell's choke hone is being used to open up a choke a little at a time. An electric hand drill powers the hone. The ring at rear of the visible spring is used to increase the tension of honing stones.*

is strung out in length in its trip toward that distant target. Wing shooters take advantage of this known effect when shooting at distant game. The portion of the shot pellets at the rear of the "string" hit the target. With less constriction, there is less stringing of the shot mass and the charge of the shot from front to rear is much less in measurement. With a full-choked gun the shot string can be as great as eighteen inches in length. This is simply because there is not enough room for all of the shot to find a new position toward that centerline, hence it passes through the choke constriction a millisecond or more behind the forward end, but that motion of mass toward the centerline does not change.

So ends my opinion except for one small item: The shot striking the taper walls transfers that motion to the shot closer to the centerline. But the outer shot is restricted in movement toward the centerline by the shot blocking its path. The outer shot, in turn, hesitate a split millisecond and allow the shot toward the centerline to pass forward first. Then finding space the outer shot "fall in" behind the centerline inner shot. This is somewhat the principle of an explosive shape charge effect. This "falling in" behind the centerline shot would account for the lengthy shot string on the way to the target.

Amazing about choke is that so little dimension change will produce such varying effects of shot pellet impact dimension. The cellophane on a common pack of cigarettes is about one-thousandth-inch in thickness. If you change bore or choke dimension this much overall — or a one-half of one-thousandth-inch increase in one wall specification — you change the entire performance of the shot

pellet impact diameter! By the same token, change the angle of the taper or forcing cone one-half degree and the whole pellet diameter impact area will change.

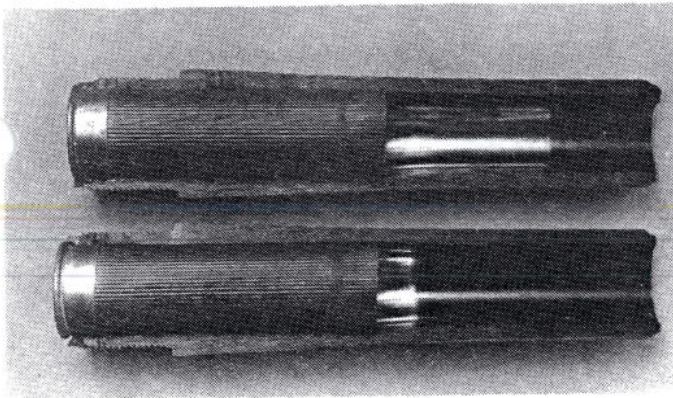
Change the diameter of the shot one size up or down to the next size and the efficiency of the choke will change in its effect on the shot pellets which, in turn, changes pattern percentage at the same range. Change the velocity of the shot as it exits the bore, with other specifications identical, and again the shot pattern will change.

Therefore any change, no matter how small, from a given position will always result in a change in pattern percentage or — stated another way — in shot impact diameter. Knowing this can be an advantage to both gunsmith and shooter as a dimensional change in bore and choke diameter can give a desired difference. From the shooter's standpoint it can give an undesired difference. For example, if a barrel is fired a lot without cleaning, plastic from the shell body will slowly build up in the choke area. This build-up changes choke dimensions and results in a change in shot impact diameter area. Remove the plastic build-up and you go back to consistent results. This can mean the difference between a hit or miss on game.

An increase or decrease in shot velocity will result in a change that the shooter can place to his advantage. Shot size change in relation to a given choke dimension also can result in an advantage.

By maintaining consistency as far as chokes go, you can maintain consistency of the choke effect results. By doing so and knowing the effect, you can make shot after shot give the same result and thus increase your odds of hitting a desired target.

## THE WALKER LONG FORCING CONE CHAMBER



This was the first improvement in shotgun barrel performance designed and developed by Ralph T. Walker of Walker Arms in the late 1950's concurrent with the introduction of the modern plastic shot protector. Since then, the long forcing cone chamber has been adopted by numerous manufacturers and utilized by gunsmiths all over the world. It is both time and field performance proven by

hundreds of shotgun shooters, both targets and game.

The short abrupt cone was designed to quickly seal the gas with the old style over powder wad. This is no longer necessary with modern plastic wads and is detrimental in that it deforms shot pellets. The long forcing cone eliminates pellet deformation in that it allows a more gradual entrance of the shot into the bore. It will add 5% - 15% to the pattern percent count and also reduces felt recoil. Available in 10-12-16-20 and 410 gauge. Cost ~~\$35~~ per chamber. **35<sup>00</sup>**

## WALKER LIQUID FLEX HONED SHOTGUN BORES

Special honing nodules on nylon springs are rotated at ultra high speed in a special oil throughout the entire length of the shotgun bore including the chamber. The result is the absolute maximum in a smooth and friction free shotgun bore. Actually smoother than a chrome plated chamber and bore.

Cost is ~~\$35~~ per bore.

**\$35<sup>00</sup>**

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## THE WALKER INTERCHANGEABLE CHOKE TUBE SYSTEMS

The interchangeable screw in choke tube system is the most versatile and least expensive method of matching the shotgun choke and the resulting shot pattern to changing game, range, shot size, and field conditions. The modern trend in shotgun barrels is definitely toward the interchangeable screw in choke tube method as opposed to the old, clumsy, and expensive solution of extra barrels. Interchangeable choke tubes allow the shooter to carry a variety of chokes in his pocket instead of several barrels! Changing choke tubes require less time than switching barrels. Each year more and more manufacturers adopt the screw in choke tube method to meet ever increasing consumer demand.

This is fine for new shotguns, but what about existing shotgun barrels and the possibility of converting them to accept the screw in choke tube method?

The truth is that no one method of installation is applicable to all types of barrels. Second, about 25% of shotgun barrels should not be fitted with any type of screw in choke if quality and safety are to be maintained.

What we at Walker Arms have done is four fold: First, we developed the finest choke tubes available on the market. Tubes that deliver a constant and uniform shot pattern using the most modern technology available, plus 28-years of practical shotgun choke experience. Second, we developed a system of four different methods of choke tube installations. Each is different in order to meet individual gun and customer requirements, however, internally, all four are identical in every dimension, hence, the shot pattern will be the same regardless of the installation method. Shot pattern performance is what is important! Third, we established a nation wide network of two thoroughly qualified authorized installers per state in addition to our own two plants. Fourth, our system is marketed only through your local dealers. We or our authorized

installers will, of course, handle consumer direct, but the retail price is identical.

## BARREL WALL THICKNESS

The first and most important consideration of any installation is the shotgun barrel wall thickness. Wall thickness is the internal bore diameter subtracted from the barrel external diameter divided by two (gives one wall thickness). There is no way to determine this visually. Even identical barrel models by the same manufacturer will vary! Each barrel must, therefore, be carefully measured internally and externally using precision micrometers and by a knowledgeable gunsmith.

If our system cannot be installed safely and correctly, we will return, as received, prepaid transportation, and no charges.

## BARREL SWAGEING

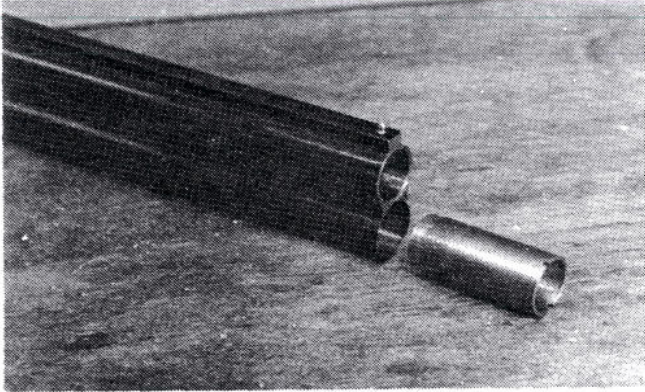
This consists of using a steel oversize plug inserted in the bore and the barrel swelled to a size that will accept a screw in choke tube. As the barrel metal is expanded, barrel wall thickness decreases in direct ratio. Quite often the barrel bore centerline will not match the swaged centerline and the choke tube cannot be installed accurately. The end result is a poor shot pattern. **We do not use this method of installation!**

All of our installations are within .001 (one thousandth) inch centerline of barrel bore to centerline of the choke tube. This is accomplished by machining and reaming the barrel between centers in a large lathe using reamer and tap pilots that match the bore diameter. These guide the tools direct on bore centerline to assure installation accuracy.

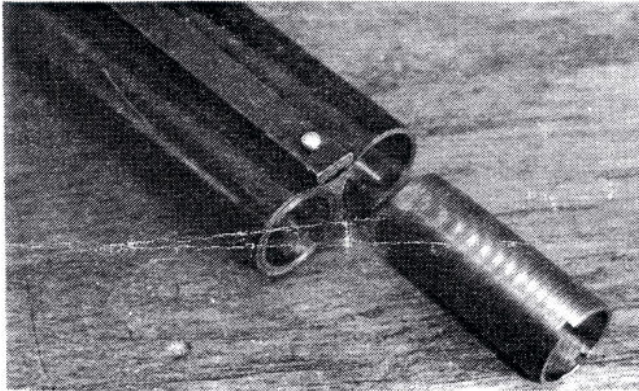
Extra Standard WalkerChoke Tube: \$        each.  
(See Choke dimensions chart).

Return packing, handling, postage: \$6.00 barrel(s) only. \$8.00 complete gun.

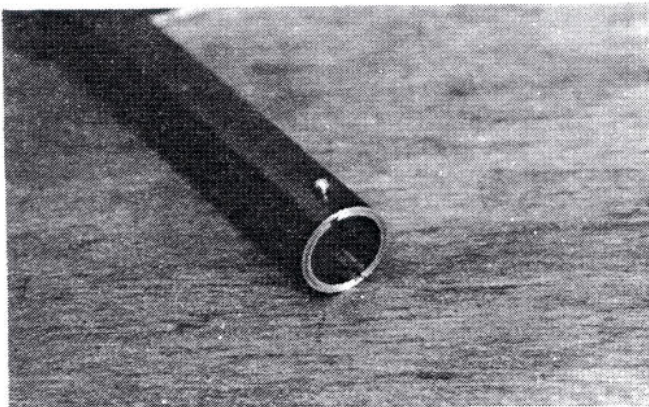
### WALKER FULL THREAD TUBES



Over and Under



Side by Side



Single Barrel

Our full thread choke tube system was specifically designed for over and under or side by side shotgun barrels. However, it can also be installed in single barrels and is virtually invisible. The full length threading of the choke tubes provide maximum shear resistant strength. No swageing, no adaptor, no change in the barrel exterior dimensions. It's all inside!

A recess is cut inside of the barrel(s) and then the recess is threaded internally. Five inch long bore guides that match exact bore internal diameter, assure that the cut recess, the threads, and the choke tubes are within one thousandths of one inch (.001) matching centerline.

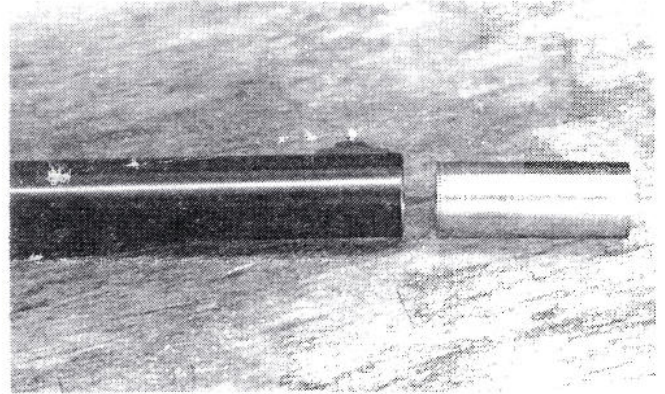
The Walker full thread choke tubes are of special dimensions and threads. They will not interchange with our Standard Walker-Choke tubes.

Available in 12-gauge only. (Available in 20-gauge - June 1985).

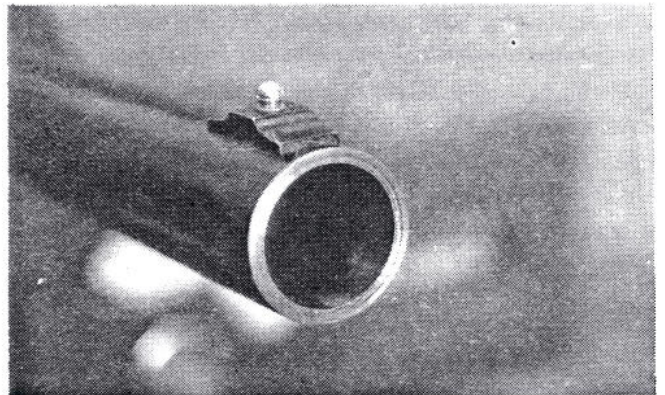
Installation cost: \$ ~~20.00~~ <sup>90.00</sup> single barrel with one choke tube furnished, \$ ~~180.00~~ <sup>180.00</sup> double barrels, includes 2 screw in choke tubes, one choke gage/wrench included per job. Any choke choice, extra full thread tubes, \$ ~~35.00~~ <sup>35.00</sup> each. (see choke dimension chart).

Return packing, handling, postage: \$6.00 barrel(s) only. \$8.00 complete gun.

### WALKER SLEEVE CHOKE



Before



After

This system can be installed in single barrels, over and under, or side by side shotgun barrels. It is a permanent installation. The choke tubes do not screw in or out.

This system was specifically designed to change a choke(s) to more constriction or less constriction by removing the old choke(s) section and installing a new choke(s) section. The installation is completely invisible. There is no external barrel(s) change or alteration. It's all inside!

## WALKERCHOKE TUBE SELECTIONS

Choke constriction is the smallest inside choke section diameter subtracted from the bore inside diameter.  
(Bore I.D. — Choke I.D. = Choke Constriction)

Our system is based on the standard bore diameter for each gauge. If a bore is not standard in diameter, larger or smaller, this can be compensated for by choosing the appropriate WalkerChoke with the internal diameter that will give the desired choke constriction. The most common error is to assume that one choke constriction will deliver the same pattern with all sizes of shot. It will not. A rule of thumb is that larger size shot will require less choke constriction, smaller size shot more choke constriction.

Choose the WalkerChoke tube that gives the necessary amount of constriction for the selected pattern density at the selected range. In other words, the WalkerChoke offers the shooter complete control of his patterns with all shotshells, all shot sizes, at all known shotgun ranges.

Please specify Standard or Full Thread when ordering tubes.

### WALKERCHOKE TUBES

10-gauge using .775 inch as standard bore I.D.

ORDER NO.	CHOKE DESIGNATION	I.D.	CONSTRICTION
1001	Cylinder	.775	.000
1002	Improved-Cylinder	.765	.010
1003	Modified	.750	.025
1004	Improved-Modified	.745	.030
1005	Full	.735	.040
1006	Xtra-Full	.730	.045
1007	Maximum-Full	.725	.050

### WALKERCHOKE TUBES

12-gauge using .730 inch as standard bore I.D.

ORDER NO.	CHOKE DESIGNATION	I.D.	CONSTRICTION
1201	Cylinder	.730	.000
1202	Skeet-1	.725	.005
1203	Improved-Cylinder	.720	.010
1204	Skeet-2	.715	.015
1205	Modified	.710	.020
1206	Improved-Modified	.705	.025
1207	Maximum-Modified	.700	.030
1208	Full	.695	.035
1209	Xtra-Full	.690	.040
1210	Maximum-Full	.685	.045

## WALKERCHOKE TUBES

16-gauge using .670 inch as standard bore I.D.

ORDER NO.	CHOKE DESIGNATION	I.D.	CONSTRICTION
1601	Cylinder	.670	.000
1602	Improved-Cylinder	.663	.007
1603	Modified	.655	.015
1604	Full	.640	.030
1605	Xtra-Full	.635	.035

## WALKERCHOKE TUBES

20-gauge using .620 inch as standard bore I.D.

ORDER NO.	CHOKE DESIGNATION	I.D.	CONSTRICTION
2001	Cylinder	.620	.000
2002	Skeet-1	.617	.003
2003	Improved-Cylinder	.615	.005
2004	Skeet-2	.610	.010
2005	Modified	.605	.015
2006	Improved-Modified	.600	.020
2007	Full	.595	.025
2008	Xtra-Full	.590	.030
2009	Maximum-Full	.585	.035

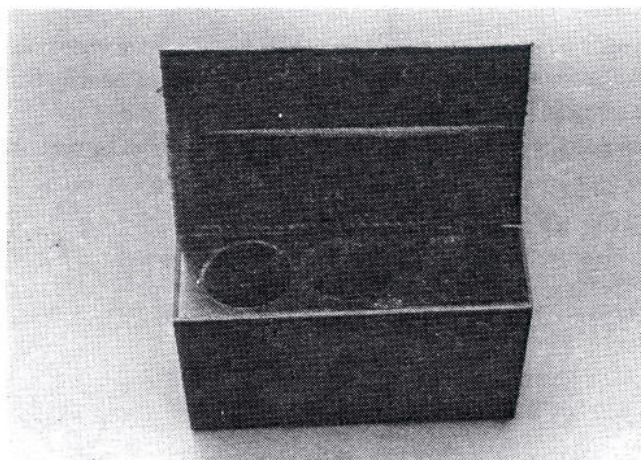
## WARRANTY

We fully guarantee any WalkerChoke Tube against manufacturing defect. We will promptly replace free of charge any tube returned to us that has not been abused, misused or altered with a tube of the same dimension specification.

We do not have control of the quality of installation of this system by others; therefore, no warranty or liability is implied or assumed under any conditions. The installer must accept full responsibility and liability for this work.

## CHOKE TUBE BELT POUCH

This is a three extra tube pouch designed to fit onto a 2" wide belt. It includes a choke gage/wrench compartment and velcro closure on the top flap, and is made from solid wood for maximum tube protection with brown naugahyde covering and heavy stitching. 12-16-20 gauge. Standard or full thread tubes: \$15.00 prepaid.



TRAIL FIREARMS

6519 - 104 Street

Edmonton, Alberta

T6H 2L3

(403) 437-1274

Offering Walker Choke Tube installation for 12 and 20 gauge shotguns, as well as forcing cone lengthening and barrel honing.

RETAIL PRICE LIST

Install Walker Full Thread tubes, w/ 1 tube	\$ 90.00
Extra Full Thread tubes	\$ 35.00
Installation with three tubes	\$ 150.00
Install walker sleeve choke	\$ 75.00
Lengthen forcing cone	\$ 35.00
Hone barrel and chamber	\$ 35.00

Twenty percent discount offered to holders of firearms dealer's permits. Shop demo barrels, ( one per shop ) will be done for half of the retail price.

DELISLE THOMPSON SPORTING GOODS LTD.  
1814-A LORNE AVE.  
SASKATOON, SASKATCHEWAN  
306 653-2171

### WALKER ARMS SCREW IN AND SLEEVE CHOKE SYSTEMS

We are pleased to announce that we have been appointed as an authorized installation center for the superb Walker Full-thread, Series "B" thread, and sleeve choke systems.

The Fullthread Walker System: In this system the tube is threaded directly into your barrel. This is our most popular system as there is no swelling or swaging of the barrel required. The choke tubes are flush with the muzzle, almost invisible. They do not require the use of a special wrench to remove them as many choke tubes do (a 25 cent piece works great!).

The barrel must have a minimum outside diameter of .820 inch at the muzzle to utilize this system.

The choke tubes are 1 7/8 inches in length with a full 1 9/16 inches of thread to give maximum shear resistance when used with magnum or steel shot loads.

The Walker Series "B" System was developed for the use of a thick wall choke tube. The thick wall choke tube is more resistant to steel shot deformation than the fullthread tubes. With the use of steel shot any choke or choke tube will be come damaged with use over a period of time. The thick wall tubes just take longer for this to occur before you need to replace your tubes.

With this system we use a special reamer to remove about 2 1/2 inches of your original barrel, undercutting the vent rib if your gun is so equipped. A new tapered section is sleeved onto the original barrel and the rib reattached.

This new tapered section has a greater wall thickness than the original and is threaded to take the choke tube. The overall appearance is that of many of the new shotguns on the market today where the barrel progressively gets larger in diameter towards the muzzle.

Unlike the Fullthread system which can be used on any style of gun, the Series "B" can only be fitted to single barrel guns.

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