

Secrets of the Houston Warehouse

by Dave Scott (*Originally Published in Precision Shooting Magazine's "Special Issue No. 1" in 1993*)

Editor's Introduction: Many, many years ago, when the earth was young, and the oceans still covered much of the land, and dinosaurs were to be found on every street corner... okay, if you insist on a date, it was 1993... we published the first of five Special Issues... and in a burst of creativity, we elected to call this one "Special Issue No. 1". Unfortunately, the first two Special Issues are long since sold out, and those few that infrequently come on the market often carry price tags that look like the Gross National Product figure of some third world countries. That first issue carried an article by Dave Scott that we still receive a dozen or more calls a month asking for copies of. After a half dozen calls this week, we have decided to save ourselves a lot of wear and tear on our photocopier, and reprint the article... one of the most popular, and most quoted pieces that we ever carried.

Update: In November 2012, Precision Shooting Magazine announced that after 56 years of publishing their monthly magazine they have decided to close their doors. Precision Shooting was a serious journal that advanced our understanding of firearms technology and excellence in the shooting sports. While this was a sad day for the shooting community, we are fortunate to still have access to this landmark article. Thank you to Editor Dave Brennan, his employees, and his ranks of writers for the years of thought-provoking reading.

In 1975, when a Houston concrete contractor opened the doors of his new business venture, the event didn't exactly make ripples among the benchrest community. The project, an enormous warehouse on Houston's east side, was built solely to be leased for industrial storage. And if the event went unnoticed, its builder, Virgil King, was equally unknown to group shooters. No one could have predicted that the Houston Warehouse and Virgil King would write one of the more fascinating chapters on the subject of extreme rifle accuracy.

From the beginning, the warehouse was utilized as planned. First, tons of telephone directories were stacked on its floor; then an oil company leased the structure to store plastics.

All the while, Virgil and a neighbor, veteran shooter Bob Fisher, were kicking around an interesting idea. Even though the building was in full use, it had an unobstructed fire lane that was 30 feet wide and ran the full length of the mammoth structure — 325 yards. Moreover, although employees of the leasing oil company were in and out during the work day, the building was deserted nights and weekends. Virgil saw an opportunity to test his most accurate gun, a Shilen-barreled .25/06 hunting rifle, in ideal shooting conditions.

Bob Fisher, a benchrest shooter, had other things in mind. He was awed when first he stood in the enormous warehouse. The floor was thick concrete, poured to withstand hundreds of tons of storage. The walls were 6" concrete without windows. The roof soared 45 feet above floor level. In short, it was obvious to Bob that this building had the potential of becoming the best shooting environment an accuracy fanatic ever popped a primer in. It literally was a benchrest shooter's dream come true, the Camelot of shooting ranges. Here, the breezes never blew, the mirage never shimmered, the sun never set and the rain never fell. Even the harshness of the weather, either heat or cold, was moderated by the insulating properties of the walls and steel roof.

The two shooters began by constructing a combination bullet trap and target holder utilizing sand contained between walls of 1 1/2" steel plate and a face of 3/4" plywood. Although the heavy device was mounted on casters, Virgil decided it would remain



Although the actual Houston Warehouse location is shrouded in mystery, this photo helps us to understand the compelling vision Virgil King had to use his 30' wide, 325 yard long straightaway in the middle of his warehouse as the ultimate precision shooting laboratory.

stationed against a wall at one end of the warehouse. To change shooting distances, the bench would be moved along the fire lane.

The warehouse already had fluorescent lighting throughout, but special illumination would be needed at the target. Bob Fisher, an electrical contractor, wired a mix of mercury vapor and quartz lighting. In combination with the fluorescent lamps, it faithfully reproduced normal outside lighting at the target. With the exception of a portable floor lamp used to eliminate shadows, the lights were mounted on the ceiling to prevent their heat from interfering with sighting.

The two shooters built a sturdy, wooden bench but quickly abandoned it when they discovered that placing a hand on its top displaced the crosshairs at the target. They also committed a major error in constructing the bench and stool as a single unit. Every bodily movement was transmitted to the rifle. The shooters correctly decided there was no point in having a million-dollar shooting range with a two-bit bench.

Determined to convincingly rectify his initial mistake, Virgil poured a massive 700-pound concrete bench consisting of a 6"-thick, steel-reinforced top perched on three legs of 6" steel pipe. To be on the sturdy side, he ran iron rods inside the legs and filled them with concrete. The stool was also three-legged and independent of the bench.

Since this ponderous shooting platform was a tad hefty to be manually hauled about, a heavy industrial caster was mounted on an eccentric at the foot of each leg. Rotated down, the casters allowed the bench to freely roll. With the casters raised, the bench sat solidly on its legs.

With the range now perfected, a minor and somewhat nagging difficulty had to be overcome. In the sealed environment of the warehouse, there was no breeze to dispel the mirage rising from a heated barrel. Because a scope tube's bulk may damage a fragile scope, or the tube itself may heat up and introduce mirage, fanning the barrel with a piece of paper became standard procedure for a while.

Finally, in a bold stroke of technological innovation, Bob brought in a small electric fan. Carefully directed over the barrel, the puny appliance effectively cleared away the barrel mirage. Care was exercised, however, not to allow errant air movement to invade the sensitive muzzle area and thereby deflect the bullet from its true path.

And so began perhaps the most insightful, revealing experimentation into practical rifle accuracy ever conducted. Over a period of six years, the levels of accuracy achieved in the Houston Warehouse went beyond what many precision shooters thought possible for lightweight rifles shot from sandbags and aimed shot-to-shot by human eye. For the first time, a handful of gifted, serious experimenters — armed with the very best performing rifles (with notable exceptions) — could boldly venture into the final frontiers of rifle accuracy, a journey made possible by eliminating the baffling uncertainties of conditions arising from wind and mirage.

Under these steel skies, a shooter could, without question, confirm the absolute limits of accuracy of his rifle, or isolate the source of a problem. In the flawlessly stable containment of the Houston Warehouse, only four general categories of accuracy problems were possible: the rifle, the scope, the load, or the shooter. For the first time, a very few exceptional rifles would display the real stuff, drilling repeated groups measuring well below the unbelievably tiny .100" barrier. The bulk of rifles, however, embarrassed their owners.

For the most part, shooters arrived at the warehouse with troubles. Their rifles were inconsistent — one group in the teens, the next in the .3's — for reasons they could not fathom. Others had consistent .25" to .30- something rifles, an accuracy level guaranteed to put a competition shooter down near the bottom of the pack. With the list of potential problems significantly narrowed by the elimination of moving air and dancing heat waves, the answers were easier to isolate in the warehouse, and shooters drove hundreds of miles or flew into Houston to get to the source of their tribulations.

Some of the best benchrest marksmen in the nation showed up with rifles they hoped would somehow perform much better in Virgil's concrete sanctuary than out there where the flags flutter. Still others wanted merely to shrink the bullet dispersion of a superb rifle a few additional thousandths of an inch by careful tuning, a task that could not be accomplished at an outside range cursed with the vagaries of natural conditions. Some departed enlightened. Others stalked away disgruntled.

The discoveries made there, some reported in Precision Shooting by T.J. Jackson, were sometimes controversial, but always fascinating. Circulating around at that

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time were mutterings that the warehouse conditions were flawed and the shooting there invalid. From what I knew about the warehouse, I wondered how anyone could fault it. After all, some of the shooters were firing numerous consecutive groups measuring "in the zeros." Flawed conditions, indeed!

For those of us who are strangers to groups "in the zeros," we're talking about 5 shots at 100 yards that are, at first glance, indistinguishable from a single shot. The bullets sizzling through the same hole merely worry away the tortured edge of the target paper in varying degrees until the hole is enlarged less than .100" over bullet diameter. Often much less.

For years, many of us expectantly thumbed through the pages of Precision Shooting, searching for more information from the Houston Warehouse. Col. Jackson, a highly respected benchrest shooter and gunsmith who frequented the warehouse, occasionally dropped us a crumb — and sometimes a bomb. But it was never enough. In late 1985, two years after the warehouse mysteriously passed into obscurity, a frustrated Dave Brennan confessed that one of the great disappointments of his editorship was that he had never received a comprehensive write-up on the shooting that went on there.

In 1983, as suddenly as it all began, the Houston Warehouse shut its doors to the men who mysteriously arrived in the night. The gunshots faded away. And with them died the hopes of many of us. Now we might never know what happened behind those sturdy concrete walls. Gone was the possibility, however remote, that any one of us would ever sit at the massive bench and launch a bullet into perfectly still air. With sinking hearts, we realized it was the end of an era that might never come again.

In June of this year [1993], I contacted T.J. Jackson in Austin and asked if he would consent to an interview on the Houston Warehouse. T.J. graciously offered to help, but suggested I contact Virgil King, since only Virgil was present every time shooting occurred in the warehouse. T.J. had reported in PS that Virgil was the primary shooter. Col. Jackson described him as having a superior delivery — "delivery" meaning bag technique, or the mechanical ability to return, position and fire the rifle identically each time. Unfortunately, T.J. had no idea how to contact Virgil.

Three nights after I talked to T.J., the phone rang at 9:45. The caller introduced himself as the caretaker of the Houston Warehouse. Virgil had read my recent Precision Shooting article on neck clearance and wanted to discuss some of his thoughts on that subject. Somewhat stunned at this fortunate coincidence, I listened intently for over an hour as Virgil spoke of case necks, shooters and the Houston Warehouse experience. Finally, I asked if he would be agreeable to an interview. He was reluctant, but at least I managed to obtain his phone number.

"The shooting would generally start about 10 at night," he began. "Everything settled down, and the air got real still. It just felt right. Then it was like shooting outside, except there was no wind or mirage. If you had a rifle that would shoot, it would shoot. If you didn't, you found out pretty soon that you had a problem."

A couple of weeks later, after several abbreviated conversations with his answering machine, I reached him again. This time, Virgil kindly consented to sparing me a couple of hours to tape a conversation on shooting and the warehouse. In order that neither of us spend all morning driving, Virgil suggested we meet about halfway between our homes — at Shilen Rifles in Ennis, Texas.

On the appointed day, Ed Shilen, a mutual friend of Virgil's and mine, introduced us, then departed for an afternoon of sailplane soaring. In the quiet of Ed's office, Virgil began to vividly sketch what many of us had tried to envision. He spoke with great clarity and sharp memory of events that concluded a decade ago.

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"Downrange at 100 yards," he continued, "if a rifle was really cooking, through the spotting scope you'd see the hole in the target open up black when the bullet passed through, then the paper would spring back and close a little bit. And if the group was .035" or so, you couldn't see the difference between it and one bullet hole through a 36X spotting scope."

A unique feature of the Houston Warehouse was the fact that it indeed had similarities to shooting outside. Unlike shooting tunnels, where the shooter must wait between shots for powder gases and heat to clear, firing in the vast expanses of the warehouse could be conducted at any pace. The offending products of combustion rapidly floated to the roof, high above.

As already indicated, of the handful of riflemen who ever fired in the warehouse, a high percentage had problems. On occasion, experimentation would continue all night or all weekend, as a shooter refused to accept the fact that his rifle simply was not going to perform. When this occurred, Virgil and his shooting guest spread cardboard on the hard warehouse floor and rested periodically, then went back to it again.

"It was pretty frustrating," Virgil admitted, "because in the warehouse I could fire three groups in any rifle and tell you if that rifle was going to shoot really well."

"Still," Virgil explained, "I felt that I owed any shooter who either drove hundreds of miles or flew into Houston the opportunity to prove to himself that his rifle just was not going to shoot. If that took hours or days, that's the way it was going to be."

Numbered among those who showed up with rifles not measuring up to expectations were distinguished personages such as Don Geraci, Harold Broughton, Ed Shilen, Frank Wilson, Henry Christman, John Jones, Wilbur Cooper, Col. Jackson, Jim Goddard, Jim Williams, and Bob Fisher. Most of the disappointed shooters reworked their equipment and returned. Those who returned generally trotted out vastly improved guns.

That's not to say that the bulk of rifles showing up there — even the reworked ones — would shoot in the zeros. Virgil estimated he could count on his fingers the rifles he had seen that would consistently shoot to this awesome accuracy level. T.J. Jackson owned two such rifles, both chambered by him for 6BR. One of his rifles, a Heavy Varmint class gun, consistently shot .050". The other, a lighter rifle, would hold at about .060". T.J. also built an exceptional 6PPC for a customer, which T.J. later purchased. Why? We can assume part of the reason is that it grouped at the .050" level. Frank Wilson had two rifles that would shoot in the zeros, but only after they had been reworked.

"We figured any gun was really shooting," Virgil explained, "when it would shoot five consecutive groups that were identical in shape and less than .080".

The most accurate rifle ever to punctuate the stillness of the Houston Warehouse happened to be Virgil King's own 10 1/2-pound Light Varmint benchrest rifle. The rifle was built around an action made to Virgil's specifications by Houston shooter Wilbur Cooper, a mechanical engineer, master machinist, and fanatical perfectionist. The action was machined from #416 stainless steel and had an integral sleeve extending 5/8" forward around the barrel, but not touching it, to provide additional bedding surface. Virgil said the tolerances were held so close in this action that he estimated, as an example, that the clearance between the bolt and boltway measured perhaps a minuscule .0001" on all sides. Consequently, simply inserting the bolt took a measure of concentration.

T.J. Jackson chambered its Shilen Select Match Grade 8-groove barrel for a .050"-shortened version of the 22PPC. He also turned the outside of the barrel to ounce-saving dimensions which permitted an oversized #7 contour to be used without the rifle exceeding the weight limit for Light Varmint class. The barrel was cut to 21 3/4" and target crowned.

Lapping compound was then smeared on the barrel threads, and by applying outward pull, the barrel was lapped into the action threads for full, positive contact. Virgil pointed out that if this procedure is not accomplished, only one thread or parts of one or several threads may be making contact. Anything less than full thread contact, he underscored, is destructive to finest accuracy.

During the lapping operation, great care was exercised to align the barrel straight with the receiver. Virgil used no mechanical means. He simply used his hands and a delicate degree of "feel." He stressed that this step should be done with great moderation. A little lapping here goes a long way.

Part of the reason for lapping-in the barrel and receiver threads is to help center the barrel in the precise middle of the receiver. The superb precision gunsmiths who build benchrest rifles correctly cut the barrel threads slightly loose. While this serves several essential purposes, there is no guarantee that the barrel will "center" when it's run up and tightened. Lapping helps eliminate this uncertainty.

Virgil confessed that lapping would not have been necessary on his rifle if he, Wilbur Cooper, and seasoned shooter John Jones had not been tardy in developing an important innovation in the mating of the barrel to the receiver. Too late to benefit Virgil, the three jointly conceived the idea of undercutting a 45-degree slope on the inside edge of the receiver ring, leaving about two-thirds of the receiver shoulder untouched and square. Another 45-degree slope, cut farther inside the receiver (on a Cooper action), terminated at the locking lugs. With the barrel precisely cut to snug up against the two sloped areas, as well as the receiver shoulder, perfect barrel centering became absolute and positive.

With the lapping done, Virgil next disassembled his Burns conversion Remington trigger and polished it to a mirror-smooth finish, setting it at a delicate 1/4 ounce. He also specified that the firing pin spring inside the bolt be as strong as feasible.

The barreled action was zero-tolerance bedded and then glued in a McMillan stock. Two action screws were also installed in place. In tuning this finely accurate rifle, Virgil firmed up the middle screw to correct a tendency for slight vertical dispersion.

He mounted a Lyman-Siebert 30X scope in Bausch & Lomb rings that had been painstakingly lapped so only a tiny amount of crosshair correction was needed to bring the gun on target. The rings were set on Weaver bases.

The finished rifle made its weight limitation by the skin of its teeth, which did nothing for the appearance of this exceptional gun. Spraying the stock would have catapulted it into the Heavy Varmint ranks. Therefore, the stock permanently retained its unfinished fiberglass appearance.

If the rifle looked like the devil, it shot like the hammers of hell. "Day after day, week after week," Virgil recalled "it would NOT shoot a group in the warehouse bigger than .070". You had to cheek it or thumb it to get it to shoot that big. Generally, it shot .035" to .050", with most groups holding around .035". But now and then you'd sneak one in a little better than that."

Friends, we're talking about firing group after group approximately the same size as the gap on your spark plugs. This, with the barrel cleaned between every six shots — one group plus one fouler. But didn't he get an occasional larger group? Something really horrible, something maybe in the (shudder) teens? "Not unless you did something wrong," Virgil responded indignantly, flinching at the implication of his rifle sinking to that dismal level.

How could the rifle and the man behind it be that consistently accurate? Virgil told me in great detail. "First, you shoot free-recoil. After a while, after all the thousands of rounds I fired in the warehouse, I developed a technique that was practically infallible. I did exactly the same thing every shot. I was like a machine, and once you find out what works, you don't change anything. We discovered that if you want a gun to really shoot, you can't cheek it, you can't shoulder it, you can't hand it, you can't thumb it. The only thing you touch is the trigger, and I tried to put my fingerprint on the trigger exactly where my last fingerprint was. I didn't even touch the bench. I planted my feet solidly on the floor and kept them right there.

"Your shoulder should be 3/16" to 5/16" from the stock so you can catch the rifle immediately when it recoils back," Virgil advised. "Otherwise the rifle will get back too far and disturb the rear bag."

The rear bag and the way you manage it is crucial, Virgil explained. First, he positioned the rifle on the bench so the stock barely protruded from the "V" of a rabbit-ear bag, then he pounded the stock firmly into the bag. As already mentioned, when the rifle recoils, it's important that the bag stay put. With proper bag technique, when the rifle is returned to its firing position, any sight corrections should be slight and made by tiny manipulation of the rear bag. The less bag adjustment, the better. Consistency is everything.

Virgil packed his rear bag very firm with casting sand, which is about 33% heavier than common sand. He then applied water and formed the "V" to the rifle stock by pounding the stock into the bag and allowing the leather to dry. Done only once, this step hardens the leather and makes the stock slide smoother. A mixture of equal amounts of talcum powder and white graphite applied to the back and front bags provided smooth sliding of the rifle, even in very humid conditions.

He packed the front bag as hard as iron. Here he employed a one-to-three mixture of Portland cement and casting sand. The cement doesn't set, but it does help hold the bag shape by resisting the twisting force imparted to the fore-end by bullet torque.

Virgil fired his many zero-level groups without any side support for the front bag, but he strongly advocates the pedestal fore-end stop. He adjusted the stop so the front bag supported the fore-end about halfway from the end of the fore-end to the receiver. He said if the bag is positioned farther forward, this part of the stock is too springy, and accuracy will suffer.

When Virgil returned his rifle after firing, he bumped the fore-end stop and then pulled the rifle back "one-millionth of an inch." In the warehouse, he found that contact between the stop and stock tended to deteriorate accuracy.

The Houston Warehouse was the perfect setting for building a load. In years of watching his rifles and a few others punch microscopically enlarged holes in targets, he recorded some interesting observations. "In the summer," Virgil noted, "the sharpest groups we could get out of the 6PPC was with Winchester 748 powder. But when the temperature fell below, say 70 degrees, it wouldn't shoot. We'd have to go to H322." His Gilmore-chambered Shilen 8-groove 6PPC barrel on the Cooper action produced groups a bit looser than the 22PPC barrel, averaging about .070".

In this shortened 22PPC, he used IMR4198 exclusively. He adopted this powder after Don Geraci, an advocate of 4198, visited the warehouse. Although 4198 has a reputation for

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Within limits, neither did powder charge. Virgil threw his charges from a Culver conversion, and the grain-cutting operation obviously gave him reasonably consistent results with the long, little kernels, considering the excellence of the resulting groups. He did, however, later use a Belding & Mull powder measure in order to lessen the grain-cutting problem.

Powder charges, as long as they were fairly consistent and bracketed within a couple of grains, were not important, he said. On one occasion, as an experiment Virgil shot one group with his 6PPC barrel on the Cooper action using a 53 Culver setting of Winchester 748, the next 52 and the third 51. All three groups were identical.

He shot the now-discontinued 68-grain Remington Bench Rest Bullets in his 6PPC barrel and 52-grain Remington Bench Rests in the 22PPC. "I decided on the Remington bullet in the beginning," Virgil explained. "I developed my brass to work with it, and I really didn't experiment with any others."

Virgil added that although he never saw an inaccurate primer, he went with the prevailing opinion and used Federal 205M's. They were seated with a Lee tool, and he was unable to detect any accuracy variances resulting from seating pressure. Apparently, as long as the primer isn't crushed and ruined in seating, nothing else in seating really matters.

One thing that IS important is that the bullet be precisely seated against the lands. T.J. Jackson reported this fact in the May 1987 issue of Precision Shooting. In a letter to the Editor, T.J. wrote, "...in all our testing in that Houston warehouse... and the dozens and dozens of groups that Virgil King shot in there 'in the zeroes'... he NEVER fired a single official screamer group when he was 'jumping' bullets. All his best groups were always seated into the lands, or at the very least... touching the lands."

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Virgil said his practice was to seat the bullets so the engraving was half as long as the width of the lands. He noticed an interesting phenomenon with rifles that could really shoot: if the bullets were seated a little short and the powder charge was a bit on the light side, the groups formed vertically. As he seated the bullets farther out and increased the powder charge, the groups finally became horizontal. If he went still farther, the groups formed big globs. He said the trick is to find the midway point between vertical and horizontal. That point should be a small hole.

What were the velocities of his loads? Virgil doesn't know or really care. "I didn't work with chronographs," he said, "because as long as a bullet went into the same hole as the previous one, it didn't make any difference how fast it was traveling." He confided, however, that his load of 4198 in the 22PPC was a shade on the warm side.

Building a load is important, Virgil conceded, but "tuning" cases is what stands between you and that final fraction of an inch that separates a good gun from a barn burner. "Tuning" cases goes far beyond sorting, neck turning and prepping the primer pockets and flash holes. These case refinements will get you only so far, Virgil stressed. To produce cases capable of shooting groups better than the guy at the next bench, you have to go the extra mile. And you make the journey with sensitive hands and a piece of #400 sandpaper.

For Virgil, the process started by purchasing a substantial number of Sako .220 Russian cases. (Yes, Virginia, there once was such a case.) After the cases were weight sorted, he annealed the necks with a small propane torch. He then loaded Bullseye powder behind toilet paper bullets and fired the rounds in a special rifle assembled for this purpose. The necks of the fire-formed cases were next inside bored. This was accomplished on a precision lathe, with the necks supported in a die during the operation.

Virgil would then outside turn the necks for a total clearance of about .0007" between loaded round and chamber. Since the neck turner left cutting rings, Virgil sanded the necks shiny smooth, which typically resulted in a somewhat widened neck-to-chamber clearance of

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.00075". He emphasized that until the hills and valleys were smoothed, the case neck was prevented from laying flat against the chamber. Flash holes were cut identically and chamfered inside, but he didn't uniform primer pockets or turn the case bases. He also had not the foggiest idea what amount of case-wall variances existed in any of his brass, but in those excellent Sako cases, probably not much.

Then came the final, critical step — the step requiring a sensitive touch and #400 sandpaper — the "tuning" step. "The secret," Virgil said, "is to get the neck tension — the grip of the brass on the bullet — exactly the same on every case. You do this by firing the case and then feeling the bullet slide in the case neck as you seat it. Here, a micrometer won't do you any good. Feel is the whole thing. If any case grips the bullet harder than the others, you take three turns over the sandpaper and fire it again, until you get exactly the same amount of seating pressure. Until the necks were tuned, I didn't feel I was ready to start tuning the gun."

Virgil continued: "You can change the powder charge slightly, and it won't really make any difference, but if you change the bullet seating depth or the grip on the bullet, you're going to see bad things happen fast."

After a case has been fired a couple of times, another condition is created in the neck that requires sensitive feel. A tiny groove pressed into the neck by the pressure ring on a flat-base bullet causes the bullet to "snap" into place when it's seated. Virgil emphasized that feeling the bullet slide down the neck and then snap into place told him everything he needed to know about whether that round was going to go into the group or not.

To sense these critical events, Virgil seated bullets in a Wilson straight-line tool BY HAND — not arbor press. He estimated that the seating pressure on his hand was moderate — perhaps 15 pounds. If seating requires significantly more pressure, the operation damages the bullet's fragile pressure ring, bulging your groups. If the seating pressure is too light, he said you're assured a mediocre .250" rifle.

Virgil did not size his case necks. With about .00035" clearance on all sides between the loaded round and chamber neck, the natural spring-back of the brass, in combination with his neck preparation, correctly gripped the bullets. Some other warehouse shooters, including T.J. Jackson, followed the same practice.

Cases, however, did wear out. Virgil estimated that a case would no longer grip and "snap" to his satisfaction when it had been recycled 20 to 25 times. It was then discarded.

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What about barrel life? In the warehouse, more than anywhere else, it could be accurately gauged, because even a tiny loosening of group size would be detected. From his experiences and those of others, Virgil estimated that stainless steel barrels chambered for the common .22 and 6mm benchrest cartridges are pretty well over the hill at 1,000 rounds. But the finest accuracy sharpness of a barrel departs much sooner. Noticeable deterioration may begin at about 700 rounds. He admitted these figures could vary widely for obvious reasons reflecting barrel care, cleaning technique and cartridge velocity levels.

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"If a gun was shooting one .250" group and then a .350", "Virgil said, "usually we couldn't help things much. Typically these guns would put three or four bullets in one hole and have the rest hanging out." These were the rifles that often were reworked and then brought back for another round in the warehouse.

Interestingly, a rifle — whether it performs well or horribly — shoots in predictable patterns. In his PS writings, T.J. Jackson observed that in the warehouse an excellent

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rifle would shoot the same size and shape group time after time. But if you changed anything, such as bullet seating, the size of the group or the shape or both would change. Virgil certainly agreed and added that with a truly flawed rifle he could call every shot, whether left, right, down or up, before he nudged the trigger "The gun follows a pattern every time," he noted. "It shoots the same group in the same order according to the cleanliness of the barrel." In other words, the predictability applied only when the rifle was cleaned between groups.

Virgil pointed out that one of the problems with the 4198 powder used in his highly accurate 22PPC was that it burned dirty. In warehouse shooting, when he was in hot pursuit of zeroes groups, he cleaned his barrel with a bronze brush and solvent after every six shots — one fouler and one group.

But at regular intervals the barrel had to undergo a scrubbing with J-B compound to remove solvent-resistant fouling 3" to 4" up from the chamber. Although the fouling couldn't be seen with the unaided eye, Virgil could feel it with the cleaning rod. With the constriction constantly controlled, the rifle would maintain its keen standard of accuracy. Virgil would have preferred H322 because it was the cleanest-burning powder he tried in the 22PPC. Unfortunately, the rifle was uncooperative.

"The gun follows a pattern every time," he noted. "It shoots the same group in the same order according to the cleanliness of the barrel." In other words, the predictability applied only when the rifle was cleaned between groups.

But no bit of information was, Virgil believes, more valuable than a little advice Jim Gilmore passed along. Jim said a barrel MUST be 21 3/4" long for optimum accuracy. That precise length, he stated, sets up a vibration pattern that duplicates well from shot to shot.

Rumors have persisted for years that some rifles shoot proportionally better at 200 yards than 100 yards, or vice versa. Virgil files that one under "occultism." His experience in the warehouse was, if a rifle was shooting a consistent .100" at 100 yards, it shot a consistent .200" at 200 yards. He admitted, however, that his knowledge here is limited, because in the warehouse they rarely fired at 200 and 300 yards.

Virgil absorbed a wealth of information from the experienced shooters who visited the warehouse. Don Geraci introduced him to IMR4198. Harold Broughton referred him to Wilbur Cooper. John Jones and Henry Christman instructed him in the proper shooting technique. And there were many other valuable lessons from perhaps the most knowledgeable people in the sport.

But no bit of information was, Virgil believes, more valuable than a little advice Jim Gilmore passed along. Jim said a barrel MUST be 21 3/4" long for optimum accuracy. That precise length, he stated, sets up a vibration pattern that duplicates well from shot to shot. Virgil faithfully followed that advice on his guns.

Anyone who strictly observes the 21 3/4" doctrine will screw off a failing barrel of that length and run a new one under it. Rechambering and rethreading, in order to achieve more pristine lands just forward of the throat, shortens the barrel. Shorten the barrel, spoil the magic length.

Through the years, the Houston Warehouse shooters were able to rate the relative accuracy of the various benchrest calibers — .22, 6mm, and .30. In the perfect conditions of the warehouse, the .22's outshot them all, followed closely by the 6mm's. The .308 calibers were a not-too-distant third. The most accurate .30 caliber ever to find its way into the warehouse also belonged to Virgil. The rifle, built around a Shilen DGA action with McMillan barrel, shot consistently within a few thousandths of .100". The barrel length? You guessed it: 21 3/4".

During the six years the Houston Warehouse was in use, less than thirty shooters were invited there. Part of the reason for such a small roster of participants was the sheer complications of the situation. First, there was no way Virgil could allow people to come and go as they wished. The warehouse was leased out and filled with thousands of dollars worth of materials belonging to someone else. Then there were always the liability and insurance problems associated with the risks of firearms use.

There also was a ticklish problem concerning the legalities of shooting there. Technically, it was against the law, because the warehouse was within the city limits of Houston. When the police knocked on the door — and they did regularly in response to the noise of gunshots — Virgil was often left with some heavy-duty explaining to do. Consequently, of necessity he had to be there any time the warehouse was in use.

To further complicate matters, preparing the range for shooting and then putting everything away was a laborious and time-consuming task, and the shooting itself consumed many

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hours. Since things usually began late at night, a typical shooting session usually put Virgil home about the time his alarm clock went off.

But frankly, Virgil also is a direct and unpretentious man who expects more honesty and integrity from his acquaintances than most of us. If he had reason to dislike or distrust a fellow shooter, that individual was not going to shoot in the warehouse. And that was that.

Of the superb shooters Virgil watched while he was shooting competitively, he rates Ron Prachyl of Dallas as the most gifted. "Ron is a real shooter, not a warehouse shooter," he pointed out. "If Ron had owned my rifle, he would never have lost any match of any type."

If, by the preceding statement, Virgil is suggesting that his own accomplishments and abilities are somehow less than outside shooters, the obvious must be stated. In the warehouse, not even the best competitive shooters in benchrest approached what Virgil was routinely able to do. His long, consecutive strings of zero-level groups, fired over a period of years and witnessed by other shooters, stand alone. Had he pursued competitive shooting with the same dedication and fierce concentration, undoubtedly his accomplishments outside would have been as impressive.

Years of warehouse shooting till the small hours, punctuated by occasional competition, finally took their toll. Although he won matches at Tomball, Lafayette, Lake Charles, New Braunfels, Austin and Knoxville, Virgil eventually confronted the fact that the shooting that used to be such fun had become work. He was burned out. Worse, he found himself habitually grieving over several humiliating encounters with the shooting conditions at Midland. He gave his beloved 22PPC to Ralph Council and slammed the warehouse doors to shooting. He didn't even save any of the remarkable targets.

The keys to the Houston Warehouse still jingle invitingly in Virgil's pocket. The bench, target holder and all-important fan are still there, collecting dust. But although the warehouse stands in readiness, Virgil has no intentions of ever firing there again. That's not to say, however, that he's through with shooting. Now and then he stokes up his Shilen-built .30-06, and on his backyard range near Palestine, Texas, fires three shots into an admittedly larger hole than he once was accustomed. Then he goes on to other things, and there's a wide selection of these. Even though he's officially retired, Virgil defines "retirement" as working harder than he ever has at the things he loves to do. That includes his present avocation, raising race horses.

As Virgil was voicing concern over a sick cow at home and the dangerous "killer" horse he regretted having to sell, a customer opened the door of Ed Shilen's office and asked where Ed was. Virgil replied that Ed had left for a local bar and probably would be there all evening. This less-than-accurate answer obviously satisfied the man. As he nodded knowingly and closed the door, Virgil glanced at his watch and jumped to his feet. He had scheduled this to be only a two-hour interview, and three hours had passed. He had pressing matters back at the house.

As he walked away, I had one final question. "Virgil," I called as he opened the door, "was there a secret you did NOT tell me?"

That stopped him in mid-stride. He stared at me for a few seconds, then broke into a broad smile. "I didn't tell you about how I finally got my 22PPC to arc."

"Arc?" I responded dully.

"Arc," he repeated. "There was one final thing I discovered late in the game. It had the rifle down to a consistent .025" in the warehouse."

I felt the sweat pop out on my brow. Now, it was me who did the staring. "Well, are you going to tell me what it is?" I finally managed to ask in my most persuasive, bordering-on-begging tone of voice.

"It was in the preparation of the brass," he said simply, then turned and walked away.

Now, if my high school math hasn't failed me again, the man just said he had suddenly trimmed those huge, gaping .035" groups by about one-third!

On a quiet night, when your annoying neighbor has borrowed your latest issue of Precision Shooting you haven't read, and there's nothing but reruns on the tube, that parting shot from Virgil King ought to give you something to think about.

