

## It's a Gas, Man

For some, carbon dioxide is much more than an industrial waste-product to blame for one of the planet's biggest threats. Vilified as this heavy gas may be in our age of environmental enlightenment, some airgunners recognize the beauty of Co2 for its properties as a lovably quirky airgun propellant. And while other shooters might turn up their noses to this gaseous matter as unworthy of serious airgunning consideration, for those that appreciate it, Co2 powers many of the most interesting airgun designs ever conceived. The length of this chapter testifies to the author's feelings on the subject.

Some of the highest quality and most beautiful of all Co2 guns also happen to be the earliest examples. The fantastic Giffard 'Carbonic Gas' rifles and pistols were wonderful works of nineteenth century gun-making art. As such, and considering their 1890's vintage and low 'production' numbers, surviving Giffards command serious money in any condition. These French hand-made and engraved pieces of shooting history have incredibly sexy profiles that absolutely ooze 'exotic'! Extremely rare and rightfully precious, one needn't examine a mint example to experience feelings of awe and wonderment at the level of craft manifest in these jewels of Old-World antiquity.



**the Giffard "Carbonic Gas" Pistol c. 1890**

*The fantastic French-made Giffard Carbonic Gas rifles and pistols were produced around 1890 in 6mm and 8mm caliber (and maybe others). Liquid Co2 not being commercially available at the time, the chamber was filled with dry ice that reverts to liquid/gaseous Co2 in a sealed chamber.*

Though not exactly pea-shooters, the Giffards were certainly not powerful enough for use as weapons of the chase, war or self-defense. No, these fantastic Co2

rifles and pistols were apparently just expensive toys of the wealthy elite. But what impressive toys they were. The past-tense is purposely applied here, as I've not heard a single report of current owners actually shooting one; much less seen any performance figures! Too bad, as it would be quite interesting to compare these century-old Co2 guns' performance to the wide variety of gas guns produced today and in America's 'golden age' of Co2 from the late 1940's into the eighties. Call me crazy (you wouldn't be the first), but near the top of my 'when I strike it rich' list is not only replicating a Giffard, but shooting the hell out of it!

However this article is not about collector guns so precious most of us will never have an opportunity to see or handle one, much less actually shoot it. No matter. Such untouchable collectors' items couldn't possibly outperform any number of modern Co2 guns or affordable American collectables. In fact when it comes to 'bang for the buck' performance, shooting pleasure and ease of customization, modern and vintage Co2 'burners' represent some of the best bargains in the airgun universe.

Condolences must go to readers inhabiting cold climates, since Co2 pressure and performance falls with the mercury. Shooters residing in warmer climes tend to appreciate the idiosyncratic properties of Co2 more than those who seldom see temperatures north of 70 degrees Fahrenheit. No doubt Co2 gun sales are substantially more vigorous below the Mason-Dixon Line than above it, with good reason. Southern airgunners savor the dog days of summer for the powerful effect on their gas-gun arsenals, while their northern brethren generate precious body-heat with multi-pump and spring-piston guns.

Co2 guns cover an extremely wide range of styles and performance, from cheap plinkers to expensive target guns to medium-game-capable big-bores. However the vast majority of gas guns ever produced fall in a medium power range of 3-6 foot-pounds for pistols and about twice that for rifles. Considering the torrid pace of the current airgun power race, these are pretty sedate power levels. But as in other race scenarios, harnessing moderate power in light, compact vehicles can produce some pretty exhilarating power-to-weight ratios.

Current Crosman and many vintage Co2 pistols produce five to six foot/pounds of muzzle energy in smaller, lighter, less expensive packages than other power-plant designs. This power level is a comfortable minimum for prey to the size of jackrabbit, but there are occasional reports of raccoons falling to close-range encounters.



*Many current and vintage Co2 pistols can be excellent small-game arms and benefit from simple to elaborate gunsmithing. This .35 caliber custom sports a Crosman trigger and 2250 chamber, bulk filling, Crooked Barn breech, a power adjuster, coco-bolo grips and red-dot scope. It averaged 7/8" groups at 25 yards with 58 grain round balls at 325 FPS/13.6 FP.*

With simple and affordable gunsmithing techniques, many of these same pistols can be hopped-up into the 8-10 foot-pound range; a power level stretching maximum ranges for small game, though not qualifying such guns for larger (medium) game. If accurate enough (and most are), an 8-10 foot-pound pistol can be effective to near forty yards on rabbit-sized critters. That said, game larger than jackrabbit should not be attempted. And though there now exist occasional custom-built pre-charged pneumatic pistols capable of taking medium to large game, even highly modified Co2 pistols do not possess such potentials. With chamber pressures peaking at about 1200 PSI in temperatures tolerable to humans, gas pistols simply cannot muster enough projectile energy for realistic pursuit of game heavier than about ten pounds. Nevertheless, their excellent small game capabilities come in smaller, handier packages than other air pistol designs of equal or greater power.

Pre-charged pneumatic pistols require long barrels, large chambers and big bores to graduate beyond the small game field. The sole exception to the big-bore part of that equation is the Evanix AR6; a .22 caliber PCP revolver capable of up to forty foot-pounds and medium game. However a hunt or shooting session with a scoped AR6, FX Ranchero or Falcon Raptor pistol will heighten one's appreciation for the

portability and holster-ability of a Crosman, Benjamin or Sheridan Co2 pistol. Though the author is not at all adverse to pre-charged pneumatics, when the menu calls for squirrel and rabbit, the shoulder-holster carries a custom Crosman, the hands a complimentary rifle, and the pockets bulge with twelve-gram Co2 cartridges.



*Though not a particularly large PCP pistol, the Falcon Raptor dwarfs a Crosman 150. The custom Crosman gets 450 FPS/6.4 foot-pounds, the Raptor 650 FPS/13.4 foot-pounds. Both guns shoot 1/2" groups at 25 yards, but the Falcon almost doubles a good shooter's effective range.*

As further testament to gas-gun capabilities, the world record score for ten-meter air pistol competition is still held by a Co2 pistol. Ten-meter being an indoor competition, temperatures are controlled to comfortable levels, minimizing Co2's disadvantage. As technically advanced as pre-charged pneumatic target guns have become, the standing ten meter pistol world record proves gas guns as inherently accurate as any design.

My extensive velocity and accuracy testing, state champion trophies and national record certificates also confirm Co2 gun performance potentials beyond the plinking role many shooters associate them with. Aforementioned awards were captured in outdoor temperatures against national caliber shooters employing the finest guns powered by air rather than gas, and costing magnitudes more than the Co2 guns that whipped 'em.

A much-beloved Sears Ted Williams 'Match Rifle' variant of the timeless Crosman 160 Co2 rifle snatched a Texas State Champion trophy and two NRA national record

certificates from fields of experienced silhouette competitors wielding fine spring-piston rifles from Air Arms, Weihrauch and Whiscombe. Not only was the Sears rifle the only Co2 gun in the field, but the only .22 caliber; effectively shattering prevailing attitudes about proper silhouette rifles and caliber.



*This 1950's vintage Ted Williams 'Match Rifle' captured a state championship and two national records. The 2-7X scoped classic weighs a svelte 6 ¾ pounds; barely half the status quo.*

No-one in their right mind would bet on a .22 Czechoslovakian Co2 pistol against the finest Hammerli, Walther and Feinwerkbau target pistols costing many times the price of the lowly Brno Tau 7. However, I'll take that bet!

In the days pre-dating tunnel-type peep sights and the 'taco hold' that now dominate Iron Sight Class, my first two attempts at the Texas State Air Pistol Silhouette Championships with a .22 Tau Co2 pistol fell just short. Having lost the Y2K state championships by one point and the 2001 championship TIE by shoot-off loss, with great determination I posted high score on day one of the 2002 championships with a 31/40. Three other shooters posted 30/40's to set the stage for a tough battle on day two for Texas State Champion in Open Sight Air Pistol. A restless night brought the supposition that at least one of those shooters would probably rise to the occasion to shoot a 33 on day two. I would need to shoot at least a 33 to avoid another 'close' disappointment.

Two antagonists actually shot 34's. But in buckling down like never before to shoot my personal best iron-sight score, so did I! The Tau's two-day aggregate of 65/80 bettered a national-caliber field of 22 shooters using some mighty fine air pistols; all .177 caliber and all air-powered.



*The .22 caliber Tau 7 bested a field of 22 shooters to capture the 2002 Texas state championship.*

Unfortunately its plain walnut does little to compliment the otherwise awesome Tau, now deserving of something special to commemorate the memorable performance. Not inclined to purchase custom grips, I took a unique tact in commemorating one of the finest memories of my airgun affliction. Since the 500 foot-per-second .22 Tau also possesses admirable small-game potentials, it seemed the customization should reflect its field worthiness. It was a labor of love.



*Prairie rattler adornment nicely commemorates the .22 Tau's Texas state championship.*

The 2007 Republic of Texas Field Target Championships included Texas' first Pistol Field-Target competition. Some old coot entered with a pistol home-made from a 1950's-vintage Crosman 180 rifle. When the Co2 settled, that 180 pistol conversion, aka- 'Frankenpistol', had mauled the field by a comfortable margin.



*The home-made 180 pistol captured Texas' first Pistol Field Target Championship.*

Not a finicky eater, Frank devours any high-quality pellet with great relish. Producing over 500 FPS and eight foot-pounds, in shooting five consecutive five-shot groups, The Beast has averaged .37" c-t-c five-shot groups at 25 yards and .74" at 50 yards. In recording such impressive average group sizes, it has also recorded five-shot groups measuring a scant .12" c-t-c at 25 yards and a mere .53" at 50! This is the smallest 25 yard pistol group I've achieved in decades of testing hundreds of air guns. For better perspective, the 1/8" twenty-five yard group translates to less than one-half minute-of-angle. Not too shabby... for a pistol home-made from a fifty-year-old Co2 rifle.

Given such excellent power and accuracy, Frank's voracious appetite of only fifteen to eighteen full-power shots per cartridge is easily forgiven. Its dual-power cocking offers instant power moderation and improved Co2 economy, but is seldom used.

Frankenpistol performs similarly in power and accuracy to an LD custom Crosman Mark 1. Aptly named after its co-creator Larry Durham, the LD Co2 pistol is an excellent choice for the airgun pistolero interested in small-game hunting, silhouette or pistol field target competition, but not interested in building a custom them self.

Nowadays Crosman offers several Co2 rifles and pistols worthwhile in stock form, which also benefit greatly from a myriad of after-market goodies available from a busy cottage industry built around Crosman's offerings. In fact Crosman now offers many custom features on several of its guns, available by special order from the Crosman Custom Shop at reasonable prices.

At least a few airgunsmiths convert certain Co2 guns to run on high-pressure air with some success, albeit sometimes mixed. Crosmans are often the platforms of choice; however the QB series of Co2 rifles are also popular for HPA conversion. My converted QB77 rifle was a good example of the mixed success, as it returned a useful (for com-petition) power-band of only about eighteen shots per 2,000 PSI charge. This limited shot count is not uncommon with Co2 to PCP conversions, owing to smallish chambers and (often) less-than-optimally-balanced hammer and valve springs.

Another Co2 rifle that has been converted to PCP with some regularity and success is the Hammerli 850/RWS 850. With its bolt-action repeating mechanism and 88 gram disposable Co2 bottle paralleling (under) the barrel, no wonder some might see Theoben Rapid design similarities and make the mental leap that a paintball-type high-pressure-air bottle might be adapted to replace the big Co2 bottle. The result is something of a poor mans' Theoben Rapid that performs well for a very reasonable price.

To its credit, Crosman recognized an opportunity to recapture some of the adult airgun market with its Benjamin Discovery rifle. Evolved from the 2260 Co2 rifle, in a stoke of marketing forethought, Crosman made the Discovery a 'Dual Fuel' gun capable

of Co2 or air power. A big hit in the marketplace, the light, handy, reasonably priced Discovery also benefits from after-market options similar to those for their other guns.

While an excellent plinker and hunter, attempts by many to make it a viable field-target rifle have exposed some inherent weaknesses; those being (primarily) the pencil-thin barrel and plastic trigger housing inherited from its 2260 lineage. The light barrel is simply not as stable as necessary for the demanding sport of field-target, where even minor shifts in zero are catastrophic. And while the trigger-action can be improved with everything from simple trigger-smithing to aftermarket sears, the plastic trigger housing 'houses' gremlins akin to the thin barrel; ultimately limiting the degree to which a fine trigger action can be achieved and maintained.

Thankfully Crosman had an ear to the grapevine, and with a little help from serious airgunners they developed the 'Marauder' Dual Fuel rifle. Suffice to say Crosman learned its Discovery lessons well. The relatively inexpensive Marauder is a fine bargain that quickly made major waves in field-target competition, hunting fields, and the market-place. The subsequent Marauder pistol has proven to possess all the fine attributes as its parent rifle.

Crosman recently introduced another reasonably-priced PCP pistol evolved from Co2 lineage. Considering airgunsmiths have been converting Crosman Co2 pistols to air for a while, it's no major epiphany there was a market looming that Crosman might as well exploit. Again outside the scope of this chapter, thankfully the Crosman 1700/1701 'silhouette' PCP pistol got a better trigger group than their Co2 pistols.

Not resting on their laurels and success of their excellent PCP rifles, and presumably responding to a certain amount of demand, Airforce Airguns makes an adapter to power their rifles on Co2. With reports ranging from favorable to highly enthusiastic, they now market some of their models as Co2 guns. While velocities and energies suffer considerably when using Co2 power, shot counts increase dramatically.

My first pre-charged pneumatic was a Galway Fieldmaster, one of the first production PCP's available. Also designed to operate on air or Co2, I used it with both propellants to learn many physics lessons by monkeying with hammer stroke and mass, and hammer-spring and valve-spring tensions. Details and results of the experimentation are recorded in the velocities section of this work.



*One of the first modern PCP rifles produced, the Galway Fieldmaster was marketed as a PCP or Co2 rifle. After copious amounts of tuning and gunsmithing, it worked well with both propellants.*

A myriad of Co2 pistol and revolver firearms replicas are available and being constantly introduced; a situation that suggests a healthy and expanding Co2 gun market. That many are of adult quality, heft and price also suggests that Co2 is not just for kids; a role the propellant had seemed to slip into during the spring-piston and PCP growth era of the 1980's through Y2K. With respected companies like Hammerli, RWS, Umarex, Colt and Beretta jumping back on the Co2 bandwagon, the future is bright for Co2 fans.



*Though no competition pistol, the Smith & Wesson 586 by Umarex is possibly the nicest quality Co2 firearm replica on the market... maybe ever!*