Primary regulators are attached to the gas bottle with either an integrated O-ring seal in the face of the regulator fitting, or a fiber or Teflon flat washer. These parts need to be replaced occasionally to prevent leaks and should be inspected every time the bottle is changed. Many primary regulators are also equipped with one or more shut-off valves located on the low-pressure outlet, allowing the CO_2 to be shut off without changing the set-screw or shutting off the main tank valve.

A primary regulator must also contain a safety relief valve to prevent dangerous system pressures in case of a malfunction or frozen regulator. Bottled CO_2 pressure can exceed 1000 psi, creating an extreme hazard if not handled properly.

Figure 1.21. The Gov Reg™ replaces traditional secondary pressure regulators and installs on a keg coupler, gas manifold, or inline. A proprietary tool is used to set the pressure, which prevents tampering and unwanted pressure adjustments.

The pressure to each keg is typically governed by a separate regulator, known as a secondary regulator. Chapter 4 has more information on how to set secondary regulators properly, but it should be noted that a primary regulator that feeds several secondary regulators needs to be set about 5–10 psi above the highest setting of the secondary regulators. If the primary regulator were set at the same number as the secondaries, then only one faucet could be open at a time since the pressure from the source would be only enough to support one line at a time.

Gaugeless regulators have a fixed pressure, connect directly to the coupler, and can only be adjusted with a proprietary tool. The gas line must be rated to withstand the pressure supplied from the gas source.

Nitrogen regulators are designed for higher pressures and have a male thread with a conical fitting that (depending on the design) seats to the gas source with or without an O-ring.

PRESSURE AND PRESSURE GAUGES

For the purposes of this manual, pressure is the amount of force acting on the surface of beer in a keg or serving vessel, and is often expressed in pounds per square inch (psi). **Absolute pressure** is the total pressure on the beer, and is the sum of atmospheric pressure plus any additional applied pressure from the dispensing gas. **Atmospheric pressure** is the amount of force exerted by the weight of air in the Earth's atmosphere above an object. At sea level, atmospheric pressure is equal to 14.7 psi. If the dispensing gas is applied at 15 psi, then the absolute pressure on the beer is 29.7 psi (14.7 psi + 15 psi).

Pressure can be measured several ways. Most pressure gauges are designed to measure the pressure of the dispensing gas applied to beer beyond the local atmospheric pressure level. This is called **gauge pressure**, usually given as pounds per square inch, gauge (**psig**). Gauges in draught beer systems will nearly always read in psig. (Some specialized gauges are designed to measure the total pressure on the beer, or absolute pressure, in units of **psia**; these are very rare in draught beer dispensing systems.)

As draught beer is dispensed, *the carbonation level will depend on the absolute pressure of the dispensing gas, not the gauge pressure of the dispensing gas*. This is true for both 100% CO_2 as well as blended gas. The carbonation level in a beer is set by the brewer to maximize flavor, aroma, and presentation. One goal of draught beer dispensing is to maintain carbonation level. If the absolute pressure of the dispensing gas is too high, the carbonation level of the beer will increase over time. If the absolute pressure of the dispensing gas is too low, the carbonation level of the beer will decrease over time. More information about this very important topic can be found in appendix C.