

Differential Pressure Gage Element (Meter Body). The formed bellows, diaphragm capsule, and single diaphragm are all used in the differential-pressure type of meter bodies. These units can be used to measure differences in pressure between two pipes, two stills, etc, from 0–1 in. of water up to 0–700 psi and with operating pressures as great as 10,000 psig. Figure 9 illustrates a formed-bellows-actuated meter body. The high-pressure and low-pressure bellows are joined together by means of the center stem assembly. The entire volume inside the bellows is filled with liquid and sealed off. When the process pressure at the high-pressure tap is greater than the process pressure at the low-pressure tap, the high-pressure bellows moves to the right and, through the center stem and liquid fill, moves the low-pressure bellows to the



Fig. 6. "C"-type bourdon tube pressure element.

right. Motion stops when the force on the range spring equals the force of the differential pressure (difference between the high-pressure and low-pressure process pressure). The cable and motion take-off arm translate the center stem movement to the torque tube and this connects to a linkage mechanism for positioning the pointer or pen arm.

Installation and Maintenance of Pressure Gages. The industrial pressure gages must be protected from excessive overload pressures, high process temperatures, and corrosive or solid entrained fluids which would deteriorate or clog up the pressure element. The instruction data supplied with the gage will outline exactly what precautions must be taken on the specific unit used.

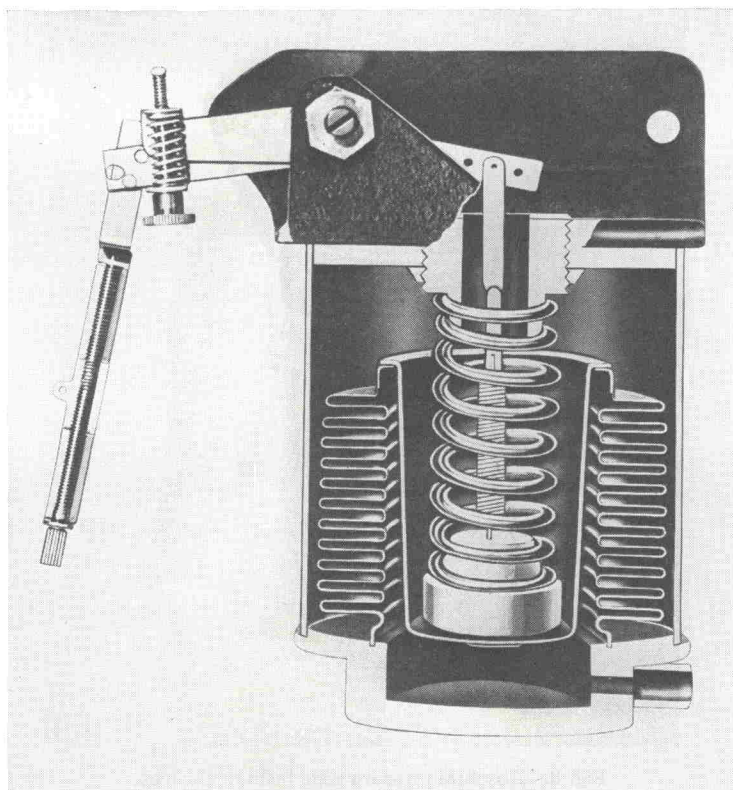


Fig. 7. Spring-and-bellows pressure element.

In checking the accuracy of a pressure gage, a primary standard or a certified secondary standard pressure unit must be employed. A primary standard would be a dead-weight tester for pressures of 20 psig and higher, and a "U"-tube manometer would be required for pressures of 1 in. of water to 20 psig. A secondary standard would be a high-precision bourdon tube pressure gage with certified accuracy of calibration and pressure ranges of 20 psig and higher, and a certified accuracy precision well-type manometer for pressures of 1 in. of water to 20 psig.

Specialized Types of Pressure Elements. All of the previously described pressure elements can be combined with various pneumatic and electrical devices to provide pressure transducers. The pneumatic transducers operate from a 20-psi pressure, clean air supply into a fixed nozzle, and a movable flapper system. The process pressure element, through a mechanism, sets the flapper in relation to the nozzle such that at minimum process pressure the space between the nozzle and flapper is maximum and the output pressure is minimum (3 psig). With maximum process pressure the space is minimum and the output is maximum (15 psig). A normal full-scale travel of the flapper is about 0.003 in.

In the electric transducers, some of the sensors used are strain gage, thermoelectric, and ionization. There are numerous other types which are somewhat specialized and will only be mentioned here. They are ultrasonic, electromagnetic, piezoelectric, capacitance, variable reluctance, variable permeability, vibrating wire, and photoelectric.