CLAIMS

What is claimed is:

1. An ionization pressure gauge comprising:

a cathode configured to be heated to emit electrons with an electron emission current;

a transistor circuit configured to pass the electron emission current with low input impedance and to control cathode bias voltage of the cathode; and

circuitry configured to detect ion current resulting from the emitted electrons and to provide an indication of pressure based on the ion current.

2. The ionization pressure gauge of Claim 1, wherein the low input impedance is substantially zero.

3. The ionization pressure gauge of Claim 1 or Claim 2, wherein the transistor circuit controls cathode bias voltage independent of magnitude of the electron emission current.

4. The ionization pressure gauge of any of Claims 1-3, further comprising a variable heating power source that variably heats the cathode.

5. The ionization pressure gauge of any of Claims 1-4, the transistor circuit comprising a field effect transistor (FET) that passes the electron emission current through its source and controls cathode bias voltage with applied gate voltage.

6. The ionization pressure gauge of Claim 5, wherein cathode bias voltage is equal to a voltage applied to a gate of the FET plus an offset voltage of the FET.

7. The ionization pressure gauge of Claim 5 or Claim 6, wherein a gate of the FET is electrically connected to a variable voltage source to variably control cathode bias voltage.

8. The ionization pressure gauge of any of Claims 1-7, further comprising a circuit that detects an offset of a transistor in the transistor circuit.

9. The ionization pressure gauge of Claim 8, wherein the circuit that detects the offset of the transistor includes a diode electrically connected to the transistor circuit.

10. The ionization pressure gauge of any of Claims 1-9, the transistor circuit comprising a current sensor that measures the electron emission current through a transistor in the transistor circuit.

11. A method of operating an ionization pressure gauge, the method comprising:

heating a cathode to emit electrons with an electron emission current;

controlling cathode bias voltage of the cathode via a transistor circuit;

passing the electron emission current via the transistor circuit with low input impedance; and

detecting ion current resulting from the emitted electrons and providing an indication of pressure based on the ion current.

12. The method of Claim 11, wherein the low input impedance is substantially zero.

13. The method of any of Claim 11 or Claim 12, cathode bias voltage controlled independent of magnitude of the electron emission current.

14. The method of any of Claims 11-13, wherein heating the cathode includes variably heating to emit the electrons with a variable electron emission current.

15. The method of any of Claims 11-14, wherein the transistor circuit includes a field effect transistor (FET) that passes the electron emission current through its source and controls cathode bias voltage with applied gate voltage.

16. The method of Claim 15, wherein cathode bias voltage is equal to a voltage applied to a gate of the FET plus an offset voltage of the FET.

17. The method of Claim 15 or Claim 16, wherein controlling cathode bias voltage includes applying a variable voltage source to a gate of the FET.

18. The method of any of Claims 11-17, further comprising calibrating the transistor circuit by detecting an offset of a transistor in the transistor circuit.

19. The method of Claim 18, wherein detecting the offset of the transistor includes using a diode.

20. The method of any of Claims 11-19, further comprising using a current sensor to measure the electron emission current through a transistor in the transistor circuit.

21. The method of any of Claims 11-20, further comprising changing the electron emission current from one value to another without dead time in pressure measurement.

22. An ionization pressure gauge comprising:

means for heating a cathode to emit electrons with an electron emission current;

means for controlling cathode bias voltage of the cathode via a transistor circuit;

means for passing the electron emission current via the transistor circuit with low input impedance; and

means for detecting ion current resulting from the emitted electrons and for providing an indication of pressure based on the ionization current.

23. An ionization pressure gauge comprising:

a cathode configured to be heated to emit electrons with an electron emission current; and

a transistor circuit configured to pass the electron emission current with low input impedance and to control cathode bias voltage of the cathode, the transistor circuit comprising a field effect transistor (FET) that passes the electron emission current through its source and controls cathode bias voltage with applied gate voltage, and wherein cathode bias voltage is equal to a voltage applied to a gate of the FET plus an offset of the FET.

24. A method of operating an ionization pressure gauge, the method comprising:

heating a cathode to emit electrons with an electron emission current;

controlling cathode bias voltage of the cathode via a transistor circuit that includes a field effect transistor (FET), controlling including applying gate voltage to a gate of the FET, wherein cathode bias voltage is equal to gate voltage plus an offset voltage of the FET; and

passing the electron emission current via the transistor circuit through a source of the FET with low input impedance.