WHAT IS CLAIMED IS:

1. A vaporizer and conditioning system for liquid, including a liquid sample input, a vaporizer operable to receive a liquid sample and convert the received liquid sample into vapor gas that is passed to an accumulator tank operable to receive the vaporized sample and a heated pressure regulator for conditioning the accumulated vaporized sample outputted from the accumulator tank to reduce the pressure thereof for passage by at least a first vapor sample outlet path to a downstream analyzer, comprising, in sequence:

a) a resistance temperature detector unit in-line with the liquid sample input;

b) a sweeping bend located in line and downstream of the resistance temperature detector unit;

c) a thermal break for minimizing heat energy transfer located in-line and downstream of the sweeping bend;

d) a flow buffering input manifold located in-line and downstream of the thermal break, the flow buffering input manifold including a liquid sample input receiving chamber, splitting the liquid sample input in the receiving chamber into a plurality of outputs from the receiving chamber to reduce pressure drop and provide flow volume uniformity;

e) where the vaporizer includes a vaporizer housing containing a plurality of liquid sample inputs and vapor outputs corresponding to the plurality of outputs from the flow buffering input manifold and a heater cartridge unit associated with each of the plurality of liquid sample vaporizer inputs characterized by:

i) a heater cartridge with an upper end and a lower end, said heater cartridge including an elongated electrically powered heating element of a select length,

ii) a coil tubing segment having a select height greater than the elongated electric heater element select length to extend above thereof, and spiral wrapping with reduced spacing between turns, configured to increase the contact surface area of the coil tubing with the elongated electric heating element, and limit pressure drop across the coil tubing segment,

iii) a thermocouple, disposed below the coil tubing segment, and

iv) an output; and

f) an exit manifold incorporating a plurality of vapor inputs corresponding to the plurality of vapor outputs from the vaporizer housing, each vapor input including a shutoff valve to terminate vapor flow, said exit manifold including an interior vapor accumulator chamber to mix the respective plurality of vapor inputs into a common vapor output stream, and an output for the common output stream from the interior vapor accumulator chamber, an exit manifold thermocouple associated with the exit manifold output stream and a shut off valve for preventing flow to the accumulator tank when a temperature anomaly is detected by the exit manifold thermocouple;

where the vaporizer housing includes: a back wall, a top wall, a bottom wall, an angled mounting plate defining a front edge and back section affixed to the back wall proximate to the bottom wall, said mounting plate projecting at an acute angle from the back wall relative to the bottom wall, said mounting plate including at least one receiving slot formed in the front edge with a tapered slot extending therefrom for a select distance in the direction of the back section;

where each coil tubing segment includes an elongated cylindrical passage of a defined diameter and a first length and a lower segment generally orthogonally disposed to the coil elongated cylindrical passage and where each heater element has a diameter corresponding to that of the elongated cylindrical passage and the lower end of the heater cartridge projects through the receiving slot of the angled mounting plate; and

a releasable clamp for engaging the lower end of the heater cartridge to secure the heater cartridge to the mounting plate,

where the heater cartridge is removable by releasing the releasable clamp from the lower end of the heater cartridge and the mounting plate and sliding the heater cartridge from the coil tubing segment.

2. The vaporizer and conditioning system for liquid of claim 1 where the at least one vapor sample outlet path is a line from the accumulator tank and includes a heated pressure regulator, a rotameter, a pressure relief valve and a downstream vapor sample outlet for downstream analysis and a bypass pathway including a rotameter and mass flow controller for outputting unused vapor sample.

3. The vaporizer and conditioning system for liquid of claim 2 where the bypass pathway recycles the unused vapor sample.

4. The vaporizer and conditioning system for liquid of claim 3 further comprising a PID controller for controlling electrically controlled components including sensors, heaters, thermocouples, solenoid valves and rotameters.

5. The vaporizer and conditioning system for liquid of claim 3 further comprising a PLC controller for controlling electrically controlled components including sensors, heaters, thermocouples, solenoid valves and rotameters.

6. The vaporizer and conditioning system for liquid of according to any of claims 1-5 further comprising a thermal mass flow controller.

7. A vaporizer and conditioning system for liquid, including a liquid sample input, a vaporizer operable to receive a liquid sample and convert the received liquid sample into vapor gas that is passed to an accumulator tank operable to receive the vaporized sample and a heated pressure regulator for conditioning the accumulated vaporized sample outputted from the accumulator tank to reduce the pressure thereof for passage by at least a first vapor sample outlet path to a downstream analyzer, comprising, in sequence:

a) a resistance temperature detector unit in-line with the liquid sample input;

b) a sweeping bend located in-line and downstream of the resistance temperature detector unit;

c) a thermal break for minimizing heat energy transfer located in-line and downstream of the sweeping bend;

d) a flow buffering input manifold located in-line and downstream of the thermal break, the flow buffering input manifold including a liquid sample input receiving chamber from which the liquid sample input in the receiving chamber is split into a select number of outputs from the receiving chamber;

e) a vaporizer housing containing a select number of liquid sample vaporizer inputs and vaporized vapor outputs corresponding to the select number of outputs from the flow buffering input manifold, said vaporizer housing including a back

wall, a top wall and a bottom wall where the top wall includes the select number of liquid sample vaporizer inputs and the bottom wall includes the select number of vaporized vapor outputs and an angled mounting plate defining a front edge and back section affixed to the back wall proximate to the bottom wall, said mounting plate projecting at an acute angle from the back wall relative to the bottom wall, said mounting plate including at least one receiving slot formed in the front edge with a tapered slot extending therefrom for a select distance in the direction of the back section;

f) a heater unit with a top portion, a bottom portion and an electrically powered elongated heating element disposed therebetween associated with each of the select number of liquid sample vaporizer inputs in the vaporizer housing, said electrically powered elongated heating element having a select length and select diameter;

g) a continuous length of tubing in the vaporizer housing, passing through to a coil tubing segment having a select height greater than the electrically powered elongated heating element select length, and spiral wrapping with reduced spacing between turns, configured to increase the contact surface area of the coil tubing with the electrically powered elongated heating element and limit pressure, said coil tubing segment defining an elongated cylindrical passage of a diameter corresponding to the select diameter of the electrically powered elongated heating element, a lower segment generally orthogonally disposed to the elongated cylindrical passage, and a vapor output segment;

a thermocouple, disposed below the coil tubing segment; and

a releasable clamp for engaging the bottom portion of the heater unit to secure the heater unit to the mounting plate where the vapor output segment of the tubing passes through the tapered slot of the mounting plate to the respective vaporized vapor output in the bottom wall,

where the heater unit is removable by releasing the releasable clamp from the bottom portion and the mounting plate and sliding the heater unit from the bottom of the coil tubing segment;

h) an exit manifold incorporating a select number of vapor inputs corresponding to the select number of vaporized vapor outputs from the vaporizer housing, each vapor input including a shutoff valve to terminate vapor flow, said exit manifold including an interior vapor accumulator chamber to mix the respective select

number of vapor inputs into a common vapor output stream, and an output for the common output stream from the interior vapor accumulator chamber and

i) an exit manifold thermocouple associated with the exit manifold output stream and a shut off valve for preventing flow to the accumulator tank when a temperature anomaly is detected by the exit manifold thermocouple.

8. The vaporizer and conditioning system for liquid of claim 7 where the at least one vapor sample outlet path is a line from the accumulator tank and includes a heated pressure regulator, a rotameter, a pressure relief valve and a downstream vapor sample outlet for downstream analysis and a bypass pathway including a rotameter and mass flow controller for outputting unused vapor sample.

9. A vaporizer enclosure comprising:

a back wall, a top wall and a bottom wall;

an upper inlet in the top wall;

a lower outlet in the bottom wall;

an angled mounting plate defining a front edge and back section affixed to the back wall proximate to the bottom wall, said mounting plate projection at an acute angle from the back wall relative to the bottom wall, said mounting plate including at least one receiving slot formed in the front edge with a tapered slot extending therefrom for a select distance in the direction of the back section;

a continuous length of tubing passing through the upper inlet and defining a liquid input, a coiled tubing section having a pitch to limit spacing gap between coils, said coiled tubing section defining an elongated cylindrical passage of defined diameter and a first length, a lower segment generally orthogonally disposed to the coil elongated cylindrical passage, and a vapor output segment length passing through the lower outlet;

a removable elongated heater cartridge with a top portion, a bottom portion and an electrically powered heating element disposed therebetween, said heater cartridge having a diameter corresponding to that of the elongated cylindrical passage where the electrically powered heating element has a length less than that of the tubing coiled section and the bottom portion projects through the receiving slot of the angled mounting plate; and

a releasable clamp for engaging the lower portion of the heater cartridge to secure the heater cartridge to the mounting plate where the vapor output segment of the tubing passes through the tapered slot of the mounting plate to the lower outlet in the bottom wall,

where the heater cartridge is removable by releasing the releasable clamp from the bottom portion of the heater cartridge and the mounting plate and sliding the heater cartridge from the bottom of the coiled tubing section.

10. The vaporizer enclosure of claim 9 further comprising a thermocouple attached to the lower segment of the tubing for detecting temperature of the tubing.

11. The vaporizer enclosure of claim 10 where the thermocouple is a bolt on type J type thermocouple.

12. The vaporizer enclosure to any of claims 9 -11 where the coiled tubing section extends above the heater cartridge.

13. The vaporizer enclosure of claim 12 where the pitch of the coiled tubing section minimizes gaps between coils to minimize hot spot formation on the heater cartridge and to maximize the heat exchange between the coiled tubing section and the heater cartridge.

14. A method of vaporizing and conditioning a liquid sample stream for analysis including a sample stream input, a vaporizer operable to receive a liquid sample and convert the received liquid sample into vapor gas that is passed to an accumulator tank operable to receive the vaporized sample and a heated pressure regulator for conditioning the accumulated vaporized sample outputted from the accumulator tank to reduce the pressure thereof for passage to a downstream analyzer, the improved method comprising the steps of:

detecting an input liquid sample temperature with a resistance temperature detector;

passing the liquid sample stream respectively through a sweeping bend, an in-line thermal break and into a vaporizer liquid input manifold to split the liquid sample stream into a select plurality of vaporizer liquid input streams identical in flow rate, pressure and temperature;

outputting each of the select plurality of vaporizer liquid input streams into a vaporizer enclosure with a number of vaporizing pathways corresponding to the select plurality, each vaporizing pathway comprising tubing with an upper liquid inlet and a lower vaporized gas output and a coiled intermediate section spirally

wound about a heater cartridge configured to increase the heat transfer contact area between said heater cartridge and the coiled intermediate section, and a temperature detecting vaporized gas output thermocouple associated with the lower vaporized gas output;

inputting the lower vaporized gas output into a vaporized gas mixing manifold with a plurality of inputs corresponding to the plurality of vaporizing pathways for receiving the output from the plurality of vaporizing pathways where each of the inputs is associated with a shutoff valve for terminating vaporized gas input to the vaporized gas mixing manifold upon detection of a temperature anomaly by the temperature detecting vaporized gas output thermocouple, where the vaporized gas mixing manifold includes a mixing chamber and an outlet for the mixed vaporized sample;

outputting the mixed vaporized sample from the vaporized gas mixing manifold through tubing including a thermocouple for detecting the temperature of the output mixed vaporizer sample, said thermocouple being associated with a solenoid-controlled valve for terminating flow from the vaporized gas mixing manifold upon detection of a thermal anomaly exceeding a select threshold by the thermocouple;

inputting the mixed vaporized sample into a sample accumulator;

outputting the accumulated vaporized sample from the sample accumulator to a heated regulator to reduce the sample pressure while maintaining temperature of the accumulated vaporized sample and preventing Joule-Thomson condensation; and

passing the accumulated vaporized sample from the heated regulator for analysis of constituent components.