CLAIMS

1. A system for continuously fractionating hydrocarbons, comprising:

providing a hydrocarbon feed fluid comprising a heavy oil component and a light end component;

feeding the hydrocarbon feed fluid upwardly into an inner tube of an upwardly inclined dual tube device, the dual tube device being inclined upwardly from horizontal by between 30° and 70°, the inner tube being housed within an annular outer tube, the space between the inner tube and the outer tube forming an annulus in fluid communication with the inlet tube, the upper end of the inner tube terminating in an open inlet tube upper end within the outer tube, an upper portion of the outer tube extending above and beyond the open inlet tube upper end, so that the hydrocarbon feed fluid exits the open inlet tube upper end and flows downwardly into the annulus;

externally heating a lower portion of the outer tube, so that downwardly flowing hydrocarbon feed fluid in the annulus is heated, to form a heated hydrocarbon fluid in the annulus, the heated hydrocarbon fluid thereby providing counter-current heating of the hydrocarbon feed fluid in the inner tube;

maintaining fractionating conditions within the annulus, so that the heated hydrocarbon fluid is thermally fractionated into a volatile upward gaseous fluid flow and a residual downward liquid fluid flow, the gaseous fluid comprising the light end component and the liquid fluid comprising the heavy oil component;

collecting the light end component from a light end outlet port in the upper end of the outer tube; and,

collecting the heavy oil component from a heavy oil outlet port in the lower end of the annulus.

2. The system of claim 1, wherein the dual tube device is inclined upwardly from horizontal by about 45°.

3. The system of claim 1 or 2, wherein the upper portion of the outer tube extending above and beyond the open inlet tube upper end is from one-third to two-thirds the length of the

annulus.

4. The system of any one of claims 1 to 3, wherein the outer tube has a full effective length from the heavy oil outlet port to the light end outlet port, and the lower portion of the outer tube to which external heating is applied is a bottom one-third portion of the full effective length of the outer tube.

5. The system of any one of claims 1 to 4, wherein the hydrocarbon feed fluid comprises bitumen.

6. The system of any one of claims 1 to 4, wherein the hydrocarbon feed fluid comprises a hydrocarbon diluent.

7. The system of any one of claims 1 to 6, wherein the fractionating conditions comprise a fractionating temperature of between 150°C and 500°C.

8. The system of claim 7, wherein the fractionating temperature is between 230°C and 480°C.

9. The system of any one of claims 1 to 8, further comprising a condenser positioned to condense the light end component to a light end liquid product.

10. The system of any one of claims 1to 9, where the hydrocarbon feed fluid comprises a water component, and the collected light end component comprises at least a portion of the water component, thereby separating oil and water components of the hydrocarbon feed fluid.

11. The system of any one of claims 1to 10, where a hydrogen source is added to the hydrocarbon feed fluid, and the fractionation conditions are effective to react the hydrogen source with the heated hydrocarbon fluid to provide an upgraded oil product in the heavy oil component.

12. The system of claim 11, wherein the hydrogen source comprises hydrogen gas.

13. The system of any one of claims 1 to 12, further comprising providing a catalyst on a surface of the inner tube or the annulus, wherein the fractionating conditions are effective to cause the catalyst to facilitate a reaction in the heated hydrocarbon fluid to provide a catalytically upgraded oil product in the heavy oil component.

14. The system of any one of claims 1 to 13, further comprising a plurality of inclined dual tube devices operating in series, with heavy oil components collected from one inclined dual tube device being use as the hydrocarbon feed fluid for a successive inclined dual tube device in the series.