CLAIMS

1. A cryogenic system for the separation of electrolytically produced oxygen and hydrogen, comprising a heat exchanger,

the heat exchanger being configured for use in the cryogenic system for the separation of electrolytically produced oxygen and hydrogen, the heat exchanger being configured to exchange heat between a mixed gas stream, hydrogen, and oxygen,

the heat exchanger comprising a plurality of cells formed by a stack of alternate planar flow-guide plates and heat transfer plates,

each heat transfer plate having at least three apertures therethrough, each aperture defining a part of a respective one of at least three fluid flow paths in the heat exchanger,

each flow-guide plate having apertures therethrough corresponding to at least two of the flow paths and a larger aperture therethrough configured to guide fluid in the remaining flow path across the face of the heat transfer plates between which the flow-guide plate is located,

each successive flow-guide plate in the stack forming part of a different flow path from the preceding one in the stack.

2. A cryogenic system according to Claim 1, wherein the heat exchanger further comprises a pair of end plates between which the stack of alternate planar flow-guide plates and heat transfer plates are clamped by means of tie rods, and wherein the tie rods are threaded tie rods, and the stack of alternate planar flow-guide plates and heat transfer plates are clamped by means of the threaded tie rods and nuts.

3. A cryogenic system according to Claim 2, wherein the heat exchanger further comprises alignment pins extending between the end plates to hold the plates in alignment.

4. A cryogenic system according to Claim 2 or 3, wherein the end plates have flow connections therethrough.

5. A cryogenic system according to Claim 4, wherein the heat exchanger comprises connecting spigots, provided on each end plate for connecting the three fluid flow paths within the heat exchanger to external gas flow pipes.

6. A cryogenic system according to any preceding claim, wherein the cells in the stack are not equally divided between the three fluid flow paths.

7. A cryogenic system according to any preceding claim, wherein the three fluid flow paths comprise one mixed gas stream flow path, one hydrogen flow path, and one oxygen flow path, the oxygen flow path being longer than the hydrogen flow path.

8. A cryogenic system according to any preceding claim, wherein the direction of flow across the face of the heat transfer plates in each of the flow paths changes along the length of the stack.

9. A cryogenic system according to any preceding claim, comprising a liquid oxygen reservoir connected to the oxygen flow path.

10. A cryogenic system according to any preceding claim, comprising an electrolyser connected to the mixed gas flow path.