[Document Name] PATENT CLAIMS

[Claim 1]

Cryogenic air separation apparatus comprising:

a heat exchanger (1) for subjecting feed air to heat exchange;

a first rectification column (2) to which feed air that has passed through the heat exchanger (1) is introduced, said first rectification column (2) comprising a first column bottom portion (21) in which an oxygen-rich liquid is stored, a first rectification portion (22) for rectifying the feed air, and a first column top portion (23) which is disposed at an upper portion of the first rectification portion (22) and stores a first vaporized gas;

a first condenser (3) which is disposed above the first column top portion (23) and employs the first vaporized gas in the first column top portion (23) as a heat source;

a second rectification column (5) comprising a second column bottom portion (31), a second rectification portion (51, 52, 53), and a second column top portion (54) from which a first nitrogen gas is drawn;

a third rectification column (6) for rectifying argon, said third rectification column (6) comprising a third column bottom portion (61) to which is introduced a crude argon feed gas drawn from the intermediate portion (51) of the second rectification portion (50) of the second rectification column (5), a third rectification portion (62) for rectifying the crude argon feed gas, and a third column top portion (63) in which argon is stored;

a second condenser (7) which is disposed above the third column top portion (63) and employs the argon in the third column top portion (63) as a heat source;

a high-purity oxygen rectification column (8) for rectifying ultra-high-purity oxygen, said high-purity oxygen rectification column (8) comprising an oxygen column bottom portion (81) having an ultra-high-purity oxygen vaporizer (9) disposed in a lower region thereof,

an oxygen rectification portion (82) to which is introduced an oxygen-rich liquid drawn from an intermediate portion of the third rectification portion (62) of the third rectification column (6), and an oxygen column top portion (83) from which an oxygen vaporized gas is drawn to be returned to the intermediate portion of the third rectification portion (62) of the third rectification column (6);

a third condenser (4) which is disposed above the oxygen column top portion (83) and employs the oxygen vaporized gas in the oxygen column top portion (83) as a heat source;

a first nitrogen compressor (10) for compressing a second nitrogen gas drawn from an upper region (41) of the third condenser (4) and the first nitrogen gas drawn from the second column top portion (54) of the second rectification column (5), after said second nitrogen gas and said first nitrogen gas have been made to pass through the heat exchanger (1); and

a compressed recycled gas line (L52) for introducing product nitrogen gas compressed by the first nitrogen compressor (10) into a warm end of the ultra-high-purity oxygen vaporizer (9) as a compressed recycled gas.

[Claim 2]

Cryogenic air separation apparatus according to Claim 1, comprising a second nitrogen compressor (11) for compressing the second nitrogen gas which is drawn from the upper region (41) of the third condenser (4) and has passed through the heat exchanger (1).

[Claim 3]

Cryogenic air separation apparatus according to Claim 1 or 2, in which the third rectification column (6) is divided into an upper crude argon column (620) and a lower crude argon column (610) at a point where the oxygen-rich liquid introduced into the ultra-high-purity oxygen rectification column (8) is drawn.

[Claim 4]
Cryogenic air separation apparatus according to any one of Claims 1 to 3, comprising an expansion turbine (24) for expanding at least one gas out of: a mixed gas comprising two or more gases from among a feed air gas, nitrogen gas recovered from the second rectification column (5), oxygen gas drawn from an upper portion (31) of the first condenser (3), and waste gas discharged from any of the first rectification column, second rectification column or third rectification column; and nitrogen gas pressure-boosted by the first nitrogen compressor (10) and/or the second nitrogen compressor (11).

[Claim 5]
Cryogenic air separation apparatus according to any one of Claims 1 to 4, comprising a supply line (L9) for supplying liquid nitrogen to the first rectification column (2) or to the second rectification column (5) as a cold source.