CLAIMS

1. A method of compressing carbon dioxide, CO_2, comprising:

a) generating a stream of high-pressure oxygen gas (11) and a stream of high-pressure hydrogen gas (9) using a high-pressure electrolyser (3),

b) feeding a reciprocating positive displacement pump (5) comprising a reciprocating member (5d), with a stream of CO_2 (6), and with the stream of high-pressure oxygen gas (11) as drive gas to actuate the reciprocating member (5d) and compress the CO_2 (6) to obtain a stream of high-pressure CO_2 (15).

2. The method as claimed in claim 1, comprising c) reacting the high-pressure CO_2 (15) with the high-pressure hydrogen gas (9) to obtain a synthetic hydrocarbon gas (13).

3. The method as claimed in any of the preceding claims, comprising feeding a second reciprocating positive displacement pump (17) comprising a second reciprocating member (17d), with a stream of water (16), and the stream of high-pressure oxygen gas (11) as drive gas to actuate the second reciprocating member (17d) and compress the water to obtain a stream of compressed water (19).

4. The method as claimed in claim 3, wherein the second reciprocating positive displacement pump (17) is a piston pump or a plunger pump.

5. The method as claimed in claim 3 or 4, comprising feeding the stream of compressed water (19) into the high-pressure electrolyser (3) as electrolyte to generate the stream of high-pressure oxygen gas (11) and the stream of high-pressure hydrogen gas (9).

6. The method as claimed in any of the preceding claims, wherein high-pressure is a pressure of at least 35 bar.

7. The method as claimed in any of the preceding claims, wherein the reciprocating positive displacement pump (5) is a piston pump or a plunger pump.

8. The method as claimed in any of the preceding claims, comprising generating the stream of CO_2 (6) for the feeding in step b) by thermal decomposition of calcium carbonate (23).

9. A synthetic hydrocarbon gas production system (1-1; 1-2; 1-3) comprising:

a high-pressure electrolyser (3) having an oxygen gas outlet (3c) and a hydrogen gas outlet (3b), wherein the high-pressure electrolyser (3) is configured to generate a stream of high-pressure oxygen gas (11) discharged through the oxygen gas outlet (3c) and a stream of high-pressure hydrogen gas (9) discharged through the hydrogen gas outlet (3b),

a reciprocating positive displacement pump (5) comprising:

a CO_2 inlet (5a) configured to receive a stream of CO_2 (6),

a CO_2 outlet (5c),

a high-pressure gas inlet (5b) connected to the oxygen gas outlet (3c), and

a reciprocating member (5d) configured to be actuated by the high-pressure oxygen gas (11) as drive gas and compress the CO_2 (6) to obtain a stream of high-pressure CO_2 (15) discharged through the CO_2 outlet (5c).

10. The synthetic hydrocarbon gas production system (1-1; 1-2; 1-3) as claimed in claim 9, comprising a reactor (7) connected to the CO_2 outlet (5c) and to the hydrogen gas outlet (3b), wherein the reactor (7) is configured to react the high-pressure CO_2 (15) and the high-pressure hydrogen gas (9) to obtain a synthetic hydrocarbon gas (13).

11. The synthetic hydrocarbon gas production system (1-2; 1-3) as claimed in claim 9 or 10, comprising a second reciprocating positive displacement pump (17) including:

a water inlet (17a) configured to receive a stream of water (16),

a water outlet (17c),

a second high-pressure gas inlet (17b) connected to the oxygen gas outlet (3c), and

a second reciprocating member (17d) configured to be actuated by the high-pressure oxygen gas (11) and compress the water (16) to obtain a stream of high-pressure water (19) discharged through the water outlet (17c).

12. The synthetic hydrocarbon gas production system (1-2; 1-3) as claimed in claim 11, wherein the high-pressure electrolyser (3) has an electrolyte inlet (3a), wherein the water outlet (17c) is connected to the electrolyte inlet (3a) to feed the high-pressure electrolyser (3) with the high-pressure water (19) as electrolyte.

13. The synthetic hydrocarbon gas production system (1-1; 1-2; 1-3) as claimed in any of claims 9-12, wherein high-pressure is a pressure of at least 35 bar.

14. The synthetic hydrocarbon gas production system (1-1; 1-2; 1-3) as claimed in any of claims 9-13, wherein the reciprocating positive displacement pump (5) is a piston pump or a plunger pump.

15. The synthetic hydrocarbon gas production system (1-3) as claimed in any of claims 9-14, comprising a thermal decomposition reaction chamber (21) configured to thermally decompose calcium carbonate, wherein the thermal decomposition reaction chamber (21) comprises a thermal decomposition reaction chamber outlet (21b) connected to the CO2 inlet (5a) of the reciprocating positive displacement pump (5).