CLAIMS

1. A fuel supply system of a liquefied natural gas fueled ship, comprising:

an Otto cycle engine fueled by liquefied natural gas and employing an Otto cycle;

a high pressure pump pressurizing liquefied natural gas discharged from a storage tank;

a vaporizer vaporizing the liquefied natural gas pressurized by the high pressure pump;

an expansion valve expanding the natural gas vaporized by the vaporizer;

a gas/liquid separator separating a gas-liquid mixture formed by the expansion valve into gas and liquid; and

an LNG cooler performing heat exchange between the liquefied natural gas pressurized by the high pressure pump to be supplied to the vaporizer and the liquid separated by the gas/liquid separator to be returned back to the storage tank,

wherein the liquid separated by the gas/liquid separator is returned back to the storage tank and the gas separated by the gas/liquid separator is supplied as fuel for the Otto cycle engine to adjust a methane number of the natural gas fuel supplied to the Otto cycle engine, and

the pressurized liquefied natural gas to be supplied to the vaporizer is heated and the liquid to be returned back to the storage tank is cooled in the LNG cooler.

2. The fuel supply system according to claim 1, further comprising:

a fuel gas heater heating the natural gas fuel separated by the gas/liquid separator to be supplied as fuel to the Otto cycle engine,

wherein the natural gas fuel having passed through the expansion valve and the fuel gas heater has a temperature required for the Otto cycle engine.

3. The fuel supply system according to claim 2, wherein the Otto cycle engine comprises:

an X-DF engine provided as a two-stroke engine for propulsion of the ship; and

a dual fuel diesel generator (DFDG) provided as a four-stroke engine for generation of assistant power of the ship,

wherein the natural gas fuel having passed through the fuel gas heater is adjusted to have a temperature and pressure required for the X-DF engine.

4. The fuel supply system according to claim 3, further comprising:

a decompression valve decompressing the natural gas fuel to be supplied to the DFDG,

wherein the natural gas fuel having passed through the fuel gas heater and the decompression valve is adjusted to have a pressure required for the DFDG.

5. The fuel supply system according to any one of claims 1 to 4, further comprising:

an LNG fuel line providing a path through which the liquefied natural gas is supplied from the storage tank to the engine through the high pressure pump and the vaporizer; and

a boil-off gas fuel line providing a path through which boil-off gas generated in the storage tank is supplied as fuel for the engine,

wherein the boil-off gas fuel line comprises compression units compressing the boil-off gas and an intercooler cooling the boil-off gas heated through compression by the compression units.

6. The fuel supply system according to claim 5, further comprising:

a boil-off gas cooler performing heat exchange between the compressed and cooled boil-off gas and the pressurized liquefied natural gas to be supplied to the vaporizer,

wherein the pressurized liquefied natural gas to be supplied to the vaporizer is heated and the boil-off gas is cooled in the boil-off gas cooler.

7. The fuel supply system according to claim 6, further comprising:

a boil-off gas expansion valve expanding the boil-off gas cooled by the boil-off gas cooler to the same pressure as the gas-liquid mixture supplied to the gas/liquid separator.

8. The fuel supply system according to claim 5, further comprising:

a controller controlling a temperature, pressure and flux of a fluid supplied to the high pressure pump, the vaporizer, the expansion valve and the gas/liquid separator or a fluid discharged from the high pressure pump, the vaporizer, the expansion valve and the gas/liquid separator according to variation in load of the Otto cycle engine.

9. The fuel supply system according to any one of claims 1 to 3, further comprising:

a gas combustion unit (GCU) treating boil-off gas generated in the storage tank.

10. A fuel supply method of a liquefied natural gas fueled ship, comprising:

a pressurization step in which liquefied natural gas discharged from a storage tank is pressurized using a high pressure pump;

a vaporization step in which the liquefied natural gas pressurized in the pressurization step is vaporized into natural gas using a vaporizer;

an expansion step in which the natural gas vaporized in the vaporization step is expanded;

a gas-liquid separation step in which a gas-liquid mixture formed by expansion in the expansion step is separated into gas and liquid; and

a fuel supply step in which the liquid separated in the gas-liquid separation step is resupplied to the storage tank and the gas separated in the gas-liquid separation step is supplied as fuel to an Otto cycle engine,

whereby the liquefied natural gas stored in the storage tank is supplied as a fuel satisfying requirements of temperature, pressure and methane number for the Otto cycle engine, and further comprising:

a heat exchange step in which the liquid to be resupplied to the storage tank in the fuel supply step is heat-exchanged with the pressurized liquefied natural gas before vaporization of the pressurized liquefied natural gas in the vaporization step,

wherein the pressurized liquefied natural gas is vaporized after being heated by the liquid to be resupplied to the storage tank and the liquid to be returned back to the storage tank is supplied to the storage tank after being cooled by the pressurized liquefied natural gas.

11. The fuel supply method according to claim 10, further comprising:

a heating step in which the gas fuel separated to be supplied to the engine in the fuel supply step is heated,

wherein a fluid having passed through the heating step has a pressure, temperature and methane number required for the Otto cycle engine.

12. The fuel supply method according to claim 11, further comprising:

a decompression step in which the gas fuel heated in the heating step is decompressed,

wherein a fluid having passed through the decompression step has a pressure, temperature and methane number required for the Otto cycle engine.

13. The fuel supply method according to claim 10, further comprising:

a compression step in which boil-off gas is discharged from the storage tank and compressed by a compressor; and

a boil-off gas fuel supply step in which the boil-off gas compressed in the compression step is supplied as fuel to the Otto cycle engine,

wherein the compressed boil-off gas has a pressure and temperature required for the Otto cycle engine.

14. The fuel supply method according to claim 13, further comprising:

a boil-off gas expansion step in which the compressed boil-off gas is expanded,

wherein the boil-off gas expanded in the boil-off gas expansion step is sent to the gas-liquid separation step to be supplied as fuel for the Otto cycle engine.

15. The fuel supply method according to claim 13, further comprising:

a boil-off gas cooling step in which the compressed boil-off gas is cooled through heat exchange between the compressed boil-off gas and the pressurized liquefied natural gas to be supplied to the vaporizer in the vaporization step,

wherein the compressed and cooled boil-off gas is supplied as fuel to the Otto cycle engine.