F. RADEMACHER.

LIQUID FUEL SUPPLYING APPARATUS.

APPLICATION FILED FEB. 3, 1903.

931,647.

Patented Aug. 17, 1909.

2 SHEETS—SHEET 1.

Fig. II

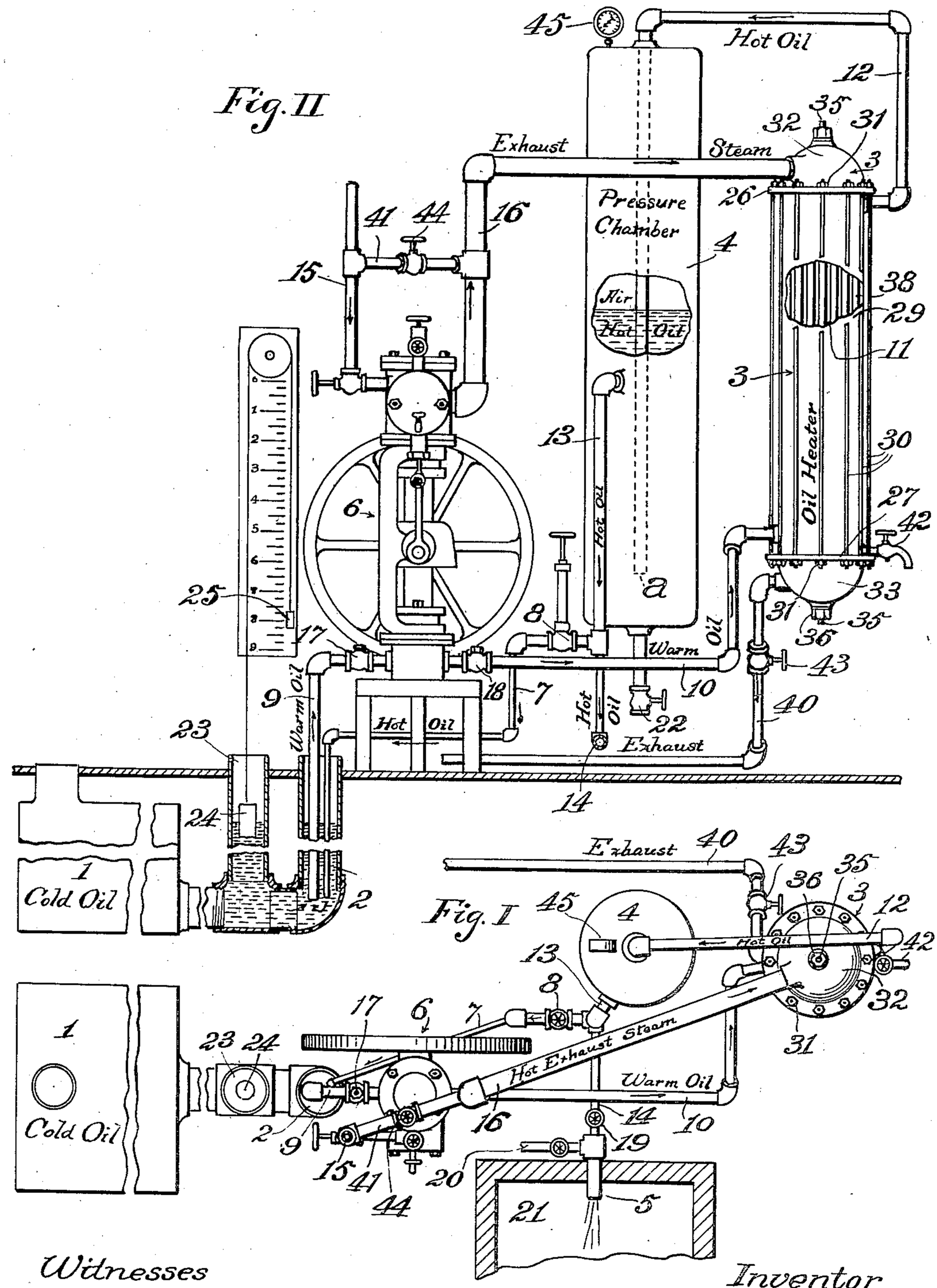

Fig. I

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2 SHEETS—SHEET 2.

Fig. IV

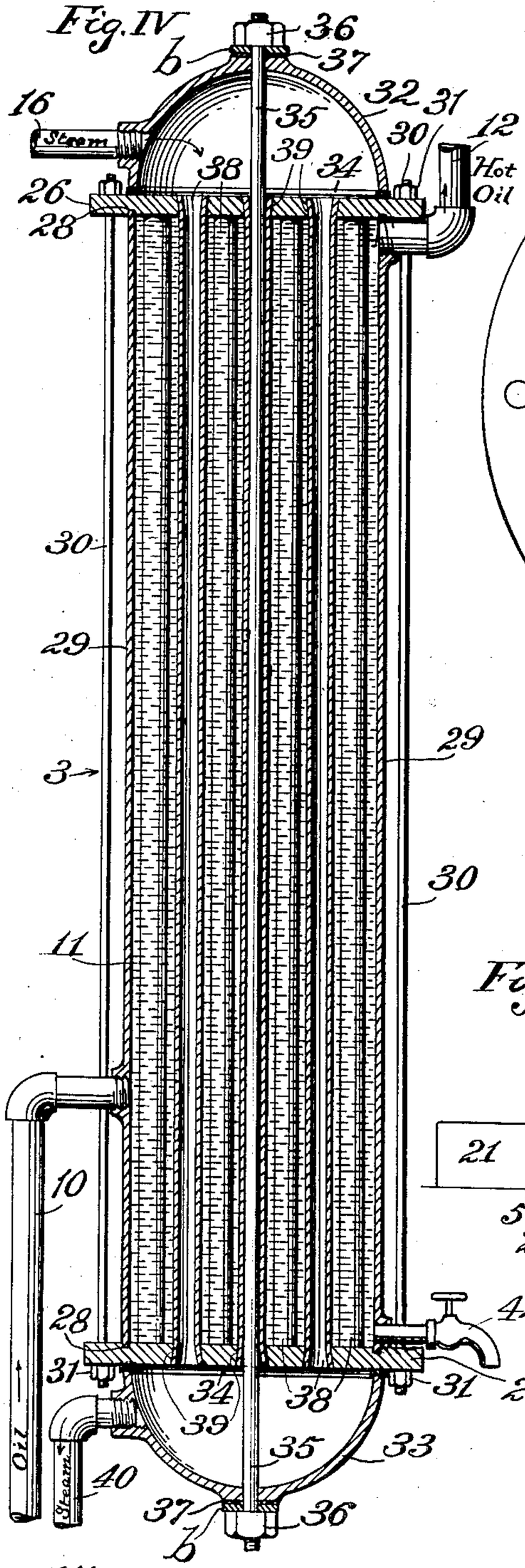


Fig. V

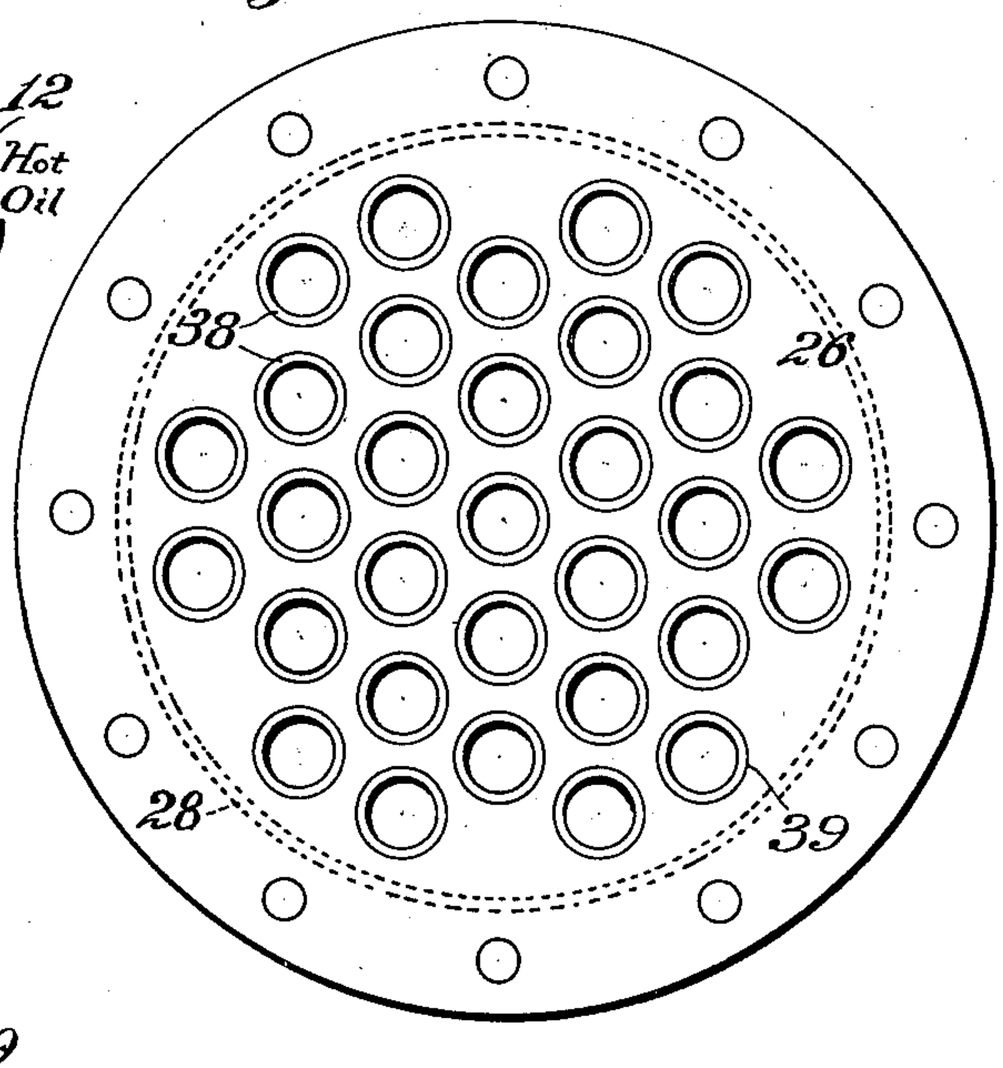
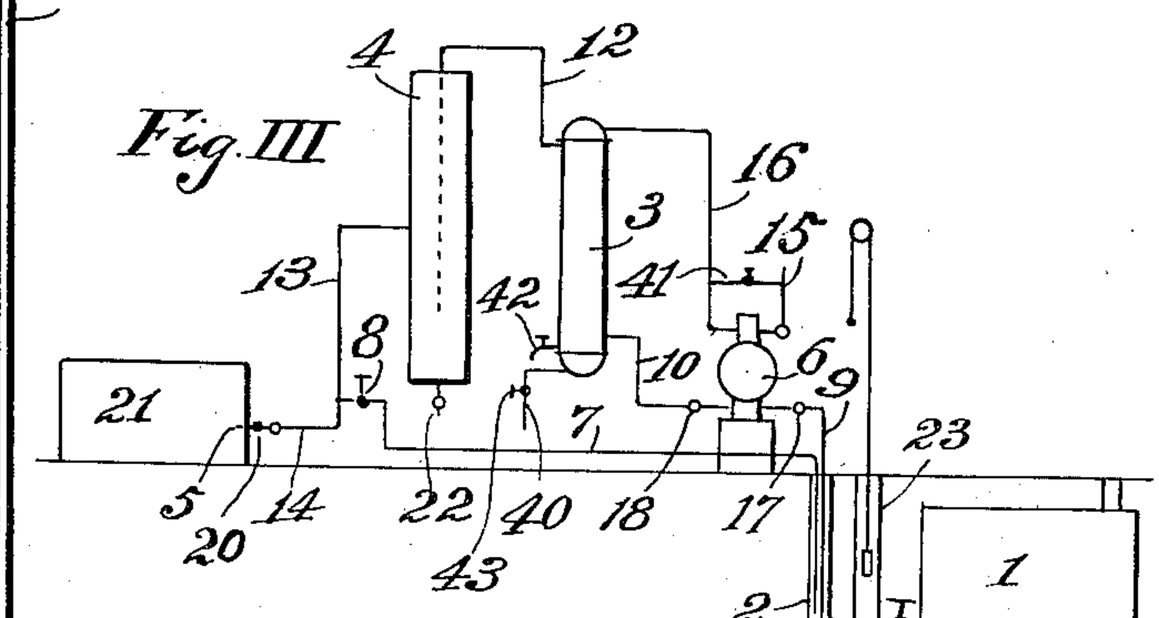


Fig. III



Witnesses

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UNITED STATES PATENT OFFICE.

FRANK RADEMACHER, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-HALF TO JOSEPH MAIER AND GEORGE ZOBELEIN, OF LOS ANGELES, CALIFORNIA; MARY MAIER EXECUTRIX OF SAID JOSEPH MAIER, DECEASED.

LIQUID-FUEL-SUPPLYING APPARATUS.

No. 931,647. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed February 3, 1903. Serial No. 141,753.

To all whom it may concern:

Be it known that I, FRANK RADEMACHER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Liquid-Fuel-Supplying Apparatus, of which the following is a specification.

This invention relates to means for supplying liquid fuel for direct combustion in a furnace or for the manufacture of gas which may be distributed or stored for subsequent consumption.

An object of this invention is to provide means for securing the highest efficiency from liquid fuel whether for immediate combustion or for the production of gas for subsequent consumption.

Another object is to provide practical means for using for fuel, crude petroleum of very low gravity and great consistency and viscosity which cannot be successfully used as fuel by any of the means or methods heretofore known.

Another object is to provide a fuel supplying apparatus which will eliminate from crude oil any contained water, and will supply the fuel to a furnace or gas retort in a refined and highly fluid condition, without any loss of its light or volatile combustible constituents.

Another object is to provide means whereby the use of liquid fuel on steam vessels may be divested of all danger from explosive gases forming in the storage tanks.

By this invention fuel which will not ignite except at high temperature can be successfully used and it is made practicable to supply the oil storage tanks of steamers with heavy low gravity crude petroleum which is not at all liable at ordinary temperatures to produce explosive or combustible gases, and to use said oil with the utmost convenience and with the highest efficiency.

A further object is a great reduction in the cost of fuel, utilizing the cheapest grades of oil without any refinery cost or waste.

The accompanying drawings illustrate the invention.

Figure I is a plan partly in section and broken in part, illustrating apparatus embodying this invention. Fig. II is a fragmental elevation of the same, partly sectioned and broken in part to contract the view. Fig. III is an unbroken diagrammatic elevation on a smaller scale, the parts being rearranged for convenient illustration. Fig. IV is an axial vertical section of the heater and water separator shown in Figs. I and II. Fig. V is a plan of the head of the oil chamber of the heater.

1 is a source of oil supply, comprising an oil chamber communicating with a vertical nipple 2 open at its upper end.

3 is a heater in the form of an oil-heating chamber or tank; 4 a pressure chamber connected with the heater; 5 an atomizer; 6 a pump connected to pump oil from the oil chamber to the atomizer 5 through the heater 3 under pressure of the pressure chamber 4.

7 is a relief and overflow pipe for conducting to the oil chamber 2, heated oil which comes from the heater 3, and 8 is a pressure regulator for the relief pipe 7 for regulating the pressure in the pressure chamber 4.

9, 10 designate an oil supply pipe which, in connection with the oil pump 6, forms a conduit from said chamber to the heater 3. The portion 9 of said pipe leads from the oil chamber 2 to the pump 6, and the portion 10 leads from the pump to the heater chamber 11.

12 is a hot-oil pipe leading from the heater 3 to the pressure chamber 4 and opening into such chamber near the bottom thereof.

13 is the hot-oil discharge pipe which leads from the pressure chamber above the mouth *a* of the hot-oil pipe 12 and has two branches, one of which, 14 is the supply pipe for the atomizer nozzle 5, and the other, 7 is a relief and overflow pipe controlled by the pressure regulator 8 and leading to the chamber 2 for the double purpose of first allowing a regular action of the pump and second supplying hot oil for warming oil in chamber 2 before it enters the supply pipe 9.

The main oil supply reservoir 1 is, it will be seen, provided with a contracted extension 2, said extension forming a supplemental oil chamber into which surplus hot oil is returned through relief pipe 7. The oil supply pipe 9 leads from said contracted extension 2 into which pipe 7 empties. This construction avoids mixing any of the heated

oil with the main body of cold oil in the supply 1, and also tends to make the oil warmer and less viscid where it enters supply pipe 9.

15 is a steam supply pipe for the oil pump 6.

16 is the exhaust steam pipe leading from the oil pump 6 to the heater 3.

Valves 17, 18 are check valves for controlling the oil. The valve 19 regulates the amount of oil supplied to the atomizer nozzle 5.

20 designates a live steam pipe for the atomizer 5.

21 designates any furnace, retort, or other receiver or converter into which the hot oil may be discharged as required.

22 is a valved impurity draw off pipe leading from the bottom of the pressure chamber 4 for the purpose of removing any water or other foreign substance or impurities which may collect at the bottom of the pressure chamber.

23 is an indicator stand pipe in which a float 24 plays up and down to move the indicator 25 to indicate the depth of oil in the supply tank 1.

The heater is desirably constructed as shown in detail in Figs. IV and V. 26 and 27 are tube sheets having annular grooves 28 into which the ends of a shell 29 are fitted by ground joints to prevent any leakage of oil. The tube sheets 26, 27 are held in place by rods 30 passed therethrough outside the shell and secured by nuts 31.

32 and 33 are hollow heads fitted steam tight, by rings of packing 34, on the tube sheets and held in place by means of a rod 35 extending through the heads 32, 33 and secured by nuts 36. Packing 37 and a washer *b* are interposed between the nuts 36 and the heads 32, 33. Tubes 38 extend between the tube sheets, being expanded into perforations 39 therein thus forming an oil tight chamber 11 within the shell 29 and between the tube sheets 26, 27. The heads 32, 33 form distributing and receiving chambers for passing the exhaust steam from pipe 16 through the tubes of the heater and to the final exhaust pipe 40.

Any other means for transforming the oil from a liquid to a vapor or gas may be substituted for the atomizer and converter without departing from the spirit of the invention.

By providing means for warming the oil in the oil chamber away from the main body of oil in the tank or other source of supply, very thick crude oil may be pumped to the heater and there, under the heat from the exhaust steam, the oil may be brought to a high degree of fluidity; and when this highly heated and highly fluid oil is allowed to stand in the pressure chamber under pressure of the contained air, then water and other contained impurities, if any, fall to the bottom and may be drawn off through the cock 22.

By supplying a highly heated oil to the atomizer, converter or other means for transforming oil to a vapor or gas, I am able to gain a great economy, but this involves a method which is claimed in an application for patent, Serial No. 141,754, filed contemporaneously herewith.

41 is a live steam pipe connecting with the exhaust pipe 16 for supplying the heater 3 with live steam for heating the oil independently of exhaust from the pump. This has a double use, viz., 1st, to heat the oil before starting the atomizer or pump; 2d to supply additional heat to the oil when the exhaust steam is insufficient.

The outlet end of the pipe 7 which is a branch from the pipe that conveys the hot oil to the vaporizer is submerged in oil near the intake of the oil supply pipe 9 as as to prevent the escape of volatile portions of the oil into the atmosphere.

45 is a gage on the pressure tank.

42 is a cock at the bottom of the heater to draw off the impurities which may deposit in the heater.

The oil supply pipe enters the heater at a considerable distance above the bottom of the heater so that the impurities which settle therefrom will not be disturbed by the inflowing oil. The hot oil pipe opens from the heater as near the top as possible so as to utilize all the space of the heater, and so that in filling the heater the oil may force the air out into the pressure chamber through the hot oil pipe.

43 is a valve on the final exhaust pipe by which the same can be controlled for the purpose of increasing the pressure, and consequently the heat in the heater. The live steam by-pass pipe 41 has a valve 44 which may be opened before starting the pump; and by closing the valve 43 to a greater or less extent the oil in the heater may be brought to a desired temperature, after which the valve 44 may be closed, the final exhaust valve 43 fully opened and the pump 6 and the atomizer 5 started into operation.

The gage 45 enables the operator to adjust the regulator 8 to the proper pressure required for supplying oil to the atomizer. A pressure of ten pounds is sufficient for this purpose under ordinary conditions.

What I claim and desire to secure by Letters-Patent of the United States is:—

1. In a liquid fuel supplying apparatus, a vertical nipple open at its upper end, a source of oil supply having a chamber communicating with said nipple, a heater, a pressure-chamber connected with the heater, an atomizer, a steam pump connected to pump oil from the nipple to the atomizer through the heater, an exhaust pipe leading

from the steam pump through the heater, a relief-pipe for conducting heated oil from the heater to the nipple, and a pressure-regulator for the relief-pipe.

2. In a liquid fuel supplying apparatus, a vertical nipple open at the top, an oil chamber communicating with the nipple, a heater, a steam pump connected to pump oil from the nipple through the heater, an exhaust-pipe leading from the steam pump through the heater, a relief-pipe discharging hot oil from the heater into the nipple, and a pressure-regulator for the relief-pipe.

3. An atomizer, a main oil supply reservoir provided with a contracted extension, an oil-heating chamber, a pressure chamber, means for supplying hot oil from such heating chamber to the pressure chamber, means for supplying hot oil from the pressure chamber to the atomizer, a pressure-regulator for regulating the supply of hot oil from the pressure-chamber to said contracted extension of the supply reservoir, and means for moving oil from said extension to the hot oil-supplying means.

4. A source of oil supply, a heater, a conduit therebetween provided with a pump, a pressure chamber, a pipe leading from the heater to the chamber near its bottom, and a branched pipe leading from the chamber above the inlet of said pipe, one branch of which communicates with the oil supply and the other one leads to the point of consumption.

5. A source of oil supply, a vertical heater communicating therewith, a vertical pressure chamber, a pipe leading from the top of the heater nearly to the bottom of the chamber, a steam pump, the exhaust from which communicates with the heater, adjustable means for permitting the steam to escape from the heater, means at the bottom of the chamber for emptying the same, and a pipe leading from the chamber at a point above the outlet of the pipe from the heater to the point of consumption.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses, at Los Angeles, in the county of Los Angeles and State of California, this 23rd day of January, 1903.

FRANK RADEMACHER.

Witnesses:
JAMES R. TOWNSEND,
G. A. THURNER.