

No. 870,507.

PATENTED NOV. 5, 1907.

F. X. GOVERS.
HEAT ENGINE.

APPLICATION FILED APR. 2, 1907.

Fig. 1,

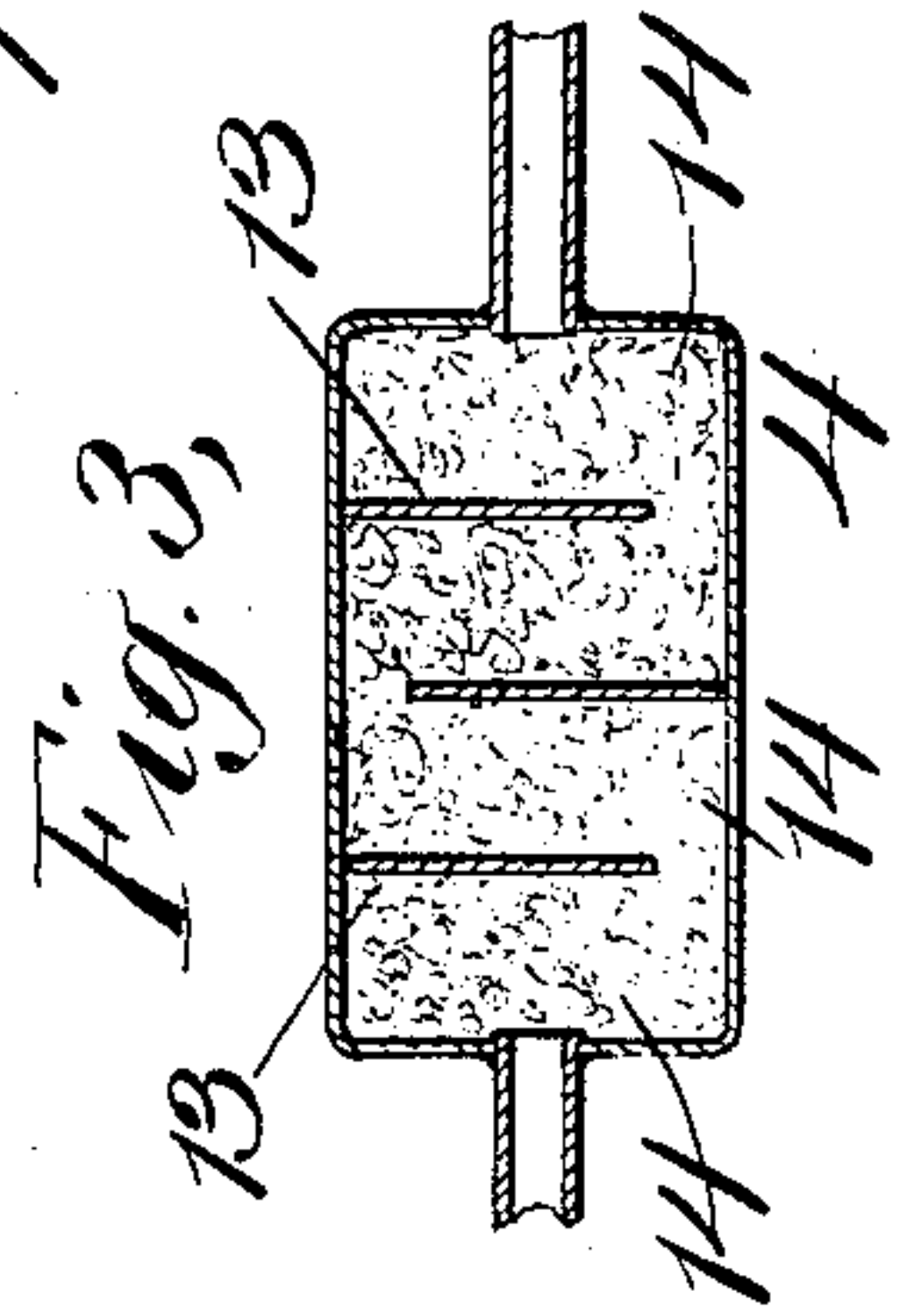
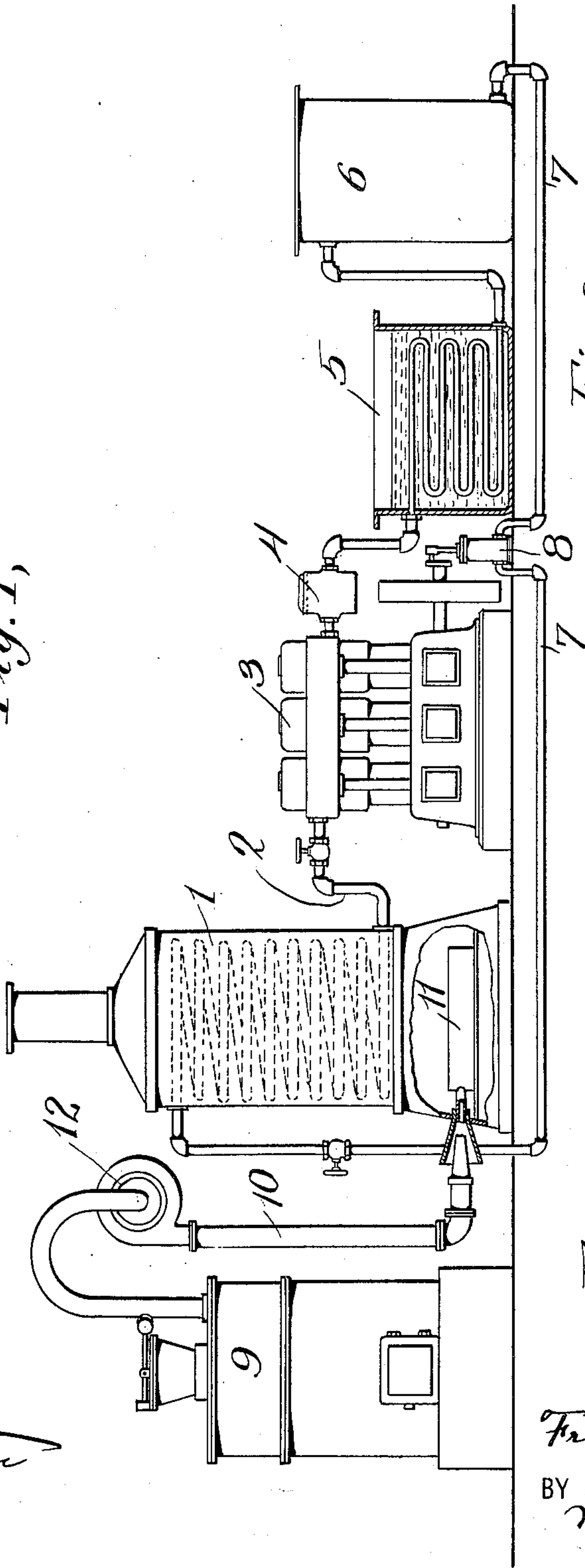
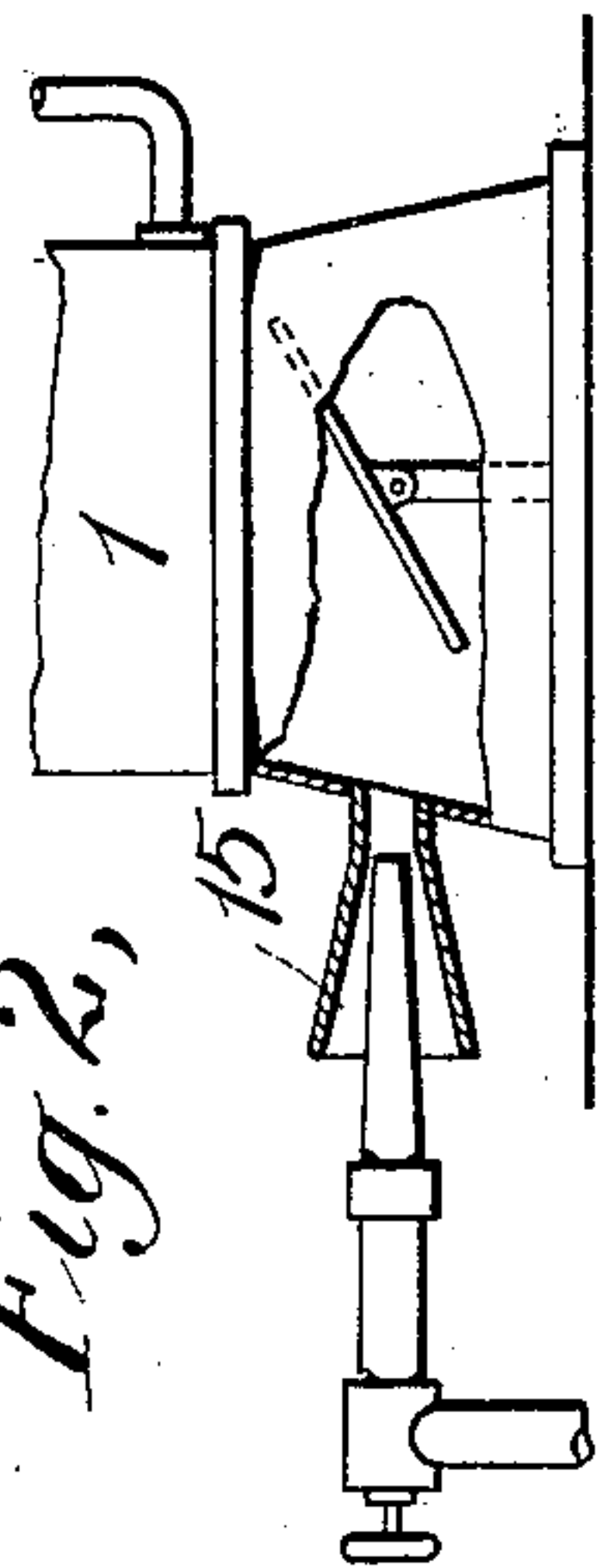


Fig. 2,



WITNESSES:

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HEAT-ENGINE.

No. 870,507.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRANCIS X. GOVERS, a citizen of the United States, residing at Owego, in the county of Tioga and State of New York, have invented certain new and useful Improvements in Heat-Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, such as will enable those skilled in the art to which it appertains to make and use the same.

My invention relates generally to heat engines, using the term in the sense in which it is used in the science of thermodynamics, and relates more especially to power producing systems, particularly to systems in which the working fluid is a chlorid of carbon liquid at ordinary temperatures and of low boiling point. Such chlorids, in the presence of water and particularly under the influence of heat, are apt to decompose at times, as I have found, with the liberation of hydrochloric acid (HCl) which exerts a harmful influence upon iron, copper, brass, and other common metals of which apparatus using such chlorids are commonly and, for practical reasons, must necessarily be composed; for example, the shell and tubes of boilers, engine cylinders and pistons, condensers, and pipes conveying the working fluid. I have found that this slow but continuous decomposition may be prevented by removing the water from the chlorids of carbon and by preventing the presence in such chlorids, at any time during the operation of the apparatus, of any material trace of water, maintaining such chlorids in an anhydrous condition, and my invention comprises, in a heat engine, means for abstracting from the chlorid of carbon used as a working fluid any moisture present. It will be understood that not only may the chlorid of carbon, as first introduced into the apparatus, contain some water, it being substantially impossible to handle fluids such as this without their taking up some moisture from the atmosphere and from containing vessels, but moisture is apt to enter the system from time to time while the apparatus is in operation, or during periods of idleness, due to leakage in the system, to the necessity of opening parts of the apparatus for inspection, repair or other reason, and the like.

I have found that it is very advantageous in the operation of engines with chlorids of carbon to maintain in the system at all times a sufficient quantity of a hygroscopic agent to fix and render harmless any traces of moisture which may gain access to such system.

In another application for Letters Patent, Sr. No. 306,477, I have described and claimed a system for generating power wherein carbon tetrachlorid, CCl_4 , is the working fluid. My invention herein described is applicable to that system, and constitutes an improvement thereon, but is also applicable to other systems wherein other chlorids of carbon, such as chloroform, chloral, ethylene chlorid, ethylidene chlorid, trichlo-

rethane, etc. are employed as the working fluids. My invention further provides for the removal of sulfids and like impurities frequently found in commercial chloroform and carbon tetrachlorid, both of which are often made from carbon bisulfid.

The objects of my invention are to remove impurities, decomposition products, etc., from working fluids of the chlorid of carbon type, to avoid chemical attack, or corrosion of the metallic parts of the system, and to accomplish these objects by simple and inexpensive means.

I will now proceed to describe my invention with reference to the accompanying drawings, and will then point out the novel features in claims.

In said drawings: Figure 1 shows diagrammatically and in elevation a power system such as referred to above, and in which the fuel used is producer gas derived from a gas producer. Fig. 2 shows diagrammatically a boiler or still arranged to use liquid fuel, and which may be substituted for the boiler or still shown in Fig. 1. Fig. 3 shows a detail section of the purifier.

In said drawings 1 designates a suitable boiler or still, which may be of any suitable and well known construction; 2 is a pipe by which the vaporized working fluid is conveyed from said boiler or still to an engine 3, which latter may be of any suitable and well known type, 4 is a purifier, 5 a condenser, 6 a storage tank, 7 a pipe leading from said storage tank back to the boiler or still 1, and 8 a feed pump. 9 is a gas producer, 10 a pipe for conveying gas from said producer to the burner 11 of the boiler or still 1, and 12 is a blower in this pipe 10.

As will be readily understood, the system operates in the following manner: Carbon tetrachlorid or other working fluid evaporated in boiler or still 1 under pressure, is conveyed by pipe 2 to the engine 3 wherein it does work, and then passes through the purifier 4 to the condenser 5 and is there condensed to a liquid, the liquid then passing to the storage tank 6 and is returned thence to the boiler or still.

The purifier may contain any suitable substance for taking from the working fluid, traces of impurities and products of decomposition therein. In the case of carbon tetrachlorid and in like chlorids, lime, calcium chlorid or like solid dehydrating agents are suitable. I do not limit myself to any particular construction of purifier, but that shown is efficient for the purpose. In the construction shown the purifier consists of a closed vessel having within it a series of staggered partitions or baffles 13 between which the lime, calcium chlorid, or other purifying material, 14, is placed; the exhaust vapor from the engine being forced by the staggered arrangement of the partitions or baffles to pass through the purifying material and in intimate contact therewith so that thorough removal of water vapor, sulfid impurities etc., is substantially assured.

I do not limit myself to the location of the purifier in any particular part of the system, but may locate the same wherever the purifying material may come into efficient and intimate contact with the working fluid, whether in the liquid or vaporous condition, so that such fluid may be maintained at all times in an anhydrous state.

Carbon tetrachlorid and certain of the other chlorids of carbon are particularly advantageous as working fluids in power systems because the density of their vapor offers thermodynamic advantages and increased efficiency, because the vapors are non-inflammable (in the case of carbon tetrachlorid and substantially so in the case of certain other of the chlorids) and because carbon tetrachlorid, at least, has, even in the vaporous condition, considerable lubricating action, so that ordinarily no other lubricant is required in the engine cylinders. However, the use of lubricating oils in a closed system such as this with oil traps or the like, is not precluded.

Gaseous or liquid fuel is preferable in systems of this sort, particularly those of relatively small power, because of its convenience, the ease with which the flame may be controlled and regulated, and the entire freedom from danger in case of accidental development of a leak in the still causing the projection of a jet of vapor or liquid toward or into the fire. The gas producer has a further economic value in this respect because good gas producers convert solid fuel into gaseous fuel very efficiently, and the gaseous fuel may be burned with much higher efficiency under the still than can solid fuel. While the use of scrubbers, tar extractors and the like, between the producer and the still 1, is not precluded in my system, in general there will be no occasion for the use of a scrubber or tar extractor, and the gas may be delivered hot to the burner, thus making available the sensible heat of the gas as it issues from the producer. As compared with a gas producer and internal combustion engine system, the power producing system above described involving the gas producer has the improved advantage (aside from the elimination of scrubbers, tar extractors, and the possibility of utilizing the sensible heat of the gas) that the presence of hydrocarbon vapors, marsh gas, hydrogen, and other gases, the rates of combustion of which are different from those of carbon monoxid, does not lower the efficiency of the apparatus, but to the contrary such components of the gas are desirable, inasmuch as they raise the calorific value of the gas. This permits the use in the producer of bituminous fuels which are often difficult to use when the gas produced is to be used in an internal combustion engine.

The gas producer 9 may be of any usual type and indeed it is desirable to use one in which steam or water vapor is mingled with the entering air current,

as the hydrogen resulting from the decomposition of the steam raises the calorific value of the gas materially.

Instead of using gaseous fuel I may use any other type of fuel. In general, and particularly for units of small power, I prefer to use either gaseous or liquid fuel as above stated, and in Fig. 2 I have shown a still provided with a liquid fuel burner 15. The still of Fig. 2 is adapted to be substituted for that of Fig. 1 in the apparatus there shown.

My invention, involving the use of a water extractor and purifier in the system, is also adapted for use in that other type of heat engines, known as refrigerating or ice making machines, either of the compression or absorption types, in which chlorids of carbon form the working fluid.

What I claim is:—

1. A heat engine comprising in combination, a vapor generator, a motor, a condenser and means connecting the same in a closed circuit, said closed circuit containing a pure chlorid of carbon as working fluid, and a purifier in such circuit containing a chemical material adapted to remove impurities from such chlorid of carbon.
2. A heat engine comprising in combination, a vapor generator, a motor, a condenser and means connecting the same in a closed circuit, said closed circuit containing an anhydrous chlorid of carbon as working fluid, and a dehydrator containing a hygroscopic agent in said circuit.
3. A heat engine comprising in combination, a vapor generator, a motor, a condenser and means connecting the same in a closed circuit, said closed circuit containing an anhydrous chlorid of carbon as working fluid, and a purifying chamber in such circuit containing solid purifying material.
4. A heat engine comprising in combination, a vapor generator, a motor, a condenser and means connecting the same in a closed circuit, said closed circuit containing an anhydrous chlorid of carbon as working fluid, and a purifier in such circuit containing solid dehydrating material.
5. A heat engine comprising in combination, a vapor generator, a motor, a condenser and means connecting the same in a closed circuit, said closed circuit containing an anhydrous chlorid of carbon as working fluid, and a purifier in said chamber containing calcium chlorid.
6. A system for generating power, comprising a vapor generator, a condenser, means for abstracting energy from the cycle, and means for connecting said parts in a closed circuit, said closed circuit containing an anhydrous chlorid of carbon as working fluid, and a purifier in such circuit containing chemical dehydrating means.
7. A heat engine comprising in combination means for converting an anhydrous chlorid of carbon as working fluid from liquid to gaseous condition and thence back to liquid condition, including means for abstracting energy from the cycle, and means for circulating such working fluid in a complete circuit, and a purifier in such circuit comprising chemical dehydrating means.

In testimony whereof I affix my signature, in the presence of two witnesses.

FRANCIS X. GOVERS.

Witnesses:

H. M. MARBLE,
K. P. McELROY.