

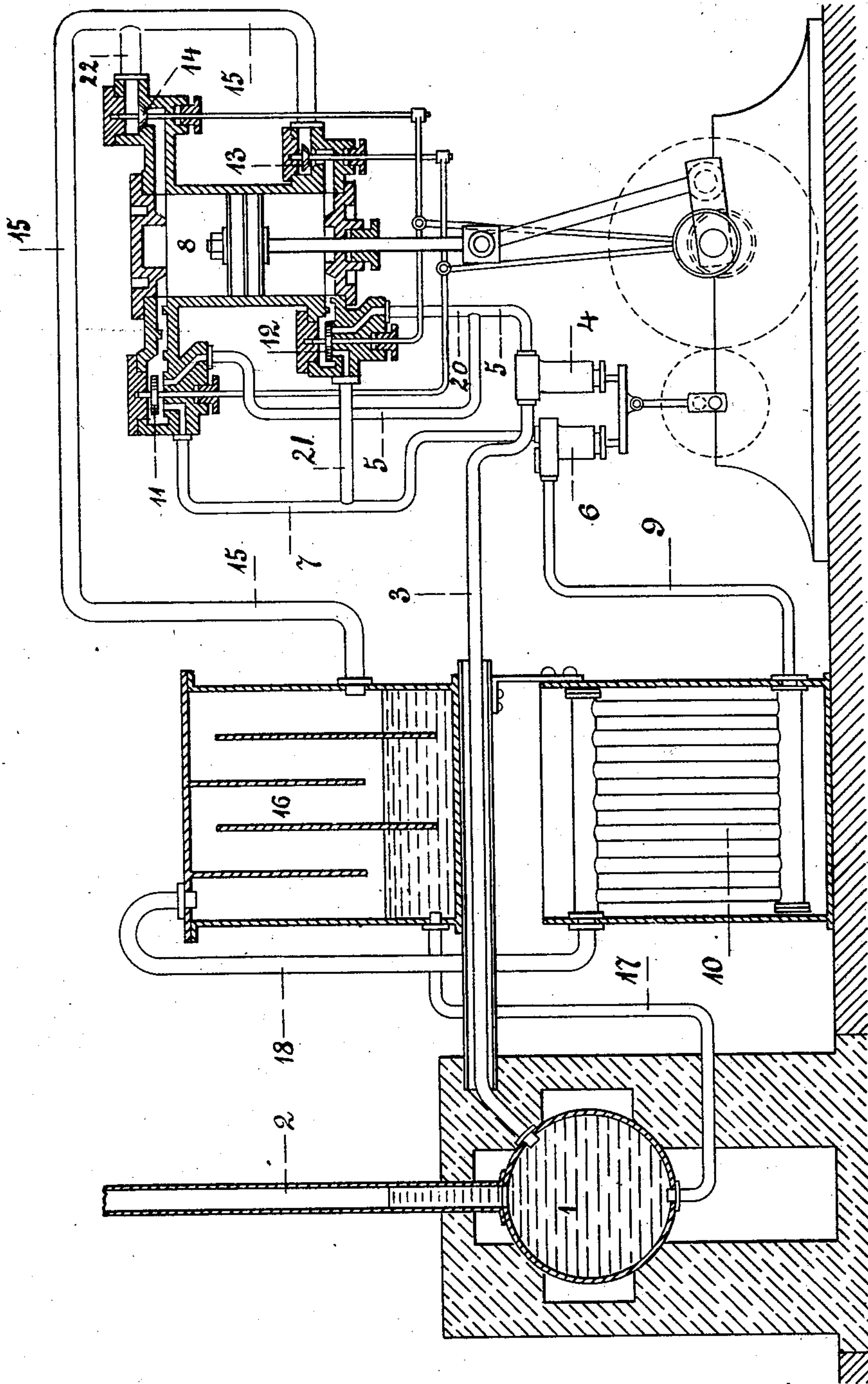
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Patented July 22, 1902.

A. SCHARFFE.
PROCESS OF VAPOR GENERATION.

(Application filed Aug. 21, 1900.)

(No Model.)



Witnesses:
J. C. Hebert.
A. Witt.

Inventor:
Adolf Scharffe.
By *W. de Vos.*
Attorney.

UNITED STATES PATENT OFFICE.

ADOLF SCHARFFE, OF TIENTSIN, CHINA.

PROCESS OF VAPOR GENERATION.

SPECIFICATION forming part of Letters Patent No. 705,306, dated July 22, 1902.

Application filed August 21, 1900. Serial No. 27,559. (No specimens.)

To all whom it may concern:

Be it known that I, ADOLF SCHARFFE, civil engineer, a subject of the German Emperor, residing at Tientsin, in the Chinese Empire, have invented a certain new and useful Process of Vapor Generation, of which the following is a specification.

It is well known that the usual apparatus for generating the motive power for driving machinery are a source of danger in all works, as the total power to be distributed to the several engines and apparatus is stored in a large quantity in one place. It is immaterial whether steam or gas pressure is used, whether the plant is large or small, or confined to a single motor. Even electricity is not excepted if generated by means of steam. The larger the generator is the greater is the danger of explosion; but even in the smallest generator of motive power there is always stored such an excess of energy that in case of an explosion the health and life of the attendants are endangered.

The object of this invention is chiefly to remove this danger, which is effected by completely avoiding the use of stations or apparatus in which a storage of motive power takes place—as, for instance, in steam-boilers—and by generating the required motive agent for driving the engine or the like by means of the same in such small quantities only as are required for producing the power during a unit of time—for instance, one stroke of the steam-engine piston. This is done by employing two different media, one of which, hereinafter called “heating liquid,” possesses a higher boiling-point than the other, hereinafter called “working medium,” and heating the heating liquid in open or closed vessels to near its boiling-point, but in any case above the boiling-point of the working medium, conducting the heating liquid and working medium separately to the motor or engine, and mixing the two substances only just before or even in the engine in such small quantities that the steam or gas developed from the working medium possesses the required pressure for performing the desired amount of work, but that no storage of energy capable of causing danger takes place in the mixing-chamber

for the heating liquid and working medium. The heating liquid thereby reduced in temperature is then returned to the heating vessel in order to be used over again, while the exhaust from the motor is condensed, and the working medium regained in this way is employed again in the manner above described. The heating liquid may be a liquid at ordinary temperatures before it is heated or may be produced for use by melting solid substances.

Whether a working medium is added to the heating liquid in the form of a liquid of lower boiling-point or of a gas or a gas absorbed in a liquid is immaterial as far as this invention is concerned, as a preferably slightly compressed gas on being mixed with the heating liquid obtains a higher pressure and can be used similarly to steam. Even salts evaporating readily without leaving a residue could be used as working medium. For the sake of convenience the evaporated working medium is hereinafter called “steam,” but may be a gas, as stated.

The mixing of the heating liquid and working medium for producing the steam can be effected, as stated above, in a separate vessel or in the engine-cylinder itself or in the piping leading to the engine.

In describing the novel method and its application the source of power has hereinbefore been designated by the general term of “working medium,” because the latter may be a liquid or a gas or even a salt evaporating without residue. When compressed or liquefied gases are used as working medium, they are condensed by a special pump after passing through the condenser or the heater and condenser, or the latter only are arranged to be under the pressure of the compressed or liquefied gas. The compression of the gas naturally is only small, as the working pressure of the same is only produced at or in the motor by mixing the compressed gas with the heating liquids. The object of the compression is only to obtain a larger effect with small quantities of the working medium, for in the engine only the difference in the pressures of the cold and heated gas is utilized.

The special result of the novel method con-

sists in the removal of all danger of explosion, and while in practice hitherto an excessively high pressure of steam had to be avoided, chiefly in consequence of the insecurity of the dangerous boilers, this danger is entirely obviated by the use of the new process. The heater for the heating medium can have any size, as there is no pressure in it likely to become dangerous, while the parts in which pressure is produced can be made of so small a diameter that they are perfectly safe against explosion under the highest pressure. If, nevertheless, an explosion should occur through insufficient strength of the walls, it can act destructively only to a very small degree, as only small quantities of steam are present.

The heating liquid may be an oil which has a boiling-point higher than that of water, and the working liquid may then be water, and in the description hereinafter given of the apparatus which is shown in the accompanying drawing it will be assumed that the heating and the working liquids are respectively such as oil and water.

The said drawing shows one form of apparatus for applying this invention in longitudinal vertical section, but with certain parts in elevation.

Referring to the said drawing, the heating medium and the working medium are brought together in the engine cylinder or motor 8, so that the motive power is generated in said cylinder. The heating medium placed in the receptacle 1, which is provided with the stand-pipe 2, is forced by pump 4 through pipes 3 and 5 and branch 20 into the passages of the valve-chamber of the motor 8. At the same time the working medium is forced by pump 6 through pipe 9 from the condenser and passes through pipes 7 and 21 into the said valve-chamber passages of the motor, so that the two mediums are mixed and the vaporization of the working medium is started just before the mediums enter the cylinder. The valves 11 and 12 admit the mixture into the cylinder above or below the piston, according to the position of the latter, while the exhaust and the heating medium reduced in temperature passes through the valves 13 and 14, through branch 22 and pipe 15, into the separator 16. The exhaust heating medium collecting in the separator passes through pipe 17 into the heating vessel 1, while the exhaust working medium flows through pipe 18 into the condenser 10 and is there condensed and then again passes into the engine 8 by means of pumps 6.

The pumps 4 and 6 are in the present case driven in the well-known manner by the main shaft of the engine. Pump 4 may be omitted, as the power-cylinder will at the beginning of the stroke draw in sufficient quantity of the heating medium, whereupon pump 6 will then supply the working medium. Prefer-

ably the pumps are provided with safety-valves, so that when the pressure of the liquid exceeds a predetermined degree the same is directly returned to the vessel without being mixed. It is obvious that instead of pumps other feeding apparatus may be used.

If oil is used as heating medium and water as working medium, it will not be necessary to condense the exhaust-steam if circumstances should not allow of having the necessary cooling-water for condensation or if the exhaust-steam can be otherwise used.

A variety of mediums may be used as heating and as working mediums, for it is only essential that the heating medium should have a higher boiling-point than the working medium, and a liquid serving in one case as heating medium may be used in another case as working medium, the heating medium in every case having a higher boiling-point than the working medium. If, for instance, water is used as heating medium and ether as working medium, water may be used in another case as working medium if, as stated above, oil is used as heating medium. Any liquid may be used that will not injuriously affect the pipes and engine. It is even possible in one machine to use one and the same liquid both as heating and as working medium if, for instance, the water used as heating medium is mixed with salts and the like that will cause the boiling-point to become higher, while the water to be used as working medium is left in its original condition. Vapors may also be used as working medium when, for instance, liquid ammonia is used as working medium and water as heating medium. In this case as soon as the water heated near to its boiling-point is mixed to the liquid ammonia the ammonia is set free and works as a gas, while the water from which the ammonia escapes is exhausted together with the water used as heating medium.

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

1. The process of generating steam or gases for power hereinbefore set forth, and consisting in mixing a medium having a high boiling-point and which is heated to a temperature below that point with a small quantity of another medium which has a boiling-point below the temperature of the first-named medium just prior to the introduction of said media into the motor, thereby vaporizing the said last-named medium, then drawing the media into a motor and operating said motor by the pressure of the vaporized medium, and then returning the first-named media to the place of heating, and so on in continuous succession.

2. The process of generating steam or gases for power hereinbefore set forth, and consisting in mixing a medium having a high boiling-point and which is heated to a temperature below said boiling-point with a small

quantity of a medium which has a boiling-point below the temperature of the first-named medium just prior to the introduction of said media into the motor, thereby vaporizing the said last-named medium, then drawing said last-named medium into a motor and there operating said motor by the pressure of the vaporized medium, then removing the last-

named medium from the said motor, and so on in continuous succession.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ADOLF SCHARFFE.

Witnesses:

HENRY HASPER,

W. KUTZKE.