Perpetual motion machine of "the second kind" Method of operation and power assessment

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Annotation

Description of a closed thermodynamic cycle, in which the value of work made by the labour body of the heat device is equal to quantity of heat generated by its heater, is presented. Realization of the cycle will allow the creation of heat devices (motors) with qualitatively new properties. Such properties will be either the highest efficiency of motors and minimal consumption of fuel or the possibility to operate using matter of the environment as a heater of the labour body. The devices realizing this possibility will have characteristics of "perpetual motion machine of the second kind". The assessment of the accessible available capacity of such devices is given.

1. Introduction

According to current opinion, all properties of processes, in which heat energy is transformed into energy of other types, are consequences of thermodynamics' postulates (its first and second laws). The second law of thermodynamics, formulated by M. Planck [1], prohibits the existence of the process, which would only result in the transformation of all heat taken from the heat reservoir (the heater of the motor's labour body) in mechanical work. According to another equivalent formulation of the second law [2], the efficiency of any heat device, which realizes a closed thermodynamic process (cycle) by its labour body in a certain temperature interval, is limited by the efficiency of Carnot cycle for this interval. In [3] – [8], the existence of closed thermodynamic cycles, during which the labour body of the heat device produces mechanical work of value equal to quantity of heat taken from the external heat reservoir (the labour body heater), is proven. Descriptions of the construction diagrams and the operation of devices realizing cycles with these energy properties are given in [3] – [5].

Evidences of the existence of the cycles, during which full transformation of heat in mechanical work happens, are logical consequences of the first law of thermodynamics. The fact of such cycles' existence contradicts the mentioned formulating of the second law.

It is obvious that, if consequences of one physical law contradict formulating of another, they both cannot be universal. Thus, a conclusion follows from the fact that contradictions exists between consequences of one thermodynamics postulate and the formulating of another: one of these postulates is not universal. Since there are no doubts in the universal nature of the first law of thermodynamics (law of energy conservation), we must refuse the doctrine of universal nature of its second law's formulating, i.e. we must acknowledge that situations can possibly exist, when some of the formulating does not work. This is confirmed in [9] – [12].

2. Full transformation of heat into work happens during the cycle when aggregative state of the heat device's labour body changes.

Then a cycle is considered, which allows realizing the process of transformation of heat obtained by the labour body of the heat device from its heater into equivalent mechanical work in the simplest way.

The cycle's attributes are the following:

- The labour body of the heat device produces a yield during the process of adiabatic expansion from the initial state of the cycle:
- In this process, the matter of the labour body changes its aggregate state forming a heterogeneous system from the equilibrium phases of liquid and prime steam;
- Expansion comes to an end when the density of the liquid phase's matter becomes equal to the initial density of the homogeneous labour body;
- On completion of expansion (with minimal temperature of the cycle) phases of the labour body are separated from each other by a hard diathermal partition;
- The heterogeneous labour body is adiabatically pressed to initial density keeping the heat balance between phases and the constancy of volume and mass of the liquid state's matter;
- Parts of the labour body separated by a diathermal partition are united in the initial volume;
- Heat contact between the labour body and the heater is made;
- The labour body is heated isochorically up to initial temperature of the cycle by heat produced by the heater.

Processes of the cycle by T-S diagram are shown on Fig. 1. A border of two-phase state regions of the labour body is formed by diagrams of specific entropies' temperature dependencies of $S_l(T)$, $S_s(T)$ of equilibrium phases of the used matter's steam and liquid. Minimal temperature of the cycle T_{min} can be chosen at will from an interval within the limits, which are melting temperature T_{mel} and critical temperature T_{cr} of the matter. A lot of possible initial states of the labour body in the cycle are presented by a section of the isochore limited by points 3 and 5 with parameters of $T_{min}, S_l(T_{min})$ and $T_{max}, S_s(T_{min})$. Initial density of the labour body in the cycle is equal to density of matter in the liquid phase under minimal temperature. The process of adiabatic expansion of the labour body from the initial state with parameters of T_o, S_o is presented by the section 1-2. Points 3 and 4 are states of equilibrium phases of the heterogeneous labour body under minimal temperature of the cycle. States of matter of phases remote from one another during the process of adiabatic

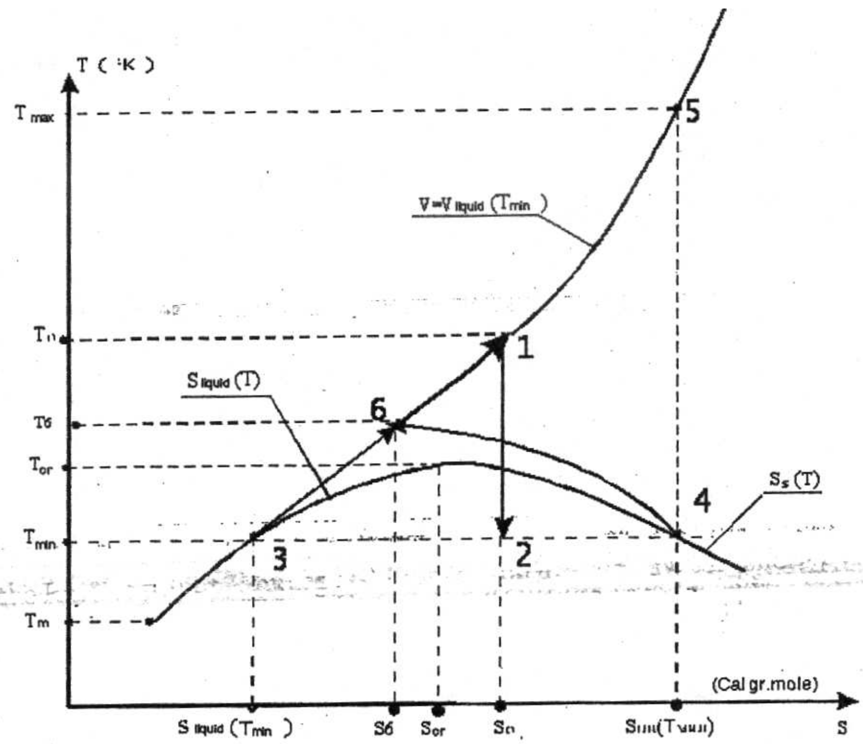

Fig. 1

compression of the heterogeneous labour body are presented by the isochore section 3-6 and the curve 4-6, which shows states of steam phase matter in the process. Heating of the unified matter of the labour body by external heat is shown by the isochore's section 6-1.

Construction diagram of the device offered for realization of the cycle [13] is shown on Fig. 2.

The operation process in each cylinder is the following:

The initial state of the labour body coincides with the extreme low position of the piston. Valve 5 is open and heat valve 7 is closed. The homogeneous labour body is adiabatically insulated from the heater and the environment. Upward motion of the piston is accompanied by the adiabatic expansion of the matter and its division into phases of steam and liquid. Liquid flows down and fills a capacity under partition 4. Infill ends when the piston is in its extreme high position. Valve 5 closes dividing the labour body phases from each other. During backward motion of the piston compression of the steam phase matter and adiabatic heating of all heterogeneous matter happen. Its temperature is less than the initial one at the moment of the piston's returning to the extreme low position. The matter's returning to the initial state is attained by opening of valve 5 and heat valve 7. Heat moving through heat system 6 isochorically heats the unified matter of the labour body to its initial temperature. After the heating is completed, valve 7 closes and a new working cycle begins in the cylinder.

3. Use of the cycle for yield production by transformation of free heat taken by the environment from the matter.

Evaluation of accessible capacity of the heating device, which realizes the process.

If maximal (initial) temperature of the labour body is chosen less than environment temperature in the described cycle, heat transformed into work can be transferred from the matter to the labour body without mechanical work consumption, i.e., in this case, the environmental matter can function as the heater of the heating device's labour body. It is

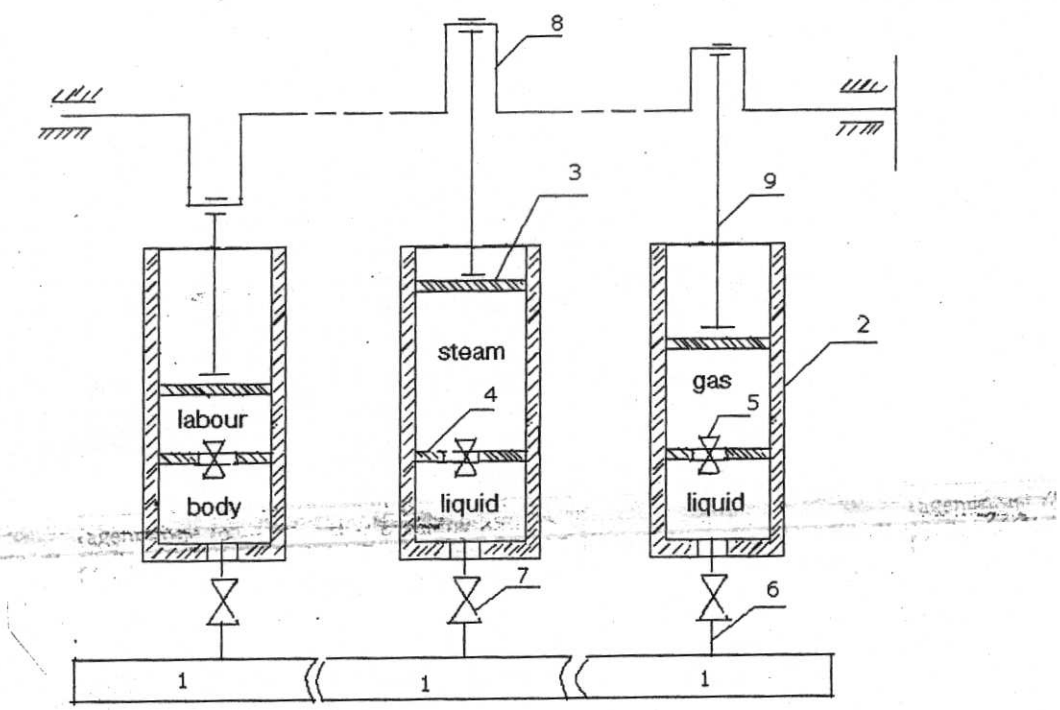

Fig. 2.

1- a heater with a temperature higher than the initial temperature of the labour body during the cycle;
2- cylinders (there can be any number of them in the device) containing the labour body in capacities limited by the cylinders' walls, their ends and moving pistons 3;
4- a hard diathermal partition in the cylinders and valves on them 5 designed for division of the labour body's phases;
6- systems for heat transmission from the heater to the labour body in the cylinders:
7- heat valves for the renewal of the adiabatic insulation of the labour bodies in the cylinders;
8- a crankshaft and a flywheel on it;
9- mechanisms connecting pistons in the cylinders with the crankshaft

seen from Fig. 1 that, among a quantity of possible initial temperatures of the cycle presented by ordinates of the isochore 3-5 section's points, there will be sufficiently low temperatures if either the critical temperature or the melting temperature of the matter is less than the external temperature.

Real matters meeting these needs are, for example, Ar, N_2, CO_2 and others. A heater of the device designed for transformation of heat taken from the environment into work must be made as a heat exchanger, through which external matter flows. The average capacity of the device is equal to the quantity of heat transferred during a unit of time from environmental matter to the labour body. In order to provide for stable operation of the device, a part of the produced capacity must be spent on matter's flushing through the heat exchanger. The available capacity is equal to the difference between the average capacity of the device and the capacity used for flashing. The ability of the heat exchanger to supply heat to the labour body is determined by the following parameters:

- the difference of environmental matter's temperatures ΔT measured at the input and output of the heat exchanger in the flow running through it;
- square S of the section of the canal where the flow runs;
- the speed of environmental matter's flow at the heat exchanger's input;
- the physical constants of environmental matter (density ρ, molecular weight m, heat capacity C_v).

Evaluation of the accessible capacity of the device realizing the process of free heat conversion is presented by the formula [7]:

$$W^{max}_{avail.} = \sqrt{\frac{1}{m} \cdot \frac{S}{V_{norm}}} \cdot \left(\frac{2}{3} C_v \Delta T\right)^{3/2}$$

V_{norm} - molar volume of gas under normal conditions.

As an example, the following values of quantities in the formula are taken:

$\Delta T = 10K$; $C_v \cong 5$ cal/degree•mole;
$S = 0.25\ m^2$; $V_{norm} = 22.4$ l/mole; $m \cong 29$ g/mole.

Design factors of the device are S and ΔT. Their values also determine the size (capacity) of the device. During the optimal operation mode of the device with these parameters' values,

$$W^{max}_{avail.} \approx 107 \text{ kW}$$

The available capacity of the heat device realizing the process of transformation of free heat taken from environmental matter into work can be compared (with similar HWD) with the capacity of heat devices of known types.

4. Conclusions

1. Closed thermodynamic cycles exist, in which positive work performed by the heating device's (motor) labour body is equal to the quantity of heat transferred to the labour body from the external heat reservoir (the heater of the labour body). Proofs of cycle's existence are logical consequences of the first thermodynamics' law.

2. Existence of thermodynamic cycles with such energy properties displays the presence of a contradiction between the first thermodynamics law and some admitted formulation of the second law. In order to find out the solution, it is necessary to refuse the doctrine of universal character of all the second law's formulations and admit that the adaptability of some of them is limited, i.e. situations are possible when these formulations do not work.

3. A fact of existence of thermodynamic cycles, the realization of which will provide for full heat transformation into work, displays the possibility to design heat devices (motors) with quantitatively new properties.

4. Heat motors, which transform all high-temperature heat generated by fuel combustion into work, will have higher efficiency than existing motors. Their efficiency will be sufficiently higher than the Carnot cycle's efficiency in used temperature intervals. Increase of accessible efficiency up to values close to 1 will allow every user to cut fuel consumption by 2 - 3 times and decrease the pollution of the environment by combustion materials and diffused heat.

5. Realization of the discovered opportunity to perform work by the transformation of free energy taken from the environmental matter will lead to the design of devices, which have properties of a "perpetual motion machine" of the second kind. Evaluation of accessible capacity of such motors lets us suppose that their practical development and wide use in different technology fields is expedient. Quality advantages of the suggested devices over the known sources of free energy (hydraulic, wind, solar, geothermal etc.) will be the independence of their efficiency from the environment (place, time, weather etc.) and a big specific output (per unit of the device's capacity). New sources of free energy will allow users to satisfy their needs for energy or heat with maximal economy and complete ecological cleanness. The autonomous operation of these devices will provide users with independence from known external sources of energy, heat, and fuel.

6. Consumer qualities of the suggested devices (economy, portability, ecological clearness, the possibility to change available capacity within wide limits) will create an unlimited market for them. Businessmen, who organize their production and sale in sufficiently large quantities, will be well-provided for high and stable profit.

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