THE VIOLATION OF SECOND LAW OF THERMODYNAMICS

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ABSTRACT: The unknown phenomenon was found of the violation of the second law of thermodynamics. Theoretically and experimentally was proved that in the environment which is in the state of thermal equilibrium at the temperature about 800°C with using a special device take place a transformation of the thermal energy to the electrical form of energy. The necessary conditions were found for occurrence and maintenance of such process.

KEYWORDS: HEAT, TEMPERATURE, ENERGY, THERMODYNAMIC, TRANSFORMATION, EQUILIBRIUM, ASYMMETRICAL, MICRO ACTIONS.
The possibility to measure the different kinds of energy in the same units was discovered by German physicist J. Mayer 1841-1845 and by English physicist J. Joule 1941-1950. This has equated thermal energy to other kinds of energy and allowed formulating the energy conservation law. In thermodynamics, this law is named the first law [1]. The first law of thermodynamics is the application of principle of the law of conservation of energy to the heat interchange between mediums and thermodynamic processes [2].

The Nicolas Sadi Carnot worked out the first theory on the conversion of heat into the mechanical work in 1824. He has established that the mechanical energy can be completely transformed into heat. However, at inverse conversion of heat to the mechanical energy the losses are inevitable. He was the first who realized correctly that the efficiency of this conversion depends on the difference of temperature between an engine and its environment [3].

Based on more studying of processes with gas mediums the German physicist Rudolf Clausius have formulated the second law of thermodynamics in 1850. There are many versions of the formulation of the second law, but all are equivalent in the general sense. Kelvin has established the new formulation of the Second Law: “It is impossible for any device that operates on a cycle to receive heat from a single reservoir and produce a net amount of work.”

Rudolf Clausius have injected the concept of the entropy established the increasing of the entropy in any process. He has stated that the entropy of an isolated system, which is not in equilibrium, will tend to increase over time and
will approaching a maximum value at the state of equilibrium. The formulation of the second law that refers to the entropy directly is as follows: “In a system the process occurs in that direction what will tend to increase the total entropy of the universe.”

In other words, we always have losses of a thermal energy. These losses of a thermal energy in the opinion of Clausius and other scientists are nonreversible. This will make impossible to use heat energy completely. This is the principle of the degradation of energy: the transformation of the heat into the other kind of energy cannot be fully accomplished without inevitable losses of the energy in the form of heat. The scientists were sure, that these losses of a thermal energy only will increase the temperature of a surrounding medium and never can be again transformed to other kind of energy.

Entropy is statistical in base. Heat is the kinetic energy of the movement of molecules in a gas or the vibration of atoms in a solid body’s. In the form of heat the energy is reduced to the state of maximum disorder in which each individual movement is neutralized by statistical laws [4].

In the years around 1900 scientific research became increasingly concerned with microscopic entities, including atoms, molecules, ions, bacteria and all sorts of tiny organisms. In physics, Brownian motion research played a significant part in the overhaul of physics in the early decades of the twentieth century, and the emergence of a 'modern' physics opposed to the 'classical' physics of previous decades. The Einstein is the first who recognized, the
perpetual motion of particles contradict the second law of thermodynamics, implying that this law could no longer be considered as completely true at the microscopic level [5].

Thermodynamics is a theory of macroscopic systems and therefore the second law can be applied only to macroscopic systems. The smaller the scale, the less the second law can be applied.

Statistical nature of the second law of thermodynamics and presence of fluctuations make a desire to converse a thermal energy to other kind of energies [6]. Therefore, in 1871, James Clerk Maxwell proposed a thought experiment, now called Maxwell's Demon.

FIG. 1. The Maxwell's Demon.

Demon 1 could violate the second law of thermodynamics by allowing only the fast moving molecules 2 to enter a hot area, and allowing only the slow moving molecules to enter a cold area by blocking or unblocking the cover 3 [7].

There is a reasonable amount of history behind the Demon. When Maxwell first conceived of it, he realized that it could violate the second law of thermodynamics but neither he nor his contemporaries attached much importance to it because of the extremely implausible nature of the Demon.
The second law of thermodynamics is important for physics. Therefore, there are a lot of works in which the attempts are given to show impossibility of a Demon.

Let us refuse “Demon” in general, by leaving door 1 that can only open to the left, i.e. we shall create asymmetrical situation for a motion of molecules (different probability of penetration of a molecule to the right and to the left).

FIG. 2. The simple door.

It will change the nature of a motion of molecules. For example, the molecule 2 has some opportunity to overcome resistance of a spring 3, to open a door and to pass into the left-hand part of box. The transition into the right-hand part of box under this condition is impossible.

Through the some time in the left-hand half of box the pressure of gas will be spontaneously raised the Second law of thermodynamics will be broken.

In this case, it is impossible to give obvious arguments of an impossibility of such device.

In these two examples, there is something similar: the asymmetrical conditions of a motion of molecules, a different probability of processes at elementary level have created. We are sure and confirm that making such conditions is the necessity for similar devices.
Such devices as Maxwell's Demon or the simple doors that can be open only one side having the size, comparable with the sizes of molecules are impossible to create.

The similar devices what can be practically made till now have not been offered. The reason of this is, from our point of view, just misunderstanding necessity the asymmetrical conditions of a motion, a different probability of processes at elementary level with medium.

Meaning the modern state of physics it is incorrectly to be restricted to the state of knowledge on a date of the formulation of the second law and, unconditionally, it will be necessary to view the individually motion of molecules, atoms, electrons, protons, ions and so on.

We have invented rather simple device which do the asymmetrical conditions of a motion, a different probability of processes at elementary level with medium for electrons.

Let as suppose, that we have a box which is filled with a gas in temperature 800°C. In this box be present a device consisting of two metal electrodes which are connected hermeticly on its perimeter by a ceramic insulation. Distance between electrodes 1 and 2 are about 0.2 - 0.3 mm, between electrodes there is vacuum space.

FIG. 3. The device.
Electrode 1 has a layer 4 (there is a coating) with a mixture of barium oxide and strontium oxide, with addition of calcium oxide. It decreases the quantity of energy, which is needed for an electron to leave the surface of the electrode (the work function). And at the temperature by 800 degrees Celsius we have electron emission from 1 electrode. At the specified temperature, the electrons from electrode 1 can emit in surrounding space but can also again enter at electrode 1.

The electrode 2 has no coated surface, and the temperature of emission of electrons into the vacuum is about 2000 degrees Celsius. For the electrode 2 only the input of electrons is possible, the emission of the electrons in surrounding space at the given temperature is impossible owing to the big work function.

In this case for the electrons on electrode 2 was realized the motion only in one direction. (Let us remember the door that can only open to the one side just as it is shown on fig. 2).

Near to the electrode 1 due to emission of electrons there will be a space charge 5 which density will gradually decrease with the distance from the electrode 1. In connection with small distance between electrodes, the part of electrons will pass to electrode 2, having charged it negative 6. The charge of the electrode 1 will be positive 7 owing to an exiting of a part of electrons in a space charge and their transition to the electrode 2.
In system will be established dynamic balance (by a FIG. 3a):

- The electrostatic field $E_1$ which has arisen between electrodes will prevent the further increase in the space charge, the increase of the negative charge on the electrode 2 and the increase of the positive charge on the electrode 1;

- A space charge $5$, a positive charge of the electrode 1 and the negative charge of the electrode 2 will be constant;

- In system will be established the condition of thermal equilibrium and this condition will be supported forever. All processes will be corresponding to the second law of thermodynamics.

Let's connect the electrode 1 and the electrode 2 with help of connecting wire 9 and resistor 10 (FIG. 3b). On the resistor, 10 due to a potential difference between electrodes 1 and 2 will flow an electric current. This electric current will lower size of potentials on electrodes 1 and 2. The electrostatic field $E_2$ will have decrease in comparison with initial value $E_1$ what will decrease acting against the emission of electrons. It will increase density of a space charge of electrons around the electrode 1 and the part of those electrons from a space charge will have been constantly passing to the electrode 2, supporting a constant electric current in the circuit. In system will be established new dynamic balance:
• Emitting electrons will constantly carry away a part of thermal energy from the electrode 1, his temperature will go down in comparison with the environmental temperature;

• There will be a constant inflow of thermal energy 11 from an environment to the electrode 1, what will compensate the losses of thermal energy with the electrons being emitted. Namely this part of a thermal energy is changing into the electrical form of energy.

• On the resistor 10 the thermal energy 12 will be constantly generated due to the electric current “i” flowing through the resistor. Instead of the resistor it is possible to put the electric engine, bulb for lighting, tank for electrolysis and so forth, i.e. to transform a thermal energy in mechanical energy, light energy, chemical energy and so on.

The physical processes in system with the closed electric circuit show that the second law of thermodynamics is not the universal law of the nature. It is very important, basic conclusion for physics in general, from which the practical, the theoretical, and the cognitive important conclusions are followed:

• The statement about gradually increasing of the entropy in isolated systems is incorrectly;

• The statement about the thermal death of the universe is incorrectly;
The thermal energy of the environment in the condition of thermal equilibrium is not inaccessible and can be transformed in other kinds of energy;

Besides a theoretical substantiation, the author has carried out experimental researches. As the object of experiences the vacuum tube in the metal envelope (a high-frequency low-power pentode) was taken.

It is known the cathodes of vacuum tubes is made with the oxide coating for decrease the work function of electrons, hence, the cathode can to serve as analogue of the 1 electrode of device (see FIG. 3). As the electrode 2 of the device were used connected together the grids and the anode. Contacts of a heater of the cathode were remained not connected.

The vacuum tube with the wires soldered by spot welding was located in furnace in which the temperature 800°C was supported.

FIG. 4. The loading characteristic of an element.

On FIG. 4. the loading characteristic of the experimental element is shown.

The executed research has rather important value for physics. The submitted research shows limitation of the second law of the thermodynamics. We should know that the second law of thermodynamics was formulated more than one and a half centuries ago in the attitude to gas environments.
However, lately the sum of knowledge's of physics, objects of the nature with which the physics has deals, has cardinally extended. In new conditions, we have found the processes, which do not correspond to the second law. We have formulated the necessary conditions at which transformation of heat into other kinds of energy is possible. That has be the unsymmetrical conditions of the processes at the elementary level.

At all its scientific importance the discovery that the state of thermal equilibrium of the medium does not interfere to the transformation a thermal energy in its others kinds of energy has no big practical value for the reason for the work of the device the high enough temperatures are required.

The long work of the author in this direction has enabled him to develop a several key diagrams of the devices capable work under usual temperatures (-40 - +100°C). The author is ready to cooperate with any firm interested in development of modern technologies that, undoubtedly, will have significant effect on development of their business.

At the first stage of using this invention the mankind will receive:

- Eternal (do not required recharging) clocks;

- Eternal (do not required recharging) mobile phones;

- Numerous eternal (do not required recharging) household devices which are not requiring a considerable mean power;
At the second stage of its using the mankind will receive:

- Automobiles not requiring fuel;

- Ocean liners not requiring fuel;

- Power stations gaining energy from a thermal energy of a surrounding medium;

It will completely change the life of Mankind.
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FIGURES CAPTIONS.

FIG. 1. Maxwell's demon.

FIG. 2. The simple door.

FIG. 3. The device.

FIG. 4. Loading characteristic of an element.
FIGURES.

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FIG. 4.