



Method, device and system for impressing energy into a medium

The invention relates to a method, a device and a system for impressing energy into a medium.

5 A non-gaseous carrier medium can be converted into a gaseous carrier medium by introducing heat energy, so that the gaseous carrier medium rises. At a predefined height, the gaseous carrier medium can be reconverted back into a non-gaseous carrier medium. The potential energy of the recovered non-
10 gaseous carrier medium at the predefined height can then for example be used to be converted into a useful energy, for example by allowing the carrier medium to fall to drive a turbine. Alternatively or additionally, the recovered non-gaseous carrier medium can also be removed as the distillate
15 of an original medium for use, for example as drinking water if the original medium was saltwater.

The reconverting of the gaseous carrier medium into a non-gaseous carrier medium can take place by cooling the gaseous carrier medium. The cooling can in this case be carried out
20 for example as a result of the fact that a transport medium is led through cooling regions arranged at the predefined height, where it receives heat of the carrier medium.

If cooling takes place by means of a transport medium, the heat received by the transport medium can additionally be used
25 to contribute to the heating of the carrier medium. This has the consequence that during operation only the lost energies, including the extracted useful energies, have to be introduced from the outside.

It is an object of the invention further to improve methods of
30 this type and also corresponding devices and systems.



A method is proposed including converting a non-gaseous carrier medium into a gaseous carrier medium by way of introduced heat energy, so that the gaseous carrier medium rises to a predefined height. The method further includes
5 compressing the gaseous carrier medium. The method further includes reconvertng the compressed gaseous carrier medium at a predefined height into a non-gaseous carrier medium by means of a cooling circuit receiving heat of the carrier medium. The method further includes returning the heat received by the
10 cooling circuit to be used for heating the carrier medium.

Furthermore, a device is proposed. The device comprises a cavity and an evaporation chamber arranged at the lower end of the cavity. The evaporation chamber is formed for converting a
15 non-gaseous carrier medium into a gaseous carrier medium by means of introduced heat energy, so that the gaseous carrier medium rises to a predefined height. The device further comprises compression means formed for compressing the gaseous carrier medium. The device further comprises a cooling circuit. The cooling circuit is formed for reconvertng the
20 compressed, gaseous carrier medium at the predefined height into a non-gaseous carrier medium by receiving heat of the carrier medium. In addition, the cooling circuit is formed for returning the received heat to be used for heating the carrier medium.

25 Finally, a system is proposed comprising a device of this type, and in addition a device formed for obtaining heat energy which is provided to the first device.

It is therefore proposed that available heat energy be used to convey a carrier medium to a greater height. This takes place
30 in that a non-gaseous - i.e. solid or liquid - carrier medium is turned into a gaseous state and as a result rises. The gaseous carrier medium is brought to a higher pressure by

- compression for the purpose of reducing the volume and increasing the temperature. At a provided height, the compressed carrier medium is cooled by a cooling circuit, so that it condenses and is thus returned to a non-gaseous state.
- 5 Returned to a non-gaseous state, the carrier medium is available for any desired use. The heat received by the cooling circuit continues to be used in that it contributes to the heating of the carrier medium at any desired location prior to compression thereof.
- 10 The compression of the carrier medium allows the heat from the carrier medium to be fed into the cooling circuit at an elevated temperature. This offers the advantage that the recycling of the heat energy in the cooling circuit can be configured more simply. In particular, the heat which is
- 15 obtained at elevated temperature allows the use of a heat pump to be dispensed with.

The compressing of the gaseous carrier medium can take place at any desired location. It can thus take place immediately after the converting of the non-gaseous carrier medium into a

20 gaseous carrier medium. With respect to the device, the compression means can for this purpose be arranged in the cavity directly adjoining the evaporation chamber.

Alternatively, the compressing can take place immediately before the reconvertng of the compressed gaseous carrier

25 medium into a non-gaseous carrier medium. With respect to the device, the compression means can for this purpose be arranged in the cavity immediately below the predefined height. As a further alternative, the compressing can also take place at any desired point midway between the converting of the non-

30 gaseous carrier medium into a gaseous carrier medium and the reconvertng of the compressed gaseous carrier medium into a non-gaseous carrier medium. With respect to the device, the compression means can for this purpose be arranged in the

cavity at any desired height on the section between the evaporation chamber and the predefined height.

The compressed, non-gaseous carrier medium can be decompressed again at any desired point in time. If the compressed, non-gaseous carrier medium is to be converted back into a gaseous carrier medium in a circuit, then the decompressing takes place at the latest before the reconversion. During the decompression of the non-gaseous carrier medium, said carrier medium continues to cool down. The energy which is released during the decompression can be used in various ways, so that as little energy as possible is lost.

Decompressing the compressed gaseous carrier medium allows for example a turbine to be driven. This can take place at the predefined height, but equally at any desired other height, in particular at a lower height. The described device can have an accordingly formed turbine.

Alternatively or additionally, the recovered non-gaseous carrier medium can be allowed to fall from a higher height to a lower height, where it can drive a turbine by means of its kinetic energy. With respect to the device, it is possible to provide for this purpose a falling path which is formed to permit the recovered non-gaseous carrier medium to fall from a higher height to a lower height, and also a turbine which is arranged at the lower height and which is formed to be driven at least by the kinetic energy of falling carrier medium.

The energy provided by turbines of this type can be used both internally to the method and externally to the method.

Internally to the method, the energy provided by a turbine can for example be used to assist the compressing of the gaseous carrier medium by means of a mechanical coupling. The coupling can for example take place between the turbine and compressor. Alternatively, the energy can be used to reduce, after a

conversion into a different energy form, by means of the resulting energy the energy required for the compressing of the gaseous carrier medium. For the conversion, it is possible to provide an energy conversion arrangement which then provides the resulting energy to the compression means. Alternatively, the energy provided by the turbine can be used to heat, after a conversion into heat energy, for example by way of an energy conversion arrangement, the carrier medium in addition before, in or after the converting from a non-gaseous state to a gaseous state.

For example after the carrier medium has been used to drive a turbine, the carrier medium can furthermore be used to recool, for example by means of a heat exchanger, a transport medium comprised by the cooling circuit.

Alternatively, a transport medium comprised by the cooling circuit can also be exchanged with non-gaseous carrier medium, for example after said carrier medium has been used to drive the turbine. Accordingly formed exchange means can be provided for this purpose.

Between the compression and the decompression of the carrier medium, the method can proceed at ambient pressure. Alternatively, the carrier medium can additionally be subject throughout the method to a pressure which exceeds the ambient pressure and is further increase by the compressing. The excess pressure can be adjusted by specially provided excess pressure means. This reduces the volume of the carrier medium in the gaseous phase, thus allowing the structural dimensions of the device to be reduced at the same throughput of the carrier medium.

In addition to the carrier medium, a transport medium comprised by the cooling circuit can also be subject throughout the method to a pressure exceeding the ambient

pressure. The excess pressure means are also accordingly formed for this case.

In one exemplary embodiment, the gaseous carrier medium is guided during its rise through at least one constriction, for example through at least one nozzle or any desired arrangement equivalent to a nozzle.

If the introduced heat energy is appropriately selected, the invention can be implemented in such a way that it is completely emission-free. However, generally, any energy source can be used to obtain the heat energy utilised. Thus, the introduced heat energy can be obtained from geothermal heat, water heat, air heat, a fossil energy carrier, a nuclear energy carrier and/or solar energy.

The heat energy can be introduced exclusively at the starting point of the rising carrier medium, i.e., with respect to the device, exclusively via the evaporation chamber. However, in an alternative approach, the heat energy can also be introduced into the carrier medium distributed over the height over which the gaseous carrier medium passes.

The device can have for this purpose an accordingly arranged energy introduction element. An energy introduction element of this type can itself comprise an energy obtaining element, or else be supplied with energy by an energy obtaining element.

An introduction of the heat energy distributed over the height has the advantage that heat energy at a lower temperature level is required. It is thus possible to supply, at selected heights or continuously along the height of a cavity, in each case precisely sufficient energy for the carrier medium to remain in the gaseous state until the predefined height is reached.

In addition, the invention can be implemented in a much more compact and cost-effective manner if for example solar collectors, as energy obtaining and introduction elements, are attached directly to the casing of a cavity in which the gaseous carrier medium rises, or even wholly or partly form this casing.

The energy introduction element can completely surround a cavity in which the carrier medium rises or, for example in the case of solar collectors, be arranged only on a sun-facing side. Furthermore, the element can extend over the entire height of the cavity or be arranged only on a selected height portion or on a plurality of the selected height portions.

Accordingly, the heat recycled by the cooling circuit can also not only contribute to the heat energy with which the non-gaseous carrier medium is converted into a gaseous carrier medium but rather, alternatively or additionally, also contribute to a heat energy with which the already gaseous carrier medium continues to be heated during the rise.

The cooling circuit can receive heat of the carrier medium for example as a result of the fact that a transport medium is led in the cooling circuit through cooling regions, for example of a cooling unit, arranged at the predefined height. The cooling regions can in this case be formed by hoses or other pipes. The cooling regions can in this case be embodied and arranged in such a way that they can at the same time be used to divert the recovered non-gaseous carrier medium to a provided collecting point.

In a supplementary embodiment, to assist the reconversion, a substance could also be introduced directly into the gaseous carrier medium, for example through an accordingly formed collector. The introducing can in this case take place for example by injecting or sprinkling. After the substance has

withdrawn heat from the carrier medium and thus assisted the condensation, the substance and carrier medium can be separated again for further use. This can for example take place in a simple manner if the carrier medium is water and the substance oil. However, instead of that, already recovered carrier medium can also be injected or sprinkled into the rising, gaseous carrier medium. As a result of the thus increased collision area for the rising, still gaseous carrier medium, the reconversion is also assisted. In this, it should merely be ensured that the injected or sprinkled carrier medium does not fall back into the evaporation chamber, but rather is supplied to the intended use. This can be achieved for example in that the carrier medium is injected or sprinkled only once it has reached a region of the cavity that is angled at the upper end.

A collector can comprise an - optionally cooled - upper surface which delimits the cavity and is embodied in such a way that it feeds the reconverted non-gaseous carrier medium to further use, for example via a collecting reservoir.

In an exemplary embodiment, the recovered non-gaseous carrier medium is temporarily stored, for example by means of an intermediate store, prior to the further use.

Temporary storage of the recovered non-gaseous carrier medium is for example suitable for delivering a reserve for times in which no external heat energy is available. Furthermore, temporary storage allows peak demands for the recovered non-gaseous carrier medium to be met or else peaks in the delivery of the recovered non-gaseous carrier medium to be buffered.

The potential energy of the recovered non-gaseous carrier medium at the predefined height can be used for conversion into an energy form desired for external use, for example by means of the above-mentioned driving of a turbine.

For a conversion of the potential energy of the carrier medium into a different energy form, the potential energy can therefore first be converted into kinetic energy. This can take place in that the recovered non-gaseous carrier medium is allowed to fall on a falling path from a higher level to a lower level, for example through a downpipe. The kinetic energy can then be converted into a different energy form. An energy converter, such as a turbine possibly having a generator arranged downstream therefrom, can be provided for this purpose.

In the end result, the potential energy can be converted into any desired energy form. It will be understood that converting into a desired energy form also includes storing in a desired energy carrier. Examples thus include inter alia a conversion into mechanical energy, into electrical energy, into energy for generating a chemical energy carrier and/or into energy for generating a physical energy carrier.

Also after the conversion of the potential energy into a different energy form, the recovered non-gaseous carrier medium can if necessary be temporarily stored in an intermediate store.

Instead of or following this, the recovered non-gaseous carrier medium can, after the conversion of the potential energy into a different energy form, continue to be used at least partly in a closed circuit. With respect to the device, the carrier medium is for this purpose returned to the evaporation chamber.

Alternatively or additionally, the recovered non-gaseous carrier medium can also be removed for external use.

The converting of the non-gaseous carrier medium into a gaseous carrier medium allows the carrier medium, depending on the composition, to be for example distilled. The distilled,

recovered non-gaseous carrier medium can then be extracted, at least partly, via a extraction point, before, after or instead of the conversion of the potential energy into a different energy form.

- 5 If, for example, sea water is used as the carrier medium, in simplified terms water evaporates, the dissolved gases are released and salts precipitated. In the condensation area at the specified height primarily pure water is then available. This opens up multiple possibilities for application and
- 10 embodiment such as drinking water recovery and irrigation. If used water or waste water from industry or households is used as the carrier medium, then by means of distillation used water or waste water cleaning can take place and recovery of the residual substances.
- 15 . The gaseous carrier medium can rise in a cavity containing, apart from any impurities, no further substances. However, alternatively, the cavity can also comprise a filling medium which is entrained by the rising gaseous carrier medium. The filling medium can be air or any other gas or gas mixture.
- 20 The use of a filling medium allows undesirable differences in pressure between the cavity and the external environment to be compensated for. Such differences in pressure can result from various operating temperatures caused by the changes in the states of the carrier medium. As the filling medium is
- 25 entrained by the carrier medium, it is possible to provide for the filling medium a closed circuit in which the filling medium is, after removing the carrier medium at the predefined height, again made available in the evaporator. However, alternatively, it is also possible to provide an open system
- 30 in which the filling medium is drawn in from the outside as a result of the entrainment within the cavity and is released back out again after use.

Generally, embodiments with closed circuits and also with open passes are suitable for all substances used and not removed for external use, such as carrier medium, transport medium and filling medium, and also for all energies not removed for external use.

Various aspects of the invention can also be described differently as follows:

The description of the presented simplified method and/or of the device for obtaining energy, in particular the definition of the terms and descriptions, are identical to those in application PCT/EP2007/051940 'Method, device and system for the conversion of energy' in the name of the Applicant Klaus Wolter. All definitions, descriptions, explanations and drawings are taken over from that document. In particular, any aspect of the cited application may be used in the present application of the simplified method, of the device and of the system for obtaining energy. Reference is made to the aspects of the changes in state, the aspects of the introduction of heat into the carrier medium (any desired heat source, i.e. including in particular solar energy), the aspect of obtaining energy by freighting (= lifting) an inert mass to a greater height in the gravitational field using the chimney effect (i.e. converting the chaotic movement of the molecules (= heat) of the carrier medium into a targeted common movement (= colder wind) by way of geometric conditions of the vessel (= structure of height h) in which the 'warm' molecules are located), representing the gain in potential energy, the aspect of the production of water (water for industrial use, service water, drinking water), the aspect of the recirculation of heat, of the recovery of heat in the method and/or of the device for obtaining energy, and the aspects of the conversion of energy (turbine, generator), such as those

of the storage and intermediate storage of the obtained energies in physical and also chemical storage media.

(It should be noted that the foregoing listing lists only the core aspects; this does not mean that the remaining aspects are unimportant. On the contrary, this restriction in the listing is to be understood merely as a memory aid for core aspects.)

The development and simplification consists in the fact that previously separate parts of the method and/or of the device for obtaining energy are rendered wholly superfluous by an extension and different process control. This leads, even if the underlying idea is identical, to a different, previously unknown solution.

The simplification now consists in the fact that the gaseous carrier medium is compressed before the condenser, but after it has reached the greater height for the purposes of impressing potential energy. The energy necessary for the compression (the compression can take place by means of all known methods and/or devices allowing gas to be compressed; such as for example piston pumps, diaphragm pumps, rotary compressors), which is an increase in pressure, is, as now in the simplified method, device and system for obtaining energy the entire branch up to the turbine sees this increase in pressure, recovered therein. In one embodiment, the energy recovered in this way can be returned to the compressor by way of a direct mechanical coupling by means of a shaft and optionally gear mechanism. Nevertheless, it is also possible to select the detour via the conversion of the kinetic energy of the turbine into other energy carriers which then, after appropriate reconversion, can be supplied to the compressor (for example: generator - electrical energy - motor). This

corresponds to indirect provision or supplying of the energy for the compression.

In a further embodiment, the compression of the vaporous carrier medium is carried out not after, but rather before or during the vertical transportation of the carrier medium; in other words, no earlier than immediately after the evaporating in the evaporator. This is possible, as the chimney effect is not influenced by the compression process. In terms of design, this means an enduring simplification, since as a result almost all moving parts are located in the base region of the simplified method, device and system for obtaining energy.

The advantage, and thus the simplification, now consists in the fact that the increase in pressure in the gaseous state leads to an increase in the boiling/condensation point. As a result, the evaporation heat in the condenser is fed into the transport medium at a higher temperature. It is thus available directly and optimally via the transport medium for the evaporation process in the evaporator and does not have first to be brought to a higher temperature level via a heat pump.

In a further embodiment, the same effect of raising the temperature is achieved as a result of the fact that, in contrast to direct transfer of the obtained mechanical energy from the liquid turbine to the gas compressor, a conversion into electrical energy first takes place via the liquid turbine and the subsequent generator, and the electrical energy is then fed into the carrier medium in or after the evaporator via an electrical heater. The mechanical energy can also be converted directly into heat via friction and equally coupled into the carrier medium at the designated locations. Combinations of all of these procedures are also possible. In a further embodiment, the coupling of this heat into the

transport medium is carried out before or in the evaporator; this leads to the same result.

Furthermore, the reduction in pressure in the turbine results in a further cooling of the carrier medium which is after all already in a liquid state there; this is also achieved by the lowering of the boiling point that takes place in this case. This aspect represents the provision of the cold pole in the entire simplified method, device and system for obtaining energy, with which the transport medium is brought to its flow temperature. In the cited method and/or device for obtaining energy, this was represented and achieved by a separate heat pump which may now be dispensed with. Merely in a further embodiment is a heat pump or else a controllable cooling device used to adjust the temperature of the cold pole. During this adjustment process, the heat pump then transports heat energy from the transport medium mainly into the cold pole.

In a further embodiment, the entire simplified method, device and system for obtaining energy is raised to an elevated pressure level in order to reduce the volume of the gaseous phase of the carrier medium; i.e. everything comprising the carrier and transport medium. The previously described simplifications remain unaffected thereby but are now set to the different basic pressure level. Nevertheless, in a further embodiment, only the carrier medium can also be raised in pressure. (Example: In the case of water as the carrier medium, approx. 1,800 litres of steam are obtained at 1 bar pressure and 1 litre of liquid. At 100 bar only 18 litres are obtained. Nevertheless, the change in the temperature level at which the evaporation takes place may be observed in this case.) This leads, as will be readily apparent, to design solutions which are more advantageous in the long term, as the system is more compact.

Now, in the case of the embodiment for obtaining water, there are two sub-embodiments. However, a common feature of both sub-embodiments is that the carrier medium is subject to an open pass. The above-described recycling of the evaporation heat is also a component. The only difference is that one sub-embodiment attaches no importance to obtaining the pump energy (see the cited method and/or device for obtaining energy); instead, the obtaining of energy in a different form (for example: electrical energy) is preferred and in the other embodiment the pump energy is used partly or else completely; this is achieved in that the conversion in the previously described manners of the potential energy which has after all been obtained is dispensed with partly or else wholly (see the cited method and/or device for obtaining energy). For example, this is carried out such that the turbine is arranged at the height h (= pump height) - i.e. after obtaining the potential energy, which represents the height at which the change in state of the carrier medium takes place, in such a way that the energy, which is necessary for the compression and is inherent to the increase in pressure, is recovered without necessarily having recourse to the potential energy.

In other words and in somewhat simplified summary, the simplified method, device and system for obtaining energy are distinguished from the predecessor by the introduction of a branch of elevated pressure. As a result, the heat pump is dispensed with entirely and the recycling of the evaporation heat is at the same time greatly simplified.

The circuit of the simplified method, device and system for obtaining energy may be obtained in a simplified manner, by way of example based on a carrier and transport medium (for example water) and an energy source (for example solar energy), as follows:

Water is evaporated, solar energy being supplied, is raised as steam, as a result of the impressed heat in a suitable structure by way of the chimney effect, to a height (potential energy is thus obtained), where a compressor is used to bring
5 the steam to an elevated pressure (the evaporation heat is thus obtained again at an elevated boiling temperature), condensed with the aid of a cooling circuit which returns the evaporation heat to the evaporator; the cooled condensate, which is at this elevated pressure, is fed to a turbine in
10 which at least the energy necessary for compression is recovered by reducing the very same increase in pressure; in this case, due to the reduction in pressure in the condensate on flowing through the turbine at the same time further cooling-down is achieved, and the cold condensate thus
15 obtained is returned to the evaporator. In addition, this cold condensate is also the cold pole for the cooling circuit in that the water of the cooling circuit is taken therefrom or cooled thereby before it is returned to the condenser.

This brief description applies, with all of its
20 interpretations, to embodiments for objects set ranging from purely obtaining energy, via mixed forms to purely obtaining water for industrial use.

In a further embodiment, the conversion of the heat energy of the carrier medium via adiabatic expansion into kinetic energy
25 takes place by means of flow of the carrier medium through one or more nozzles or devices equivalent to nozzles. The chimney located after the evaporator may for example also be regarded as a nozzle of this type, if the flow cross section of said chimney is smaller than the flow cross section of the volume
30 in the evaporator. Any other nozzle design and also structural arrangements thereof in the method, device and/or system for obtaining energy, which causes the function of converting the

heat energy into kinetic energy for the purpose of vertical transportation, can also be used.

The invention will be described hereinafter in greater detail based on an exemplary embodiment. In the drawings:

- 5 Fig. 1 shows schematically the construction of an exemplary device according to the invention;
- Fig. 2 is a schematic flow chart illustrating the operation of the device from Figure 1;
- Fig. 3 is a schematic block diagram of an exemplary device
- 10 according to the invention;
- Fig. 4 shows schematically the construction of a further exemplary device according to the invention;
- Fig. 5 is a schematic block diagram of a further exemplary device according to the invention;
- 15 Fig. 6 shows schematically the construction of a further exemplary device according to the invention;
- Fig. 7 shows schematically an exemplary recovery of heat in a device according to the invention; and
- Fig. 8 shows a quadrant diagram of an exemplary heat and
- 20 gravity plant according to the invention.

Figure 1 shows an exemplary embodiment of a device according to the invention for impressing energy into a medium, which device can be used for the efficient conversion of energy.

- 25 The device comprises a structure 10 having a cavity 11. It will be understood that the cavity could in an alternative embodiment also be arranged obliquely, for example adjoining the flank of a hill. An evaporation chamber 12 is arranged at the lower end of the cavity 11 at the height $h = h_0$.

Arranged at the upper end of the cavity 11 is first a compressor 101 and subsequently at the height $h = h_1$ a cooling unit 13. The compressor 101 can in this case be configured in any desired manner, for example as a piston pump, diaphragm pump, rotary compressor, etc. From the cooling unit 13, a downpipe 14 leads to a turbine 15 with a generator connected thereto. The turbine 15 is in turn connected to the evaporation chamber 12. The cooling unit 13 is in addition connected to the evaporation chamber 12 via a heat return line 16. The cooling unit 13 and heat return 16 form elements of a cooling circuit.

Furthermore, the turbine of a conventional solar chimney power plant 17 is optionally arranged in the cavity.

An element 18 for recovering heat energy is arranged in such a way that it can supply heat energy to the evaporation chamber 11. An example of an element of this type is a solar collector. However, instead of the sun, the element 18 can also use any other desired energy source. Furthermore, it will be understood that a plurality of elements of this type can also be provided. Furthermore, incident solar energy can also be used directly for heating.

Finally, an element 19 for recovering and introducing heat energy is arranged along the casing of the cavity. The element 19 can for example comprise a solar collector.

Figure 2 is a flow chart illustrating the mode of operation of the device from Figure 1 in principle.

The evaporation chamber 12 contains a carrier medium in a non-gaseous state, for example water as a liquid carrier medium.

The element 18 for recovering energy supplies external heat energy to the evaporation chamber 12 (step 20).

Owing to the supplied heat energy, the carrier medium is converted into a gaseous state, that is to say, it evaporates and rises in the cavity 11.

The element 19 additionally introduces heat energy,
 5 distributed over the height of the cavity to assist the rise, into the rising, gaseous carrier medium, thus preventing auto-condensation before the cooling unit 13 is reached. It is then necessary to supply to the evaporation chamber 12 only as much energy as is required for the conversion of the non-gaseous
 10 carrier medium into a gaseous carrier medium.

Shortly before the height $h = h_1$, the compressor compresses the carrier medium, so that the gaseous carrier medium which continues to rise reaches the cooling unit 13 at increased pressure (step 21).

15 At the height $h = h_1$, the carrier medium is returned to the previous state (step 22). That is to say, the steam from the carrier medium is condensed again. In the illustrated example, the reconversion is caused by a cooling unit 13. A cooling unit of this type can consist for example of a network of
 20 hoses. On the one hand, the network offers a large collision area to produce or to condense a condensation fog. On the other hand, a transport medium, as a coolant which assists the condensation on the network, can flow through the hoses. The network diverts the condensate obtained in the direction of
 25 the downpipe 14.

The transport medium heated in the hoses can be supplied via the heat return line 16 to the evaporation chamber 12 in order to assist there the effect of the heat energy fed-in and then to be returned cooled to the cooling unit 13 (step 23). Owing
 30 to the additionally provided energy introduction element 19, the heat which is returned from the cooling unit 13 via the heat return 16 to the evaporation chamber 12 during ongoing

operation can even be sufficient as the sole supply of energy at this location. External heat must then be supplied to the evaporation chamber merely for start-up; or during start-up non-gaseous carrier medium is first injected into the cavity 11 so that it is initially converted into steam only on reaching the cavity 11 itself. However, additionally or alternatively, the heated transport medium can also heat the carrier medium at a different location, for example via the element 19.

10 The carrier medium then has, owing to the height $h_1 - h_0$ over which it has passed, an impressed potential energy. It is allowed to fall downward through the downpipe 14, so that kinetic energy is obtained from the potential energy (step 24).

15 This kinetic energy can then be converted into a different, desired energy form (step 25). For example, the falling carrier medium can drive the turbine 15, and the resulting rotational energy can then be used to operate the connected generator and to generate electrical energy.

20 In the region from the compressor 101 to the turbine 15, the carrier medium is subject to an increased pressure; this is illustrated in Figure 1 by dotted areas. Additional energy is thus stored in the carrier medium owing to this pressure. The turbine 15 can therefore be designed in such a way that it is additionally driven by the decompression of the carrier medium reaching it.

After the carrier medium has driven the turbine 15, it can then be cooled down and led into the evaporation chamber 12 at the original pressure level again (step 26). The original pressure level can in this case correspond to the ambient pressure or to an increased pressure level which allows the

device to be made more compact owing to the thus reduced volume of the gaseous medium.

The optional solar chimney power plant 17 can additionally use the rising steam from the carrier medium between step 20 and
5 step 21 in the conventional manner to obtain energy.

A few selected details and possible variations of the device from Figure 1 are illustrated in the block diagram shown in Figure 3.

A carrier medium is supplied to an evaporator 32, or more
10 generally a state changer. The carrier medium can for example be sea water. The evaporator 32 corresponds to the evaporation chamber 12 in Figure 1. In the evaporator 32, the carrier medium is evaporated by means of supplied heat energy.

The steam rises in the cavity of a structure 30 until it
15 reaches a compressor 301. The cavity can additionally contain a filling medium which is entrained by the carrier medium in an open or a closed circuit. The compressor 301 compresses the carrier medium.

The still gaseous carrier medium continues to rise and reaches
20 a second state changer 33. The second state changer 33 can for example correspond to the cooling unit 13 from Figure 1 which, as an active condensate collector, causes a cooling of the steam by means of a cooling circuit to assist the
condensation. The received heat is supplied to the evaporator
25 32 by way of heat return.

Should evaporation and condensation be used for distillation of the carrier material, then at least a part of the condensed carrier medium can be supplied directly to a consumer via an extraction point 40. If the carrier medium is for example sea
30 water, the salts contained precipitate during the evaporation,

and a part of the condensed carrier medium can be used as drinking water or for irrigation.

The non-removed part of the condensed carrier medium is supplied to an intermediate store 41, for example a water tank, which is also arranged substantially at the height of the second state changer 33. The temporary storage allows the desired energy form to be obtained at a desired time. This also includes intensified obtaining of the desired energy form at peak load times, and/or a time-uniform distribution of the obtaining of the desired energy form, if the supplied heat energy is available for example only at specific times and therefore condensate can be obtained only at specific times.

The condensed carrier medium is then allowed to fall, in a manner controlled according to needs, through a downpipe, so that it strikes and drives a turbine 35. In addition, a decompression of the carrier medium can be used to drive the turbine 35. It will be understood that the turbine 35 or a further turbine could also be arranged, only to use the decompression energy, at the height of the second state changer 33. The turbine 35 can be mechanically coupled by means of a shaft and transmission mechanism to the compressor 301 and thus drive said compressor in order to compress the carrier medium.

In addition, the rotational energy generated by the turbine 35 can either be used directly by a consumer and/or be supplied to a generator 42 for generating electrical energy. The electrical energy can in turn either be supplied directly to a consumer or else be used for a further energy conversion 43, such as for the production of hydrogen or oxygen.

After the condensed carrier medium has driven the turbine 35, it can be temporarily stored in a further intermediate store 44 in order then to be supplied to the evaporator again, in a

closed circuit. It will be understood that a removal of distilled carrier medium via an extraction point can also take place before or after the second intermediate store 44, so that a larger amount of carrier medium is available for driving the turbine.

The carrier medium leaving the turbine 35 and stored in the intermediate store 44 has the lowest carrier medium temperature in the system, and is thus a cold pole. The transport medium from the cooling circuit comprising the cooling unit 33 and heat return can for example be brought to its flow temperature at this location by means of the carrier medium. There, the transport medium can be cooled, for example by means of heat exchangers, or be exchanged with the carrier medium.

Owing to the increased heat energy which can be received by the cooling circuit in the cooling unit, a heat pump is generally no longer required. However, in certain exemplary embodiments, the use of a heat pump is still possible, for example for exchanging heat between the transport medium and cold pole, or for adjusting the temperature of the cold pole.

Insofar as condensed carrier medium was removed from the circuit, it is additionally returned to the evaporator 32 from the outside, for example in the form of further sea water.

Figure 4 shows a further modification of the device from Figure 1 as a further exemplary embodiment of a device according to the invention for the efficient conversion of energy. Like components have been provided with the same reference numerals as in Figure 1.

In this exemplary embodiment, an evaporation chamber 12, a structure 10 comprising a cavity 11, a cooling unit 13, a downpipe 14, a turbine 15 and a heat return 16 are again arranged as in the example from Figure 1.

However, in the embodiment corresponding to Figure 4, no element 19 for recovering and inserting heat energy is arranged along the casing of the cavity, although this element could be provided in this case too.

- 5 The basic difference from the exemplary embodiment from Figure 1 consists in the fact that although a compressor 102 is also provided, said compressor is now arranged between the evaporation chamber 12 and structure 10.

10 The device from Figure 4 operates substantially like the device from Figure 1. In this case, merely the carrier medium is compressed immediately after the conversion into a gaseous carrier medium. The already compressed gaseous carrier medium rises in the cavity 11 in the structure until it reaches the cooling unit. This allows the structure to have a smaller
15 diameter for the same throughflow of carrier medium as in Figure 1.

It will be understood that any desired other arrangement of the compressor between the two positions illustrated in Figures 1 and 4 is also possible.

- 20 A few selected details and possible variations of the device from Figure 4 are illustrated in the block diagram shown in Figure 5.

The illustration in Figure 5 corresponds substantially to the illustration in Figure 3, to the description of which
25 reference is made.

However, in Figure 5, the compressor 302 is arranged, similarly as in Figure 4, between the evaporator 32 and the structure 30.

- In addition to the optional mechanical back coupling between
30 the turbine 35 and the compressor 302, further possible

system-internal back couplings are also indicated by dotted lines.

Thus, for example, generating of heating heat can be provided by means of mechanical energy supplied by the turbine 35 or by
 5 means of electrical energy supplied by the generator 42. The mechanical generation of heat can take place for example by means of friction. This heat can then be fed into the carrier medium at one or more locations of the system. An example is a feeding of the heat energy into the evaporator 32.
 10 Alternatively or additionally, electrical energy supplied by the generator 42 can for example be used to operate the compressor 302 or other current-operated components of the device.

In other words, certain possible details of the invention may
 15 be described as follows, wherein although compression means are not mentioned in these embodiments, they are nevertheless in each case provided in a similar manner as the compressor in Figures 1, 3, 4 or 5.

The method and/or the device to recover energy is based on the
 20 collection and conversion of thermal energy via the route of gaining potential energy in the gravitational field of a mass ($E_{pot} = m \cdot g \cdot h$; 'm' being the mass raised in height in kilogramme, 'g' the gravitational constant, and 'h' the height), into energy and/or energy carriers which we need or
 25 believe we need to structure our environment.

The physics utilised here to recover energy is given by the introduction of energy into a change of aggregation state solid and/or liquid into aggregation state gaseous and back, and by the gas dynamics in the form of adiabatic expansion
 30 which takes place after a change of aggregation state into the gaseous form. Adiabatic expansion leads to a chimney effect which plays a role in this method and/or device. Finally, this

leads to a conversion of energy in the form of heat into energy stored in the gravitational field which can and/or is then converted back into other energy forms.

5 The method and/or device to recover energy is a "heat pipe" in basic principle but with decisive changes and extensions. This is arranged in the gravitational field of the mass such that for a movement from its one end to the other (= height h), energy must be expended to overcome a difference in potential of the gravitational field. For example, transferred to the
10 case "earth", this means that one end is e.g. at ground level (height $h_0 = 0$) and the other end is at height $h_1 > 0$ above ground.

The functional basic principle of operation of the method and/or device for recovering energy is described as follows
15 (Fig. 3): a substance (= carrier medium) is transformed by means of externally introduced energy into the gaseous aggregation state, then by the physical effects of adiabatic expansion playing the major role transported to height h and there converted back (= condensed) into the previous
20 aggregation state. The substance with introduced potential energy is then available for energy recovery. Optionally, it can be stored temporarily at this height for later use. The potential energy can then be converted by means of corresponding devices and/or methods into other physical or
25 chemical energy forms, i.e. extracted from the carrier medium. After extraction of the potential energy, the substance can optionally again be temporarily stored. Then optionally, if planned in the corresponding embodiment, the carrier medium can be returned to the circuit.

30 To implement the method and/or device to recover energy, in one embodiment a circuit with the following elements is established (see also Fig. 1):

An evaporation chamber to evaporate a carrier medium by means of introduced external heat, connected thereto a structure of height h in which the vapour can rise and in which a solar chimney power plant can be installed, connected thereto in one embodiment a cooling unit (= cooling device) to recover condensate from the vapour of the carrier medium, in another embodiment the height h is set in relation to the heat introduced into the carrier medium such that the cooling through the upward movement (that is the physical process of converting heat (= microscopic movement) into macroscopic movement, that is the synchronous movement of the molecules/atoms - the chimney effect) generates a vapour subcooled to the point that in the best case auto-condensation begins and a cooling unit is not required, then in one embodiment condensate collectors/condensers are provided e.g. in the form of networks which serve as large collision surfaces in order to generate or further condense a condensation mist/condensate, then not necessarily connected thereto an intermediate storage device for the condensate (necessary e.g. for the case of absence of external heat or to cover peak demand or to buffer peaks in condensate supply), connected thereto a downpipe for the condensate, connected thereto a turbine with associated generator in which the kinetic energy obtained from the potential energy of the condensate of the carrier medium via the fall in the downpipe can be converted e.g. into electrical energy (also can again be converted directly into heat), not necessarily connected thereto a further intermediate storage device for the condensate, and connected thereto again the evaporation chamber. Here the heat occurring in the cooling unit can again be introduced via a transport medium into the heating in the evaporation chamber.

To implement the method and/or device for recovering energy, various embodiments are possible. In the method and/or device described above, the carrier medium, apart from contaminants, is not necessarily the only gas within the structure of height h , in a further embodiment the structure of height h is also flooded with a filling medium (primarily air, but also any other gas / gas mixture can be used). The option of a filling medium arises from pressure differences between the cavities of the method and/or device and the external environment at different operating temperatures which are caused by changes in aggregation state. These can optionally be compensated by filling media, from which constructional measures arise for the design of the building object. As the filling medium is carried along by the carrier medium, this leads to at least two embodiments. Firstly a closed circuit for the filling medium which is made available in the evaporator again by a return device after removal of the carrier medium at height h , and secondly an open system where the filling medium is aspirated from the outside by the carrying along within the structure and after use discharged outside again.

From further consideration of the method and/or device for recovery of energy, a further benefit arises. As a side effect of the change in aggregation state of a used substance, depending on its composition a fractioned distillation occurs. If e.g. sea water is used as the carrier medium in an open circuit in the method and/or device to recover energy, in simple terms sea water evaporates, the gases dissolved are released and salts precipitated. In the condensation area of height h then mainly pure water is available which has already been pumped by means of the energy recovered without further intermediate steps to height h . From here again multiple applications and embodiments arise (key words: (drinking) water production, irrigation). If e.g. used water or waste

water from industry and households is used, the method results in used water or waste water cleaning and recovery of residual substances.

Further embodiments consider in particular, optionally, the evaporation heat or evaporation enthalpy of the carrier medium concerned, which must be applied as latent heat on aggregation state change from liquid/solid to gaseous but then released again on reverse transformation designated sublimation or condensation heat. This is then optionally returned, by the return transport described above by means of the cooling unit, to the area of aggregation state change from liquid/solid to gaseous (see Fig. 3). This means that during operation from the outside only the lost energy need be introduced into the evaporator. This includes also the useful energy extracted. In total, these embodiments have the advantage of a far lower constructional cost for recovery of energy.

In a further embodiment the networks mentioned above are established by constructional design and arrangement of the cooling areas of the cooling unit, e.g. networks of hoses through which a coolant (= transport medium) flows.

In a further embodiment the recovery of evaporation heat and hence condensation are improved by spraying / showering / introduction of condensate which was previously cooled by the cooling unit in a further embodiment. In further embodiments the condensate can also be replaced by substances which achieve the same physical effect. (Example: in the case of the carrier medium water, the introduced substance to improve condensation could also be oil. This would have the advantage of simple separation of the two substances).

For all substances (carrier medium(a), transport medium(a), filling medium(a), energies (heat, electrical energy, mechanical energy, wind, kinetic energy)) and aggregation

states in the method and/or device to recover energy, constructional solutions are possible with closed circuits or open passages.

5 The transport media used in this method and/or device only fulfil functional auxiliary tasks, e.g. as catalysts in chemical reactions, which however are again functionally necessary for implementation of the embodiment concerned. E.g. the return of heat that can be recovered in the cooling unit is organised via an optionally closed circuit of a transport
10 medium back to the evaporator. Also, the transport medium in this process can but need not be subject to a change in aggregation state. This would be the case if this part of an embodiment were also designed as a "heat pipe". In another embodiment the heat transport medium, e.g. a fluid of higher
15 boiling point (e.g. vegetable or mineral oil, salt melt etc.) comprises a gas that does not change its aggregation state on introduction of heat recovered in a cooling unit.

The thermal energy which drives this method and/or device can be taken from any arbitrary sources. E.g. ground (geothermal
20 heat), water (water heat), air (air heat), fossil energy carriers (gas, oil, coal, methane ice etc.), nuclear energy carriers (fusion or fission) or sun (solar energy).

In further embodiments, the structure of height h (= chimney) coincides with the device for recovery of energy/heat, which
25 drastically reduces the complexity and hence construction and installation costs. The physical/technical background for this is the consideration that the energy necessary for height transport by means of the chimney effect for the carrier medium need not necessarily be introduced into the evaporation
30 chamber (Fig. 1), i.e. concentrated (consequence: high temperatures required), but can also be introduced distributed over the height course of the structure of height h

(consequence: only low temperatures required, i.e. only heat as many height metres as required). If the device for recovery of energy/heat, e.g. in the case of a solar collector, is designed in this way, the collector and structure of height h coincide. In any other case in which also only low starting temperatures for evaporation or transport energies are present, the same applies. Thus, for these embodiments the fundamental process sequence with the following stations applies: That of evaporation - with not necessarily sufficient transport energy to bridge height h , that of recovery and introduction of energy (heat) for transporting the carrier medium to recover potential energy and compensation for losses (the carrier medium here also simultaneously fulfils the function of a transport medium for a possibly temporary excess energy recovery), that of condensing and recovering latent energies (said latent energies are the evaporation heat and the heat of the carrier medium) after reaching height h , said energies are then supplied back to the evaporation, and that of recovering useful energy and returning the carrier medium to the evaporator. Here too, all embodiments already cited above are possible for the purpose of obtaining drinking water or cleaning waste water etc., and open and/or closed circuits (see also Fig. 3).

The energy and/or energy carriers which we need or believe we need to structure our environment can e.g. be electrical energy or chemical energy carriers or physical energy carriers e.g. hydrogen and oxygen from electrolysis, or pump energy such as energy for distillation.

The advantage of this method and/or device for recovering energy, in the case of use of input energy carriers such as geothermal heat, air or water heat, and solar energy, is the absolute absence of emissions of substances that contaminate the environment.

For delimitation:

- the method and/or device presented here for recovering energy is not a solar chimney power plant (solar chimney power plants belong to the group of thermal power plants, as does the method and/ or device for recovering energy presented here). A solar chimney power plant is a non-essential component of the power plant presented here.
- the energy recovery method and/or device presented here is not a sea water thermal power plant. The heat of sea water is merely one solution for structure of the energy source.
- the energy recovery method and/or device presented here is not a geothermal power plant. Geothermal heat is merely a further solution for structure of the energy source.

In the case where ground heat is used as an energy source, it can be considered to use existing shaft systems e.g. in the Ruhr area. Thus, the start-up costs for development are minimised and also the construction time to first commissioning reduced. This heat recovery could take place e.g. in the galleries, and the shafts would form the structures of height h , and there is also then at ground level the possibility of a storage lake for the condensate which can serve the function of "storage power plant" for control and operation of peak load distribution.

Figure 6 schematically illustrates the structure of a further device. The device corresponds to the device described with reference to Figure 3. However an element for energy conversion, heat production and heat storage 45 - arranged between turbine 35 and/or generator 42 on the one hand and evaporator 32 on the other hand - has been added. Such a device is exemplary for the following embodiments:

In a further embodiment of the method and/or device of energy the energy recovered by the method and/or device is introduced in the form of heat into a storage (Fig. 6) (45). From this the heat is again fed into the energy recovery cycle as required. This heat storage can have as a storage medium in various embodiments for example iron or another metal or simply consist of stone (for example basalt, granite, marble, fireclay etc.), or a liquid for example brine, molten salt or molten metal.

10 The advantage of this type of intermediate storage is the procurable much higher energy density in comparison to the storage of the carrier medium and thus weight at great height and therefore a substantially lower cost results. At the same time there is the possibility of heat being continually fed
15 into the evaporation process, which in some embodiments leads to the fact that no negative pressure arises in the building; this also provides some structural advantages.

The capacity of this method is shown by the example of 365 heat storages consisting of basalt ($0.84 \text{ kJ/kg} \cdot \text{K}$, 3000 kg/m^3),
20 which are heated to 600°C and each has a volume of $300 \times 300 \times 300 \text{ m}^3$. The heat quantity stored therein results in 15,000 Peta Joules, which rounded up corresponds to the annual requirements of the Federal Republic of Germany for primary energy during the year 2005. This amount of heat can be
25 generated by means of the method and/or the device for recovering energy illustrated here and can be available again to be used in other energy carriers.

In a further embodiment of the method and/or the device for recovering energy the return of heat just as the new
30 introduction of vaporization heat and optionally also the re-introduction of the basic heat of the carrier medium are performed in each case by a heat exchanger. These are

- expediently connected together by pipes in each case (Fig. 7). Thus: one heat exchanger collects the energy from the steam and/or the condensate of the carrier medium - this is the cooling unit - and transfers this to the transport medium.
- 5 The other returns this collected energy in the evaporator back to the carrier medium for evaporating - this is then the evaporator. These heat exchangers in various embodiments can be passive (= counter-flow, parallel-flow, cross-flow heat exchangers) and/or active (= heat pump).
- 10 If in an embodiment for heat transmission, passive heat exchangers are used by preference, since passive heat exchangers are not ideal, in one embodiment at least one further heat exchanger must be incorporated for transmitting the residual heat not transferred by the passive heat
- 15 exchangers for transmission of this to the evaporation process, or however in a further embodiment this residual heat is dissipated by the heat exchanger into the environment of the method and/or the device for recovering energy and must then be again compensated by an external energy input,
- 20 increased by this amount, to the evaporation process. The incorporation of this active heat exchanger is more expediently, but not necessarily carried out at the site of the evaporator, where the transmission paths of this residual heat to the evaporation process are short.
- 25 An example (Fig. 7) illustrates the flow of heat: it is assumed that the heat exchangers are counter-flow heat exchangers and the carrier, as the transport medium, is water and the flow temperature of the transport medium to the cooling unit (60) is 70°C and the outflow temperature is
- 30 100°C, the temperature of the steam of the carrier medium at the inlet of the counter flow is 102°C and at the outflow is 72°C, the flow temperature of the transport medium to the evaporator is 100°C, which in turn meets a carrier medium at

72°C. If this passive counter-flow heat exchanger of the evaporator (62) is now designed similarly to that of the cooling unit, a carrier medium at 98°C and a transport medium at 74°C are present in the outflow. At the same time, this passive heat exchanger however can only release a fraction of the energy buffered in the transport medium and thus for the cooling unit to again reach the flow temperature of 70°C necessary for operation, the residual heat must be actively dissipated and thus the temperature of the transport medium must be again reduced by 4° C. This is done by means of a heat pump (61) (= principle of the refrigerator) wherein the heat is expediently pumped in such a manner that it can be fed back into the evaporation process for evaporation.

Figure 8 shows the technical-physical principle of the simplified system, method and/or device for obtaining energy in the form of a quadrant diagram in which the functional groups are illustrated substantially as transitions between the quadrants. Exceptions include the external supply of energy in the form of heat (Fig. 8 (1)) and the consumer (Fig. 8 (2)) which are positioned outside the actual core region of the system, method and/or device. Also the generator (Fig. 8 (7)), the store (Fig. 8 (8)) and the circulation pump for the transport medium (Fig. 8 (11)), the heat recycling, such as the core pump of the system, method and/or device, the actual drive pump, the heat (Fig. 8 (12)) which drives or propels the carrier medium in the circuit for obtaining energy (Fig. 8 (9)) in the functional quadrants I and II.

The first functional group to be described is the heat exchanger (Fig. 8 (3)) which causes the phase transition of the carrier medium, in this case from liquid to gaseous, and represents, as a result of its arrangement and function, the gaseous state at low pressure and at low height (quadrant I).

The compressor (Fig. 8 (4)) then serves to increase the pressure and thus the volume, and also the temperature of the gaseous carrier medium. It thus forms the transition from quadrant I to II in which then the carrier medium is still
5 gaseous at elevated temperature and in which the drive pump drives it to a greater height. Subsequently, the heat is withdrawn from the gaseous carrier medium in the heat exchanger (Fig. 8 (5)) and the liquid state thus re-established. This heat, which after all contains the
10 evaporation heat at an elevated temperature level, and also the basic heat of the carrier medium, is made available again for the evaporation process in the heat exchanger (Fig. 8 (3)) via the circulation circuit of the heat (Fig. 8 (10)) by means of the transport medium. The cooled-down liquid now obtained
15 in this way is supplied in the functional quadrant III from the greater height to the turbine (Fig. 8 (6)) which is after all arranged at a lower height and in which the energy present in the pressure is converted into mechanical energy. The pressure on the turbine is in this case composed of the
20 increase in pressure which is provided by the compressor and the pressure provided by the difference in height. The mechanical energy thus obtained is now used in the functional quadrant IV as required, partly again for increasing the pressure in the compressor, and also for obtaining electrical
25 energy in the generator. The energy obtained in the generator can then be supplied, depending on the consumer's needs, either to said consumer or else to the store in that it can by way of conversion for example again be stored as heat or else in a different form as cited hereinbefore. The cooled-down
30 carrier medium, which is present at lower pressure after the turbine, is now returned to the evaporation heat exchanger, thus closing this circuit too.

As the amount of heat of the gaseous carrier medium has decreased as a result of the conversion of heat into kinetic and then into potential energy, the amount of heat returned through the circulation circuit is not sufficient to evaporate the same amount of carrier medium as had risen. This is then compensated for by the supplying of heat and by the increase of the base temperature of the carrier medium at the coolest point of the system, method and/or the device, which is present at the output of the turbine. Likewise, all lost heat of the actual components is used to increase the base temperature.

It will be understood that the described embodiments are merely examples which can be modified and/or supplemented in various ways within the scope of the claims.

Claims

1. Method including:

- converting a non-gaseous carrier medium into a gaseous carrier medium by means of introduced heat energy, so
5 that the gaseous carrier medium rises to a predefined height;
- compressing the gaseous carrier medium;
- reconverting the compressed gaseous carrier medium at a
10 predefined height into a non-gaseous carrier medium by means of a cooling circuit receiving heat of the carrier medium; and
- returning the heat received by the cooling circuit to be used for heating the carrier medium.

15 2. Method according to claim 1, wherein the compressing of the gaseous carrier medium takes place as follows:

- immediately after the converting of the non-gaseous carrier medium into a gaseous carrier medium; or
- immediately before the reconverting of the compressed
20 gaseous carrier medium into a non-gaseous carrier medium; or
- on the passage between the converting of the non-gaseous carrier medium into a gaseous carrier medium and the reconverting of the compressed gaseous carrier
25 medium into a non-gaseous carrier medium.

3. Method according to claim 1 or 2, including:

- driving a turbine by decompressing the compressed gaseous carrier medium.

30 4. Method according to one of claims 1 to 3, including:

- allowing the recovered non-gaseous carrier medium to fall from a higher height to a lower height in such a

way that the non-gaseous carrier medium at the lower height drives a turbine.

5. Method according to one of claims 3 or 4, including:

5 using the energy provided by the turbine

- to assist the compressing of the gaseous carrier medium by means of mechanical coupling; or

- to reduce, after a conversion into a different energy form by means of the resulting energy, the energy

10 required for compressing the gaseous carrier medium; or

- additionally to heat, after a conversion into heat energy, the carrier medium before, in or after the converting of the non-gaseous carrier medium into a gaseous carrier medium.

15 6. Method according to one of claims 3 to 5, including:

- cooling a transport medium comprised by the cooling circuit by means of the carrier medium after said carrier medium has been used to drive the turbine.

20 7. Method according to one of claims 3 to 5, including:

- exchanging a transport medium comprised by the cooling circuit with non-gaseous carrier medium after said carrier medium has been used to drive the turbine.

25 8. Method according to one of claims 1 to 7, wherein the carrier medium is additionally subject throughout the method to a pressure which exceeds the ambient pressure and which is further increased by the compressing.

30 9. Method according to claim 8, wherein additionally a transport medium comprised by the cooling circuit is subject throughout the method to a pressure exceeding the ambient pressure.

10. Method according to one of claims 1 to 9, including:

- at least partially extracting the recovered non-gaseous carrier medium for external use.

5

11. Method according to one of claims 1 to 10, including:

- guiding the gaseous carrier medium during its rise through at least one constriction.

10 12. Device comprising:

- a cavity;
- an evaporation chamber which is arranged at the lower end of the cavity and formed for converting a non-gaseous carrier medium into a gaseous carrier medium by means of introduced heat energy, so that the gaseous carrier medium rises to a predefined height;
- compression means formed for compressing the gaseous carrier medium;
- a cooling circuit formed for reconvertng the compressed, gaseous carrier medium at the predefined height into a non-gaseous carrier medium by receiving heat of the carrier medium, and formed for returning the received heat to be used for heating the carrier medium.

25

13. Device according to claim 12, wherein the compression means are arranged in the cavity as follows:

- immediately after the evaporation chamber; or
- immediately below the predefined height; or
- on the section between the evaporation chamber and the predefined height.

30

14. Device according to claim 12 or 13, comprising a turbine which is formed to be driven at least by decompressing the compressed gaseous carrier medium.
- 5 15. Device according to one of claims 12 to 14, comprising:
- a falling path formed to allow the recovered non-gaseous carrier medium to fall from a higher height to a lower height; and
 - a turbine arranged at the lower height and formed to be
10 driven at least by the kinetic energy from falling carrier medium.
16. Device according to one of claims 14 or 15, comprising at least one of the following:
- 15
- a mechanical coupling between the turbine and the compression means;
 - an energy conversion arrangement formed for converting the energy provided by the turbine into a different energy form and for providing the resulting energy for
20 the compression means; and
 - an energy conversion arrangement formed for converting the energy provided by the turbine into heat energy and for providing the heat energy for additional heating of the carrier medium before, in or after the converting
25 of the non-gaseous carrier medium into a gaseous carrier medium.
17. Device according to one of claims 14 to 16, comprising:
- a heat exchanger formed for cooling a transport medium
30 comprised by the cooling circuit by means of the carrier medium after said carrier medium has been used to drive the turbine.
18. Device according to one of claims 14 to 16, comprising:

- exchange means formed for exchanging a transport medium comprised by the cooling circuit with non-gaseous carrier medium after said carrier medium has been used to drive the turbine.

5

19. Device according to one of claims 12 to 18, comprising excess pressure means formed for adjusting a pressure on the carrier medium, which pressure exceeds the ambient pressure and is further increased by the compression means.

10

20. Device according to claim 19, wherein the excess pressure means are formed for adjusting a pressure on a transport medium comprised by the cooling circuit, which pressure exceeds the ambient pressure.

15

21. Device according to one of claims 12 to 20, comprising:
- an extraction point for at least partially extracting the recovered non-gaseous carrier medium for device-external use.

20

22. Device according to one of claims 12 to 21, comprising:
- at least one constriction formed for allowing the gaseous carrier medium to pass during the rise thereof.

25

23. System comprising a device according to one of claims 12 to 22 and also at least one device formed for obtaining heat energy which is provided to the device according to one of claims 12 to 22.