Title: COHERING, CONCENTRATING CONVECTIVE CURRENT PRODUCER AND METHODS OF INITIATING AND HARNESSING CONVECTIVE CURRENTS

Abstract: Methods of manufacturing cohering, concentrating convective current producers with methods of harnessing convective currents via density differences.
Cohering, Concentrating Convective Current Producer and Methods of Initiating and Harnessing Convective Currents

This invention teaches a radical approach for manufacturing cohering, concentrating convective current producers and discloses methods of harnessing convective currents via density differences with alternative solutions to some commonly encountered problems in this field. Because this invention is so radical I take care to describe the background to the approaches employed in the exemplary embodiments described later.

Background

Readers skilled in the arts employed in my invention should be familiar with the history of the natural philosophy, science and technology invoked herein since it is well established and runs back over many centuries. Professor Enzo Levi provides an excellent historical review that covers 2,300 years in the evolution of Hydraulic Science; "El Aqua Segun La Ciencia" (The Science of Water - The Foundation of Modern Hydraulics). Almost all the initiators of concepts covered within my invention are well described in his monumental tome, in particular Heron of Alexandria, Archimedes, Leonardo da Vinci, Galileo, Torricelli, Venturi et al - through Osborne Reynolds and Sir Charles Parsons up to modern heroes too many to mention here.

To spare the intelligent reader repetition of what should be well understood, I will omit rehearsal of fundamental concepts. However, unfortunately many of these ideas may have been skipped over and I urge readers to ensure their thorough, intimate understanding of terms that previously may have been glossed in haste (e.g. Siphon, Archimedean displacement, Venturi, Henry's Law, cavitation - particularly pre-inception phases, vortices, the profoundly universal implications from the four laws of thermodynamics and so on).

To give a specific example of common misapprehension, there are only two Oceans - at the base of one, as Torricelli remarked, we dwell (Noi viviamo sommersi nelfondo d'un pelago d'aria). The other Ocean (effectively all one recycling body) is made of that most peculiar substance, water. Air and water occupy the genus 'fluid' and, apart from an approximate density difference with three orders of magnitude, they share many similarities in their flowing behaviour. Although water is roughly 1,000 times denser than air and sub-classed as a liquid, it remains useful to consider it as part of the fluid family. Both air and water interact constantly, not only with respect to Henry's Law; without this perpetually churning interchange, life as we know it, including our own - would not exist.

There are many brave attempts to harness useful work from our natural world but sadly so many of them echo our early hunter-gatherer forebears who only later employed slash and burn methods of agriculture before civilisation dawned. We burn fuels foolishly - or vainly we try to catch capricious wind and wave - else we look to intermittent sun and tide. Ultimately, all natural energy stems from these prime movers - our sun or gravity. Wind comes from solar radiation and gravity; waves arise from wind - everything energetic leads back to our stars or our earth's gravity, sine qua non. So far we seem to have ignored the massive potential energy that seethes and constantly recycles over two thirds of our planetary surface. It is this potent energy that I seek to harvest and harness with my invention, turning it to useful and productive work. Apart from producing mechanical and electrical energy, I also show how I can produce benign side effects, such as cooling, producing clean water, enhancing fish stocks, safely disposing of waste heat and so on.
The Natural Philosophy of the Current Invention

First, a mental picture: if beneath the sea-bed there existed a massive, empty cavern, then clearly a hole drilled in the sea-bed would cause water to rush through it, most likely in the same form as the familiar 'bath tub vortex'. If we placed a turbine at this exit, it would rotate rapidly and we could extract work from what was once potential and is now kinetic energy. That work could then be further translated or transmitted via electrical, hydraulic, pneumatic or other means to a ship-based or shore-based station.

Lacking such a vacant cave and aperture, one could assume that the seawater had no further to fall and could therefore yield nothing useful. However, the Ocean - as noted earlier, perpetually recycles. It does this courtesy of the sun, gravity and density differences. Convection, the same engine that powers our atmosphere, operates gravitationally on density differences - not merely those caused by temperature. Winds and currents are generally seen to move horizontally, yet convection obeys gravity and operates in the vertical. The reason we see the preponderance of horizontal winds and currents is because, relative to the depths of both the atmospheric and marine Oceans, their widths are several orders of magnitude wider than their heights.

If the entire marine Ocean, to scale, were portrayed as a broadsheet newspaper page, then its depth would be equivalent to the thickness of that page. Convection's vertical preference yields to the more easily available sideways route.

Sometimes vertical movements hold sway - tornadoes in the atmosphere, eddies, rising air bubbles and salt-fingering in the seas - all adopt the vertical mode of transport. Salt-fingering, since identified via Jevons (1857) and Lord Rayleigh (1883) as 'double diffusion' is the mechanism behind "An Oceanographical Curiosity: The Perpetual Salt Fountain" by Stommel; et al (1956).

The Ocean holds (actually continuously captures and releases) over 2.5 % of 'dissolved' air. For the most part there is no ionic bonding involved and the term 'dissolved' should perhaps be modified to 'suspended' albeit in visually hard-to-detect nano-bubbles ('invisibubbles').

This air readily releases and congregates at the slightest reduction in pressure or at any obliging nucleation point such as suspended particles and so on. Rising bubble columns readily entrain surrounding water; such rising water itself will become 'super-saturated' as it ascends into less pressure thereby precipitating more bubbles.

In a kettle one can hear the de-airing process prior to the quiet pause when true water boiling commences. This mechanism is also known as pre-inception cavitation. In the oil and gas industries, their de-gassers operate by means of centrifugal 'cyclonic' devices.

We can see then that the Ocean not only holds potential energy and density differences but also constantly exchanges them by various means. My invention nurtures and encourages this exchange process, then harvests the kinetic energy thus realised.
The Technology and Engineering of the Current Invention

Prior Arts


Exemplary Embodiments of the Current Invention

Because this is a radical, new invention with broad and universal scope, I demonstrate some specific, simplified and idealised embodiments to aid the reader's understanding. This simplification should not be interpreted as in any way limiting the universality of variations on these principles that should be apparent to any reader skilled in the art.

This unique combination of the principles and effects of: Bernoulli's Effect (Venturi), Archimedean Displacement, Convection, Siphonic Flow (whether in real or 'virtual' siphon systems), Cyclostrophic (centrifugal effects), Henry's Law, Pre-Inception Cavitation, Cyclonic De-gassing, air/bubble lift pump; all combine within a 'McNulty Dervish Unit' to initiate, then harvest energetic flow in a completely new inventive step. Maxwell's Demon was an imaginary miniature molecule-sorter creature conjured by Maxwell to help understanding; as an homage to Maxwell's Demon, and for brevity, I have referred to the novel mechanism producing the combined sorting effects incorporated above as a McNulty Dervish.

Explanation of Diagrams

In a preferred and idealised exemplary embodiment of this invention I now refer to a series of illustrative diagrams to enumerate and describe the main components.

Figure 1 shows an overview of a simplified system, not to scale, with an on-shore turbine generator assembly TGA, two feed-pipes FP1 and FP2, and a McNulty Dervish Unit MDU.

Figure 1a shows a view of a ship-mounted system similar to that shown in Figure 1.

Figures 2 a, b, c, d, e & f represent sequential views of operation.

Figures 3 a and b show plan and elevation views of a McNulty Dervish Unit MDU, the Venturi Tube VT, the Cyclostrophic Inducing Geometry CIG, the Feed Pipe FP2. The Feed Manifold FM, The Supporting Structure SS, and the Injector Pipes IP.

Figure 4.1 shows a schematic representation of a cooling, condensing and return piping system CCRPS running on from the same type of turbine generating assembly in figure 1.

Figure 5 shows a McNulty Dervish Unit MDU without feed pipes but with integrated flow capturing / generator assemblies FCGA (in place functionally of the on-shore/on-ship Turbine Generator Assembly TGA) and electrical feed cables EFG running back to shore (or ship).
Operational Sequence
The Turbine Generator Assembly (TGA) initiates the flow by pumping water from Feed Pipe 1 (FP1) through Feed Pipe 2 (FP2), then though the Feed Manifold (FM) and ultimately out from the Injector Pipes (IP). Note that this method is purely exemplary and that there are many alternative means of initiating and harnessing flow, some of which are listed elsewhere in this description.

Once flow proceeds from IP then both swirl and upward flow from the top of MDU will ensue. More, displacing water will flow upwards through the MDU from below. As this entrained flow-through develops, the Venturi and cyclostrophic effects will create a centrifugally self-refining low-density vertically axial spinning column extending from within the MDU and upwards towards the sea surface, slightly reminiscent of an air/bubble lift pump. Suction thus created at the IP will reach back through FP2, TGA and FP1. The siphonic flow thus caused can now perform work on the turbine in the TGA and it can now switch to generator rather than motor mode so electricity will flow from the TGA. Note that the (previously surface) water running through the system will be both relatively ‘supersaturated’ with air and warmer than the deeper water, thus aiding buoyancy effects within and from the MDU. Additionally, extra air could be drawn in or injected within the flow - indeed it would be possible to run an additional or supplementary air-based system conjointly or in parallel with the system as described even to the extent of running the TGA as an air turbine. Excess air (effectively compressed) could also be captured after exit from the MDU and piped back to an air version of the TGA. The warmer water (media) mentioned above may be considerably warmer than simply surface seawater if, during the land or ship-based portion of the flow, it picked up additional heat from the ambient surroundings, whether this effect was used for cooling, condensation or other useful purposes. Again this heat, although perhaps considered normally as too low-grade to perform useful work, would add considerably to the subsequent upward buoyant flow from the MDU.

Power Take-Off and Initiation Processes
It should be emphasised that there are two perpetual energetic cycles on the planet; the water-in-air (hydrodynamic) cycle is generally well known, typically we divert and harness the descending portion for power take-off, via river dams and hydroelectric schemes. Less known is the air-in-water cycle - almost an inverse of the former. Air dissolves in water, compressed ‘invisibubbles’ sink; later they nucleate, precipitate/expand as ‘visibubbles’, entrain water with them and rise to the surface. In an analogous manner, I can divert and harness the ascending portion for power take-off. In the bulk of this narrative I have referred to turbines and electricity as the obvious means for extracting energy, but clearly many other forms of power take-off and energy production could be employed at suitable points in the cycle. Additionally, the means of initiation discussed herein should not be taken as exclusive to other processes. Essentially, any means of causing current flow - including but not limited to: nucleation, precipitation, heating, aeration, rarefaction, pressure changes, sonic modulation, electrolysis - could be employed singly or conjointly to start and/or sustain the process. Although this description is an outline showing exemplary embodiments, there are many variations and embodiments possible utilising the general themes and approaches outlined herein and the scope of this document should be interpreted in its general principles of utilising this ‘initiator and harnesser of convective currents’ to overcome some of the common limitations encountered in the generation of natural clean energy and the like.

John McNulty
Claims

Although specific exemplary embodiments have been employed herein to establish a context for describing the system, it has much wider applicability within the fields of energy production, harvesting and beyond - in such consequential environmental applications as water treatment, cooling, pisciculture and so on. Consequently, varying modifications thereof will be apparent to those skilled in the art without departing from the scope of the invention as defined by the appended claims:

1/ A coherent current initiator and concentrator assembly, comprising a plurality of Venturi and vortex inducing elements, assembled to yield vortical axially oriented low pressure current flows, deliberately designed to cause sustained ascending low pressure regimes that in turn create self-amplifying increasing buoyancy, including means of initiating and harnessing current flows, such means being either locally or remotely connected, where such initiation means may be mechanical, as in turbines or agitators, electrical, electrolytic, thermal, sonic, or via gaseous or fluid injection and where such harnessing means, also locally or remotely connected, may be via turbines, generators, pressure difference transducers, magnetohydrodynamic transducers, thermal difference transducers or hydraulic transducers

2/ An assembly as in claim 1, where the remote means are connected by pipes, conduits or cables to an on-shore or on-ship energy harvester, converter and controller
3/ An assembly as in claim 1, where additional means are provided for temporarily storing and then transmitting higher pressure fluids to shore or ship for later employment in useful work.

4/ An assembly as in claim 1, where the assembly may be securely physically anchored to the bed of a body of water or river, or may be moored so that it is situated at an optimum convenient point between the bed and surface.

5/ An assembly as in claim 1, where an additional extra pressure ('head') may be created by means of pipes and chambers arranged below the level of the main assembly, thereby creating extra 'head' pressure.

6/ An assembly as in claim 1, where extra buoyancy is provided to the assembly by means of warmer, aerated or gaseous fluids piped from external sources.

11 The application of the assembly as described in claim 1, to provide both heat transfer and condensation of atmospheric vapour via suitable piping arrangements to and from the assembly and to and from a ship or shore based installation.

8/ The application of the assembly as described in claim 1, to provide transport of nutrient rich deeper water to the surface in order to encourage and nurture natural food chains.

9/ The application of the assembly in claim 1, to provide a naturally enhanced means (via the claim 8) of 'sinking' carbon within the long-term marine carbon cycle.
A. CLASSIFICATION OF SUBJECT MATTER
INV. F03B17/00
ADD.

According to International Patent Classification (IPC) and/or both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C. See patent family annex.

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