I2P Competition

Sustainable Water Pump

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Figure 1. Above-ground system

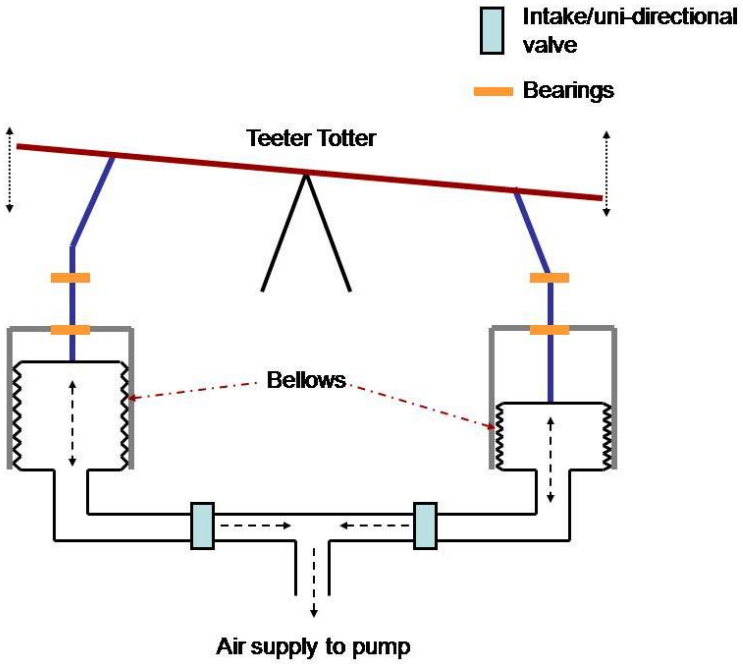
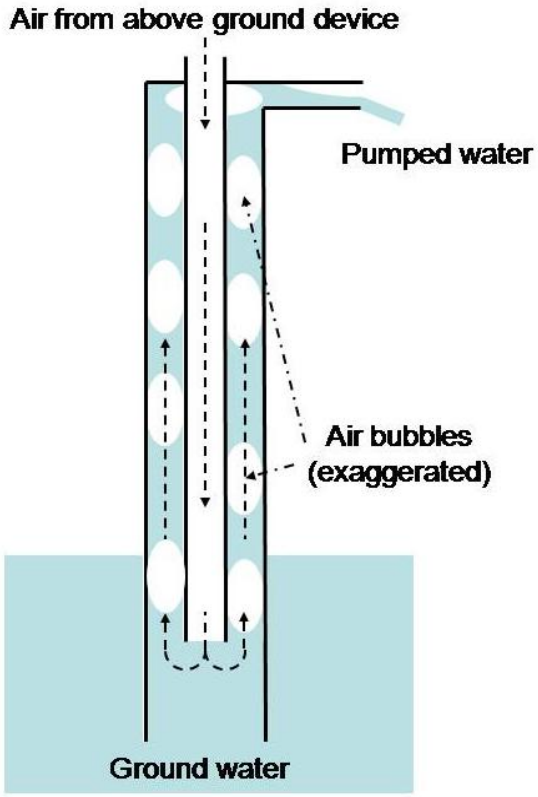


Figure 2. Below-ground system



General Overview:

Clean drinking water is a universal necessity, and one that many people in America take for granted. However, for approximately 600 million people in this world, safe drinking water and sanitary conditions are not easily accessible (UN press release, March 2006). Nevertheless, there may be hope for many of these individuals, as "Underused water resources in parts of Africa offer great potential for irrigation, especially using simple and inexpensive technologies," (UN Food and Agriculture Organization). In light of these startling reports, students from Christian Student Fellowship (CSF) have decided to explore a creative way to provide access to safe water.

To achieve this goal, we propose to develop a simple and inexpensive airlift pump. The proposed pump has no moving parts below the ground and requires no electricity to run. The air lift pump concept is a decades-old device that uses buoyancy to lift a column of water, which has the potential to provide communities with potable water. The background research clearly indicates that a need exists for such a cost-effective solution to a pressing problem.

To develop this concept, CSF will partner with Lifewater International, a non-profit organization that has been installing wells and working with communities for almost 30 years. In keeping with the vision of our partner, CSF will help to create a cost-efficient product in which a community can take ownership.

Product Overview:

The proposed airlift pump involves an above-ground system and a below-ground system. The above-ground system consists of a user-operated pumping mechanism that will deliver air into the pipes below the ground, while the below-ground system consists of a set of pipes that will deliver air downward, or water upward.

Above-Ground:

Since Lifewater requires a pump made of inexpensive and durable materials, the above-ground system will be constructed from objects that can be found in local junkyards and landfills. Hence, small villages could be creative in solving problems that arise from faulty materials, thus eliminating the need to wait for expensive parts.

The preliminary design of the above-ground system consists of a teeter-totter, two fifty-five gallon drums, and piping. The teeter-totter mechanism will inject air into inflatable bellows encased within the fifty-five gallon drums as shown in Figure 1. The teeter-totter design makes the system more efficient by allowing work to be done with each arm. The downward motion of each arm will inject air into the drums, down through the pipes, and into the well.

Below- Ground:

Currently, Lifewater uses drill bits, four inches in diameter, to drill their wells. Consequently, the entire below-ground system will need to fit in a cylindrical space with a four-inch diameter. To facilitate this, the below-ground pump will consist of two vertical concentric polyvinyl chloride (PVC) pipes in the ground, an outer pipe with a maximum diameter of four inches and an inner pipe with a smaller diameter. These pipes will extend below the water table (the depth and percent of pipe submerged will vary from well to well). Air will be pumped down through one of these pipes, creating air bubbles underneath the water bolus in the other pipe, which pushes this water up to ground level. An added advantage of this system is the absence of moving parts below the ground, thus greatly reducing the chance of this portion of the pump failing and needing repairs.

Current Technology

The technology of the airlift pump is not new by any means. There is related material published in patent 2,399,634 dated May 7, 1946. In fact, this technology can be seen in many other industrial applications, like pumping oil, sludge, etc. It is believed that because of the unique way of injecting air into the system and its non-industrial use, this pump will not infringe on any existing patent.

Competition/Market

CSF would encourage competition for this product. As previously stated, the purpose is to provide clean drinking water to those who need it. Because this market does not seem to have a large margin for revenue, CSF assumes that competitors in the market would have non-profit objectives, similar to those of Lifewater International. CSF believes that competition would encourage improvements in technology, and consequently help more communities in need.

Although the proposed product corresponds to technology of an existing airlift pump, an innovative approach is used to accomplish a durable and inexpensive design. The design uses recyclable and easily accessible materials. It includes no moving parts below the ground, therefore minimizing the need for costly maintenance. In addition, the well can easily be operated by one or two people—either by one person standing and moving the arm of the pump up and down with handles, or two people sitting and moving the arm with their legs, just as if they were on an actual teeter-totter.

It should also be noted that Lifewater is already established in various communities of nine different countries, therefore providing the opportunity for ready placement of this pump in communities around the world that are in need of potable water.